



**In the dark depths
of the rainforest,**

The Bats of Southwestern Amazon thrive

A book about the BR-319 highway

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In the dark depths of the rainforest,

The Bats of Southwestern Amazon thrive

The primary aim of this book is to debunk prevalent misconceptions about bats while highlighting their wide array of species, shapes, and colours. This book takes a clear, educational approach to teach readers about the bat species living along the BR-319 highway. This road runs through the rainforest between the cities of Manaus and Humaitá. Readers will also learn about what these bats eat, their role in nature, and how they help the environment. We especially want to highlight that bats don't threaten people nearly as much as some think. We hope you find this book interesting and will share what you learn. Enjoy reading and learning!



In silence and darkness, while we sleep, they soar high above our heads. They return home only when we retire for the night, at dawn. Who are they? If you guessed “bats,” your answer is correct! If you couldn’t answer, that’s perfectly fine. Bats are among the animals with which we have the least interaction, and many details about them remain unknown to most people. Bats are mammals, just like dogs, porpoises, and you, reading this book. Mammals feed milk to their babies until they can eat on their own and become independent. However, one thing sets bats apart from us and other mammals: their remarkable ability to fly! Among

all the creatures that feed, only bats possess the remarkable ability to flap their wings and gracefully take flight. Although they are often mistaken for birds, the creatures we commonly observe in the skies and forests, bats have more in common with tapirs than with macaws, or toucans. Isn’t that intriguing?!

What exactly is a bat?

Bats are typically small creatures that are most active during the twilight and nighttime hours, which is why researchers classify their behavior as crepuscular-nocturnal. Globally, there are approximately 1400 species of bats, with 182 species recorded in Brazil. They inhabit nearly every corner of the world, except for the coldest regions like the North and South Poles, as well as some isolated islands far from continents.

The dietary preferences of most bat species primarily include fruits, flower nectar, insects, fish, small frogs, and mice. Some even subsist on blood, though it's worth noting that human blood is not a staple in the diets of these species. Instead, they typically prefer the blood of birds and other mammals that also inhabit the forest.

Bats can exhibit various colors, including



FIGURE 1. Bat flying inside a cave.



FIGURE 2. The primarily carnivorous bat *Chrotopterus auritus* in a shelter.





FIGURE 3. Pregnant female striped-faced bat *Artibeus lituratus* in a shelter.



FIGURE 4. *Micronycteris microtis* shelters in the tree canopy.

shades of brown, black, gray, and even reddish or yellowish hues. Some species may have distinct markings or patterns on their fur or wings. The specific coloration and patterns can serve different purposes, such as camouflage, species recognition, or signaling.

Bats may spend most of their lives alone or are social and live (FIGURE 1), in small groups or even in groups with thousands of other bats (FIGURE 2).

During the day, nocturnal bats roost in shelters they have constructed or just occupy some naturally formed location. The shelters they build may be made from palm or caeté leaves (FIGURE 3). Caeté leaves are from a type of palm tree (*Acrocomia aculeata*) which is native to Brazil and very common in the Amazon rainforest region. Its leaves have sharp spines along the edges and underside midrib. The spiny leaves help deter predators and protect bat colonies living inside where they are unlikely to be seen by predators. There are also those who dig into abandoned termite nests in trees, creating a small hole to shelter their little family. Others simply take shelter in branches in the treetops (FIGURE 4).

Fun fact: Did you know that the structure of bat wings is very similar to that of our hands? They have five fingers (including a big toe!) and all the bones and joints (FIGURE 5). That's why scientists call bats Chiroptera. The word "Chiroptera" comes from the Greek words "cheir" meaning hand and "pteron" meaning wing. Have you ever imagined flying with your own hands?

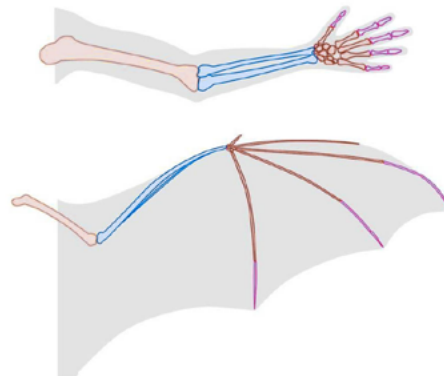


FIGURE 5. Similarity between a human's arm and a bat's wing. Each color corresponds to homologous bones (of the same embryonic origin). Note that our upper limbs are homologous to bat wings: they have the same origin, but with different functions.

While most people are aware that most bats are active at night, not so many know how they communicate and navigate in the dark. Bats “visualize” their surroundings in darkness by emitting extremely high-frequency sounds known as ultrasound. In addition to emitting these sounds, bats have the remarkable ability to detect the echoes produced when these sounds bounce off objects (as shown in FIGURE 6). This process is called echolocation, enabling bats to determine the position and distance of objects in their vicinity. It lets bats figure out where things are and how far away they are. It’s like they have a map in their brains!

This extraordinary ability allows them to fly and “see” in the darkness, locate food, and navigate without colliding into obstacles. However, it’s important to note that bats are not blind; some have excellent vision!

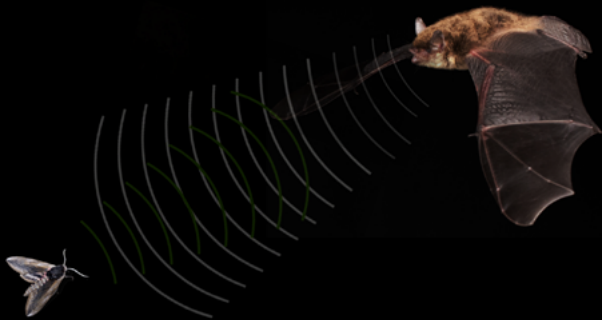


FIGURE 6. Bats emit sound waves and hear their echo when they encounter an object, like a moth ready to be preyed upon!



FIGURE 7. *Pygoderma bilabiatum*, showing that bats vary greatly in their morphological characteristics, such as colors, eye shape and size of the nasal leaf.

Bats also use their great sense of smell to find tasty meals in the forest (as depicted in FIGURE 7).

Fun fact: While humans can hear sounds within the frequency range of 2 to 20 kHz, bats emit sounds through their nostrils or mouths and can hear at significantly higher frequencies, ranging from 20 to an astonishing 215 kHz, depending on the bat species. This wide range of ultrasonic frequencies is a key reason why we seldom hear their calls. Just imagine the cacophony if we were capable of hearing the high-pitched calls of hundreds of bats flying overhead every night! Fortunately, we’re spared from that experience, but it’s a remarkable example of the diverse and specialized sensory abilities of different species.

In Brazil, there is a diverse array of at least 182 different bat species with varying dietary preferences. Along the BR-319 route between Manaus and Humaitá, researchers have identified and documented 31 species so far. It's important to note that the majority of these bats do not feed on blood and have different dietary habits. Instead of feeding on blood, they consume mosquitoes, midges, flies, moths, and various other insects that can be a significant nuisance in the forest. The presence of bats is crucial as they effectively capture insects while flying, making them known as aerial insectivores (as shown in FIGURE 8). Without this feeding strategy, airborne pests could become even more problematic.

FIGURE 8. *Myotis riparius*, an aerial insectivorous bat, that is, a bat that captures insects in the air for food.



But remember that crickets, katydids, spiders, and other invertebrates also make up the diet of some bats. These animals are discovered by bats when they are perched on plants, in foliage, or on trunks and branches. Because they are specialists at hunting these little creatures, these bat species are known as gleaning insectivores.

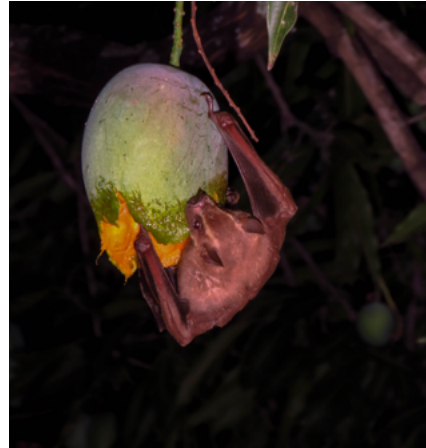


FIGURE 9. Striped-faced bat *Artibeus lituratus* feeding on a mango in a yard.



FIGURE 10. *Platyrrhinus lineatus* eating an embaúba fruit.

On the other hand, some bats simply haven't adapted to dining on insects and prefer juicier, sweeter things like fruits; these bats are known as frugivores. Bananas, mangoes, and guavas are among the many fruits consumed by these species (see FIGURES 9, 10).



FIGURE 11. Nectarivorous bats have an elongated face and long tongue to reach the nectar inside the flowers.



FIGURE 12. *Noctilio leporinus*, the fishing bat, is also known as the bulldog bat for its large cheeks – the place where it stores the fish it chews to eat later!



While many bats have a diverse range of dietary preferences, some bats find that fruits are not sweet enough and instead opt to consume nectar. These bats are known as nectarivorous bats (as shown in FIGURE 11), because they drink the nectar from flowers and may also consume their pollen, similar to a hummingbird, but during the night. In addition to bats that feed on insects and plants, there are those that eat meat: carnivorous

bats! Small rodents, frogs, and even other bats are on the menu for these species. But there is a red-headed bat that may have observed the edges of bodies of water and deduced that fish were delicious. This species decided to make small fish the main course on its menu! The fishing bat (as depicted in FIGURE 12) typically lives near large streams, rivers, and lakes close to where you reside.

Furthermore, there are those bats that have gained notoriety for their unique feeding habits: **vampire bats**! They have a penchant for feeding on blood and are appropriately called **hematophagous** a word which is derived from two Greek words: "haima," meaning blood, and "phagein," meaning to eat or consume. Worldwide, only three species exhibit this behavior. Two of them, *Diphylla ecaudata* (depicted in FIGURE 14) and *Diaemus youngii* (shown in FIGURE 15), prefer the blood of birds, while the third, *Desmodus rotundus* (seen in FIGURE 13), feeds on the blood of peccaries, tapirs, and deer. On occasion, when these larger animals are scarce in the forest, bats seize the opportunity in people's surroundings, to feed on the blood of chickens, pigs, cattle, horses, and even the toes of unsuspecting humans. However, such occurrences are rare.

With these diverse dietary preferences, the vital role of these species in the environment becomes evident: they help control insect populations, disperse seeds from the fruits they consume, and even pollinate the flowers from which they drink nectar. Can you imagine what a forest would be like if bats were eliminated?



FIGURE 13. Vampire bat *Desmodus rotundus*, the most common of all, feeds on mammalian blood.



FIGURE 14. *Diphylla ecaudata*, feeds on bird blood.



FIGURE 15. *Diaemus youngii*, feeds on blood mainly from birds.

Of course the lives of bats go beyond their feeding habits, and their reproductive and parenting methods are both curious and unique. Females and males typically reach adulthood and are able to reproduce, at around 2 years of age. Bat mothers can experience up to two pregnancies per year, each lasting approximately 3 months, resulting in one or two babies per year. Most species tend to have only one baby at a time, similar to the one depicted in FIGURE 16. Births and nursing usually coincide with times when there is an abundance of food, such as the end of the dry season and the middle of the rainy season. This is because mothers require a significant amount of energy and dedication to nurture their offspring, as illustrated in FIGURE 18. After giving birth, how do these mothers care for their babies?



FIGURE 16. Gravid female *Rhinophylla fischerae*.

FIGURE 17. Female *Carollia* in the shelter with her calf and a juvenile nearby.



FIGURE 18. Female *Micronycteris microtis* with her baby attached to her nipple. The baby stays there even during its mother's flight.

During the reproductive period, females of certain species establish maternity colonies, where multiple females gather together to raise their offspring in a single shelter. Within these colonies, they cooperate and provide mutual assistance: some females may care for the babies while others venture out in search of food. The females that leave the shelter return with food for those who remained behind. However, in most forest-dwelling species, females carry their young with them when they

forage. The baby bats cling to their mother's nipples beneath their wings (as depicted in FIGURE 17). These juvenile bats possess baby teeth that are shaped like small hooks, which help them securely attach to their mother's body, preventing them from falling while she is in flight. This behavior continues until the young bats develop the ability to fly and feed for themselves.

Can bats transmit diseases?

The issue of the rabies virus

But what is rabies, anyway? Rabies is a zoonosis, meaning it's a disease that can be transmitted from infected animals to humans. Rabies has no cure and is caused by a virus that can only be transmitted among mammals. It's important to emphasize that the rabies virus is not solely transmitted by bats! The number of cases of this disease has increased with the rise in deforestation and, subsequently, the human population, underscoring the importance of preserving our forests. When infected with the rabies virus, bats can die and display symptoms such as disorientation in flight, weight loss, aversion to light, and even an inability to fly! Despite being commonly associated with the bat that feeds on the blood of other mammals, *Desmodus rotundus* (depicted in FIGURE 19), it is not the species that presents the highest infection rate. However, due to its feeding habits, it can more easily transmit the virus to other mammals. This bat takes between 9 and 30 days to succumb to the disease and, in most

cases, does not exhibit aggressive behavior. The virus is transmitted through contact between the infected animal's saliva and the site of the bite when the bat feeds on the blood of other animals. Although they were not captured on BR-319, it's likely that the three species of vampire bats are present in areas near the highway. However, please remember that **out of the 1400 bat species, only three are known to feed on human blood**, and they typically do not inhabit human dwellings. Therefore, most of the bats you have seen or will encounter in your life are likely insectivorous or frugivorous, which are the most common types in the Amazon, as you will see below.

Important! In case of an accident, suspected contact with an infected animal, or if you notice bites on your body, especially in children and on the toes, seek immediate medical attention at the nearest Basic Health Unit. It is possible to receive rabies vaccine doses after potential exposure to a rabid animal. The rabies vaccine is crucial for preventing the disease and saving lives. Rabies is an incurable disease. Do not risk your life.



FIGURE 19. Vampire bat *Desmodus rotundus*. Note the size of the finger of this species compared to the others.

The Bat Species along the BR-319

Biologists who have studied bats here have identified several bat species. To accomplish this, they needed to capture the bats to observe certain morphological characteristics and take measurements of their bodies, such as the length of the forearm.

In Brazil, bat species typically do not have common names, as these animals are elusive, constantly on the move at night, and challenging to observe up close. This makes it difficult for people to study them extensively and give them nicknames based on their characteristics or be-

haviors. To avoid confusion, scientists use scientific names (Latinised) for each species, and these names will be used in this guide. You are welcome to create your own names to help you remember the species and highlight significant characteristics. This way, you can learn about them and share your knowledge with others! But first, take a look at the names of some parts of a bat's body in FIGURE 20.

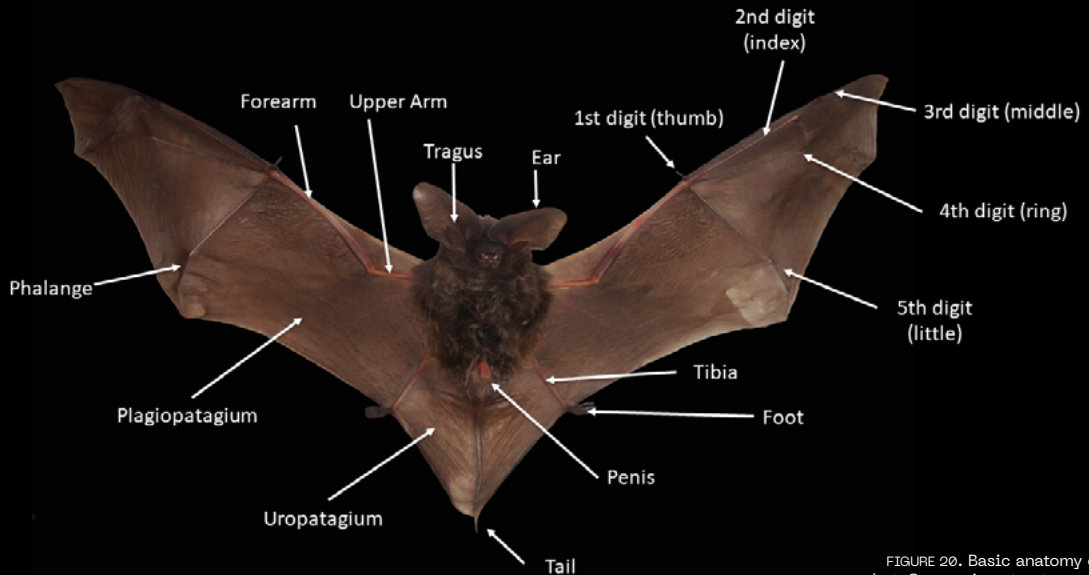


FIGURE 20. Basic anatomy of a bat. Some wing structures may be absent in other species, such as the uropatagium and tail.

Now that you've gained some insight into what bats are like and what they do, delve deeper into the biology of each species that inhabits the silence and darkness of BR-319, within one of the world's most biodiverse environments: the Amazon Rainforest! This guide is not exhaustive, and there are more species in the region than we can describe here. However, if you come across any of them, you can refer to this guide to aid in their identification. Observe the diversity of nasal leaves, teeth, and feeding habits among these species.

Your nighttime adventure begins here!

Have a good time!



Note the particularities of
each species' dentition!
This is a *Hsunycteris*
thomasi.

Family Phyllostomidae

This family boasts the highest number of species in Brazil (93) and showcases a wide diversity of ecological, morphological, and behavioral characteristics. Most species within this family possess a nasal leaf, which is an extension of the skin on their nose. This structure serves to direct the sounds emitted by bats to different locations in their environment.



Carollia perspicillata

* Species of the genus *Carollia*

Description: Bats belonging to this genus are small (10 – 23 g) and typically display grayish or brownish coloring. They have a nasal leaf and medium-sized ears. Identifying them to the species level can be challenging, as the primary difference between them often lies in the shape of their skulls.

Diet: These bats are frugivores. They consume small, soft fruits from the forest, such as peppers and jaborandis, as well as pollen and nectar. Their feeding habits contribute to seed dispersal, promoting forest regeneration, and they also play a role in pollinating flowers, leading to fruit production.



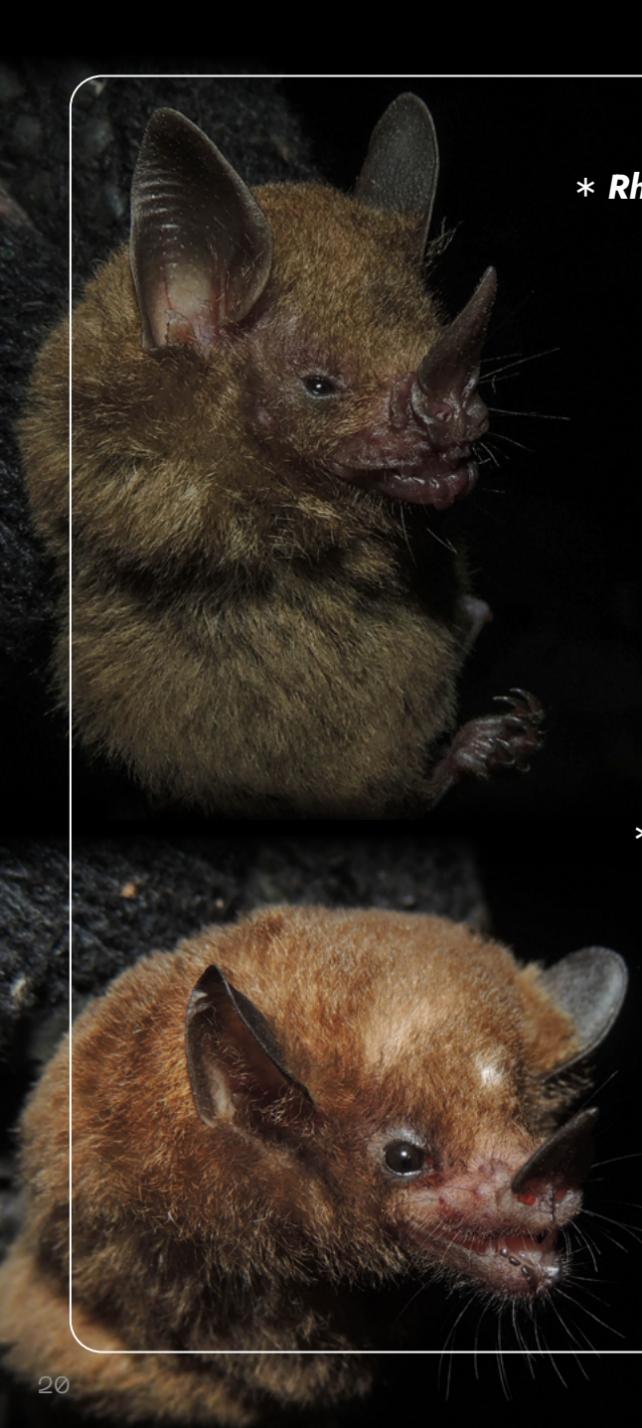
Carollia benkeithi

* ***Rhinophylla pumilio*** (Dwarf Little Fruit Bat)

Description: This is a small bat (7 – 13 g) that constructs tents for shelter, typically forming harems consisting of one male and two or three females. It prefers evergreen forests and tends to avoid open areas like pastures. It shares similarities with the *Carollia* genus but is smaller, has a more “flattened” face, and features differently arranged rounded vibrissae (small pads resembling warts).

Diet: *Rhinophylla pumilio* is frugivorous, consuming small, soft fruits from forest groves, along with pollen and nectar. They aid in seed dispersal to support forest regeneration and pollinate flowers, contributing to fruit production.



Two small brown bats with prominent snouts are shown against a dark background. The bat in the upper left is looking towards the right, while the bat in the lower left is looking towards the right. Both have large, upright ears and long, thin whiskers.

* ***Rhinophylla fischeræ*** (Fischer's Little Fruit Bat)

Description: This small bat (7 – 13 g) also constructs tents for shelter, usually in harems consisting of one male and two or three females. It prefers evergreen forests and avoids open areas like pastures. While it resembles *Rhinophylla pumilio*, its incisor teeth have slight differences.

Diet: *Rhinophylla fischeræ* is frugivorous, primarily feeding on small, soft fruits from the forest groves, along with pollen and nectar. They participate in seed dispersal for forest regeneration and contribute to pollinating flowers, which leads to fruit production.

* ***Hsunycteris thomasi*** (Thomas's Nectar Bat)

Description: This is a small bat weighing around 8 grams, featuring an elongated snout adapted for feeding on flower nectar. Its tongue is equipped with elongated hair-like papillae that allow it to capture nectar from inside flowers, acting like a sponge. These bats play a crucial role in pollination within forests.

Diet: Nectarivore. Their diet primarily consists of nectar and pollen, contributing to the pollination of flowers, ultimately leading to fruit production. They may also consume small fruits and insects.

* ***Choeroniscus minor*** (Lesser Long-tongued Bat)

Description: A small bat with an average weight of 10 grams, characterized by its brownish fur and an exceptionally long tongue that extends through the middle of its lower teeth. Similar to other nectar-feeding bats, its tongue is equipped with elongated hair-like papillae for extracting nectar from flowers, resembling a sponge. These bats tend to form shelter groups of approximately eight individuals in tree hollows and favor well-preserved areas.

Diet: Nectarivore. Their diet primarily consists of nectar and pollen, but they can also consume insects. Their role in pollinating flowers is significant.



* ***Artibeus obscurus*** (Dark Fruit-eating Bat)

Description: A medium-sized bat weighing between 29 and 35 grams, named for its darker fur compared to other members of the Artibeus genus. It prefers humid, dense forests but can also be found in altered environments like gardens and plantations.

Diet: Frugivorous. These bats primarily feed on fruits, including very tough ones, thanks to their powerful bite! They have a particular fondness for figs. Their consumption of fruits aids in seed dispersal and contributes to forest regeneration.



* ***Artibeus planirostris*** (Flat-faced Fruit-eating Bat)

Description: A large bat weighing between 40 and 60 grams, featuring facial stripes that are not highly prominent and a nasal leaf with unconnected edges at the base. Some of its fur is longer than the rest, covering its body and head. They seek shelter under foliage or palm leaves and can coexist with other bat species in the same location.

Diet: Frugivorous. Their diet primarily consists of fruits, although they may also consume insects. Their role in seed dispersal is essential.



* ***Artibeus lituratus*** (Great Fruit-eating Bat)

Description: This is a large bat with a weight ranging from 53 to 88 grams, easily recognizable by the well-defined white stripes on the top of its head extending to its snout. It is the largest among the *Artibeus* species and can consume large, hard fruits. It inhabits a range of environments from preserved ones to urban centers.

Diet: Their diet primarily consists of fruits, and they can also eat leaves. They are known for their ability to consume very hard fruits, owing to their powerful bite. Similar to other *Artibeus* species, they particularly enjoy figs. Their consumption of fruits aids in seed dispersal and contributes to forest regeneration.



* ***Artibeus concolor*** (Brown Fruit-eating Bat)

Description: A medium-sized bat weighing between 18 and 20 grams, characterized by its lack of facial stripes, light brown fur, nasal leaf, and ears lighter in color compared to other *Artibeus* species. The base of the nasal leaf is loose and not attached to the upper lip.

Diet: Frugivorous. Their diet primarily consists of fruits, but they can also consume pollen, nectar, floral parts, and insects. They play a crucial role in pollinating flowers and dispersing seeds.



* ***Artibeus cinereus*** (Gervais's Fruit-eating Bat)

Description: This is a small bat weighing between 10 and 13 grams, typically featuring yellowish or yellow ear tips. They construct various shelters in the form of tents using palm and caeté leaves (*Heliconia* spp.). They prefer well-preserved forests but can tolerate a certain degree of habitat modification.

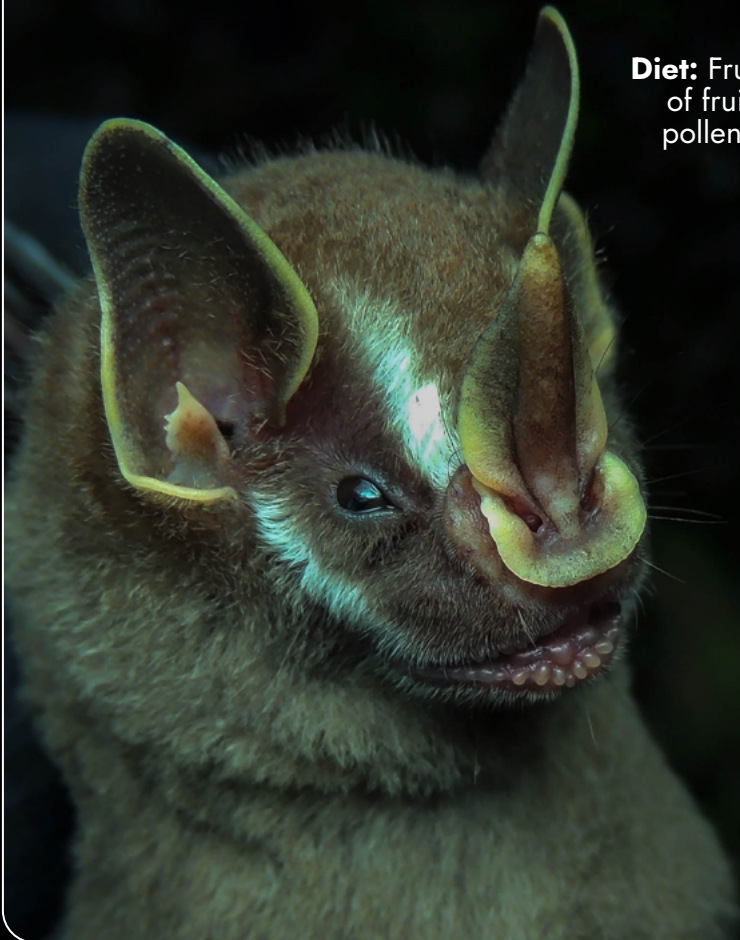
Diet: Frugivorous. Their diet primarily consists of fruits, but they can also consume insects. They contribute to seed dispersal.



* ***Artibeus gnomus*** (Gnome Fruit-eating Bat)

Description: A small bat weighing between 9 and 11 grams, featuring a nasal leaf and large, wide, pointed ears with a yellowish tint. It displays well-defined white facial stripes, and the vibrissae (small pads resembling warts) on the lower lip are typically yellowish.

Diet: Frugivorous. Their diet primarily consists of fruits, but they can also ingest nectar and pollen. They assist in pollinating flowers and dispersing seeds.



* ***Mesophylla macconnelli*** (MacConnell's Bat)

Description: This is a small bat weighing between 5 and 9 grams, characterized by its pale coloring close to white and yellow ears and nasal leaf. It is typically found in well-preserved forests, where it forms shelters with up to eight individuals using tents constructed from palm leaves.

Diet: Frugivorous. Their diet primarily consists of fruit, but they can also consume insects. They contribute to seed dispersal.



* ***Sturnira tildae*** (Tilda's Yellow-shouldered Bat)

Description: This is a medium-sized bat with a weight ranging from 18 to 28 grams. Males of this species are known for their pheromone glands on each shoulder, which create brownish spots on the local area, in addition to producing a distinctive sweet smell.

Diet: Frugivorous. Their primary diet consists of fruits, although they may also consume pollen and nectar. They play a role in seed dispersal.



* ***Uroderma bilobatum*** (Tent-making Bat)

Description: This is a medium-sized bat with a weight ranging from 13 to 20 grams. They construct tents by biting the veins of leaves. Group sizes can vary from less than 10 to more than 50 individuals. It is considered the “architect” among bats, and its habits are well-known. They have well-defined facial stripes.

Diet: Frugivorous. Their primary diet consists of fruits, but they can also consume pollen, nectar, and insects. They contribute to seed dispersal and pollinate flowers.





* ***Vampyriscus bidens***

(Bidentate Yellow-eared Bat)

Description: A small bat weighing between 11 and 13 grams, featuring yellowish ears and wide, well-defined white facial stripes.

It also has a dorsal line that varies from well-marked to faint. It is rarely found and occurs in humid areas, evergreen forests, and close to water. Despite the name suggesting vampires, this species does not feed on blood.

Diet: Frugivorous. Their primary diet consists of fruits, but they can also consume pollen and nectar. They contribute to seed dispersal.



* ***Vampyriscus brocki***

(Brock's Yellow-eared Bat)

Description: A small bat weighing between 11 and 13 grams, with light brown back fur and a slightly marked white dorsal line. It can inhabit well-preserved forests and more open woodlands. Despite the name suggesting vampires, this species does not feed on blood.

Diet: Frugivorous. Their primary diet consists of fruits, but they can also eat nectar and small insects.

* ***Micronycteris microtis***

(Common Big-eared Bat)

Description: A small bat weighing between 7 and 9 grams, with relatively long, brownish fur. It has large ears and a small nasal leaf. They shelter in caves, rock shelters, tree hollows, and structures built by humans.

Diet: Insectivorous. Their diet primarily consists of insects, but there are records of predation on vertebrates, such as small lizards.



* ***Micronycteris megalotis***

(Little Big-eared Bat)

Description: A small bat weighing between 4 and 9 grams, featuring long, rounded ears and a short, pointed nasal leaf. They occupy various areas, from flooded forests to drier regions, seeking shelter in tree hollows, fallen trunks, small rock cavities, and even human-made structures. They form colonies of 3 to 25 individuals.

Diet: Insectivorous. They primarily feed on insects found on foliage.





* ***Lophostoma silvicola*** (White-throated Round-eared Bat)

Description: This is a medium-sized bat with a weight ranging from 15 to 23 grams. They have wide, long ears, long dark fur, and dark membranes. They primarily inhabit forests but can also visit cultivated areas. They use termite mound holes for shelter, where they create a large hole at its base for entry and exit.

Diet: Insectivorous. Their diet consists of insects found on foliage.



* ***Lophostoma brasiliense*** (Pygmy Round-eared Bat)

Description: This is a small bat with a weight ranging from 7 to 13 grams. They have wide, long ears, long dark fur, and dark membranes. Similar to *Lophostoma silvicola*, they primarily inhabit forests but can also visit cultivated areas. They use termite mounds for shelter, where they create a large hole at the base for entry and exit. Their behavior is similar to *Lophostoma silvicola*.

Diet: Insectivorous. They primarily feed on insects found on foliage.



* ***Trachops cirrhosus***

(Fringe-lipped bat)

Description: This is a medium-sized bat with an average weight of 32 grams. They have several pointed vibrissae (little pads that look like warts) on their lips and chin. They shelter in small groups in tree hollows, rocky cavities, and abandoned buildings. Large maternity colonies can also be found.

Diet: Carnivorous. They specialize in feeding on small toads, frogs, and tree frogs. They primarily hunt males, as they are easily located when vocalizing to attract females. They can also prey on lizards and insects found on foliage.



* ***Gardnererycteris crenulatum***

(Striped Hairy-nosed Bat)

Description: This is a medium-sized bat with a weight ranging from 20 to 27 grams. They have large, pointed ears and long, light fur. They possess a large nasal leaf with jagged and irregular edges. They shelter in small groups in rocky cavities and tree hollows, and they sometimes coexist with other bat species.

Diet: Insectivorous. They feed on insects found on foliage.

* ***Tonatia maresi***

(Southern Stripe-headed Round-eared Bat)

Description: This is a medium-sized bat with a weight ranging from 21 to 33 grams. They have pointed, pleated ears, a small and wide nasal leaf, and a chin marked by flat vibrissae (little pads that look like warts). They are found in forests but may also utilize pastures and other modified environments when searching for food.

Diet: Insectivorous. They feed on insects found on foliage.

* ***Phyllostomus elongatus***

(Lesser Spear-nosed Bat)

Description: This is a medium-sized bat with a weight ranging from 30 to 44 grams. They have large, pointed ears and a nasal leaf. The tip of their wings is usually white. They shelter in tree hollows in small harems but may use caves for shelter when in larger groups.

Diet: Insectivorous. They feed on insects found on foliage.



* ***Phylloderma stenops*** (Pale-faced Bat)

Description: This is a large bat with a weight ranging from 51 to 64 grams. They have triangular ears, a naked face, and large eyes. They prefer preserved forests but tolerate some degree of environmental change. They feed near wetter areas such as wetlands and floodplains.

Diet: Omnivorous. They feed on fruits and insects, almost in equal proportions. They also contribute to seed dispersal.



* ***Trinycteris nicefori***
(Niceforo's Big-eared Bat)

Description: This is a small bat with a weight ranging from 7 to 11 grams, featuring orange colouring and a thicker mask around the eyes.

Diet: Insectivorous. They feed on insects found on foliage.





* ***Chrotopterus auritus*** (Big-eared Woolly Bat)

Descrição: This is the second-largest bat found in Central and South America, with a weight ranging from 79 to 100 grams. They have long, dense fur, big ears, and a naked face. They can be found in diverse habitats, including areas designated for commercial tree planting (forestry). They typically fly close to the ground when hunting prey and depend on the availability of stable shelters such as tree hollows, crevices, caves, and abandoned urban structures. They have a characteristic smell due to the production of pheromones.

Diet: Carnivorous. Their diet includes small animals such as rodents, birds, frogs, tree frogs, other bats, and occasionally fruits.

Family Thyropteridae (Disk-winged Bats)

This family is known for having species with adhesive discs on their hands and feet, allowing them to hang onto smooth leaf surfaces as if they had suction cups. Unlike most bat species, they don't usually hang upside down. The family comprises only five species, all of which roost in leaves, particularly those of *Heliconias* that have not fully opened and remain in trumpet shape. Once the leaves open, the bats change their shelter.

* *Thyroptera tricolor*

(Spix's Disk-winged Bat)

Description: This is a small bat with a weight ranging from 4 to 5 grams. Its main characteristic is the discs that function as suction cups near the big toes and ankles. Their fur is white/off-white ventrally from the neck, and the back and head have brown fur, while the wings are dark gray — hence the “tricolor” in their name.

Diet: Insectivorous. They feed on small insects caught in the air as they fly.





Note the adhesive discs
that serve as suction
cups on the feet and
fingers of this species!



* ***Thyroptera discifera***

(Peter's Disk-winged Bat)

Description: This is a small bat with a weight ranging from 4 to 5 grams. Its main characteristic is the discs that function as suction cups near the toes and ankles. Unlike *T. tricolor*, its coat is brownish and uniform.

Diet: Insectivorous. They feed on small insects caught in the air as they fly.



Family Emballonuridae

(Sac-winged or sheath-tailed bats)

The Emballonuridae family includes 17 species in Brazil and is known for species with “sacs” on their wings, which are folds of the wing membrane. These “sacs” are more developed in males, and they use them in courtship to disperse their scent to attract females. They can often be seen lined up on tree trunks near streams during the day, and they may fly or become startled when approached by humans. One of the main characteristics for identifying them from a distance is their behavior and the zigzag dorsal stripes seen in some species. So far, only one species from this family has been recorded along BR-319. However, capturing bats from this family with mist nets, a common method in sampling along BR-319, is rare. Recording the sounds of these bats is the most effective technique for documenting species in this family.



Wing sacs of
Saccopteryx.



Bats from the Emballonuridae family
lined up on a tree trunk.



* ***Saccopteryx bilineata*** (Greater Sac-winged Bat)

Description: This is a small bat, weighing around 8 to 9 grams, characterized by having two zigzag stripes on its back. It typically roosts near streams in the forest, but it can also be found at the entrance of rocky cavities, under bridges, and in tree hollows. This species is often seen camouflaged on tree trunks, lined up in rows. It has a fold on each wing, which functions like a sac (hence the name of the genus) to store secretions from various parts of the body, such as saliva and urine.

Diet: Insectivorous. It primarily feeds on small insects captured in mid-air while flying.

Family Vespertilionidae

(Common, vesper, or simple nosed bats)

Vespertilionidae is the family with the largest number of species in the world. In Brazil, 26 species have already been recorded. It has species that live in the Amazon and others that live in cold regions of Europe! They are very diverse, come in different sizes and colors.



Myotis ruber



Myotis lavalii

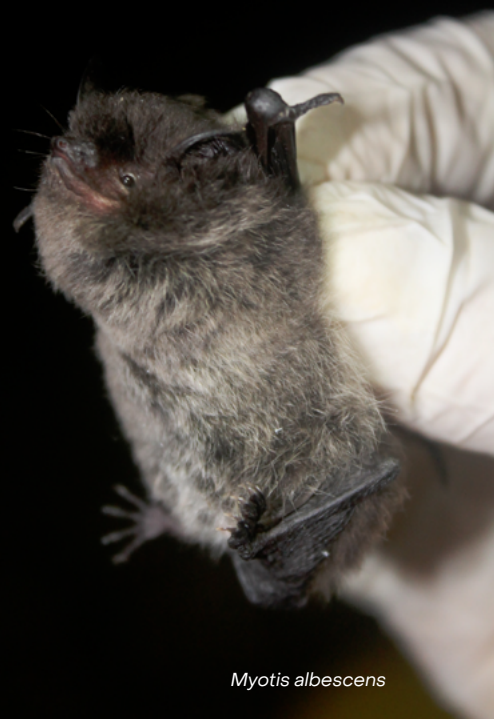
* **Species of the genus *Myotis*** (Mouse-eared Bats)

Descrição: The *Myotis* that inhabit the BR-319 region are small and can often be confused with moths, as their slow flight does not seem to have a well-defined destination. They fly in the woods of forests, but also in open places, even around lampposts. They are very difficult to identify to the species level, as often the only difference between them is the shape of the skull!

Diet: Insectivorous. They feed on small insects caught in the air as they fly.



Myotis riparius



Myotis albescens

Now, let's explore a family of bats that was not specifically captured in the BR-319 region, but you might encounter them quite close to your location.

Family Molossidae

(Free-tailed bats)

They are insectivorous bats with free tails, generally smaller in size than the palm of your hand. These bats tend to be gregarious, which means they often gather in large groups in the same location. In some cases, this location might be the ceilings of our homes. As a result, it's not uncommon to find bats from the Molossidae family either inside houses or on the ground, sometimes injured after encounters with dogs and cats.

If you ever come across a fallen bat, you should check to see if it has a loose tail and is relatively small in size. It's important to note that adult Molossidae bats can sometimes be mistaken for sick individuals or juveniles because they do not move effectively on the ground and struggle to take flight from low heights. If you do find a fallen bat, the best approach is to gently relocate it without handling it to a place where it can climb, such as a tree or a high wall. This way, it will have the opportunity to climb and take flight.



Molossus rufus



Molossus molossus



Nyctinomops macrotis

Molossids have similar characteristics, such as a loose tail. The most common they may be of the genus *Molossus*, in the first two photos. Note that they are small species.

If you've made it this far, you're likely becoming quite the bat expert! We hope you've enjoyed the book and learned many new things. We are passionate about bats and rely on your help to spread accurate information about them. Share what you've learned with your family and friends. Bats are incredible creatures and are an integral part of our rich biodiversity, aiding in forest regeneration and, consequently, benefiting us humans.



Who Are We?

We are a small group of researchers who have been conducting studies along the BR-319 highway in the Purus-Madeira interfluvial region. What unites us is our shared interest in understanding the mechanisms that sustain the planet's greatest biodiversity.

The information contained in this book is part of the results from dozens of research projects conducted in the past by various scientists and graduate students, supported by different projects, including the following:

- Biodiversity Research Program in Western Amazonia (PPBio-AmOc);
- National Institute for Amazonian Research Center for Integrated Studies of Amazonian Biodiversity (INCT – CENBAM);
- Biodiversity survey planning and ecosystem process monitoring for scientific inclusion of rural communities along the BR-319 highway in the state of Amazonas (PRONEX/FAPEAM/CNPq - 16/2006, granted to William Magnusson);
- Ecological and historical factors in the evolution of Amazonian biota: molecular and phenotypic variation of species and biological communities in western Amazonia (FAPEAM/CNPq - 003/2009, granted to Albertina P. Lima).

Currently, the studies conducted along the BR-319 highway and in the Purus-Madeira interfluvial region are supported by the following projects:

- Project: Identification of the environmental impacts of the BR-319 highway on wildlife in the southwestern region of Amazonas: an integrative approach to understand multi-taxa patterns (FAPEAM/PROFIX-RH - 009/2021 - 01.02.016301.00407/2022-94, granted to Sergio Santorelli Junior).

The main objective of this project is to identify whether different biological groups interact with each other and with the environment, and how this happens. Integrating this information will allow the identification of critical variables, generate hypotheses that were previously unknown, and estimate the possible negative impacts of the BR-319 highway on the region's wildlife. Filling this knowledge gap on a local scale could provide support for national public policies, as has already happened with other ecosystem ecology studies.

- Project: Long-Term Ecological Research Program in Southwest Amazon, granted to William Magnusson; funded by the National Council for Scientific and Technological Development (CNPq/MCTI/CONFAP- FAPs/PELD - 21/2020 - 441366/2020-1) and the Amazonas State Foundation for Research (FAPEAM) Call for Proposals No. 021/2020 – PELD Southwest Amazon | Grant Agreement: 247/2022).

- Project: National Institute for Amazonian Research Center for Amazonian Biodiversity (58/2022 - INCT, 406474/2022-2).

One of the main objectives of PELD-PSAM is to understand ecosystem processes, biological interactions, and human impacts on biodiversity in the southwestern Amazon region. However, to achieve this goal, PELD-PSAM needed to consolidate and recover field infrastructure (plots and sampling trails used in the RAPELD system) initially installed in 2006. As a result, studies in the region were restarted, and various biological groups that were sampled in the last 10 years are being re-sampled, which will allow the evaluation of the effect of the BR-319 highway on the species living there.

The creation of this book would also not have been possible without the support of the Postgraduate Program in Ecology of the National Institute for Amazonian Research (INPA), National Council for Scientific and Technological Development (CNPq), Coordination for the Improvement of Higher Education Personnel (CAPES), Amazonas State Foundation for Research (FAPEAM), Amazonian Foundation for the Defense of the Biosphere (FDB), the employees of the Chico Mendes Institute for Biodiversity Conservation (ICMBio) in Humaitá (AM), Bat Conservation International, the Center for Integrated Studies of Amazonian Biodiversity

(INCT-CENBAM), and all field assistants and workers who contributed in some way to the bat sampling on the BR-319. The data used in the making of this book were collected in the field by researcher Rodrigo Marciente Teixeira da Silva, with the assistance of researchers Paulo Estefano Dineli Bobrowiec and William Ernest Magnusson, and are deposited in the Ecological Studies Data Repository of the Biodiversity Research Program (PPBio). These and other data can be accessed online and for free by anyone.

To find out more about bats, visit the Bat Library at https://ppbio.inpa.gov.br/en/Bat_Library or scan the code:



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