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Phylogeny and Taxonomy of Bat

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Short Communication

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DESCRIPTION

Bats belong to the *Chiroptera* order of animals. Because their forelimbs have evolved into wings, they are the only mammals capable of actual and sustained flight. Bats fly with their incredibly long spread-out digits coated by a thin membrane called patagium, making them more nimble than most birds. Kitti's hog-nosed bat is the smallest bat and possibly the smallest extant animal, measuring 29–34 millimetres in length, 150 millimetres across the wings, and weighing 2–2.6 grammes. Flying foxes are the largest bats, with the giant golden-crowned flying fox, *Acerodon jubatus*, weighing 1.6 kg and having a wingspan of 1.7 m.

Bats are the second biggest mammal order after rodents, accounting for roughly 20% of all identified mammal species worldwide, with over 1,400 species. Traditionally, these were separated into two suborders: fruit-eating megabats and echolocating microbats. However, more recent evidence has confirmed the division of the order into *Yinpterochiroptera* and *Yangochiroptera*, with megabats and numerous species of microbats belonging to the former. The majority of bats are insectivores, while the rest are frugivores (fruit eaters) and nectarivores (nectar-eaters). A few species, such as vampire bats that feed blood, devour things other than insects.

Most bats are nocturnal, and many of them roost in caves or other safe havens; it's unclear whether these behaviours are used to avoid predators. Bats can be found all throughout the world, with the exception of severely cold climates. Bats play a crucial role in pollinating flowers and distributing seeds in their environments; many tropical plants rely only on bats for these activities.

Bats provide certain direct benefits to humans at the expense of some drawbacks. Bat faeces has been mined as guano and used as fertiliser in caves. Because bats eat insects, insecticides and other insect control measures are less necessary. They are sometimes plentiful and close enough to human populations to be employed as tourist attractions, and they are eaten throughout Asia and the Pacific Rim. Fruit bats, on the other hand, are generally seen as pests by fruit growers. Bats are a natural reservoir for numerous infections, including rabies, due to their physiology, and because they are extremely mobile, sociable, and long-lived, they may easily transfer disease among themselves. When people engage with bats, these characteristics become potentially dangerous.

Bats may be connected with beneficial attributes such as protection from particular diseases or risks, rebirth, or long life, depending on the culture, but in the West, bats are commonly darkness, malevolence, witchcraft, vampires, and death are all connected with it.

Bats' delicate skeletons do not fossilise well, and only about a quarter of all bat genera have been discovered in the fossil record. Most of the oldest known bat fossils, such as Archaeopteropus, were already highly similar to current microbats (32 million years ago). Palaeochiropteryx tupaiodon (48 million years ago) and Hassianycteris kumari (48 million years ago) were the earliest fossil mammals to be discovered with coloration: both were reddish-brown.

Bats were previously classified with treeshrews (Scandentia), colugos (Dermoptera), and primates in the superorder Archonta. Bats are now classified as members of the Laurasiatheria superorder, with the sister taxon Fereuungulata including carnivorans, pangolins, odd-toed ungulates, even-toed ungulates, and cetaceans. *Chiroptera* is a sister taxon of odd-toed ungulates, according to one study (Perissodactyla).

Megabats are thought to have evolved during the early Eocene, and they belong to one of the four major lines of microbats. Pteropodidae, or megabats, are included in the *Yinpterochiroptera* suborder, as are the families Rhinolophidae, Hipposideridae, Craseonycteridae, Megadermatidae, and Rhinopomatidae. The remaining bat families (all of which use laryngeal echolocation) are classified as *Yangochiroptera*, according to a 2005 DNA research [1, 2]. The two new proposed suborders were supported by a phylogenomic study published in 2013.

The molecular phylogeny was contentious since it suggested that microbats did not have a common ancestor, implying that certain seemingly improbable alterations took place. The first is that bats evolved laryngeal echolocation twice, once in *Yangochiroptera* and once in rhinolophoids [3]. The second is that laryngeal echolocation originated in *Chiroptera*, was lost in the Pteropodidae family (all megabats), and then developed into a tongue-clicking system in the genus Rousettus. The sequence of the vocalisation gene FoxP2 was used to determine whether laryngeal echolocation was lost in pteropodids or gained in echolocating lineages, but the results were unclear.

The discovery in 2003 of Onychonycteris finneyi, an early fossil bat from the 52-million-year-old Green River Formation, suggests that flying originated before echolocation ability. Modern bats only have two claws on two digits of each hand, but Onychonycteris possessed claws on all five of its fingers. It also possessed longer hind legs and shorter forearms, comparable to sloths and gibbons, which are climbing mammals that hang from branches [4]. The small, broad wings of this palm-sized bat suggested that it couldn't fly as quickly or as far as subsequent bat species.

Instead of continuously flapping its wings while flying, Onychonycteris most likely alternated between flaps and glides. This indicates that this bat did not fly as often as current bats, but instead hopped from tree to tree, spending the majority of its time climbing or hanging from branches. The Onychonycteris fossil's unique traits further support the theory that mammalian flight originated in arboreal locomotors rather than terrestrial runners [5].

The "trees-down" theory claims that bats first flew by using their height and gravity to drop down on prey rather than running fast enough for a ground-level take off.

CONCLUSION

Echolocation was most likely developed in bats as a result of communication calls. Icaronycteris (52 million years ago) and Palaeochiropteryx (52 million years ago) were Eocene bats with cranial modifications that suggested they could detect ultrasound. This could have been employed to search for insects on the ground and map out their surroundings during their gliding phase, or for communication. It's possible that when flight adaption was established, echolocation was used to locate flying prey.

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