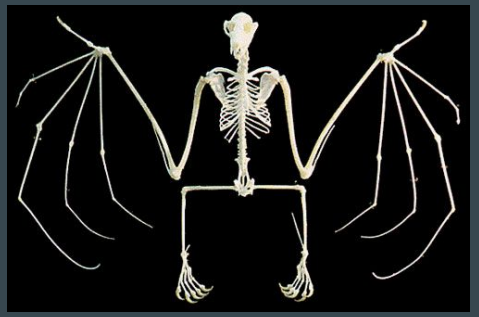
Chiroptera

By Shannon Doyle
and Rebekah Mullins

Morphology

- Bat bones are light and slender, and even reduced in some (with a shortened and thinned ulna arm bone and fibula leg bone)
    - This, with their fused cranial bones for extra lightness (like birds), contribute to their abilities to fly
    - Also like many birds, they have a large sternum/breastbone for flight muscles to attach to. From there, the patagium or wing membrane is supported by the arm and four elongated fingers (hence Chiroptera, or “hand-wing”). The patagium extends to the tail, forming a flap (uropatagium) supported by special foot bones (calcars) that helps bats fly and maneuver and is even used to scoop insects into their mouth on the fly
- The first digit on their wings (like our thumbs) is small and clawed to help them climb or walk on the ground
    - Bats on the ground or in water are not helpless and in fact some spend as much time there as in the air
- Megachiroptera (fruitbats, flying foxes) have large forward-facing eyes that see well in very dim light. Microchiroptera have smaller eyes and can see about as well as us, therefore requiring sonar/echolocation at night
    - They produce pulses of high-pitched sound and listen for the echos; so microbats usually have huge very sensitive ears
    - They also often have fleshy growths around the nose and mouth to direct their ultrasonic pulses, allowing them to “scan” wide or narrow areas



Diet

- 70% are insectivores (about 1240 species worldwide, which is roughly a quarter of all mammals); but there are some fruit-eating bats, nectar-eating bats, carnivorous bats that prey on small mammals/birds/lizards/frogs, fish-eating bats, and blood-sucking vampire bats (in South America)
- One little brown bat can eat up to 1000 insects in an hour (great pest control)

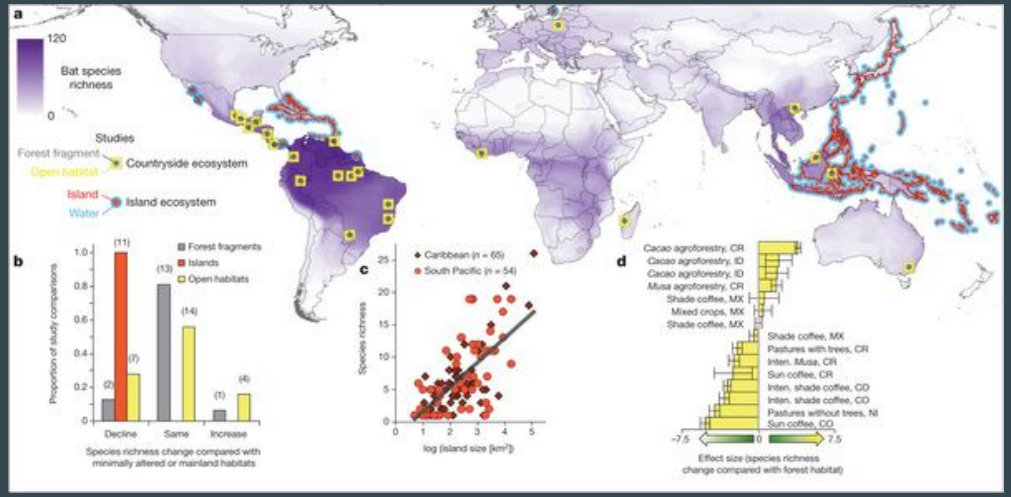
Carnivorous bat

Vampire bat

Reproduction

- Males and females typically segregate in their caves until spring
- One born at a time but can have up to three litters per season
    - Mother great at manipulating pregnancy length based on food sources
    - Young hang from their belly fur for milk even while flying and become independent quickly (as soon as 6 weeks when their wings develop)
- Slowest reproducing animal in the world, hence major concern for conservation (white-nose syndrome can wipe out entire caves at once)
- Although life spans vary among species, can live up to 20 years in the wild, with the longest recorded living in the wild at 33
    - Highly uncommon for small mammals to live so long; postulated is due to their annual hibernation and in some cases, induced hypothermia ie torpor (while some species simply migrate)

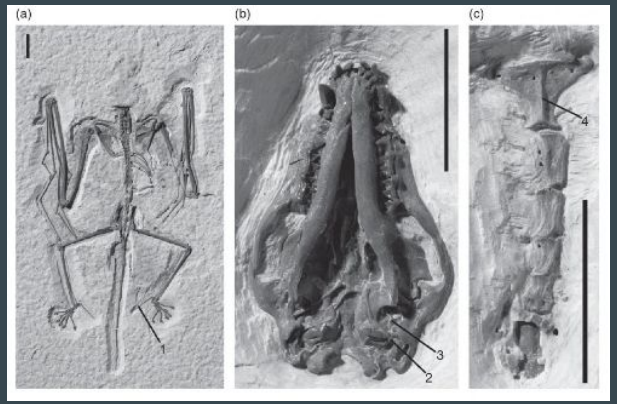
Biogeography



- Native to nearly all regions (except polar regions and some isolated islands); generally found in temperate but at greatest diversity in tropical areas
  - Found in nearctic, palearctic, oriental, ethiopian, neotropical, australian, and oceanic islands regions
- Even found in suburban and urban areas
  - As long as there are roosting sites (vary widely between species--can be caves, crevices, houses, trees, etc) and sufficient food supply, you can probably find a bat
  - Given their immense number of variants, at least one specie of bat is well-suited to live in any given area

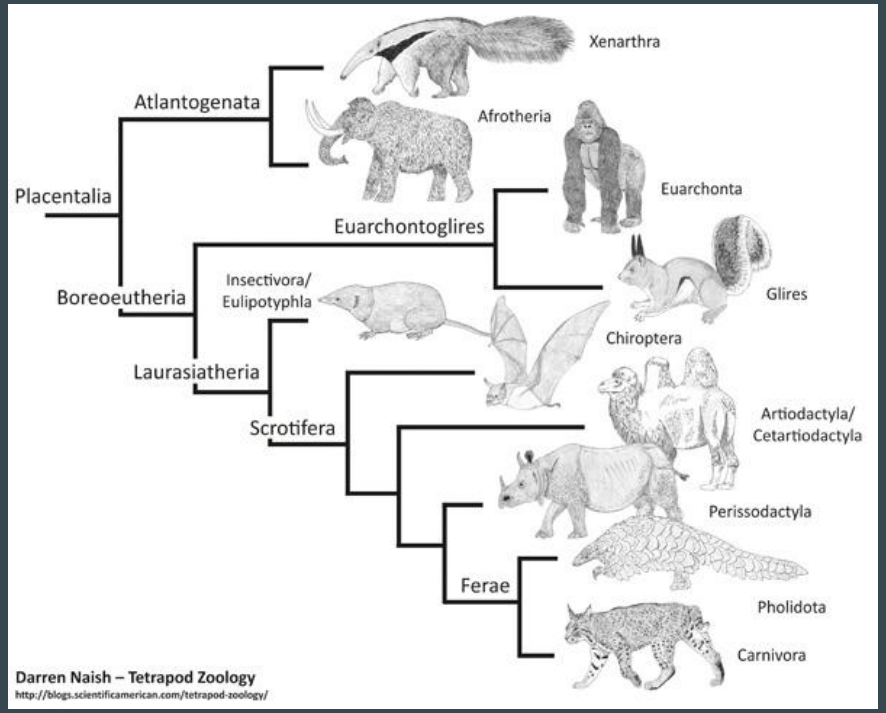
Fossil History

- Bats have a rich fossil history extending back over 50 million years but have a poor fossil record due to their brittle bones and often tropical habitat which is detrimental to preservation.
- Over 70 % of the fossil record is missing.
- Most bat fossils found are mainly cranial and dental remains.
- The best preserved fossils are from the Eocene, while skeletons from the Oligocene, Miocene and Pliocene are rare.
- The *Icaronycteris index*, found in Wyoming USA, is from approx. 52.2 mya in the Eocene, and possesses qualities of flight and echolocation similar to modern day bats (top right).
- In 2008, a new fossil bat, *Onychonycteris finneyi*, also from Wyoming, found capable of flight but not echolocation (bottom right).
- Phylogenetic analyses have concluded from this that flight must have evolved before echolocation.



Systematic Status

- There has been much debate concerning the phylogeny of Chiroptera.
- Originally grouped in the superorder Archonta, which included Primates, Dermoptera and Scandentia.
- Now placed within Laurasiatheria after molecular analyses strongly contradicted original clade.
- Many scientists disagree on Chiroptera's closest relations but recent studies suggest that they are a sister group to a larger clade that includes Carnivora, Cetacea and Perissodactyla.



Taxonomy

- Within the order Chiroptera, there are two suborders of bats, Microchiroptera and Megachiroptera.
- Microchiroptera are distinguished by their use of echolocation for navigation and finding prey, and their lack of a claw at the second finger of the forelimb. Most eat insects while others feed on fruit, nectar, pollen or small animals (top right).
- Megachiroptera bats are generally larger than Microchiroptera bats, have well-developed visual cortices, instead of echolocation, and eat fruit, nectar or pollen (bottom right).

Conservation

- According to IUCN, 26 species of bats are Critically Endangered, 51 are Endangered, and 954 are considered Vulnerable.
- Loss of habitat (especially tropical rainforest) remains the most imminent peril to bats worldwide
- In addition, bats in much of the world are killed because of harmful myths and misplaced fears or hunted for local consumption and commercial use
- Because bats reproduce so slowly, recovery from serious losses is very slow and difficult.
- Organizations such as the BCI (Bat Conservation International) work to conserve the world's bats and their habitats through research efforts and education on the dangers faced by bats.

batcon.org
BAT CONSERVATION
INTERNATIONAL

Dispelling Myths

- Bats can be adorable! See below or google “cute bat” (the results are truly cute)
- They are not blind
- They do not try to get caught in your hair
- They do not want to suck your blood, even vampires

Dwarf epauletted fruit bat: 3 inches long and found in Africa

Big eared bat (that’s the actual name)

Unknown species but...

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