

Echolocation: use of sound to orient, detect obstacles, forage
 - bats, porpoises, whales, some birds, some shrews

Calls may be clicks or tonal signals from nasal passages (whales), tongue (fruit bats) or larynx (microchiropterans, shrews)

Echolocation effective over longer distances in water
 Bats must be within 5-10 meters of prey to detect (1.5 sec away)
 Sounds travels farther, faster, and attenuates less quickly in water

Calls described by:
 time (duration, repetition),
 frequency (pitch),
 intensity (signal strength)

Reflected pulses provide information
 Bats can discern fine scale details
 Attenuation with distance
 Low frequency sound would be better, but for prey size
 Low frequency has long wavelengths which go around prey

"Self-deafening"

General features associated with echolocation in bats

Conspicuous, elaborate facial ornamentation (nose leafs, tragus) function in transmission of echolocation pulses

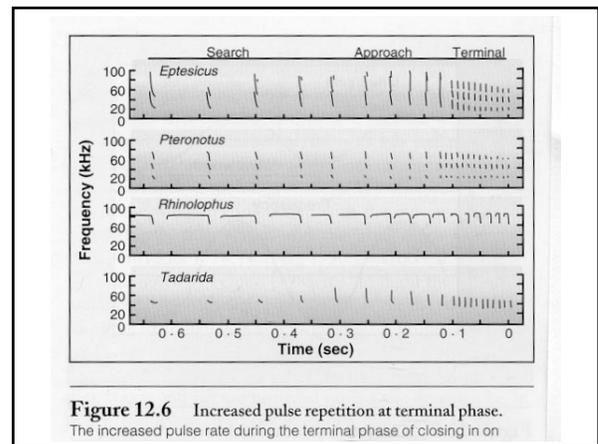
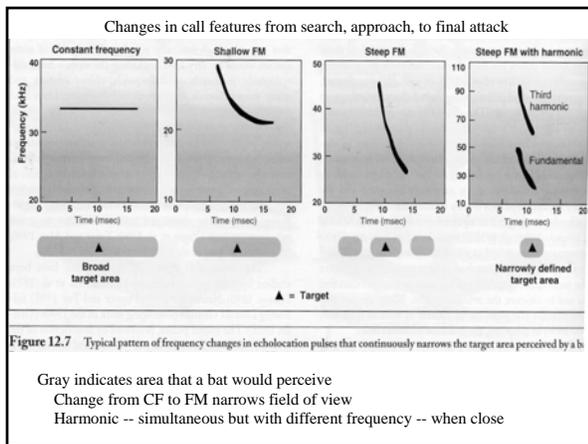
Tragus key in processing return pulses, localizing objects

Pinnae focus, amplify sound, aid in directionality of hearing

Eyes larger in Megachiropterans than Microchiropterans

Figure 12.11 Facial features of a Gambian epauleted fruit bat (*Lyonycteris gammatana*, Family Pteropodidae). The large eyes, lack of facial ornamentation, and simple ears with no tragus (as opposed to many bat rostrals with most echolocating bats).

Phyllostomatidae



Echolocation

Habitat partitioning

Differences in:
Signal
Wing
Flight

Counter-strategies
Moths emit sounds
Tuned to bat signals

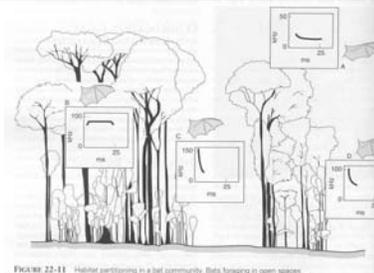


FIGURE 22-11 Habitat partitioning in a bat community. Bats foraging in open spaces about the canopy typically have high-frequency calls, while those that forage in the forest understory have lower-frequency calls.

Vaughn

Modern Bat Suborders

Suborder Megachiroptera (“fruit-eating bats”)
Single family, Pteropodidae (166 species)
15 g to 1.6 kg
Primarily frugivores (also nectar, pollen)
Very few echolocate (by tongue-clicking)



Suborder Microchiroptera
17 Families, 764 species; worldwide distribution
1.5 g to 200 g
Most are insectivores
Use echolocation to forage
Elaborate facial and nose features



Megachiroptera: Old World fruit bats (flying foxes)

Single family: Pteropodidae (166 species)
Ethiopian, Oriental and Australian regions
Often roost in large, conspicuous congregations

Strong fliers,
no tail or uropatagium

Do not hibernate

Large eyes, dog or foxlike in appearance,
no tragus

Nectar/pollen eaters or fruit eaters -- subfamilies



Macroglossinae

Pteropodinae

Hammer-headed fruit bat (*Hypsignathus monstrosus*)

Africa.

Sexually dimorphic -- males 2x body mass
Males here, females have fox-like head




MICROCHIROPTERA: insectivorous, echolocating bats

16 families, individuals are mostly small and insectivorous
Number of families indicates adaptive radiation

Echolocate for foraging and flying

Many species hibernate

Tragus well-developed
Nose/face ornamentation
Eyes generally small



MOW

Craseonycteridae
Single species

Smallest bat --
smallest mammal by mass

New family based on size?



Rhinopomatidae -- Mouse-tailed bats

Only bats with long tail
Do not hibernate but enter torpor
Most primitive microchiropterans
Gestation 123 days, 1 young



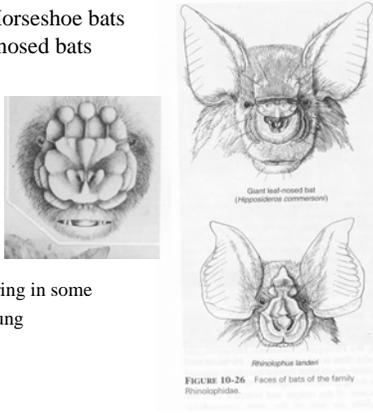
Rhinolophidae -- Horseshoe bats
Old-world leaf-nosed bats

10 genera, 130 species

Hibernate

Echolocation through nostrils

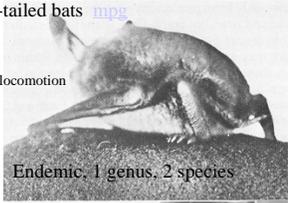
Mate fall, fertilize in spring in some
 Gestation 50 days, 1 young
 > 30 years longevity



Mystacinidae -- New Zealand short-tailed bats [mpg](#)



Quadrupedal locomotion



Endemic: 1 genus, 2 species

Mormoopidae -- leaf-chinned bats
 2 genera, 8 species
 Gregarious cave-dwellers
 Colonies -- up to 800,000 individuals
 1,400 kg of insects / night!

Noctilionidae -- Bulldog bats or fishing bats



1 genus, 2 species
Noctilio leporinus fishes
 Hind claws as gaffs



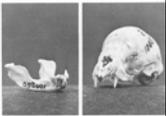
Phyllostomatidae -- leaf-nosed bats

49 genera, 143 species

New world—Nearctic, Neotropical

Insectivorous, carnivorous, nectivorous, frugivorous.
 Originated from insectivorous stock
 Includes vampire bats

Gestation period of captives: 205 - 214 days.
 Single young typical.

Molossidae -- Free-tailed bats [mpg](#)

12 genera, 80 species

Fast, long-lasting flight
 90 km to foraging areas
 Foraging 600 m above ground

Warm areas generally

Gestation 60-90 days,
 single young born



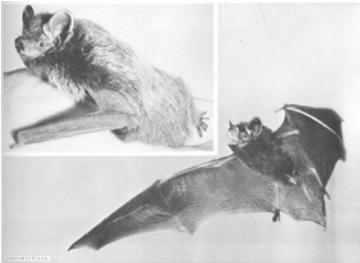

Vespertilionidae -- Vespertilionid bats

35 genera, 320 species – 1/3 of species

Variety of feeding styles

Gestation 50-70 days,
 single young

Temperate species:
 Hibernation
 Daily torpor



Vespertilionidae -- Vespertilionid bats

Only species of bats in Minnesota are Vespertilionids:

<i>Myotis lucifugus</i>	Little brown myotis or Little brown bat
<i>Myotis keenii</i>	Keen's myotis
<i>Lasionycteris noctivagans</i>	Silver-haired bat
<i>Pipistrellus subflavus</i>	Eastern pipistrelle
<i>Eptesicus fuscus</i>	Big brown bat
<i>Lasiurus borealis</i>	Red bat
<i>Lasiurus cinereus</i>	Hoary bat