BATS

2007

There are over 800 species of bat world-wide, almost 20% of the world's mammals, second to rodents that comprise about 40%. Historically, bats were associated with black nights, demons, old hags, witchcraft and disease. Only comparatively recently have we learned their true worth to us.

In Australia, we have 22 genera with 55 species and most inhabit the tropical areas. There are 12 species in cooler Victoria and only 6 in Tasmania.

Bata are mammals (Class Mammalia) that suckle their young. They are furry, nocturnal and fly, using "hand-wings" (Order Chiroptera).

Other mammals are capable of some flight – e.g. Sugar Gliders of Australia and Flying Squirrels of South America - but this flight is very limited and is really gliding. Those animals have a web of skin connecting front and back legs and this is stretched out to allow the glide. The bats have skin stretched from the shoulders over the forearm to the ankle and held out by the fingers of the hands. The digits are much modified and elongated.

The bats thumb is very small and used as a hook. The knees on a bat bend backwards and the tendons in the feet are so arranged that when the bat roosts by hanging by its toes the toes do not straighten under the weight. This allows the bat to sleep in that position and saves energy.

The Linnaen classification grouped bats with the primates because their forelimbs bear "hands" (not paws). The current classification separates the bats into 2 groups:

MEGACHIROPTERA

These are mostly big bats, weighing from 25-900 g, with a wingspan of 15-90 cm. They are mostly fruit-eaters or nectar-sippers.

The Megachiroptera use vision for navigation, although one genus (*Rousettus*) also uses clicks made by the tongue for acoustic navigation. Megachiropterans do not hibernate; when food supply is scarce they migrate in search of a new supply.

A modern theory is that this group of bats (which includes our Flying Foxes or *Fruit bats*) are distinctly different from the other main group of bats – Microchiroptera – and must have evolved separately. The Megachiroptera may be primates like us – olden days "batmen" – and they have similarities such as vision, hands, and structure of the inner ear.

In Queensland, some fruit bats are believed to be carriers of a deadly arbovirus disease that affects horses, and humans in contact with infected horses.

MICROCHIROPTERA

These are mostly small bats, weighing from 3-180 g, with a wingspan from 10-40 cm. These bats are mostly insectivorous (including all of our local bats) but some are also carnivorous. In the latter group are the fish-catching bats of South America and West Indies (e.g. *Noctilio sp*.) and the Ghost bats of Northern Australia. The 3 species of Vampire bats of Mexico and South America exist entirely on blood. These bats approach their victim firstly by flight, but creep up close along the ground and make a nick on the animals leg or exposed part. They have an anticoagulant in their saliva and the blood flows freely from the wound. The bat laps or sucks up the blood. Dogs are not often "blood donors" to Vampires because they hear the ultra-sound signals when the bats approach and are very wary.

Microchiropterans all hibernate to some extent. They have functional eyes and can use them but echo-location is their main mode of navigation and for hunting. One group (*Noctilio)* hunts fish rather than insects in the air. The bats skim low over water and uses the bounce of echo from the fish's swim-bladder to locate small fish just under the surface. They hook the fish by dipping their clawed feet into the water as they fly over, in the same manner as an Australian White-breasted Sea Eagle. The insectivorous bats catch their prey in the air usually by contact with the wings and funnelling into the tail flap. They then grab the insect with their mouth whilst still

flying. Some bats hover over the leaves and take insects from the surface, or they may land on the ground and scuttle after the insect.

The fossil records show that these bats have changed little for 50 million years. They appear to have evolved from insectivorous ancestors like the Shrew and developed the ability to exploit a new environment, the open sky. All Australian bats are derived from Asian fauna, unlike our other mammals (including marsupials) that developed in Gondwanda, the Great South Land, which was isolated from other continents for over 50 million years.

Some bats, such as the Bent-wing Bat, roost in caves. However, most bats require hollows in trees for roosting or nesting. These bats are dependent on trees for their survival. It is important that these hollow-bearing trees (and particularly the dead trees) are retained in farm paddocks. Small remnants, or even one scrappy old tree in an otherwise cleared paddock, have been observed to contain up to eight species of bats, often with numbers in the tens or even hundreds.

Bats can consume up to half their body mass each night in the form of insects and they do us a great service in controlling mosquitoes and moths. The latter are often pests in crops and orchards. We need to encourage bats by retaining old, dead trees and planting more trees that will ultimately provide refuge.

ECHO-LOCATION

The Microchiroptera emit sounds from the larynx through nose or mouth – up to 200 signals per second, with a duration of 1/100 to 1/1000 of a second – and these are reflected back to the bats ears. The bats brain then processes this data and determines distance, shape and speed of an object (such as an insect). The pitch of the sound may be constant or it may, in some species, be variable. In most species the sound is ultra-sonic; that is, we cannot hear it. The White- striped Bat is an exception, and some of its sounds are audible to us. This is a high flying bat, not often seen or caught, but one that we often hear at night near campfires in inland Australia.

While bats have the capacity to use ultra-sound, they do not always do so, especially if they are in familiar territory and are not hunting. Thus, they have been observed to bump into objects not normally in their local environment. They can be caught in a loom net placed on a flight path, or over a cave, but once released are not easily caught a second time at that place.

Other species of animals use echo-location to aid navigation. There are two species of birds that do so. The first is the *Oil Bird* that frequents dark caves in Indonesia. This bird uses low-frequency clicks in that situation, rather than vision, but when outside it uses vision plus a keen sense of smell to locate fruit. The *Cave Swiftlet* of Indonesia also behaves in a similar fashion but it is not a nocturnal food-gatherer. It emits about 6 clicks per second and the pitch is within our hearing range.

We are all familiar with dolphins and their renowned ability to navigate using ultra-sound. *Cetaceans* (whales) in general probably all have that ability.

HIBERNATION

In winter when food is scarce and it is cold the bat must find a means of surviving. The energy expended flying is very high and if there are not enough insects to catch the bat would soon use up its store of fat. The bat is warm blooded and its body temperature is usually kept at a fixed level, unlike a reptile where it may drop as the environment gets colder. The extensive wing system allows loss of a lot of heat – it is a "radiator" – and so the bat chooses to go into a torpor to prevent this. Usually bats seek a safe, warm refuge to spend the cold months. Many huddle in large groups in caves. Others shelter under bark or in cavities in trees.

In the torpid state the body temperature drops to within a few degrees of the ambient temperature. This reduces the heat loss from radiation and it slows down the body metabolism so that its energy loss is perhaps only 1% of that when it is flying. The bat has to have some stored fat to alow it to survive. Bats that are over-wintering in caves should never be disturbed because they will lose energy and that may be something they have not got to spare. It is a precarious balance.

We are familiar with other species that hibernate – e.g. Brown Bear and squirrels of America. Our Brush-tailed Phascogale or Tuan (a marsupial carnivore) can also go into torpor, but only for very short periods.

REPRODUCTION

The need for hibernation markedly affects reproduction. There are 2 strategies employed by the Microchiroptera:

- After mating in autumn the egg is fertilised but held in a state of suspended development (diapause), similar to that in the kangaroo, until the bat comes out of hibernation in spring.
- The sperm is stored until spring and then fertilization and implantation occurs.

These strategies are intended to match food supply to rearing the young. The gestation period varies with species, from 50-240 days (very long for such small mammals). The young (1 or 2) are suckled from teats beneath the armpits, but they attach to others in the groin area when the mother is in flight. Later the young are left in the "nest" (a hole, crack, or cave). The bats are born in Dec-Jan and are dependant for 3-10 weeks. Once they fly that is the end of dependence.

SOME BATS FOUND IN VICTORIA

- Grey-headed Fruit-Bat (*Pteropus poliocephalus*)
- Little Red Fruit-bat (*Pteropus scapulatus*)
- White-striped Free-tail Bat (*Tadarida australis*)
- Common Bent-wing Bat (*Miniopterus schreibersii*)
- Lesser Long-eared Bat (*Nyctophilus geoffroyi*)
- Goulds Long-eared Bat (*Nyctophilus gouldi)*
- Chocolate Bat (*Chalinolobus morio*)
- Goulds Wattled bat (*Chalinolobus gouldii*)
- Little Brown Bat (*E. pumilus*)
- Small Forest Eptesicus (*E. vulternus*)
- Large Forest Eptesicus (*E. sagitula*)

Photos of 4 bats found locally:

Lesser long-eared bat

Chocolate Bat

Small Forest Eptesicus

Goulds Long-eared Bat