



## Explore the world of bat conservation through the national curriculum

### Teachers' notes

# 1. WHAT ARE BATS?

### Relevant areas of learning and experience:

*Science and Technology, Language, Literacy and Communication, Humanities – Geography, mathematics*

### 1. Classification

There are over 1,300 species of bat in the world, found in almost every corner of the globe except the poles. The order CHIROPTERA (based on the Greek for hand-wing) is the second most successful mammalian order (rodents are the most numerous). There are known to be over 5,000 species of mammal in the world, and there are new species being described regularly.

Working through the various levels of classifying animals can be adapted to all ages and abilities.

Make a broad collection of photographs. Mounted and laminated these can be used time and again for sorting into classes, orders and families. The discussion that goes with this is all-important.

#### Classes

- Compare movement in the five vertebrate groups, highlighting the importance of a flexible backbone.
- How do bats differ from birds and flying insects? All bats fly with their hands and arms, (See *Flight*) and these hand wings make every one very easily recognisable as a bat. And yet this is the second most varied group of mammals worldwide since rodents are more varied

#### Orders

- Explore patterns of variation within and between mammal species, and within and between different species of bat. Look for similarities and differences between ourselves and bats

Explore the variation of parental care in different mammals

#### Families

On the fact sheet each head represents one of the 18 families of bats.

Pupils should be able to see by looking at the heads which of the five senses are most important to them.

#### Genus and Species

In each family, species that are very similar are put together into the same group or genus.

In the UK there is one genus with species so similar that it can be very difficult to tell them apart even when examining them very closely These are the bats in the *Myotis* genus. We now know we have six *Myotis* species living and breeding in the UK.

Refer to *British Bats- the different species* to draw up tables to highlight differences in size, habitat, food, distribution. Visit the BCT website [www.bats.org.uk](http://www.bats.org.uk) and search on Species for further details.

## Teachers' notes **1. WHAT ARE BATS?**

### Why give animals a Latin name?

E.g. *Myotis mystacinus*

Plants and animals have a Latin name which is used by scientists all over the world, whatever language they speak, and this is written in an agreed way.

First is the genus name, *Myotis*, beginning with a capital letter, then the species name, *mystacinus*, with the first letter written in lower case. The whole name is usually written in italics.

### Extension

Extend studies to bats worldwide. Search reference books and the web for information on different bats and bat families and where they live.

- Where is the greatest biodiversity? Why?
- What are the characteristics on which classification is based? What is the basis of some scientific disagreements? What is a sub-species?

## 2. Evolution

**Evolution** is a theory, an idea with lots of evidence that explains the process by which living things can gradually change over time. The theory of evolution was developed by Charles Darwin and Alfred Russel Wallace back in 1859.

Find out more about Charles Darwin, how he developed his theories, and how they were received by people at that time.

Fossils are the remains or traces of animals and plants preserved in rock but we don't know of the origins of bats because the small, light skeletons of bats do not preserve well and are rarely found. We know these early bats were insect-eaters by looking at fossil bats' teeth and fossilised moths in their stomachs. The earliest bat fossils found were already looking very like the bats you and I see. From the evidence we have, we think bats may have originated around 100 million years ago.

**Early evidence.** Messel Pit (known in German as *Grube Messel*) is one of the most famous and richest fossil sites in the world, renowned for the quality of the fossils found there.

Search the web for photos and descriptions of bat fossils found there. It is thought bats probably evolved from small tree-living insect-eating mammals which developed membranes to help them glide from tree to tree. Discuss.

**Which came first?** Fossils found so far showed that bats could fly and echolocate but scientists still disagree over which came first, flight or echolocation. In what ways was the fossil of a bat they named *Onychonycteris*, discovered in Wyoming in rocks formed 52 million years ago, different from 'younger' fossils? Discuss the significances of this in terms of evolution.

### Explore the debate on bat evolution.

- What are the chief differences between the two suborders described as micro-chiroptera and mega-chiroptera in traditional classification?
- What different conclusions have been drawn based on more recent molecular techniques?

It is important to consult as up-to-date information as possible, preferably from more than one source. When quoting always make a note of the source and its date.

**A diversity of bats.** Through many millions of years bats have gradually evolved in order to live in many different habitats and feed on different food sources. These differences enable them to feed and fly in slightly different ways and places.

- Find out the names of the 18 different families of bats worldwide. Plot the numbers of species in each.

## Teachers' notes **1. WHAT ARE BATS?**

- Explore where they are found in the world and see if there is any relationship with habitat.
- Find out more about different species of bat and the foods they depend on.
- Refer to an atlas of the world to see how the evolution of flight led to bats being the most widely distributed of all the mammalian orders.
- How do the bat species of New Zealand differ from bats elsewhere? Why? How has this made them particularly vulnerable?
  
- Make a phylogenetic tree for mammals and see how closely they relate to other orders of mammals – perhaps do this in the style of a family tree.