



There are so many species of plant and animal in the world that centuries ago scientists tried to work out a system of putting them into some kind of order. Taxonomy is the name given to the science of classifying, or sorting, forms of life. It gives plants and animals Latin names which are used all over the world, and arranges them in groups according to how people believe they are related.

As new plants and animals are discovered and more is learnt about them, this has to be updated, and sometimes scientists disagree about details.

Bats, like us, are mammals, one of five groups or CLASSES of animal that have a backbone. Run your finger down the middle of your back and you will feel a row of bumps. Each is part of one of your vertebrae, the bones that make up your backbone.

Follow the numbers on this page to see where bats fit into the ANIMAL KINGDOM

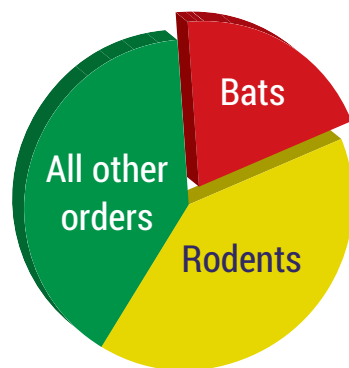
1 The table below shows the five CLASSES of vertebrate. Can you add to it by filling in the gaps?

fish	amphibians	reptiles	birds	mammals
cod	frog			bat

2 Each CLASS is then sorted into ORDERS. There are over 5,000 species of mammal in the world and these have been sorted into 27 ORDERS. The order of rodents has the largest number of species, and includes animals such as mice, rats and squirrels.

The order of bats – CHIROPTERA, (meaning hand-wing) is the second largest group, a completely separate order from the rodents with whom they are sometimes confused.

Over one-fifth of all mammal species are bats!



3 Each ORDER is then sorted into FAMILIES.

There are 18 bat families in the world.

Each head shown here represents one family.

Only bats in the **VESPER family** or the **HORSESHOE family** are found in the UK. Bats of both these families are also found in many other parts of the world.



4 Each FAMILY is then sorted into GENERA.

The genus name is rather like a surname, though it is written first in the full Latin name.

Several new *Plecotus* species have been recognised recently in other parts of the world, but there are only two known in the UK.

There are six genera in the Vesper family. One of these is PLECOTUS genus

5 Each GENUS is then sorted into SPECIES.

The species is the basic unit of classification.

The Latin name of a species is made up of the genus name and the unique species name.



brown long-eared bat
Plecotus auritus



grey long-eared bat
Plecotus austriacus

Fossils are the preserved remains or traces of animals and plants from long ago, and give us clues about life as it was on earth in the past. Bats may have originated 100 million years ago, but we don't know much about their origins because their small light skeletons do not preserve well and are rarely found. The earliest bat fossils found already looked very like the bats we see today.

Bats, Chiroptera, comprise one of the most widely distributed groups of mammals, flight having enabled them to inhabit all but extreme desert and polar regions, and to reach most islands. In New Zealand and many oceanic islands, they are the only native mammals, and have gradually evolved into separate species.

Why is there such a huge diversity of bats?

The suggestion is that around 100 million years ago the flowering plants began to develop and diversify. By 70 million years ago many of the plant families we recognise today were established. Alongside them, insects diversified, in turn providing food for insectivorous mammals, and this may have been what triggered off the radiation in insectivorous bats.

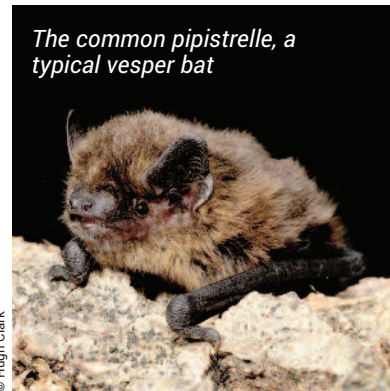
But when and how did bats first take to the air?

This is just one of many questions that scientists are still asking in this ongoing detective story. All the fossils found so far show that bats could fly and echolocate. A fossil discovered in Wyoming (USA) in rocks formed 52 million years ago was different in several ways from the 'younger' fossils. The hind limbs were longer and the forearm shorter with claws on all its fingers, so it was a good climber. It had short broad wings and possibly just fluttered and glided.

Traditional classification

Traditionally the Old World Fruit Bat family was classified as a sub-order known as megachiroptera, or mega bats, found only in the Old World. All the other families, the micro chiroptera, are found worldwide. Molecular techniques now split them into the Yinterochiroptera and the yangochiroptera. Modern bat classification places the Rhinolophoid bats with the fruit bats.

UK bat families



The common pipistrelle, a typical vesper bat

© Hugh Clark

The Vesper or plain-nosed bats (Vespertilionidae) and the horseshoe bats (Rhinolophidae) are the only two bat families that live in the UK. Unlike bats in the tropics, they have developed a strategy to survive the cold winters of temperate regions when food is scarce.

A **phylogenetic tree** or evolutionary tree is a branching diagram showing the evolutionary relationships among species — their **phylogeny** — based upon similarities and differences in their physical or genetic characteristics.

Wales' 'special' bats

Only two species of horseshoe bat live in the UK, and Wales holds significant populations of both.

The lesser horseshoe bat is widely distributed across lowland Wales and it is thought the population on the Gower is genetically different from the rest of Wales. This is a small bat about the size of a plum.



Lesser horseshoe bat

© JJ Kaczanow



Greater horseshoe bat

© Gareth Jones

The greater horseshoe bat is much larger, about the size of a pear. It is even rarer and more restricted in distribution than the lesser. It is found in parts of Gwent, with the second largest population in the UK present in south Pembrokeshire.