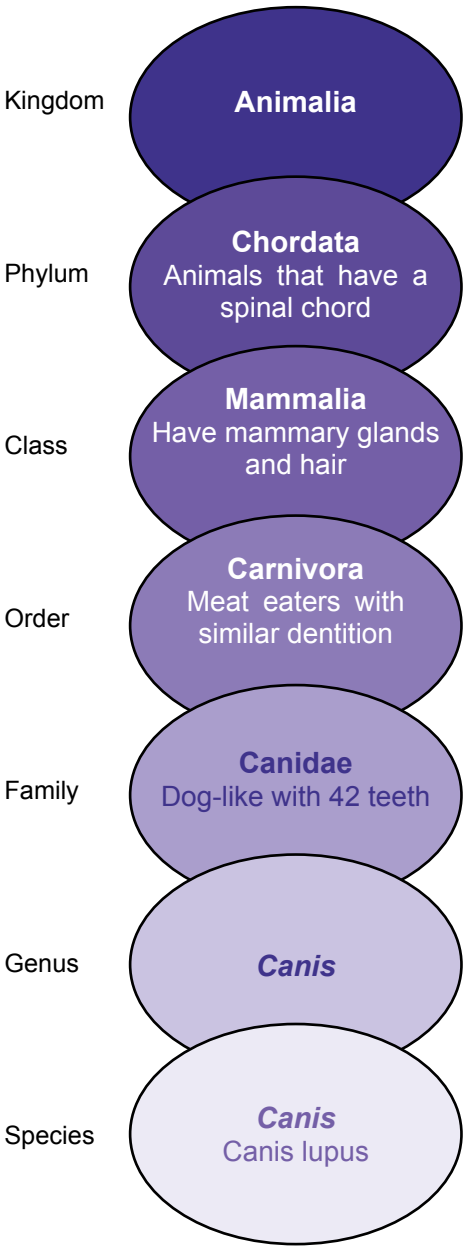
Taxonomy: the classification of life

Assistant Education Officer Vicky Hughes explains how the system of classifying animals, and in particular wolves, works.

There are at least 1.7 million species of living organisms that have been identified and there could be between 3 and 10 million species still waiting to be discovered. How do we know which organisms have been seen before and which are new discoveries?

All organisms are classified according to their homology; this is the shared characteristics that have been inherited from a common ancestor. The more recently any two species have shared an ancestor, the more characteristics they share and the more similar these characteristics are. The homologies can be anatomical structures such as body parts, patterns of embryonic development and more recently DNA.

With this information every organism can be put into different groups depending on these similarities. Taxonomists use a system of identification which was pioneered by Carolus Linnaeus (1707 - 1778) who abandoned the traditional naming system in favour of the grouping of organisms according to their physical similarities and differences based on scientific names using Latin. His system of giving an organism a scientific name of two parts is called binomial nomenclature. We still use this system today.



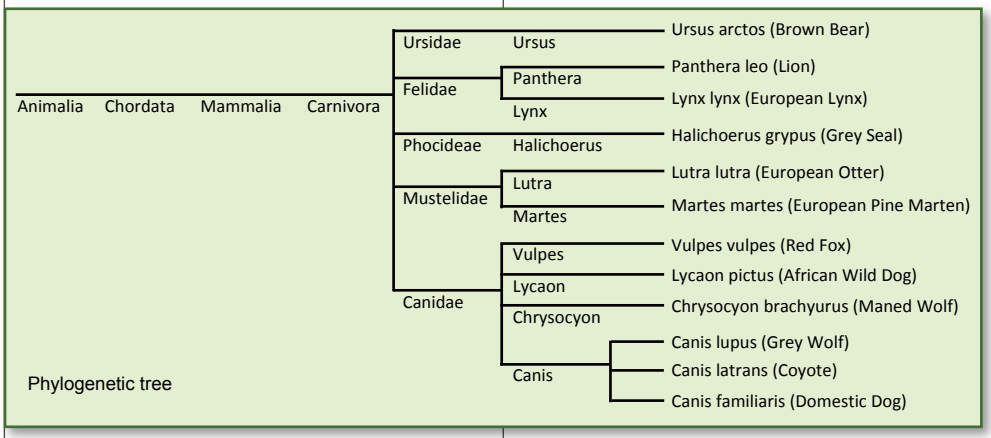
In addition to identifying and naming species, a major objective of systematics is to group species into broader taxonomic categories. The first step of such a hierarchical classification is built into the Latin (binomial) name for each species. We group species that have similarities, and so are closely related, into the same genus. For example - the grey wolf and the domestic dog are both found under the genus of Canis; this genus also includes species such as the red wolf and the coyote. Beyond the grouping of species within genera, taxonomy extends to progressively broader categories of classification. It places related genera into the same family, puts families into orders, orders into classes and classes into phyla with phyla finally falling into kingdoms of which there are five currently recognised. These families are Monera, Protista, Fungi, Plantae and Animalia, into which every living thing from single celled algae, bacteria and viruses all the way through to the most complex multi-celled animal can be classified.

The table below shows eight different species all of which come from the Class Mammalia, which contains every known mammal on earth and falls into the Order Carnivora, which contains every mammal that makes up the majority of its diet with meat. From looking at their full classification it can be seen how closely related these species are:

Kingdom	Animalia	Animalia	Animalia	Animalia	Animalia	Animalia	Animalia	Animalia
Phylum	Chordata	Chordata	Chordata	Chordata	Chordata	Chordata	Chordata	Chordata
Class	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia
Order	Carnivora	Carnivora	Carnivora	Carnivora	Carnivora	Carnivora	Carnivora	Carnivora
Family	Canidae	Canidae	Canidae	Canidae	Canidae	Canidae	Ursidae	Felidae
Genus	Canis	Canis	Canis	Canis	Lycaon	Chrysocyon	Ursus	Panthera
Species	lupus	lupus	simensis	latrans	pictus	brachyurus	arctos	leo
Subspecies	-	dingo	-	-	-	-	-	-
Binomial name	Canis lupus	Canis lupus dingo	Canis simensis	Canis latrans	Lycaon pictus	Chrysocyon brachyurus	Ursus arctos	Panthera leo
Common name	Grey Wolf	Dingo	Ethiopian Wolf	Coyote	African Hunting Dog	Maned Wolf	Brown Bear	Lion

The dingo and the wolf are the closest relatives in this example sharing the same genus and species names, whilst the Ethiopian Wolf and Coyote are more distant relations within the same genus and so on until you get to the Lion and Brown Bear, who fall into the Carnivore family but branch away from the canid line into their own families.

Each taxonomic level is more comprehensive than the previous one for example all species of dogs are mammals, but not all mammals are dogs.



Phylogenetic tree

In order to illustrate the relationships between species, phylogenetic trees are used; these are similar to human family trees in which the branches show both close and distant relations with the connections between. By working backwards through these trees it is also possible to identify the point whereby evolution species have divided from each other due to their habitat, diet or geographical location.

Canids originated approximately 40 million years ago, they are the oldest family in the order of Carnivora; the modern day family of canidae contains all of the existing species of canid found in the world today, of which there are currently 14 recognised genera and 34 different species.

This number of species is a continuous issue for debate as within each recognised species there are a number of closely related subspecies, which with modern advances in DNA sequencing have to be reclassified as species in their own right.

The difference between a species and a subspecies is as follows:

A species is a group of similar looking populations whose individuals have the potential to inter-breed and produce viable fertile offspring.

A subspecies is a diversion from the original species usually through geographical isolation. For example the European grey wolf (Canis lupus lupus) is a subspecies of the grey wolf found in North America. It is geographically isolated from other wolves but could still breed and produce viable offspring should it come into contact with grey wolves or other wolf subspecies.

There is still one species which the debate carries; Red Wolf (Canis rufus). It is hoped that through DNA analysis of this species it will eventually be placed into the canid family tree.

The science of taxonomy is fiercely debated and forever changing. It is highly complex and new information is published constantly. The ever changing classification can seem confusing to the wolf enthusiast, but whatever they are called they are still wolves that need our help.

Vicky Hughes, BSc (Hons)

List of Wolf Species and subspecies

(The UKWCT understand that this list may differ from other views and is subject to change. To our knowledge no definitive list is held.)

Subspecies of Canis lupus (Grey wolf)

Common Name	Classification	Status	Historic Range
Mackenzie River Valley Wolf	*Canis lupus occidentalis*	Stable	Alaska, Northern Rocky mountains, Western and Central Canada
Great Plains Wolf	*Canis lupus nubilus*	Stable	Southern Rocky mountains, Midwestern United States, North-eastern Canada, far South-western Canada and South-eastern Canada
Eastern Timber Wolf	*Canis lupus lycaon*	At Risk	South-eastern Canada, Eastern United States
Arctic Wolf	*Canis lupus arctos*	Stable	Canadian Arctic, Greenland
Vancouver Island Wolf	*Canis lupus crassodon*	Endangered	Vancouver Island
Mexican Wolf	*Canis lupus baileyi*	Critically Endangered	Central Mexico, Western Texas, Southern New Mexico and Arizona
Dingo	*Canis lupus dingo*	Vulnerable	Australia and South-east Asia
Eurasian Wolf	*Canis lupus lupus*	Stable	Western Europe, Scandinavia, Russia, China, Mongolia, Himalaya mountains
Arabian Wolf	*Canis lupus arabs*	Critically Endangered	Southern Israel, Saudi Arabia, Yemen & Oman
Caspian Sea Wolf	*Canis lupus campestris*	Endangered, declining	Between Caspian and Black Seas
Russia Wolf	*Canis lupus communis*	Stable	Central Russia
Iranian Wolf	*Canis lupus pallipes*	Stable	Northern Israel, Saudi Arabia, Turkey, Afghanistan, Pakistan and Iran
Tundra Wolf	*Canis lupus albus*	Stable	Northern Russia and Siberia
Italian Wolf	*Canis lupus italicus*	Endangered	Italy, Switzerland, France
Iberian Wolf	*Canis lupus signatus*	Stable	Portugal, North West Spain
Other Wolf Species – some of which are in debate			
Red Wolf	*Canis rufus*	Critically Endangered	North Carolina, USA
Ethiopian Wolf	*Canis simensis*	Critically Endangered	Afro-pine regions of Ethiopia
Himalayan Wolf	*Canis himalayensis*	Critically Endangered	Northern India and Eastern Nepal
Indian Wolf	*Canis indica*	Endangered	Eastern Indian Subcontinent