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What is Biological Classification?



Author:
Alexandra Mushegian,
University of Basel

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Taxonomy

Identifying, naming and classifying species

Taxonomy is the field of biology dealing with identifying, naming, and classifying species. Every species has a unique two-part name situating it within a genus, and is further assigned to a series of higher-order taxonomic rankings. The basic taxonomic hierarchy or classification is generally agreed to consist of Domain, Kingdom, Phylum, Class, Order, Family, Genus, and Species.

Taxonomy reflects the evolutionary relatedness of organisms and groups of organisms. The higher the taxonomic level, the more distantly related the organisms are within it, that is, the longer ago they shared a common ancestor. (Sometimes scientists find it meaningful to subdivide these levels further, into levels such as subphylum or subclass; these definitions are somewhat arbitrary and vary from field to field.) Groups are defined by possessing certain characters, or traits. Traditionally these have been observable or morphological characteristics, but with the invention of DNA sequencing, genes and molecular markers have also been able to be used as characters.

Scientists aim to describe a single 'tree of life' that reflects the evolutionary relationships of living things. However, evolutionary relationships are a matter of ongoing discovery, and there are different opinions about how living things should be grouped and named. EOL reflects these differences by supporting several different scientific 'classifications'. Some species have been named more than once. Such duplicates are listed under synonyms.

Example: Classification for the African Bush Elephant (Loxodonta africana (Blumenbach, 1797))

The screenshot shows the EOL page for *Loxodonta africana* (Blumenbach, 1797). The main image is a large photograph of an adult elephant and a calf in a savanna. To the right of the main image is a vertical strip of smaller images, including a map of Africa. Below the main image is a Creative Commons license and the source 'Wikimedia Commons'. The 'Classification' section on the right lists the taxonomic hierarchy: Animalia, Chordata, Vertebrata, Mammalia (Linnaeus, 1758), Theria (Parker and Haswell, 1897), Eutheria (Gill, 1872), Proboscidea (Illiger, 1811), Elephantidae (Gray, 1821), Loxodonta Anonymus (1827), and finally *Loxodonta africana* (Blumenbach, 1797) with the synonym *Loxodonta cyclotis* (Matschie, 1900). The page also features a 'Reviewed by 3 curators' note and a 'learn how to curate' link.

Phylogenetics

The study of the evolutionary relatedness of organisms

In many cases, scientists may disagree as to which taxonomic group an organism belongs. The question usually comes down to how well a certain character reflects the relatedness of organisms.

For example, if presence or absence of wings was used as a character defining a group, then butterflies, bats, and birds would be considered one group and all other, wing-less, organisms would be considered a separate group. However, based on an overwhelming number of additional characters, we can see that each of these groups—butterflies, bats, and birds—is more closely related to certain organisms without wings than they are to each other. (Butterflies are insects, many of which lack wings; bats are mammals; birds evolved as a subgroup of the dinosaurs and are now most closely related to crocodilians.) This is because the development of wings occurred several times in evolutionary history, such that winged organisms occur in a number of different taxa.

Accurate taxonomies based on correct inferences of evolutionary history are how we organize our knowledge about life on Earth, therefore are an essential part of efforts to evaluate and preserve biological diversity. Creating accurate classification schemes requires a combination of modern methods (DNA sequencing and computer-assisted evolutionary reconstruction) and old-fashioned ones—discovering and closely observing as many species as possible to gain a fuller picture of the tree of life.