[Template:Other uses](/wiki/Template:Other_uses" \o "Template:Other uses) [Template:Redirect](/wiki/Template:Redirect) [Template:Pp-semi-indef](/wiki/Template:Pp-semi-indef) [Template:Pp-move-indef](/wiki/Template:Pp-move-indef) [Template:Use dmy dates](/wiki/Template:Use_dmy_dates) [Template:Automatic Taxobox](/wiki/Template:Automatic_Taxobox)

**Animals** are [multicellular](/wiki/Multicellular), [eukaryotic](/wiki/Eukaryotic) [organisms](/wiki/Organism) of the [kingdom](/wiki/Kingdom_(biology)) **Animalia** (also called **Metazoa**). All animals are [motile](/wiki/Motility), meaning they can move spontaneously and independently at some point in their lives. Their [body plan](/wiki/Body_plan) eventually becomes fixed as they [develop](/wiki/Developmental_biology), although some undergo a process of [metamorphosis](/wiki/Metamorphosis) later on in their [lives](/wiki/Life). All animals are [heterotrophs](/wiki/Heterotroph): they must ingest other organisms or their products for [sustenance](/wiki/Sustenance).

Most known animal [phyla](/wiki/Phylum) appeared in the fossil record as marine species during the [Cambrian explosion](/wiki/Cambrian_explosion), about 542 million years ago. Animals are divided into various sub-groups, some of which are: [vertebrates](/wiki/Vertebrates) ([birds](/wiki/Birds), [mammals](/wiki/Mammals), [amphibians](/wiki/Amphibians), [reptiles](/wiki/Reptiles), [fish](/wiki/Fish)); [molluscs](/wiki/Molluscs) ([clams](/wiki/Clams), [oysters](/wiki/Oysters), [octopuses](/wiki/Octopuses), [squid](/wiki/Squid), [snails](/wiki/Snails)); [arthropods](/wiki/Arthropods) ([millipedes](/wiki/Millipedes), [centipedes](/wiki/Centipedes), [insects](/wiki/Insects), [spiders](/wiki/Spiders), [scorpions](/wiki/Scorpion), [crabs](/wiki/Crabs), [lobsters](/wiki/Lobsters), [shrimp](/wiki/Shrimp)); [annelids](/wiki/Annelids) ([earthworms](/wiki/Earthworms), [leeches](/wiki/Leeches)); [cnidarians](/wiki/Cnidarians) ([jellyfish](/wiki/Jellyfish), [sea anemones](/wiki/Sea_anemone), [corals](/wiki/Corals)); and [sponges](/wiki/Sponges).

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## Etymology[[edit](/index.php?title=(none)&action=edit&section=1)]

The word "animal" comes from the Latin [*Template:Wiktlat*](/wiki/Template:Wiktlat), meaning *having breath*, *having soul* or *living being*.[[1]](#cite_note-1) In everyday non-scientific usage the word excludes humans – that is, "animal" is often used to refer only to non-human members of the kingdom Animalia; often, only closer relatives of humans such as [mammals](/wiki/Mammal), or mammals and other [vertebrates](/wiki/Vertebrate), are meant.[[2]](#cite_note-2) The biological definition of the word refers to all members of the kingdom Animalia, encompassing creatures as diverse as [sponges](/wiki/Sponge), [jellyfish](/wiki/Jellyfish), [insects](/wiki/Insect), and [humans](/wiki/Human).<ref name=americanheritage\_animal>[Template:Cite encyclopedia](/wiki/Template:Cite_encyclopedia)</ref>

## History of classification[[edit](/index.php?title=(none)&action=edit&section=2)]

[thumb|left|alt=oil painting of wigged scholar in suit and waistcoat|](/wiki/File:Carl_von_Linné.jpg)[Carl Linnaeus](/wiki/Carl_Linnaeus), known as the father of modern [taxonomy](/wiki/Taxonomy_(biology)) [Aristotle](/wiki/Aristotle) divided the living world between animals and [plants](/wiki/Plant), and this was followed by [Carl Linnaeus](/wiki/Carl_Linnaeus), in the first hierarchical classification.<ref name=Linn1758>[Template:Cite book](/wiki/Template:Cite_book)</ref> In Linnaeus's original scheme, the animals were one of three kingdoms, divided into the classes of [Vermes](/wiki/Vermes_in_the_10th_edition_of_Systema_Naturae), [Insecta](/wiki/Insecta_in_the_10th_edition_of_Systema_Naturae), [Pisces](/wiki/Pisces_in_the_10th_edition_of_Systema_Naturae), [Amphibia](/wiki/Amphibia_in_the_10th_edition_of_Systema_Naturae), [Aves](/wiki/Aves_in_the_10th_edition_of_Systema_Naturae), and [Mammalia](/wiki/Mammalia_in_the_10th_edition_of_Systema_Naturae). Since then the last four have all been subsumed into a single phylum, the [Chordata](/wiki/Chordate), whereas the various other forms have been separated out.

In 1874, [Ernst Haeckel](/wiki/Ernst_Haeckel) divided the animal kingdom into two subkingdoms: Metazoa (multicellular animals) and [Protozoa](/wiki/Protozoa) (single-celled animals).[[3]](#cite_note-3) The protozoa were later moved to the kingdom [Protista](/wiki/Protista), leaving only the metazoa. Thus Metazoa is now considered a synonym of Animalia.[[4]](#cite_note-4)

## Characteristics[[edit](/index.php?title=(none)&action=edit&section=3)]

Animals have several characteristics that set them apart from other living things. Animals are [eukaryotic](/wiki/Eukaryote) and [multicellular](/wiki/Multicellular),<ref name=NationalZoo>[Template:Cite web](/wiki/Template:Cite_web)</ref> which separates them from [bacteria](/wiki/Bacteria) and most [protists](/wiki/Protist). They are [heterotrophic](/wiki/Heterotroph),<ref name=Windows>[Template:Cite web](/wiki/Template:Cite_web)</ref> generally digesting food in an internal chamber, which separates them from plants and [algae](/wiki/Alga).[[5]](#cite_note-5) They are also distinguished from plants, algae, and [fungi](/wiki/Fungus) by lacking rigid [cell walls](/wiki/Cell_wall).<ref name=AnimalCells>[Template:Cite web](/wiki/Template:Cite_web)</ref> All animals are [motile](/wiki/Motility),<ref name=Concepts>[Template:Cite web](/wiki/Template:Cite_web)</ref> if only at certain life stages. In most animals, [embryos](/wiki/Embryo) pass through a [blastula stage](/wiki/Blastula),[[6]](#cite_note-6) which is a characteristic exclusive to animals.

### Structure[[edit](/index.php?title=(none)&action=edit&section=4)]

With a few exceptions, most notably the [sponges](/wiki/Sponge) (Phylum [Porifera](/wiki/Porifera)) and [Placozoa](/wiki/Placozoa), animals have [bodies](/wiki/Anatomy) differentiated into separate [tissues](/wiki/Biological_tissue). These include [muscles](/wiki/Muscle), which are able to contract and control locomotion, and [nerve tissues](/wiki/Nervous_system), which send and process signals. Typically, there is also an internal [digestive](/wiki/Digestion) chamber, with one or two openings.<ref name=scienceperspectives10/> Animals with this sort of organization are called metazoans, or [eumetazoans](/wiki/Eumetazoan) when the former is used for animals in general.[[7]](#cite_note-7) All animals have [eukaryotic](/wiki/Eukaryotic) cells, surrounded by a characteristic [extracellular matrix](/wiki/Extracellular_matrix) composed of [collagen](/wiki/Collagen) and elastic [glycoproteins](/wiki/Glycoprotein).[[8]](#cite_note-8) This may be calcified to form structures like [shells](/wiki/Animal_shell), [bones](/wiki/Bone), and [spicules](/wiki/Spicule_(sponge)).[[9]](#cite_note-9) During development, it forms a relatively flexible framework[[10]](#cite_note-10) upon which cells can move about and be reorganized, making complex structures possible. In contrast, other [multicellular organisms](/wiki/Multicellular_organism), like plants and fungi, have cells held in place by cell walls, and so develop by progressive growth.<ref name=scienceperspectives10/> Also, unique to animal cells are the following intercellular junctions: [tight junctions](/wiki/Tight_junction), [gap junctions](/wiki/Gap_junction), and [desmosomes](/wiki/Desmosome).[[11]](#cite_note-11)

### Reproduction and development[[edit](/index.php?title=(none)&action=edit&section=5)]

[Template:See also](/wiki/Template:See_also) [thumb|left|240px|alt=microscopic view of dart with point| Some species of land snails use](/wiki/File:Monachoides_vicinus_dart_lateral.jpg) [love darts](/wiki/Love_dart) as a form of [sexual selection](/wiki/Sexual_selection)[[12]](#cite_note-12)

Nearly all animals undergo some form of [sexual reproduction](/wiki/Sexual_reproduction_in_animals).[[13]](#cite_note-13) They produce [haploid](/wiki/Ploidy#Haploid_and_monoploid) [gametes](/wiki/Gamete) by [meiosis](/wiki/Meiosis) (see [Origin and function of meiosis](/wiki/Origin_and_function_of_meiosis)). The smaller, motile gametes are [spermatozoa](/wiki/Spermatozoon) and the larger, non-motile gametes are [ova](/wiki/Egg_cell).[[14]](#cite_note-14) These fuse to form [zygotes](/wiki/Zygote), which develop into new individuals[[15]](#cite_note-15) (see [Allogamy](/wiki/Allogamy)).

Many animals are also capable of [asexual reproduction](/wiki/Asexual_reproduction).[[16]](#cite_note-16) This may take place through [parthenogenesis](/wiki/Parthenogenesis), where fertile eggs are produced without mating, budding, or [fragmentation](/wiki/Fragmentation_(reproduction)).[[17]](#cite_note-17) A [zygote](/wiki/Zygote) initially develops into a hollow sphere, called a [blastula](/wiki/Blastula),[[18]](#cite_note-18) which undergoes rearrangement and differentiation. In sponges, blastula larvae swim to a new location and develop into a new sponge.[[19]](#cite_note-19) In most other groups, the blastula undergoes more complicated rearrangement.[[20]](#cite_note-20) It first [invaginates](/wiki/Invagination) to form a [gastrula](/wiki/Gastrula) with a digestive chamber, and two separate [germ layers](/wiki/Germ_layer) — an external [ectoderm](/wiki/Ectoderm) and an internal [endoderm](/wiki/Endoderm).[[21]](#cite_note-21) In most cases, a [mesoderm](/wiki/Mesoderm) also develops between them.[[22]](#cite_note-22) These germ layers then differentiate to form tissues and organs.[[23]](#cite_note-23)

### Inbreeding avoidance[[edit](/index.php?title=(none)&action=edit&section=6)]

[thumb|In Gombe Stream National Park, male chimpanzees remain in their natal community while females disperse to other groups](/wiki/File:Gombe_Stream_NP_Mutter_und_Kind.jpg)

During [sexual reproduction](/wiki/Sexual_reproduction), [mating](/wiki/Mating) with a close relative ([inbreeding](/wiki/Inbreeding)) generally leads to [inbreeding depression](/wiki/Inbreeding_depression). For instance, inbreeding was found to increase juvenile mortality in 11 small animal species.[[24]](#cite_note-24) Inbreeding depression is considered to be largely due to expression of deleterious [recessive](/wiki/Dominance_(genetics)) [mutations](/wiki/Mutation).[[25]](#cite_note-25) Mating with unrelated or distantly related members of the same species is generally thought to provide the advantage of masking deleterious recessive mutations in progeny.[[26]](#cite_note-26) (see [Heterosis](/wiki/Heterosis)). Animals have evolved numerous diverse mechanisms for avoiding close inbreeding and promoting [outcrossing](/wiki/Outcrossing)<ref name=Pusey>[Template:Cite journal](/wiki/Template:Cite_journal)</ref> (see [Inbreeding avoidance](/wiki/Inbreeding_avoidance)).

As indicated in the image of chimpanzees, they have adopted dispersal as a way to separate close relatives and prevent inbreeding.[[27]](#cite_note-27) Their dispersal route is known as natal dispersal, whereby individuals move away from the area of birth.

[thumb|left|DNA analysis has shown that 60% of offspring in](/wiki/File:Malurus_splendens_-Yangebup,_Western_Australia,_Australia_-male-8.jpg) [splendid fairywrens](/wiki/Splendid_fairywren) nests were sired through extra-pair copulations, rather than from resident males.[[27]](#cite_note-27)

In various species, such as the [splendid fairywren](/wiki/Splendid_fairywren), females benefit by mating with multiple males, thus producing more offspring of higher genetic quality. Females that are [pair bonded](/wiki/Pair_bond) to a male of poor genetic quality, as is the case in inbreeding, are more likely to engage in extra-pair copulations in order to improve their reproductive success and the survivability of their offspring.[[28]](#cite_note-28)

### Food and energy sourcing[[edit](/index.php?title=(none)&action=edit&section=7)]

[Template:Main](/wiki/Template:Main) [thumb|left|alt=multi-color stain of cell showing mitosis|A](/wiki/File:Mitosis-fluorescent.jpg) [newt](/wiki/Newt) [lung](/wiki/Lung) [cell](/wiki/Cell_(biology)) [stained](/wiki/Staining_(biology)) with [fluorescent](/wiki/Fluorescent) [dyes](/wiki/Dye) undergoing the early [anaphase](/wiki/Anaphase) stage of [mitosis](/wiki/Mitosis) All animals are [heterotrophs](/wiki/Heterotroph), meaning that they feed directly or indirectly on other living things.[[29]](#cite_note-29) They are often further subdivided into groups such as [carnivores](/wiki/Carnivore), [herbivores](/wiki/Herbivore), [omnivores](/wiki/Omnivore), and [parasites](/wiki/Parasite).[[30]](#cite_note-30) [Predation](/wiki/Predation) is a [biological interaction](/wiki/Biological_interaction) where a predator (a heterotroph that is hunting) feeds on its prey (the organism that is attacked).<ref name=Ecology>Begon, M., Townsend, C., Harper, J. (1996). [*Ecology: Individuals, populations and communities*](/wiki/Ecology:_Individuals,_populations_and_communities) (Third edition). Blackwell Science, London. ISBN 0-86542-845-X, ISBN 0-632-03801-2, ISBN 0-632-04393-8.</ref> Predators may or may not kill their prey prior to feeding on them, but the act of predation almost always results in the death of the prey.[[31]](#cite_note-31) The other main category of consumption is [detritivory](/wiki/Detritivory), the consumption of dead [organic matter](/wiki/Organic_matter).[[32]](#cite_note-32) It can at times be difficult to separate the two [feeding behaviours](/wiki/Feeding_behaviour), for example, where [parasitic species](/wiki/Parasite) prey on a host organism and then lay their eggs on it for their offspring to feed on its decaying corpse. Selective pressures imposed on one another has led to an [evolutionary arms race](/wiki/Evolutionary_arms_race) between prey and predator, resulting in various [antipredator adaptations](/wiki/Antipredator_adaptations).[[33]](#cite_note-33) Most animals indirectly use the energy of [sunlight](/wiki/Sunlight) by eating plants or plant-eating animals. Most plants use light to convert [inorganic](/wiki/Inorganic) molecules in their environment into [carbohydrates](/wiki/Carbohydrate), [:fats](/wiki/Fat), [proteins](/wiki/Protein) and other biomolecules, characteristically containing [reduced](/wiki/Reduction_(chemistry)) carbon in the form of carbon-hydrogen bonds. Starting with [carbon dioxide](/wiki/Carbon_dioxide) (CO2) and water (H2O), photosynthesis converts the energy of sunlight into chemical energy in the form of simple sugars (e.g., [glucose](/wiki/Glucose)), with the release of molecular [oxygen](/wiki/Oxygen). These sugars are then used as the building blocks for plant growth, including the production of other biomolecules.<ref name=scienceperspectives10>[Template:Cite book](/wiki/Template:Cite_book)</ref> When an animal eats plants (or eats other animals which have eaten plants), the reduced carbon compounds in the food become a source of energy and building materials for the animal.[[34]](#cite_note-34) They are either used directly to help the animal grow, or broken down, releasing stored solar energy, and giving the animal the energy required for motion.[[35]](#cite_note-35)[[36]](#cite_note-36) Animals living close to [hydrothermal vents](/wiki/Hydrothermal_vent) and [cold seeps](/wiki/Cold_seep) on the [ocean floor](/wiki/Seabed) are not dependent on the energy of sunlight.[[37]](#cite_note-37) Instead [chemosynthetic](/wiki/Chemosynthesis) [archaea](/wiki/Archaea) and bacteria form the base of the [food chain](/wiki/Food_chain).[[38]](#cite_note-38)

## Origin and fossil record[[edit](/index.php?title=(none)&action=edit&section=8)]

[Template:Life timeline](/wiki/Template:Life_timeline)

[Template:Further](/wiki/Template:Further) [thumb|alt=pre-historic fish with bony skull|](/wiki/File:Dunkleosteus_BW.jpg)[*Dunkleosteus*](/wiki/Dunkleosteus) was a [Template:Convert](/wiki/Template:Convert) [prehistoric fish](/wiki/Prehistoric_fish).[[39]](#cite_note-39) Animals are generally considered to have [evolved](/wiki/Evolution) from a [flagellated](/wiki/Flagellate) eukaryote.[[40]](#cite_note-40) Their closest known living relatives are the [choanoflagellates](/wiki/Choanoflagellate), collared flagellates that have a morphology similar to the choanocytes of certain sponges.[[41]](#cite_note-41) [Molecular](/wiki/Molecular) studies place animals in a supergroup called the [opisthokonts](/wiki/Opisthokont), which also include the choanoflagellates, [fungi](/wiki/Fungus) and a few small parasitic [protists](/wiki/Protist).[[42]](#cite_note-42) The name comes from the posterior location of the [flagellum](/wiki/Flagellum) in motile cells, such as most animal spermatozoa, whereas other [eukaryotes](/wiki/Eukaryotes) tend to have anterior flagella.[[43]](#cite_note-43) The first fossils that might represent animals appear in the [Trezona Formation](/wiki/Trezona_Formation) at Trezona Bore, West Central Flinders, [South Australia](/wiki/South_Australia).<ref name=roseMaloof>[Template:Cite journal](/wiki/Template:Cite_journal) [Pdf](http://www.princeton.edu/geosciences/people/maloof/papers_pub/24Maloof.pdf)</ref> These fossils are interpreted as being early sponges. They were found in 665-million-year-old rock.<ref name=roseMaloof/>

The next oldest possible animal fossils are found towards the end of the [Precambrian](/wiki/Precambrian), around 610 million years ago, and are known as the [Ediacaran or Vendian biota](/wiki/Ediacaran_biota).[[44]](#cite_note-44) These are difficult to relate to later fossils, however. Some may represent precursors of modern phyla, but they may be separate groups, and it is possible they are not really animals at all.[[45]](#cite_note-45) Aside from them, most known animal phyla make a more or less simultaneous appearance during the [Cambrian](/wiki/Cambrian) period, about 542 million years ago.[[46]](#cite_note-46) It is still disputed whether this event, called the [Cambrian explosion](/wiki/Cambrian_explosion), is due to a rapid divergence between different groups or due to a change in conditions that made fossilization possible.

Some paleontologists suggest that animals appeared much earlier than the Cambrian explosion, possibly as early as 1 billion years ago.[[47]](#cite_note-47) [Trace fossils](/wiki/Trace_fossil) such as tracks and burrows found in the [Tonian](/wiki/Tonian) period indicate the presence of [triploblastic](/wiki/Triploblastic) worms, like metazoans, roughly as large (about 5 mm wide) and complex as [earthworms](/wiki/Earthworms).<ref name=Seilacher1998>[Template:Cite journal](/wiki/Template:Cite_journal)</ref> During the beginning of the Tonian period around 1 billion years ago, there was a decrease in [Stromatolite](/wiki/Stromatolite) diversity, which may indicate the appearance of grazing animals, since stromatolite diversity increased when grazing animals became extinct at the [End Permian](/wiki/Permian–Triassic_extinction_event) and [End Ordovician](/wiki/Ordovician–Silurian_extinction_event) extinction events, and decreased shortly after the grazer populations recovered. However the discovery that tracks very similar to these early trace fossils are produced today by the giant single-celled protist [*Gromia sphaerica*](/wiki/Gromia_sphaerica) casts doubt on their interpretation as evidence of early animal evolution.<ref name=Matz2008>[Template:Cite journal](/wiki/Template:Cite_journal)</ref><ref name=MSNBC200811>[Template:Cite news](/wiki/Template:Cite_news)</ref>

## Groups of animals[[edit](/index.php?title=(none)&action=edit&section=9)]

[Template:MainTraditional](/wiki/Template:Main) morphological and modern molecular [phylogenetic analysis](/wiki/Phylogenetics) have both recognized a major evolutionary transition from "non-bilaterian" animals, which are those lacking a [bilaterally symmetric](/wiki/Symmetry_in_biology) [body plan](/wiki/Body_plan) ([Porifera](/wiki/Porifera), [Ctenophora](/wiki/Ctenophora), [Cnidaria](/wiki/Cnidaria) and [Placozoa](/wiki/Placozoa)), to "bilaterian" animals ([Bilateria](/wiki/Bilateria)) whose body plans display bilateral symmetry. The latter are further classified based on a major division between [Deuterostomes](/wiki/Deuterostome) and [Protostomes](/wiki/Protostome). The relationships among non-bilaterian animals are disputed, but all bilaterian animals are thought to form a [monophyletic](/wiki/Monophyly) group. Current understanding of the relationships among the major groups of animals is summarized by the following cladogram:[Template:Clade](/wiki/Template:Clade)

### Non-bilaterian animals: Porifera, Placozoa, Ctenophora, Cnidaria[[edit](/index.php?title=(none)&action=edit&section=10)]

Several animal phyla are recognized for their lack of [bilateral symmetry](/wiki/Bilaterally_symmetrical), and are thought to have diverged from other animals early in evolution. Among these, the sponges ([Porifera](/wiki/Porifera)) were long thought to have diverged first, representing the oldest animal phylum.[[48]](#cite_note-48) They lack the complex organization found in most other phyla.[[49]](#cite_note-49) Their cells are differentiated, but in most cases not organized into distinct tissues.[[50]](#cite_note-50) Sponges typically feed by drawing in water through pores.[[51]](#cite_note-51) However, a series of phylogenomic studies from 2008-2015 have found support for [Ctenophora](/wiki/Ctenophora), or comb jellies, as the basal lineage of animals.[[52]](#cite_note-52)[[53]](#cite_note-53)[[54]](#cite_note-54)[[55]](#cite_note-55) This result has been controversial, since it would imply that that sponges may not be so primitive, but may instead be secondarily simplified.[[52]](#cite_note-52) Other researchers have argued that the placement of Ctenophora as the earliest-diverging animal phylum is a statistical anomaly caused by the high rate of evolution in ctenophore genomes.[[56]](#cite_note-56)[[57]](#cite_note-57)[[58]](#cite_note-58)[[59]](#cite_note-59) Among the other phyla, the Ctenophora and the [Cnidaria](/wiki/Cnidaria), which includes [sea anemones](/wiki/Sea_anemone), [corals](/wiki/Coral), and [jellyfish](/wiki/Jellyfish), are radially symmetric and have digestive chambers with a single opening, which serves as both the mouth and the anus.[[60]](#cite_note-60) Both have distinct tissues, but they are not organized into [organs](/wiki/Organ_(anatomy)).[[61]](#cite_note-61) There are only two main germ layers, the ectoderm and endoderm, with only scattered cells between them. As such, these animals are sometimes called [diploblastic](/wiki/Diploblastic).[[62]](#cite_note-62) The tiny [placozoans](/wiki/Placozoan) are similar, but they do not have a permanent digestive chamber.

The [Myxozoa](/wiki/Myxozoa), microscopic parasites that were originally considered Protozoa, are now believed to have developed from within Cnidaria.[[63]](#cite_note-63) A new group of animals, the [Dendrogrammatidae](/wiki/Dendrogrammatidae), was discovered in Australian water. Further DNA testing is required, but scientists suspect they could represent a whole new phylum, possible descendants of the [Ediacaran fauna](/wiki/Ediacara_biota).[[64]](#cite_note-64) [thumb|left|upright|alt=Orange elephant ear sponge under water with sea fan in background|Orange elephant ear sponge,](/wiki/File:Elephant-ear-sponge.jpg) [*Agelas clathrodes*](/wiki/Agelas_clathrodes), in foreground. Two corals in the background: a [sea fan](/wiki/Sea_fan), [*Iciligorgia schrammi*](/wiki/Iciligorgia_schrammi), and a sea rod, [*Plexaurella nutans*](/wiki/Plexaurella_nutans).

### Bilaterian animals[[edit](/index.php?title=(none)&action=edit&section=11)]

The remaining animals form a [monophyletic](/wiki/Monophyletic) group called the [Bilateria](/wiki/Bilateria). For the most part, they are [bilaterally symmetric](/wiki/Symmetry_(biology)), and often have a specialized head with feeding and sensory organs. The body is [triploblastic](/wiki/Triploblastic), i.e. all three germ layers are well-developed, and tissues form distinct organs. The digestive chamber has two openings, a mouth and an anus, and there is also an internal body cavity called a [coelom](/wiki/Coelom) or pseudocoelom. There are exceptions to each of these characteristics, however — for instance adult [echinoderms](/wiki/Echinoderm) are radially symmetric, and certain [parasitic worms](/wiki/Parasitic_worm) have extremely simplified body structures.

Genetic studies have considerably changed our understanding of the relationships within the Bilateria. Most appear to belong to two major lineages: the [deuterostomes](/wiki/Deuterostome) and the [protostomes](/wiki/Protostome), the latter of which includes the [Ecdysozoa](/wiki/Ecdysozoa), and [Lophotrochozoa](/wiki/Lophotrochozoa). In addition, there are a few small groups of bilaterians with relatively similar structure whose relationships with other animals are not well-established. These include the [Acoelomorpha](/wiki/Acoelomorpha), [Rhombozoa](/wiki/Rhombozoa), and [Orthonectida](/wiki/Orthonectida).

#### Deuterostomes and Protostomes[[edit](/index.php?title=(none)&action=edit&section=12)]

[thumb|alt=blue and gray wren on branch|](/wiki/File:Superbfairywrenscropped.jpeg)[Superb fairy-wren](/wiki/Superb_fairy-wren), *Malurus cyaneus* [Deuterostomes](/wiki/Deuterostome) differ from [protostomes](/wiki/Protostome) in several ways. Animals from both groups possess a complete digestive tract. However, in protostomes, the first opening of the gut to appear in embryological development (the [archenteron](/wiki/Archenteron)) develops into the mouth, with the anus forming secondarily. In deuterostomes the anus forms first, with the mouth developing secondarily.[[65]](#cite_note-65) In most protostomes, cells simply fill in the interior of the gastrula to form the mesoderm, called schizocoelous development, but in deuterostomes, it forms through [invagination](/wiki/Invagination) of the endoderm, called enterocoelic pouching.[[66]](#cite_note-66) Deuterostome embryos undergo radial [cleavage](/wiki/Cleavage_(embryo)) during cell division, while protostomes undergo spiral cleavage.[[67]](#cite_note-67) All this suggests the deuterostomes and protostomes are separate, monophyletic lineages. The main phyla of deuterostomes are the [Echinodermata](/wiki/Echinodermata) and [Chordata](/wiki/Chordate).[[68]](#cite_note-68) The former are radially symmetric and exclusively marine, such as [starfish](/wiki/Starfish), [sea urchins](/wiki/Sea_urchin), and [sea cucumbers](/wiki/Holothuroidea).[[69]](#cite_note-69) The latter are dominated by the [vertebrates](/wiki/Vertebrate), animals with backbones.[[70]](#cite_note-70) These include [:fish](/wiki/Fish), [amphibians](/wiki/Amphibian), [reptiles](/wiki/Reptile), [:birds](/wiki/Bird), and [mammals](/wiki/Mammal).[[71]](#cite_note-71) In addition to these, the deuterostomes also include the [Hemichordata](/wiki/Hemichordata), or acorn worms, which are thought to be closely related to Echinodermata forming a group known as [Ambulacraria](/wiki/Ambulacraria).[[72]](#cite_note-72)[[73]](#cite_note-73) Although they are not especially prominent today, the important fossil [graptolites](/wiki/Graptolite) may belong to this group.[[74]](#cite_note-74)

#### Ecdysozoa[[edit](/index.php?title=(none)&action=edit&section=13)]

[thumb|alt=multi-colored dragonfly on branch facing left|](/wiki/File:Sympetrum_flaveolum_-_side_(aka).jpg)[Yellow-winged darter](/wiki/Yellow-winged_darter), *Sympetrum flaveolum* The [Ecdysozoa](/wiki/Ecdysozoa) are protostomes, named after the common [trait](/wiki/Phenotypic_trait) of growth by [moulting](/wiki/Moulting) or [ecdysis](/wiki/Ecdysis).[[75]](#cite_note-75) The largest animal phylum belongs here, the [Arthropoda](/wiki/Arthropoda), including insects, spiders, crabs, and their kin. All these organisms have a body divided into repeating segments, typically with paired appendages. Two smaller phyla, the [Onychophora](/wiki/Onychophora) and [Tardigrada](/wiki/Tardigrada), are close relatives of the arthropods and share these traits. The ecdysozoans also include the [Nematoda](/wiki/Nematoda) or roundworms, perhaps the second largest animal phylum. Roundworms are typically microscopic, and occur in nearly every environment where there is water.[[76]](#cite_note-76) A number are important parasites.[[77]](#cite_note-77) Smaller phyla related to them are the [Nematomorpha](/wiki/Nematomorpha) or horsehair worms, and the [Kinorhyncha](/wiki/Kinorhyncha), [Priapulida](/wiki/Priapulida), and [Loricifera](/wiki/Loricifera). These groups have a reduced coelom, called a pseudocoelom.[thumb|alt=snail in shell facing right|](/wiki/File:Grapevinesnail_01.jpg)[Roman snail](/wiki/Roman_snail), *Helix pomatia*

#### Lophotrochozoa[[edit](/index.php?title=(none)&action=edit&section=14)]

The [Lophotrochozoa](/wiki/Lophotrochozoa), evolved within Protostomia, include two of the most successful animal phyla, the [Mollusca](/wiki/Mollusca) and [Annelida](/wiki/Annelida).[[78]](#cite_note-78)[[79]](#cite_note-79) The former, which is the second-largest animal phylum by number of described species, includes animals such as [snails](/wiki/Snail), [clams](/wiki/Clam), and [squids](/wiki/Squid), and the latter comprises the segmented worms, such as [earthworms](/wiki/Earthworm) and [leeches](/wiki/Leech). These two groups have long been considered close relatives because of the common presence of [trochophore](/wiki/Trochophore) larvae, but the annelids were considered closer to the arthropods because they are both segmented.[[80]](#cite_note-80) Now, this is generally considered [convergent evolution](/wiki/Convergent_evolution), owing to many morphological and genetic differences between the two phyla.[[81]](#cite_note-81) The Lophotrochozoa also include the [Nemertea](/wiki/Nemertea) or ribbon worms, the [Sipuncula](/wiki/Sipuncula), and several phyla that have a ring of ciliated tentacles around the mouth, called a [lophophore](/wiki/Lophophore).[[82]](#cite_note-82) These were traditionally grouped together as the lophophorates.[[83]](#cite_note-83) but it now appears that the lophophorate group may be [paraphyletic](/wiki/Paraphyletic),[[84]](#cite_note-84) with some closer to the nemerteans and some to the molluscs and annelids.[[85]](#cite_note-85)[[86]](#cite_note-86) They include the [Brachiopoda](/wiki/Brachiopoda) or lamp shells, which are prominent in the fossil record, the [Entoprocta](/wiki/Entoprocta), the [Phoronida](/wiki/Phoronida), and possibly the [Bryozoa](/wiki/Bryozoa) or moss animals.[[87]](#cite_note-87) The [Platyzoa](/wiki/Platyzoa) include the phylum [Platyhelminthes](/wiki/Platyhelminthes), the flatworms.[[88]](#cite_note-88) These were originally considered some of the most primitive Bilateria, but it now appears they developed from more complex ancestors.[[89]](#cite_note-89) A number of [parasites](/wiki/Parasites) are included in this group, such as the [flukes](/wiki/Trematoda) and [tapeworms](/wiki/Tapeworm).[[88]](#cite_note-88) Flatworms are [acoelomates](/wiki/Aceolomate), lacking a body cavity, as are their closest relatives, the microscopic [Gastrotricha](/wiki/Gastrotricha).[[90]](#cite_note-90) The other platyzoan phyla are mostly microscopic and [pseudocoelomate](/wiki/Body_cavity#Pseudocoelomates). The most prominent are the [Rotifera](/wiki/Rotifera) or rotifers, which are common in aqueous environments. They also include the [Acanthocephala](/wiki/Acanthocephala) or spiny-headed worms, the [Gnathostomulida](/wiki/Gnathostomulida), [Micrognathozoa](/wiki/Micrognathozoa), and possibly the [Cycliophora](/wiki/Cycliophora).[[91]](#cite_note-91) These groups share the presence of complex jaws, from which they are called the [Gnathifera](/wiki/Gnathifera_(phylum)).

The [Chaetognatha](/wiki/Chaetognatha) or arrow worms have been traditionally classified as deuterostomes, though recent molecular studies have identified this group as a basal protostome lineage.[[92]](#cite_note-92)

## Number of extant species[[edit](/index.php?title=(none)&action=edit&section=15)]

Animals can be divided into two broad groups: [vertebrates](/wiki/Vertebrate) (animals with a [backbone](/wiki/Vertebral_column)) and [invertebrates](/wiki/Invertebrate) (animals without a backbone). Half of all described vertebrate species are fishes and three-quarters of all described invertebrate species are insects. The following table lists the number of described [extant](/wiki/Extant_taxa) species for each major animal subgroup as estimated for the [IUCN Red List of Threatened Species](/wiki/IUCN_Red_List_of_Threatened_Species)*, 2014.3.<ref name=IUCN1014>The World Conservation Union. 2014.* [IUCN Red List of Threatened Species](/wiki/IUCN_Red_List_of_Threatened_Species)*, 2014.3. Summary Statistics for Globally Threatened Species.* [*Table 1: Numbers of threatened species by major groups of organisms (1996–2014)*](http://cmsdocs.s3.amazonaws.com/summarystats/2014_3_Summary_Stats_Page_Documents/2014_3_RL_Stats_Table_1.pdf)*.</ref>*

[thumb|301px|right|alt=pie chart showing arthropoda with 90 percent of phylum|The relative number of species contributed to the total by each phylum of animals](/wiki/File:AnimalsRelativeNumbers.png)

|  |  |  |  |
| --- | --- | --- | --- |
| **Group** | **Image** | **Subgroup** | **Estimated number of described species**[**[93]**](#cite_note-93) |
| **Vertebrates** | [alt=large goldfish facing right|140px](/wiki/File:Carassius_wild_golden_fish_2013_G1.jpg) | [Fishes](/wiki/Fish) | 32,900 |
| [alt=green spotted frog facing right|140px](/wiki/File:Lithobates_pipiens.jpg) | [Amphibians](/wiki/Amphibian) | 7,302 |
| [alt=florida box turtle facing right|140px](/wiki/File:Florida_Box_Turtle_Digon3.jpg) | [Reptiles](/wiki/Reptile) | 10,038 |
| [alt=Secretary bird gliding to the right|140px](/wiki/File:Secretary_bird_(Sagittarius_serpentarius)_2.jpg) | [Birds](/wiki/Bird) | 10,425 |
| [alt=drawing of squirrel facing right on branch|140px](/wiki/File:Squirrel_(PSF).png) | [Mammals](/wiki/Mammal) | 5,513 |
| [Template:Right](/wiki/Template:Right) | | |
| **Invertebrates** | [alt=wasp facing right|140px](/wiki/File:European_wasp_white_bg02.jpg) | [Insects](/wiki/Insect) | 1,000,000 |
| [alt=snail in shell facing right|140px](/wiki/File:Grapevinesnail_01.jpg) | [Molluscs](/wiki/Mollusc) | 85,000 |
| [alt=Tasmanian giant crab facing up with large left claw|140px](/wiki/File:J_J_Wild_Pseudocarcinus_cropped.jpg) | [Crustaceans](/wiki/Crustacean) | 47,000 |
| [alt=Table coral at French Frigate Shoals, Northwestern Hawaiian Islands|140px](/wiki/File:FFS_Table_bottom.jpg) | [Corals](/wiki/Coral) | 2,000 |
| [alt=black spider|140px](/wiki/File:Spider.svg) | [Arachnids](/wiki/Arachnid) | 102,248 |
| [alt=drawing of Cambrian-aged soft-bodied, caterpillar|140px](/wiki/File:Aysheaia.jpg) | [Velvet worms](/wiki/Velvet_worm) | 165 |
| [alt=horse shoe crab on sand facing right|140px](/wiki/File:Carcinoscorpius_rotundicauda_(mangrove_horseshoe_crab).jpg) | [Horseshoe crabs](/wiki/Horseshoe_crab) | 4 |
|  | Others | 68,658 |
| [Template:Right](/wiki/Template:Right) | | |
| [**Template:Right**](/wiki/Template:Right) | | | |

Over 95% of the described animal species in the world are invertebrates.

## Model organisms[[edit](/index.php?title=(none)&action=edit&section=16)]

[Template:Main](/wiki/Template:Main) Because of the great diversity found in animals, it is more economical for scientists to study a small number of chosen species so that connections can be drawn from their work and conclusions extrapolated about how animals function in general. Because they are easy to keep and breed, the fruit fly [*Drosophila melanogaster*](/wiki/Drosophila_melanogaster) and the nematode [*Caenorhabditis elegans*](/wiki/Caenorhabditis_elegans) have long been the most intensively studied metazoan [model organisms](/wiki/Model_organism), and were among the first life-forms to be genetically sequenced. This was facilitated by the severely reduced state of their [genomes](/wiki/Genome), but as many [genes](/wiki/Gene), [introns](/wiki/Intron), and [linkages](/wiki/Genetic_linkage) lost, these ecdysozoans can teach us little about the origins of animals in general. The extent of this type of evolution within the superphylum will be revealed by the crustacean, annelid, and molluscan [genome projects](/wiki/Genome_project) currently in progress. Analysis of the [starlet sea anemone](/wiki/Starlet_sea_anemone) genome has emphasised the importance of sponges, placozoans, and [choanoflagellates](/wiki/Choanoflagellate), also being sequenced, in explaining the arrival of 1500 ancestral genes unique to the Eumetazoa.[[94]](#cite_note-94) An analysis of the [homoscleromorph sponge](/wiki/Homoscleromorpha) [*Oscarella carmela*](/wiki/Oscarella_carmela) also suggests that the last common ancestor of sponges and the eumetazoan animals was more complex than previously assumed.[[95]](#cite_note-95) Other model organisms belonging to the animal kingdom include the house mouse ([*Mus musculus*](/wiki/Mus_musculus)) and zebrafish ([*Danio rerio*](/wiki/Danio_rerio)).

## See also[[edit](/index.php?title=(none)&action=edit&section=17)]

[Template:Wikipedia books](/wiki/Template:Wikipedia_books)

* [Animal attacks](/wiki/Animal_attacks)
* [Animal coloration](/wiki/Animal_coloration)
* [Biological classification](/wiki/Biological_classification)
* [Ethology](/wiki/Ethology)
* [Fauna](/wiki/Fauna)
* [List of animal names](/wiki/List_of_animal_names)
* [List of animals by number of neurons](/wiki/List_of_animals_by_number_of_neurons)
* [Lists of animals](/wiki/Lists_of_animals)
* [Lists of organisms by population](/wiki/Lists_of_organisms_by_population)
* [Zoology](/wiki/Zoology)

## References[[edit](/index.php?title=(none)&action=edit&section=18)]

[Template:Reflist](/wiki/Template:Reflist)

## Bibliography[[edit](/index.php?title=(none)&action=edit&section=19)]

[Template:Refbegin](/wiki/Template:Refbegin)

* [Template:Cite book](/wiki/Template:Cite_book)
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## External links[[edit](/index.php?title=(none)&action=edit&section=20)]

[Template:Sister project links](/wiki/Template:Sister_project_links)

* [Template:Wikispecies-inline](/wiki/Template:Wikispecies-inline)
* [Template:Eol](/wiki/Template:Eol)
* [Tree of Life Project](http://tolweb.org/)
* [Animal Diversity Web](http://animaldiversity.org/) – [University of Michigan's](/wiki/University_of_Michigan) database of animals, showing [taxonomic classification](/wiki/Taxonomic_classification), images, and other information.
* [ARKive](http://www.arkive.org/) – multimedia database of worldwide endangered/protected species and common species of UK.
* [The Animal Kingdom](http://logic-law.com/index.php?title=Kingdom_Animalia/Metazoa)
* [Getting a Leg Up on Land](http://www.scientificamerican.com/article/getting-a-leg-up-on-land/) Scientific American Magazine (December 2005 Issue) – About the evolution of four-limbed animals from fish.

[Template:Animalia](/wiki/Template:Animalia) [Template:Eukaryota](/wiki/Template:Eukaryota) [Template:Nature](/wiki/Template:Nature) [Template:Portal bar](/wiki/Template:Portal_bar)

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[Category:Animals](/wiki/Category:Animals) [Category:Zoology](/wiki/Category:Zoology) [Animals](/wiki/Category:Kingdoms_(biology)) [Category:Cryogenian first appearances](/wiki/Category:Cryogenian_first_appearances)