

FUR, FEATHERS & SCALES, and LIFE CYCLES

Variety of Life

Approximately two million living species have been discovered and named. Because there are so many different types of animals and plants, putting them into groups with other species with similar characteristics, allows for easy identification, shows relationships between species and can possibly show evolutionary trends.

How do we group species?

There are many ways to group species; we could look at their colour, number of legs, where they live or how they move, but there is one recognised scientific system for grouping or classifying species called taxonomy, which was first outlined in the 1750's.

Firstly, every living thing on earth can be classified into one of five kingdoms.

- **Monera** - bacteria and bluegreen algae.
Over 5,000 species (*spp.*)
- **Protocista** - algae and protozoans.
Over 80,000 *spp.*
- **Fungi** - mushrooms, moulds and lichens.
Over 150,000 *spp.*
- **Plants** - Over 350,000 *spp.*
- **Animals** - Over 1,500,000 *spp.*

Once the appropriate kingdom is allocated a further six hierarchical steps or divisions are followed through.

One of the easiest ways to initially group species from the animal kingdom is to see whether they have a backbone or not. Animals without a backbone are called **INVERTEBRATES**.

They make up approximately 97% of all animal species and include insects, arachnids (spiders and scorpions), molluscs (e.g. snails), crustaceans, centipedes, millipedes, starfish and jellyfish.

INVERTEBRATES
97%

The seven levels of classification

- KINGDOM** - See information on the left.
- PHYLUM** - Group of related classes
e.g. *Chordata* (with spinal chord).
- CLASS** - Group of related orders
e.g. *Mammalia*.
- ORDER** - Group of related families
e.g. *Carnivora*.
- FAMILY** - Group of related genera
e.g. *Felidae* (the cat family).
- GENUS** - Group of related species
e.g. *Panthera* (big cats).
- SPECIES** - Every individual type of animal.
e.g. *Panthera tigris* (tiger).

Note: There are also sub-species where two or more populations of a species have some discernable differences e.g. one recognised species of tiger with five living sub-species: Sumatran, Indian, Chinese, Siberian, and South China.

These invertebrates
have an exoskeleton
(A protective rigid layer on
the outside of their body).

For more information on invertebrates, please see the Drusillas Park minibests brochure.

VERTEBRATES are animals with a backbone. There are five vertebrate groups: fish, amphibians, reptiles, birds and mammals. Each of these groups have specific features that allow them to be effectively classified together.

Life Cycles

Animals and plants need to reproduce in order for the species to continue beyond the lifespan of any individual.

Many simple organisms (e.g. bacteria) reproduce simply by dividing themselves (asexual reproduction). More complex animals require the mixing of genetic material (gametes) from male and female parents (sexual reproduction).

Some plants can reproduce in both ways, bluebells reproduce asexually from bulbs whilst strawberries use runners; however both plants also have flowers which form seeds and fruit when pollinated.

Because sexual reproduction involves mixing of genes, evolution can occur.

The process by which the genetic material meets and joins is called fertilisation; this can occur either internally or externally. External fertilisation usually occurs in water and is used by some fish, amphibians and invertebrates. Internal fertilisation is far more effective than external fertilisation (enclosed environment).

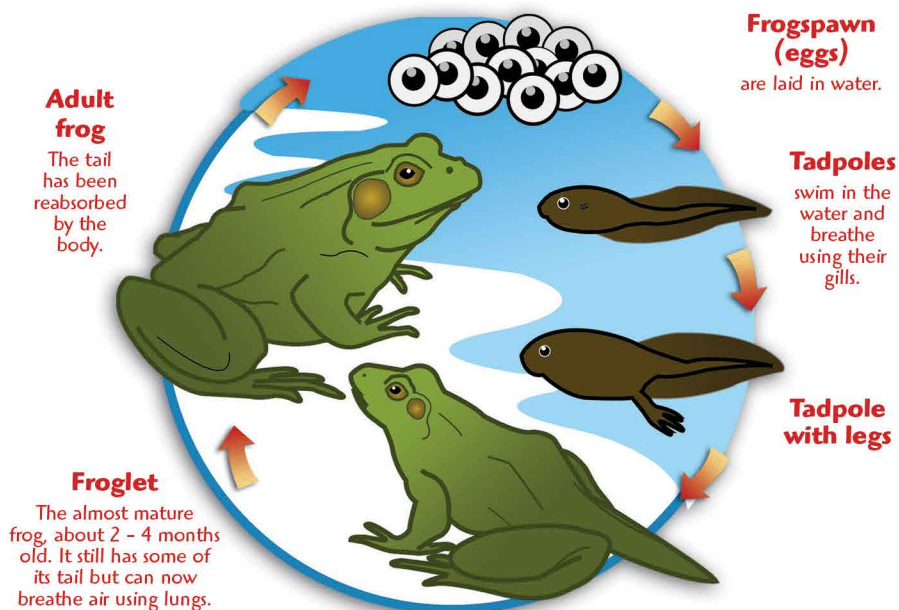
Following fertilisation, the foetus needs to develop before it is able to survive in the outside world. This can occur within an egg or inside the female's body. Egg laying is called ovipary whilst having live young is called vivipary. The period between fertilisation and hatching/birth is known as incubation (egg laying species) or gestation (for animals that give birth to live young).

Most animals including all birds and most fish, amphibians, reptiles and invertebrates lay eggs. Egg laying has many advantages including mass production (ensures that some young will survive), ability to withstand adverse weather (some eggs survive the winter in Britain), and no constraints of pregnancy to females (e.g. more mobile; pregnant birds would have problems flying).

Nearly all mammals give birth to live young (only echidnas and duck-billed platypuses lay eggs) and all feed their young on milk produced by females. Fewer young need to be produced by this method.

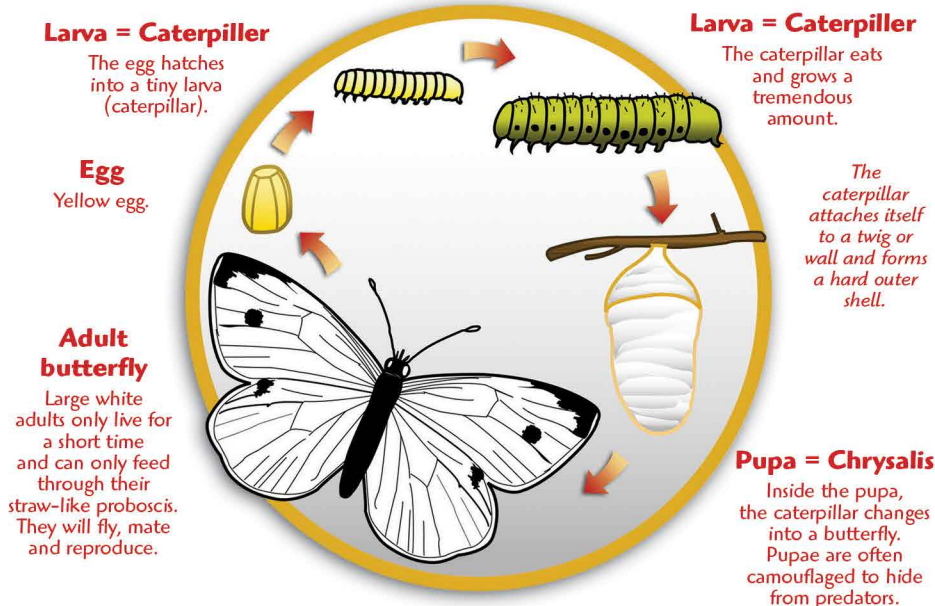
Not all animals when born (or hatched) continue to grow directly into adults. Some animals have changes to go through before they reach maturity. Two good examples of life cycles are the frog and the butterfly.

The Life Cycle of a FROG



The Life Cycle of a BUTTERFLY

The metamorphosis of a large white butterfly



Generally, the higher the level of parental care, the fewer offspring that need to be produced to ensure that some will survive to form the next generation.

Whilst often it is the female that raises the young, in some species it is the male who has the responsibility, the male seahorse and male ostrich both incubate their young.

Whether an animal builds a nest can depend upon its lifestyle, this can also determine how developed it is at birth. Grazing animals such as cattle, horses and deer are often on the move - finding food and escaping predators; therefore their young are born fully furred, with their eyes open and the ability to walk within hours. Other animals e.g. mice and humans are naked and helpless at birth.

There is a similar pattern in birds, some (e.g. sparrow and starlings) hatch naked and helpless, whilst others (ducks and chickens) can run and feed almost immediately.



Vertebrate Groups

FISH

A fish is any aquatic (water dwelling) vertebrate that is not a mammal, bird, reptile or amphibian. Many scientists divide fish into two main classes: **cartilaginous fish** and **bony fish**. Cartilaginous fish, such as sharks, rays and skates have skeletons made from cartilage and skin made of dentine and enamel (just like teeth). Bony fish such as carp, trout and cod have bony skeletons and scales made of bony material. Jawless fish (e.g. hagfish and lampreys) are sometimes classed in a separate group. There are more than 33,000 species of fish.

What makes a fish a fish?

1. Lives in water.
 2. Breathes through gills.
 3. Streamlined body shape.
 4. Mainly produces eggs.
 5. Are ectothermic (cold-blooded, therefore cannot generate body heat internally).
 6. Have wet scales.
- Ecto - outside thermic - heat*

AMPHIBIANS

Amphibian comes from the Greek word meaning double life. Their eggs are laid in water and the young are aquatic and breathe through gills. However as they grow, a metamorphosis takes place and the adults develop limbs and lungs. Adults are still dependant on having water around them, but breathe air. Their skin has no scales, but glands which produce a mucus to help keep the skin moist. There are more than 8,000 species of amphibian. Frogs, toads, newts, salamanders and caecilians are all amphibians.

What makes an amphibian an amphibian?

1. Lays eggs in water.
2. Larvae live in water breathing with gills, adults can survive on land breathing with lungs.
3. They have a moist, permeable, glandular skin.
4. Are ectothermic (cold-blooded).

REPTILES

Reptiles were the first vertebrates to fully live on land. They have a waterproof and watertight covering of scales and their eggs developed a shell that meant they could be laid out of water. They are ectothermic (cold blooded) and are therefore dependent on the surrounding temperature so most of the 10,000 reptile species live in hot places. Warming up and cooling down is achieved by activities such as basking, burrowing, seeking shade, spending time in water and being active during warmer parts of the day. Turtles, tortoises, crocodilians, snakes, lizards and tuataras are all reptiles.

What makes a reptile a reptile?

1. Are ectothermic.
2. Breathe through lungs.
3. Dry scaly skin.
4. Lay eggs (or have live young) on land.

BIRDS

There are more than 11,000 different species of bird that live in a wide variety of environments all over the world. Birds are endothermic (warm blooded) and produce their body heat through respiration. Birds have more than one type of feather, each with different functions: flight feathers on wings and tails, down feathers which aid insulation and contour feathers which cover the body. It is thought that feathers initially evolved to prevent heat loss and gave them an advantage over cold blooded competitors. Feathers later became used for other purposes.

What makes a bird a bird?

1. They are endothermic (warm-blooded).
2. They are covered in feathers.
3. Lay hard shelled eggs.
4. Are bipedal with front limbs modified to wings.
5. Are toothless (apart from a temporary egg tooth).
6. Have a beak.

MAMMALS

As far as we know, mammals similar to shrews appeared on Earth around 200 million years ago and there are now more than 6,000 species worldwide, found in most of the world's habitats. They are endothermic (warm-blooded) and their young are nourished from their mother's milk. The milk is produced in special mammary glands, which is where the name comes from (mamma is latin for breast). There are three types of mammals: monotremes, marsupials and placentals. Monotremes (echidnas and duck-billed platypuses) are primitive mammals who feed their young milk and are endothermic, but still lay eggs. Marsupials (e.g. wallabies and koalas) are pouched mammals which produce their young at an early stage of development and then nourish them in a pouch. Placentals (e.g. humans and meerkats) nurture the foetus through a placenta and are more developed when born. Some can walk and feed almost as soon as they are born.

What makes a mammal a mammal?

1. They are endothermic (warm-blooded).
2. They are covered in hair or fur.
3. Live birth (except monotremes).
4. Feed their young on milk.

Your education session @ DRUSILLAS

Your 30 minute education session can focus on either vertebrate classification or life cycles. Initial discussions establish ways of grouping animals or what a life cycle is. Volunteers are then dressed up to represent the vertebrate groups (e.g. with scaly or smooth skinned waistcoats) with an emphasis put on either the groups characteristics or how they develop. Appropriate props are shown (e.g. ostrich eggs and mermaids purses) and the pupils have the opportunity to handle some animal artefacts – for example turtle shells and crocodile skins on loan from HM Revenue & Customs. Photographic images are additionally shown during a Life Cycles session. The session is completed with animal encounters with two live animals.

Naturally, health and safety is considered throughout and everyone is asked to clean their hands after touching animals and artefacts.

VERTEBRATE ANIMALS AT DRUSILLAS



Meerkat (*Suricata suricatta*)

Meerkats are a species of mongoose that inhabit the dry open plains of southern Africa. They are social animals living in large groups of between 20 and 30 individuals, sometimes with other mongoose species. Meerkats are diurnal animals that return to their burrows at night. They work together as a team with each member taking specific duties during the day. A sentry or look out keeps watch for predators and will bark a warning to the group at the first sign of danger. There are also 'baby sitters' that guard the young while the rest of the group are out hunting. Meerkats feed mainly on invertebrates, but they also eat small mammals, eggs, lizards and occasionally snakes.

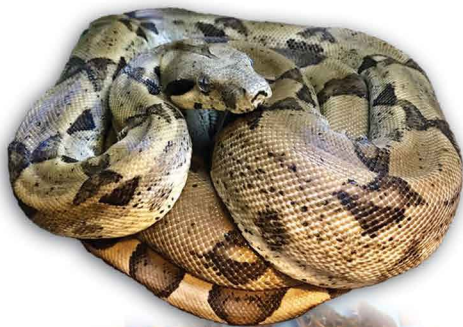
Chilean flamingo (*Phoenicopterus chilensis*)

Flamingos are easily distinguished by their pink feathers, their long neck and legs, and their unusual hooked beak. Their colour is gained from the carotenoids in their food, such as crustaceans and molluscs. The beak is an adaptation for feeding and is used as a filter system - the submerge the beak in the water, then push the water out with their tongue, leaving only the tiny animals behind.

Drusillas has a number of reptiles that can be shown to school groups, when available.

Snakes (various species)

All snakes used in education sessions are constrictors that naturally eat small mammals - we do not use any venomous snakes.



Milk snake - found from northern South America to southern Canada, mainly in forested areas.

Corn snake - from central and south-east USA, live in woodland, grassland and urban areas.

Boa constrictor - from tropical areas in Central and South America, can grow up to 4 metres and weigh up to 45kg.

Royal python - from West and Central Africa, live in savannah and sparsely wooded plains.



Red panda (*Ailurus fulgens*)

Found in forests of between 2,000m and 5,000m altitude in countries around the Himalayas including India and China. They mostly eat bamboo and are endangered due to habitat destruction and hunting. Scientists believe that red pandas are more closely related to raccoons and coatis, than they are to giant pandas.



Humboldt penguin (*Spheniscus humboldti*)

Humboldt penguins are found on the coasts of Chile and Peru. They often dig burrows in sand or piles of guano (droppings) to nest. The dinner jacket colouring of penguins acts as camouflage, when viewed from underneath, the gleaming white front of the penguin is difficult to see against the brightness of the surface. Penguins have a clear eyelid that helps them to see clearly under water, and they have bristles on their tongue to enable them to grip slippery fish.



Lizards

There are over 4,500 species of lizard in the world, ranging in size from 1.6cm (dwarf gecko) to 3 metres (Komodo dragon).

Blue-tongued skink (*Tiliqua scincoides*)

From deserts, grasslands and forests in Australia, their blue-tongue is thought to confuse predators. Skinks are ovoviviparous, incubating eggs inside the body before giving birth to live young.



Bearded dragon (*Pogona vitticeps*)

From woodlands, forests, scrubby areas and deserts in Australia. They feed on insects and other small animals, and vegetation. They are spiky (like a dragon) and if threatened erect their throat frill (beard) and open their mouth wide. Lay clutches of 15-25 eggs throughout the breeding season.



FIND OUT MORE...

Useful websites:

www.drusillas.co.uk

www.froglife.org

www.bbcearth.com/nature

kids.nationalgeographic.com/animals

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