THE ANIMAL BOOK
A visual encyclopedia of life on Earth
THE ANIMAL BOOK
The Animal Book
A visual encyclopedia of life on Earth
AUTHOR

David Burnie is a fellow of the Zoological Society of London, and has written and contributed to more than 100 books on the natural world. He was consultant editor of DK’s highly successful Animal and The Natural History Book, and is a former winner of the Aventis Prize for Science Books.
CONTENTS

Foreword 8

Tree of life 10

Microscopic life 12
- Bacteria 14
- Single-celled life 16
- Zooplankton 18
- Seaweeds 20

Fungi 22
- Mushrooms 24
- Sac fungi and lichens 26
- Cup fungi 28

Plants 30
- Liverworts and mosses 32
- Ferns 34
- Conifers 36
- Flowering plants 38
- Venus flytrap 42
- Broadleaved trees 44

Invertebrates 48
- Sponges 50
- Jellyfish, anemones, and corals 52
- Pacific sea nettle 54
- Worms 56
- Molluscs 58
- Giant clam 62
- Squid, octopuses, and cuttlefish 64
- Starfish, urchins, and sea cucumbers 66
- Centipedes and millipedes 68
- Spiders and relatives 70
- Sea spider 74
- Crustaceans 76
### Insects

<table>
<thead>
<tr>
<th>Group</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dragonflies and damselflies</td>
<td>82</td>
</tr>
<tr>
<td>Stick insect</td>
<td>84</td>
</tr>
<tr>
<td>Crickets and grasshoppers</td>
<td>86</td>
</tr>
<tr>
<td>True bugs and treehoppers</td>
<td>88</td>
</tr>
<tr>
<td>Praying mantis</td>
<td>90</td>
</tr>
<tr>
<td>Beetles</td>
<td>92</td>
</tr>
<tr>
<td>Butterflies and moths</td>
<td>94</td>
</tr>
<tr>
<td>Slug moth caterpillar</td>
<td>98</td>
</tr>
<tr>
<td>Flies</td>
<td>100</td>
</tr>
<tr>
<td>Bees, wasps, and ants</td>
<td>102</td>
</tr>
</tbody>
</table>

### Fish

<table>
<thead>
<tr>
<th>Group</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sharks, rays, and skates</td>
<td>106</td>
</tr>
<tr>
<td>Whale shark</td>
<td>110</td>
</tr>
<tr>
<td>Saltwater fish</td>
<td>112</td>
</tr>
<tr>
<td>Black-striped salamella</td>
<td>118</td>
</tr>
<tr>
<td>Deep-sea fish</td>
<td>120</td>
</tr>
<tr>
<td>Freshwater fish</td>
<td>122</td>
</tr>
</tbody>
</table>

### Amphibians

<table>
<thead>
<tr>
<th>Group</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frogs and toads</td>
<td>128</td>
</tr>
<tr>
<td>Tree frogs</td>
<td>134</td>
</tr>
<tr>
<td>Salamanders and newts</td>
<td>136</td>
</tr>
</tbody>
</table>

### Reptiles

<table>
<thead>
<tr>
<th>Group</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turtles and tortoises</td>
<td>140</td>
</tr>
<tr>
<td>Lizards</td>
<td>144</td>
</tr>
<tr>
<td>Komodo dragon</td>
<td>148</td>
</tr>
<tr>
<td>Snakes</td>
<td>150</td>
</tr>
<tr>
<td>African bush viper</td>
<td>154</td>
</tr>
<tr>
<td>Crocodiles and alligators</td>
<td>156</td>
</tr>
</tbody>
</table>
### Birds

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ostriches and relatives</td>
<td>160</td>
</tr>
<tr>
<td>Gamebirds</td>
<td>162</td>
</tr>
<tr>
<td>Pigeons and doves</td>
<td>164</td>
</tr>
<tr>
<td>Parrots and cockatoos</td>
<td>166</td>
</tr>
<tr>
<td>Military macaw</td>
<td>168</td>
</tr>
<tr>
<td>Cuckoos and turacos</td>
<td>170</td>
</tr>
<tr>
<td>Owls</td>
<td>172</td>
</tr>
<tr>
<td>Barred owl</td>
<td>174</td>
</tr>
<tr>
<td>Hummingbirds and swifts</td>
<td>176</td>
</tr>
<tr>
<td>Kingfishers and relatives</td>
<td>178</td>
</tr>
<tr>
<td>Toucans and woodpeckers</td>
<td>180</td>
</tr>
<tr>
<td>Birds of prey</td>
<td>182</td>
</tr>
<tr>
<td>King vulture</td>
<td>186</td>
</tr>
<tr>
<td>Ducks, geese, and swans</td>
<td>188</td>
</tr>
<tr>
<td>Penguins</td>
<td>190</td>
</tr>
<tr>
<td>Emperor penguins</td>
<td>192</td>
</tr>
<tr>
<td>Storks, ibises, and herons</td>
<td>194</td>
</tr>
<tr>
<td>Pelicans and relatives</td>
<td>196</td>
</tr>
<tr>
<td>Flamingos</td>
<td>198</td>
</tr>
<tr>
<td>Cranes and relatives</td>
<td>200</td>
</tr>
<tr>
<td>Waders, gulls, and auks</td>
<td>202</td>
</tr>
<tr>
<td>Albatrosses</td>
<td>206</td>
</tr>
<tr>
<td>Perching birds</td>
<td>208</td>
</tr>
<tr>
<td>Red-backed shrike</td>
<td>214</td>
</tr>
</tbody>
</table>

### Mammals

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mammals with pouches</td>
<td>218</td>
</tr>
<tr>
<td>Armadillos, sloths, and anteaters</td>
<td>222</td>
</tr>
<tr>
<td>Hedgehogs and moles</td>
<td>224</td>
</tr>
<tr>
<td>African elephants</td>
<td>226</td>
</tr>
<tr>
<td>Rabbits, hares, and pikas</td>
<td>228</td>
</tr>
<tr>
<td>Rodents</td>
<td>230</td>
</tr>
<tr>
<td>Bushbabies, lemurs, and tarsiers</td>
<td>234</td>
</tr>
<tr>
<td>Gibbons, apes, and humans</td>
<td>236</td>
</tr>
<tr>
<td>Orang-utans</td>
<td>238</td>
</tr>
<tr>
<td>New World monkeys</td>
<td>240</td>
</tr>
<tr>
<td>Old World monkeys</td>
<td>242</td>
</tr>
<tr>
<td>Bats</td>
<td>244</td>
</tr>
<tr>
<td>Honduran white bats</td>
<td>248</td>
</tr>
<tr>
<td>Dogs, foxes, and relatives</td>
<td>250</td>
</tr>
<tr>
<td>Bears</td>
<td>252</td>
</tr>
<tr>
<td>Polar bear</td>
<td>254</td>
</tr>
<tr>
<td>Seals and walrus</td>
<td>256</td>
</tr>
<tr>
<td>Cats</td>
<td>258</td>
</tr>
<tr>
<td>Lions</td>
<td>262</td>
</tr>
<tr>
<td>Otters, raccoons, and weasels</td>
<td>264</td>
</tr>
<tr>
<td>Mongooses, civets, and genets</td>
<td>266</td>
</tr>
<tr>
<td>Meerkats</td>
<td>268</td>
</tr>
<tr>
<td>Rhinos and tapirs</td>
<td>270</td>
</tr>
<tr>
<td>Horses and relatives</td>
<td>272</td>
</tr>
<tr>
<td>Plains zebras</td>
<td>274</td>
</tr>
<tr>
<td>Cows, antelope, and sheep</td>
<td>276</td>
</tr>
<tr>
<td>Hippopotamuses</td>
<td>280</td>
</tr>
<tr>
<td>Pigs, peccaries, and deer</td>
<td>282</td>
</tr>
<tr>
<td>Camels, llamas, and giraffes</td>
<td>284</td>
</tr>
<tr>
<td>Giraffes</td>
<td>286</td>
</tr>
<tr>
<td>Dolphins and porpoises</td>
<td>288</td>
</tr>
<tr>
<td>Whales</td>
<td>290</td>
</tr>
<tr>
<td>Humpback whale</td>
<td>292</td>
</tr>
</tbody>
</table>
Foreword

This book is the ultimate guide to all kinds of living things. In it you can find out how different creatures look, how they work, and how they behave, from bacteria to bugs, worms to whales.

If you’re already a budding naturalist, you’ll know that scientists divide the living world into groups. Each group has special features that set it apart. For example, insects are the only animals with six legs and wings, while mammals are the only animals that produce milk, and the only ones with fur. This book is divided in the same way. In each group you’ll find lots of different species, or individual kinds of living things. Tigers, golden eagles, and daisies are all examples of species. So are humans, too.

Life on Earth is incredibly varied, and more species are discovered every year. Researchers have so far identified about 100,000 kinds of fungus, 300,000 kinds of plant, and an amazing 2 million kinds of animal. But even more species are waiting to be found, particularly in remote places such as mountain rainforests and deep seabed mud. The total number of species could be as high as 20 million, with insects topping the list as the most successful animals of all time.

Some species are good at surviving in today’s world, but unluckily many are not. They are harmed by hunting, pollution, and deforestation, or by changes in their habitats as wild places are taken over by humans. Some of the world’s most vulnerable animals have already become extinct, and many more are in danger of joining them.
That’s why conservation is more important than ever before. By helping individual animals and protecting their habitats, scientists and volunteers have already brought many species back from the brink of extinction. These success stories include some of the world’s favourite animals, such as the giant panda and the humpback whale, and lots of less-known species, from the peregrine falcon and American alligator to the golden lion tamarin. You can find out more about them in this book, and you can help them yourself by joining conservation organizations, such as the World Wildlife Fund (WWF). By getting involved, you can help to ensure life on Earth remains beautiful, varied, and exciting.

David Burnie
The Tree of Life

Our planet is inhabited by a huge variety of living things. Biologists work out how different organisms are related by studying their DNA. This helps them to divide all life into kingdoms: animals, plants, fungi, and different types of micro-organisms. Within each kingdom are smaller groups, linking together similar kinds of creatures. Living beings which can breed together to produce fertile offspring are said to be of the same species. Most of the labels for the pictures in this book are species names.
Insects are the most successful group of invertebrates.

Insects

Feathers make these vertebrates unique.

Birds

These warm-blooded, furry vertebrates feed their young on milk.

Mammals

These cold-blooded vertebrates have scaly skin.

Reptiles

Animals with backbones are called vertebrates.

Vertebrates

Underwater vertebrates, fish breathe through gills.

Fish

These vertebrates live partly in water and partly on land.

Amphibians
Tiny micro-organisms were the first living things to evolve. They are too small to be seen with the naked eye: the smallest are less than a micrometre long, or one hundredth of the width of a human hair. Nevertheless, they are the most numerous creatures on Earth, and play a vital role in supporting all other life forms.

**Cytoplasm**  The inside of the cell is made up of a liquid called cytoplasm. Miniature organs, or organelles, float in this liquid. Chemical processes take place in the cytoplasm to keep the organism alive.

**Nucleus**  This structure contains the cell’s DNA, its genetic code. Micro-organisms breed by splitting in half to create two clones, each with a copy of the same DNA.
Flagellum ➔ Many micro-organisms move using these tail-like structures, which often spin like propellers. Sometimes they work like sense organs to detect changes in temperature or acidity.

Membrane ➔ This thin outer layer keeps the cell together. It allows useful chemicals to enter and waste to flow out. Some micro-organisms have an extra protective layer called a cell wall.

Microscopic life

Features

- Were the first living creatures on Earth
- Are so small they can only be seen through a microscope
- Are often made up of a single cell
- Often breed by splitting themselves in two
- Sometimes cause diseases, but many are essential to life
Bacteria are the smallest and simplest living things. There are about 5 million trillion trillion of them on Earth, each made of a single cell. They live almost everywhere, from hot springs and seabed ooze to animal intestines and plant roots. Many are essential partners for other living things, but some can cause deadly diseases if they get out of control. *Clostridium botulinum* normally lives in the soil, but it produces a poison that can paralyze or kill animals including humans. Like all bacteria it can breed at a phenomenal rate by repeatedly dividing in two. *Nitrobacter* fertilizes soil and water, helping plants and animals to grow. It swims by spinning a long hair, or flagellum, and can move 50 times its own length in a single second. *Staphylococcus epidermidis* lives on the surface of human skin. Normally
it is harmless, but it can cause life-threatening infections if it gets inside the body. *Psychrobacter urativorans* contains its own antifreeze, and can live in very cold conditions, while *Lactobacillus acidophilus* grows well in warm milk and is used for making yogurt. *Deinococcus radiodurans* is one of the world’s toughest bacteria. It can survive intense cold, strong acids, and enough radiation to kill a human being 1,000 times over. *Escherichia coli* is one of the most common bacteria in human intestines. Normally it is harmless, but some strains produce food poisoning. *Acetobacter aceti* is used to make vinegar, but *Vibrio cholerae* causes cholera if it contaminates water or food. *Nostoc* grows in damp places. It forms long chains and lives by collecting the energy in sunlight, just like a plant.
The smallest living creatures on Earth are made up of a single cell. Bacteria are the most numerous, but another group, called protoctists, contains a bewildering variety of life. They are mostly bigger and more complicated than bacteria. Some protoctists are like animals, while others are more like tiny plants. A few are like both at the same time. **Arcella discoides** is a protoctist that lives in water, inside a yellow-brown rounded shell. Its jelly-like body reaches out through a hole, trapping any food that drifts by. **Protacanthamoeba** also has a shell. Like many single-celled creatures it can reproduce by dividing in two. **Centropyxis** lives in lakes and marshes. Its shell is made up of tiny mineral particles stuck together with a special glue, and has short, stubby spines. **Micrasterias** is a
green alga with a cell made of two matching halves. It lives like a plant by collecting the energy in sunlight, and its presence sometimes turns lakes and ponds bright green. **Scaly cercozoa** 5 have oval-shaped shells covered with flat silica plates, while the **stalked ciliate** 6 has an inverted bell-shaped body on a slender stalk. If its bell is touched, the stalk coils up like a spring, quickly pulling the body out of harm’s way. **Dinoflagellates** 7 live mainly in the sea, and many of them are poisonous. Sometimes they explode in numbers, causing “red tides” that kill millions of fish. **Forams** 8 have round cells with a starburst of sticky threads. **Diatoms** 9 have silica cells and use sunlight to grow. They are the most important part of plankton, the huge mass of life that drifts in fresh water and the seas.
ZOOPLANKTON  Zooplankton are fragile creatures that drift or swim gently through the water. Many species, such as the ones in this picture, are so tiny that they can only be seen through a microscope. Some live as plankton all their lives, while others are the larvae of larger creatures such as fish and crustaceans. Zooplankton are essential to life in the sea and fresh water because so many other animals feed on them.
Size  Range from microscopically small up to several metres long. Habitat  Oceans, seas, lagoons, lakes, rivers, and other water bodies. Distribution  Worldwide. Diet  Algae, smaller zooplankton, plant plankton, bacteria, and particles of debris. Breeding  Most produce eggs. Many tiny species live for only a few weeks. In some species, such as Daphnia, the females may release eggs every two to three days. Predators  A wide range of water-dwelling animals eat zooplankton, including fish, crustaceans, molluscs, and corals. Larger kinds are food for sea birds and for animals such as seals, sharks, and whales. Conservation status  Vulnerable to warming of the oceans or increased exposure to ultraviolet light from the sun.
Seaweeds look like plants, but they are actually simple organisms called algae, with fronds that take in nutrients from seawater. Some are tiny, but the biggest are as tall as a five-storey office block. Most seaweeds are firmly attached to rocks, and some are incredibly tough, taking a tremendous battering from the waves. **Toothed wrack** is an olive-brown seaweed from the North Atlantic Ocean. It grows on rocks that are uncovered at low tide. Found in temperate areas, **broad weed** looks like a big red leaf. **Chondria dasyphylla** lives along shores worldwide. Like most red seaweeds it lives below the low-tide mark and sometimes grows on animal shells. **Irish moss** is another red seaweed, with flat, branching fronds. It contains a substance called **Air-filled pods or bladders**.
carrageenan, which is used to thicken yogurt and ice cream. A large, dark-brown seaweed, **sea oak** ⑤ has lots of feathery fronds. It often grows in rock pools and has air-filled pods that help it to float. **Sea lettuce** ⑥ is a green seaweed that grows worldwide on mudflats and sheltered rocks. Its crumply fronds are sometimes collected and used as food. **Sea beech** ⑦ has paper-thin red fronds, while **Polysiphonia lanosa** ⑧ is a red seaweed shaped like mossy tufts. It grows on other seaweeds instead of on rocks. **Wireweed** ⑨ is a fast-growing brown seaweed that originally comes from Japan. It has accidentally been spread to many other parts of the world. **Coral weed** ⑩ has a crunchy feel. It grows in rock pools and is reinforced with minerals, making it harder for sea animals to eat.
Fungi mostly exist as tangles of microscopic threads called hyphae. Some kinds grow into mushrooms above the ground. These develop to spread spores, tiny cells which float off and grow into new fungi. By doing this, fungi recycle dead plants and animals, turning them into nutrients that other organisms can re-use.
Features

- Mostly grow as bundles of tiny threads
- Gain energy by breaking down other living things
- Scatter spores, which can grow into new fungi
- Grow structures such as mushrooms to spread spores

Cap ➞ The top of this mushroom spreads out to give as much area as possible for spores to grow. The red colour warns hungry animals that it is poisonous.

Stem ➞ The stem of the mushroom connects it to the rest of the fungus, which is a network of fine threads buried underground.

Gills ➞ These thin, fragile membranes are where the spores develop. They fill the space under the cap so that they can produce as many spores as possible.
Most mushrooms grow in damp places, from grassy fields to shady woodlands with lots of fallen leaves. Their purpose is to scatter tiny seed-like spores, so that fungi can spread. Some mushrooms have unusual colours that really stand out. Violet coral ¹ has brightly coloured coral-like branches, while the pink waxcap ⁷ has a rosy cap on a pale stalk. The unusual red cage fungus ⁶ has a crimson mesh-like structure, which hatches from a small whitish “egg”. The creamy white cultivated mushroom ⁸ is grown around the world for food. Most mushrooms, including the velvet bolete ⁵, make spores that are blown away in the wind. The fluted bird’s nest ⁹ has a different way of spreading. It makes packets of spores inside tiny cups. If a raindrop lands in one of the cups, the packets
splash out, landing up to 1 m (3 ft) away. The sessile earthstar \( \text{7} \) spreads its spores in a similar way, puffing them out of a papery sac when it is hit by raindrops. While some mushrooms, such as the chanterelle \( \text{8} \), are good to eat, other types are deadly poisonous. The most dangerous of all mushrooms is the death cap \( \text{9} \), since it is highly toxic and looks similar to edible kinds. Some fungi are difficult to mistake because of their size, colour, shape, or smell. The poisonous fly agaric \( \text{10} \) is easy to spot with its bright red-and-white cap. The odour of the smelly stinkhorn \( \text{11} \) carries for long distances. The smell attracts flies, which spread the stinkhorn’s spores. The biggest mushroom of all is the giant puffball \( \text{12} \), which can measure more than 1 m (3 ft) across, and weigh as much as 20 kg (44 lb).
Sac fungi make their spores in tiny containers or sacs, which break open when they are ripe. The sacs are much too small to see, but the fungi that produce them have lots of strange and interesting shapes. Many live on dead wood or rotting plants, but ergot 1 grows on grasses and cereals such as rye and wheat. It produces a powerful poison that can be deadly if it gets into bread. Coral spot 2 attacks damp wood, while the jelly baby fungus 3 grows in clumps among fallen leaves. Both are harmless, but powdery mildews 4 are a headache for farmers and gardeners because they attack all kinds of living plants. The first signs of trouble are white spots on the leaves, showing where the fungus is at work. Dead man’s fingers 5 and cramp balls 6 both feed on dead wood. Unlike most fungi,
they are hard to the touch. The morel 7 looks unappetizing with its sponge-like cap, but is valued for its delicious taste. The Périgord truffle 8 is even more highly prized. It grows underground beneath oak trees, and has to be sniffed out by specially trained pigs or dogs. Orange peel fungus 9 grows on bare ground and has a vivid orange colour that makes it easy to spot. Lichens are living partnerships between fungi and algae or bacteria. They grow very slowly but can live to be hundreds of years old. The common wall lichen 10 is flat and brightly coloured and grows on bare rock, particularly near the sea, while the hooded tube-lichen 11 is common on trees, rocks, and walls. Oakmoss lichen 12 lives on the bark of oak trees. It has a woody smell and is used for making perfumes.
CUP FUNGI

These strange bowls are actually a variety of cup fungus, a group of sac fungi that grow into eye-catching shapes. The cups produce sacs full of spores that are scattered about by wind and rain. In some varieties, these sacs absorb water and swell up until they burst, catapulting the spores out. The biggest cups make an audible pop when this happens, and the spores can sometimes be seen as a faint cloud.
Size ➤ Up to 30 cm (12 in) across. **Habitat ➤** Moist, dead wood in tropical or subtropical forest. **Distribution ➤** Tropical and subtropical areas worldwide, from the USA, Central and South America, and Africa to Southeast Asia. **Diet ➤** Dead and rotting wood. Like all fungi, they feed by breaking down organic matter in their environment. This can be useful for getting rid of dead plants and animals, but harmful where the fungus grows through living creatures. **Breeding ➤** The fungus consists of a network of threads that mostly grow underground. The cup develops only to spread spores, cells a bit like seeds that grow into new colonies of threads. **Number of species ➤** About 230.
Plants have the ability to trap energy from sunlight, using it to make food and to grow. By doing this they provide nourishment for themselves and for the animals that feed on them. Plants also absorb carbon dioxide from the atmosphere and release oxygen to replace it, maintaining the balance of gases animals need to survive.

Stem ▶ Plant stems can be thin and fragile or thick and woody like tree trunks. They are filled with tiny tubes that carry water from the plant’s roots up to the leaves, and food from the leaves back down to the roots.
Flowers

Many types of plants grow flowers to reproduce. They have colourful petals and interesting smells to attract animals, which spread pollen from flower to flower. Some plants offer visitors a meal of sugary nectar.

Pollen

Flowers produce a fine dust called pollen, which is spread by wind or animals such as birds and insects. When pollen reaches other flowers of the same species it fertilizes them, causing them to develop seeds.

Leaves

The green colouring in leaves is a substance called chlorophyll. Plants use it to trap energy from sunlight by a process called photosynthesis. They use this energy to combine carbon dioxide from the air and water from the soil to form sugars, which the plants use as food.

Features

- Collect energy from sunlight and use it to grow
- Have cells with walls made of microscopic fibres
- Commonly have flowers to produce and fertilize seeds
- Include the longest-living things
- Provide food and oxygen that supports much of life on Earth.
Liverworts and mosses

Found mainly in damp places, liverworts and mosses are the world’s simplest plants. They don’t have roots or flowers, and they spread by making microscopic spores instead of seeds. Some of them could easily sit on a fingernail and even the biggest are only waist-high. Liverworts are often shaped like flat ribbons and keep dividing in two as they grow. Most kinds are green but even scalewort is often red or brown. It grows on tree trunks and rocks, usually in the shade. Crystalwort lives on wet mud or on the surface of ponds. It is sometimes used in aquariums for sheltering newly hatched fish. Common liverwort is often seen in gardens. In the summer it is covered with growths like tiny palm trees, which make and then scatter its spores. Mosses have thin leaves and wiry stems and often grow in clumps. Many kinds,
including the white fork moss 1, turn grey or white if they dry out but become green again within minutes if it rains. Fire moss 2 makes its spores in capsules shaped like matchsticks. It grows on walls and on burned ground. Swan’s-neck thyme moss 3 is common in woods, while blue-leaved bog moss 4, or sphagnum, grows in waterlogged places. This moss can hold more than 20 times its own weight in water and slowly forms peat, a brown, soil-like material, when it dies. Common hair-cap moss 5 is one of the world’s tallest mosses, growing in springy tussocks up to 60 cm (24 in) high. Its stems are stiff and unbranched, with narrow painted leaves. Ostrich-plume feather moss 6 gets its name from its stems, which look like tiny feathers or ferns. It lives in forests in the far north of Europe and Canada.
Long before the age of the dinosaurs, ferns and their relatives were the biggest plants on Earth. Today they still include some tree-like varieties more than 15 m (50 ft) tall, but most ferns grow much closer to the ground. All these plants spread by making tiny spores instead of seeds, and most of them have feathery fronds that unroll as they grow. The whisk fern is a primitive plant with brush-like stems.

It starts life underground, using fungi to help it get food from the soil. Horsetails have hollow stems with rings of bright green branches. They contain sharp crystals of silica and were once used for scrubbing pots and pans. The ostrich fern, found in the Northern Hemisphere, grows near streams and rivers, while the hart’s-tongue fern grows on shady banks and old walls. Common staghorn ferns
Plants ● Ferns

Ferns live in the forests of the Southern Hemisphere, where they grow on the trunks of trees. Their fronds trap rain and falling leaves, making private compost heaps that help them to grow.

**Hard fern** 6 has two types of fronds: feathery ones that catch sunshine, and much narrower ones that spread its spores. Most ferns live in damp places, but **cliff brake** 7 grows in rocky crevices in South Africa, and has wiry black stems that are good at coping with drought. **Royal fern** 8 is an impressive plant with a rosette of spreading fronds. It is sometimes grown in gardens, but **bracken** 9 is a notorious weed. Fast growing and poisonous to animals, it spreads by underground runners, and can form patches more than 500 m (1,640 ft) across. It is found on every continent except Antarctica and on islands far out to sea.
Conifers include the world’s tallest, heaviest, and oldest trees. They do not grow flowers, and they make their seeds in cones. Most conifers are evergreen, with tough, waxy leaves that are good at coping with hot summer sunshine as well as freezing winter winds. The Cedar of Lebanon 1 comes from the Middle East and is often planted in parks. It has huge branches that spread out like shelves, and short, needle-like leaves. Common in Europe and the Middle East, the European yew 2 has tiny cones that look like bright red berries. They are poisonous to many animals, but birds feed on them, helping the trees to spread. The Maritime pine 3 grows wild in southern Europe. It is full of sticky resin, which oozes out if its bark is cut. The Golden larch 4 comes from China. It sheds all its leaves...
in late autumn and sprouts new ones in spring. The monkey puzzle 5 from South America has sharply pointed leaves and an umbrella-like shape when it is fully grown. The European silver fir 6 has upright cones, which disintegrate when they are ripe instead of falling to the ground. Giant sequoias 7 from California are some of the largest living things on Earth. They can weigh more than 2,000 tonnes and their fireproof bark is up to 75 cm (30 in) thick. The sitka spruce 8 comes from North America’s west coast but is now grown all over the world as a timber tree. The Scots pine 9 is one of the world’s toughest trees and the most widespread conifer. It grows right across Europe and Russia, including places where winter temperatures hit -60°C (-76°F), far colder than a deep freeze.
Flowers come in an incredible variety of shapes. Some are bigger than a washing-up bowl, but the smallest could fit through the eye of a needle with room to spare. Many plants grow flowers to spread their pollen and to scatter their seeds. Like most flowering plants, *gorse* attracts insects, which carry its pollen as they wander from plant to plant. It grows its seeds in pods that suddenly snap open when the seeds are ripe. *Red clover* is often grown to feed farm animals and to help fertilize the soil. Found on scrubby hill slopes in southeastern Europe, *lilac* has strongly scented flowers. An evergreen shrub of dry Mediterranean scrub habitats, *common lavender* is full of fragrant oils. *Wild tulips* have yellow flowers that grow from bulbs. Widespread in Europe, they are close
relatives of cultivated tulips, which are grown as garden flowers. The **monk’s hood cactus** is adapted for life in very dry conditions. It has spines instead of leaves and a juicy water-storing stem. Like most cacti, it has shallow roots, which soak up water during rare periods of rain.

**Wild carrot** is the ancestor of the carrots that we eat. Grasses are flowering plants, but they use the wind to spread their pollen, and their flowers are often small. They include wild plants, such as the **cock’s foot grass**, as well as domestic cereals, such as wheat and rice, which are the world’s most important foods. The **bee orchid** is a little plant from a giant family. Its flowers mimic female insects, such as bumblebees, and spread pollen by attracting male insects looking for a chance to breed.
Many flowering plants are grown for their eye-catching blooms. There are more than 100 wild kinds of roses and thousands of cultivated varieties. The **apothecary’s rose** is one of the oldest. It has been grown in gardens for at least 750 years. The **bird-of-paradise plant** from South Africa is also grown for its spectacular flowers. In the wild they are pollinated by sunbirds, which carry pollen on their feet. Plants are also visited by hungry animals, so some use special defences to survive. **Monkshood** is protected by powerful poisons, while **milk thistle** has sharp spines that keep hungry animals at bay. The **common poppy** is a frequent weed in fields. Its seeds can survive in the soil for many years and they start growing as soon as the ground is ploughed. The
**common dandelion** (5) is even more widespread. Its seeds float away on feathery parachutes, and take root on roadsides, in fields, and in lawns. The **daisy** (6) blooms for most of the year. Like the dandelion, its flowers are made up of lots of mini flowers, or florets, packed together in a single flowerhead. **Foxgloves** (17) have tubular flowers that are just the right shape for visiting bumblebees. Flowering plants are also common in fresh water. The **sacred lotus** (18) grows in tropical lakes and has large flowers held above the water, while the **common water hyacinth** (19) has air-filled leaf-stalks that make it float. The **white water lily** (20) has floating flowers that close up in the late afternoon. They hold pollinating insects overnight and release them the next day.
VENUS FLYTRAP A flesh-eating plant that catches prey in its “jaws” is the stuff of nightmares, but the Venus flytrap is only a threat to flies and spiders. The hinged leaves gape open like a big, red mouth, attracting prey with their bright colour. If an insect or a spider lands on “trigger” hairs on the surface, the leaf snaps shut, trapping the prey inside. The plant then releases juices to digest its food.
Size ➤ Up to 30 cm (12 in) tall  
Habitat ➤ Wet, boggy areas of peat or sandy soil.  
Distribution ➤ Coastal areas of North and South Carolina in the southeastern USA.  
Diet ➤ Like other plants, the Venus flytrap gets energy from sunlight. It evolved to be carnivorous as it often grows in poor soil and needs the extra nutrients that it can get from insects.  
Breeding ➤ Bears clusters of white flowers from May to June. The small, black seeds may be dispersed in water or picked up by birds.

Lifespan ➤ Up to 30 years if cultivated.  
Predators ➤ Slugs, birds, rodents, and tiny insects such as aphids and thrips, which suck the plant’s juices.  
Conservation status ➤ At risk due to habitat loss and over-collection for the exotic plant trade.
Unlike conifers, broadleaved trees are flowering plants. There are thousands of different kinds, from mighty giants in wild forests to small, ornamental garden trees. In warm parts of the world, most broadleaved trees are evergreen. Where winters are cold, they often shed their leaves in the autumn and grow a new set in spring. The common fig is a small broadleaved tree with tiny flowers hidden inside a special bud. When seeds start to develop, the bud ripens into a fig. The sugar maple tree from North America is famous for its stunning autumn colours. In spring its sweet sticky sap is harvested to make maple syrup. The European common ash is a fast-growing tree with winged seeds, while the foxglove tree has beautiful mauve flowers that appear before its leaves. Mango trees come from

- **Common fig**
- **Sugar maple**
- **Common ash**
- **Foxglove tree**
- **Paper mulberry**
- **Sandalwood**
- **Yellowhorn**
- **Cocoa tree**
- **Mango tree**

---

Fig contains hundreds of tiny flowers

Ribbed, oval fruit

Seeds have papery wings
South Asia. Like many trees, they hide their seeds in sweet, fleshy fruits. Animals that eat the fruit spread the seeds to new areas. The cocoa tree originally comes from Central and South America. Cocoa is made from its seeds, which grow inside fleshy pods. Ylang-ylang from Southeast Asia has richly scented flowers that are used for making perfumes. Common walnut produces valuable timber and nutritious nuts, while the common pear from Europe is the ancestor of pears grown to eat. Holly is a small evergreen tree with very prickly leaves. Holly trees are either male or female. In winter, female ones produce bright red berries, which are eaten by birds. Lemon trees come from Asia. Their fruit contain lots of citric acid, a chemical that gives them their sharp but mouth-watering taste.
Broadleaved trees produce many useful substances as well as some that can be harmful. **Common laburnum** contains a deadly poison, while the **quinine tree** contains a drug that can be used to treat malaria. It grows in South America, and quinine is extracted from its bark. **Silver birch** is a hardy tree, living in very cold climates in northern Europe and Asia. Its flowers grow in catkins, which scatter tiny seeds in the wind. The **pink silk tree** has large, feathery leaves and flowers in upright tufts. It is sometimes called the “sleep tree” because its leaves fold up at dusk and open again at dawn. The **Spanish chestnut** is a slow-growing tree with edible nuts. These grow inside prickly cases and are often roasted instead of being eaten raw. The **Judas tree** has rounded,
heart-shaped leaves and beautiful purple-pink flowers that appear in spring. These flowers grow in clusters and often sprout directly from the trunk. The **English oak** is a long-lived tree with very hard timber, which was once used to build sailing ships. Like other oaks it has tiny flowers in trailing catkins, and its seeds are acorns, which grow in scale-covered cups. The **pomegranate** is a spiny, shrubby tree with large, bright-red flowers. It produces tasty fruit that contain hundreds of seeds. **Avocado trees** originally come from Mexico and the West Indies, but they are now grown in warm places across the world. They have small creamy flowers and pear-shaped fruit with a single, very large stone. In the wild, avocados fall off the tree when they are still hard and ripen on the ground.
Invertebrates

The largest group of animals, invertebrates range from sponges and jellyfish to shellfish, crabs, spiders, and insects. They mostly hatch out from eggs. Some start life as larvae, tiny creatures which look very different from their parents. Others hatch as miniature versions of adults, growing bigger as they mature.

Legs ➤ This spider belongs to a group of invertebrates called arthropods, which have jointed legs. Muscles run through the leg joints to enable them to move. As well as spiders, arthropods include centipedes, millipedes, insects, and crustaceans.

Sense organs ➤ The tarantula has complex sense organs, such as these “palps” which feel out its surroundings. Other invertebrates, such as worms and sponges, are much simpler and may not even have brains.
Features

- Do not have backbones or a bony skeleton
- Often have a hard outer coating (exoskeleton)
- Often hatch out from eggs
- Often hatch as larvae, changing shape to become adults

Exoskeleton ➔ Many invertebrates have a hard outer casing called an exoskeleton. It supports their internal organs, helps them move around, and provides protection. The exoskeleton does not stretch, so the creature has to shed its skin as it grows.

Spiny hairs ➔ Small animals such as invertebrates make tasty morsels for larger predators, so many have evolved defence systems. This tarantula can release stinging hairs from its legs, which stick into its attacker’s skin, causing pain and itching.
Found mainly in the sea, sponges are some of the world’s simplest animals. They don’t have heads, tails, eyes, or even mouths. Instead of moving about, they pump water through pores in their bodies and filter out tiny particles of food. Sponges don’t have bones, but their bodies are often reinforced by mineral crystals and fibres, which give them a crunchy or spongy feel. Some sponges, such as the red tree sponge 1, grow upwards like underwater plants. Others, such as the lemon sponge 2, are almost spherical, while some, such as the breadcrumb sponge 3, grow as a crust on rocks. The yellow finger sponge 4 grows in upright columns, peppered with pores. The European boring sponge 5 uses acids to tunnel through shells and solid rock. Growing on shallow reefs in Malaysia and Indonesia, the
red purse sponge resembles a miniature balloon. Water flows in through its sides and out through the narrow opening at the top. Vase sponges work in the same way, but are much larger. The azure vase sponge and pink vase sponge, both from the Caribbean, can be up to 45 cm (1 1/2 ft) high, but the world’s tallest vase sponges grow bigger than a fridge, and are known to live for more than 100 years. The Mediterranean bath sponge lives on the shallow seabed. Its extra-springy skeleton makes it perfect for washing with, once it has been cleaned. Most sponges grow near the surface of the sea, but Venus’s flower basket lives deep down. Like the deep-sea glass sponge, it has an intricate skeleton made of silica, which lasts long after the sponge has died.
Invertebrates  >  Jellyfish, anemones, and corals

Jellyfish, anemones, and corals

Armed with stinging tentacles, jellyfish and their relatives catch and kill prey. All of them are soft-bodied, although many corals protect themselves by building hard cases or tubes. Most kinds, including the white-spotted jellyfish 1, have mild venom, but the deadly sea wasp 2 from Australia and Southeast Asia can kill humans who brush against its tentacles. The poison acts within seconds, and stings continue to work even when the tentacles are pulled away. The moon jellyfish 3 lives close to coasts all over the world. It is quite compact, but the Portuguese man o’war 4 has tentacles up to 50 m (164 ft) long, almost the length of four buses. Its powerful venom makes it nearly as dangerous as the sea wasp. The red coral 5 has a brightly coloured skeleton, which is sometimes made into...
jewellery. Sea anemones have extra-thick tentacles, with stings that work like harpoons. The **magnificent sea anemone** is one of the biggest, growing up to 1 m (3 ft) wide. It lives on coral reefs and its tentacles often shelter brightly coloured clownfish, which are immune to its stings. The **red sea whip** has thin stalks that bend in the current, while the **common sea fan** has large flaps held at right-angles to the current. This maximizes water flow towards the sea fan and allows it to get the most food. The **orange sea pen** has two food-collecting lobes and a swollen “root” that anchors it in the seabed. When touched, it vanishes into a burrow in the sand. The **organ pipe coral** gets its name from its bright red, pipe-shaped tubes. It is found in shallow waters in the Indian and Pacific Oceans.
PACIFIC SEA NETTLE  With their soft, golden bells and fine, trailing tentacles, these jellyfish look harmless. But they are carnivores. Their tentacles are equipped with millions of tiny barbs which inject poison into anything they touch. The venom paralyzes prey, which is fed into a mouth under the sea nettle’s bell. Although it can give humans a painful sting, this jellyfish is rarely dangerous to us.
Size ➤ Bell up to 45 cm (18 in) across; tentacles and arms up to 4.6 m (15 ft) long  

Habitat ➤ Surface waters of the Pacific Ocean in autumn and winter, deeper waters in spring and summer.  

Distribution ➤ West coast of Canada, the USA, and Mexico. Also found around Japan.  

Diet ➤ Small fish, crustaceans, and other jellyfish.  

Breeding ➤ Eggs hatch into larvae. These grow into stationary structures called polyps, from which new jellyfish grow.  

Lifespan ➤ Up to a year in the wild and up to 18 months in captivity.  

Predators ➤ Sea turtles and fish.  

Conservation status ➤ The species is not under threat. In fact, in some areas they swarm in large numbers.
The word “worms” describes many different kinds of creatures. Most of them have flat or round bodies with a head and tail. While some are smaller than a full stop, worms also include the world’s longest and skinniest animals, stretching further than an Olympic-size swimming pool. Worms usually live in water or wet places, but many are parasites of other creatures. Tapeworms feed inside the intestines of animals such as cats, pigs, and humans, and can grow to many metres in length. Several leaf-shaped flatworms, such as the giant intestinal fluke and liver fluke, also infect people, sometimes causing serious diseases and even death. Fortunately, most other worms are harmless, although their bright colours warn predators that they have a nasty taste. Flowers’ flatworm lives on coral reefs and ripples.
its body as it swims. The **Christmas tree tube worm** stays in the safety of a burrow. It collects food with a spiral tuft of tentacles, which instantly fold up and disappear if a predator comes nearby. **Southern African velvet worms** and **Caribbean velvet worms** have short, stumpy legs. They creep along the forest floor, and capture their prey by spraying it with sticky threads. **Lugworms** live in burrows on beaches and mud-flats. The **sea mouse** has a bristly body for digging through sand. Best known of all worms, the **common earthworm** helps to make the soil fertile by burrowing through it and eating dead leaves and other waste. The **fire worm** has poisonous bristles that help it to crawl over rocks and coral reefs. The **king ragworm** eats seaweed and carrion using its two pincer-like teeth.
Molluscs are amazingly varied animals, ranging from fast-moving squid, to clams, slugs, and snails. Most of them live in water and have shells. Clams and their relatives have two-part shells joined by a hinge. If danger strikes, the shell snaps shut, protecting the animal inside. Snails and their relatives have spiral shells. Like clam shells, they keep growing, so their owners never have to move house. The sunburst carrier, a sea snail, fastens pebbles to its shell, using them as camouflage. The tiger cowrie has an egg-shaped shell with a beautiful pattern and glossy sheen. The precious wentletrap has a ribbed shell. It preys on anemones and corals, using cutting jaws. Found in tropical oceans, the pink conch and trumpet triton are two of the largest sea snails. The pink conch grazes on...
seagrass and seaweed, while the triton is a predator, attacking starfish and other slow-moving prey. It hunts at night and paralyzes its victims with poisonous saliva before beginning to feed. Like most apple snails, the **channelled apple snail** has gills, and lives in fresh water. The **common mussel** lives just below the waterline on rocky shores, using its gills to filter out small particles of food. The **common pelican’s foot** creeps across mud and sand on the seabed. Its shell has extensions that resemble webbed feet. The **edible oyster** and the **great scallop** are often harvested to eat. Mussels and oysters glue themselves to rocks using sticky threads. Scallops lie on the seabed. If a predator tries to creep up on them, they swim away by clapping their shells open shut.
Invertebrates > Molluscs

Some molluscs, such as the **Philippine watering pot** 🍃, do not need to move, because they sieve their food out of the water. But many others, including the **red abalone** 🍃, creep about on a muscle-packed sucker that works like a foot. The red abalone grazes on algae, and its grip is incredibly strong. When threatened, it clamps its shell to the rock and is almost impossible to dislodge. The **common limpet** 🍃 is much smaller, but just as tough. It clings to wave-battered rocks and can withstand the fiercest winter storms. Sea slugs, or nudibranchs, have a foot but no shell. They are famous for their brilliant colours. Many kinds, such as the **black-margined sea slug** 🍃, have a tuft of gills on their backs and a pair of tentacles that look like miniature horns. The black-margined sea slug feeds on sponges. So do
the varicose sea slug ⑮ and the Spanish dancer ⑯, a giant sea slug that swims by rippling its body, making it look like a dancer wearing a skirt. Molluscs are also common on land, particularly in damp areas. The Pacific banana slug ⑰ and the European black slug ⑱ live in cool climates but the giant African snail ⑲ is a tropical species that has become a major pest in warm parts of the world because of its large appetite and fast breeding. Back in the water, clams are molluscs with hinged shells. A few, such as the swan mussel ⑲, grow in rivers and streams, but most, including the fluted giant clam ⑳, live in the sea. Like its big brother the giant clam, it contains microscopic algae that live in its flesh. These algae produce nutrients, which contribute to the clam’s food supply.
GIANT CLAM

The giant clam is the world’s heaviest shelled animal, and possibly the largest species that has ever lived. It has a huge, thick shell formed of two parts, with a deeply folded edge. The edges of the inner body, or mantle, are often a beautiful iridescent blue-green or gold, and can be seen when the shell opens to feed. It is a myth that a giant clam can catch and swallow people, because a clam will only close, slowly, if it is attacked.
Size  Shell up to 1.5 m (5 ft) long  
Weight  Up to 200 kg (440 lb) 
Habitat  The clams anchor themselves on sand or coral rubble in reefs or in lagoons. 
Distribution  Tropical areas of the Indian and western Pacific Oceans and South China Sea. 
Diet  Giant clams filter plankton out of the sea using their gills. They also get nutrients from plant-like algae called zooxanthellae that live inside their mantle tissues. 
Breeding  Giant clams expel sperm and eggs into the ocean. The eggs develop into larvae called veligers, which swim freely and hunt for food. 
Predators  Sea stars, snails, some fish, and humans. 
Conservation status  Vulnerable due to harvesting for food and the aquarium trade.
Squid, octopuses, and cuttlefish

Unlike other molluscs, squid and their relatives are fast-moving hunters with keen senses and big brains. Octopuses have eight arms covered in suckers. Squid and cuttlefish also have eight arms, plus two long tentacles which shoot out to catch their prey. Many of these animals can change colour in seconds, helping them to hide. The North Pacific giant octopus hunts on the seabed. Like many octopuses, it can squirt clouds of black pigment into the water to confuse predators. Fully spread out, its legs can measure over 4 m (13 ft) from tip to tip. Far smaller, but much more dangerous, the blue-ringed octopus has a highly toxic bite. It can kill humans, although it usually swims away. The common squid has a streamlined body with prominent side fins, and lives in the open sea. Like other squid, it zooms...
Jet propulsion is also important for octopuses when they need to make a quick getaway. The whip-lash squid hovers in deep water, waiting for prey with its long tentacles extended. The chambered nautilus has a spiral shell and about 90 tentacles which tightly grip its prey. Mostly found in shallow waters, the Atlantic octopus spends the daytime in rocky lairs and hunts after dark. The Australian giant cuttlefish and common cuttlefish cruise over the shallow seabed looking for crabs and other prey. The extraordinary mimic octopus is one of the few octopuses that hunt while the sun is up. As well as changing colour, it can disguise itself to resemble more than a dozen different animals, making it look more dangerous than it really is.
Invertebrates

Found only in salt water, starfish and their relatives are unique in many ways. Most of these slow-moving creatures have five arms branching out from the centre of their bodies. They have skeletons or cases made of hard, chalky plates. The common brittle star moves by snaking its arms, but most animals in this group move around using hundreds of little tubes, which act as feet.

The ochre starfish feeds on mussels and other molluscs, using the tubes to grip its prey. Sea cucumbers collect food using a ring of tentacles around their mouths. The sea apple cucumber is a highly poisonous reef-dweller. It has bright colours warning predators not to attack. Other species, such as the sausage-shaped prickly redfish, are coloured to match the sand. The Indo-Pacific cushion star becomes
short-armed as it gets bigger, eventually maturing into a dumpy cushion shape. It often grazes on coral. The notorious **crown of thorns starfish** is a large species with venomous, thorny arms. It can devastate reefs with its voracious appetite for coral. Sea urchins creep over rocks and reefs, scraping up food with their downward-pointing mouths. The **edible sea urchin** has short spines and a rounded case, while the **purple urchin** has extra-long spines that easily break off. The **sea potato** burrows into seafloor mud, and has bristly spines and a streamlined shape. Sea urchins use their spines for self-defence, while sea cucumbers squirt out a mass of sticky threads. The **blue starfish** and its relatives have a different kind of protection: if any of their legs are bitten off, they slowly grow back.
Centipedes and millipedes belong to a group of animals called arthropods, which have legs with joints and a hard body case. Millipedes are slow-moving vegetarians, but centipedes are agile predators, with keen senses and poisonous fangs. Yellow earth centipedes hunt underground. With their bendy bodies and short legs, they squeeze between particles of soil. If they are dug up, they quickly wriggle away. The Indian tiger giant centipede is one of the biggest, growing up to 25 cm (10 in) long. It can easily kill small rodents and can give humans an extremely painful bite. Centipedes have two legs on each segment of their body, but millipedes have four. The American giant millipede can have more than 200 legs. Like other millipedes, it grows extra pairs every time it moults.
or sheds its skin. Pill millipedes are short and stubby, and often have 50 legs or fewer. They get their name because they can tuck in their legs and roll up into a ball. The **black giant pill millipede** is from Madagascar, while the **white-rimmed pill millipede** is found in Europe. The **brown giant pill millipede** from the forests of Borneo is one of the biggest pill millipedes. Fully rolled up, it is about the size of a golf ball. Most centipedes hunt outside, but the **house centipede** often comes indoors. With its long legs, it is an amazingly fast sprinter, scuttling up walls and ceilings to catch spiders and other prey. With over 300 legs, the **African giant millipede** is one of the largest millipedes. If threatened by predators, it releases a foul-smelling liquid to persuade them it is not nice to eat.
Many people are scared of spiders, but the world would be very different without them. These eight-legged animals are super-efficient hunters. Out of many thousands, scientists have found only one kind that feeds on plants. Close relatives of spiders include sun spiders, whip spiders, and harvestmen, as well as ticks, mites, and scorpions. The **chaco tarantula** lives in a burrow by day and comes out to feed after dark. Like all spiders, it kills its prey by injecting venom through a pair of fangs. The **marbled orb weaver** catches flying insects by spinning wheel-shaped webs, but the **goldenrod crab spider** sits on top of flowers where it ambushes bees and butterflies. **Audouin’s trapdoor spider** lurks in a silk-lined burrow, equipped with trip-lines and a camouflaged lid. If anything
touched a trip-line, the spider flings open the lid and grabs its prey. The Mexican red-kneed tarantula 5 is a forest-dwelling spider, and a popular pet. It grows slowly and can live for more than 20 years. The southern black widow 6 from North America is far smaller but more dangerous. Females are much bigger than males, and they can give people a fatal bite. The daddy long-legs spider 7 often lives indoors, and so does the giant house spider 8, a species that spins funnel-shaped webs. Raft spiders 9 lie in wait by the edges of ponds and pools where they catch tadpoles and small fish. The enormous goliath tarantula 10 from South America eats insects, rodents, frogs, and even bats. It is one of the biggest spiders in the world, with a leg span as big as a dinner plate.
All spiders make silk, but only some species spin webs to catch their prey. Many other kinds hunt on the ground. The **Brazilian wandering spider** is one of the most dangerous of these prowling predators. It roams through forests after dark, and sometimes wanders into urban areas where it clammers over people as they sleep. The **Sydney funnel-web spider** from Australia is also hazardous to humans. Females live in burrows, but males sometimes stray into backyards, and will bite humans if they feel threatened. The **woodlouse spider** is much smaller, but it has extra-strong fangs for biting into the hard body cases of woodlice. **Nursery web spiders** and **cave spiders** make silk sacs to carry their eggs, while the **American golden silk orb-weaver** uses its silk to build some of the world’s...
biggest webs. Shaped like cartwheels, and more than 1 m (3 ft) across, the webs are strong enough to catch hummingbirds and even frogs. Like spiders, scorpions have eight legs, but they also have a pair of pincers and a poisonous sting in their tails. The **giant desert hairy scorpion** is the largest kind in North America. Like other scorpions, it uses its pincers to tear apart its prey, while its sting is mainly for self-defence. The **yellow thick-tail scorpion** is smaller, but its venom is much more powerful. It comes from the Sahara Desert and the Middle East. **Gold scorpions** also live in the same part of the world, but the **imperial scorpion** is a forest species from tropical Africa. It is one of the biggest scorpions, measuring up to 25 cm (10 in) long. Although it looks menacing, its sting is not much stronger than that of a wasp.
Sea spiders belong to a group of marine animals called Pantopoda, meaning “all legs”. Their legs are so long compared to their tiny bodies that they have to keep some of their internal organs inside them. This strikingly coloured yellow-kneed sea spider comes from coral reefs off the coast of Australia. It is only a few centimetres across, but larger specimens can grow up to 90 cm (35 in) from tip to tip.
Size 1 mm–90 cm (1⁄25 in–35 in) Habitat Seabed; smaller species live in shallow water, while larger sea spiders live in the deep waters of the Antarctic Ocean. Distribution Seas and oceans worldwide Diet Soft-bodied animals such as sea sponges, anemones, and coral polyps. The sea spider uses its sucking mouthpart, or proboscis, to extract fluids from the prey, or breaks off pieces and puts them in its mouth. Breeding The eggs hatch into larvae. In most species the larvae float around freely as they grow. In some they live on their father’s front legs, while in others the larvae live as parasites in animals such as coral polyps or clams.
Crustaceans are not common on land, but they flourish in fresh water and the sea. They include lobsters, shrimps, and prawns, and also hundreds of different kinds of crabs. Some crustaceans swim in gigantic swarms, but crabs usually roam the seabed or scuttle over the shore. The edible crab has an extra-tough shield, or carapace. Its powerful pincers can crack open mollusc shells, and crush human fingers, too. The red reef hermit crab and white-spotted hermit crab have small pincers, and live in shells borrowed from other animals. Like other hermit crabs, they change shells as they grow. Each time these crabs move home, they carefully check their new shell to make sure that it is exactly the right fit. Blue swimming crabs have back legs that work like paddles. These crabs like
Invertebrates
Crustaceans

**Spotted coral crab**

**Panamic arrow crab**

**Japanese spider crab**

**Sponge crab**

**Orange fiddler crab**

spending time on sandy or muddy coastlines. **Warty box crabs** burrow in seabed sand. They shield their faces with their claws, giving them the alternative name, the shame-face crab. **Christmas Island red crabs** live in tropical forests, surrounded by the Indian Ocean. During the breeding season, millions of them emerge from the forest and march to the coast, where they mate and lay their eggs.

**Orange fiddler crabs** make burrows in mangrove swamps. Males have a tiny claw for feeding and a giant one for signalling to females across the mud. The **Panamic arrow crab** lives on reefs, while the **Japanese spider crab** prowls the seabed. Measuring up to 4 m (13 ft) across, this amazingly leggy animal is the world’s biggest crustacean, with a lifespan of up to 100 years.
Lobsters, shrimps, and prawns are crustaceans with long bodies and lots of legs. The Norway lobster lives in a burrow, and feeds at night on live animals and dead remains. Blue-striped squat lobsters are close relatives of crabs. Like other squat lobsters, they have 10 legs, but the last leg pair is small, and tucked away under their tails. Reef lobsters are brightly coloured, which makes them popular aquarium pets. The stripe-leg spiny lobster has extra-long antennae that can make a creaky, clicking sound to scare predators away. If it is cornered, it swims backwards at high speed. Antarctic krill live in the icy Southern Ocean, in swarms that can stretch for kilometres in every direction. These finger-sized crustaceans are a vital food for penguins, seals, and whales, including the blue whale, which can
swallow more than 4 tonnes of krill per day. The sculptured slipper lobster has a rounded shape, and blends in against seabed sand. The peacock mantis shrimp is a predator with a knockout punch. Using its front legs, it smashes open snail shells and crabs, and can even shatter the glass of aquariums. The giant deepsea isopod scavenges food on the sea floor, occasionally feeding on live prey. Since light is extremely faint in deep sea, this isopod has large antennae to help it feel its way around. Vernal tadpole shrimps from California breed in short-lived freshwater pools. The adult shrimp die when the pools dry up, but their eggs can survive for up to 10 years, hatching when it rains. The common marble shrimp is brown with green spots during the day, but turns red at night.
Insects

From beautiful butterflies to buzzing mosquitoes, insects are the most successful creatures on Earth. Their bodies have a hard outer casing and are divided into three sections: the head, thorax, and abdomen. Most adult insects have wings and many kinds can fly. Scientists believe there are still millions of new species left to discover.

Wings  Most insects have two pairs. One pair may be adapted into another form, such as a beetle’s wing-cases. This female jungle nymph cannot fly, but can shake its wings, producing a hissing sound to scare off attackers.

Head  The first section of the body carries the brain, sense organs, and mouth. Insects’ mouths are adapted to suit their diet. This jungle nymph chews leaves, while butterfly mouths are suited for drinking nectar from flowers.
**Features**

- **Antennae**: These sense organs can pick up scents from the air, a bit like a human nose. Some insects also use them to feel their way around.
- **Thorax**: The middle section supports three pairs of legs and two pairs of wings.
- **Abdomen**: The last section of the body contains the digestive and reproductive organs.
- **Insects**
  - Have compound eyes
  - Mostly have wings
  - Mostly have a body divided into three sections
  - Have antennae to sense their surroundings
  - Have six jointed legs
Speeding through the air on transparent wings, dragonflies and damselflies chase insects for food. Dragonflies are robust with rounded heads, whereas damselflies are more slender with broader heads. Both have extra-large eyes for spotting anything that moves and can zoom sideways and even backwards as they close in for a kill. Their young, known as nymphs, are also hunters. They grow up underwater, and use stealth and camouflage to catch their prey. The common green darner 1 flies over streams in North America. Its stiff wings stick out sideways when it rests. The southern hawker dragonfly 2, from Europe, breeds in small ponds. It hunts away from water, and approaches people that come nearby. The Illinois river cruiser 3 patrols rocky streams and rivers, while the flame skimmer 4 prefers warm water,
sometimes hunting over hot springs. The **azure damselfly** ❼ breeds in small ponds and streams. Like other damselflies, it has a very slender body, with widely spaced eyes, and wings that fold back when it lands. The **emperor dragonfly** ❻ is one of Europe’s largest insects, but it looks small compared to the giant **comet darter** ❽ from North America. This dragonfly can outpace an Olympic sprinter and spends much of its time on the wing. The **broad-bodied chaser** ❼ rests on plant stems and rushes out to grab passing insects from its perch. The **banded demoiselle** ❼ has a flitting, butterfly-like flight. The **grey petaltail** ❻ hunts over swamps and often stops to settle on trees. Its young are ferocious predators, crawling over the surface of swamps on damp nights and catching other insects in their fast-moving jaws.
STICK INSECT Masters of disguise, stick insects sit quietly on tree branches, looking exactly like dead twigs or green shoots so that predators don’t notice them. There are thought to be more than 3,000 species across the world, ranging from tiny leaf and twig shapes up to “branches” 55 cm (22 in) long. This stick insect from Madagascar resembles a thorny bramble shoot, a very unappetizing prospect for predators.
Size  2.5–55 cm (1–22 in)  Weight  Up to 65 grams (2 1/4 oz)
Habitat  Rainforests and jungles.  Distribution  Tropical and subtropical areas of Southeast Asia and Australia, also Madagascar, South and Central America, and southern USA. Some species also found in mainland Europe as well as the British Isles.  Diet  Leaves of trees and shrubs and berries.

Breeding  Females lay live eggs on their own or by mating with males. The eggs hatch into nymphs, which moult several times as they grow into adults.  Lifespan  From a few months to a few years.  Predators  Birds, small reptiles, and rodents. Defences include camouflage, sharp spines, flashing wings, hissing, or spraying bad-smelling or burning liquid.
Crickets and grasshoppers

With their powerful back legs, crickets and grasshoppers are some of the best jumpers in the insect world. They are also some of the loudest, rubbing their legs or wings to make high-pitched sounds. Many live on their own, but locusts are famous for migrating in enormous swarms. The African green milkweed locust (1) is one of the biggest of these insect travellers, while the desert locust (2) holds the record for numbers. Some of its swarms contain more than 30 billion insects, which is four times the number of people on Earth. Most grasshoppers rely on camouflage for protection. The foaming grasshopper (3), however, oozes poisonous froth from behind its head, while its day-glow colours warn that it is dangerous to eat. Adult grasshoppers usually have two pairs of wings, but some...
Crickets are wingless and cannot fly. The biggest of these include wetas from New Zealand. The Cook Strait giant weta is almost as large as a mouse. If it is threatened, it raises its spiny back legs over its head, making it look ready for a fight. Most crickets and grasshoppers feed on plants, but some species are predators and scavengers. Some others even feed on their own kind. The mole cricket spends its life in underground burrows, feeding on worms, roots, and grasses. Like real moles, it has massive front legs that work as shovels. The oak bush cricket is a hunter, while the African cave cricket feeds on almost anything, from bat droppings to carrion. The huge violet-winged grasshopper comes from South America. Measuring up to 12 cm (5 in) long, it is even bigger than some birds.
True bugs are a special group of insects that live in fresh water as well as on land. They have sharp mouthparts for sucking up liquids. Some feed on plant sap, while others eat blood or fluids from their partly digested prey. Sap-sucking bugs feed in the open, and often use camouflage to hide. The thorn bug \(\text{\textdagger}\) has an amazingly realistic spike that looks just like a thorn. Tropical species, such as the wart-headed bug \(\text{\textdagger}\), can be bigger than some butterflies. This bug has brightly coloured hindwings to startle enemies that get too close. The green colour of the common green shield bug \(\text{\textdagger}\) helps it to blend in among leaves. Young spittle bugs \(\text{\textdagger}\) shelter inside nests of foam, which protect them from hungry birds. The peanut-headed bug \(\text{\textdagger}\), another tropical species, has large eye spots on its...
hindwings to confuse predators. The bed bug is a flightless parasite, which emerges after dark to suck human blood. Many predatory bugs ambush their prey. On land they include the white-spotted assassin bug and its many relatives. In fresh water, predatory bugs are even more common. Some, such as the common pond skater, live on the water’s surface, attacking other insects that crash land. A strong swimmer, the giant water bug is big enough to prey on frogs and fish. It can even give humans a painful bite. Most bugs are silent, but some make amazingly loud sounds. Male Himalayan cicadas attract females by making a deafening courtship song. Like other cicadas, they sing when they are adult, but the rest of their lives is spent feeding on roots underground.
With strange angular features and triangular heads, praying mantises look almost like creatures from another planet. They are instantly recognizable by their long, folded front legs, held up together as if in prayer. These can lash out with astonishing speed to catch hold of live prey. Some species, such as this Thai boxer praying mantis, are brightly coloured, but most blend in with their surroundings.
Size 1.2–15 cm (½–6 in)  
Weight up to 10 g (⅓ oz)  
Habitat Rainforests and jungles.  
Distribution Tropical areas, especially Africa, Southeast Asia, and Australia. Also South and Central America and the southern USA. Some species are also found in Europe, Central Asia, and Japan.  
Diet Flying insects such as moths, grasshoppers, flies, and other mantises. Females eat males after, or even during, mating.  
Breeding Females lay hundreds of eggs in an egg case stuck to a plant or buried in the ground. Eggs hatch into nymphs.  
Lifespan 10–12 months.  
Predators Large birds, frogs, chameleons, snakes, bats, and monkeys. Mantises protect themselves by camouflage.
With around 400,000 species, beetles make up by far the largest group of insects. They start life as larvae, also known as grubs. Adults usually have two pairs of wings. Their front wings, called elytra, are specially hardened and fit over the hindwings like a case. Beetles eat a huge range of different foods. The sexton beetle (1) buries the dead bodies of small birds and rodents such as mice. The female lays eggs in these remains, so her grubs have their own private food supply. The violin beetle (2) squeezes its flat body under tree bark, where it feeds on other insects and snails. The grubs of the jewelled frog beetle (3) grow up inside plant stems. Beetles vary greatly in size. While the smallest could easily fit on the head of a pin, the biggest kinds, such as the Hercules beetle (4), can be more than
15 cm (6 in) long. The seven-spot ladybird feeds on aphids, making it a useful ally for farmers and gardeners. Wallace’s longhorn beetle grubs bore into living trees, while stag beetle grubs live in rotting wood. They stay hidden for up to six years, before turning into adults. Adult males fight with their antler-shaped jaws and the winner gets a chance to mate. The great diving beetle is found in ponds and streams, where it swims with back legs that work like a pair of oars. It eats tadpoles and even small fish. Measuring up to 10 cm (4 in) long, the goliath beetle is the heaviest insect in the world. Its grubs can weigh up to 100 g (3½ oz). Beneath the soil’s surface, click beetle grubs, known as wireworms, chew their way through roots. They can cause serious damage to crops.
Unlike other insects, butterflies and moths are covered with thousands of tiny scales, which create vivid patterns. Butterflies are often brightly coloured, while moths are usually drab. Most moths, including Wallich’s owl moth, fly by night and use their camouflaged markings to hide during the day, but some fly by day and have eye-catching wings. Male queen cracker butterflies click their wings when they fly as a way of marking their territory. Apollo butterflies often live in cold climates on mountains, but far more butterflies and moths come from warm parts of the world. Often mistaken for a butterfly, the beautiful Madagascan sunset moth is a daytime flyer. The Hercules moth is one of the largest species, measuring up to 34 cm (13 in) across. From Papua New Guinea,
Queen Alexandra’s birdwing 6 is the world’s biggest butterfly with a wingspan of up to 31 cm (12 in). It flies high up, and in the past collectors used shotguns to knock it out of the trees. The North American monarch butterfly 7 is the greatest traveller, flying 4,500 km (2,800 miles) from Mexico as far north as Canada to breed. When winter comes, it flies all the way back again to escape the cold. Indian leaf butterflies 8 are easy to spot with their wings open, but look just like dead leaves with them closed. Silk moths 9 have been bred in captivity for thousands of years. Silk is made by unwinding the cocoons that shelter their caterpillars. The American moon moth 10 lives for less than a week as an adult. Like many other moths, it only eats as a caterpillar. Adults do not have working mouths.
Butterflies and moths live their lives in four stages: egg, caterpillar, pupa, and adult. The caterpillar stage is the main feeding period, and butterflies and moths are often very choosy about their food. The **purple mort bleu** from Central and South America, grows up on bamboo leaves, while in Australia caterpillars of the **acacia carpenter moth** bore their way into wattle or acacia trees.

The **tiger swallowtail** from North America lays its eggs on many kinds of plants, but the **zebra swallowtail** always picks out pawpaw trees. The **swallowtail** and **scarce swallowtail** have caterpillars with inflatable coloured “horns”. The horns suddenly appear if the caterpillar is touched, and they have a repulsive smell that helps to keep predators away. The **common morpho** from Central
and South America, has striking, bright blue wings. The butterfly was once collected for use in jewellery because its blue colour does not fade even after it has died. The huge **Atlas moth** (18), found in Southeast Asia, has the largest wing area of any butterfly or moth. At over 400 cm² (62 sq in), it is the size of a dinner plate. The **verdant sphinx** (19) and its relatives are some of the fastest fliers. Narrow wings and streamlined abdomens help these moths to attain top speeds of more than 35 kph (22 mph). The **owl butterfly** (20) gets its name from the huge eyespots on its hindwings. They give it a scary “face”, making birds think twice before risking an attack. The **giant Agrippa** (21) has the biggest wingspan of any insect. The largest giant Agrippa moth on record measured 36 cm (14 in) from tip to tip.
Butterflies and moths begin life as wingless larvae called caterpillars. Some of these are hard to spot but others, such as this slug moth caterpillar from Papua New Guinea, are brightly coloured and bizarrely shaped. You might expect such a colourful creature to develop into an equally striking adult, but fully developed slug moths are often dull in colour.
Size ▶ Variable, but small  
Habitat ▶ Lowland forest, swamps, and mangroves.  
Distribution ▶ Tropical, subtropical, and some temperate areas, including the eastern USA, sub-Saharan Africa, South and Southeast Asia, and Australasia.  
Diet ▶ In many species adults have no mouthparts. They do all their eating as caterpillars, devouring the leaves of plants such as figs. Some species are seen as pests as they eat crops.  
Breeding ▶ Caterpillars retreat into hard, round cocoons, from which they emerge as adult moths. Adults mate and lay eggs that will hatch into new caterpillars.  
Predators ▶ Parasitic flies and wasps. Pest species may be killed by humans.  
Number of species ▶ About 1,000 slug moth species.
Flies include some of the world’s most helpful insects, as well as some of the most harmful ones. Many of them have bristly bodies, and most have just one pair of wings. In place of the rear wings, they have a pair of tiny knobs. These work like an aircraft’s gyroscopes, keeping the fly stable in the air so it can perform extreme aerobatics. These include landing upside down and hovering steadily in mid-air. The humble house fly is the best-known of these insects, with an annoying habit of flying indoors. It eats anything sweet and spreads germs as it feeds. The bluebottle fly lays its eggs on meat and carrion, which its maggots burrow into, eating as they go. Mosquitoes have sharp mouthparts and drink blood by piercing the skin of other animals. In some parts of the world they carry parasites.
that can cause malaria and other killer diseases. The marsh crane fly 1 has extra-long legs that break off if it is touched. Bee flies 5 do a useful job by pollinating flowers. The bat fly 6 has no wings. It does not need them because it spends its adult life in the fur of bats. Drone flies 7 are very good at mimicking honey bees. Like bee flies, they are effective pollinators. The awesome-looking giant blue robber fly 8 from Australia grabs other insects on the wing, and flies with a distinctive buzzing sound. Male stalk-eyed flies 9 have bizarre heads with eyes set far apart. In the breeding season, males stand head to head, and the one with the widest eyes wins. The banded brown horsefly 10 bites horses, and sometimes humans, too, but timber flies 11 are harmless and do not feed at all as adults.
Bees, wasps, and ants

Bees and their relatives are very useful insects. Although many of them pack a painful sting, they help farmers by pollinating crops and killing pests. Apart from sawflies, they all have slender waists and most have two pairs of transparent wings. **Honey bees** live in nests containing thousands of workers ruled by a single queen. The queen lays the eggs, while the worker bees build the nest, collect food, and care for the young. **Army ants** also live together but do not make a permanent home. Instead, millions of them rush across the rainforest floor, grabbing small animals with their powerful jaws. The **great carpenter bee** feeds on nectar from flowers, and lays its eggs in tunnels in dead wood. Like other bees, it uses its sting only if attacked. **Leaf-cutter ants** make giant nests underground, and feed on a special...
fungus which they grow on chewed-up leaves. These ants are harmless, but some others are not. Tropical fire ants have a vicious sting that feels worse than a burn. The mammoth wasp is a predator. It paralyzes the grubs of scarab beetles and lays eggs on their bodies, so its young have a private food supply. Common wasps make papery nests, and help to get rid of pests by hunting insects to feed their young. Plasterer bees and buff-tailed bumblebees nest in the ground. Plasterer bees waterproof the walls of their nests with a fluid from their bodies. Bumblebees have furry insulation which lets them fly in the cold days of early spring. They are good crop pollinators. The horntail looks dangerous, but cannot sting. Females lay their eggs in pine trees, and their grubs feed by chewing through wood.
Fish

Fish were the first vertebrates to evolve. They live underwater and their streamlined bodies are adapted for speedy swimming. They breathe by absorbing oxygen from the water through their gills. Fish have a special extra sense, using organs along their sides to detect vibrations in the water.

Tail  Most fish use their tails to power themselves through the water. This lionfish can use its tail to stay steady in the water, so it can hang motionless, ready to ambush passing prey.
Fins › Fish fins consist of bony spines linked by membranes. The fish uses them to steer its body through the water. In some species they are adapted for other purposes such as burrowing into mud or sand to hide. This lionfish can inject venom through spines in some of its fins.

Gills › Like all animals, fish need oxygen to survive, which they absorb from the water using gills. As the fish swims, water constantly flows across a stack of fine membranes inside the gills, through which oxygen passes into the fish’s bloodstream.
Razor-sharp teeth and powerful jaws make sharks the most fearsome hunters in the seas. Like skates and rays, they have skeletons made of cartilage or gristle. Frilled sharks 1 and bluntnose sixgill sharks 2 live in deep water, but many other sharks live near the surface, in open water or close to the shore. Most sharks have a streamlined body and several rows of sharp teeth, which are constantly replaced throughout their lives. Their relatives chimaeras, a group of blunt-headed fish, have teeth that last the whole of their lives. The spotted ratfish 3 and elephant fish chimaera 4 use their flat teeth for crushing molluscs and crabs. Some sharks have to swim non-stop to breathe, but zebra sharks 5 spend the day resting on the seabed, waking up to hunt after dark. Skates and rays have wing-like front fins.
and mouths on their undersides. Some kinds, including the **common stingray** 9, have a venomous spine in their tails. Accidentally treading on these fish can be very dangerous. In some cases, a single jab from a spine can kill a person. Rays swim by beating their front fins like a bird’s wings. The **spotted eagle ray** 7 feeds on seabed animals, while the **giant manta ray** 8 scoops up plankton as it “flies” through the open sea.

Measuring up to 9 m (30 ft) across, this colossal but harmless fish is the largest ray in the world, with an exceptionally big brain. The **smalltooth sawfish** 9 is a rare and unusual ray with a toothed snout like a saw. It uses this to dig up animals in the seabed and to slash at other fish that come nearby. The **longnose sawshark** 10 looks similar, but is much smaller, with two barbels, or feelers, attached to its snout.
Some of the world’s biggest sharks roam the open seas. The shortfin mako is one of the fastest of these tireless hunters. In short bursts, it can swim at more than 70 kph (43 mph). Makos feed mainly on fast-swimming fish and squid, but the great white shark has a taste for seals, dolphins, and occasionally humans, too. Growing up to 7 m (24 ft) in length, and weighing as much as 2 tonnes, this gigantic and much-feared predator typically attacks from below, and sometimes bursts out of the water as it slams into its prey. The beautifully streamlined blue shark travels thousands of kilometres a year, between the places where it feeds and the places where it breeds. Like most large sharks it gives birth to live young. Small-spotted catsharks and their relatives lay eggs with leathery cases. Called
“mermaid’s purses”, they can take over a year to hatch. The smooth hammerhead \(\text{15}\) belongs to a family of sharks with strange T-shaped heads. Its eyes are at each end of the head, enabling it to see all around as it swims. Port Jackson sharks \(\text{16}\) and horn sharks \(\text{17}\) live on the seabed. They have downward-facing mouths and flat back teeth, which crunch up molluscs and other hard-bodied animals. The thresher shark \(\text{18}\) is an open-water predator. Its extra-long tail works like a whip, stunning other fish and making them easy to catch. Blacktip reef sharks \(\text{19}\) and whitetip reef sharks \(\text{20}\) rarely harm humans, but the bull shark \(\text{21}\) is a notorious man-eater, with a habit of swimming up rivers and cruising close to the shore. Despite its size, up to 3.4 m (11 ft) long, it can hunt in water just 1 m (3 ft) deep.
WHALE SHARK  By far the largest fish in the world, the whale shark has a huge mouth that stretches almost as wide as its whole body, armed with up to 300 rows of tiny teeth. However, despite its fearsome appearance, this gentle giant feeds on plankton. In fact, it is often followed by shoals of smaller fish that keep the shark clean by eating bacteria and debris from its mouth.
Size › 7–12 m (23–40 ft). Some may grow even larger.

Weight › Up to 18½ tonnes

Habitat › Tropical and warm temperate seas. They migrate thousands of kilometres every year.

Distribution › Pacific, South Atlantic, and Indian Oceans.

Diet › Plankton, small fish, and crustaceans. Whale sharks feed by taking in water then pushing it through their gills to filter out the food.

Breeding › The female carries up to 300 embryos and gives birth to live young.

Lifespan › Unknown but thought to be up to 150 years.

Predators › Adults have no enemies except humans. Other sharks, sailfish, and killer whales may attack the young.

Conservation status › Vulnerable due to hunting.
Saltwater fish come in a mind-boggling variety of shapes, sizes, and colours, and scientists discover many new kinds every year. Rays and sharks have rubbery (cartilaginous) skeletons, but most saltwater fish have bony skeletons and are covered in scales. The **spotted boxfish**’s scales fit together like armour plating, while the **long-spine porcupinefish** has scales with sharp spines. If it feels threatened, this fish swallows lots of water and turns into a prickly ball. The **clown triggerfish** lives in the Indian and Pacific Oceans and jams itself in coral reefs if danger comes its way. It feeds by crunching up sea urchins and other hard-shelled animals. The **sargassumfish** lives in floating seaweed around the world. Even in broad daylight, its incredible camouflage makes it almost impossible to see. The **zebra moray**...
comes out to feed at night. To firmly grip its prey, it has a second set of jaws in its throat, which can spring forward into its mouth. Needlefish live near the surface of the sea. Large specimens have been known to spear people by jumping on to boats. The red lionfish’s striped colours warn predators that this fish is venomous. It defends itself by spreading out its poison-tipped fins. The stonefish can give humans a lethal jab with its venomous spines. The yellow seahorse swims with its body upright. Like other seahorses it is one of the world’s slowest fish, with a maximum speed of just a few metres an hour. Male coral toadfish make strange grunting or whistling sounds to attract females. After the females have laid their eggs, the males guard them until the young fish hatch and swim away.
More fish live on coasts and coral reefs than anywhere else in the seas. The emperor angelfish and its relatives are some of the most colourful reef-dwellers with vivid markings that change as they mature. Banded archerfish live in estuaries in Southeast Asia. They look for insects on overhanging branches and knock them off by squirting a jet of water from their mouths. The blue-spotted seabream eats animals on the seabed, while the beautiful powder-blue surgeonfish feeds mainly on algae and underwater plants. Surgeonfish look harmless, but when attacked they fight back using two sharp blades on either side of their tails. The clown anemonefish hides in the tentacles of sea anemones. Unlike other fish, it is not harmed by their stings. Common bluestripe snappers
Saltwater fish live on coral reefs. They move in fast-swimming shoals by day, dispersing at night to feed. Harlequin tuskfish flip stones over with their teeth to get at small animals hiding underneath. The Mediterranean parrotfish crunches up food with its beak-shaped mouth. Like many other parrotfish it starts out life as female, but may change into a male as it grows older. Atlantic mudskippers live in mangrove swamps where they climb up roots or hop across the mud. Their front fins work like stubby legs, and they can survive out of the water by breathing air through their skin. The albacore tuna belongs to a family of high-speed swimmers with muscle-packed bodies and long, razor-like fins. Unlike most fish, tunas are warm-blooded, and can hurtle through water at up to 80 kph (50 mph).
Sea fish thrive in cold water because it is often full of food. **Shore rocklings** search for shrimps and crabs in rock pools using sensitive whiskers or barbels. **Atlantic mackerels** live in the open sea. Like tunas they have muscle-packed bodies and a streamlined shape for speeding through the water. They have to keep swimming, as they rely on the flow of water to breathe. **Turbot** and other flatfish live on the seabed. Very young flatfish look like other fish. As they grow up, one eye moves around their heads until, as adults, they swim on one side with both eyes facing up. The **lesser weeverfish** also lives on the bottom, with its body half-buried near the shore. This venomous fish has spines on its back, which it raises to defend itself against predators. It can even give humans a painful sting. **Sockeye salmon** spend
their adult lives in the northern Pacific Ocean but return to fresh water to breed. In some rivers, thousands of sockeyes fight their way upstream, creating a feast for fish-eating eagles and bears. The John Dory looks big when seen from the side, but it is good at sneaking up on other fish because its body is as thin as a human hand. The Atlantic cod and Atlantic herring are often fished for food. Cod can produce 5 million eggs every time they breed, but their numbers have plummeted due to overfishing. Herrings are some of the most common fish in seas. A single shoal can contain more than a billion members, attracting predators such as seals, whales, and larger fish. The European plaice and common sole are two flatfish that are highly prized as food. Both of them often hide on the seabed by covering themselves with sand.
BLACK-STRIPED SALEMA  These tropical fish are found in waters around the Galápagos Islands. They form huge schools of hundreds or thousands. When a predator approaches, the school bunches into a tight cluster known as a bait ball. By swarming together, splitting, and changing direction in a flash, these fish try to confuse predators, making it difficult for them to attack.
Size ➔ Up to 30 cm (12 in) long  
Habitat ➔ Reefs and rocky areas in shallow waters. They gather in large shoals during the day, but disperse at night.  
Distribution ➔ Eastern Pacific Ocean, only around the Galapagos Islands.  
Diet ➔ Plankton and fish larvae  
Breeding ➔ The female releases eggs that float freely in the ocean. These eggs hatch into tiny larvae without scales or fins, which slowly develop into young fish.  
Predators ➔ Dolphins, seals, penguins, and sharks.  
Conservation status ➔ Vulnerable due to changes in its environment. Recently, a weather system called El Niño has disrupted the oceans around the Galapagos, increasing water temperatures, which may affect fish like these.
The deep sea is dark, silent, and bitterly cold. The fish that live here have evolved strange shapes to survive. Food is hard to find, so deep-sea fish cannot waste any chance to catch a meal. The **tripodfish** perches above the seabed, propped up by three long rays that stick out from its fins. It faces into the current and catches small animals that drift by. The **common fangtooth** lives at depths of up to 5,000 m (16,400 ft). It feeds on smaller fish, grabbing them with its needle-like fangs and swallowing them whole. The **orange roughy** gathers over ocean ridges and underwater mountains. It grows very slowly and can live to be 150 years old. **Footballfish** attract their prey using luminous lures that dangle in front of their mouths. If other fish come near to investigate, they are...
Female footballfish really are as big as footballs, but the males are tiny and often fasten themselves to the females as parasites. The Pacific grenadier 5 cruises over the ocean floor, gently rippling its long, rat-like tail, while the black swallower 6 has a super-stretchy stomach and can gulp down prey larger than itself. Feelers fish 7 stay close to the ocean floor. Their front fins are thin and whiskery and work like antennae for sensing food. The longnose lancetfish 8 is a daily visitor to the deeps. It hides in the dark by day, coming closer to the surface to feed when night falls. The pelican eel 9 has enormous jaws but tiny teeth. It uses its mouth like a scoop to catch its prey. Like the black swallower, it has an expandable stomach to deal with over-sized meals.
Fish live in a huge variety of freshwater habitats, from lakes and rivers to streams and ponds. They can be found in hot springs where the water temperature is a steamy 40°C (104°F), and in chilly caves hundreds of metres underground. The smallest fish, even the fully grown ones, are not much bigger than a grain of rice, while the biggest are as long as a family car. Some freshwater fish, including the goldfish 1 and koi carp 2, have been raised in captivity for hundreds of years. There are many varieties of both these fish, and the rarest koi carp can be worth more than $1 million. Catfish are common freshwater fish, particularly where the water is murky or the current is slow. The glass catfish 3 from Southeast Asia has a transparent body. The South American tiger shovelnose catfish 4 has
long barbels that probe the riverbed for food. The chain pickerel is an ambush hunter. It lurks in the shallows and lunges at other fish with a powerful flick of its tail. The red piranha from South America usually eats fish, worms, and crustaceans, but a large group of red piranhas can attack big mammals, stripping away chunks of flesh with their razor-sharp teeth. The American paddlefish looks ferocious, but it feeds only on tiny animals filtered out by its gills. Tigerfish are fierce predators from Africa’s rivers. They are famous for putting up a tremendous fight if hooked. The European eel is a long-distance migrant. It spawns in the Sargasso Sea, in the North Atlantic Ocean, and its tiny young travel all the way back to Europe’s rivers, an epic journey of up to 6,000 km (3,700 miles).
Many freshwater fish have special skills that help them to survive. The elephantnose fish (10) from tropical Africa lives in murky rivers. It finds its way by giving off weak electric signals and probes for food using its long lower jaw. The electric eel (11) from South America uses electricity to find and kill prey. It can give a jolt of up to 650 volts, enough to knock a person off their feet. The foureyed fish (12) has eyes that are divided into two, letting it see clearly above and below the waterline. Siamese fighting fish (13) are small but famously aggressive. When two males clash, they sometimes fight to the death. Far away from the tropics, the Arctic char (14) lives in icy rivers and cold lakes. It is one of the world’s most northerly freshwater fish, surviving as close as 800 km (500 miles) from the North Pole.
The European perch is a patient predator, lying in wait for its prey. It lays eggs in long ribbons and fastens them to underwater plants. A distant relative of the European perch, the African Nile tilapia breeds in a very different way. The female scoops up her eggs, up to 2,000 at a time, and holds them in her mouth until they hatch and her young swim away. African lungfish live in lakes and swamps that can dry out for months at a time. They seal themselves up in cocoons of mud and survive by breathing air. The rainbow trout originally came from North America but has been introduced into lakes and rivers in many other parts of the world for food and sport. Another American fish, the longnose gar bursts out of hiding to stab other fish with its needle-sharp teeth.
Amphibians spend part of their lives in the water and part on land. Some kinds undergo metamorphosis, like many invertebrates, starting out as water-based tadpoles with gills and evolving into air-breathing adults. They need fresh water to survive, and many species are threatened with extinction due to pollution, disease, and destruction of their habitat.

**Poison glands** Many species of amphibian secrete a poisonous slime from glands in their skin. This helps to keep them moist as well as to deter predators. Some amphibians simply taste nasty, while others, like this cane toad, can be deadly to some predators.

**Skin** Amphibians have permeable skin, so water can pass outwards and evaporate. This means they mostly live in water or in damp areas to stop their bodies from drying out.
Features

- Usually lay eggs to reproduce
- Have moist skin, and may die if they dry out
- Often spend much of their lives in water
- Some hatch as tadpoles, and change shape to become adults
- Are cold-blooded

Legs  Some amphibians only have legs as adults. These kinds hatch out from eggs as tadpoles, tiny swimming creatures with tails. As the tadpoles mature, legs grow out of their bodies and their tails shrink and disappear.
Frogs and toads look very different to other amphibians, with their stubby bodies and long back legs. Frogs are usually sleek and slippery, but most toads have dry, warty skin. Nearly all of these animals start life as tadpoles, changing shape as they grow up. The lemur frog 1 from Central America hunts insects by night and hides under leaves during the day. Like other treefrogs, it is an expert climber with slender, sucker-tipped toes. The giant broad-headed treefrog 2 lives in South American forests. It clings to tree trunks and branches, while the Australian green treefrog 3 sometimes climbs into houses, where it makes itself at home in water tanks and kitchen sinks. The Amazon milk frog 4 lays its eggs in rain-filled tree-holes. It lives high in the treetops and hardly ever comes to the
ground. The South American paradoxical frog 5 spends its life in lakes and pools. It gets its name from its monster tadpoles, which are up to four times the adult’s length. The Solomon Islands horned frog 6 has a pointed snout and horn-like projections above its eyes, camouflaging it perfectly among fallen leaves. The European common toad 7 hunts all kinds of small animals, including beetles, snails, and slugs. The rare golden mantella 8 frog from Madagascar is brilliantly coloured, warning predators that it has poison-covered skin. The Malayan tree toad 9 is one of the few true toads that lives off the ground. The enormous cane toad 10 gulps down mice and even snakes. Originally from Central America, this ravenous predator has become a major pest in Australia and other parts of the world.
Toads usually move by crawling, but frogs often hop and jump. In emergencies, the European common frog can leap more than seven times its own length, equivalent to a human athlete clearing a school bus without a run-up. In Central and South America, tiny poison-dart frogs climb up trees or hop over the rainforest floor. Their bright colours are a warning to predators to stay away. The golden poison-dart frog is the deadliest, with enough poison to kill two African elephants, while the granular poison-dart frog is one of the smallest, and could easily fit inside a matchbox. In the past, native Americans used these frogs to make poison hunting darts, which is how they got their names. In the breeding season, frogs and toads often make loud calls. Male edible frogs
and **wood frogs** sound like quacking ducks, while the male **American bullfrog** sounds more like a mooing cow. This massive frog swallows almost anything it can cram into its mouth, including smaller frogs, young turtles, and small water birds. The “horns” and the brown colour of the **Asian horned frog** help it blend in among fallen leaves. The **Indian bullfrog** leaps into water if it is disturbed. It usually climbs out after a few minutes, but can stay underwater for several hours. **Painted toads** and **tomato frogs** live on land and come out to feed at night. Their skin is covered with a glue-like substance, which helps to protect them from attack. **Tinker reed frogs** from Africa lay their eggs on waterside plants. Their tadpoles wriggle down into the water after hatching.
Frogs and toads have lots of different shapes, and varied lifestyles that help them to survive. If threatened, the Mexican burrowing toad can blow itself up to resemble a small balloon. It lives underground and feeds on ants, coming to the surface only when it breeds. The horned marsupial frog has a strange way of breeding that lets it stay high up in trees. The female carries her eggs in a pouch on her back. Instead of producing tadpoles, they hatch directly into baby frogs. The midwife toad is so called because the male carries the female’s eggs. When the eggs are ready to hatch, he takes them to water so that the tadpoles can swim away. Fleischmann’s glass frog lives in trees. On its underside, its tiny beating heart can be seen through its transparent skin. The ornate horned frog is a sit-and-
wait hunter from the grasslands of Argentina. Camouflaged by its green and brown markings, it lurks in muddy ground and grabs anything edible that comes nearby. The desert rain frog lives and breeds among Namibian sand dunes, hiding beneath the surface during the day. Wallace’s flying frog glides through the forests of Southeast Asia on its webbed feet. Fraser’s clawed frog from Africa stays in water all its life. It has a flat body, sensitive fingers, and upward-facing eyes. The African bullfrog lives in grassland and savanna. Big and aggressive, it sometimes eats its own kind. It spends the dry season underground. Males of this species defend their eggs fiercely until they hatch. The common spadefoot toad digs burrows with its back legs, and spends half the year hidden away.
There are more than 900 known species of tree frogs, most of which live high up in the branches of tropical rainforests. These red-eyed tree frogs are easy to recognize, thanks to their startling colouring. Their bright eyes are thought to surprise predators and discourage them from attacking. However, during the day they often keep their eyes shut, relying on their green skin to camouflage them among forest leaves.
Size ➢ Up to 7 cm (2¾ in)  

Habitat ➢ Trees and shrubs near water in warm, tropical forests and jungles.  

Distribution ➢ Central America  

Diet ➢ Insects such as crickets, flies, and moths, also worms and spiders.  

Breeding ➢ Females lay a batch of 50 eggs on a leaf over water. This process is repeated several times. The eggs hatch after about five days and tadpoles fall into the water.  

Lifespan ➢ Up to five years.  

Predators ➢ Many climbing and flying birds, reptiles, and mammals, including snakes and monkeys. Fish may prey on tadpoles.  

Conservation status ➢ Numbers of some species are declining where their forest habitats are being cut down.
With their slender bodies and long tails, salamanders and newts look very different from frogs and toads. Many are well camouflaged, but others, including the fire salamander 1 and tiger salamander 2, have bright warning colours. This shows other animals that they are poisonous and best left alone. Some species spend all their lives on land, but most return to water to mate and lay their eggs. The Asian crocodile newt 3 heads for ponds at the beginning of the monsoon, while the Japanese giant salamander 4 is fully aquatic and never leaves its watery home. Measuring up to 1.5 m (5 ft) long, this huge, wrinkly-skinned amphibian feeds on fish and freshwater insects, and hunts after dark. Young salamanders and newts breathe using feathery gills. Some salamander species, such as the
Axolotl and olm, keep their gills throughout their lives. If the axolotl loses a body part, it can regrow the entire part within months. The olm lives in dark, flooded caves. Extremely slender and totally blind, it finds its food by smell and touch. Great crested newts breed in ponds, and have elaborate courtship displays. The male grows his impressive crest in spring and uses it to attract females waiting to lay their eggs.

On land, salamanders and newts live in damp woodlands and rocky places, and hunt mainly after dark. During the summer, many species, such as the California newt and Ensatina salamander, keep moist by hiding under rotting logs. The three-toed amphiuma buries itself in mud, and makes a waterproof cocoon. This slimy, snake-like amphibian has tiny legs but a powerful bite.
Reptiles

Millions of years ago reptiles ruled the Earth in the form of dinosaurs. Modern reptiles are mostly smaller, although they still include fearsome predators such as the Komodo dragon, giant snakes, and ferocious crocodiles, which can attack and kill human beings. However, they also include gentle vegetarians, such as giant tortoises and the green sea turtle.

Cold-blooded Unlike birds and mammals, reptiles cannot keep their bodies warm by burning food. Instead they rely on sources of heat in their environment to keep warm.
**Scaly skin** As well as skin, reptiles have an outer layer of protective armour. Lizards and snakes are covered in scales. Turtles, tortoises, crocodiles, and alligators have scutes, horny layers of skin backed by bony plates.

**Lungs** Reptiles have lungs and must breathe air to survive. Even turtles that live under water, usually return to the surface to breathe.

**Legs** Most reptiles have four legs. Some groups, such as snakes, have no legs at all. They move by pushing against the ground with their flexible bodies.
With their domed shells and beak-like mouths, turtles and tortoises are easy to recognize. The yellow-margined box turtle has a hinge on the underside of its shell. If danger strikes, it quickly pulls in its head and legs, and shuts itself away. The American red-bellied turtle likes sunning itself near the shore, while the Carolina box turtle escapes the heat by retreating into cover or by burying itself in mud. Turtles and tortoises come in many sizes. The smallest ones are not much bigger than a baseball, but the record-breaking leatherback sea turtle can weigh as much as a small car. It is one of the greatest travellers in the animal world, swimming vast distances with its large flippers. Sea turtles live mainly in tropical oceans, but freshwater turtles live in rivers and lakes, where they eat...
plants or animal prey. The common snapping turtle ❶, from North America, is one of the world’s biggest freshwater turtles. It lurks in the mud at the bottom of rivers and lakes. The Chinese soft-shelled turtle ❷ has a nose like a snorkel, and spends most of its time in the water. Turtles and tortoises breed by laying eggs. Freshwater kinds, such as the painted turtle ❸, lay theirs in holes not far from the water’s edge. The female alligator snapping turtle ❹ leaves the water in spring to lay eggs, whereas the male spends most of his time at the bottom of rivers or lakes. Sea turtles, including the loggerhead ❺, dig nests in sandy beaches. After hatching, the young turtles dig their way to the surface and then scuttle towards the sea. It is a dangerous time, and many are caught by predators before they reach the water’s edge.
Tortoises are close relatives of turtles, but they have stronger legs and spend all their lives on land. Like turtles, tortoises breed by laying eggs. Most of them are vegetarian, although some, including the South American red-footed tortoise, also eat small animals and dead remains. Tortoises are famous for being slow, but to make up for this, they can be amazingly long-lived. The Hermann’s tortoise, for example, has a lifespan of 50 years, while the Aldabra giant tortoise from coral islands in the Indian Ocean can survive for more than two centuries. One recently died in captivity at the astonishing age of 255. Most tortoises have high shells, which predators find hard to break. The African pancake tortoise is almost flat, which allows it to hide in rocky cracks to avoid...
predators. It has the tiniest families, as it lays just one egg at a time, although it usually breeds several times each year. **Galápagos tortoises** live on islands in the Pacific Ocean. They are as large as the Aldabra giant tortoise, and often have shells with a saddle-shaped front. This lets them stretch their necks high up to munch prickly cacti, their primary food. **Radiated tortoises**, from Madagascar, have shells with raised knobs, but the lumpiest shell belongs to the **Indian starred tortoise**, which has star-like markings that hide it in dry grass. The **spur-thighed tortoise** from Europe and North Africa has bony projections on its hind legs. It lays up to 20 eggs at a time, while the **desert tortoise**, found in small burrows in the deserts of North America, lays as few as four eggs.
There are more than 4,000 lizard species in the world, more than all other reptiles put together. Most of them hunt small animals, and most lay eggs, although some give birth to live young. The **emerald skink** (1) preys on insects. It spends most of its time on tree trunks, while the heavy-bodied **Gila monster** (2) stays on the ground. Found in North American deserts, the Gila monster is one of the few lizards with a poisonous bite. Fortunately, it is a slow mover, so attacks on people are very rare. The **Asian water monitor** (3) grows up to 2 m (6½ ft) long. A good swimmer, it hunts all sorts of animals, from fish and frogs to crabs. The **Madagascar day gecko** (4) is mostly found on trees and belongs to a family of lizards famous for their “sticky” toes. Like other geckos, it can cling to almost
any surface, and can even hunt upside down. When faced with danger, many lizards shed their tails. This distracts their enemies while they run away. The Australian frilled lizard has a different technique to protect itself. It stands its ground and opens up its frill, making it look much more threatening than it really is. The North African sandfish skink dives for safety, disappearing into the desert sand by “swimming” through it. The green basilisk from Central America has the most impressive escape trick of all. Standing on its back legs, it runs over the surface of lakes and streams, before swimming away from the predator. Found in the Galapagos Islands, the marine iguana is the only lizard that feeds in the sea. It uses its blunt jaws to tear seaweed from underwater rocks.
Geckos are widespread in warm parts of the world, where there are plenty of insects for them to hunt. One of the most popular reptile pets, the common leopard gecko from South Asia is easy to look after. This small gecko has an amazingly loud call for an animal just 20 cm (8 in) long. The slow worm, from Europe, has no legs at all while the common scaly foot, from Australia, looks like a snake with tiny leg flaps. Both these lizards hunt insects and spiders, finding their prey on the ground. The Central American green iguana is a much bigger reptile, with a spiky crest. Although it looks dangerous, it feeds mainly on plants and often climbs high up trees. Chameleons are even better climbers and hardly ever come to the ground. Parson’s chameleon from Madagascar
is the largest chameleon. It creeps along branches using its feet and its tail and catches insects by shooting out its unbelievably long, sticky tongue. Like other chameleons, its eyes swivel in all directions, and it can change colour to match its background or to show its mood. The tokay gecko gets its name from its harsh “to-kay” call. This large gecko from Southeast Asia lives in houses and often hunts indoors. African fat-tailed geckos live in deserts. Unlike other geckos, they do not have sticky toes, and rarely climb. Jackson’s chameleon lives in East Africa. The males of this species are identified by the three horns on their snouts. The red tegu is one of the biggest lizards in South America. A predator and a scavenger, it sometimes steals chickens from farms.
Like a creature out of a horror film, the Komodo dragon lurches over the ground in search of carrion and live prey. The world’s largest lizard, it has a poisonous bite, and can smell food more than 5 km (3 miles) away by flicking out its forked tongue. It can swallow small prey whole and knock down bigger animals with a swipe of its powerful tail, killing them with a bite to the throat.
Size ➢ Up to 3.1 m (10 ft) long  

Weight ➢ Males up to 90 kg (198 lb); females weigh about half as much.  

Habitat ➢ Tropical forest and scrub. Adults live on the ground, but young dragons are more agile and live in trees to stay safe.  

Distribution ➢ Indonesian islands of Komodo, Rinca, Padar, and western Flores.  

Diet ➢ All kinds of carrion and live prey, including wild pigs, water buffalo, snakes, and lizards.  

Lifespan ➢ About 30 years  

Top speed ➢ 20 kph (12 mph), but only in short bursts.  

Predators ➢ Adults have no natural enemies. Young dragons may be eaten by snakes, birds of prey, and even other dragons.  

Conservation status ➢ Komodo dragons are threatened by hunting and by forest and scrub clearance.
With their sleek, shiny bodies and needle-sharp fangs, snakes often trigger panic and fear. Most kinds are harmless to humans, but venomous ones kill more than 20,000 people a year. All snakes are legless, and nearly all eat live prey. Their amazingly flexible jaws and stomachs let them swallow animals much wider than themselves. The African Gaboon viper waits to ambush its prey with record-breaking fangs up to 5 cm (2 in) long. In a single bite, it can inject enough venom to kill a baboon or an antelope. The African mole viper catches small animals underground, while the extremely venomous desert death adder from Australia attracts food by using the thin, worm-like tip of its tail as a lure. The boa constrictor from Central America is non-venomous and kills by muscle power alone. Like other...
constrictors, it coils around its prey, tightening its grip while the victim slowly suffocates. Boas feed mainly on mammals and birds, but the Asian king cobra is an expert at eating other snakes. At 5 m (16 ft) long, it is the biggest venomous snake on Earth. The monocled cobra expands its neck into a “hood” when threatened, while the North American western diamond-backed rattlesnake makes a rattling sound with its tail to warn off enemies. The mighty green anaconda is one of the world’s longest and heaviest snakes, weighing more than 100 kg (220 lb). At the other extreme, the Eurasian blindsnake is often less than 30 cm (12 in) long. It feeds on ants, spiders, and centipedes. Most snakes are good swimmers. The yellow-lipped seakrait spends its life in tropical seas, coming to land only when it is time to breed.
Some snakes give birth to live young, but most breed by laying eggs. Female blood pythons from Southeast Asia coil around their eggs to keep them warm. The mother stays with her eggs for up to three months, and does not eat until her young have hatched. The green tree python from Australasia is a superb climber, but the Asian banded flying snake is even better at moving about in trees. It jumps from tree to tree, gliding up to 100 m (330 ft) by stretching out its body and flattening its underside. The Burmese python is one of the longest snakes in the world, measuring up to 7 m (23 ft) from head to tail. Like all pythons and rattlesnakes, it has heat sensors on its head, letting it “see” warm-blooded prey even when it is completely dark. The brightly patterned California mountain kingsnake...
mountain kingsnake looks venomous, but its colours are a trick and it is actually non-poisonous. Other snakes use different kinds of self-defence. The pine snake from North America squirts out horrible-smelling fluid when threatened, while the European grass snake turns upside down with its tongue hanging out and pretends to be dead. The South American false water cobra has a dangerous bite, and warns away enemies in the same way as a true cobra by widening its neck. In places with cold winters, snakes hide away and hibernate. Most hide on their own, but North American garter snakes gather together in hundreds in underground dens. They come to the surface in spring and squirm in tangled masses as they fight for the chance to mate.
AFRICAN BUSH VIPER  This small but deadly snake hunts mostly at night. Although it eats small animals, its venom can cause serious illness or even death in humans. However, this hasn’t stopped people from keeping it as a pet. This snake is sometimes called the variable viper because it exists in a variety of colours, including green, yellow, red, and orange, and because it may change colour as it matures.
Size: Males average 65 cm (26 in) in length; females average 71 cm (28 in). Habitat: Bushes and shrubs in tropical forests and other densely vegetated areas. Distribution: West and Central Africa. Diet: Small nocturnal mammals such as rodents and shrews, small birds, frogs, and reptiles. Breeding: Mating occurs in the rainy season. Females give birth to up to nine live young, abandoning them immediately afterwards. The young are venomous and able to hunt for themselves from birth. Lifespan: 10–20 years in the wild. Captive vipers may live longer. Predators: Adult African bush vipers have few if any predators. They may eat the young of their own species.
Lurking in rivers, lakes, and sheltered shores, crocodiles and alligators use stealth and muscle power to ambush and kill their prey. Even the smallest kinds, such as the African dwarf crocodile, have scales like armour plating, while the largest can smash open boats with their giant jaws. Crocodiles swallow small animals whole. They tear bigger ones apart, after pulling them underwater so they drown. The African Nile crocodile often lies in wait near the banks of rivers and water holes, where it attacks animals coming to drink. Females are devoted parents, guarding their eggs and carrying their young to water once they have hatched. Found in Australia and Southeast Asia, the saltwater crocodile is the biggest reptile in the world. Measuring up to 7 m (23 ft) long, it is...
a notorious man-eater, often attacking after dark. The American crocodile feeds mainly on fish, while the American alligator eats all kinds of animals, from frogs to deer. Like the rare Chinese alligator, it can be told from true crocodiles by the shape of its head, and by the way its teeth fit together when its mouth is closed. Caimans are relatives of alligators from Central and South America. The broad-snouted caiman lives in marshes and swamps, while the spectacled caiman lives on coasts, as well as in inland lakes and rivers. The critically endangered gharial is a unique fish-eating species from India, with extremely narrow jaws and dozens of sharply pointed teeth. It lives in deep rivers and finds its prey mainly by touch.
Birds

The masters of the air, birds can fly higher, further, and faster than any other creature. Their front limbs are adapted into wings, and their bodies are covered in feathers for warmth and for a streamlined shape. Their bones are partly hollow, making them light but strong and ideally suited for flying through the air.

Beak > Birds use their beaks as their main tool. This vulture’s beak is adapted for tearing flesh, but other birds use theirs as drills, saws, or even sieves.
Feathers › Different types of feather have different uses. Warm, fluffy down feathers keep the bird warm. Long, stiff feathers grow on the wings to direct the air in flight. Many species grow brightly coloured feathers to attract a mate.

Wings › All birds have wings, although not all of them can fly. The wings flap with great force to lift the bird off the ground. Once in the air, some birds simply hold their wings out to soar like a glider, while others can perform amazing aerobatics.
Standing more than 2.5 m (8 ft) tall and weighing up to 160 kg (350 lb), twice as much as a man, ostriches are the world’s biggest birds. Ostriches cannot fly but they are the fastest animals on two legs, with a cruising speed of 70 kph (45 mph). They live in Africa and feed on seeds and fruit, swallowing stones as big as golf balls to help them grind up their food. Emus, from Australia, are almost as big, with feathers that look like shaggy fur. They have tiny wings, and three toes on each foot, where ostriches have two. Thousands of emus sometimes gather together in flocks, crossing deserts and raiding farmland in search of food. The northern cassowary and southern cassowary are rainforest birds from Australia and New Guinea, with a helmet-like crest on their heads. They live on their own and
Birds > Ostriches and relatives

Ostriches and relatives can be dangerous if cornered, kicking out with their claws. Rheas come from South America. Males are hard-working parents, sitting on the eggs and taking care of the stripy chicks. Lesser rheas live in flocks of up to 30 birds. During the breeding season, males fight for attention of female partners. Kiwis come from New Zealand and are chicken-sized, flightless birds with long beaks. They live in forests and feed at night, sniffing out insects and worms. Some are very rare. The little spotted kiwi lives on offshore islands, safe from predators. Greater rheas live in flocks of up to 100. Males use impressive wing displays to attract potential mates. The ornate tinamou and elegant crested tinamou also come from South America. They can fly, but prefer to run away from danger instead.
Gamebirds are often good fliers, but the majority of them spend most of their lives on the ground. They peck at seeds and small animals, and scratch up food with their feet. Unlike most other birds, they don’t like washing in water, but they love taking a dust bath to keep their feathers clean. The red junglefowl from southern Asia looks and sounds just like a farmyard rooster, with its “cock-a-doodle-do” call. It is the distant grandparent of chickens, which are the most common birds on Earth. Found in North America, the wild turkey is another large gamebird that has been tamed. Gamebirds live in a variety of habitats. Some, such as the greater prairie chicken, live in open grassland, but others are found in forests, mountains, or wind-swept Arctic tundra. The satyr...
tragopan 1 lives in cool forests high in the Himalayan mountains. Most gamebirds roost, or sleep, in trees, but the bare-faced curassow 3 feeds above ground, too. Male gamebirds are often much more eye-catching than females. Male Lady Amherst’s pheasants 6 are stunningly coloured, and Siamese firebacks 7 have red faces and a feathery crest. Indian peacocks 8 have extraordinary plumes that open like a fan, attracting peahens. Most gamebirds nest on the ground, and some produce incredible numbers of eggs. One grey partridge 9 laid 25 eggs at one time, which is a world record for any bird. Females usually sit on the eggs to incubate them, but Australian malleefowl 10 bury their eggs inside a nest that looks like a huge compost heap. The heap warms the eggs until they hatch.
Pigeons and doves include many common birds, as well as others that are very rare. They have rounded bodies and short legs, and their heads often bob backwards and forwards when they walk. All of them are vegetarians, and many, including the mourning dove and woodpigeon, live near fields and farms, which provide a steady supply of food. Pigeons and doves are mostly brown or grey, but some tropical kinds are much more colourful. They include the African green pigeon, which clambers about in trees like a parrot, and the very rare pink pigeon from the island of Mauritius in the Indian Ocean. The pink pigeon almost became extinct in the 1990s, but was rescued by conservationists when just 10 birds were left in the wild. The pheasant pigeon from New Guinea...
has strong legs and feeds on the ground, while the **wompoo fruit dove** lives high up in rainforest trees. It swallows fruit whole and scatters the seeds in its droppings, helping trees to spread. Pigeons and doves are found in dry places, too. The crested **spinifex pigeon** lives in the rocky hills of central Australia and feeds on the seeds of desert grasses. The commonest of all, the **domestic pigeon** thrives in urban areas, where it dodges traffic, nests on buildings, and eats scraps of leftover food. The tiny **diamond dove** from Australia is often seen in pairs or small groups, feeding on the ground. It is only 20 cm (8 in) long. At the other extreme, the **southern crowned pigeon** from New Guinea weighs as much as a chicken. It is one of the biggest pigeons in the world, measuring up to 75 cm (30 in) long.
Parrots are some of the world’s brainiest, noisiest, and most colourful birds. Most of them live in tropical forests, although a few favour open habitats. They use their curved beaks to crack open nuts and seeds, and they vary greatly in size. The tiny Pacific parrotlet 1 is smaller than a sparrow, but the bigger ones, such as the blue-and-yellow macaw 2, can be nearly 1 m (3 ft) from head to tail. Big or small, all parrots have strong feet with fleshy toes. They use them for climbing about and for holding their food. The African grey parrot 3 and the budgerigar 4, from Australian grasslands, are amazingly good at mimicking human speech. One record-breaking budgerigar learned more than 1,700 words, while trained grey parrots can answer questions and even count. Found in New Zealand,
kakapos are the world’s rarest and heaviest parrots. They cannot fly, and come out only at night. These slow-moving birds are easily caught by predators, and only about 125 kakapos are left in the wild. Cockatoos are parrots with feathery crests. Found in Australia and New Guinea, the sulphur-crested cockatoo sometimes flies into city gardens and parks, while the cockatiel, like the budgerigar, lives in dry scrub and grassland. Most parrots nest in tree-holes, and many, including the galah, pair up for life. Male and female parrots often look the same, but eclectus parrots are so unalike that they were once thought to be different kinds of bird. The kea lives in the mountains of New Zealand. Unusually for a parrot, it eats almost anything, including live animals and carrion.
MILITARY MACAW  One of the largest and most dazzling members of the parrot family, the military macaw has spectacular plumage, with a bright green body, shimmering sky-blue wingtips, and scarlet patches on its head and tail. Its large beak is adapted for picking fruit and cracking open nuts. Highly intelligent and sociable, it is popular in zoos and is sometimes kept as a pet, although it can be noisy!
Size➤ Body length up to 75 cm (30 in)  Wingspan➤ Up to 1.1 m (3 ft 6 in)  Weight➤ Around 900 g (2 lb)  Habitat➤ Lowland tropical forests and semi-arid woodland. Lives in large flocks, nesting in treetops or on cliff faces.  Distribution➤ Central America and northern South America.  Diet➤ Fruit, vegetables, berries, nuts, and seeds. In the Amazon rainforest, they sometimes eat clay from river banks, possibly to remove toxins they have swallowed in their food.  Breeding➤ They perform complex courtship flights and mate for life.  Lifespan➤ Up to 60 years in the wild.  Predators➤ Large mammals, some reptiles, primates, and birds of prey.  Conservation status➤ Threatened by habitat loss and illegal trade in cage birds.
Raising a family is hard work for birds because they have to build a nest and look after their young. Many cuckoos skip these tasks by laying their eggs in other birds’ nests. The nests’ owners do not realize that they have been tricked, and raise the young cuckoos themselves. The common cuckoo is one of the best-known of these birds, with a loud “cuc-oo” call that gives it its name. It breeds in Europe and Asia and spends the winter in Africa, undertaking a yearly journey of up to 15,000 km (9,300 miles). The pheasant-cuckoo from Central and South America and the jacobin cuckoo from Africa and Asia also cheat when they breed, but the giant coua from Madagascar makes its own nest in trees. Cuckoos feed mainly on small animals such as spiders and caterpillars, but turacos live...
but turacos live mostly on fruit. Found only in Africa, they include the noisy **grey go-away bird** and the **great blue turaco**, which feeds high up in trees. Turacos have strong feet, and they run along branches like squirrels as they look for food. The **greater roadrunner**, from the USA and Mexico, is an extra-large cuckoo that spends much of its life on the ground. It is a great runner, as its name suggests, with a top speed of about 30 kph (18 mph). It sprints after lizards and snakes, battering them against rocks before swallowing them whole. The **green turaco** lays two eggs in a flimsy nest, and its young clamber out among branches before they learn to fly. The **hoatzin** from South America is a strange bird that feeds only on leaves. Its chicks are good climbers thanks to small claws on their wings.
When the sun sets, most birds settle down to sleep. Owls are the opposite, because this is when most of them start to hunt. Guided by their large eyes and super-sensitive ears, they noiselessly swoop on their prey. Owls come in many different sizes, and they live all over the world. The Ural owl (1) and the northern hawk-owl (2) are from northern Eurasian forests, while the black-and-white owl (3) lives in the jungles of Central and South America. The tiny elf owl (4) is a desert-dweller from the southern USA and Mexico. It weighs only 40 g (1 1/2 oz), which is much lighter than a mobile phone. The great grey owl (5) is nearly 50 times heavier. It has a flat, rounded face and staring yellow eyes. Its face channels sound towards its ears, letting it pinpoint small mammals on the ground.
or even under snow. The snowy owl lives in the high Arctic region, where its white plumage makes good winter camouflage. The sun never sets during the Arctic summer, so the owl has to hunt by day. The ghostly barn owl is one of the world’s most widespread birds, and lives on every continent except Antarctica. It can hunt in total darkness, flying with slow wingbeats just a few metres above ground.

Owls are silent when they hunt, but many have strange or spooky calls. When it is alarmed, the northern saw-whet owl makes a sound like a saw being sharpened, while the great horned owl has a deep and echoing hoot. The eastern screech owl is a short, stocky bird, with a large head and almost no neck. Despite its name, this owl doesn’t screech, instead it whistles and trills.
BARRED OWL

Named for its brown-and-white striped plumage, the barred owl is also known as the hoot owl for its distinctive, repeated call. Barred owls roost in trees during the day and hunt by night, seeking out animals such as rodents and rabbits. The feathers on their wings are specially shaped to allow them to fly almost silently so they can take their prey by surprise, swooping down to grab their victims with razor-sharp talons.
Size: Up to 51 cm (20 in) long. Wingspan: Up to 1.1 m (43 in). Weight: Males about 630 g (22 oz); females about 800 g (28 oz). Habitat: Forests, wooded swamps, and suburbs. Distribution: Originally found in the eastern USA, down to Texas in the south. Now also found in California, Oregon, southwestern Canada, and Mexico. Diet: Rodents, rabbits, birds, frogs, reptiles, and fish. Breeding: Females lay a clutch of one to five eggs. The chicks can fly at six weeks and mature at around two years. Lifespan: Up to 18 years in the wild. Predators: Great horned owls may occasionally take adult barred owls. Raccoons and weasels may eat eggs and young. Conservation status: Not threatened.
In different ways hummingbirds and swifts break all kinds of records as they speed through the air. Beating their wings up to 70 times a second, hummingbirds zip forwards, backwards, or hover on the spot like tiny helicopters. They include species such as the racket-tailed puffleg, with its eye-catching tail plumes, and the Andean hillstar, which lives high in the Andes at up to 5,000 m (16,400 ft). The calliope hummingbird spends the winter in Central America but migrates northwards as far north as Canada every spring, an amazing feat for such a little bird. Most hummingbirds have long beaks that work like drinking straws to suck sugary nectar from flowers. The sword-billed hummingbird is the only bird with a beak longer than its body. It feeds on large trumpet-shaped flowers, hovering.
underneath them to get at its food. The **stripe-breasted starthroat**’s folded wings are much longer than its tail. The tiny **bee hummingbird** from Cuba is the smallest bird in the world. Males are 5 cm (2 in) long and weigh less than a sugar cube. Hummingbirds are found only in the Americas, but swifts live all around the world. They feed on insects that they catch on the wing. The **alpine swift** and **white-throated swift** nest in rocky crevices. Like all swifts they have tiny feet that cling but cannot hop or perch. The **common swift** from Europe, Africa, and Asia is one of the world’s fastest birds. It spends most of its time on the wing, and even eats, drinks, and sleeps in flight. After leaving the nest, a young swift does not land until its second or third birthday, when it starts to breed.
Kingfishers often live near water, but most of their relatives are land-based. Many of them hunt small animals, and nearly all dig nest holes in riverbanks or in trees. The biggest of these birds are ground hornbills, which can weigh twice as much as a farmyard hen. At the other extreme, some kingfishers weigh just 10 g (1/3 oz), which is less than a CD. The blue-crowned motmot 1 from Central and South America swoops on insects and other animals from a favourite perch. The African red-billed hornbill 2 lives on the ground and in trees, while the northern ground hornbill 3 patrols Africa’s grasslands on its large scaly feet. Hornbills get their name from the helmet, or casque, that many have on top of their beaks. The Malabar pied hornbill 4 from South Asia has an...
extra-large casque, and its wings make a distinct whooshing sound as it flies. **European bee-eaters** are experts at catching bees while flying. After they have caught one, they wipe it against a perch to remove its sting. The **hoopoe** is a migratory bird that breeds in Europe and Asia. It uses its slender beak to probe in the ground for grubs and worms. **Common kingfishers** live along rivers and streams, where they dive for fish. The North American **belted kingfisher** is another waterside hunter. Like its relatives, it hits its catch against a perch before swallowing it head-first. The Australian **laughing kookaburra** is the world’s biggest kingfisher, with a noisy laughing call. It lives in woodland and swoops on anything that it can swallow, including insects, lizards, and snakes.
Toucans and woodpeckers look very different but they belong to the same group of birds. They live mainly in woods and forests, and usually nest in holes. All of them have specially shaped feet for clinging to tree trunks, but the most attention-grabbing feature of toucans is a giant multicoloured beak. The **red-breasted toucan** feeds mainly on fruit. Like many toucans, its beak is filled with air spaces, saving a lot of weight. The **spot-billed toucan** has a smaller beak but it feeds in typical toucan style. After picking a piece of fruit, it tosses it in the air and then swallows it whole. The **white-whiskered puffbird** and **white-eared puffbird** feed mainly on insects, and often nest in old termite mounds or in holes in the ground. Like toucans, **collared aracaris** and **chestnut-eared aracaris** live.
in the forests in Central and South America. They roam the treetops in small flocks and roost together in hollow trees. The toco toucan is one of the largest birds in the toucan family. Its colossal beak allows it to reach fruit growing on the tips of branches. It also eats small animals such as insects and frogs. Some woodpeckers, including the northern flicker, feed on the ground, but most cling to tree trunks and hammer into them with their beaks in search of insects to eat. The great spotted woodpecker from Europe and Asia eats wood-boring grubs, while the heart-spotted woodpecker from Southeast Asia probes for insects under bark. The North American pileated woodpecker is one of the largest of these wood-busting birds. Despite its impressive size, it feeds mainly on ants.
With their hooked beaks and piercing claws, birds of prey are natural killers. Most of them use their feet to grab food, and their hooked beaks to tear it apart. Some, such as the African bateleur, eat carrion as well as live prey. Vultures, on the other hand, are full-time scavengers, gulping down rotting remains. Birds of prey usually hunt alone, but the Harris’s hawk from North America is one of the few that work in teams. The golden eagle hunts over mountains and the Arctic tundra. With its huge wings and powerful legs, it can lift prey as heavy as itself. North American bald eagles often gather near water, where they catch live fish or eat dead ones that wash up on the shore. They build massive nests from sticks, and the biggest one on record weighed...
nearly 3 tonnes. Falcons and kestrels are much smaller birds, with slim bodies and slender wings. The Australian grey falcon dives down on other birds, while the common kestrel hovers in mid-air before dropping on voles, insects, and even worms. The peregrine falcon is the fastest animal on Earth. Hurtling towards the ground with its wings partly folded, it can hit speeds of more than 300 kph (186 mph), which is almost as fast as a Formula 1 racing car. Found all over the world, the osprey hunts fish, snatching them from the water's surface and then carrying them back to its perch. The African secretary bird has extra-long legs and hunts on the ground. An expert snake-eater, it uses its wings as shields and often stamps on its prey before swallowing it whole.
Many birds of prey won’t touch food unless it is alive. Caracaras are less picky, and don’t mind if their food is living or dead. The crested caracara feeds mainly on the ground, but it also behaves like an airborne raider, chasing other birds to make them drop their prey. Most vultures have weak claws and rarely hunt for themselves. Instead they work like a clean-up squad, tracking down and feeding on dead remains. American turkey-vultures often feed on animals killed on roads, although black vultures sometimes push them aside so they can get all the food for themselves. The Andean condor from South America is the largest vulture, and one of the world’s biggest flying birds. With its huge 3.2 m (10½ ft) wingspan, it soars over remote mountains and rocky shores, feeding on all kinds of animal casualties, including...
stranded whales. Kites are hunters and scavengers that patrol near the ground. The red kite often feeds on dead rabbits and birds, but the snail kite eats freshwater apple snails. Holding them down with one foot, it uses its slender beak to pull the snails out of their shells. Africa and Asia have many vultures of their own. The Rüppell’s vulture is almost bald on its head and neck, as feathers in this area would get clogged with blood when the bird feeds on animal carcasses. The Egyptian vulture uses stones to crack open ostrich eggs. The palm-nut vulture is partly vegetarian. It swallows oil-palm fruit, as well as insects, scorpions, and crabs. The African white-backed vulture uses its large wings to soar and circle in the air, looking for carrion. Like the Rüppell’s vulture, it jostles for food at big carcasses.
KING VULTURE

Found in Central and South America, the king vulture may have got its name from its habit of driving smaller birds away from its food. Like all vultures, this odd-looking, colourful scavenger feeds on carrion. It is one of the largest and most powerful scavenging birds, and its sharp beak and strong muscles can rip open the carcasses of dead animals that other, smaller birds cannot get into.
Size ➤ Body up to 80 cm (32 in) long. **Wingspan ➤** Up to 2 m (6½ ft) **Weight ➤** Up to 4.5 kg (10 lb) **Habitat ➤** Lowland tropical forests and nearby grasslands. **Distribution ➤** Tropical areas of Central and South America, from Mexico to Argentina. **Diet ➤** Dead animals **Breeding ➤** Females lay one creamy white egg, which takes up to 58 days to hatch. Both parents care for the young, feeding it with carrion which they store in a throat pouch called a crop. **Lifespan ➤** Unknown in the wild. More than 30 years in captivity. **Predators ➤** Snakes may take the eggs. Jaguars may eat sick or injured adults. **Conservation status ➤** Not currently in danger, but numbers are declining possibly due to habitat loss.
Ducks and their relatives are expert swimmers, which is why they are also known as waterfowl. Nearly all of them have webbed feet and waterproof feathers. Most live on lakes and rivers, but some ducks, including the king eider 1, breed on coasts and spend the winter at sea. Magpie-geese 2 lay up to 12 eggs a year. Despite having large families, they face lots of predators and only a few of the young survive. The North American wood duck 1 nests high up in tree-holes. Soon after the ducklings hatch, their mother leads them to water, and they have to jump all the way to the ground. The common shelduck 4 often breeds in rabbit burrows, but most other waterfowl nest in the open, near the water’s edge. Geese feed mainly on grass, but ducks and swans usually eat while afloat. Northern
Northern shoveler use their flat beaks to filter small animals from water, while red-breasted mergansers have saw-edged beaks for catching slippery fish. Mute swans tip up on end as they swim, using their long necks to reach for food buried in mud. When threatened, these swans curve their necks and half-raise their wings to scare off attackers. The bar-headed goose is a long-distance migrant, climbing to over 6,000 m (19,700 ft) as it crosses the Himalayas.

Mallards are the most widespread duck in the world. The domestic duck, a descendant of the mallard, has been farmed for thousands of years. Found only around wet habitats, the Australian black swan is a large, nomadic bird, which flies to lakes that fill up after rain.
On television, in films, and in real life, penguins have true star appeal, with their upright bodies and black-and-white plumage. Penguins cannot fly, but they are superb swimmers. They use their wings like flippers to speed after fish and other prey in some of the world’s coldest and stormiest seas. **Galápagos penguins** live in the Galápagos Islands right on the Equator. They are the only penguins to breed in tropical waters. All other penguins live in much colder waters in the Southern Hemisphere. **Adélie penguins** are among the few that breed in Antarctica, building nests out of stones among the rocks in spring. Another Antarctic species, the **Emperor penguin** is the biggest penguin, growing up to 1.2 m (4 ft) in height. It breeds on the ice, and males keep the eggs warm during the long polar winter by balancing...
them on their feet. The females, meanwhile, stay out at sea to feed, returning to land when the chicks hatch. The little penguin 4, at 40 cm (16 in), is the smallest of all penguins. It nests in burrows on the shores of New Zealand and Australia, coming ashore after dark. The African or jackass penguin 5 gets its name from its donkey-like call. It is a close relative of the Humboldt penguin 6 and Magellanic penguin 7, both of which nest in the far south of South America. The king penguin 8 looks like a smaller version of the emperor penguin. It nests on remote rocky islands in Antarctica, and incubates its eggs in the same way as the emperor penguin. The macaroni penguin 9 is one of several kinds of penguin with feathery crests. It comes to land to breed, but spends the rest of the year far out at sea.
These tall, stately birds are the largest of all penguin species. Emperor penguins live on pack ice and hunt in the freezing waters of the Antarctic Ocean, darting after fish with incredible agility. Their dense feathers and thick layer of fat protect them from the intense cold. On land, adults and chicks huddle together in large colonies, taking turns to enjoy the warmth at the centre of the group.
Size ➢ About 1.15 m (3 ¼ ft) tall  
Weight ➢ Up to 37 kg (81.5 lb)  
Habitat ➢ Coastal areas, islands, and pack ice  
Distribution ➢  
Antarctica  
Diet ➢ Fish, squid, crustaceans, and krill.  
Breeding ➢  
Emperor penguins breed once a year during winter. Females lay a single egg, then leave to find food. Males rest the eggs on their feet, covering them with a warm layer of skin called a brood pouch. The females return once the eggs have hatched. Both parents then care for the chick.  
Predators ➢ Adults may be eaten by killer whales, sharks, or leopard seals. The chicks may be taken by birds such as Antarctic skuas and giant petrels.  
Conservation status ➢ Scientists suspect this species will become threatened as sea ice melts due to climate change.
Storks, ibises, and herons

With their long beaks and even longer legs, storks and their relatives are built for hunting by stealth. Many of them stride through shallow water in search of food, but some species feed on land. The great egret 1 waits patiently for fish and frogs and then spears them with a sudden jab of its beak. The cattle egret 2 hunts in rough grassland, snapping up grasshoppers and other insects stirred up by animal hooves. Bitterns hunt by the water’s edge, with their necks hunched and ready to strike. The Eurasian bittern 3 is perfectly camouflaged to match dead reeds. If anyone comes nearby, it stands up straight and sways slowly from side to side, just like reeds blowing in the wind. Eurasian spoonbills 4 and American roseate spoonbills 5 catch their prey by wading through water and...
sweeping their flattened beaks from side to side. If they feel food with the tip of their beak, the “spoon” instantly snaps shut. African saddle-billed storks have a wingspan of up to 2.75 m (9 ft). Like other storks, they fly with their necks stretched out and their legs trailing behind. While storks and ibises usually hunt by day, night herons are active after dark.

The black-crowned night heron lives in wetlands all over the world, creeping along the water’s edge and ambushing its prey. Grey herons live year-round in western Europe, but European white storks migrate northwards every year from Africa and South Asia, soaring high on outstretched wings. The beautiful scarlet ibis lives in South America and the Caribbean. It gets its amazing scarlet colour from its diet of small crustaceans.
Pelicans and their relatives nearly all have webbed feet, and most swim or dive to catch their food. The shoebill ① is an odd-one-out. It lives in African swamps, where it scoops up frogs and fish in its enormous beak. The white-tailed tropicbird ② and red-billed tropicbird ③ are always on the move. They flutter above tropical oceans, splashing down with their wings partly folded and quickly taking off with their catch. The great cormorant ④ chases fish in rivers, lakes, and on coasts. It dives down beneath the surface, using its feet as propellers and steering with its wings. Like other cormorants, its feathers are not waterproof and when it has finished fishing it holds its wings out to dry. The flightless cormorant ⑤, from the Galapagos Islands, has stumpy wings and is the
only cormorant that cannot fly. The *anhinga* (4), or snakebird, swims with its body below the waterline, so that only its head and neck can be seen. Pelicans are famous for the huge pouches hanging below their beaks, which they use for catching fish. The *American white pelican* (3) fishes from the surface, but the *brown pelican* (8) cruises just above the waves and dive-bombs its prey. The *magnificent frigatebird* (9) soars over the ocean on amazingly long and slender wings. It feeds by snatching fish from the surface, or by chasing other birds so that they drop their catch. Boobies and gannets feed by diving into the sea at high speed to grab passing fish. The *northern gannet* (10) plummets from 30 m (98 ft) up. It folds back its wings as it slams through the water, disappearing with an impressive splash.
FLAMINGOS With their amazingly long necks and legs, and their brilliant pink colouring, flamingos are easy to recognize. These greater flamingos, one of six species in the family, live in huge flocks of up to 250,000 birds, which feed, nest, and breed together. They feed by wading through the shallows with their heads partly underwater. Their specially adapted beaks have a built-in sieve to filter out tiny pieces of food.
Size ➤ Up to 1.5 m (5 ft) tall
Wingspan ➤ 1.7 m (5½ ft)
Weight ➤ Up to 4 kg (8 ¾ lb)
Habitat ➤ Lagoons, salt lakes, and shallow, muddy coasts.
Distribution ➤ Central and South America, Caribbean, Africa, southwest Europe, and Asia.
Diet ➤ Shrimps, worms, microscopic algae, and small pieces of water plants. Their pink colour is a by-product of the flamingos’ diet.
Breeding ➤ Females lay a single egg in a nest that looks like a miniature volcano made out of mud.
Lifespan ➤ 30 years in the wild, longer in captivity.
Predators ➤ Adults have few natural enemies, but chicks may be eaten by hyenas, birds of prey, and marabou storks.
Conservation status ➤ Not threatened.
Cranes and rails look very different, but they belong to the same, very varied group of birds. All of them have long legs, and many of them have long, pointed beaks. Cranes live in the open, but rails have slender bodies so they can hide among waterside plants. The clapper rail likes mangrove swamps, while the king rail from North and Central America lives in marshes. Although these birds are timid, many of them have noisy calls. The common moorhen makes a loud “kurruk”, while the water rail grunts and squeals. The brolga is an Australian crane with a red band on its head. It spends its life on the move, travelling to places where it has recently rained. The common crane, from Europe, Asia, and Africa, is a long-distance migrant, travelling thousands of kilometres.
each year. Like other cranes, it is legendary for its courtship dances and its amazingly loud trumpeting call. The **great bustard** is a massive grassland bird from Europe and Asia. Males can weigh up to 21 kg (46 lb), making them some of the heaviest flying birds. **Grey crowned cranes** live in Africa. Unlike most cranes they can perch, and they spend the night roosting in trees. The beautiful **red-crowned crane** lives in Russia, China, and Japan. Standing up to 1.8 m (6 ft) tall, it is one of the largest cranes, and one of the rarest, with fewer than 3,000 left in the wild. The **American coot** is much more common, and can easily be seen in wetlands across North America. Coots are good swimmers, with paddle-shaped flaps on their toes. They can also be quarrelsome, often kicking and splashing when they fight.
Waders and their relatives live in marshes, on coasts, and in the open sea. Most of them lay their eggs on the ground, and some travel record distances to breed. The American black oystercatcher feeds on shrimps and worms, but is also an expert at smashing open shells of oysters and crabs. The Eurasian oystercatcher uses the same hunting technique to get at mussels and other prey. The pied avocet feeds by striding through shallow water and sweeping its upturned beak from side to side. The tip of its beak is amazingly sensitive, helping it catch insects, shrimps, and other small animals entirely by touch. Black-necked stilts wade through water on pencil-thin, bright-red legs. Relative to their bodies, their legs are gigantic, and they stick out behind when these birds
sit on their eggs. The **dunlin** ② and the **red knot** ④ breed in the Arctic tundra and then migrate south in enormous flocks. The red knot travels as far as the tip of South America and New Zealand, an epic round trip of 30,000 km (18,600 miles). The **wattled jacana** ⑦ from South America has giant toes for walking over lily pads in shallow lakes. The **American woodcock** ⑧ has 360-degree vision, thanks to eyes near the top of its head. During their courtship displays, male woodcocks fly at just 8 kph (5 mph), a slow-flying record for a bird, equivalent to a gentle jog. The male **ruff** ⑨ has bright courtship plumage, with a feathery collar around its neck. The **long-billed curlew** ⑩ is specially equipped to pull up worms, with a curved beak more than half its body length.
Gulls and auks are good swimmers, with waterproof feathers and webbed feet. Gulls often wander inland, but auks are true seabirds, using their wings to fly and to swim. The little auk \(\text{1} \) is the smallest auk, growing up to 19 cm (7 in) long. It has a black-and-white body and a short, stubby beak. It nests among boulders in the high Arctic and feeds in huge flocks that look like swarms of bees. The razorbill \(\text{2} \) breeds on rocky ledges, but the tufted puffin \(\text{3} \) and Atlantic puffin \(\text{4} \) nest in clifftop burrows. Puffins use their multicoloured beaks to catch sand eels and other fish. Holding them crosswise, they can carry up to a dozen at a time. Terns and noddies are relatives of gulls with long tails and pointed wings. The brown noddy \(\text{5} \) breeds on tropical islands, while the Arctic tern \(\text{6} \) migrates...
between the Arctic and the Southern Ocean. In its 30-year lifespan, it can travel up to 2.4 million km (1.5 million miles), six times the distance from Earth to the Moon. The **Caspian tern** stays close to coasts, and often breeds near lakes. Like most terns, it is a fiercely protective parent, dive-bombing anyone who comes close to its nest. Auks catch all their food at sea, but gulls often scavenge along the shore and inland.

**Ross’s gull** lives near the edge of the Arctic pack-ice and rarely strays further south. The **great black-backed gull** is the biggest gull at 78 cm (31 in) long, and has a fearsome appetite. It often preys on other seabirds, and it can swallow young rabbits in a single gulp. The **common gull** often follows tractors ploughing fields, swooping down to snap up worms.
Perhaps the ultimate sea birds, albatrosses spend most of their lives gliding over the oceans. They may fly hundreds of miles in a single day, and they are able to lock their enormous wings open so they can glide with little or no effort. Black-browed albatrosses, like the ones above, are the most common and widespread species, but even they are endangered by human activity.
Size 83–95 cm (33–37 in) tall  Wingspan Up to 2.4 m (8 ft)  Weight Up to 5 kg (11 lb)  Habitat They spend most of the year at sea but return to land to breed.

Distribution South Atlantic Ocean  Diet Crustaceans, fish, squid, and also dead penguins. They pick food from the ocean surface or dive for it, and sometimes follow trawlers for discarded fish.  Breeding Albatrosses mate for life. The female lays one egg, which both parents care for.  Lifespan Usually about 30 years, but may live as long as 70 years.  Predators Tiger sharks may take adults. Rats or skuas may take the eggs.  Conservation status Endangered, as they often die after becoming tangled in fishing lines.
There are thousands of kinds of perching birds, outnumbering all other birds put together. Most are small, with special feet that lock tight when they perch, keeping them in place. During the daytime most perching birds are constantly busy as they search for food, build their nests, and look after their young. The **scarlet-chested sunbird** from Africa feeds on sugary nectar from flowers using a curved beak. The **northern cardinal** lives in Canada, the USA, and Mexico. In the winter the male’s brilliant red plumage stands out against the snow. Blue manakins come from the rainforests of Brazil. Males attract females with elaborate dances but play no part in raising a family. The **white-throated dipper** from Europe and Asia is one of the few perching birds that can dive and swim. It
feeds underwater, collecting small animals in rivers and streams. The **blue-winged pitta** lives in Southeast Asia, where it eats insects on the forest floor. **Rufous horneros** from South America make football-shaped nests out of mud. Both parents help in the construction, which includes a slit-shaped entrance and a curved inner corridor. Male **Andean cock-of-the-rock** put all their energy into courtship, but the females raise the young. **Bare-throated bellbirds** from South America are some of the world’s loudest birds, with piercing metallic calls. Male **golden bowerbirds** attract partners by piling sticks around small trees. These bowers are up to 2 m (6 1/2 ft) high, decorated with fruit and flowers. The **red crossbill** has a cross-tipped beak for extracting seeds from pine cones.
Perching birds need lots of high-energy food because they are very active. African paradise flycatchers catch insects on the wing, while eastern paradise whydahs collect seeds and insects on the ground. During the breeding season male whydahs grow spectacular tail feathers that can be three times their body length. The black-capped chickadee from North America often visits bird feeders in the winter months. Like other chickadees it is a natural acrobat, hanging upside down from twigs as it searches for insects and spiders. The multicoloured Gouldian finch is a seed-eater from northern Australia. It is rare in the wild but is sometimes kept as a cage bird. The Eurasian golden oriole feeds mainly on fruit. Males have striking plumage but they are...
hard to see because they feed in treetops. The lesser bird-of-paradise lives in the forests of New Guinea. Males are much more colourful than females, and they show off their finery in remarkable courtship displays. The yellow-headed blackbird has a call that sounds like a creaky, rusty gate. It breeds in North America and forms enormous flocks in winter that often feed in fields. The eastern meadowlark is another North American bird, with a loud whistling call. It feeds on the ground, probing for insects with its sharply pointed beak. Brown-headed cowbirds lay their eggs in the nests of other birds. Asian red-billed blue magpies are nest raiders, stealing and eating other birds’ eggs and chicks. They belong to the crow family, which contains the world’s biggest perching birds.
Perching birds include some long-distance travellers as well as some that stay put throughout the year. The **European robin** is one of the stay-at-homes. It often lives in gardens where it feeds on insects and worms. The **barn swallow** catches insects in midair. It breeds in North America, Europe, and Asia but flies south when autumn arrives, a round trip of up to 20,000 km (12,400 miles).

**Winter wrens** live across the Northern Hemisphere. In cold weather they often roost together, and more than 60 winter wrens have been found in a single nest box. The **Bohemian waxwing** comes from the forests of North America, Europe, and northern Asia but sometimes migrates southwards in winter if insects and berries get hard to find. The **long-tailed tit** forms busy winter flocks that flutter.
through European woodlands in a single file. The thrush family is famous for its tuneful singers. They include the Eurasian blackbird, song thrush, and the North American western bluebird. Like most perching birds, the male western bluebird sings to attract females and also to warn other males to keep away. The northern mockingbird sings for hours at a time. It copies the songs of other birds, and even the ringtones of mobile phones. The house sparrow has followed humans all over the Earth and is now the world’s most widespread bird. It often nests under roofs and in holes in walls. House sparrows are a common sight inside supermarkets and warehouses, eating spilled food. The Eurasian skylark feeds on the ground but sings high up in the air.
This gruesome display is the larder of the red-backed shrike. A small but efficient hunter, this shrike is sometimes called the butcher bird because of its habit of sticking its prey on thorns. This dries out the bodies, so that they decay slowly and the bird can save them to eat later. The shrike eats larger animals such as lizards by pulling them off the thorns bit by bit.
Size  Up to 18 cm (7 in) long  Wingspan  26 cm (10 in)  Weight  30 g (1 oz)  Habitat  Heathlands and commons with thorny bushes in Europe, and dry scrublands in Africa.  Distribution  Continental Europe, western and central Asia. Winters in central-southern Africa.  Diet  Bees, beetles, and other large insects. Also small mammals, birds, and reptiles.  It may chase and catch insects in flight or swoop at prey on the ground.  Breeding  From late May to early July. Females lay up to six eggs.  Lifespan  Up to eight years.  Predators  None known.  Conservation status  Not threatened. However, the bird has almost disappeared from the UK due to habitat loss and possibly pesticide use.
Mammals

All mammals feed their young with milk produced in special glands in the mother’s skin. They are warm-blooded, generating heat inside their bodies, and often have fur to protect them from the cold. Most mammals have large brains relative to their body size and are capable of learning, remembering, and forming social relationships.

Fur › Warm-blooded creatures such as mammals need to insulate themselves from outside temperatures. Fur traps air next to their skin, helping them to stay warm.

Ears › Mammals have tiny bones inside their ear canals. Sound waves make these bones vibrate, passing signals to the brain. This system gives mammals exceptionally good hearing.
Mammals generally have larger heads and brains compared to their body size than other animals. They include the most intelligent creatures on the planet.

Features

- Almost all give birth to live young
- Feed their young on milk
- Mostly have hair or fur
- Are warm-blooded
- Include human beings

Teeth ➤ Mammals have a very varied diet. Some eat only plants, others eat meat, and many eat both. This tiger’s long, sharp fangs are perfect for killing and eating other animals.
Instead of growing inside their mothers, these animals, known as marsupials, develop inside a pouch. They are born very early and find the pouch by crawling through their mother’s fur. Some baby marsupials have their mother’s pouch to themselves, but young Virginia opossums share it with up to 12 siblings, and have to hang on tight to survive. They live in the USA, Mexico, and Central America, often straying into urban areas. Virginia opossums are good climbers and feed at night, sometimes raiding dustbins for leftover food. Marsupials also live in South America, but most of them come from Australia. The parma wallaby and red-necked wallaby have powerful back legs for jumping, but the honey possum has tiny paws and a slender wrap-around tail. Weighing just 14 g (½ oz), it is one of the
world's smallest marsupials, and feeds on sugary nectar from flowers. The sugar glider 5 eats insects, fruit, and sap. It can glide up to 50 m (164 ft) between trees, using the stretchy skin between its legs as a parachute. The red kangaroo 6 is the largest and fastest marsupial, with a top speed of 50 kph (30 mph). Young kangaroos, or joeys, stay in their pouch for up to six months before exploring the world outside. Doria's tree kangaroos 7 from New Guinea spend their lives off the ground. The heaviest tree-climbing marsupials, they feed on leaves, flowers, and fruit. Common ringtails 8 also eat leaves, but the grey four-eyed opossum 9 and bare-tailed woolly opossum 10 have a more varied diet, including earthworms, insects, and birds' eggs. Both live in the Americas and feed mainly at night.
Australia’s marsupials come in many different shapes and sizes. Some live in trees, but they also include burrowers that live and feed on the ground. The **southern hairy-nosed wombat** (1) digs a network of tunnels, coming out after dark to feed on grass. The burrows are handed on from one generation to the next and can be more than 50 years old. **Common wombats** (4) are bigger and more powerful.

Like other wombats, they have a backward-opening pouch. This stops earth from getting in when they are digging and protects their young from roots and twigs. The **numbat** (3) lives in forests and feeds on termites. It can eat 20,000 of these insects a day, lapping them up with its long, sticky tongue. The **greater bilby** (14) is one of Australia’s strangest-looking marsupials with rabbit-like ears, a pointed snout, and long,
silky fur. It lives in dry places, and digs burrows that spiral downwards like a corkscrew, making it harder for predators to get inside. The **Tasmanian devil** (15) is the world’s biggest meat-eating marsupial with a thick-set body, powerful jaws, and sharp teeth. It is mainly a scavenger, swallowing the skin and even bones of dead animals. Far more appealing and much better known, the **koala** (8) lives in gum trees and feeds on their leaves. It eats for about six hours a day and spends the rest of its time asleep. The **western quoll** (17) is active at night and hunts like a cat, while the **mountain brushtail possum** (10) lives in thick forests and sleeps in hollow trees. The **common spotted cuscus** (19) is another tree-dweller, with a tail adapted for grasping branches. The female carries her young on her back after they have left her pouch.
Armadillos are the only mammals to have a hard, protective shell. They have flexible bands to let their bodies bend and some kinds, including the three-banded armadillo 1, can roll themselves up into a ball. The pichi 2 has another way of keeping out of trouble. It wedges itself in its burrow, making it hard for predators to drag it out. Most armadillos live in Central and South America but the nine-banded armadillo 3 lives as far north as the USA. Its family life is very unusual because it always has identical quadruplets each time it breeds. Armadillos feed mainly on ants and termites, although they do eat other animals such as grubs and worms. The giant anteater 4 is one of the biggest insect-eating mammals, swallowing up to 30,000 ants a day. It rips open anthills or
termite mounds with its claws and licks up its food with its sticky 60 cm (2 ft) long tongue. Sloths are distant relatives of anteaters, but they hang from branches, and feed on leaves. The southern two-toed sloth never moves in a hurry, and the brown-throated sloth is one of the slowest mammals in the world. Its top speed in trees is about 0.3 kph (1/5 mph) and it eats, sleeps, and even gives birth upside down. The silky anteater from Central and tropical South America can climb just as well as a sloth. Large, curved front claws and a prehensile tail help it to live in trees, where it nests in holes. Pangolins are unmistakable animals with their covering of overlapping scales. The African ground pangolin and Indian pangolin are so well protected that they can even keep lions and tigers at bay.
When the sun sets, hedgehogs set off to find food. Armed with up to 5,000 sharp spines, they rummage through the undergrowth, rolling up into a spiky ball if they are threatened with attack. They eat small animals, fruit, and carrion. The desert hedgehog from Africa and the Middle East usually prefers insects and their larvae but can also tackle scorpions and venomous snakes. The North African hedgehog gives birth to about six babies, or “hoglets”, each time it breeds. At first their spines are soft but they harden within a day. The European hedgehog lives in lots of different habitats including farms and gardens. Despite its dumpy shape, it is a great climber, scrambling up fences and walls and dropping unharmed onto the other side. The pygmy shrew has a vicious bite. This tiny mammal...
is just 5 cm (2 in) long but can attack earthworms many times its size. The **North American least shrew** is almost as small and has venomous saliva that helps it to overpower its prey. The **Hispaniolan solenodon** looks like a giant shrew. It is only found on Hispaniola, an island in the Caribbean. The **moonrat** from Southeast Asia is related to hedgehogs and eats fruit as well as animal prey. The **European mole** lives underground and digs tunnels with its spade-like front paws. It feeds on earthworms, storing them in special “larders” and biting off their heads to stop them from getting away. The **star-nosed mole** from North America looks for food with 22 pink tentacles on its nose. A good swimmer, it is amazingly quick on the draw, taking just a quarter of a second to sense and grab its food.
AFRICAN ELEPHANTS

The largest land animals, African elephants are equipped with a long trunk, which they use not only for breathing, smelling, and trumpeting, but also to grip and move objects and to suck up water. Their huge ears allow heat to escape, keeping them cool. Elephants are known for their intelligence, and they form strong family relationships.
Size ➔ Males up to 4 m (13 ft) tall; females up to 2.6 m (8½ ft) tall. Weight ➔ Males up to 6 tonnes and females up to 3.2 tonnes. Habitat ➔ Savanna. Distribution ➔ Sub-Saharan Africa. Diet ➔ Leaves and bark from trees, and grass. They can eat up to 160 kg (350 lb) of food a day. Breeding ➔ Females (cows) give birth to one baby every two to four years. Elephant herds consist mainly of females, and other members may help the mother to care for the baby. Lifespan ➔ Around 60 years in the wild. Predators ➔ Adults have no predators. Calves may be killed by lions, leopards, hyenas, or crocodiles. Conservation status ➔ Vulnerable as they are hunted for their ivory tusks.
Rabbits and hares have many predators but their keen senses and long legs give them a head start in the race for safety. At the first sign of danger, most rabbits sprint into their burrows. Hares stay above ground, bounding away at up to 80 kph (50 mph). Rabbits and hares have big ears and large front teeth, and they feed entirely on plants. There are more than 50 breeds of rabbit, including the lop-eared rabbit, whose dangly ears can measure 70 cm (27 in) long. The Angora rabbit is valued for its long, soft hair, which is spun into yarn. These two breeds, and many others, are descendants of the European rabbit, which has been kept in captivity for hundreds of years. In the wild, European rabbits live in big burrow systems called warrens. They breed amazingly quickly, raising up to 40 babies, or “kits”, each year.
The American eastern cottontail looks very similar to the European rabbit but breeds above ground. Hares are usually bigger than rabbits and live on their own. The European hare stays brown all year round, but many other kinds, including the Arctic hare and mountain hare, turn white in winter for camouflage against the snow. Pikas are relatives of rabbits and hares, but are much smaller with shorter ears. The American pika lives in rocky burrows high up in mountains. To survive the winter, it collects plants and dries them like tiny piles of hay, to eat when other food is scarce. The antelope jackrabbit has the biggest ears of all wild hares. The snowshoe hare’s ears and paws are thickly furred, keeping it warm in the bitterly cold winters of Canada and Alaska.
Added together rodents easily outnumber all other mammals on Earth. They live almost everywhere on dry land and in fresh water too. Most rodents feed on plants. Their front teeth grow non-stop, enabling them to gnaw through their food and anything in their way. The grey squirrel is an expert climber with nimble front paws. Originally from North America, it has pushed out the Eurasian red squirrel in many parts of the British Isles. The red squirrel uses its long tail to balance itself while jumping from one tree to another. The North American southern flying squirrel glides between trees on folds of stretchy skin. It can travel almost 30 m (100 ft) in a single flight, landing right on target even in the dark. The marmot lives in mountain burrows and hibernates for up to nine months every year. The world's unique habitat for these small yet diverse animals is the subject of this page in the book "Mammals: Rodents."
The largest rodent is the capybara from the swamps of South America. It grows to the size of a small pig. To escape its enemies, it dives into water and can hold its breath for up to five minutes. The beaver is a good swimmer and is renowned for building dams. The biggest beaver dam on record, in Canada, is 850 m (1/2 mile) long and was first spotted by satellite. Many other rodents, such as the desert pocket mouse, get all their water from their food. Azara’s agouti from South America has small families with just two young, but Norway lemmings sometimes produce more than 50 babies a year. When their burrows get overcrowded, young lemmings pour across the Arctic tundra in search of food. The golden hamster from the Middle East is very rare in the wild but millions are kept as pets.
Rodents include some rare animals as well as common ones found all over the world. The domestic guinea pig 11 from South America was once raised for food but is now a popular pet, with many different breeds. The naked mole-rat 12 from east Africa lives in big families and spends its whole life tunnelling underground. It is one of the world’s weirdest-looking mammals with big front teeth, bare wrinkly skin, and tiny eyes. Chinchillas 13 have a luxurious fur coat that protects them from the cold. Found in the South American Andes, these rodents are hunted for their fur, and are now endangered in the wild. The mara 14 looks a lot like a hare. It lives in South America’s grasslands and is one of the fastest rodents, bounding along at 45 kph (28 mph). The brown rat 15 is a worldwide pest. Adaptable and intelligent,
it survives in all kinds of habitats, from remote islands to urban drains. An expert climber and a good swimmer, it eats almost anything, including seeds, eggs, leather, and even soap. The house mouse is another rodent that lives alongside people, although it keeps out of sight. It is found on every continent except Antarctica and has even been discovered aboard planes and deep down in mines. The mountain viscacha is a close relative of the chinchilla and lives high up in mountains. The South American coypu feeds in lakes and swamps. African dassie rats live in rocky hillsides. They have flat skulls and bendy ribs for squeezing into cracks. The African crested porcupine is the world’s best-armed rodent. When threatened, it charges backwards into its enemy, stabbing it with its sharp, hollow quills.
Bushbabies and their relatives belong to a group of mammals called primates, which includes monkeys, apes, and also humans. Most of these animals live in trees and all of them have forward-facing eyes, allowing them to judge distances in three dimensions. Bushbabies come from Africa, but lemurs are found in Madagascar and nowhere else in the world. There are many different kinds of lemurs and each has its own way of living. The white-footed sportive lemur feeds mainly on leaves, but Verreaux’s sifaka also eats fruit, flowers, and bark. Coquerel’s sifaka is an amazingly acrobatic climber, even with a baby on board. The Senegal bushbaby and moholi bushbaby come out after dark. They can leap 25 times their own body length as they spring from branch to branch. The
ring-tailed lemur climbs well, but spends much of its time on the ground. It is very sociable and always keeps together in groups. The black-and-white ruffed lemur is the largest lemur at 60 cm (24 in) long, but only weighs about 4 kg (9 lb), about the same as a pet cat. Lorises are plant- and insect-eaters from tropical forests in Asia. The slow loris creeps along branches once the sun has gone down. The Philippine tarsier is a pocket-sized primate with enormous staring eyes. Like other tarsiers, it leaps on to insects in the dark and crunches them up with its sharp teeth. The nocturnal aye-aye from Madagascar is the world’s strangest primate, with skinny hands and scraggy fur. It feeds on fruit, eggs, and insects, and uses its extra-long middle finger to tweak out insect larvae from wood.
Gibbons and apes include our closest relatives in the living world. Not only are they similar to people in appearance, but they are also highly intelligent animals. The hoolock gibbon lives in South and Southeast Asia, which is where all wild gibbons are found. Like other gibbons, it uses its hands like hooks to swing from branch to branch, speeding through the forest almost as fast as a man can run. The siamang is the biggest gibbon. It eats leaves and fruit, and starts the day with a loud dawn chorus that can be heard from far away. The skin on its throat is elastic and inflates to the size of a grapefruit, amplifying its amazingly loud calls. The lar gibbon is black or brown, but northern white-cheeked gibbons start life with creamy fur and turn darker as they grow up. Gorillas come from Africa, and spend most...
of their lives on the ground. The **western gorilla** 🧵 can weigh three times as much as an adult man, but the **eastern gorilla** 🧵 is even bigger, weighing a massive 220 kg (485 lb). Despite their size, gorillas are peaceful plant-eaters and rarely attack people unless their young are threatened. Also from Africa, the **chimpanzee** 🧵 is the primate most similar to us. It lives in large groups and eats all kinds of food, from termites to monkeys, which it ambushes in trees. The **Sumatran orang-utan** 🧵 and **Bornean orang-utan** 🧵 are two fruit-eaters from Southeast Asia. Like chimps, they are highly intelligent and are good at problem-solving and making simple tools. **Humans** 🧵 are the only living primates that walk upright on two legs. Today there are more than 7 billion of us, spread over every land habitat on Earth.
ORANG-UTANS  These apes are some of humans’ closest relatives. In fact, their name means “person of the forest” in Malay. These shy treetop dwellers are very intelligent animals. Long arms and flexible hands and feet help them to move around in trees, looking for fruit and other food. Young orang-utans stay with their mothers for up to seven years, learning the skills they need to survive as adults.
Size ➢ Males up to 1.5 m (5 ft); females up to 1.3 m (4 ¼ ft) tall.  
Weight ➢ Males 50–80 kg (110–176 lb); females 30–45 kg (66–99 lb).  
Habitat ➢ Rainforest. Orang-utans are solitary animals, but females and their offspring may be seen together.  
Distribution ➢ Tropical forest in Borneo and in northern Sumatra, Indonesia.  
Diet ➢ Mainly figs and other fruit, leaves, occasionally insects, honey, and birds’ eggs.  
Breeding ➢ Orang-utans start breeding in their teens. Females give birth once every eight years and infants stay with them for six to seven years.  
Lifespan ➢ Up to 50 years in the wild and 60 years in captivity.  
Predators ➢ Tigers.  
Conservation status ➢ Critically endangered due to habitat loss.
New World monkeys come from Central and South America. Many of them have flat noses and tails that wrap around branches like an extra hand. **Black-capped squirrel monkeys** live in large groups in the treetops, feeding on fruit and insects. They have more than two dozen separate calls, including special alarm sounds if they spot a predator such as an eagle or a snake. The **white-faced saki** has shaggy fur and feeds closer to the ground. The **red bald-headed uakari** looks as if its head has been shaved. Its red face is thought to attract potential mates. Most New World monkeys feed during the day, but the **northern night monkey** wakes up after dark and is most active on moonlit nights. The tiny **pygmy marmoset** is the world’s smallest monkey, weighing just five times as much...
as a mouse. Like other marmosets it scampers along branches, and has hands with sharp claws. It gnaws holes in the bark of trees and licks up the sap that oozes out. The southern muriqui, also known as the woolly spider monkey, is the largest New World monkey. The Venezuelan red howler is the noisiest land animal with a roar that can be heard up to 5 km (3 miles) away. Howlers live in trees and eat leaves. They call at dawn to claim their feeding territory high above the ground. The beautiful golden lion tamarin is one of the most endangered monkeys in the world. It was rescued from extinction in the 1980s when fewer than 100 were left. The grey woolly monkey stays high up in trees, but the white-headed capuchin sometimes feeds on the ground, and is good at walking on all fours.
Old World monkeys live in Africa and Asia, as far north as Japan. Most of them are tree-dwellers, although baboons spend much of their time on the ground. Unlike New World monkeys, they cannot grip with their tails but they include some amazingly good climbers as well as the fastest monkey on all fours. **L’Hoest’s monkey** 1 from Central Africa lives in mountain forests. It mainly eats fruit and leaves and has cheek pouches for storing food. The **rhesus macaque** 2 is found in South Asia, Thailand, and China. It lives in all kinds of habitats, from forests to the outskirts of towns. **De Brazza’s monkey** 3 from Africa has a long, white beard, while the **proboscis monkey** 4 from Borneo has a huge, fleshy nose. Proboscis monkeys live in mangrove swamps and are great swimmers and divers.
They leap from a height of 15 m (50 ft), hitting the water in a noisy belly-flop. The African patas monkey is a ground-dweller and a great runner, with a record-breaking top speed of 55 kph (34 mph). Baboons also come from Africa but they have big teeth and a much heavier build. The olive baboon forages in open grassland, while the hamadryas baboon lives in rocky places. If baboons are threatened, the biggest males face up to the enemy, giving the rest of the troop time to escape. The grivet eats insects and plant food. Its predators include the yellow baboon, which hunts smaller monkeys for food. The multicoloured mandrill from West Africa has a vivid blue and red face. It lives in giant troops called hordes, which can contain 800 animals, a record for any primate.
Lots of small mammals can glide, but bats are the only ones that can really fly, using muscle power to flap their wings. Their wings are made of skin stretched between amazingly slender finger bones, which can be as thin as a human hair. Small bats usually feed on flying insects but most big ones eat fruit, which they find using keen eyesight and a superb sense of smell. **Lyle’s flying fox** is a fruit-eater from the forests of Southeast Asia. Named after its fox-like face, it spends the daytime roosting upside down in trees, using its large clawed thumbs to move along branches. **Geoffroy’s tailless bat** comes from Central and South America and feeds on sugary nectar with its brush-tipped tongue, but **Kitti’s hog-nosed bat** from Thailand and Myanmar hunts insects, snatching them out.
of the air or picking them off plants. It is the world’s tiniest mammal with large ears but a body as small as a bumblebee’s. The **Egyptian rousette** eats fruit, but the legendary **vampire bat** from Central and South America drinks blood from mammals and birds. Silent and stealthy, it scuttles up to its victims on all fours, slicing through their skin with its sharp teeth and lapping up a meal of blood. The **large flying fox** is one of the world’s biggest bats, with a wingspan of 1.5 m (5 ft). Like the **spectacled flying fox** from Australia and New Guinea, it sets off to feed at sunset, flying up to 50 km (31 miles) in search of food. Wahlberg’s **epauletted fruit bat** is a fruit-eater from Africa, but the **lesser horseshoe bat** is an insect-eater, with a small body and surprisingly big wings.
Most of the world’s micro-bats feed on flying insects, which they catch after dark. They have small eyes and find their prey by echolocation, using bursts of high-frequency sound to form an “image” of their surroundings. The common noctule from Europe and Asia catches most of its food in the air. It also snatches insects off leaves and swoops on them on the ground. The European grey long-eared bat has enormous ears that are almost as long as its body. During the winter when it hibernates, it carefully tucks them away under its wings. Natterer’s bat from Europe hibernates in caves and mines. During its long winter sleep, its body temperature can drop to just 2°C (35°F) and it may breathe just once an hour. The broad-eared free-tailed bat lives in Central and South America where it is warm all year round.
year round. It roosts in small groups, but some of its relatives sleep and breed in huge colonies, numbering a million bats or more. **Daubenton’s bat** scoops up insects from the surface of lakes and ponds, hunting mainly at dawn and dusk. The **European free-tailed bat** spends the whole night on the wing. Like other free-tailed bats, it has a distinctive mouse-like tail. The **common pipistrelle** is the smallest bat in Europe. It often roosts in old buildings and hunts around streetlamps, catching insects that are attracted by the light. The **ghost bat** is the biggest predatory species in Australia. As well as catching insects, it eats frogs, lizards, birds, and even other bats. **Spix’s disc-winged bat** lives in Central and South American forests. It has suction cups on its wrists and ankles for roosting underneath leaves.
HONDURAN WHITE BATS These tiny Central American bats have fluffy white fur, making them look like puffs of cotton wool. They also have eye-catching, golden-yellow ears, black wings, and a snout with a pointed top. They are often found huddled in a colony of four to eight bats roosting under a *Heliconia* leaf, which they adapt to make a tent for themselves.
Size 3.5–4.5 cm (1 1/2–1 3/4 in)  
Weight About 6 g (1/5 oz)  
Habitat Tropical rainforest. The bats chew through the veins of Heliconia leaves, so that the two sides of the leaf hang down to form a tent. They roost inside this tent, which protects them from sun, rain, and predators.  
Distribution Lowlands of Central America.  
Diet Fruit  
Breeding Females produce one baby in the rainy season. Males and females roost together until the young are born, then the males leave. The young suckle for 20–21 days.  
Predators Snakes and small mammals such as opossums.  
Conservation status Numbers have declined sharply in recent years due to destruction of their habitat.
Dogs and foxes are expert hunters, although most of them also eat plants and carrion. Dogs originally developed from wolves, which people gradually learned to tame. There are now hundreds of different breeds of dog, from the tiny chihuahua, the smallest of domestic dog breeds, to the hardy husky, which is used for pulling sledges. Huskies can work in temperatures as low as -50°C (-58°F).

They are the only mammals, apart from humans, that have walked to both the North and South Pole. African wild dogs live in highly organized packs, rearing young co-operatively and hunting together to kill animals much bigger than themselves. Each wild dog has its own coat pattern, which is as unique as a fingerprint. Coyotes come from North and Central America. They hunt alone, in pairs, or in packs, and
Dingoes were introduced into Australia from Asia by humans about 4,000 years ago. They hunt small animals on their own but band together to attack kangaroos. Arctic foxes are specially suited to life in the far north. In winter their coat turns pure white, and they can hunt on drifting ice hundreds of kilometres out at sea. The red fox is one of the world’s most widespread predators, occurring throughout the Northern Hemisphere. It often lives in cities, where it scavenges leftover food from bins and rubbish dumps. The North African fennec fox is smaller than a cat. It pounces on rodents and insects, pinpointing them with its giant ears. The grey wolf is the biggest member of the dog family. It lives in packs and communicates with an eerie howl that can be heard from far away.
Legendary for their size and strength, bears are some of the world’s biggest land mammals, with stocky bodies and flat paws. Most of them stay well away from people but some can be highly dangerous, particularly when they are hungry or protecting their cubs. The **Asiatic black bear** lives in forests from India to Japan. It spends more than half its life in trees and feeds on fruit, nuts, and small animals. The **American black bear** is slightly bigger but also good at climbing. Like all bears, it has a superb sense of smell, and sometimes breaks into cars or campsites to get at stored food. The **brown bear** is the most widespread, with several forms found in different parts of the world. Most famous is the **grizzly bear**, which lives in western North America. Standing up to 3 m (10 ft) tall on
its back legs, it is strong enough to drag away a moose or a horse. It eats almost anything that it can catch or collect, including deer, fish, berries, and even moths. The Kodiak brown bear is from Alaska is even bigger, but the polar bear is the largest of all. It is the only bear that actively hunts people, although seals are its usual prey. The sun bear and sloth bear live in southern Asia. The sun bear’s tongue can protrude up to 25 cm (10 in) to extract food such as honey and grubs from holes and crevices. The spectacled bear comes from forests high up in the South American Andes. It feeds on fruit, plant shoots, and meat. The giant panda lives in central China, where it feeds entirely on bamboo. Like all bears, it has tiny cubs. They weigh only about 120 g (4 oz) when they are newly born.
POLAR BEAR  This powerful Arctic predator is the largest land-based meat-eater. Instantly recognizable by its thick white fur, the polar bear is a strong swimmer and a lethally effective hunter. Its usual prey is seals, which it ambushes as they surface through holes in the ice to breathe. The polar bear is often curious about people and can be dangerous if it comes too close to human settlements.
Size ➤ Males up to 3 m (10 ft); females up to 2.2 m (7 ft) tall, standing on their hind legs. Weight ➤ Males weigh 300–800 kg (660–1,760 lb); females about 150–300 kg (330–660 lb).
Habitat ➤ Arctic tundra and sea ice. Spends a lot of its time hunting on sea ice. Distribution ➤ Arctic Circle; Canada and northern Alaska; Greenland; northern Scandinavia, Russia, and Siberia. Diet ➤ Seals, narwhals, walruses, and seabirds. They may go without food for months, living off their body fat. Breeding ➤ They mate from March to May. Cubs are born from November to January. Lifespan ➤ Up to 30 years. Predators ➤ None. Conservation status ➤ Vulnerable. Melting of ice due to climate change is reducing their habitat.
Seals are awkward on land but fast and graceful in the sea. All of them have streamlined bodies, and flippers instead of legs. The smallest seals are just over 1 m (3 ft) long but the biggest measure more than 4 m (13 ft) around their blubbery waists and weigh more than 3 tonnes. The Antarctic fur seal 1 breeds on islands in the Southern Ocean, while the brown fur seal 2 lives along the coasts of Australia and South Africa. The California sea lion 3 is an expert at catching fish, and is a star performer at wildlife parks and zoos. At full speed it can swim at 40 kph (25 mph). Walruses 4 have huge wrinkly bodies, bristly moustaches, and white tusks up to 1 m (3 ft) long. They live in the Arctic and feed on clams and other seabed animals, sucking them out of their shells. Steller’s sea lion 5 from the North...
Pacific is the biggest of its kind. Like all sea lions and fur seals it can walk on its flippers, while other seals crawl on their stomachs when they come ashore. The southern elephant seal is the largest seal and a record-breaking diver. It can plunge more than 2 km (1 1/4 miles) deep to catch fish and squid, holding its breath for an hour and a half. Weddell seals live around Antarctica. These expert divers specialize in long, deep dives under Antarctic ice shelves. In the winter season, they gnaw holes in the sea ice so that they can come to the surface to breathe. Grey seals are fish-eaters from the North Atlantic, but the Antarctic leopard seal is a ferocious killer of warm-blooded animals, including penguins and other seals. Unusually for a true seal, it uses its front flippers to swim and steer.
Sleek, stealthy, and patient, cats are natural killers. Apart from lions, most of them hunt on their own, using their claws and teeth to catch their prey. They include the fastest animals on four legs as well as some of the world’s laziest predators, which snooze up to 20 hours each day. Geoffroy’s cat is from South America is a typical small cat. It hunts at night, catching mammals, birds, and fish. The black leopard is a variety of the regular leopard, with unusually dark fur. The clouded leopard gets its name from its cloud-shaped markings. It comes from the forests of South and Southeast Asia, and often hunts in treetops. The snow leopard lives in the mountains of Central Asia, where its thick coat and wrap-around tail protect it from the cold. Ocelots are forest cats from Central and
South America. Night hunters, they prey on rodents but can climb trees to stalk monkeys and birds. **Leopards** live in Africa and Asia. To safeguard their food from scavengers, they sometimes haul prey high into trees. The **jaguar** is the biggest cat in the Americas. It is a good swimmer and often feeds on turtles, crushing their shells with its powerful bite. The **lion** is the only wild cat that lives in groups, known as prides. Although males are bigger than females, or lionesses, the females do most of the hunting and take sole charge of raising the young. The **rusty-spotted cat** from India and Sri Lanka is the smallest wild cat, while **tigers** are the biggest and the most dangerous. Tigers are found from Asia’s tropical rainforests to eastern Siberia, but fewer than 5,000 are left in the wild.
Most cats hunt after dark, creeping up on their prey and pouncing. The cheetah 1 is different because it hunts by day, relying on speed to make a kill. This lean African cat is the world’s fastest sprinter. It speeds after antelope at up to 100 kph (62 mph), tripping up its victims with a swipe of its front paws. Domestic or pet cats are found all over the world, and have lived alongside people for about 10,000 years. There are many different breeds, including the fluffy Persian cat 1, with its long hair and short muzzle, and the elegant Siamese 3. The Cornish Rex 4 has ultra-soft fur, while the Manx cat 5 does not have a tail. Most pet cats are good hunters and they sometimes go back to living in the wild. Both domestic and wild cats are renowned for their agility. The caracal 6 is a long-legged
A stunning acrobat, it leaps up to 3.1 m (10 ft) off the ground to knock birds out of the air. The European wild cat feeds mainly on rodents, but it also attacks ground-nesting birds, swallowing everything including their feathers and bones. Lynxes and bobcats have stubby tails and tufted ears. The Canadian lynx is found mostly across Alaska, Canada, and in a few areas of the northern USA. Its main prey is the snowshoe hare, while the North American bobcat stalks and pounces on all kinds of animals, from insects to young deer. The puma, also known as the cougar or mountain lion, is one of the most widespread cats in the world, found all the way from western Canada to the tip of South America. It is normally shy but it sometimes attacks humans and can kill.
Perhaps the most famous of all wild animals, lions are instantly recognizable by their size, brownish-orange coat, and the male’s bushy mane. They are renowned for their strength and ferocity. These African lion cubs are practising hunting skills, play-fighting with each other and their mother. These games may look like fun, but they teach the cubs how to stalk, ambush, and kill prey. These will be essential skills when they reach adulthood.
Size ➢ Males up to 2.5 m (8 ft 2 in) long; females up to 1.7 m (5½ ft) long. Weight ➢ Males weigh 190 kg (418 lb), females 126 kg (278 lb) Habitat ➢ Hot, dry grassland, scrubland, and occasionally forests. Lions live in groups called prides. Males defend the pride’s territory, which can be up to 260 km² (100 sq miles). Distribution ➢ Asian lions live in the Gir Forest in western India. African lions are found in sub-Saharan Africa. Diet ➢ Antelope, zebra, and wildebeest, hunted by the females. Predators ➢ None, but may be killed by rival males, hyenas, and humans. Breeding ➢ Lions breed all year round. Females give birth to up to six cubs per litter. Conservation status ➢ Lions are in danger due to hunting and habitat loss.
Otters and their relatives include many expert hunters as well as the smelliest mammals on Earth. They have slender bodies and short legs, with small ears and thick fur. Most of these animals catch their food on land or in fresh water. The **sea otter** is the only one that lives offshore. It feeds on shellfish, breaking them open with a stone using its stomach as a worktop. The rare **giant otter** from South America’s rivers is longer but lighter and has a paddle-shaped tail. North American **striped skunks** have an overpowering method of self-defence. If anything or anyone comes too close, they squirt a foul-smelling liquid from glands beneath their tails. The liquid smells like a mixture of burning rubber and rotting eggs and takes days to fade away. **Wolverines** live in northern parts of Canada, USA,
Europe, and Asia. Up to 1 m (3 ft 5 in) long, they are the world’s strongest mammals for their size, capable of killing a reindeer or a moose. In North America the raccoon 5 is a common nocturnal visitor to gardens and backyards. Intelligent and curious, it often raids dustbins for leftover food, and catches fish and frogs in ponds. The least weasel 6 is the smallest meat-eating mammal. As thin as a finger, it hunts mice in their burrows underground. Kinkajous 7 from South America feed mainly on fruit, while the honey badger 8 from Africa breaks into bees’ nests. It has very thick fur, which protects it from angry bees’ stings. The Eurasian badger 9 eats plants and animals, and lives in burrow systems called setts. Some setts contain more than 300 m (984 ft) of tunnels, and can be 100 years old.
Mammals ➜ Mongooses, civets, and genets

Mongooses, civets, and genets

Mongooses are famous for fighting snakes, although they eat lots of other animals, including insects, lizards, birds, frogs, and even scorpions. Alert and watchful, their quick movements protect them from getting bitten or stung by their prey. They often live in groups and are generally active during the day. The African banded mongoose makes its home in old termite mounds, while meerkats use their long front claws to burrow underground. The Egyptian mongoose hunts in thick undergrowth and sometimes catches fish and crabs at the edge of streams and ponds. The Indian grey mongoose often lives near towns and villages where it helps out by killing rats, snakes, and scorpions for food. Civets and genets are different to mongooses in that they usually feed at night.
and live on their own. The **Asian palm civet** eats fruit and flowers as well as small animals, and stays mainly in trees. The **binturong** from Southeast Asia has shaggy black fur, tufted ears, and a prehensile tail. **Masked palm civets** live in forests in Southeast Asia and China. Like other civets they can squirt attackers with a powerful-smelling fluid, produced by glands at the base of their tails.

The **small-spotted genet** looks like an extra-long cat with a slender tail. Found in southern Europe and Africa, it is an expert climber and often catches birds roosting in trees. In some areas it raids farms and is considered a pest. The **banded linsang** from Southeast Asia has a beautifully striped and spotted coat. It nests in trees and spends most of its life off the ground.
MEERKATS These cheeky, sociable animals are related to mongooses. Meerkats live in groups called mobs. They dig burrows to protect them from the hot African sun and from predators. Mobs feed and hunt together, with some meerkats acting as lookouts, standing on their hind legs to watch for danger. If a predator approaches, the lookout gives a warning cry and the whole mob dives for cover.
Size ➢ Up to 60 cm (24 in) long. Males are slightly larger than females. Weight ➢ Up to 1 kg (35 oz) Habitat ➢ Open plains, dry, hot grasslands, and savanna. Distribution ➢ Southern and southwestern Africa. Diet ➢ Insects, birds and birds’ eggs, lizards, rodents, and fruit. Lifespan ➢ 5–15 years in the wild. Breeding ➢ Meerkats breed all year round, but more so in warmer months between August and March. Usually only the dominant female breeds. She may have up to four litters a year, with two to four young per litter. Males and siblings help raise the young, teaching them hunting and survival skills. Predators ➢ Hawks, eagles, and jackals. Conservation status ➢ Not currently in danger.
Rhinos and tapirs

After elephants, rhinos are the world’s largest land animals, with barrel-shaped bodies and thick, folded skin. They have few natural enemies but most rhinos are threatened by illegal hunting for their horns. The African black rhino weighs up to 1.5 tonnes. Notorious for its poor eyesight and bad temper, it feeds on leaves and twigs using its flexible upper lip, and does not like being disturbed. They eat twigs and leaves, which they grasp with their flexible upper lips. The Javan rhino and Sumatran rhino are found in the forests of Indonesia. Javan rhinos have a single horn, and are some of the rarest mammals in the world, with fewer than 50 left in the wild. Sumatran rhinos are also critically endangered. They have two horns and are born with a wiry coat of brown fur. Smallest of all rhinos, they can still grow to a height of 1.5 m (5 ft). The
Indian rhino 1 is the biggest Asian species, with a single horn and armour-plated skin. It lives in tall grasslands, and almost became extinct in the early 1900s, when fewer than 200 were left. About 3,000 live in India today, protected by armed guards. Tapirs are distant relatives of rhinos, with long noses like miniature trunks. They eat fruit and leaves and find their food mainly by smell. The mountain tapir 3, Baird's tapir 5, and South American tapir 7 come from Central and South America. The largest of all, the Malayan tapir 8 is the only Asian species, and the only one that is black and white when fully grown. The African white rhino 9 is the giant of its family. It has two horns and can weigh almost 3 tonnes. Despite its colossal size, it is astonishingly quick and agile, galloping at nearly 50 kph (31 mph).
The horse family contains some of the fastest and best-known mammals in the world. They live in herds and have very good eyesight and hearing. At the first sign of danger they quickly gallop away. Zebras are wild animals and so are most asses, but donkeys and horses were tamed thousands of years ago. The plains zebra 1 is the biggest wild member of the horse family, with narrow stripes and a white underside. It lives in East Africa, and is in danger of dying out, with fewer than 5,000 alive in the wild. Grant’s zebra 2 also comes from East Africa. It is the smallest zebra, growing up to 1.4 m (4½ ft), and has thick stripes and a black upright mane. The Somali wild ass 3 lives in the rocky deserts of northeast Africa. It is the ancestor of the donkey 4, a sure-footed animal used by humans to...
carry burdens in many parts of the world. The Persian onager 5 is a wild ass from Asia and is now found only in Iran. Przewalski’s horse 6 from Mongolia is the last true wild horse in the world. It almost died out in the 20th century, but is slowly recovering thanks to the work of conservationists. The mule 7 is a hybrid, or mixture, between a male donkey and a female horse. However, there are also more than 1,000 pure horse and pony breeds. The Shire horse 8, bred in Britain, is one of the biggest and the best at pulling loads. The heaviest Shire horse on record, born in 1848, weighed more than 1.5 tonnes. Today, Shire horses are quite rare, but some are still used in forestry. Arab horses 9 are the fastest breed, and are used in horse racing. The most valuable can fetch a price of more than $10 million.
They may look like peaceful creatures, but zebras can be vicious when it comes to defending themselves or their territory. Males sometimes fight for a chance to breed with females, kicking out and biting at each other. Even predators such as lions and cheetahs have to be careful around zebra herds, as they can be injured or even killed in battles with large males.
Size ▶ Up to 1.4 m (4 1/2 ft) tall  

Weight ▶ Males weigh around 360 kg (794 lb); females around 320 kg (705 lb)

Habitat ▶ Grasslands and open savannas. They usually keep close to water holes. In the dry season, they move in huge herds to find food and water. 

Distribution ▶ Southern Africa  

Diet ▶ Grass, occasionally shrubs.  

Breeding ▶ Plains zebras breed all year round. Foals are often born in the rainy season, and can walk within an hour of being born.

Lifespan ▶ 15–20 years in the wild.  

Predators ▶ Lions, cheetahs, leopards, and hyenas. Zebras may team up with each other or even with other species such as wildebeest, for protection against predators.
Cows, antelope, and sheep

Cattle and their relatives all have hooves, and special stomachs for digesting leaves and grass. Some of them live on their own, but most keep together in herds. The **gaur** 1 is the largest kind of wild cattle, weighing up to 20 times as much as an adult man. It comes from the forests of tropical Asia and has few natural enemies apart from tigers and crocodiles. Domesticated cattle such as the **Texan longhorn** 2 can be almost as big. This breed has some of the world’s biggest horns, measuring an incredible 3 m (10 ft) from tip to tip. The **yak** 3 comes from the mountain pastures of Central Asia, while the **American bison** 4, or buffalo, is a grassland animal from the Great Plains in Canada and the USA. At one time there were more than 50 million of these massive grazers, but after years of hunting only about 500,000
Mammals ▶ Cows, antelope, and sheep

Feet have two main hooves

Greater kudu

Common eland

Addax

Gemsbok

Nilgai

Common waterbuck

Sable antelope

Zebra duiker

Klipspringer

African buffalo

Wildebeest

Hartebeest

Andx

Bohor reedbuck

Sitatunga

Horns have knobly rings

Stripes provide camouflage

African common eland is one of the biggest kinds. It is a gentle animal and is sometimes farmed. Gemsboks live in the deserts of southern Africa. Like most antelope, both males and females have horns. The common waterbuck lives in grassland and woods but runs into lakes and swamps when threatened. The African buffalo is one of the biggest and most dangerous grassland animals. Adult males can even kill lions and demolish cars. Wildebeest are some of the commonest African antelope, migrating in huge herds that follow the yearly rains. Each migration involves up to 1.5 million wildebeest and thousands of other animals including zebras. The klipspringer lives on rocky outcrops in eastern and southern Africa. Its rubbery hooves give it a good grip.
There are more antelope in Africa than anywhere else in the world. Thomson’s gazelle lives in East Africa’s grasslands, where it often mixes with herds of zebras and wildebeest. It keeps a constant lookout for predators, sleeping in five-minute bursts for just an hour every day. The springbok from southern Africa can leap more than six times its own length. Males lock horns during the breeding season, when they fight for the right to mate. Günther’s dik dik is a miniature antelope that lives in shrubby places, while the gerenuk stands on its back legs to feed in shrubs and trees, helped by its long, slender neck. The blackbuck lives in India and Nepal. Females are mainly brown, but males are black and white with spirally-twisted horns. The muskox is named after the strong
smell emitted by males during the breeding season. It looks like a buffalo, but is actually a relative of wild goats and sheep. It lives in the high Arctic and has a thick, shaggy coat to protect it from the intense winter cold. The North American mountain goat is a fearless and agile climber. It can leap along narrow ledges just a few hours after being born. The Alpine ibex is just as sure-footed. It lives high above the treeline in the European Alps, and is famous for its horns, which can be up to 1 m (3 ft) long. The mouflon from Europe and Asia is the wild ancestor of sheep that live on farms. Male bighorn sheep from North America use their horns to fight with their rivals. They crash head-on with enormous force and their fights can last several hours until one of the contestants walks away.
HIPPOPOTAMUSES

Hippopotamus means “river horse”, and these animals love water. They spend the day submerged to stay cool and keep their skin moist, coming ashore to graze at night. Hippos can close their nostrils to hold their breath, and sometimes even fall asleep underwater, coming up to breathe without waking up. With their long tusks, hippos can be dangerous, especially if their young are threatened.
Size ➢ Up to 1.7 m (5½ ft) tall  

Weight ➢ Males up to 4.5 tonnes; females up to 1.5 tonnes

Habitat ➢ Shallow lakes, rivers, swamps, and grassland around these areas.

Distribution ➢ Sub-Saharan, Eastern, and Central Africa.

Diet ➢ Grass, reeds, and small shoots of plants.

Breeding ➢ Hippos breed about once every two years and have just one calf each time. The calves suckle for nearly a year and can do so even underwater.

Lifespan ➢ About 50 years.

Predators ➢ Adults have no predators apart for humans. Young hippos may be eaten by crocodiles, lions, and hyenas.

Conservation status ➢ Numbers have fallen sharply in recent years due to habitat loss and because they are hunted for their teeth.
Pigs come in many shapes and colours.
Domestic varieties are raised for their meat in farms across the world. The spotty Piétrain pig, originally from Belgium, is one popular variety. Domestic pigs have descended from the wild boar. With its bristly fur and bulldozer-like snout, this formidable creature digs up roots, burrowing animals, and also crops in fields. It originally comes from Europe, North Africa, and Asia, but has been released in many other places where it is sometimes a serious pest. The collared peccary is found from southern USA to South America and is similar to a wild boar. The Buru babirusa from Indonesia has some of the strangest tusks of any pig. It has two growing out of its mouth and two more growing upwards through its snout. The warthog lives in Africa’s grasslands.
Like other wild pigs it can be dangerous if cornered, particularly if it has piglets to protect. Pigs eat almost anything, but deer are vegetarians, feeding on leaves, lichens, and bark. Most male deer have antlers, which they shed and regrow each year. The fallow deer’s antlers are flat like the palm of a hand, but the wapiti has branching antlers that end in sharp points. Every autumn, male wapiti or stags clash head-on in a trial of strength that decides who gets a chance to breed. The tiny Java mouse deer is the world’s smallest hoofed mammal, no bigger than a rabbit, while the moose is by far the largest deer, with a record weight of more than 800 kg (1,760 lb). Moose live on their own, but reindeer are much more sociable. In the Canadian Arctic, half a million of them can travel in a single herd.
For thousands of years, the one-humped camel or dromedary has been used as a working animal in North Africa and the Middle East. Nicknamed the “ship of the desert”, it can go for two weeks without drinking, and when it does find water it can swallow enough to fill four kitchen sinks. Its hump stores an emergency reserve of fat, and it has cushioned feet that stop it from sinking in the desert sand. The Bactrian camel from Central Asia is even tougher because it has to cope with extreme winter cold. It has two humps instead of one and a thick winter coat that falls off when spring arrives. Giraffes are the world’s tallest animals. They live in Africa’s tree-studded grasslands, feeding on leaves and twigs that other mammals cannot reach. The Masai giraffe is the largest, with a record height of...
6 m (20 ft). The okapi 1 from Central Africa is a forest-dwelling relative of giraffes, while the guanaco 2 belongs to the camel family. It lives high in the Andes like the South American alpaca 3. Alpacas are raised for their silky fleece. Some breeds have short coats but suri alpacas 7 can have a fleece so long that it trails along the ground. All alpacas are descendants of the vicuña 4. This wild grazer, also from the Andes, can survive at 5,000 m (16,400 ft), a height that would leave many people gasping for breath. The llama 9, a tame relative of the guanaco, is used for carrying burdens on narrow mountain paths. Back in Africa, Rothschild’s giraffe 10 is easily recognizable with its big spots and long white “socks” on its lower legs. Loss of habitat has threatened its existence, with fewer than 670 left in the wild.
GIRAFFES With their amazingly long necks reaching into the treetops, giraffes are the tallest living animals. They have only seven bones in their necks, the same number as humans. Their long, slender legs allow them to gallop as fast as a horse, but become a problem when they have to bend down to drink. Giraffes also have long, bluish-purple tongues, and horn-like growths on their heads. Each giraffe can be recognized by its unique pattern of blotches.
Size  Males up to 6 m (20 ft); females up to 4.7 m (15½ ft) tall  Weight  Males weigh up to 1.6 tonnes; females up to 1.1 tonnes  Habitat  Grassland, savanna, and open woodland  Distribution  Sub-Saharan Africa  Diet  Giraffes mainly feed on acacia trees. They have tough mouths and tongues to cope with the thorns  Breeding  Giraffes breed in the rainy season, and calves are born in the dry season. Females give birth standing up, and a calf can walk within an hour of being born  Lifespan  About 25 years in the wild  Predators  Lions, but young giraffes may also be killed by leopards, hyenas, wild dogs, and crocodiles  Conservation status  Numbers of some giraffe species are reducing due to habitat loss
Dolphins and porpoises are related to whales, but they are smaller and faster, with sharply pointed teeth. Some live alone but most travel in groups called pods or schools. Intelligent and playful, they communicate with clicks and whistles. Like some whales, dolphins use sound waves to find their food. The striped dolphin lives worldwide, mainly where the sea is warm. It feeds on fish and squid, and often surfs the bow-waves in front of fast-moving boats. Risso's dolphin has a flattened head instead of a beak. As it gets older, its body often becomes scarred from fighting with other dolphins and grappling with squid. Porpoises are usually shorter than dolphins, with barrel-shaped bodies and blunt jaws. The tiny vaquita is one of the rarest and smallest species, measuring just 1.2 m (4 ft) long, while Dall's
porpoise ① is the fastest with a top speed of about 55 kph (34 mph). The Amazon river dolphin ⑤ has small eyes and the Indus river dolphin ⑥ is almost blind. Both these dolphins live in fresh water and rely on sound waves to hunt. The bottlenose dolphin ⑦ is smart and agile, making it a popular performer at aquariums. It frequently interacts with humans in the wild, too. Commerson’s dolphin ⑧, on the other hand, is a much rarer species from icy southern seas. The killer whale ⑨, or orca, is by far the biggest member of the dolphin family, weighing up to 7 tonnes. A cunning and quick-witted predator, it attacks other dolphins and whales, and sometimes tips up ice floes to make seals slide into the sea. It is even known to attack seals on beaches, using large waves to wash itself back out to sea after grabbing its prey.
For more than 30 million years, whales have roamed the open seas. They include some of the biggest animals that have ever lived. They breathe air through blowholes on top of their heads and swim by beating their flukes, or horizontal tails. The beluga  and narwhal  are two small whales from the Arctic. Belugas have white skin that blends with Arctic ice floes. Narwhals have a long twisted tusk, which they were hunted for in the past. The tusks were sold as “unicorn horns” and were thought to have magical powers. The humpback whale  is a fish-eater and an incredible acrobat. It sometimes bursts right out of the water, crashing back onto the surface with a massive splash. The humpback is much longer than a bus, but it is only half the size of the blue whale , the largest animal on Earth. This mega-
mammal weighs about 150 tonnes, which is more than the heaviest dinosaur, and grows up to 27 m (89 ft) long. It feeds on tiny animals called krill, filtering them out of the water, swallowing up to 8 billion every day. The bowhead whale is the world’s biggest hunter-killer with a huge head and about 50 enormous teeth. It feeds on giant squid, diving up to 3,000 m (9,840 ft) beneath the waves to find prey. The gray whale makes the longest migrations of any mammal, a round trip of 20,000 km (12,430 miles) from Alaskan waters to warmer waters off Mexico. Beaked whales feed in seabed canyons, sucking up squid and fish. Baird’s beaked whale is the biggest of these mysterious animals while Cuvier’s beaked whale is the most widespread.
HUMPBACK WHALE These whales are famous for the males’ complex, haunting songs, which carry for thousands of kilometres through the ocean. Humpback whales are remarkably agile for their size. They can push themselves right out of the water, twisting in the air to land on their backs with an enormous splash. This movement is known as breaching. Many whales do it, but scientists do not know why.
Size Males up to 14 m (46 ft) long; females up to 16 m (52 1/2 ft) long. Weight Up to 40 tonnes. Habitat Ocean; humpback whales breed in warm tropical and subtropical waters but migrate to cooler waters to feed. Distribution Oceans and coastal areas across the world. Diet Plankton, krill, and small fish, which they filter out of the water.

Breeding Females breed once every two to three years and nurse their calves for about 12 months. Humpback whales become adult at about five years. Lifespan Up to 95 years. Predators Killer whales may hunt young humpbacks. Conservation status No longer threatened since hunting by humans was banned in 1966.
INDEX

A

abdomens 81, 97
adders 150
African bush vipers 154–155
African savannah elephants 226–227
agoutis 231
algae 16–17, 20, 27, 61
alligators 139, 156, 157
alpacas 285
alpine swifts 177
anemone cups 26
anemones 53, 114
angelfish 114
Angora rabbits 228
anhingas 196, 197
anteaters 222–223
Antelope jackrabbits 229
antelopes 277, 278
antennae 78, 79, 81, 121
antlers 283
ants 102–103, 222
antshrikes 208
apes 236–237
apollos 94
Arab horses 273
aracaris 180–181
armadillos 222
arthropods 48
ash trees 44
asses 272
atlas moths 97
auks 204
avocets 202
axolotls 137
aye-ayes 235
azure vase sponges 51

B

babies see young
babiruras 282
baboons 242–243
baboos 223
barbets 180, 181
barred owls 173
barn owls 173
barnacles 78
barrelled owls 174–175
bateleurs 182
bats 244–247, 248–249
bat flies 100, 101
beaks 158
birds 168, 176, 180, 181, 195, 198, 202
whales 291
bears 252–253, 254–255
beavers 231
bed bugs 88, 89
bee-eaters 178, 179
bee flies 100, 101
bee hummingbirds 177
bees 102–103
beetles 92–93, 103
bellbirds 209
beluga whales 290
bettongs 218
big cats 258–261, 262–263
bilbies 220–221
binturongs 267
birch trees 46
birds-of-paradise (birds) 210, 211
birds-of-paradise (plants) 40
bird’s nests (fungi) 24–25
birds of prey 182–185

birth 217
mammals 222, 223, 224, 227, 228, 239, 255, 263, 269, 287
reptiles 144, 152, 155
sharks 108, 111
bitterns 194
black bears 252
black-browed albatrosses 206–207
black leopards 258
black rhinoceros 270
black-striped salemas 118–119
black swans 189
black widow spiders 71
black vultures 184
blackbirds 211, 213
blind animals see sight
blindsnakes 151
blood pythons 152
bloodsuckers 88, 89, 100, 245
blue whales 290–291
bluebirds 213
bluebottle flies 100
boa constrictors 150–151
boars 282
bobcats 261
bones 137, 158, 216, 244, 286
bonobos 237
boobies 197
boring sponges 50–51
Bornean orang-utans 237
bottlenose dolphins 289
bowerbirds 209
bowhead whales 290, 291
box turtles 140
boxfish 112
brackens 35
brains 126
intelligence 217, 226, 237, 288
breadcrum sponges 50
bream 114
breathing 104, 106, 115, 126
lungs 139
mammals 226, 231, 246, 257, 280, 290
breeding see birth, reproduction
brittle stars 64, 65
brolgas 200
brown bears 252, 253
brown noddies 204
brown rats 232–233
budgerigars 166
buffaloes 276, 277
bugs 88–89
bull sharks 109
bullfrogs 130, 131, 133
bumblebees 103
burbots 124
burrows
badgers 265
marsupials 220, 221
moles 225
rabbits 188, 228
spiders 70
bushbabies 234–235
bustards 201
butterflies 94–97
buzzards 182–183

cacti 39
caimans 157
calls
birds 173, 179, 200, 201, 209, 211, 213
bugs 89
frogs 130–131
primates 236, 240, 241
whales 292
camels 284
camouflage 58, 94, 112, as eyes 88–89, 95, 97
as plants 85, 88, 129, 134, 194
against snow 173, 229, 253
stripes 259, 277
cane toads 126–127
caps (fungi) 22
capsids 88
capuchins 241
capybaras 230–231
caracals 260–261
caracaras 184
carapaces 49
carnivores (meat-eaters) 43, 54, 139, 217
carpenter bees 102
carpenter moths 96
carps 122
cases 52, 80 see also shells
cassowaries 160–161
catbirds 209
caterpillars 95, 96, 98–99
catfish 113, 122
cats 258–261, 262–263
catsharks 107, 108
cedar trees 36
centipedes 68–69
chachalacas 163
chaffinches 209
chambered nautiluses 65
chameleons 138–139, 146–147
chanterelles 25
chars 124–125
cheetahs 260, 274
chestnut trees 46, 47
chickadees 210
chickens 162
chihuahuas 250
chimaeras 106
chimpanzees 237
chinchillas 232, 233
chipmunks 230
chlorophyll 31
cicadas 89
civets 266–267
clams 58, 61, 62–63
claws 77, 184, 223, 244, 253
see also pincers, talons
click beetles 93
climbing animals 128, 152, 219, 224, 234, 259, 279
clostridia 14
cold-blooded animals 105, 127, 138
colleagues see groups
colonies 192, 247, 248
colours 31, 154, 198
to attract food 42, 120
as mimicry 65
as warnings 22, 56, 66, 86, 88, 113, 129, 130, 136
cold-blooded animals 105, 127, 138
collective nouns see groups
colours 31, 154, 198
to attract food 42, 120
to attract mates 83, 159, 240
as camouflage 64, 88, 107, 131, 147
as mimicry 65
as warnings 22, 56, 66, 86, 88, 113, 129, 130, 136
comet darners 83
communication see calls
conch 58–59
condors 184
conifers 36–37
constrictors 150–151
coots 201
coral spots (fungi) 26
coral weeds (seaweed) 21
corals (fungi) 24
corals (marine animals) 52–53
cormorants 196–197
Cornish Rexes 260
cottontails 228, 229
couas 170
coucals 171
cougars 261
courtship see mating
cowbirds 211
cows 276
coyotes 250–251
coypus 233
crab spiders 70
crabs 76–77
crakes 201
cramp balls 26–27
crapes 200–201
crickets 86–87
crocodile newts 136
crocodiles 156–157
crossbills 209
crows 211
crustaceans 18, 48, 76–79
ctenopomas 124
cuckoo-doves 165
cuckoos 170–171
cup fungi 28–29
curassows 162, 163
cushion stars 64–65
cuttlefish 62, 63
cytoplasm 12
**Index**

**D**
- daddy long-legs spiders 71
- daisies 41
- damselflies 82–83
- dandelions 41
- darners 82, 83
- dead man’s fingers 26–27
- death cap mushrooms 25
- deep-sea fish 120–121
- deer 282, 283
- defences 40, 49, 67, 85, 153, 264
  - armour 112, 140, 156, 223, 271
- confusing predators 64, 88–89, 118, 134, 145
  - see also camouflage, poisonous animals, venomous animals
- degus 233
- desmans 225
- diatoms 17
- diet 195, 235, 257
  - feeding 43, 75, 96, 160, 264, 284, 286
  - carnivores 43, 54, 139, 217
  - herbivores 80, 217, 237
  - see also bloodsuckers, scavengers
- dingoes 250, 251
- dippers 208–209
- disease carriers 14, 15, 56, 100–101
- diving animals
  - birds 196, 208–209
  - mammals 231, 242–243, 257, 290
  - reptiles 145
- DNA 12
- dogfish 108
- dogs 27, 250
- dolphins 288–289
- domesticated animals 146, 154, 168, 232, 250, 273, 282, 284, 285
- donkeys 272–273
- dormice 231
- doves 164, 165
- dragonflies 82–83
- dromedaries 284
- ducks 188–189
- dunlins 203

**E**
- E. coli 15
- eagles 182–183
- ears 216, 224, 226, 228, 229, 246, 251
- hearing 172, 216, 229, 272
- earthworms 57
- echolocation (sound waves) 246, 288, 289
- eels 112, 121, 123, 124
- eggs 51, 105, 127, 159
- amphibians 132, 135, 139
- birds 163, 170, 187, 193, 211
- fish 108–109, 117, 119
- insects 91, 92, 96, 100, 102, 103
- invertebrates 79
- plankton 19
- egrets 194
- elands 277
- electric eels 124
- electric shocks 124
- elephants 226–227
- elks (wapitis) 283
- emperor penguins 190, 192–193
- emus 160
- endangered species  see threatened species
- energy from sunlight 15, 17, 30, 31, 43
- ergots 26
- evolution 104
- exoskeleton 49
  - see also shells, skeletons
- extinction 126, 164, 241, 271
  - see also threatened species
- eyes 81, 101, 109, 116, 124, 147
- as markings 88–89, 95, 97
  - see also sight
- falcons 183
- fallow deer 283
- fangs 70, 72, 150, 217
  - see also teeth
- feathers 159, 162, 174, 185, 196, 210
- feeding 43, 75, 96, 160, 264, 284, 286
- bloodsuckers 88, 89, 100, 245
  - see also scavengers
- feet 133, 162, 193, 197, 208
- hooves 276, 277, 279, 283
- fennec foxes 251
- ferns 34–35
- ferrets 265
- fighting 93, 114, 124, 153, 161, 201
- mammals 226, 266, 274, 278, 279, 288
- finches 209, 210
- fin whales 291
- fins 105, 107, 113, 121
- fire ants 103
- fire ants 103
- fire salamanders 136
- fire worms 57
- firs 34–35
- flagella 13
- flamingos 198–199
- flatworms 56
- fleeces  see coats
- fliers 181
- flies 100–101
- flightless birds 160, 161, 167, 190, 196–197
- flightless insects 80, 87, 89, 101
- flippers 140, 257
- flocks 161, 198, 211
- flowering plants 31, 38–41
- flowering trees 44–47
- fly agaric 22–23, 25
- fly catchers 208, 210
- flying foxes 244, 245
- flying squirrels 230
- food storage 187, 197, 214, 242, 284
- football fish 120
- foxes 250, 251
- foxgloves 41, 44
- francolins 163
- freshwater fish 122–125
- frigatebirds 197
- frogs 128–133, 134–135
- fruit bats 245
- fruit trees 44–45, 47
- fruitbodies (fungi) 23
- funnel-web spiders 72
- fur 103, 216, 228, 229, 232, 253, 265
- coats 250, 264, 285
- fur seals 256

**G**
- galahs 167
- gallinules 201
- gamebirds 162–163
- gannets 197
- gars 125
- gazelles 278
- geckos 144, 146, 147
- geese 188
- gender changes 115
- genders, differences between
  - birds 163, 167, 169, 211
  - fish 121
- invertebrates 71
- mammals 237, 243, 259, 278
- genets 266–267
- gerbils 232
gharials 157
ghost bats 247
giant clams 62–63
giardia lamblia 12–13
gibbons 236
gills 23, 105, 126, 136–137
giraffes 284–285, 286–287
gliding animals 133, 159, 206, 219
go-away birds 170, 171
goats 279
goldfish 122
gophers 232
goliath beetles 93
goliath tarantulas 71
gorillas 236–237
gorses 38
goshawks 185
grebes 201
grivets 243
height 33, 34, 51, 160, 190, 198
growth rings 61, 142
grubs see larvae
guanacos 285
guans 162, 163
guillemots 204
guinea pigs 232
guineafowls 162
gulls 204–205
hearings 172, 216, 229, 272
hearts 132
hedgehogs 224, 225
herbs see larvae
herd 275, 276, 277, 278, 283
hibernation 153, 230, 246
hogs 282
holly trees 45
horses 272, 273
horseflies 101
house centipedes 69
house flies 100
house mice 232, 233
hoverflies 101
hovrers 250
huntsman spiders 70
hyacinths 41
hybrid animals 273
hydroids 52
isopods 79
mobs 268
packs 250, 251
prides 259
schools 118–119, 288
swarms 55, 78, 86
grouse 162, 163
growth rates 20, 27, 35, 71, 120
growth rings 61, 142
grubs see larvae
guanacos 285
guans 162, 163
guillemots 204
guinea pigs 232
guineafowls 162
gulls 204–205
hearing 172, 216, 229, 272
hearts 132
hedgehogs 224, 225
height 33, 34, 51, 160, 190, 198
mammals 227, 239, 252, 255, 270, 281 284–285
herbivores (plant-eaters) 80, 217, 237
herds 227, 275, 276, 277, 278, 283
hermit crabs 76
herons 194, 195
herring 117
hibernation 153, 230, 246
sleep 177, 221, 223, 246, 278, 280
hinnies 273
hippopotamuses 280–281
hoatzins 171
hogs 282
holly trees 45
Honduran white bats 248–249
honey bees 102
honeybirds 180
honeyeaters 210
hoopoes 179
hooves 276, 277, 279, 283
hordes 243
hornbills 178–179
horses 272, 273
horseflies 101
house centipedes 69
house flies 100
house mice 232, 233
hoverflies 101
howsman spiders 70
hyacinths 41
hybrid animals 273
hydroids 52
isopods 79

habitats 14, 122, 162, 233, 237
loss of 43, 126, 169, 187, 215, 239, 263, 281, 287
hammerkops 197
hamsters 231
hands 236
hares 228–229
harriers 185
harvestman spiders 70
hawks 182
heads 80, 101, 109, 140, 157, 185, 217
H
intellengence 217, 226, 237, 288
brains 126
intestines 15, 56

I
ibexes 279
ibises 195
iguanas 145, 146–147
impalas 278
intelligence 217, 226, 237, 288
brains 126
intestines 15, 56

mobs 268
packs 250, 251
prides 259
schools 118–119, 288
swarms 55, 78, 86
grouse 162, 163
growth rates 20, 27, 35, 71, 120
growth rings 61, 142
grubs see larvae
guanacos 285
guans 162, 163
guillenmots 204
guinea pigs 232
guineafowls 162
gulls 204–205
hearing 172, 216, 229, 272
hearts 132
hedgehogs 224, 225
height 33, 34, 51, 160, 190, 198
mammals 227, 239, 252, 255, 270, 281 284–285
herbivores (plant-eaters) 80, 217, 237
herds 227, 275, 276, 277, 278, 283
hermit crabs 76
herons 194, 195
herring 117
hibernation 153, 230, 246
sleep 177, 221, 223, 246, 278, 280
hinnies 273
hippopotamuses 280–281
hoatzins 171
hogs 282
holly trees 45
Honduran white bats 248–249
honey bees 102
honeybirds 180
honeyeaters 210
hoopoes 179
hooves 276, 277, 279, 283
hordes 243
hornbills 178–179
horses 272, 273
horseflies 101
house centipedes 69
house flies 100
house mice 232, 233
hoverflies 101
howsman spiders 70
hyacinths 41
hybrid animals 273
hydroids 52
isopods 79

H
habitats 14, 122, 162, 233, 237
loss of 43, 126, 169, 187, 215, 239, 263, 281, 287
hammerkops 197
hamsters 231
hands 236
hares 228–229
harriers 185
harvestman spiders 70
hawks 182
heads 80, 101, 109, 140, 157, 185, 217
hearing 172, 216, 229, 272
hearts 132
hedgehogs 224, 225
height 33, 34, 51, 160, 190, 198
mammals 227, 239, 252, 255, 270, 281 284–285
herbivores (plant-eaters) 80, 217, 237
herds 227, 275, 276, 277, 278, 283
hermit crabs 76
herons 194, 195
herring 117
hibernation 153, 230, 246
sleep 177, 221, 223, 246, 278, 280
hinnies 273
hippopotamuses 280–281
hoatzins 171
hogs 282
holly trees 45
Honduran white bats 248–249
honey bees 102
honeybirds 180
honeyeaters 210
hoopoes 179
hooves 276, 277, 279, 283
hordes 243
hornbills 178–179
horns 147, 270, 271, 276, 277, 278, 279

I
ibexes 279
ibises 195
iguanas 145, 146–147
impalas 278
intelligence 217, 226, 237, 288
brains 126
intestines 15, 56
<table>
<thead>
<tr>
<th>Index</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>J</strong></td>
<td></td>
</tr>
<tr>
<td>jacamars 181</td>
<td></td>
</tr>
<tr>
<td>jacanas 203</td>
<td></td>
</tr>
<tr>
<td>jackals 250</td>
<td></td>
</tr>
<tr>
<td>jackrabbits 229</td>
<td></td>
</tr>
<tr>
<td>jaguars 258, 259</td>
<td></td>
</tr>
<tr>
<td>jays 211</td>
<td></td>
</tr>
<tr>
<td>jellyfish 52, 54–55</td>
<td></td>
</tr>
<tr>
<td>John Dories 117</td>
<td></td>
</tr>
<tr>
<td>jungle nymphs 80–81</td>
<td></td>
</tr>
<tr>
<td><strong>L</strong></td>
<td></td>
</tr>
<tr>
<td>laburnum trees 46</td>
<td></td>
</tr>
<tr>
<td>ladybirds 92, 93</td>
<td></td>
</tr>
<tr>
<td>langurs 243</td>
<td></td>
</tr>
<tr>
<td>lanternfish 121</td>
<td></td>
</tr>
<tr>
<td>larch trees 36–37</td>
<td></td>
</tr>
<tr>
<td>larks 211, 213</td>
<td></td>
</tr>
<tr>
<td>larvae fish 118</td>
<td></td>
</tr>
<tr>
<td>insects 92, 98, 103</td>
<td></td>
</tr>
<tr>
<td>invertebrates 48, 55, 63, 75</td>
<td></td>
</tr>
<tr>
<td>plankton 18</td>
<td></td>
</tr>
<tr>
<td>lavender 38</td>
<td></td>
</tr>
<tr>
<td>leaves 31, 42, 249</td>
<td></td>
</tr>
<tr>
<td>legs amphibians 127</td>
<td></td>
</tr>
<tr>
<td>birds 160, 202–203</td>
<td></td>
</tr>
<tr>
<td>insects 81, 86, 87, 90, 93, 101</td>
<td></td>
</tr>
<tr>
<td>invertebrates 48, 49, 64, 66–67, 78</td>
<td></td>
</tr>
<tr>
<td>mammals 237, 286</td>
<td></td>
</tr>
<tr>
<td>reptiles 139, 140</td>
<td></td>
</tr>
<tr>
<td>legspan 71</td>
<td></td>
</tr>
<tr>
<td>lemon sponges 50</td>
<td></td>
</tr>
<tr>
<td>lemon trees 45</td>
<td></td>
</tr>
<tr>
<td>lemurs 234–235</td>
<td></td>
</tr>
<tr>
<td>length 83, 91, 109, 119, 149, 155</td>
<td></td>
</tr>
<tr>
<td>birds 169, 175, 187, 215</td>
<td></td>
</tr>
<tr>
<td>invertebrates 55, 63, 75</td>
<td></td>
</tr>
<tr>
<td>mammals 263, 269, 293</td>
<td></td>
</tr>
<tr>
<td>leopards 258–259</td>
<td></td>
</tr>
<tr>
<td>lichens 27</td>
<td></td>
</tr>
<tr>
<td>life stages 96 see also eggs, larvae</td>
<td></td>
</tr>
<tr>
<td>lifespans 43, 85, 91, 120, 135</td>
<td></td>
</tr>
<tr>
<td>birds 169, 175, 199, 205, 207, 215</td>
<td></td>
</tr>
<tr>
<td>invertebrates 51, 55, 77</td>
<td></td>
</tr>
<tr>
<td>mammals 227, 239, 269, 275, 281, 287, 293</td>
<td></td>
</tr>
<tr>
<td>reptiles 142, 149, 155</td>
<td></td>
</tr>
<tr>
<td>lilac 38</td>
<td></td>
</tr>
<tr>
<td>lilies 30–31, 39, 41</td>
<td></td>
</tr>
<tr>
<td>limpets 60</td>
<td></td>
</tr>
<tr>
<td>linsangs 267</td>
<td></td>
</tr>
<tr>
<td>lionfish 104–105, 113</td>
<td></td>
</tr>
<tr>
<td>lions 259, 262–263</td>
<td></td>
</tr>
<tr>
<td>liverworts 32–33</td>
<td></td>
</tr>
<tr>
<td>lizards 138, 144–147</td>
<td></td>
</tr>
<tr>
<td>llamas 285</td>
<td></td>
</tr>
<tr>
<td>loaches 122</td>
<td></td>
</tr>
<tr>
<td>lobsters 78, 79</td>
<td></td>
</tr>
<tr>
<td>locusts 86</td>
<td></td>
</tr>
<tr>
<td>lop-eared rabbits 228</td>
<td></td>
</tr>
<tr>
<td>lorikeets 166</td>
<td></td>
</tr>
<tr>
<td>loris 235</td>
<td></td>
</tr>
<tr>
<td>lovebirds 167</td>
<td></td>
</tr>
<tr>
<td>lungs 139 see also breathing lynx 261</td>
<td></td>
</tr>
<tr>
<td><strong>M</strong></td>
<td></td>
</tr>
<tr>
<td>macaques 242–243</td>
<td></td>
</tr>
<tr>
<td>macaws 166, 167, 168–169</td>
<td></td>
</tr>
<tr>
<td>mackerel 116</td>
<td></td>
</tr>
<tr>
<td>maggots 100</td>
<td></td>
</tr>
<tr>
<td>magpie-geese 188</td>
<td></td>
</tr>
<tr>
<td>magpies 211</td>
<td></td>
</tr>
<tr>
<td>mallards 189</td>
<td></td>
</tr>
<tr>
<td>malleefowl 163</td>
<td></td>
</tr>
<tr>
<td>mammoth wasps 103</td>
<td></td>
</tr>
<tr>
<td>manakins 208</td>
<td></td>
</tr>
<tr>
<td>mandrills 243</td>
<td></td>
</tr>
<tr>
<td>maple trees 44</td>
<td></td>
</tr>
<tr>
<td>maras 232</td>
<td></td>
</tr>
<tr>
<td>markings 88–89, 95, 97, 114, 143, 258 see also camouflage, colours</td>
<td></td>
</tr>
<tr>
<td>marmosets 240–241</td>
<td></td>
</tr>
<tr>
<td>marmots 230</td>
<td></td>
</tr>
<tr>
<td>marsupials 218–221</td>
<td></td>
</tr>
<tr>
<td>martens 265</td>
<td></td>
</tr>
<tr>
<td>martins 212</td>
<td></td>
</tr>
<tr>
<td>mating</td>
<td></td>
</tr>
<tr>
<td>calls 89, 130–131, 201, 213</td>
<td></td>
</tr>
<tr>
<td>competing for 93, 101, 153, 161, 274, 278, 283</td>
<td></td>
</tr>
<tr>
<td>displays 113, 137, 161, 163, 169, 203, 208, 209, 211</td>
<td></td>
</tr>
<tr>
<td>and eating 91 for life 167, 207 see also birth, reproduction meerkats 266, 268–269</td>
<td></td>
</tr>
<tr>
<td>membranes 13, 15, 23, 105</td>
<td></td>
</tr>
<tr>
<td>merlins 183</td>
<td></td>
</tr>
<tr>
<td>metamorphosis 48, 126</td>
<td></td>
</tr>
</tbody>
</table>
Mexican red-kneed tarantulas 48–49
mice 231, 232, 233
midges 100
migration
  birds 170, 176, 189, 200–201, 203, 204–205, 212
  fish 108, 111, 123
  insects 86, 95
  mammals 277, 291
mildews 26
military macaws 168–169
millipedes 68–69
mimicry 39, 63, 65, 95, 101, 166, 213
mink 265
minnows 123
mites 73
mobs 268
mockingbirds 213
mole-rats 232
moles 225
molluscs 58–61, 62–63, 64–65
mongooses 266
monkey puzzles 36, 37
monkeys 240–243
moonrats 225
moorhens 200
moose 282–283
mosquitoes 100–101
mosses 32–33
moths 94, 95, 96, 97
motmots 178
mourning doves 164
mouths 75, 80, 98, 100, 110, 121, 125
fangs 70, 72, 150, 217
see also teeth
mudskippers 115
mules 273
mullet 114
mushrooms 23, 24–25
muskrats 231
mussels 59, 61
mute swans 189

N
naked mole-rats 232
Natterer’s bats 246
natterjack toads 129
nautiluses 63
necks 143, 151, 189, 198, 278, 286
nests
  birds 163, 170, 180, 182–183, 190, 209, 211, 212
  insects 88, 102, 103
  mammals 248
  reptiles 141
newts 136–137
nocturnal animals
  birds 172, 173
  insects 89, 94
  invertebrates 59
  mammals 240, 247, 265, 280
northern cardinals 208
noses see smell
nucleus 12
numbats 220
nunbirds 180
numlets 180
nymphs 80–81, 82, 85, 91

O
oak trees 47
ocelots 258–259
octopuses 62–63
okapis 284, 285
olms 137
onagers 272, 273
opossums 218, 219
possoms 218–219, 211
orang-utans 237, 238–239
orb-weaver spiders 70, 72–73
orcas 289
orchids 39
organisms 12, 49, 74, 81, 104
  brains 126
  ears 216, 224, 226, 228, 229, 246, 251
  eyes 81, 101, 109, 116, 124, 147
  hearts 132
  intestines 15, 56
  lungs 139 see also breathing
  stomachs 121, 150, 276
  senses 13, 48, 81, 104 see also smell, sight, hearing
orioles 210–211
ospreys 183
ostiches 160
otters 264–265
owls 172–173, 174–175
oxygen 104–105
see also breathing
oystercatchers 202
oysters 59

Pacific sea nettle 54–55
packs 250, 251
pandas 253
pangolins 223
panther chameleons 138–139
Pantopoda 74
parakeets 167
parasites 56, 75, 89, 100–101, 120
parental care
  amphibians 132, 133
  birds 161, 187, 193, 207
fish 113, 125
mammals 216, 227, 238, 249, 250, 259, 262, 269
reptiles 152, 155, 156
parrots 166–167, 168–169
partridges 163
peacocks 162, 163
peccaries 282
pelicans 196, 197
penguins 190–191, 192–193
perch 125
perching birds 208–213, 214–215
pests 61, 99, 129, 232–233, 267, 282
pets 146, 154, 168, 232, 250, 273, 282, 284, 285
pheasants 162, 163
pichi armadillos 222
piculets 181
pigeons 164–165
pigs 27, 282–283
pikas 229
pill millipedes 68, 69
pincers 73, 76 see also claws, talons
pine trees 36, 37
pipesnakes 150
pipistrelle bats 247
piranhas 123
pittas 208, 209
plaice 117
plankton 17, 18–19
plasterer bees 103
plovers 202
poison-dart frogs 130, 132
poisonous animals
  amphibians 126, 129, 130, 136
  fish 113
  fungi 22, 25, 26
  insects 86
  invertebrates 52, 54, 57, 59, 66, 68, 73
  plants 35, 36, 40, 46
  reptiles 144, 148
  microscopic life 14, 17
see also venous animals
polar bears 253, 254–255
polecats 265
pollen 31, 38
pollinators 39, 40, 41, 100, 101, 102, 103
pond skaters 89
ponies 273
poppies 40
populations 14, 86, 117, 237, 247, 276–277
porcupines 232, 233
pores 50
porpoises 288–289
Portuguese men o’war 52
possoms 218–219, 221
opossums 218, 219
potoroos 218
pottos 235
pouches
  for carrying young 132, 193, 218, 219, 220
  for food storage 187, 197, 242
prairie dogs 230
praying mantises 90–91
prides 259
proboscis monkeys 242–243
protocists 18
psammodromus 145
ptarmigans 163
puffballs 25
puffbirds 180
puffer fish 112
puffins 204
pumas 261
pupas 96 see also larvae
pythons 152, 153
quail-doves 164
quails 163
quolls 221
rabbits 228–229
raccoons 265
ragworms 57
rails 200
ratfish 106
rats 232–233
rattlesnakes 151
rays 106–107
recycling 22
red-backed shrikes 214–215
red-eyed tree frogs 134–135
red lionfish 104–105
reef lobsters 78
reindeer 283
reproduction 12, 14, 16, 31
  see also birth, eggs, mating
  rheos 161
rhinos 270–271
roadrunners 171
robins 211, 212
rodents 230–233
rollers 179
roses 40
roundworms 56
royal ferns 35
rufous horneros 209
ruffs 203
Rüppell’s vultures 158–159
sac fungi 26–27, 28–29
saki monkeys 240
salamanders 136–137
salmon 116–117
salmonella 15
saltwater fish 112–117
sandpipers 203
sapsuckers 181
sawfish 107
sawflies 102
sawsharks 107
scales 94, 112, 139, 142, 156, 223
scallops 59
scavengers 79, 87, 147, 221, 251
  birds 165, 182, 185, 186, 205, 207
  schools 118–119, 288
  scorpions 72, 73
  screamers 189
  scutes 139
  sea anemones 53, 114
  sea cucumbers 66, 67
  sea lettuces 21
  sea lions 256–257
  sea mice 57
  sea pens 52, 53
  sea potatoes 67
  sea slugs 60–61
  sea spiders 74–75
  sea urchins 66, 67
  sea whips 53
  seadreams 114
  seadragons 113
  seahorses 113
  seakraits 151
  seals 256–257
  seaweeds 20–21
  secretary birds 183
  sac fungi 26–27, 28–29
  saki monkeys 240
  salamanders 136–137
  salmon 116–117
  salmonella 15
  saltwater fish 112–117
  sandpipers 203
  sapsuckers 181
  sawfish 107
  sawflies 102
  sawsharks 107
  scales 94, 112, 139, 142, 156, 223
  scallops 59
dispersal (spreading) 31, 41, 43, 45, 46, 165
pollen 31, 38
pollinators 39, 40, 41, 100, 101, 102, 103
see also spores
self-defence see defences
senses 13, 48, 81, 104
hearing 172, 216, 229, 272
see also smell, sight
sequences 36–37
seriemas 201
setts 265
shags 197
sharks 106–109, 110–111
sheep 279
shelducks 188
shells 49
cases 52, 80
invertebrates 48, 58–61, 62, 65, 76
mammals 222
reptiles 149
single-celled life 16, 17
shire horses 273
shoals (schools) 118–119, 288
shoebills 196
shrews 224–225
shrikes 210, 214–215
shrimps 78, 79
siamangs 236
sifakas 234
sight
amphibians 137
birds 203
fish 109, 124
mammals 234, 244, 270, 289
see also eyes
silk moths 95
silk producers 70, 72–73, 95
silky anteaters 223
single celled life 14–15, 16–17
plankton 17, 18–19
siphonophores 52
size 19, 29, 111, 135, 248 see also height, length, weight
skates 106–107
skeletons 51, 52–53, 106, 112
bones 137, 158, 216, 244, 286
see also exoskeleton
skimmers 82–83
skin 49, 69, 115, 126, 131, 139, 192
mammals 216, 219, 236, 244
skinks 144, 145, 146
skunks 264
skylarks 213
sleep 177, 221, 223, 246, 278, 280
hibernation 153, 230, 246
sliders 140, 141
sloths 223
slow worms 146
slug moth caterpillars 98–99
slugs 60–61
smell
as defence 69, 85, 96, 153, 264, 267
for reproduction 25, 31, 279
senses 137, 148, 226, 244, 252, 271
snails 58–59, 61
snakes 139, 150–153, 154–155, 183, 266
snapper 114–115
snapping turtles 141
snowy owls 173
soles 117
solenodons 225
sound waves 246, 288, 289
sounds see calls
sparrows 210, 213
speed
birds 160, 171, 176, 183, 203
fish 113
insects 97
mammals 219, 223, 232, 243, 250–251, 256, 260, 289
reptiles 149
sperm whales 291
spider monkeys 240, 241
spiders 48–49, 70–72, 74–75
spines 39, 40, 67, 105, 107, 116, 224
sponges 50–51
spoonbills 194–195
spores
fungal 22, 23, 24, 25, 26, 28, 29
plant 32, 33, 34
springboks 278
spruce trees 37
squid 64–65
squirrel monkeys 240
squirrels 230
staphylococcus 14–15
starfish 66, 67
stargazer lilies 30–31
starlings 212
stems 23, 30
stick insects 84–85
stilts 202–203
stingrays 106, 107
stings 49, 52, 53, 73, 102, 103, 116
stinkhorns 25
stools 265
stomachs 121, 150, 276
stonefish 113
storks 194–195
streptococcus 15
sugar gliders 218, 219
Sumatran orang-utans 237, 238–239
sun bears 253
sunbirds 208
swallows 212
swan mussels 61
swans 188, 189
swarms 55, 78, 86
swifts 177
T

Tadpoles 127, 128, 129, 131, 132
tails 104, 107, 109, 145, 230, 240
talons 174
see also claws, pinchers
tamanduas 223
tamarins 241
tapeworms 56
tapirs 270–271
tarantulas 48, 49, 70, 71
tarsiers 235
Tasmanian devils 221
teeth 106, 110, 115, 157
mammals 217, 230, 232, 281, 291
see also fangs, mouth
tegus 147
tench 122
tentacles 52, 53, 55, 65, 114, 225
terns 204–205
terrapins 140
territory 94, 241, 263, 274
Thai boxer praying mantises 90–91
thistles 40
thoraxes 81
thorn bugs 88
threatened species
amphibians 125
birds 169, 206
mammals 232, 239, 241, 270, 271, 285
Index

plants 43
reptiles 149, 157
thrushes 213
ticks 72
tigers 216–217, 259
timber flies 101
tinamous 161
tinkerbirds 181
tits 209, 212–213
toadfish 113
toads 126–127, 128–129, 130, 131, 132, 133
todies 179
tokay geckos 147
tokoekas 160
toothed wracks 16
tongues 148, 220, 223, 253, 287
tortoises 139, 140, 141, 142–143
toucans 180, 181
tragopans 162–163
tree dragons 147
tree frogs 128, 133, 134–135
tree kangaroos 219
treehoppers 88–89
trees 36–37, 44–47
tropicbirds 196
troct 125
tree bugs 88–89
truffles 27
trunks, elephant 226
trunks, tree 30
tulips 38–39
tuna 115
turacos 170, 171
turbot 116
turkey-vultures 184
turkeys 162
turtle doves 164
turtles 139, 140–142
tusks 226, 227, 256, 280, 282, 290

U
uakaris 240
ural owls 172
urchins 65

V
vampire bats 244, 245
vaquitas 288
vase sponges 51
velvet worms 55
venomous animals
fish 107, 113, 116
invertebrates 52, 54, 70
mammals 225
reptiles 150, 151, 154
see also poisonous animals
venus flytraps 42–43
vipers 150, 151, 154–155
viscachas 233
voles 230
vultures 158–159, 182, 184–185, 186–187

W
waders 202–205
wagtails 212
wallabies 218
walnut trees 45
walrus 256
wapitis (elks) 283
warblers 209, 212
warm-blooded animals 115, 137, 152, 159, 216
warrens 228
warthogs 282–283
wasps 102, 103
water intake 28, 39, 33, 51, 126, 227, 284
water monitors 144
waxwings 212
weasels 265
weather systems 119
weeds 35, 40
see also seaweed
weeverfish 116
weevils 93
weights 25, 37, 62, 149, 151
birds 175, 177, 201, 207
large mammals 227, 237, 255, 273, 281, 283, 287, 289, 291, 293
small mammals 218–219, 240–241, 269
wentletraps 58
weta 87
whale sharks 110–111
whales 288, 290–291, 292–293
whelks 59
whiskers 116, 218
whydahs 210
wigeons 188
wild turkeys 162
wildebeest 277
wings
birds 161, 171, 174, 190, 196, 206
insects 80, 86–87, 88–89, 92, 94, 100
mammals 244
wingspan 95, 97, 169, 175, 184, 187, 195, 199, 207, 215, 245

turtles 139, 140–142
vultures 158–159, 182, 184–185, 186–187

Z
zebras 272, 274–275, 277
zooplankton 18–19

wolves 251
wolverines 264–265
wombats 220
wood ducks 188
wood frogs 130, 131
woodcocks 203
woodpeckers 181
wood pigeons 164
working animals see
domesticated animals
worms 48, 56–57
wrens 209, 212
wrynecks 181

yaks 276
yellow-kneed sea spiders 74–75
yew trees 36–37
ylang-ylang trees 45
young
birds 171, 175, 177
fish 116, 123
insects 82, 83, 88
mammals 218, 219, 224, 231, 238, 249, 253, 262, 269, 275, 281, 287, 293
reptiles 141, 149, 155

whiskers 116, 218
whale sharks 110–111
whales 288, 290–291, 292–293
whelks 59
whiskers 116, 218
whydahs 210
wigeons 188
wild turkeys 162
wildebeest 277
wings
birds 161, 171, 174, 190, 196, 206
insects 80, 86–87, 88–89, 92, 94, 100
mammals 244
wingspan 95, 97, 169, 175, 184, 187, 195, 199, 207, 215, 245

zebras 272, 274–275, 277
zooplankton 18–19