



# First Animal Encyclopedia



A first  
reference  
book for  
children







# First Animal Encyclopedia





Penguin  
Random  
House

**REVISED EDITION**

**Editor** Ishani Nandi

**Art editor** Shipra Jain

**Senior editor** Shatarupa Chaudhuri

**DTP designer** Bimlesh Tiwary

**Managing editors** Laura Gilbert,

Alka Thakur Hazarika

**Managing art editors** Diane Peyton Jones,

Romi Chakraborty

**CTS manager** Balwant Singh

**Publisher** Sarah Larter

**Senior producer, pre-production** Ben Marcus

**Producer** Nicole Landau

**Jacket editor** Laura Gilbert

**Jacket designer** Diane Peyton Jones

**Publishing director** Sophie Mitchell

**Art director** Stuart Jackman

**Consultant** John Woodward

**ORIGINAL EDITION**

**Author** Penelope Arlon

**Senior Art Editor** Tory Gordon-Harris

**Consultant** Kim Dennis-Bryan PhD. FZS

**Design Assistance** Amy McSimpson

**Publishing Manager** Sue Leonard

**Managing Art Editor** Clare Shedden

**Jacket Designer** Poppy Jenkins

**Picture Researcher** Sarah Pownall

**Production Controller** Shivani Pandey

**DTP Designer** Almudena Díaz

First published in Great Britain in 2004

This edition first published in Great Britain in 2015 by

Dorling Kindersley Limited

80 Strand, London, WC2R 0RL

Copyright © 2004, © 2015

Dorling Kindersley Limited, London

A Penguin Random House Company

10 9 8 7 6 5 4 3 2 1

001-274454-Sept/2015

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise) without the prior written permission of the copyright owner.

A CIP catalogue record for this book is available from the British Library.

ISBN 978-0-24118-872-9

Printed and bound in Hong Kong

A WORLD OF IDEAS:  
SEE ALL THERE IS TO KNOW

# Contents

## Introduction

4-5 The animal kingdom

## Mammals

6-7 Mammals  
8-9 The world of mammals  
10-11 Lemurs and monkeys  
12-13 The apes  
14-15 The cat family  
16-17 Big cats  
18-19 The dog family  
20-21 Bears  
22-23 Small and cunning  
24-25 The burrowers  
26-27 Insect-eating mammals  
28-29 Rodents  
30-31 Flying mammals  
32-33 Marsupials  
34-35 The mighty elephant  
36-37 Hoofed mammals  
38-39 The cattle family  
40-41 The horse family  
42-43 Hoofed giants  
44-45 Water mammals  
46-47 Ocean giants

## Birds

48-49 Birds  
50-51 The world of birds  
52-53 Courtship  
54-55 Nesting  
56-57 Hatching out  
58-59 Songbirds  
60-61 Life in the air  
62-63 Freshwater birds  
64-65 Sea birds  
66-67 In the chill  
68-69 Birds of prey  
70-71 Night flyers



- 72-73 Exotic flyers
- 74-75 Game birds
- 76-77 Globetrotters
- 78-79 Flightless birds

- 134-135 Sea crustaceans
- 136-137 Sea molluscs
- 138-139 Brainless wonders
- 140-141 The world of microlife

## Fish

- 142-143 Fish
- 144-145 The world of fish
- 146-147 Finding food
- 148-149 Staying alive
- 150-151 Making more fish
- 152-153 Sharks and rays

## Reptiles and amphibians

- 80-81 Reptiles and amphibians
- 82-83 The world of reptiles
- 84-85 Under a shell
- 86-87 Introducing lizards
- 88-89 Hunting and defence
- 90-91 Slithering snakes
- 92-93 Attack and defence
- 94-95 Crocodiles and alligators
- 96-97 The world of amphibians
- 98-99 Frogs and toads
- 100-101 Hunting and hiding
- 102-103 Salamanders and newts

## Reference section

- 154-155 Amazing animal facts
- 156-157 True or false?
- 158-159 Quiz
- 160-161 Who am I?
- 162-163 Where in the world?
- 164-165 Glossary
- 166-167 Index
- 168 Picture credits and acknowledgements

## Creepy-crawlies

- 104-105 Creepy-crawlies
- 106-107 The world of insects
- 108-109 Egg to adult
- 110-111 On the move
- 112-113 Eating habits
- 114-115 Defence
- 116-117 Pests and plagues
- 118-119 Butterflies and moths
- 120-121 Beetles and bugs
- 122-123 Bees and wasps
- 124-125 Ants and termites
- 126-127 Flies
- 128-129 Other creepy-crawlies
- 130-131 Spiders and scorpions
- 132-133 Strange land creatures

## About this book

The pages of this book have special features that will show you how to get your hands on as much information as possible! Look out for these:



The Picture Detective quiz will get you searching through each section for the answers.

Turn and learn buttons tell you which pages to turn to in order to find more information on each subject.

Every page is colour-coded to show you which section it is in.



# The animal kingdom

The animal kingdom is divided into vertebrates and invertebrates. Mammals, birds, reptiles, amphibians, and fish are vertebrates. Insects are a type of invertebrate.



## Animals

All animals, including people, have one thing in common – they eat other living things, either plants, or animals, or both. Almost all, except a few sea creatures, can move around.



The beetle has muscles attached to its skeleton just like you do. Its skeleton is on the outside, however, while yours is on the inside.

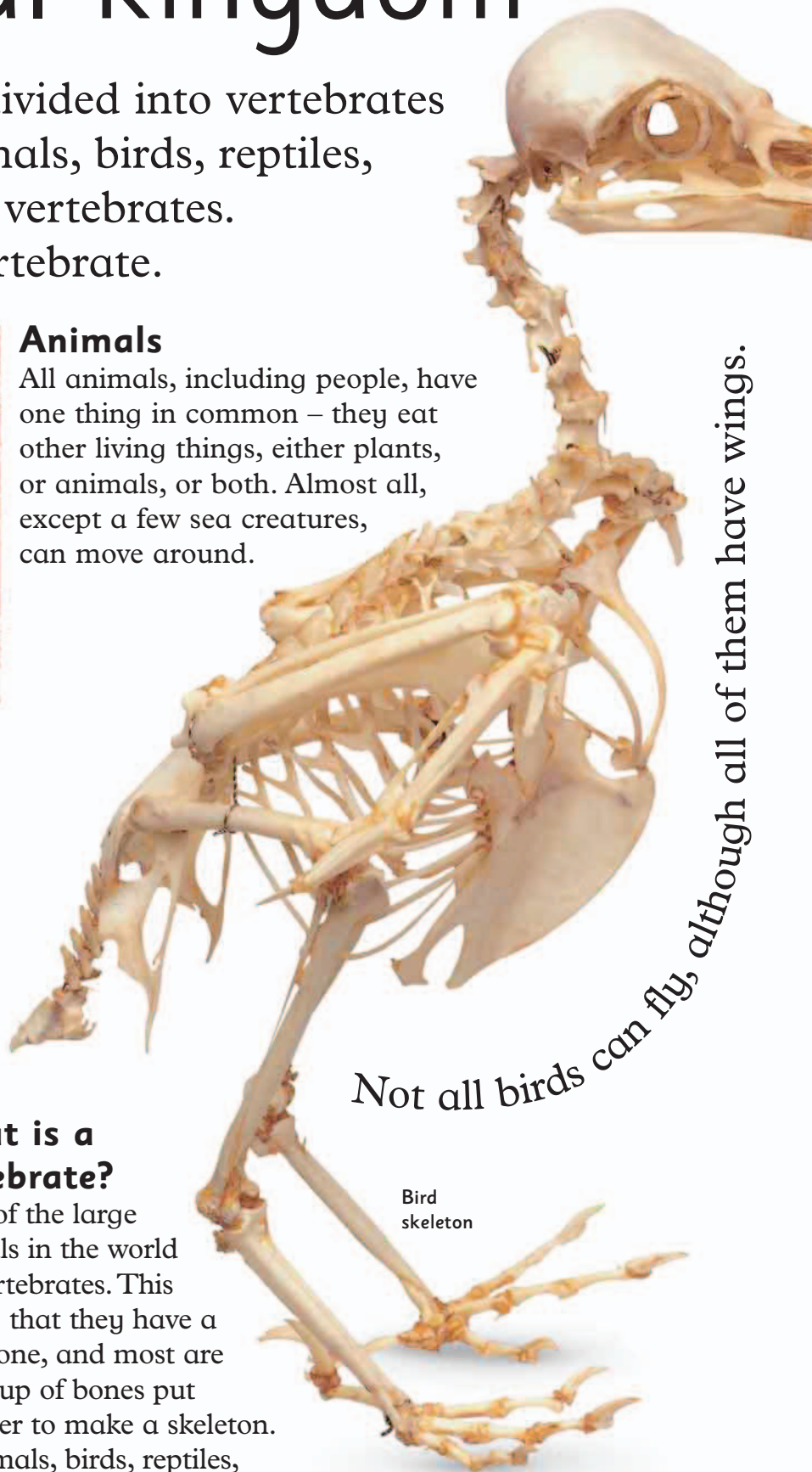
Beetle skeleton

## What is an invertebrate?

The word invertebrate simply means not having a backbone. The “creepy-crawly” section of this book deals with the animals called invertebrates. Some of them have skeletons on the outside of their bodies, while some don't have any bones at all.

## What is a vertebrate?

Most of the large animals in the world are vertebrates. This means that they have a backbone, and most are made up of bones put together to make a skeleton. Mammals, birds, reptiles, amphibians, and fish are all vertebrates.



*Not all birds can fly, although all of them have wings.*

Bird skeleton

### Creepy-crawlies

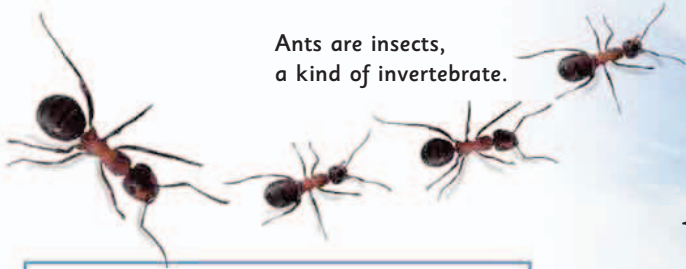
Creepy-crawlies, or invertebrates, make up over 95 per cent of all animals. But most of them are so small you don't notice them.

Stag beetle



Some people think that there are millions of creepy-crawlies we do not even know about yet.

Ants are insects, a kind of invertebrate.



Most vertebrates can move around.

### Vertebrates

All vertebrates came from the same ancestor millions of years ago, but have changed, or evolved, into these four main groups.



**Mammals:** most live on land and none can breathe underwater.

The lion is one of the most ferocious meat-eaters of the mammal group.



**Birds:** all birds have wings and most of them can fly.

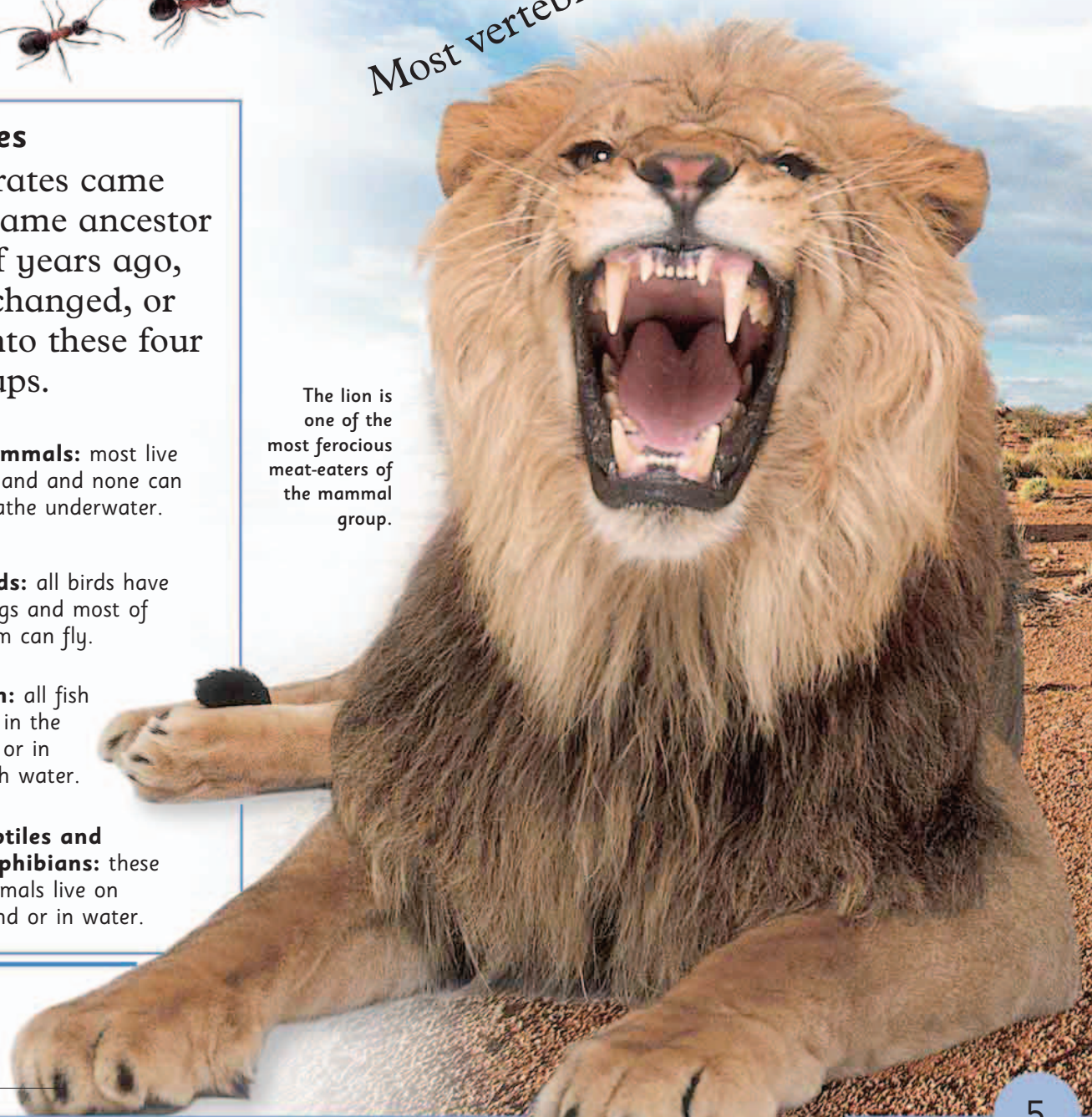


**Fish:** all fish live in the sea or in fresh water.



**Reptiles and amphibians:** these animals live on land or in water.

Lions keep their sharp claws inside their toes to protect them, until they need to attack.



No, a few invertebrates have no brains.

# Mammals

You may wonder if animals such as dogs, bats, elephants, and mice have anything in common. They do – they are all mammals and have more in common than you may think.



European rabbit



Orang-utan



Mongolian gerbil

Siamese cat



Boxer dog

Eastern chipmunk



Red fox



Sea lion

Maned wolf



Field mice



Rodriguez flying fox



Which mammal lives the longest?





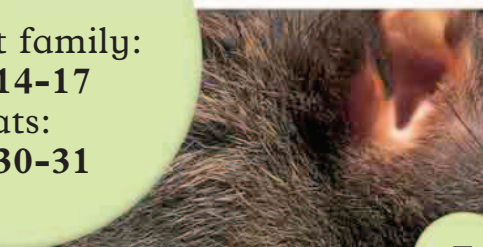
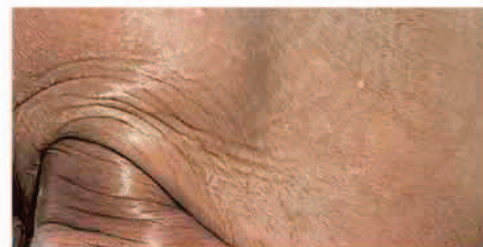
Long-eared bats

Two-toed sloth

Pipistrelle bat

### Picture detective

Take a look through the Mammals section and see if you can spot who these hairy skins belong to.



### Junior mammals

Mammal babies look like little versions of their parents. They are all looked after by their mothers or both parents until they can feed and look after themselves.



Baby red-necked wallaby

Baby tiger



### Turn and learn

The cat family:  
pp. 14-17  
Bats:  
pp. 30-31

# The world of mammals



Gorilla skeleton

Mammals include animals such as the whale, the kangaroo, and you and me! We all have fur, we are warm-blooded, and we feed new babies our milk.



## Mammal babies

Most mammal females give birth to live babies, rather than laying eggs. The baby grows inside the mother's body until it is born.

## The skeleton

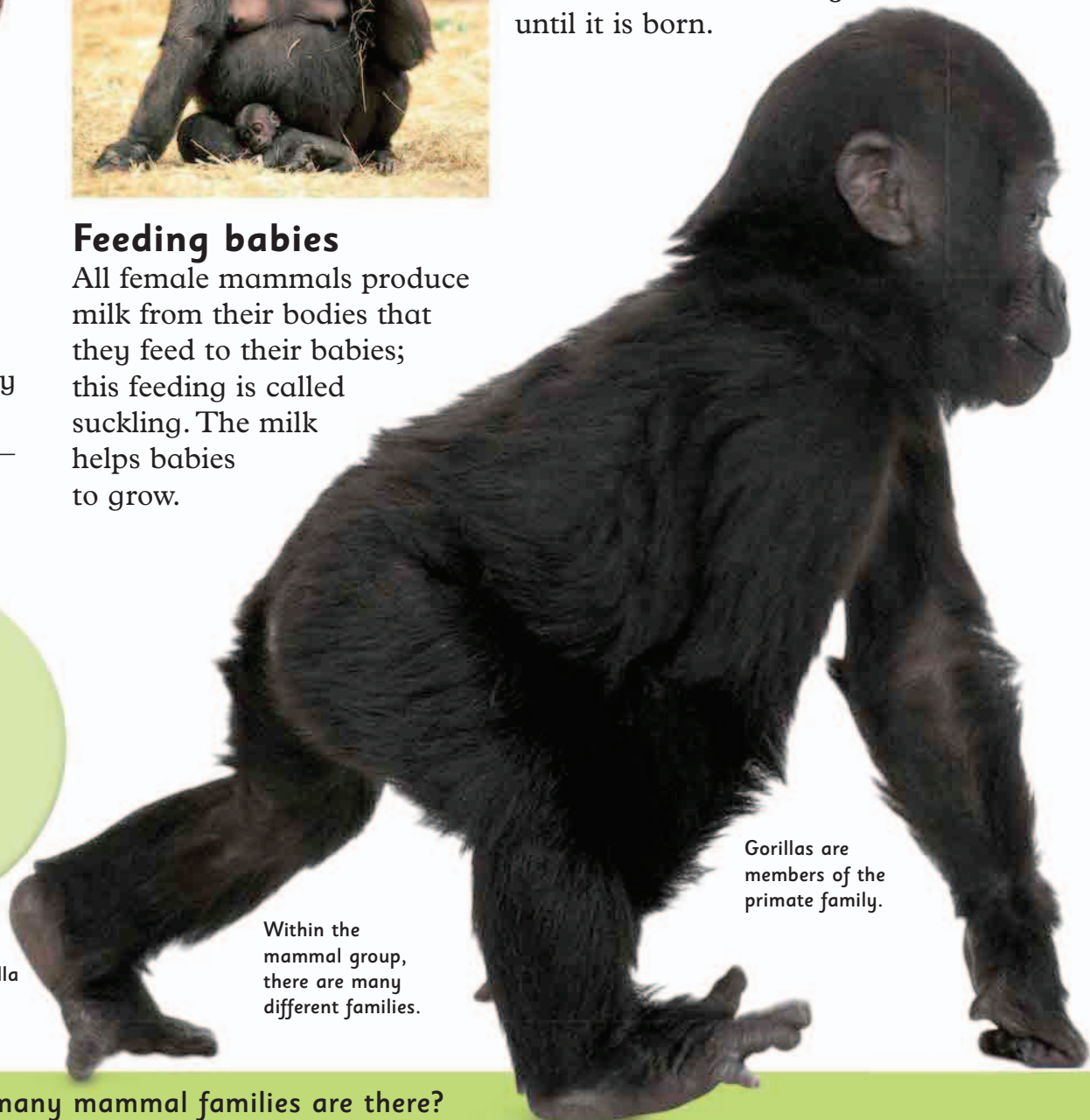
Mammals may look very different, but stripped back to the bone, we all have the basic bony skeleton. Scientists call us vertebrates – animals with a backbone.

## Feeding babies

All female mammals produce milk from their bodies that they feed to their babies; this feeding is called suckling. The milk helps babies to grow.

## Turn and learn

Bears:  
pp. 20-21  
Elephants:  
pp. 34-35



Baby gorilla

Within the mammal group, there are many different families.

Gorillas are members of the primate family.

Polar bears can live in chilly Arctic regions because they are warm-blooded and have thick fur.



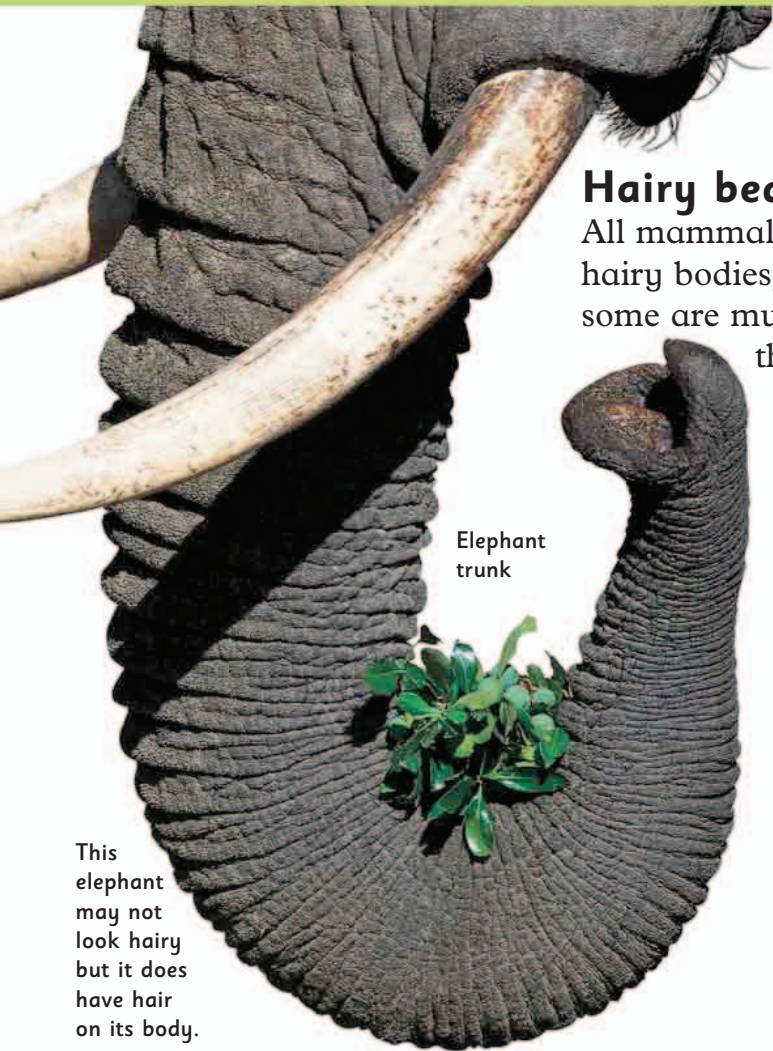
### Warm blood

Mammals are warm-blooded, which means they can warm up and cool down their bodies to keep their temperature level. An elephant in the hot jungle has the same temperature as a polar bear in the snow.

### Hairy beasts

All mammals have hairy bodies, though some are much hairier than others.

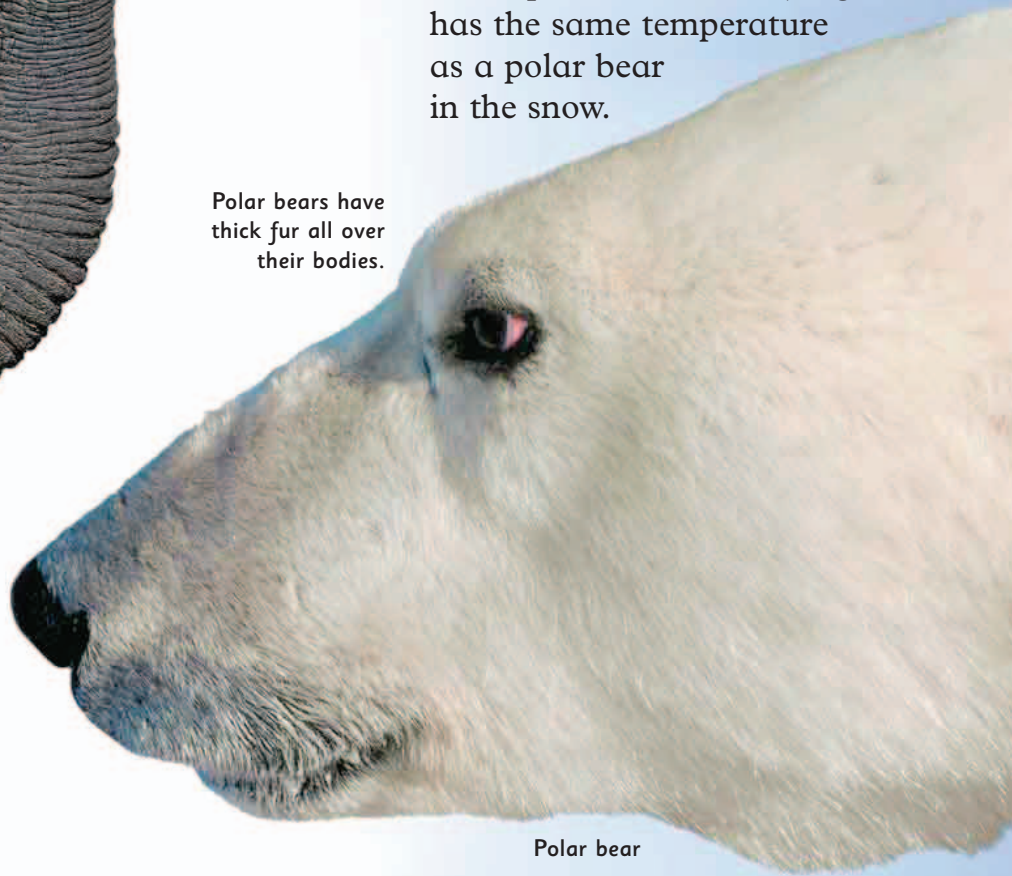
This hair, or fur, keeps them warm.



Elephant trunk

This elephant may not look hairy but it does have hair on its body.

Polar bears have thick fur all over their bodies.



Polar bear

### Getting around

Mammals have developed different ways of moving about.



**Cats:** some mammals, such as the cat, have long legs to run with.



**Bats:** these are the only mammals that can fly – they have wings.



**Dolphins:** sea mammals have flippers and strong tails to swim with.



**Moles:** a mole has feet like spades, which are useful for burrowing.



### The odd one out

It is usually true that animals give birth to live babies, but there are a few species, including this duck-billed platypus, that lay eggs. Platypus eggs are soft and the size of marbles.

# Lemurs and monkeys



Howler monkey

Monkeys and lemurs, along with the apes, make up the mammal group known as primates.

## Record-breaker

Talking to each other is important to primates, which live together in large groups. The howler monkey, the loudest land animal on Earth, screams to neighbouring groups, and can be heard several miles away.



Ring-tailed lemur



## Monkeys

Monkeys have grasping hands so they can climb trees. Many have recognizable features, such as this tamarin's white moustache.

The emperor tamarin has a long, white moustache.

## Monkey business

Most people think monkeys all look similar, but some are quite different.



**White-faced saki:** the male is black and the female brown.



**Tamarin:** the golden lion tamarin has gold fur and a long mane.



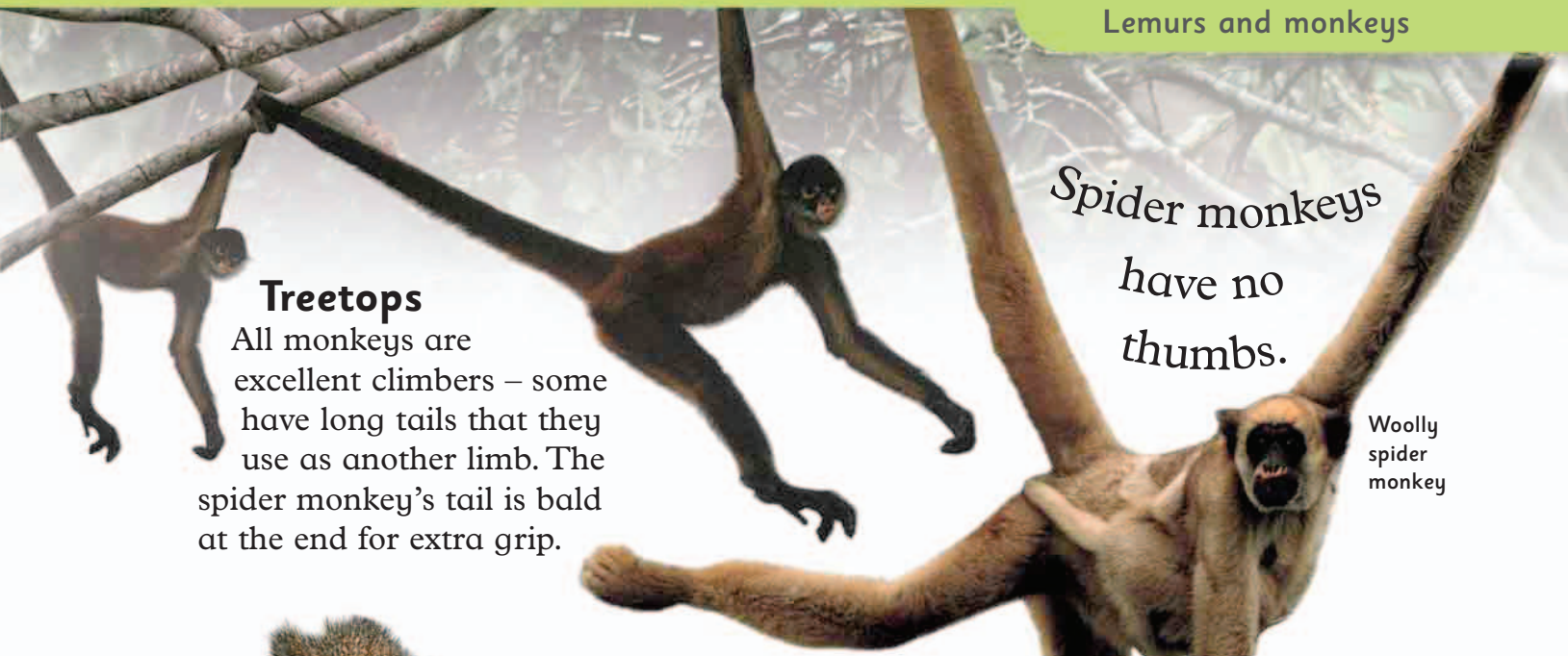
**Woolly monkey:** it lives in South America and has thick fur.



**Proboscis monkey:** this male monkey has a very long, prominent nose.

## weird or what?

Japanese macaques, a type of monkey, live in the mountains of northern Japan. To keep warm in the winter, they take baths in the hot volcanic springs.



### Treetops

All monkeys are excellent climbers – some have long tails that they use as another limb. The spider monkey's tail is bald at the end for extra grip.

Spider monkeys have no thumbs.

Woolly spider monkey

Mandrill

### Ground monkey

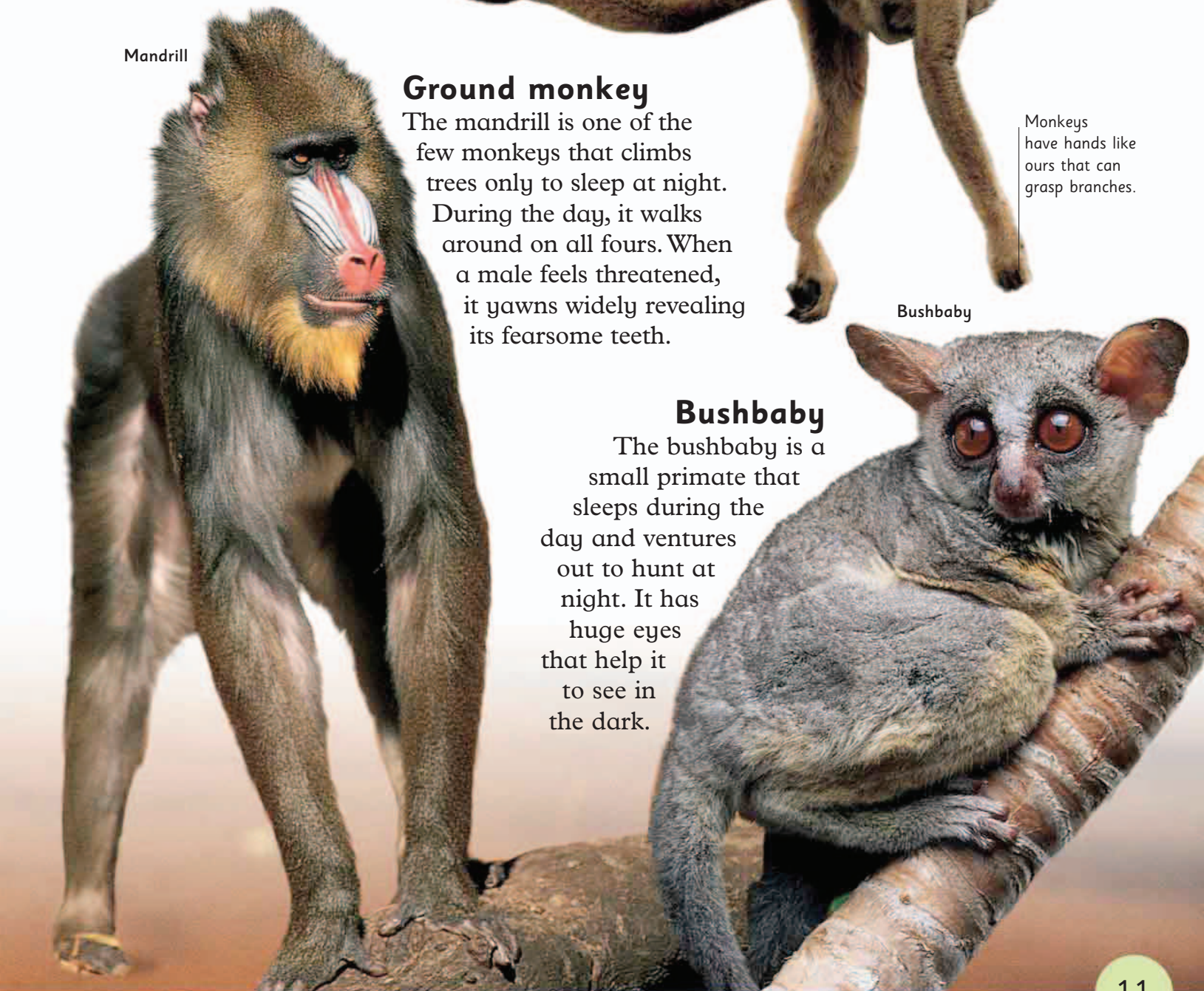
The mandrill is one of the few monkeys that climbs trees only to sleep at night. During the day, it walks around on all fours. When a male feels threatened, it yawns widely revealing its fearsome teeth.

Monkeys have hands like ours that can grasp branches.

Bushbaby

### Bushbaby

The bushbaby is a small primate that sleeps during the day and ventures out to hunt at night. It has huge eyes that help it to see in the dark.



# The apes

Many people confuse monkeys and apes. Apes are large, intelligent creatures that have no visible tails and can stand more upright than monkeys. You and I are members of the ape family.

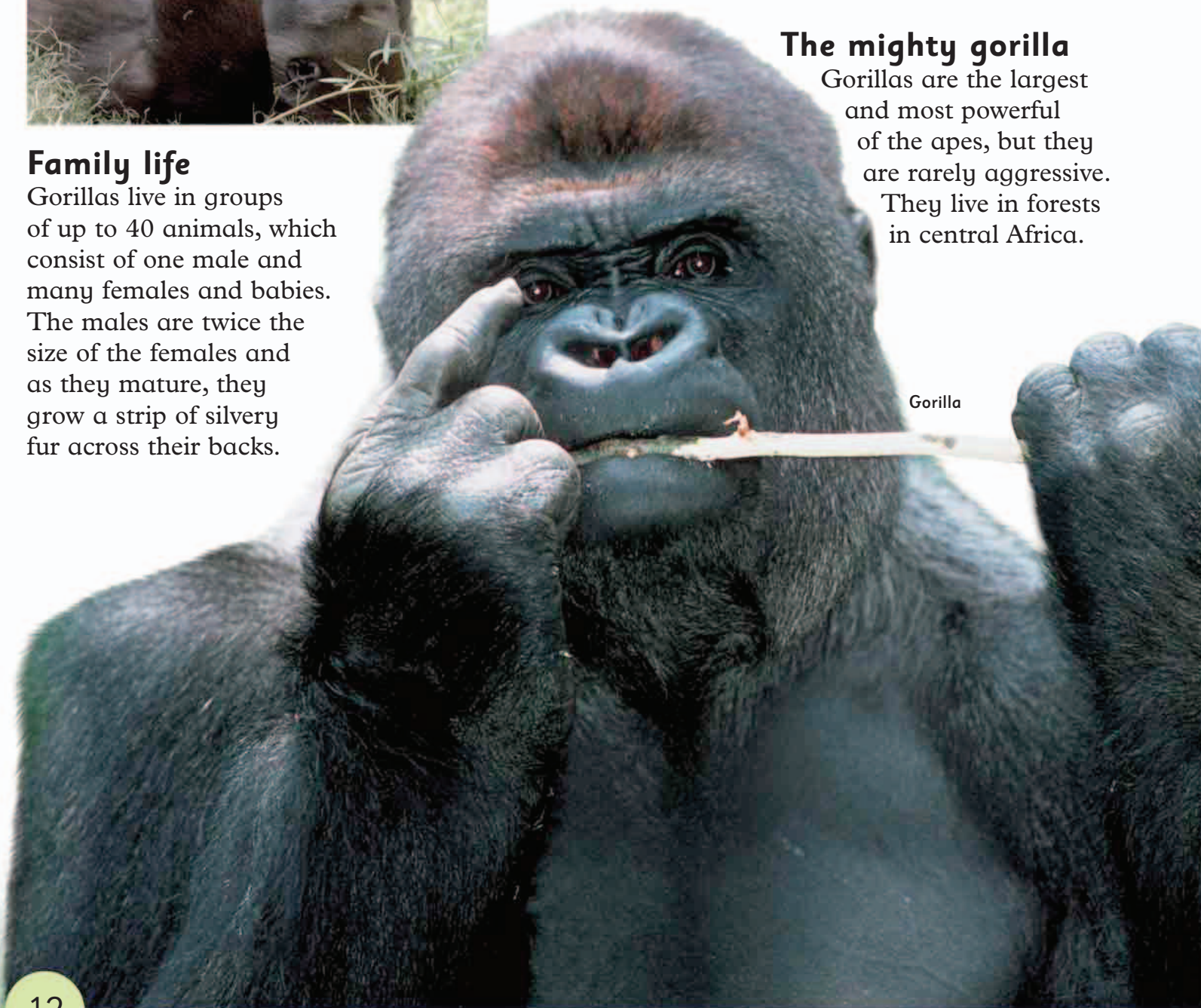


## Family life

Gorillas live in groups of up to 40 animals, which consist of one male and many females and babies. The males are twice the size of the females and as they mature, they grow a strip of silvery fur across their backs.

## The mighty gorilla

Gorillas are the largest and most powerful of the apes, but they are rarely aggressive. They live in forests in central Africa.



Gorilla



### King of the swingers

Gibbons are the most agile of all the apes. Their wrists and shoulders are very flexible, which means they are able to swing from branch to branch quickly. They live in pairs.

### Treetop apes

These orange orang-utans live in the rainforests of Borneo and Sumatra up in the trees. They rarely go down to the jungle floor, preferring to eat and sleep in the treetops.



### The clever chimp

Chimpanzees are very intelligent indeed. They communicate with facial expressions and are one of the only animals to use tools.



This chimp is breaking nut shells using a piece of stone as a tool.

Grooming strengthens friendships within the group.



### Grooming

Chimps live in communities of up to 120 apes. Grooming is very important in ape societies. They can often be seen picking dirt and ticks out of each other's fur.

# The cat family

Lynx

All cats around the world spend their time doing the same sorts of activities: hunting, eating, and sleeping.

This lynx is about twice the size of a pet cat.

## Living alone

Cats like to live on their own; only a few live in groups. Usually, the cats that live together are mothers and their babies.

## Cat carnivores

Cats only eat meat, and those living in the wild have to catch it. Some are fussier than others.



**Caracal:** these cats can leap high into the air to catch birds.



**Bobcat:** this cat lives in the woodlands of North America and eats rabbits.



**Jaguarundi:** this small, stocky cat eats anything it can catch.



**Fishing cat:** this cat catches fish by grabbing them with its claws.

Pumas are the long jumpers of the cat world. They can make massive leaps of 12 m (40 ft).

## Climbers

Some cats live in forests, and many can climb trees. They have very good balance and sharp claws that hook onto branches.

Puma



### The loudest roar

Most big cats roar; when this lion gets angry, his roar can be heard 8 km (5 miles) away! All other cats miaow, purr, and growl.



Lion

Domestic cat

There are more than 300 million pet cats in the world. They are closely related to wild cats.

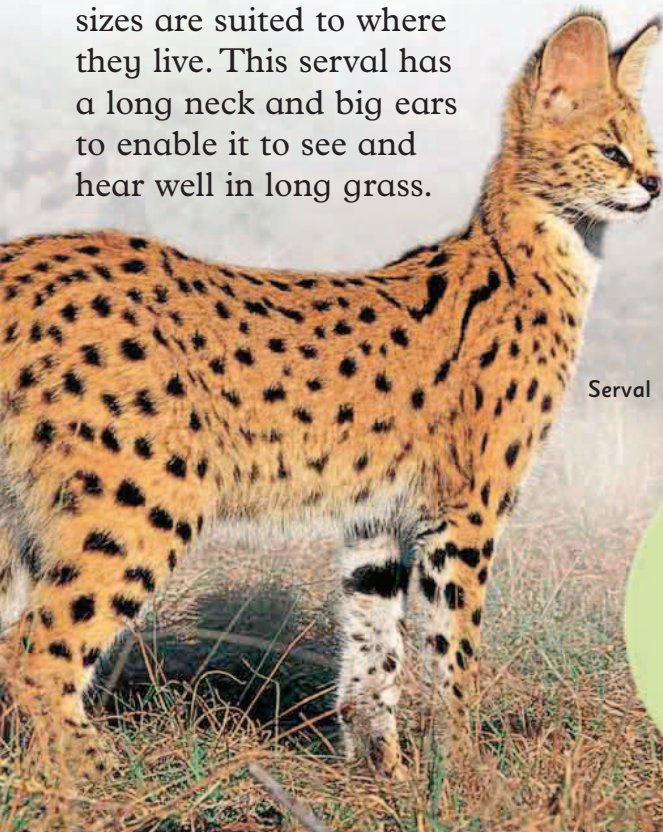


### A fine coat

A cat's fur keeps it warm and camouflaged. Cats spend a lot of time licking their fur with their rough tongues to clean it.

### Cat features

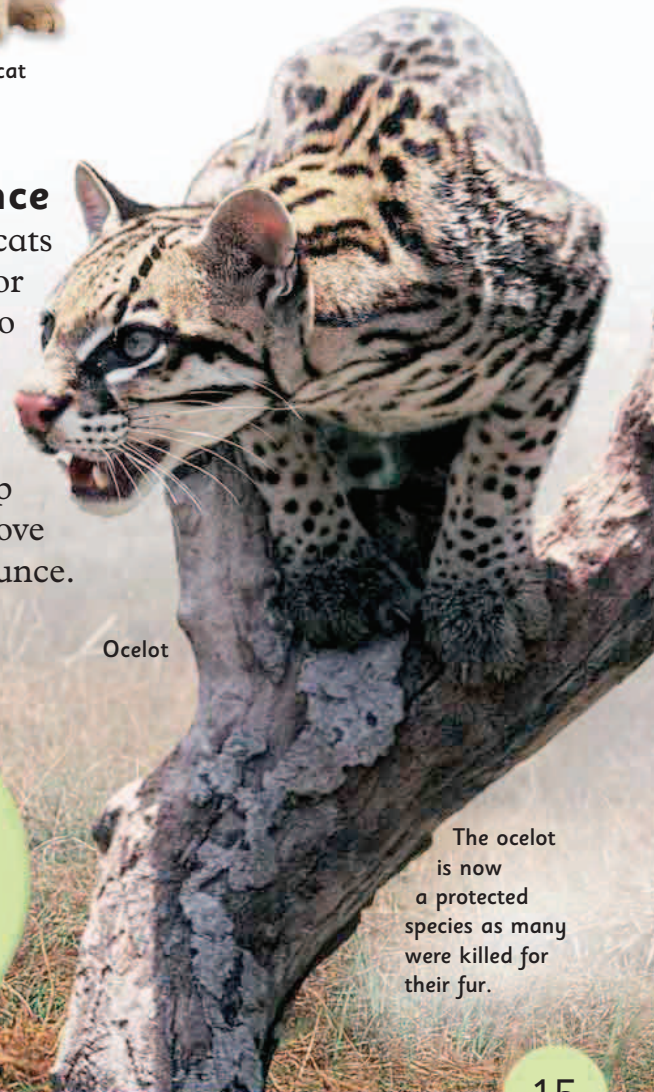
All cats look similar, but their coats, shapes, and sizes are suited to where they live. This serval has a long neck and big ears to enable it to see and hear well in long grass.



Serval

### Stalk and pounce

Unlike dogs, cats cannot run fast for long distances, so most rely on their ability to stalk and pounce. When stalking, they keep their bodies low, move slowly, and then pounce.



Ocelot

### Turn and learn

Dogs that live in the wild:  
pp. 18-19

The ocelot is now a protected species as many were killed for their fur.

# Big cats

The five largest, most ferocious meat-eaters of the cat family are known as the “big cats”. They are the lion, tiger, jaguar, leopard, and snow leopard.

## King of the cats

Lions, found on the grassy plains of Africa, are the only cats that live in groups, or prides.

All mother cats carry their cubs in their mouths.

Pride of lions

## Black leopard

Leopards come in different colours, but most are yellow with black spots. Black panthers were once thought to be a different type of cat, but are actually black leopards.



## Sleepyheads

Cats are among the sleepest animals in the world: they spend more than 19 hours a day asleep. Prides of lions can often be seen napping under trees. They are perfectly safe to sleep in the open as they are in little danger of being killed by another animal.

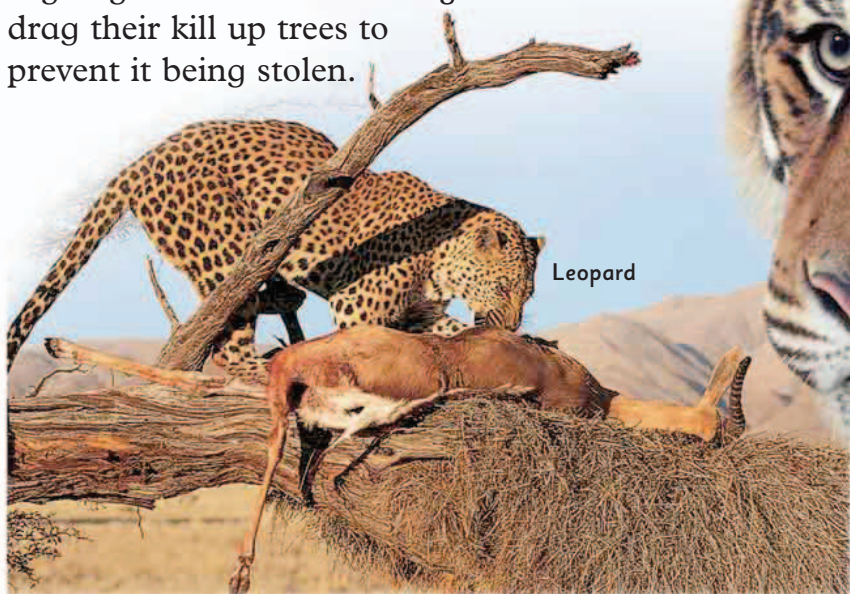


**Water cat**

The jaguar has large spots and loves swimming, which is quite unusual among cats. During the day it catches fish by flipping them out of the water with its paws. At night it hunts for animals in the jungle.

**Spotted leopard**

Leopards love to climb trees. High up in the branches is a good spot to watch what is going on below. Often they will even drag their kill up trees to prevent it being stolen.



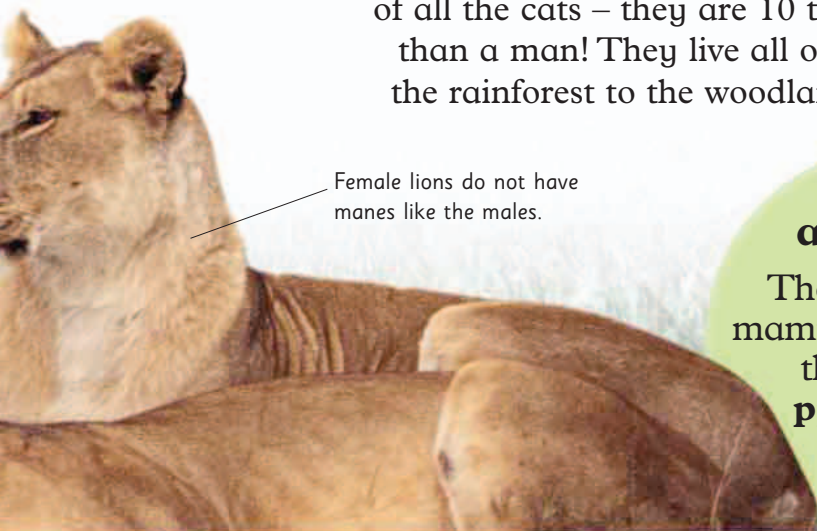
Leopard



Tiger

**The giant tiger**

Tigers are the largest and most powerful of all the cats – they are 10 times stronger than a man! They live all over Asia, from the rainforest to the woodlands of Siberia.



Female lions do not have manes like the males.

**Turn and learn**

The fastest land mammal on Earth – the cheetah: pp. 154-155

Tigers hunt mainly in the dark.

Their whiskers help them to feel their way in the dark.

# The dog family



When you think of dogs, you probably think of pets, but many members of the dog family live in the wild.

## Wolves

Wolves live in packs of about 20, which are led by a male and female. They are meat-eaters and all work together to hunt and kill. They can grow up to 1 m (3 ft) tall and have very sharp teeth, which are useful for tearing up meat.

European grey wolf

Wolves sometimes spray their urine to mark out their territory.



## Wolf language

Facial expressions and body language are used by wolves within a pack to communicate with each other. When they want to keep other wolf packs away, they howl rather than bark.

## Training the wolf

For thousands of years, people have trained dogs to do certain jobs.



**Guide dogs:** many dogs are used to guide blind people.



**Sheep dogs:** people have been using dogs to round up sheep for centuries.



**Police dogs:** these guard dogs use their noses to sniff out criminals.

At night, whole packs howl together to warn other wolves that they are there.





Red fox

### Urban foxes

A fox is a small dog. It tends to hunt at night and lives alone or in small family groups. The red fox has become a common sight in towns and cities, where it raids dustbins for food.

### weird or what?

Dogs have been man's best friend for over 12,000 years! All pet dogs are descendants of the grey wolf and still share many characteristics, such as a very good sense of smell and hearing.

African hunting dog

When the dogs have killed, the whole pack shares the food.

These dogs are often known as "painted wolves" because of their beautiful colouring.



### Raccoon dog

This hairy dog is called the raccoon dog, although it is not related to the raccoon. It is one of the only dogs that climbs trees.

### Wild dogs

African hunting dogs live in packs of up to 30. They have long legs and a lean body. They hunt together as a pack and can kill prey larger than themselves. They hunt at least once a day.

Grey wolves live all over the world, including in North America, northern Asia, Europe, Africa, and the Middle East.

A fox's tail is called a brush.

# Bears

Members of the bear family are big, furry mammals with large heads, thick legs, and short tails. They have five claws on each foot.

## Bear necessities

Bears have a good sense of smell, but weak eyesight and hearing. This is reflected in their large nose and very small ears and eyes.

Brown bear



## Bears of the world

There are only eight types of bear in the world, including the polar bear and the brown bear.



**Brown bear:** this big bear lives in Europe, Asia, and North America.



**Polar bear:** the biggest and most deadly bear. It lives in the Arctic.



**Spectacled bear:** it got this name because it looks as if it is wearing glasses.

## A long doze

Many bears are dormant in the winter, which means they doze or sleep non-stop during this time. They eat and eat during the summer and autumn months, building up fat they can use in the winter.

The brown bear can stand up to 3.5 m (11 ft) – that's twice the height of an adult human!

Which bear makes nests in trees?



**American black bear:** this bear sleeps up to six months during winter.



**Sloth bear:** its claws grow up to 8 cm (3 in) long, and help it tear open ant nests.



**Giant panda:** this black-and-white bear mostly lives by itself.



**Sun bear:** it uses its 25-cm- (10-in-) long tongue to suck honey out of trees.



**Asiatic black bear:** this very rare bear is a protected species.

### Climbing bears

Bears normally walk slowly, but if they feel the need they can gallop at very high speeds.

It may seem unlikely because of their size, but most bears are also able to climb trees. This giant panda is climbing a tree to find a safe place to rest.

The giant panda eats mostly bamboo shoots. It will sometimes eat small animal grubs if it can find them.



### Water bears

Polar bears live in the Arctic. They have thick fur to keep them warm in the chilly weather. They are excellent swimmers and can hold their breath for up to two minutes underwater.



### Mother love

The mother bear looks after her cubs fiercely during their first year, teaching them how to survive. She sometimes stands on her back legs to increase her height and frighten enemies away.



The sun bear.

# Small and cunning

There are many small, meat-eating mammals that hunt or scavenge for their food. Many are known for their clever hunting methods.

## The weasel family

Members of the weasel family have long bodies and short legs. They have a fierce reputation for hunting – they are able to kill animals larger than themselves.

Weasels hunt by themselves, killing animals by biting their necks.

The American mink has a dark brown coat all year round.



Stoat

## Stoats

Stoats and minks are small animals related to weasels. In summer, stoats are brown with a white tummy, and in winter, some turn white so that they are camouflaged in the snow.

Weasel

## Turn and learn

The badger, a relative of the weasel:  
p. 25



### Raccoons

Raccoons are small animals with fox-like faces and bandit-style masks. They are inquisitive creatures who make clever hunters.

Raccoons are often seen in towns rifling through dustbins. They have even been known to open door latches.



### Smelly skunks

Skunks are found in the Americas and feed on small animals and fruit. When threatened, they lift their tails and let out a foul stink, which you can smell from a kilometre (half a mile) away!



### Mongoose family

Mongoose are so cunning that they can kill some of the world's most venomous animals, such as snakes.

Meerkats

This mongoose has clamped its teeth around a snake's neck to kill it.



### Meerkats

Meerkats are a type of mongoose that live in groups. They hunt during the day, while a sentry scans the area from the highest point, sitting upright, looking out for enemies.

### Weasel relatives

These mammals belong to the weasel family.



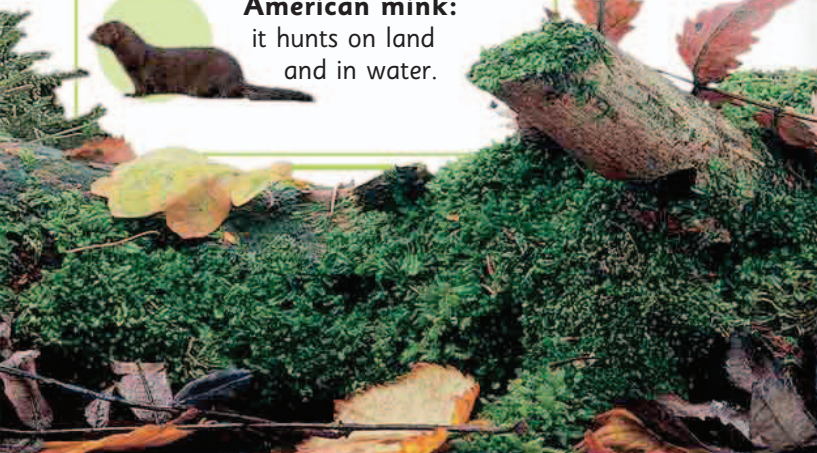
**Wolverine:** this animal has a larger, stockier body than a weasel.



**Polecat:** polecats are sometimes kept as pets. They are called ferrets.



**American mink:** it hunts on land and in water.



# The burrowers

Many mammals are diggers, building their homes beneath the ground. Some use their burrows only to sleep in, while others live underground.

## Rabbits

Most rabbits dig burrows, called warrens, underground to protect themselves from enemies, to shelter from cold, and to provide a safe place for their babies. European rabbits live in large groups.

Rabbit warrens are often a maze of tunnels.



## Boxing hares

Hares are relatives of rabbits that have longer ears. They can sometimes be seen boxing during the spring breeding season. They stand on their back legs, hitting out with the front ones.

Hares do not actually live underground, they live in hollows they make with their bodies in the earth.



## The aardvark

This animal has a body like a pig, ears like a rabbit, and it licks up ants like an anteater, but it is not related to any of these animals! It is a very good burrower, digging long tunnels with its claws.



## Armadillo

Armadillos look as if they could take on an army with their bony armoured backs. They dig burrows to find food and make dens. Most rest in their burrows during the day and hunt by night.

Badgers have quite large, stocky bodies, and small heads with long noses to root out food.

## Badgers

Badgers have short legs that are good for scurrying down tunnels. Their burrows, known as setts, are passed down through generations of badgers. They tend to hunt at night.

Badgers have poor eyesight but a good sense of smell.



## Moles

You will know when European moles are about because they leave molehills behind on the ground. Moles spend most of their lives underground eating worms and insects.



The star-nosed mole uses its paws as paddles to "swim" through the earth.



European mole

# Insect-eating mammals

Many mammals spend their lives eating insects and other small creepy-crawlies. Most of them only hunt at night.

## Giant anteater

The giant anteater is a large mammal that likes to eat ants and termites. It has a large nose and a tongue that is as long as your arm, perfect for sticking into termite mounds.

Pangolins shut their nostrils while eating ants to stop them from rushing up their noses.

## Scaly anteater

Sometimes called a scaly anteater, this pangolin is not actually related to anteaters. It uses its long claws to dig into anthills and termite mounds.



## Silky anteater

The silky anteater has a shorter nose and paler fur than its cousins. It spends much of its time digging out tree ants and licking them up.



The giant anteater can eat more than 30,000 ants in one day!

## Turn and learn

Ants and termites:  
pp. 124-125  
Earthworms:  
p. 33

The head and paws appear as the hedgehog sniffs its surroundings and looks out for danger.



When curled up, the hedgehog looks like a spiny ball.



## Small and prickly

Hedgehogs use their long noses to snuffle in the earth for insects and worms. They are covered in sharp spines that are made of a kind of hair. If this creature feels threatened, it rolls its body into a prickly ball. Not many animals would attempt to eat a spiny hedgehog!



The hedgehog flips itself over and goes on its way.

## Shrews

Shrews are small, active mammals that have to eat plenty of insects and worms every few hours to keep their energy up. They can eat more than their weight in food every day.



## The spiny echidna

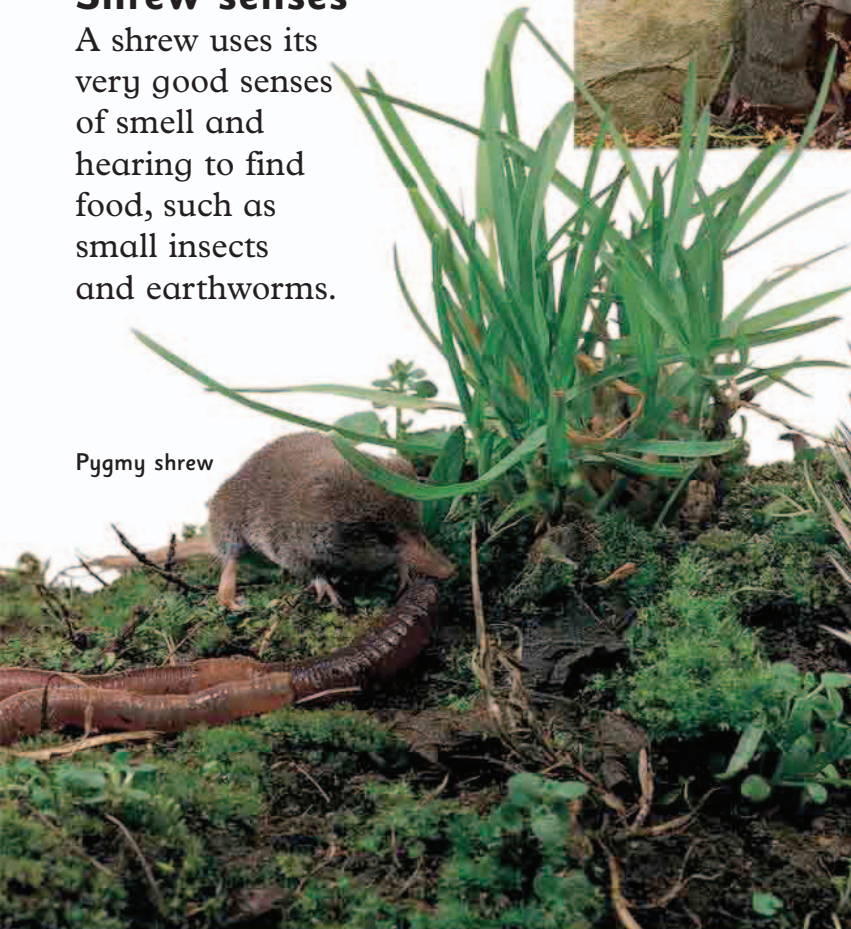
The insect-eating echidna is also covered in spines. It is one of the most unusual animals because, with the duck-billed platypus, it is one of the only mammals that lay eggs.

Echidna

## Shrew senses

A shrew uses its very good senses of smell and hearing to find food, such as small insects and earthworms.

Pygmy shrew



# Rodents

Rodents are the mammal group that includes mice and rats. Rodents are found all over the world from deserts to the Arctic.

## The brown rat

The rat is considered a pest. It lives almost everywhere in the world and can exist in huge numbers if enough food is available.

Brown rat

A rat's tail helps it to balance and turn in the water.



## Dinner time

Rats eat everything we eat and more, which is why they can survive worldwide. The brown rat is a very good swimmer and can catch small fish underwater.

Rats and mice have a very good sense of smell and "talk" to each other using their body smells.

## weird or what?

The black rat was responsible for killing half the population of London in 1665. It brought fleas to England that carried a deadly disease called the bubonic plague.

## Rodent teeth

All rodents have four big front teeth, like this marmot's. They are very sharp.



## Rodent groups

Over 40 per cent of the world's mammals are rodents. They come in many shapes and sizes.



**Hamster:** this creature comes from Western Asia and is a very popular pet.



**Squirrel:** it is an excellent tree climber and uses its tail for balance.



**Vole:** water voles live by rivers and lakes and make burrows in the banks.



**Naked mole rat:** it lives underground and burrows with flat feet.



**Porcupine:** this animal has sharp quills that it raises when threatened.

## Mice

Mice have pointed noses and long whiskers, which help them find their way around dark corners. This house mouse eats many different types of food and can produce 36,000 droppings in a year.

Harvest mice use their tails like hands, to grip onto stalks.



House mouse



## Towns of rodents

Some rodents live on their own, but a lot of them, such as these prairie dogs, live in large underground communities called towns. Each town comprises a number of burrows connected by long tunnels.

Harvest mouse



## A long, long sleep

The dormouse can be found in the woods and fields of Europe and is an excellent climber and jumper. It hibernates, or sleeps, for seven months during the winter without waking up.

# Flying mammals



Flying squirrel

Some mammals have “wings”, so they can glide through the air, but bats are the only mammals that can actually fly by flapping their wings.

## The glider

The flying squirrel has loose pieces of skin on either side of its body. When it jumps, it opens them out like an umbrella and can glide for 100 m (330 ft), steering with its tail and legs.

## Bats

Bats’ wings are actually long arms with skin stretching between each finger. Their thumbs stick out like small claws to grip branches.



Greater mouse-eared bats

During the day, bats roost in dark caves, trees, or under a roof of a building. They sleep upside-down.

Bats squeak to find one another in the dark.



Vampire bat



The saliva of vampire bats numbs the skin of its victims so they can’t feel the blood-sucking bite.

## The real vampire

The vampire bat’s favourite meal is fresh blood, even yours! It feeds by digging its sharp teeth into the flesh, then laps up the blood.

## Bat features

A bat’s head shape reflects the way it feeds.



**Fruit bat:** has a long snout, and a long tongue to sip nectar and eat fruit.



**Long-eared bat:** this bat has large ears that can hear insects’ wings flapping.



**Long-nosed bat:** these bats have long noses to help them smell flowers.



### Bat babies

Some bats bring up their babies together in a huge nursery, often filled with thousands of bats. Amazingly the mother can always find her baby when she returns with food.

Fruit bat

### Bat diet

Most bats eat insects. Others, like this fruit bat, use their long tongues to eat fruit and sip nectar from flowers.

### Catching insects

Bats are very good at catching insects in mid-air – in the dark! They find them by making clicking noises and listening for the echoes bouncing off insects.

### Turn and learn

Gliding frogs:  
pp. 100-101  
Bloodsuckers:  
pp. 116-117

This Geoffroy's long-nosed bat drinks nectar.

# Marsupials

A marsupial is a mammal with a pocket, called a pouch, for carrying its babies in.



## Koala

Koalas look like little bears. They live in Australia and are the only animal that eats eucalyptus leaves. They are so hard to digest that koalas spend 19 hours of the day sleeping to let their tummies settle.



## Little devil

The Tasmanian devil is not much bigger than a small dog but it is very aggressive. It is the biggest meat-eating marsupial and has such powerful jaws that it can eat the entire animal – bones and all!

## More marsupials

Apart from a few that live in South America, almost all marsupials come from Australasia. They vary a lot in looks.



**Dorian's tree kangaroo:** this small kangaroo can climb trees.



**Numbat:** this marsupial feeds almost entirely on ant-like termites.



**Rabbit-eared bandicoot:** These large-eared burrowers are most active at night.



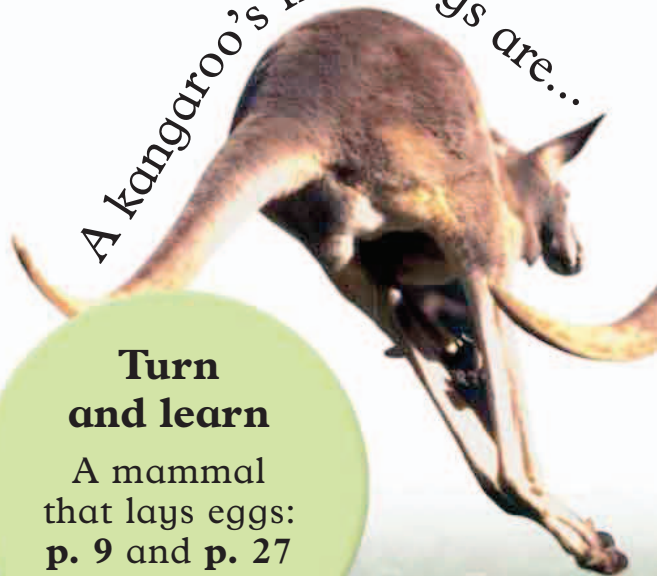
## Bouncing marsupials

Kangaroos cannot walk. Instead they have enormous back legs that they use to jump everywhere. They can move very fast just by leaping.

A kangaroo's front legs are...

## Turn and learn

A mammal that lays eggs:  
p. 9 and p. 27



### Supermum!

Opossums live in the Americas. Unusually for marsupials, the mother has no pouch. Instead, her babies cling to her. Sometimes one mother can have up to 20 babies at one time!

Opossums are very good tree climbers.



### In the pouch

Most marsupials have pouches. When the babies are born, they are as small as beans and wriggle straight into the pouch. They do most of their growing there, instead of in their mother's tummy.

The joey belonging to this mother is definitely big enough to climb out of its pouch.

### Little joey

Kangaroo and wallaby babies are commonly known as joeys. They spend several months in the mother's pouch, and even when they are big enough to walk, they sometimes jump back in for safety.



... not used when it hops.



Their huge tails help to balance them when they hop.



# The mighty elephant

Elephants are the largest land animals on Earth – the biggest one ever found weighed as much as 150 men! There are two main types of elephant, the African and the Asian.

African elephants flap their enormous ears to keep themselves cool in the hot sun.

African elephants

## Living in herds

African elephants live in groups called herds. However, only females and youngsters live together, males live on their own. A family usually contains about 8-10 elephants.

Elephants' tusks are very big upper teeth.



## Playtime!

Baby elephants love to play, which is an important part of growing up in a herd. They chase one another, throw sticks, and climb all over each other.

## An amazing nose

Elephants have enormous noses, called trunks. But they are no ordinary noses, they do many more jobs than simply smelling. Elephants use their trunks to eat, drink, wash, and even pick up vibrations from the ground.



Elephants make loud, trumpeting calls to each other.

Asian elephant

## A handy nose

An elephant can grip things with the end of its nose, like people do with their hands. It uses its trunk to grasp plants and eat them, to greet other elephants, and to show aggression to others.

Elephants use their trunks to grab leaves high up in the trees that other animals cannot reach.



## Bathtime!

An elephant's skin is very sensitive and needs a lot of bathing to rinse away creepy-crawlies and keep it cool. It often sucks up water in its trunk and sprays it over its body.

*African elephants have much bigger ears than Asian elephants.*

# Hoofed mammals

A hoof is a certain type of foot with a hard covering. Hoofed mammals are found all over the world.



## Wild pigs

Pigs are hoofed mammals that eat almost anything. Wild pigs are speedy runners and protective of their little, stripy babies.

## Different hoofs

A hoofed foot has a hard case, like a big toenail, around each toe for strength. Hoofed feet are good for fast running.



**Horse:** a horse has only one toe surrounded by a hoof. It runs on tiptoe.



**Rhinoceros:** these large-hoofed mammals have three toes.



**Camel:** the camel has two toes that are widely spaced for walking on sand.

## The tapir

Tapirs have very long noses and look like pigs, but they belong to a different hoofed family.

## On bended knee

The warthog is a long-legged, African pig. When it feeds, it kneels on its wrists.



## Quick, duck!

Tapirs spend much of their time in the water. When threatened, they sink under water leaving their noses poking above the surface like a snorkel so they can breathe.



Malaysian tapir

The nose and upper lip form a trunk.



### Deer of the north

Reindeer live in cold areas in the northern parts of the world. Twice a year they “migrate” – take a long journey – for thousands of miles to avoid bad weather and to breed.

### Deer giants

The elk lives in swampy forests of North America and Europe. It is the largest deer in the world. Its antlers can grow to 2 m (7 ft) across – bigger than an umbrella – with up to 20 spikes on them.



### Deer

Deer are woodland animals that live together in small groups, called herds. They have antlers, which are made of bone.

Deer lose their antlers and grow new ones every year.



### Branching out

Only male deer have antlers (apart from female reindeer, who have them as well). Deer antlers are always branched, unlike the pointed horns of cattle.

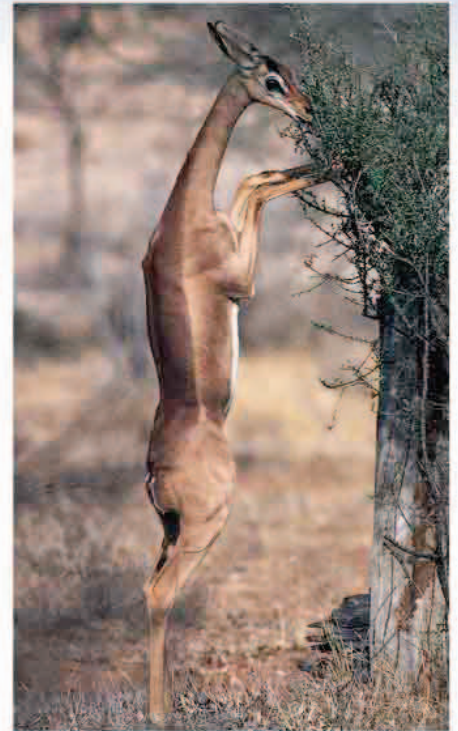


# The cattle family

The cattle family are hooved mammals. They are herbivores, which means they eat plants. They have four stomachs to digest the plants they eat.

## Early walkers

Many members of the cattle family are killed for food by other animals. Babies, like this wildebeest calf, are able to run within hours of their birth so they can try to stay out of danger.

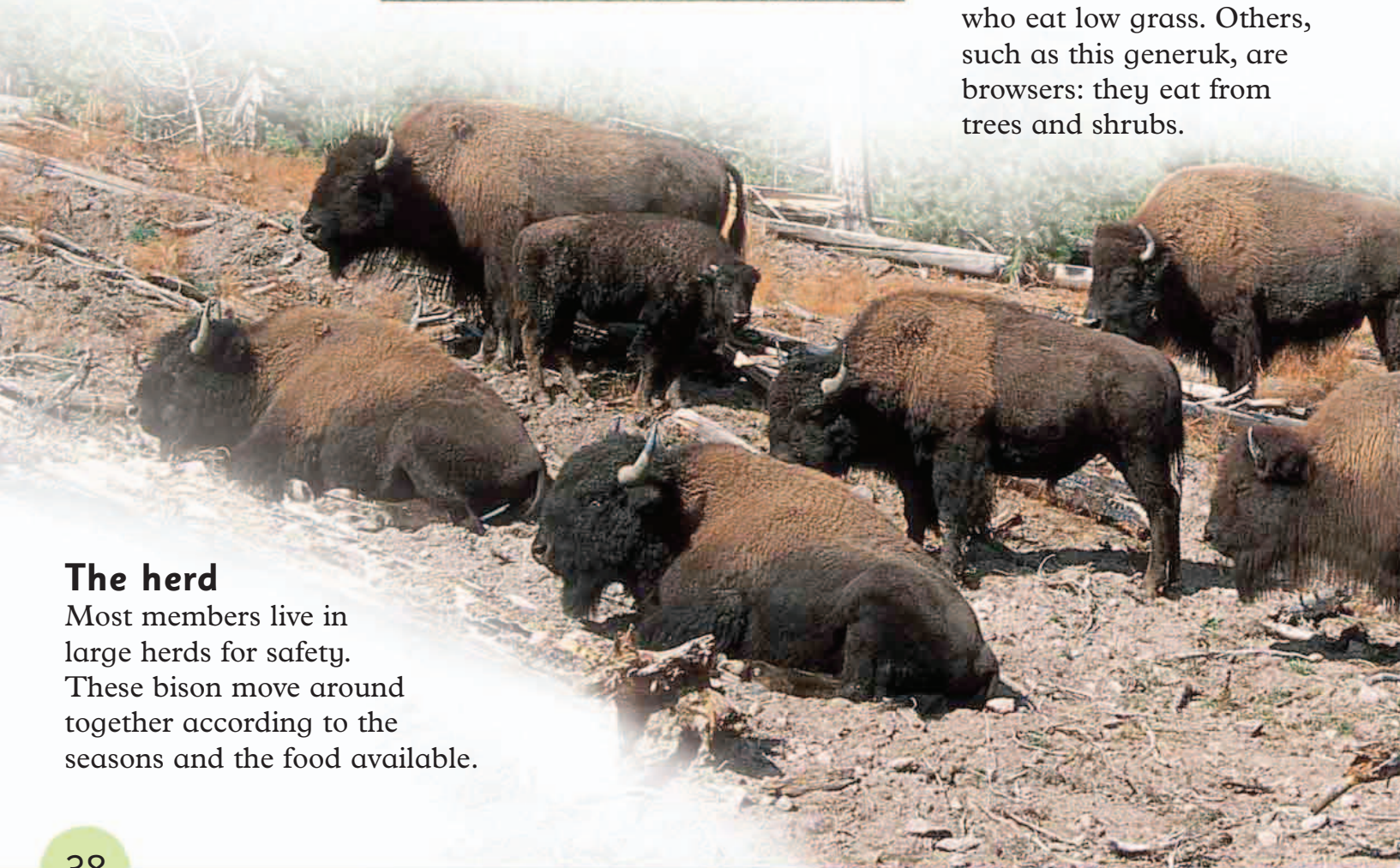


## Grazers and browsers

The cattle family all eat plants. Some are grazers, who eat low grass. Others, such as this generuk, are browsers: they eat from trees and shrubs.

## The herd

Most members live in large herds for safety. These bison move around together according to the seasons and the food available.





## The horn collection

Unlike deer, members of the cattle family do not have branched horns.



**Antelope:** male antelopes have long, pointed horns.



**Bighorn sheep:** the horns of the male sheep curve almost in a circle.



**Blackbuck:** these impressive horns are long and wiggly.



**Muskox:** their horns curve right down, then up at the tips.



**Ibex:** this mountain goat has huge, thick horns that curve over its back.

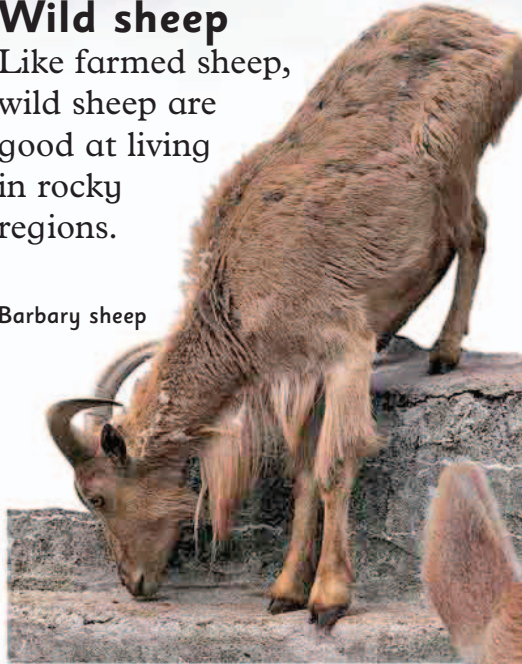


**Sitatunga:** male sitatungas have long spiral horns.

## Wild sheep

Like farmed sheep, wild sheep are good at living in rocky regions.

Barbary sheep



## Spring in its step

The springbok gets its name from its high spring-like bounces that show predators – animals that want to eat them – how fit it is.

## Taming the beast

Wild cows, sheep, and goats were tamed thousands of years ago to provide meat, milk, wool, and leather. Modern farm cows are only distant relations of wild cattle.

Jersey cow



# The horse family

Thousands of years ago, horses were wild animals. Later, humans tamed them and wild horses almost disappeared. Wild horses of today include zebras and asses.

## The hoof

All horses and their relatives have one toe surrounded by a hoof. They run on tiptoe, which means they can run very fast. All horses have long tails and manes.

Stallion

Male horses are called stallions and females are called mares.



## Mustangs

The wild horses in the USA are actually tame horses that escaped into the wild hundreds of years ago. They live in herds of one male and lots of females.

The hard hoof protects the toe.

## Mood swings

Horses communicate with each other by moving their heads, tails, and ears.



**Teeth showing:** horses bare their teeth if they are unhappy or if they are sniffing the air.



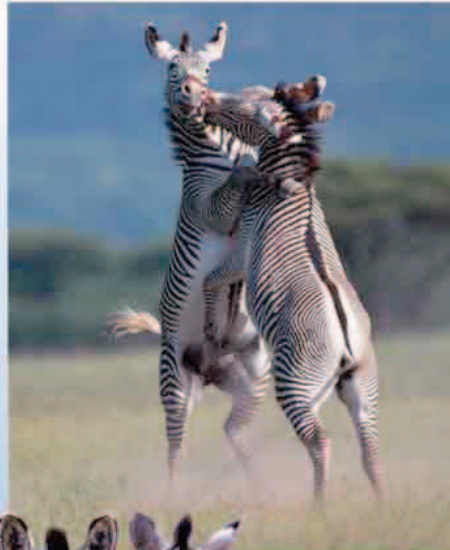
**Ears back:** when a horse is angry, it puts its ears back flat against its head.



**Ears forward:** when a horse is paying attention, it has its ears facing forwards.

## Wild ass

Asses are smaller than horses and have much longer ears. Asses that live with humans are called donkeys. The African wild ass, which is quite rare, lives in the rocky deserts of North Africa.



## Fighting it out

Male zebras fight for females by rearing up or kicking with their back feet. One male will take control of about six females.

## Stripy horses

Zebras are stripy horses. No one knows why they are stripy but we do know that, like our fingerprints, each zebra's stripes are unique. They live in Africa in large herds and graze on grass.

Plains zebras



# Hoofed giants

The last members of the hoofed family are by no means the least. They are some of the biggest mammals in the world. Meet the hoofed giants.

## Healthy appetite

Giraffes are never short of food – they have such long necks that they can reach high leaves on trees.



## Family members

Some cousins of the hoofed giants are much smaller in size.



**Okapi:** this animal is the only relative of the giraffe. It has a much shorter neck.



**Pygmy hippo:** this small hippo is a fifth the size of its cousin.



**Alpaca:** alpacas and llamas are camel cousins that live in South America.

## Giraffes

The giraffe is the world's tallest animal. It is taller than three tall men standing on each other's heads!





A two-humped camel is called a bactrian.

### **Ships of the desert**

Camels live in hot, dry places. Their humps act like huge food stores of fat that they can use up when there is nothing available to eat.

### **The huge rhinoceros**

The rhinoceros has skin that is thicker than this book and huge horns that are made of hair.



White rhino



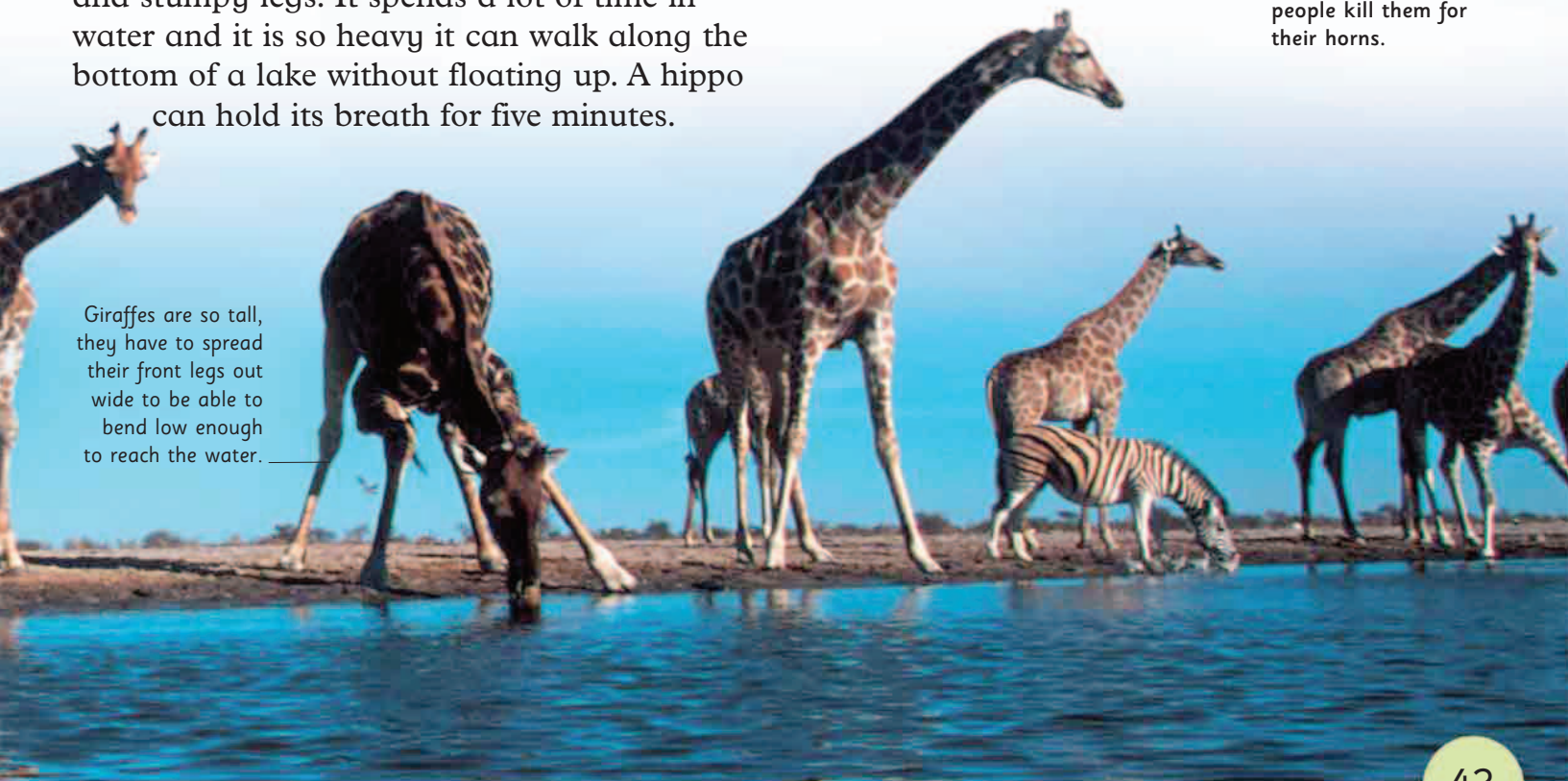
### **The hippopotamus**

This mammal giant has a huge, stocky body and stumpy legs. It spends a lot of time in water and it is so heavy it can walk along the bottom of a lake without floating up. A hippo can hold its breath for five minutes.



Indian rhino

There are very few rhinos left because people kill them for their horns.



Giraffes are so tall, they have to spread their front legs out wide to be able to bend low enough to reach the water.

# Water mammals

Not all mammals live on land – some live in water. Unlike fish, however, water mammals have to go to the surface to breathe.

## Seals

Seals, which include sea lions and walrus, have flippers instead of arms and legs. These make them very good at swimming but not good at walking.

**Turn and learn**  
Giant mammals of the sea:  
pp. 46-47

Sea lions can walk more easily than other seals because their flippers are able to move in several directions.

## Underwater lives

Seals spend most of their lives in water, but return to land to have babies. They have a thick layer of fat, called blubber, which keeps them warm.

Seals are often very playful in the water.



## Otters

Otters are mammals that have webbed feet to help them swim. The river otter lives along river banks and spends its day swimming to catch food.



## Otters of the sea

The sea otter is the smallest sea mammal. It has luxurious, thick fur that keeps it very warm. It rarely comes to land, and even sleeps in the water. When it nods off, it wraps itself up in kelp plants to stop it from drifting away!

## Sea cows

Manatees are often called sea cows because they are so big and they “graze” on underwater plants. They spend all their lives in water, and even give birth there.



Walrus use their noses, like pigs, to root around the sea floor for food, such as crabs or sea urchins.

## Walrus

Walrus are huge sea mammals. They have powerful, blubbery bodies and two large, front teeth, called tusks, which can grow up to 1 m (3 ft) long. Their tusks help them cut through ice sheets and keep enemies away.



## In the pink

Walrus are normally greyish brown in colour. But when they sunbathe, they turn blush-pink because their blood rushes to the surface of their skin to cool it down.

# Ocean giants

Whales and dolphins look like fish but they are actually mammals. The whale family includes some of the biggest creatures on earth.



## The big blue

The blue whale is the largest animal in the world – its heart is the size of a small car. The next largest creature, a bull African elephant, could sit on its tongue!



## Turn and learn

Water mammals:  
pp. 44-45  
Plankton:  
pp. 140-141



## Toothed whales

There are two kinds of whales – toothed whales and baleen whales. Toothed whales eat fish and large animals, such as seals. The killer whale can even leap onto beaches to grab unfortunate seals.



## Baleen whales

Some whales, such as this humpback whale, have rows of filters called plates, instead of teeth. These are called baleen whales. They gulp huge amounts of water, then sieve it through the plates to remove the food – tiny animals called plankton.



## Underwater gossip

Whales live in groups, or pods, and many talk to each other using squeaks, whistles, rumbles, or clicks. Beluga whales “speak” so much that they are sometimes called sea canaries.



## Whales

Most whales look quite similar but a few have different features.



**Narwhal:** this whale has an enormous sword-like tusk, which is actually a tooth.



**Porpoise:** the porpoise is a toothed whale that looks similar to a dolphin.



**Sperm whale:** this whale holds the record for the deepest dive of any mammal.



**Amazon river dolphin:** this dolphin is one of the only freshwater whales.

## Leaping dolphins

Dolphins are small whales. They are highly intelligent and curious, and are often seen leaping alongside boats at sea.



Bottlenose dolphin

Dolphins have very strong tails that help lift it high above the surface.

Dolphins leap out of the water to avoid enemies – leaping helps them to swim faster – or to herd fish by making loud splashes.



Spotted dolphin

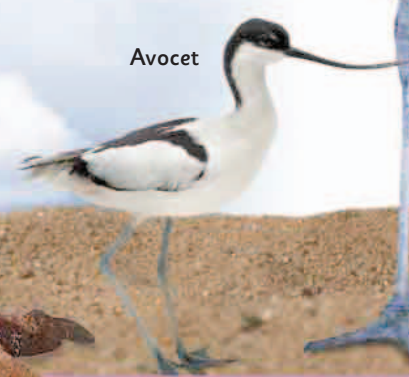
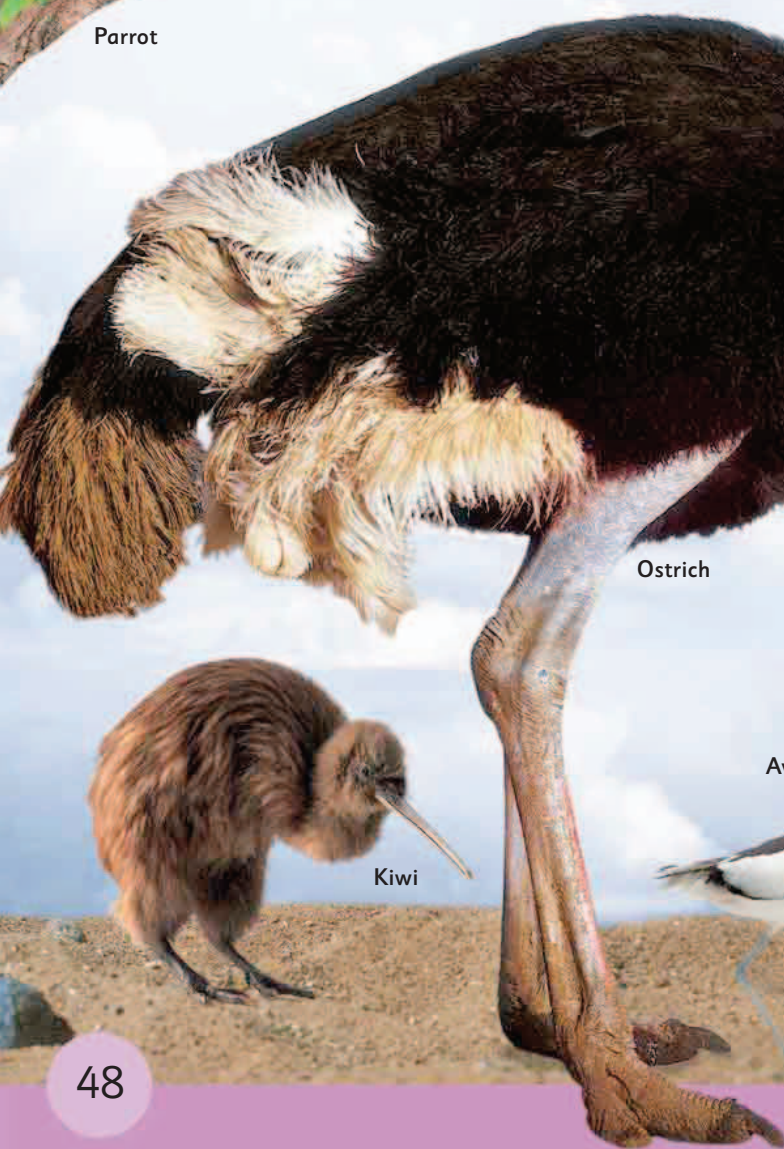
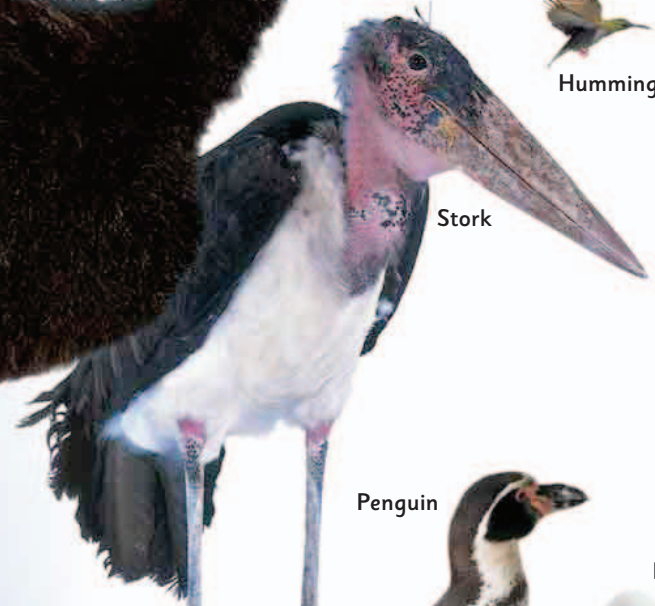
## Underwater babies

Whale and dolphin babies, called calves, grow in their mother’s tummies, like other mammals. The calf drinks its mother’s milk until it is old enough to eat solid food. Spotted dolphins, like this mother and calf, live in groups of up to 15.

# Birds

Most birds can fly. This has meant that over the years, they have been able to live in places that other animals could not get to. They live all over the world, even in the chilly Arctic.

Scientists have discovered that modern birds evolved from dinosaurs.

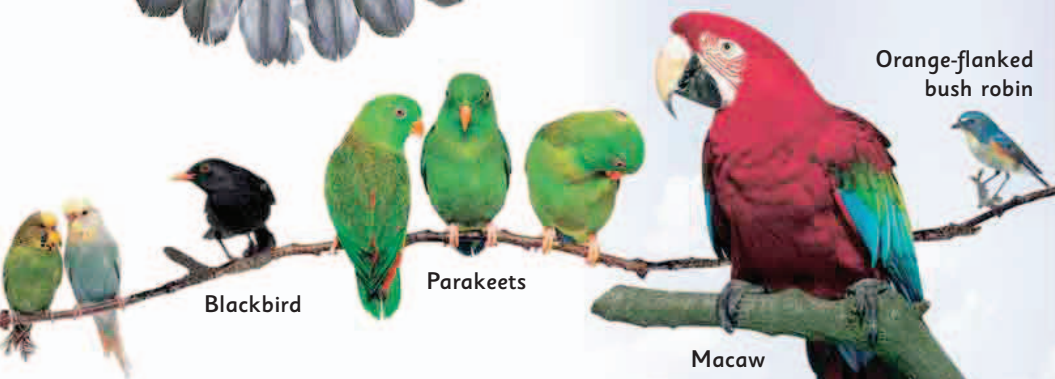


**Picture detective**

Take a look through the bird pages and see if you can spot who these body parts belong to.



Buzzard



Blackbird

Parakeets

Orange-flanked bush robin

Macaw

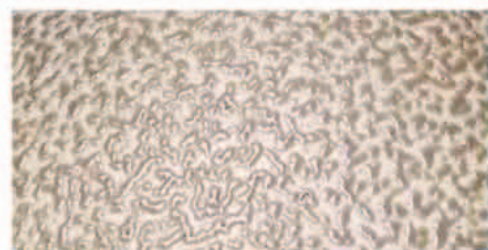


Flamingo



Turkey

Chicken



**A world full of birds**

There are almost 10,000 different kinds of birds in the world. They range from the enormous, flightless ostrich, which is taller than a man, to the bee hummingbird, which is smaller than your thumb.

**Turn and learn**

Flying mammals: pp. 30-31  
 Flying insects: pp. 110-111

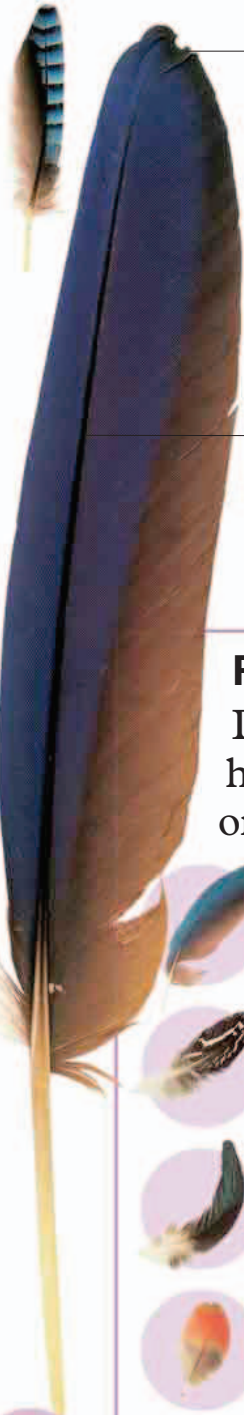
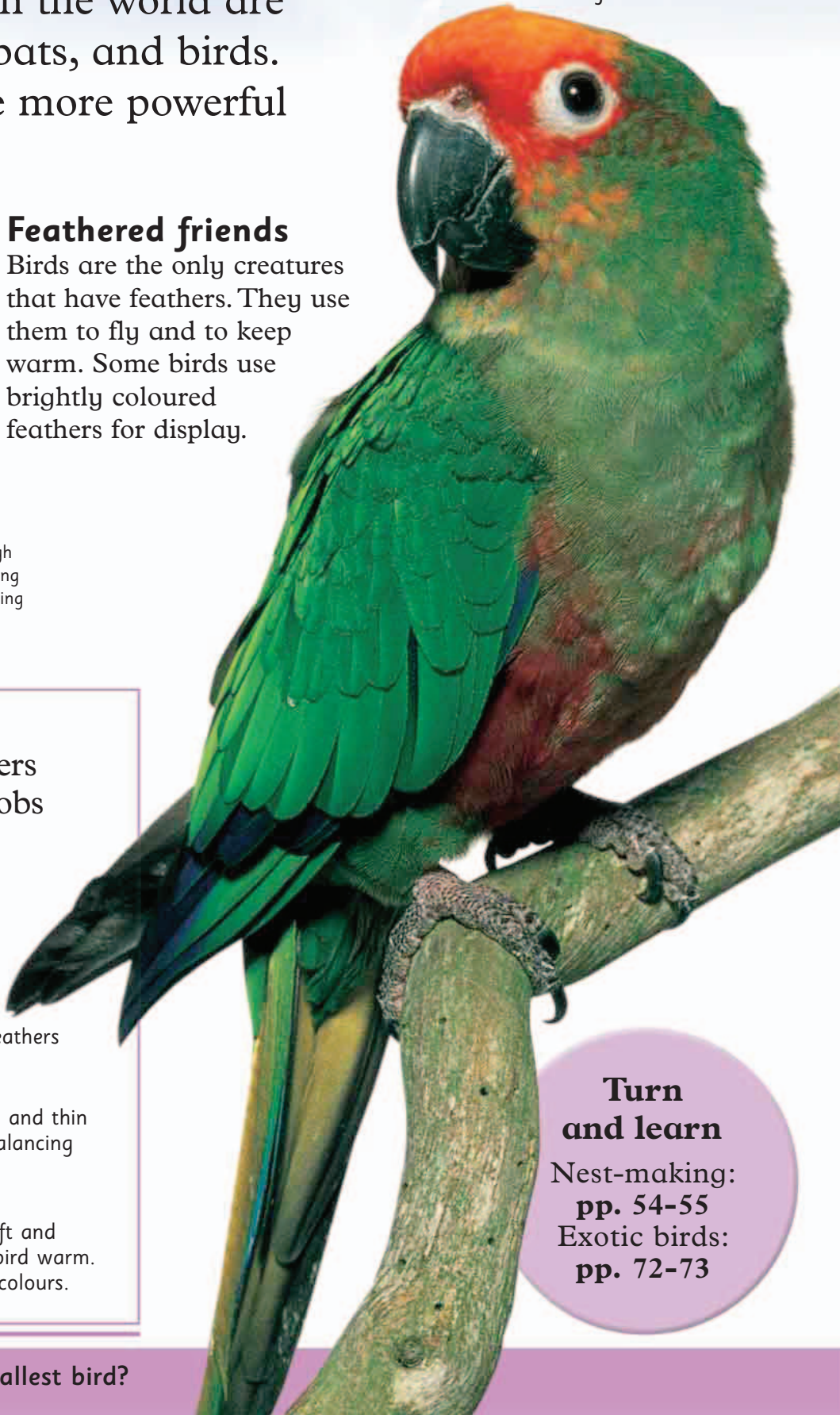
# The world of birds

Birds spend much of their time looking after, or preening, their feathers to keep them in good condition.

Only a few animals in the world are able to fly – insects, bats, and birds. But none of them are more powerful or skilled than birds.

## Feathered friends

Birds are the only creatures that have feathers. They use them to fly and to keep warm. Some birds use brightly coloured feathers for display.



Feathers are made up of tiny hair-like barbs that all mesh together.

A rigid “backbone”, or quill, runs through the centre of the wing feathers, strengthening them for flying.

**Feathers**  
Different feathers have different jobs on a bird.



**Outer wing:** strong feathers to provide power in flight.



**Inner wing:** has smooth and flat feathers to help in flight.



**Tail feather:** long and thin for steering and balancing during flight.



**Body feather:** soft and downy to keep a bird warm. Some have exotic colours.

**Turn and learn**  
Nest-making: pp. 54-55  
Exotic birds: pp. 72-73

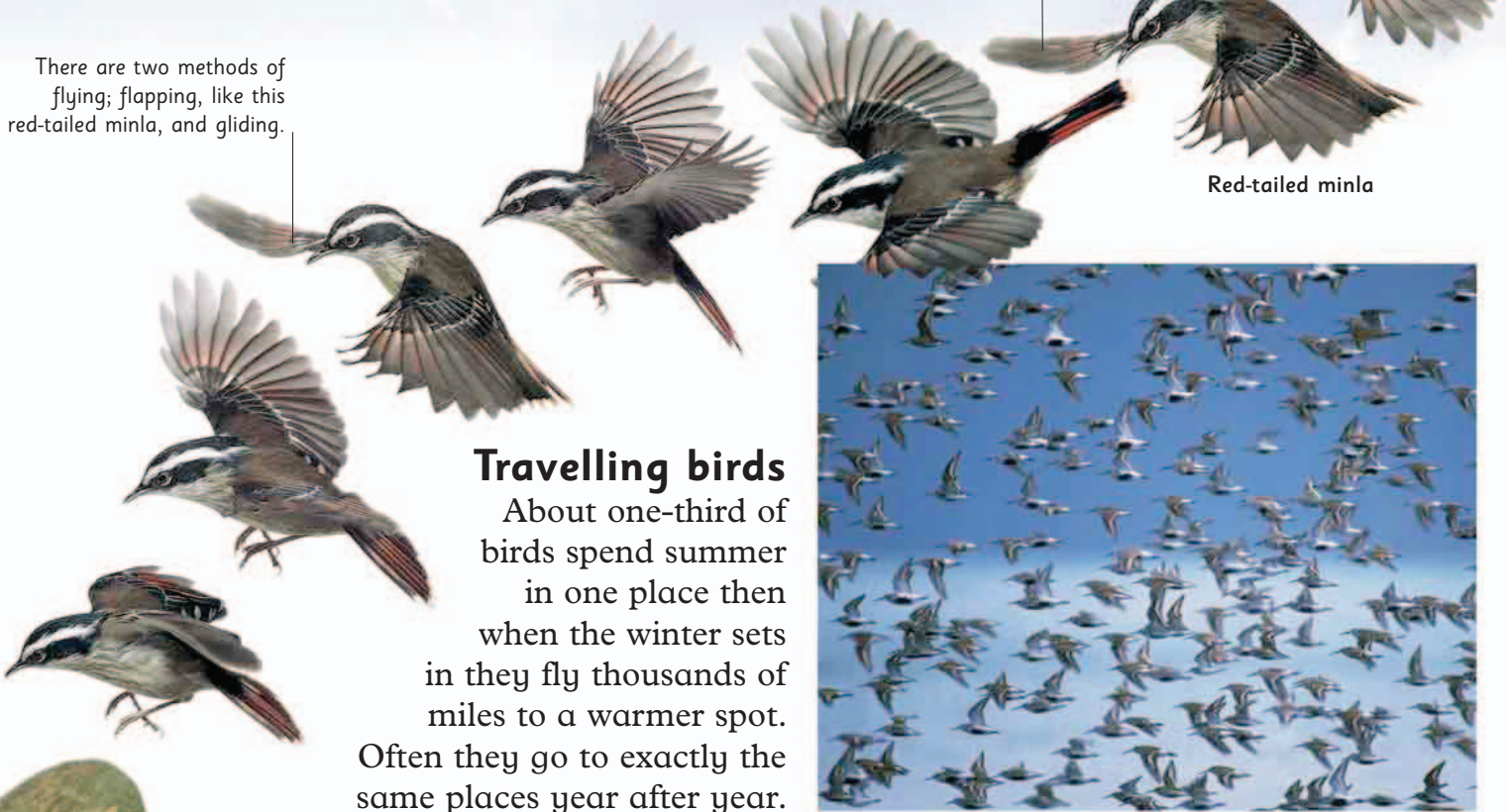
## Flight

Birds that can fly have wings and a very light skeleton – many of the bones are hollow. Their short and compact bodies also help make them neat fliers.

There are two methods of flying; flapping, like this red-tailed minla, and gliding.

By flapping its wings up and down, the bird remains in the air.

Red-tailed minla



## Travelling birds

About one-third of birds spend summer in one place then when the winter sets in they fly thousands of miles to a warmer spot. Often they go to exactly the same places year after year.

## Feet

The shapes of birds' feet vary in different habitats.



**Eagle foot:** birds of prey have sharp talons to kill and grip animals.



**Perching foot:** songbirds have three toes in front and one behind for perching.



**Webbed foot:** waterfowl have webbed feet to help them to paddle on water.



**Ostrich foot:** two thick toes help this flightless bird to run very fast.

## Bills

The shape and size of a bird's bill, or beak, show what they eat.



**Duck:** wide and flat to tear plants and filter food underwater.



**Woodpecker:** long and hard to chisel into wood and pick out insects.



**Chaffinch:** short and cone-shaped, ideal for cracking seeds.



**Heron:** ideal for stabbing fish underwater.

## Communication

All birds have good hearing so they can respond to songs from other members of their family. Birds are well known for their tunes, and some, like this parrot, even speak.



# Courtship

At various stages in her life, a female bird will be on the lookout for a mate. Males go out of their way to impress the ladies, often in spectacular ways.



## A good decorator

The male satin bowerbird builds an avenue of twigs, and at each end he places a collection of anything he finds attractive, such as shells, bones, or berries. The female picks the bower she finds the most appealing.

### weird but true

Some birds of prey perform amazing aerobatic displays. The male and female lock talons in mid-air and fall almost to the ground before swooping up again.

## Fierce competition

There is often competition between the males to attract the females, so performances have to be very slick. This female has chosen her mate.

Crowned cranes



## Pairing off

It is important for birds to find the right partner.



**Peacock:** the male shows off by shaking his spectacular tail.



**Swans:** when a male and female swan mate, they stay together for life.



**Pheasant:** male pheasants fight aggressively with each other for females.



Spotted-backed weaver

## Building a home

The male weaver bird builds an incredible nest that hangs from a branch. When a female passes by, he hangs beneath it fluttering his golden wings and shrieking to her to join him.

## Foot dance

The blue-footed booby has blue feet, which attracts the females. When a male wants a mate, he dances and lifts his feet to show them off.



Once cranes have selected a partner they dance together, then bow, leap, bounce, and make sudden frantic runs.

## Show off

The male frigate bird has a huge, red neck pouch, which he inflates with air when he is looking for a mate. When a female passes by, he wobbles it around and makes gobbling noises to impress her.



Of the 15 species of cranes, 11 are either threatened or in danger of extinction.

# Nesting

All birds lay eggs, which other animals find tasty. To keep their eggs safe, many birds build nests.



## A city in a nest

Some weavers, called social weavers, build one huge nest to hold lots of birds. This only happens in dry regions, because if it got too heavy with rain it would fall.

Hummingbirds are the smallest birds in the world.

Weaver bird

## Out of reach

The most important thing about a nest is that no enemies can reach it. For this reason many birds build their nest in trees.

Weaver birds go one step further than building nests in trees; they build them hanging down from branches.



## Tiny home

This hummingbird has built its nest on a fir cone. Some hummingbirds use spiders' webs to secure their nests.





### A perfect fit

Round, hollow nests like this are called cup nests. Birds build them in trees using twigs, feathers, moss, and anything else they can find.

When a bird has made its nest, it turns around and around in it until it has made a perfect hollow.



Pileated woodpecker

### Handy holes

Hollowed-out trees are good places to keep eggs safe. Woodpeckers make nests by chiselling through the wood with their sharp beaks. The following year, birds such as parrots, may use it.



### Nests

Some birds go to great lengths to make amazing-looking nests.



**Tunnel home:** some weaver birds build nests with tunnel entrances.



**In the reeds:** the reed warbler builds its nest between thin reeds.



**Mud nest:** the domed ovenbird makes its nest entirely out of mud.



**Tree trunk:** A blue tit has built this nest in a hollow tree trunk.

### Ground eggs

Some birds don't make nests at all. Instead, they lay their eggs on the ground. These Eurasian oystercatchers' eggs are camouflaged against the pebbles.



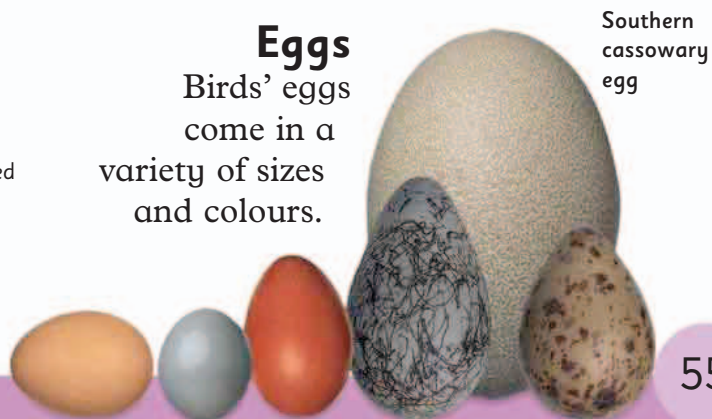
The eggs are speckled and difficult to spot.

### Safety in numbers

Along the west coast of Africa, thousands of cape gannets lay their eggs at the same time, right next to each other. This reduces the chances of the eggs being eaten.

### Eggs

Birds' eggs come in a variety of sizes and colours.



Southern cassowary egg

# Hatching out

Making or finding a nest is a lot of work for birds, but looking after the eggs and chicks is even harder!

Inside the eggs, each chick grows using the yolk as food.



## Nest birds

The mother bird sits on her nest keeping the eggs warm until they hatch. When they are born, they need constant feeding until they can look after themselves.

Blue tit chicks



After two weeks, there is barely enough room to move. The chicks are now ready to fly away.

At one day old, the bald chicks are very hungry.

At three days old, the chicks are demanding constant food. Their bright mouths are easily seen by parents.



At nine days, their feathers are starting to appear and the nest is getting crowded.

## Baby birds

There are two types of young bird. Nest birds are born blind and naked and depend completely on their parents. The other type, like ducklings, hatch with open eyes and a coat of downy feathers.

## Waterbirds

Waterbirds are often born on the ground rather than in nests, so they have to be able to get out of danger quickly. Ducklings take to water very soon after hatching.

Duckling



The chick has an egg tooth that it uses to poke through the shell.

It then pushes against both ends and breaks itself out of the egg.



## Swan family

A female swan lays up to eight eggs in a clutch and only she looks after them. When the chicks are born, both parents take care of them for about five months.



These swan chicks catch a ride on their mother's back.

Wren

## Feeding frenzy

Both parents help to feed their chicks. Some can make up to 1,000 trips a day between them to bring back enough food.



## Rotten parents

Cuckoos don't look after their chicks. Instead, the female lays her egg in another bird's nest. When it hatches, the chick kicks out the other eggs.



The cuckoo chick is fed by the adopted parents, and is often bigger than they are.

# Songbirds

Most of the world's birds are part of a huge family known as the songbirds. They spend a lot of their time in flight.



## Foot perch

Songbirds, or perchers, all have a unique type of foot, which helps them to grip onto even the thinnest branches. Three of their toes point forwards and one points backwards.

The short beak is used to crack hard foods, such as nutshells.

Songbirds can sleep on twigs and branches without falling off.

Blue tit



## A variety of birds

Members of the songbird family vary in looks, habits, and songs.



**Robin:** European robins are easy to spot because of their red tummies.



**Blackbird:** the blackbird often sings in the evenings from a high perch.



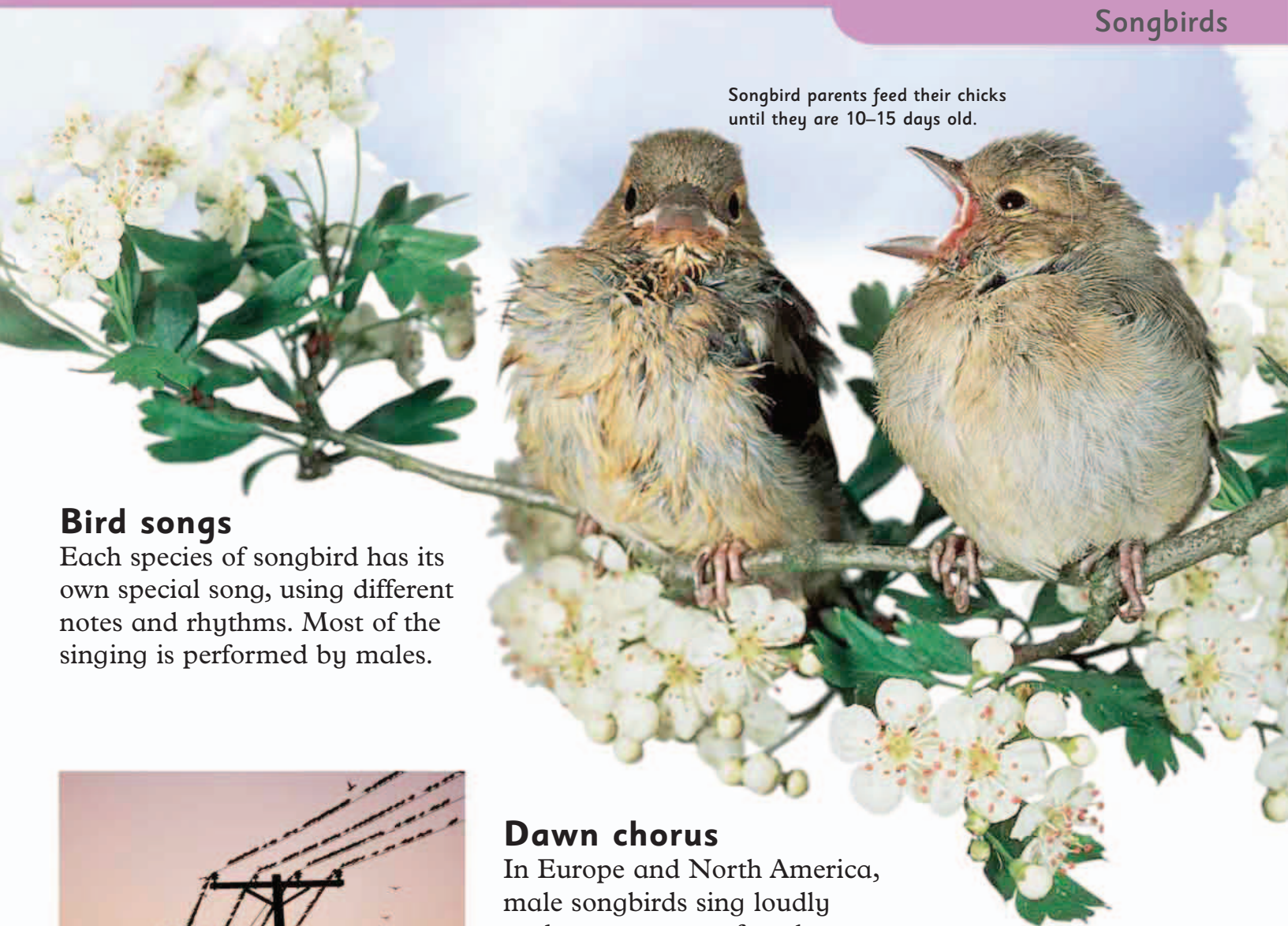
**Warbler:** these birds are known for their different songs, including a scolding song.



## Finding food

Like this song thrush, most songbirds are small, but because they use up a lot of energy flying, they need a lot of food. They feed on small insects, worms, and snails.

Songbird parents feed their chicks until they are 10–15 days old.



### Bird songs

Each species of songbird has its own special song, using different notes and rhythms. Most of the singing is performed by males.



### Dawn chorus

In Europe and North America, male songbirds sing loudly at dawn to attract females. Somehow, the females can hear and identify the correct tune among the many melodies.

### Safety in flocks

Many songbirds live in groups, called flocks. They collect food together and join forces to fight off bigger birds that might eat them.

Many songbirds are small and compact, with short beaks.



Dunnock

### weird or what?

The Australian lyrebird can not only imitate other birds' songs but also other sounds it hears in the rainforest, such as chainsaws and even camera clicks!

# Life in the air

Some birds are spectacular acrobats. They are the experts of the air – a few can even fly backwards! Many birds spend most of their lives in the air.

## Hummingbirds

These tiny birds beat their wings in a figure-of-eight pattern. This means that they can hover and fly backwards! Smaller species beat their wings 80 times a second.

## Record holder

The smallest bird in the world is the bee hummingbird. Found in Cuba, it feeds on nectar from flowers. Its eggs are smaller than peas!

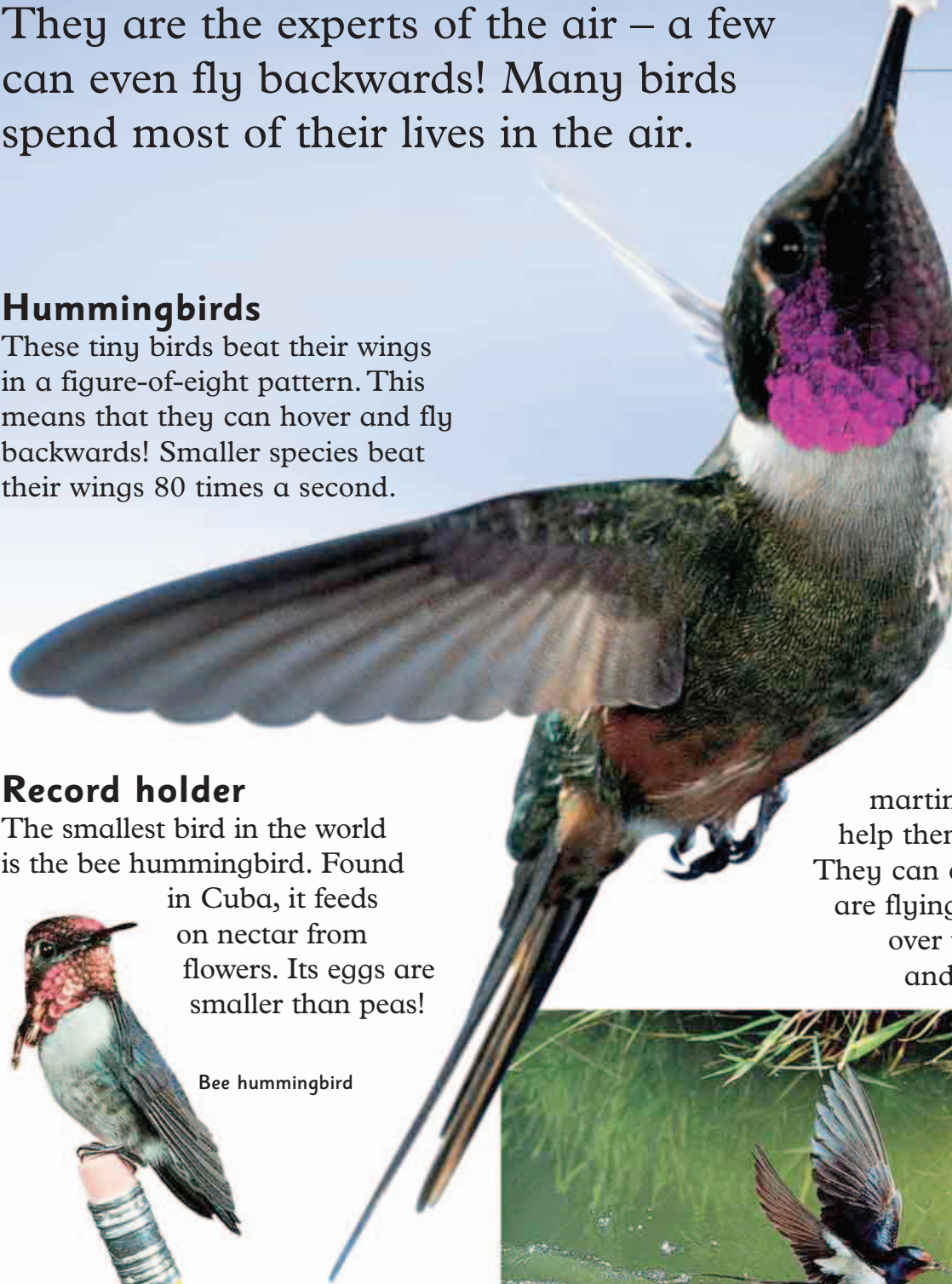


Bee hummingbird

Some flying insects are bigger than the bee hummingbird.



Hummingbirds have long beaks that can poke into flowers to sip the nectar.



Magenta-throated woodstar hummingbird

## Air acrobats

Swifts, swallows, and martins have forked tails that help them to control their flight. They can catch insects while they are flying and even swoop down over water, like this swallow, and drink without landing.



Swallow



## Nesting

Swifts, such as this chimney swift, spend a lot of their time in the air but they must land when they are ready to nest.

## Swallows' nests

Swallows collect mud pellets and mould them into cup-shaped nests. These can often be seen beneath the eaves of buildings. The parents feed the chicks by hovering near them rather than landing.



Forked tail



Swallows have small beaks, but big mouths to catch insects in mid-air.



**Turn and learn**  
Other nesting methods:  
pp. 54-55

## Nesting

### in burrows

Sand martins look similar to swallows. They make their nests by digging burrows in soft earth along riverbanks or in cliffs.



Swift

## The swift

Swifts can spend a lot of time in the air without landing. They even sleep on the wing!

# Freshwater birds

If you search around fresh water anywhere in the world, you will find teams of birds living on it or near it. Some are swimmers and others are waders.

## Kingfishers

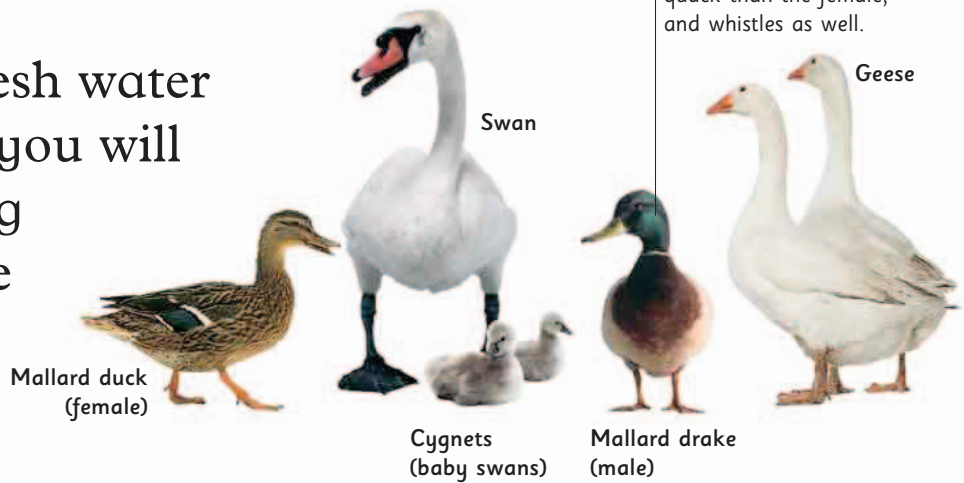
Kingfishers live by rivers. They perch on branches above the water waiting for fish to swim past. When they see one, they dive!



When the kingfisher catches a fish, it flicks its wings, resurfaces, and flies away with its dinner.



The male mallard makes a lower pitched quack than the female, and whistles as well.



## Waterfowl

Ducks, geese, and swans are waterfowl. They have boat-shaped bodies and webbed feet, which make them very good swimmers.

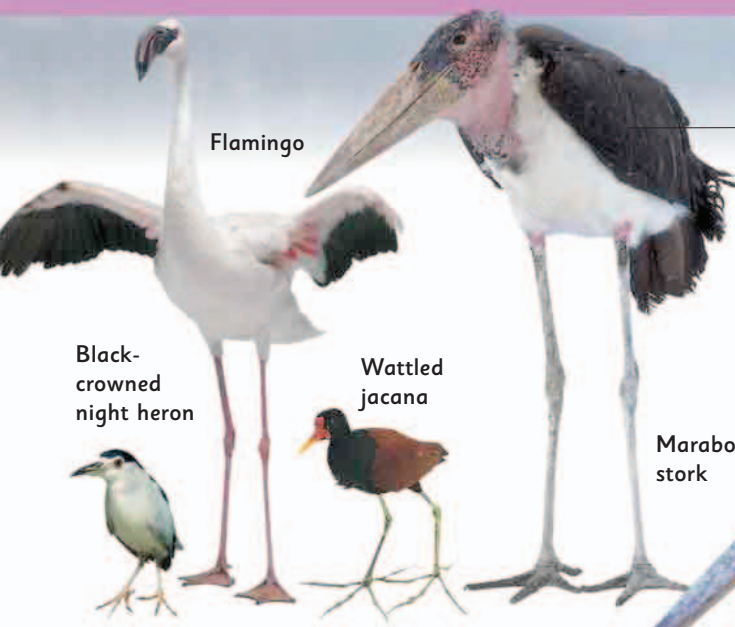


## Bottoms up!

Waterfowl have long bills with sharp ridges along them to grip slippery fish. Mallards often feed by tipping their heads into the water to reach plants.







Flamingo

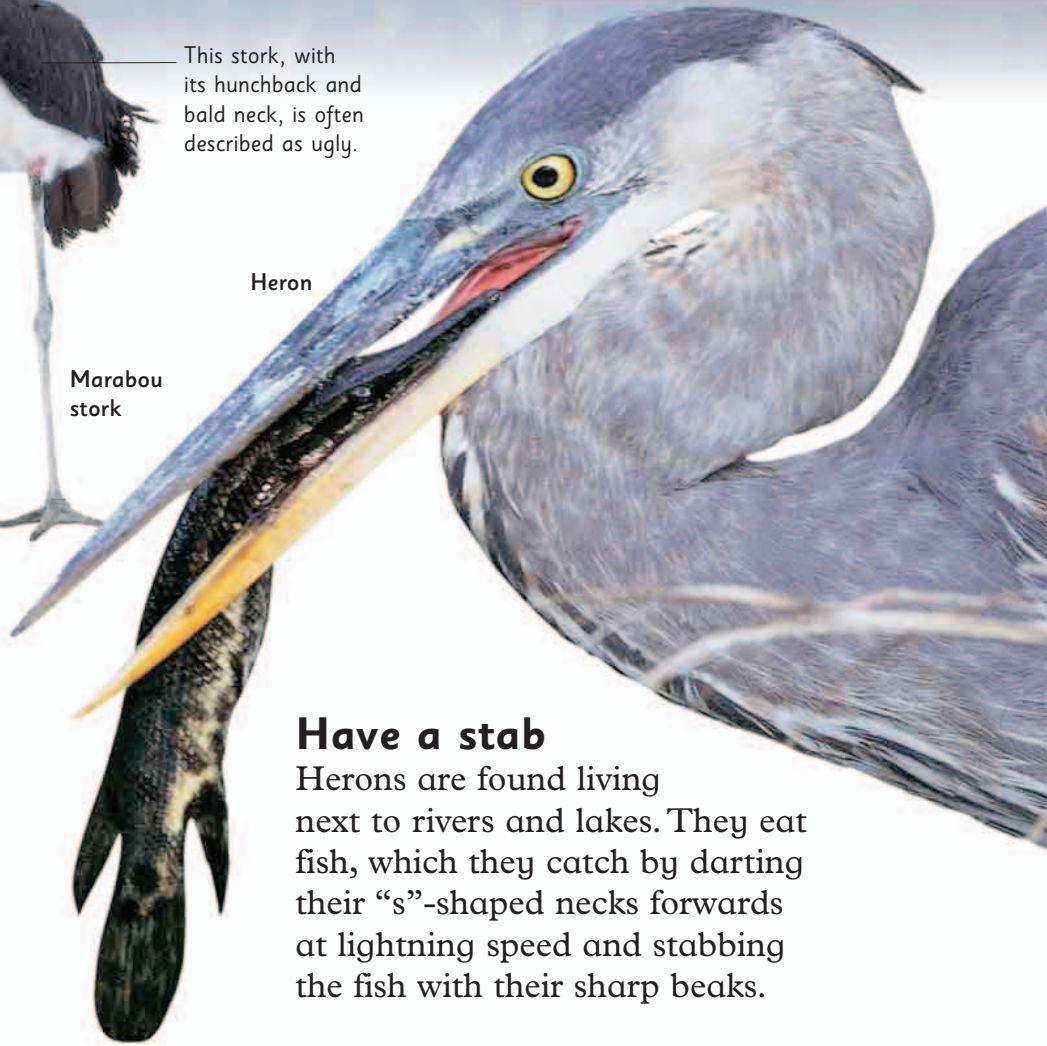
Black-crowned night heron

Wattled jacana

Marabou stork

This stork, with its hunchback and bald neck, is often described as ugly.

Heron



## Waders

Waders have long legs that allow them to walk in shallow water without getting their feathers wet. Some also have long necks for finding food.

## Have a stab

Hérons are found living next to rivers and lakes. They eat fish, which they catch by darting their “s”-shaped necks forwards at lightning speed and stabbing the fish with their sharp beaks.



Flamingos sleep in the water, often on one leg.

## Pink flamingos

Flamingos live in huge flocks, of sometimes a million birds! Many of them are pink because of the tiny shrimps that they eat.

Flamingos' bills act like sieves to filter out tiny food from the water.

Flamingo



## Turn and learn

Migrating birds:  
pp. 76-77  
Sea birds:  
pp. 64-65

# Sea birds

Many birds spend their lives next to the sea or out on the open ocean. Some return to land only to breed and raise young.

## A life at sea

A lot of sea birds, such as this albatross, have webbed feet that help them swim, and special beaks to hold slippery fish.



Webbed feet

The albatross has the largest wingspan of any bird

## Dramatic divers

The sea is full of prey and birds have various ways to catch it. Some chase fish underwater while others, such as gannets and boobies, dive down like torpedoes from the air to snatch them.



## Other sea birds

The coastlines of the world are always packed with sea birds.



**Herring gull:** this bird is common in Europe and North America.



**Inca tern:** this bright-beaked bird lives on the west coast of South America.



**Cormorant:** this bird can also be found inland in Europe, Asia, and Africa.

Pelican



Pelicans also use their large mouths to catch rainwater for drinking.



## A mouthful of fish

A pelican dives underwater and scoops up fish in its large mouth. It can fit three times more fish in its mouth pouch than in its stomach!



## Cliff birds

These black-legged kittiwakes, like many other birds, live in huge, noisy groups on cliff faces. They even nest and lay their eggs on the narrow ledges.

Kittiwakes



The cliffs are a safe place to rest, away from enemies.

## A flock of gulls

Gulls can often be seen in huge numbers along the seashore. They eat almost anything, raiding rubbish dumps and stealing other birds' eggs.

The albatross' beak is hooked, with special ridges to help it hold onto fish.



## Puffins

The puffin has webbed feet and small wings, which it uses like fins to swim, as well as to fly. It raises its one chick, called a puffling, in a burrow.

The puffin can dive to depths of 60 m (200 ft).

Puffin

## Turn and learn

The ultimate sea bird – the penguin: pp. 66-67

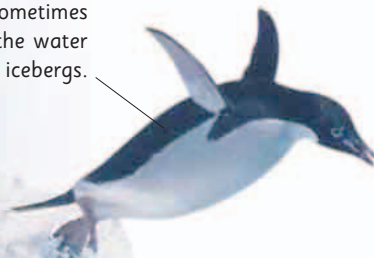
## What a lot of fish!

Atlantic puffins have large, colourful beaks. The top bill and tongue are ridged with spikes that enable it to hold lots of fish at one time.

# In the chill

You have to be pretty tough to survive the freezing temperatures of the Antarctic. But some birds not only survive but thrive in the chill.

Penguins cannot fly but they sometimes leap into the water from icebergs.



## Water wings

Penguins may look clumsy on land and can't even make it into the air, but in the water they are master swimmers. They use their wings as flippers and their tails and feet to steer.



## The penguin

Most penguins, such as these emperor penguins, live in colonies, which can consist of hundreds of thousands of birds.

## Keeping warm

To keep them warm in icy water and in the snow, penguins have a dense covering of waterproof feathers and many layers of fat.

Egg





Penguins' feet are positioned so far back that when they stand upright, they have to use their tails to balance or they would topple over backwards.

### Other snow birds

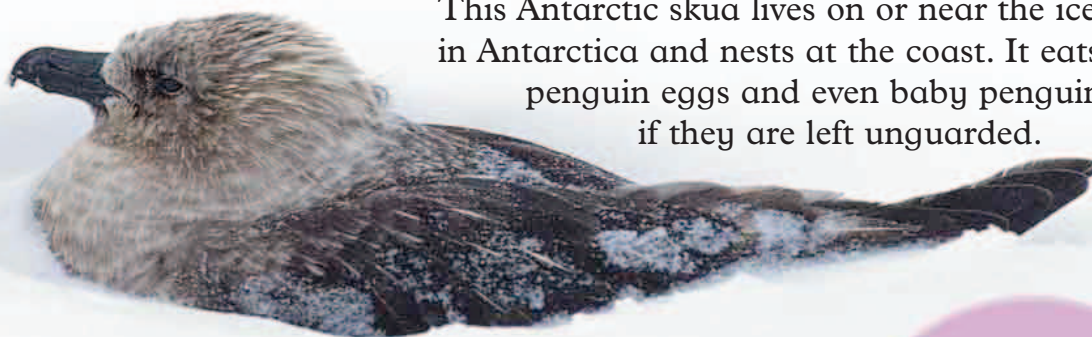
One of the few birds that lives and breeds on Antarctica all year round is the snow petrel. It is completely white, which keeps it hidden in the snow.



Antarctic skua

### Penguin predators

This Antarctic skua lives on or near the ice in Antarctica and nests at the coast. It eats penguin eggs and even baby penguins if they are left unguarded.



Adult penguins have white tummies and dark backs, which help to camouflage them in the water.

### Penguin parents

King penguins tuck their eggs under their bellies, resting them on their feet. The parents take turns to look after their egg. When king penguin chicks are born, they are covered in brown, downy feathers.



In very cold conditions chicks and penguins huddle together for warmth.

### Turn and learn

Flightless birds:  
**pp. 78-79**  
Other sea birds:  
**pp. 64-65**

### Slip-sliding around

Penguins find it hard to walk, so they often slide on their bellies over snow and ice, pushing with their flippers and feet.

The chicks must be fed until they grow adult, waterproof feathers



# Birds of prey

With their huge wings, sharp talons, and hooked beaks, birds of prey are the hunting kings of the bird world.



## Hunting

Many birds of prey spot an animal on the ground from very high up in the air with their excellent eyesight. They swoop down and grab it with their sharp talons.

African hawk eagle



Birds of prey are the only birds that kill with their feet.

Eagles are the most powerful of the birds of prey. They can kill animals as big as themselves.



Secretary bird

## Walkabout

Secretary birds have incredibly long legs. They rarely fly. Instead they can be seen taking long strides across the grasslands of Africa.

These birds are famous for eating snakes, which they kill by stamping on them.



Red tailed buzzard



A buzzard's wings are huge, which means they are fast flyers that can glide and even hover without flapping their wings.

### The vulture

Vultures are the waste collectors of the world, eating dead animals before they rot. They very rarely kill their own food.



Vultures

Vultures are very clean birds. After eating they will often fly long distances to have a bath.



### A vulture's taste

Vultures don't just eat dead animals. This Egyptian vulture enjoys eggs as well.

The Egyptian vulture loves ostrich eggs but cannot break them with its beak. Instead it uses a stone to crack the egg.



Ostrich egg



### The osprey

Ospreys have such good eyesight that they can spot fish swimming underwater. They swoop down to the surface and seize the fish in their talons, often without landing on the water.

# Night flyers



As the sun sets, most birds settle down for a good night's sleep. Owls and nightjars, however, are preparing for a night of hunting.



## Nightjars

Nightjars rest on the ground during the day. At night they hunt, plucking insects out of the air as they fly.



Barn owl

Hooked beaks help to tear up food.

## Owls

All owls, such as this barn owl, hunt in darkness and must rely on their amazing eyesight and hearing to help them.

Owls use their sharp talons to catch and grip animals that they eat.

## Owl types

Owls come in lots of sizes and colours and can be found around the world.



**Great horned owl:** this regal-looking owl has ear tufts or "horns".



**Spectacled owl:** this owl lives in the South American rainforest.



**Snowy owl:** this owl has extra feathers on its feet, to keep it warm, like slippers.



**Burrowing owl:** this owl makes its nest underground.



## Hidden from sight

During the day owls sleep, often in branches of trees. Their feathers camouflage them so well, as on these scops owls, that people very rarely notice them.

Many owls have velvety fringes around their flight feathers that make their wings very quiet as they fly through the air.



Owl eggs are almost completely round.



## Hunting by night

All owls eat small animals. They swoop silently on their victims in the dark and grab them in their sharp talons.

In the dark owls sometimes find animals only by the sounds they make.

Tawny owl



Most owl chicks learn to fly when they are two months old. Until then, they are fed by their parents.

Owls like to eat animals, such as mice and small birds.



## Eating

Owls cannot chew so they swallow their food whole. When they have digested the animal, they cough up the bones and fur as a small pellet.



If you tear one of these pellets apart, you can see the whole skeleton of the animal it has just eaten.

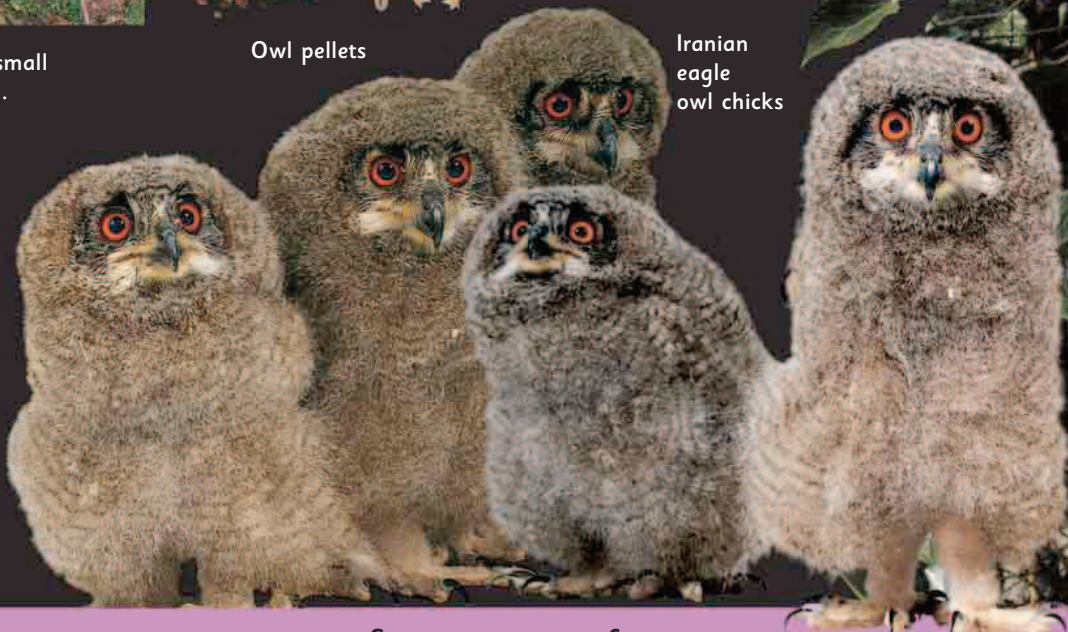
Owl pellets

An owl's mouth may look quite small but it can open very wide indeed.

## Owl chicks

Rather than build nests, owls prefer to lay their eggs in holes of some kind – in trees or buildings. The male and female both help to feed the chicks.

Iranian eagle owl chicks



The elf owl – it is only 15 cm (6 in) tall.

# Exotic flyers

Tropical rainforests and places with warm climates are filled with exotic and colourful birds, which are often very large.

This species of toucan lives in the top of the rainforest canopy.

Chestnut-eared aracari

The toucan uses its massive bill to reach for fruits on the tips of branches.

Although the bill looks heavy, it is hollow and, therefore, very light.

Toucan

Toucans have two toes facing forwards and two facing backwards on each foot.

## Toucans

These birds live in the South American rainforest and surrounding areas. They are famous for their huge bills.

## Birds of paradise

These exotic birds are from Papua New Guinea. This raggiana bird of paradise is showing off his beautiful feathers to a female by opening his wings and shaking them at her.



## The parrot family

Parrots are very colourful and often very noisy. They are strong fliers and good climbers. Parrots include macaws, budgerigars, lovebirds, and parakeets.



Rainbow lorikeet

### Crested cockatoos

These parrots, called cockatoos, have a bright yellow crest on their head, which they raise when they are frightened or angry.



### Nuts about nuts

Almost all parrots eat fruit, nuts, and seeds. They are the only birds that hold food up to their mouths using their feet.

Lorikeets are the most colourful of all parrots. They can be found along the east coast of Australia.

Scarlet macaw



Budgerigars are popular as pets for their ability to mimic sounds and "talk".

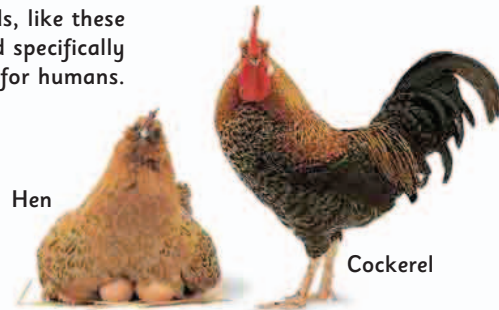


### Turn and learn

Colourful creatures of the ocean:  
pp. 144-151

# Game birds

Some game birds, like these chickens, are raised specifically to provide food for humans.



Hen

Cockerel

Game birds live most of their lives on the ground. Most are plump with a small head, short wings, and sturdy, strong legs.

## Sport

Game birds, such as this male common pheasant, are hunted by humans for sport, which is why they are called game birds.

This male common pheasant has a tough, hooked beak for digging up plant roots and insects to eat.

## Good-looking males

Like most male game birds, this cockerel is more brightly coloured than the hen. He uses his fine feathers to attract females.

Males have brightly coloured feathers...

The tail drags along the ground behind the male when not spread out.



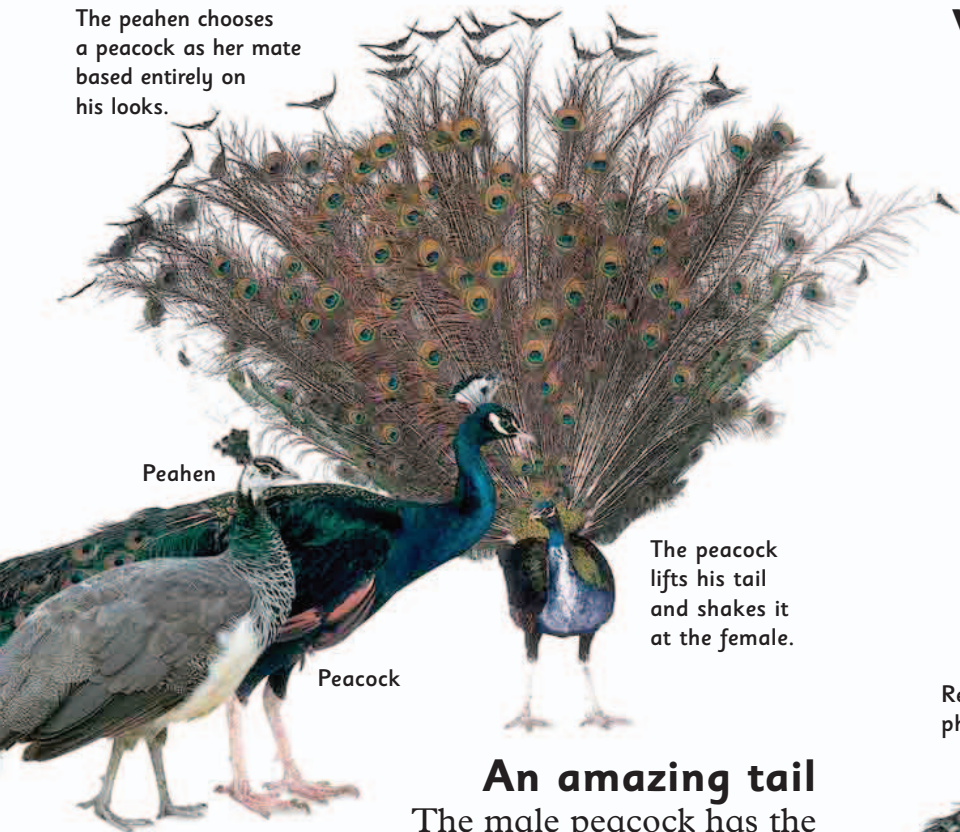
## Nesting

Most game birds nest in shallow holes in the ground. They can produce more than 20 eggs in one nest – more than most other birds. Females are duller in colour than the males, to camouflage them against the ground when nesting.

Some game birds keep their eggs warm not by sitting on them, but by burying them underground.



The peahen chooses a peacock as her mate based entirely on his looks.



Peahen

Peacock

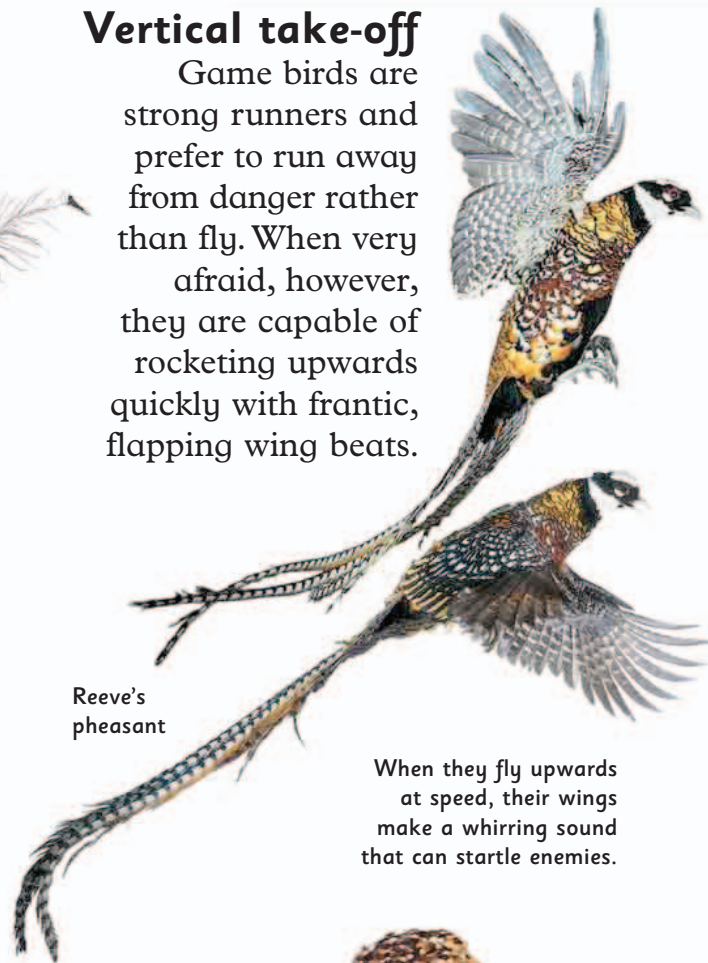
The peacock lifts his tail and shakes it at the female.

### An amazing tail

The male peacock has the most spectacular tail in the animal world. When he wants to attract attention, he raises it high.

### Vertical take-off

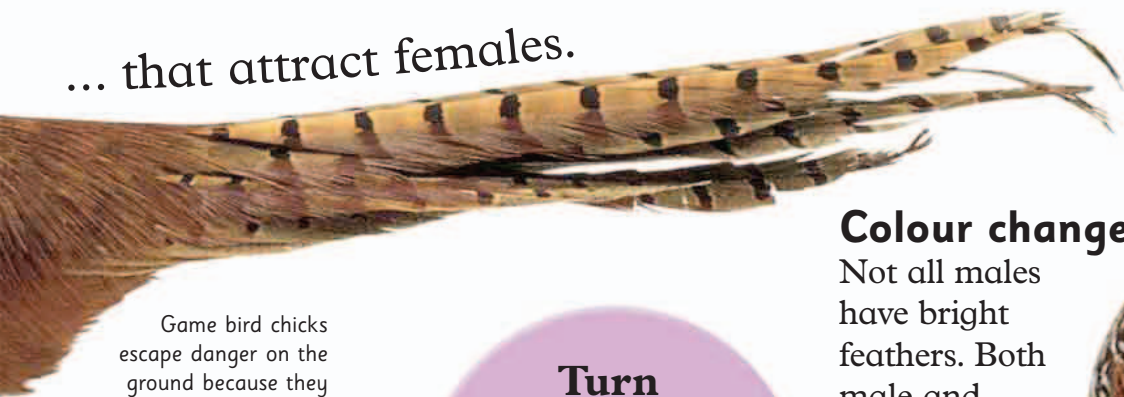
Game birds are strong runners and prefer to run away from danger rather than fly. When very afraid, however, they are capable of rocketing upwards quickly with frantic, flapping wing beats.



Reeve's pheasant

When they fly upwards at speed, their wings make a whirring sound that can startle enemies.

... that attract females.



Game bird chicks escape danger on the ground because they are able to run and fly soon after hatching.



Pheasant chicks

**Turn and learn**  
Courtship displays between birds:  
pp. 52-53

### Colour change

Not all males have bright feathers. Both male and female willow ptarmigans change their colours throughout the seasons so they are always camouflaged.



This male ptarmigan is in its summer plumage.

# Globetrotters

The great advantage birds have is that they can fly. This means they can choose the warmest part of the world to live in at any one time.

## Record holder

The Arctic tern is the biggest traveller of all. Each year, it flies the whole way around the world from the Arctic to the Antarctic and back again.



## Migration

Many birds have a summer and a winter home in different places. Their journey from one place to another is called migration.

## Travelling birds

Birds have different travel habits. Some fly non-stop, some rest on the way.



**Song thrush:** these small birds are night fliers and use the stars to find their way.



**Buzzard:** these birds of prey wait for a warm day and glide for long distances.



**Sanderling:** waders eat a lot before leaving so they can fly non-stop.



**Canada goose:** geese are fast fliers, so they use a lot of energy and need to stop frequently to eat.



**Swan:** these birds fly by day or night but rest if visibility gets poor.



**Ruby-throated hummingbird:** this tiny bird flies non-stop across the Gulf of Mexico.

## Gaggles of geese

Each winter, tens of thousands of snow geese leave Canada for a 2,000 km (1,250 miles) trip to California and Mexico. They follow exactly the same route each year.

**Turn and learn**

Waterfowl:  
pp. 62-63  
Birds of prey  
pp. 68-69

**Birds of prey**

Hawks, buzzards, and eagles from North America fly south to warmer climates as the winter approaches.



Bald eagle

*Eagles use warm air currents to help them glide.*

**Knots**

Knots leave the Arctic in the autumn and fly towards South America. They travel over the 3,218 km (2,000 miles) of ocean non-stop.



**“V” formation**

Many birds fly in a “v” formation because the bird in front makes the air easier to fly through for the ones behind.



# Flightless birds

Some birds cannot fly even though they have wings. Often, as a result of this, they become excellent at running or swimming instead.

## New Zealand birds

There are so few mammals here that some birds have no need to fly.



**Kakapo:** this flightless bird is the world's rarest parrot.



**Kiwi:** the kiwi lives on the ground. Its feathers are so small they look like fur.



**Takahē:** these birds were almost extinct, but are slowly increasing in numbers.

The ostrich has a long neck and a small head.

## Rapid runners

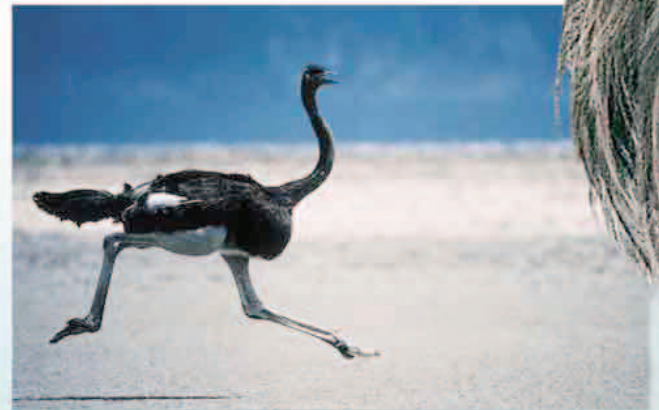
Ostriches are the fastest bird runners in the world. In fact they are faster than racehorses – they can reach speeds of 75 kph (45 mph).

## The ostrich

Ostriches are the world's largest birds. They have feathers, which look more like fur, to keep them warm. Even though they can't fly they still have small wings, which are not used for flying, but may have various other uses like shading their young.

Ostrich

The ostrich is the only bird in the world to have only two toes.



## Moving in flocks

Like flying birds, ostriches and emus live in large groups, called flocks.



## Flightless wings

One reason birds have wings is to make a quick escape from predators. If birds don't have predators, they have no need to fly and may lose this ability over time.

Flightless birds, like this rhea, have wings that they don't use for flying.



### Turn and learn

Penguins:  
pp. 66-67  
Bird's eggs:  
pp. 56-57

Large flightless birds have thick legs, which help them to run fast.

Rheas and emus have three large toes that all face forwards.

## Penguins

The penguin uses its wings as flippers to "fly" underwater. Its feathers are short and stiff to help keep them warm in cold climates.



## Flightless cormorants

The Galápagos Islands off western South America have no animals that kill birds, so their cormorants have lost the ability to fly. They have become good swimmers.

## Rearing rheas

Most birds' eggs are looked after by their mothers, but in the rhea family the father is in charge. He sometimes looks after up to 60 eggs, all from different mothers, in one nest.



The father looks after the babies until they are five months old.

# Reptiles and amphibians

Reptiles and amphibians are the “cold-blooded” creatures of our world. Most amphibians, which include frogs and toads, live near water. Reptiles, such as snakes and lizards, are found both on land and in water.

Flying gecko

Baby caiman

Green tree python

Anole lizards

Baby spectacled caiman

Common snake-necked turtle

Common snapping turtle

Madagascar day gecko

Rattlesnake

## Cold-blooded

Cold-blooded creatures do not have cold blood. Cold-blooded means they are the same temperature as the air or water around them. If they are cold, they sunbathe. If hot, they seek shade.

Picture Detective

Take a look through the reptiles and amphibians pages and see if you can spot who these skins belong to.

Green anaconda



Reptiles have scaly skin.

Wagler's pit viper

Ornate horned toad



Indian star tortoise



European common frog



Diadem snake

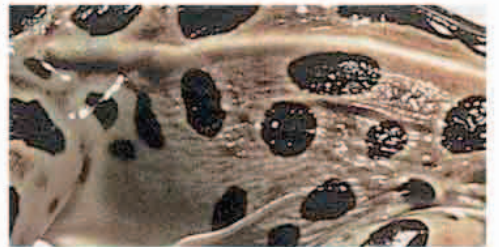
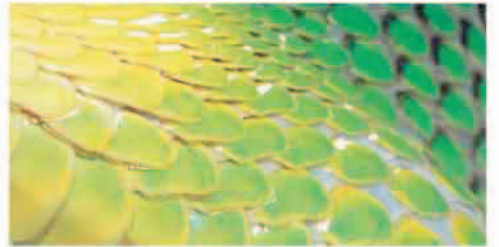


White's tree frog



Asian tree toad

Green iguana



Turn and learn

Creatures with scales: pp. 142-151

# The world of reptiles

Reptiles are mainly egg-laying animals that have a tough skin covered in scales. They live on land and in water.

## Eating habits

Most reptiles are meat-eaters, apart from tortoises, which move too slowly to catch fast-moving prey. Lizards, such as this gecko, can eat half their own weight in insects in one night.

## The reptile groups

There are four main groups of reptiles.



**The tortoise family:** these reptiles all have a shell over their bodies.



**Snakes and lizards:** the majority of reptiles fall into this group.



**The crocodile family:** this group are the giants of the reptile world.



**Tuataras:** these reptiles are very rare and look a bit like lizards.

Reptiles can eat huge meals, then go without food for days.

Most reptiles, like this lizard, swing their bodies from side to side when walking.

All reptiles shed their skin from time to time.

Flying gecko

## Hot and cold

Reptiles have scales, which can control how much water they lose through their skin. This means they can live in dry places. They are, however, cold-blooded, and so rely on the climate to keep their bodies warm.

European eyed lizard

## Reptile babies

Nearly all reptiles lay eggs, which hatch into miniature versions of their parents. However, a few, such as this slow worm, give birth to live young.



This lizard, which lives in the desert, basks on rocks to warm up its body.

Tuataras live in burrows and hunt at night. They can live for 100 years.



### Living fossils

Tuataras are the only survivors of a group of reptiles that lived with the dinosaurs millions of years ago. Today, they live on a group of islands off New Zealand.

### Scaly skin

A reptile's skin is covered with scales made of keratin, like your nails.



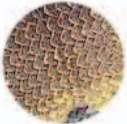
**Tortoise:** the shell of a tortoise has lots of large, hard scales on it.



**Lizard:** lizards' scales have stretchy skin between them.



**Crocodile:** these scales are strengthened in between by bony plates.



**Snake:** the skin on snakes has overlapping scales for extra protection.

### Reptile relatives

The reptiles of today are living relatives of dinosaurs and look very similar to their ancient ancestors. You can see similarities between the *Tyrannosaurus rex* and this lizard.

*Tyrannosaurus rex*



Collared lizard

### Turn and learn

Snails:  
pp. 132-133



# Under a shell

You can spot tortoises or turtles because they carry their homes on their backs – these domes, called shells, are attached to their bodies.



Tortoise

## Tortoise or turtle?

The main difference between these two reptiles is that tortoises live on land and turtles live in water.

### Shell shapes

Shells are hard and protect the body. They come in many shapes.



**Starred tortoise:** their high domed shells are difficult to attack.



**African red-necked turtle:** flatter shells help turtles slip through water.



**Red-footed tortoise:** these tortoises have unusually long shells.



Turtles

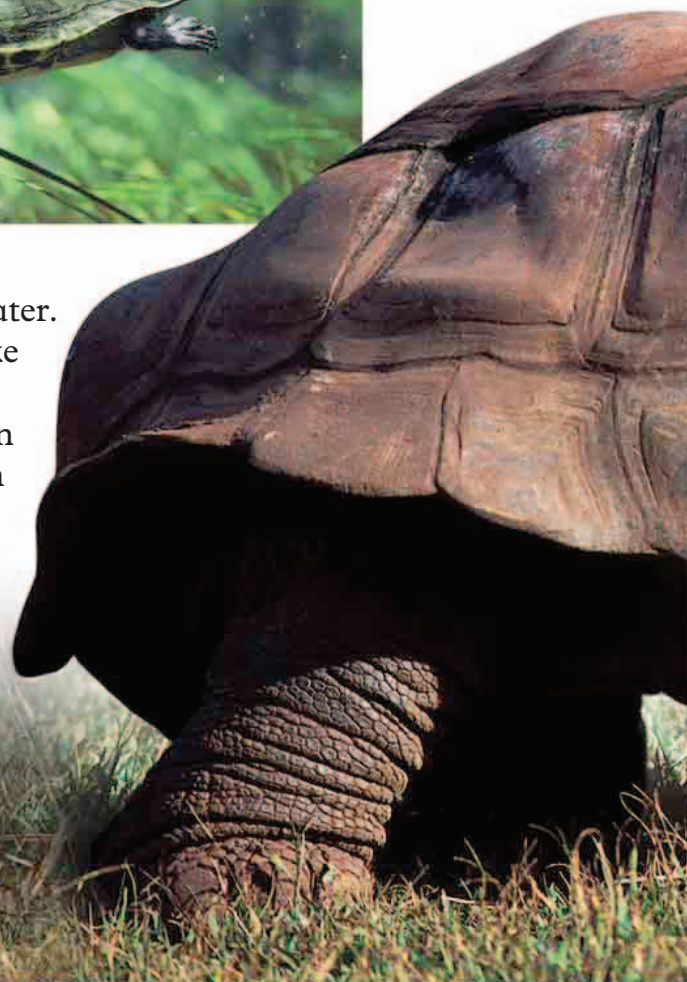
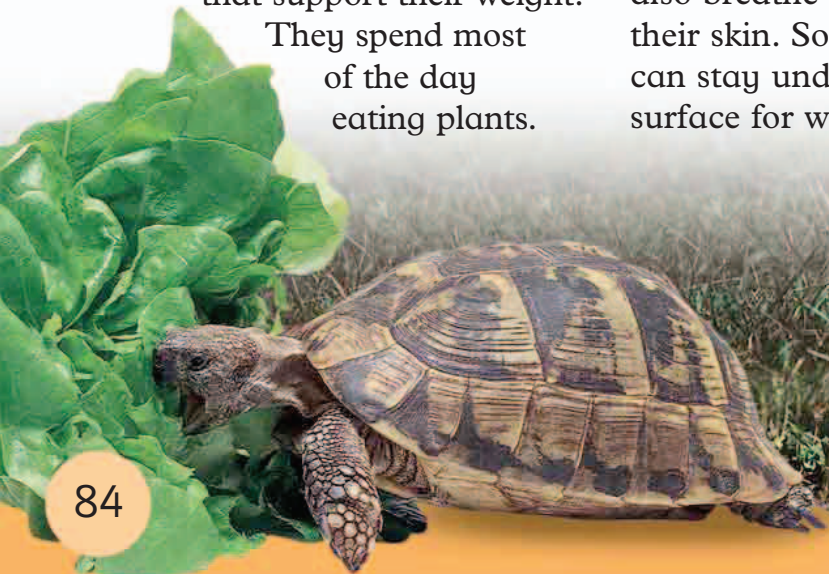
## Tortoises

Tortoises walk very slowly because of their heavy shells. They have short, stocky legs that support their weight.

They spend most of the day eating plants.

## Turtles

Turtles live under water. They sometimes poke their heads out to breathe, but they can also breathe through their skin. Some can stay under the surface for weeks.





### Eggs and babies

Most turtle and tortoise eggs are completely round, like ping-pong balls. Some are hard, but others are quite soft to touch. The babies peck their way out of the eggs.

Tortoises and turtles are born complete with their shells.

### Race to the ocean

Turtles return to land to lay eggs – sometimes thousands of them on one beach. When they hatch, the babies all make a rush for the sea where they will live.



Hinge-back tortoise



### Hiding on the spot

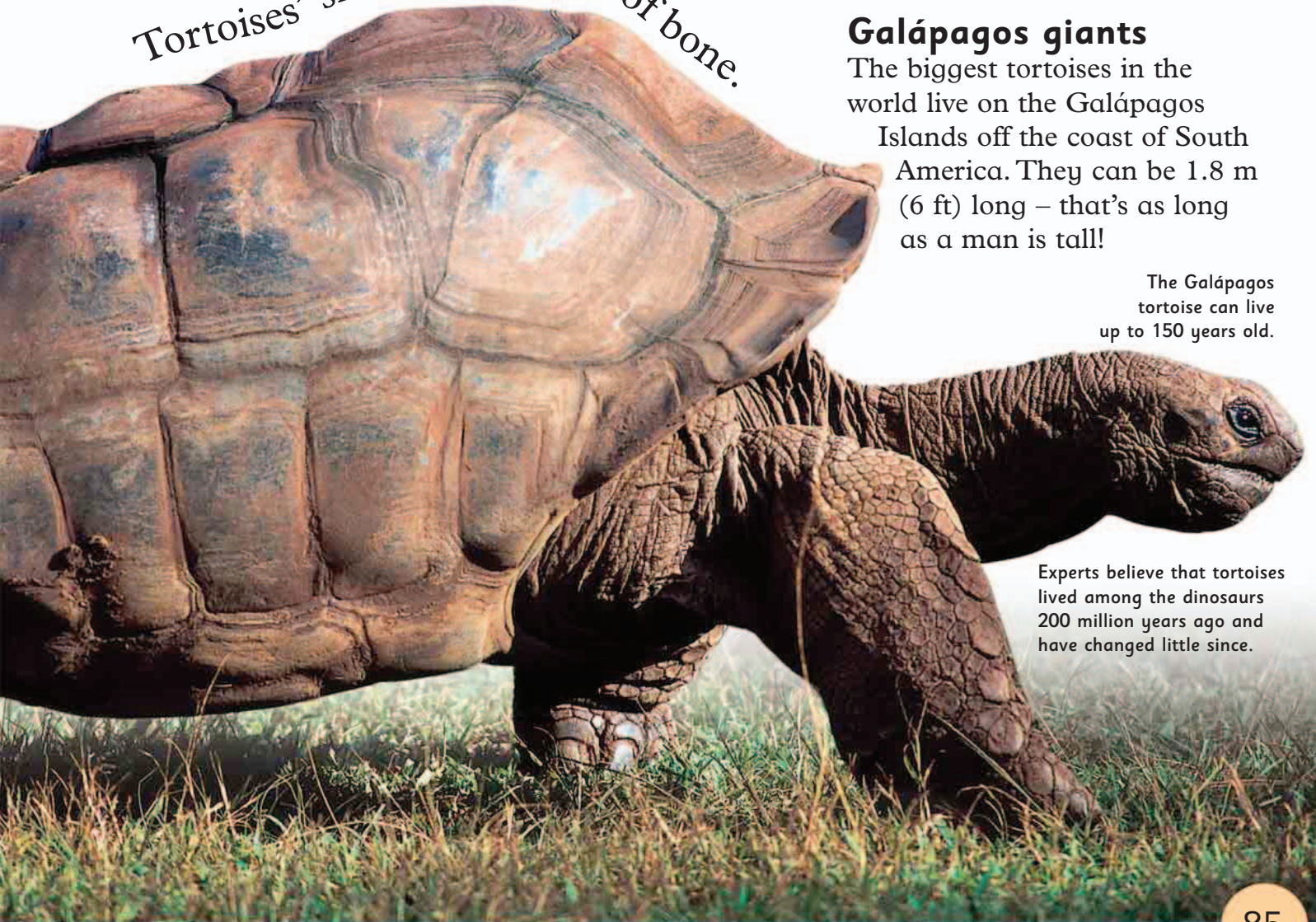
When a tortoise feels threatened, it quickly pulls its legs and head under its shell, and keeps very still. The shell is too hard for any animal to eat.

Tortoises' shells are made of bone.

### Galápagos giants

The biggest tortoises in the world live on the Galápagos Islands off the coast of South America. They can be 1.8 m (6 ft) long – that's as long as a man is tall!

The Galápagos tortoise can live up to 150 years old.



Experts believe that tortoises lived among the dinosaurs 200 million years ago and have changed little since.

# Introducing lizards

There are over 40,000 different types of lizard, living in habitats ranging from deserts to rainforests. They are particularly fond of hot places.

Most lizards have sharp teeth along the edges of their jaws.



Tokay gecko

## Lizards

Lizards have scaly bodies and four feet that each have five fingers. As lizards grow, they shed their skin about once a month.



Slow worm

## Legless lizards

This slow worm is not a worm – it's a lizard. It looks like a snake but, unlike snakes, it has eyelids and a notched tongue, whereas snakes' tongues are forked.

Madagascar day gecko



Some lizards have no eyelids. They lick their eyes to clean them.

## Day gecko

Most geckos prefer to be active at night but this Madagascar day gecko likes the daylight. It lives in forests and eats small insects and fruit.





### Flying lizards

Lizards can't fly, but some can glide from tree to tree. This lizard has skin around its body that opens out, like a parachute.

### Getting around

Lizards are extremely agile. They can run very fast, some climb trees, and some can even walk on water!

Climbing lizards, such as chameleons, have long claws that grip onto branches.

### Eggs

Most lizards lay eggs on the ground.



**Laying:** lizards lay their eggs among leaves on the ground or in sandy holes.



**Eggs:** the eggs are soft and leathery – easier to break out of.



**Hatching:** after two to three weeks the lizards hatch.



**Babies:** baby lizards look like their parents.



Chameleon



The chameleon's tail helps it to balance when it perches on thin twigs.

### Sticky fingers

Geckos have special toe pads covered in millions of tiny hair-like spikes. These spikes can grip any surface, so geckos are able climb up walls and even along ceilings.



### Walking on water

When they want to go faster, some lizards, like this crested water dragon, run on their hind legs. The basilisk lizard above can even run for short distances across the surface of the water, its wide feet pushing it along at high speed.



Crested water dragon

The racerunner can run at 29 kph (18 mph) – that's faster than most people can run.

# Hunting and defence

Some lizards are fast runners, so they can get away from danger quickly. They also use their speed to catch smaller animals for food.

## Get lost!

When the frilled lizard feels threatened, it doesn't run away. Instead it opens its umbrella-like frill around its neck, rocks its body, and hisses loudly. This is often enough to scare the enemy away.

The frilled lizard also lashes its tail backwards and forwards.

When the loose skin on a frilled lizard opens out, it looks four times bigger.

## Turn and learn

Insect defence:  
**pp. 114-115**  
Fish defence:  
**pp. 148-149**

Frilled lizard

Chameleon

## Losing the tail

Some lizards are able to detach part of their tail if it is grabbed. Often the tail will carry on wiggling when it has broken off, which can distract the enemy.



This tree skink has broken its tail and is growing a new one.

## Lunch time

Most lizards eat meat. Some eat small animals; some can eat animals bigger than themselves. This chameleon flicks out its enormous, sticky tongue and catches insects on the tip.



The Komodo dragon can grow to 3 m (10 ft) long.

## Enter the dragon

The Komodo dragon is the largest of all lizards. It is so powerful it can catch and kill animals bigger than itself. It has a long forked tongue that it uses to taste the air and search out dead animals. It lives in Indonesia.

## A touch of venom

The Gila monster is one of only two species of venomous lizards. When it has caught a victim, it chews the venom into their bodies to kill them.

Thorny devil

Gila monster

## Thorny defence

The thorny devil has a very tough defence. Its back is covered with sharp spines, which make picking it up and eating it very difficult indeed.

# Slithering snakes

Snakes can survive anywhere, from cold climates to the hot deserts and rainforests of the world – you can even find them underwater.

## Getting around

Snakes have no arms and no legs. Instead they have a bendy body that wriggles. Some slither in a straight line, others like this viper wiggle in an “s” shape.



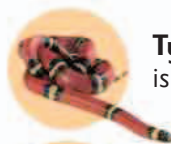
A snake's forked tongue flicks in the air to smell food or alert it to enemies.



Red-tailed racer

## Types of snake

Snakes can be divided into four different groups, or families.



**Typical snakes:** this family is the biggest of the four.



**Vipers:** they have venomous fangs and live in the hot places.



**Constrictors:** kill their prey by squeezing them to death.



**Cobras and kraits:** they are some of the most deadly creatures alive.

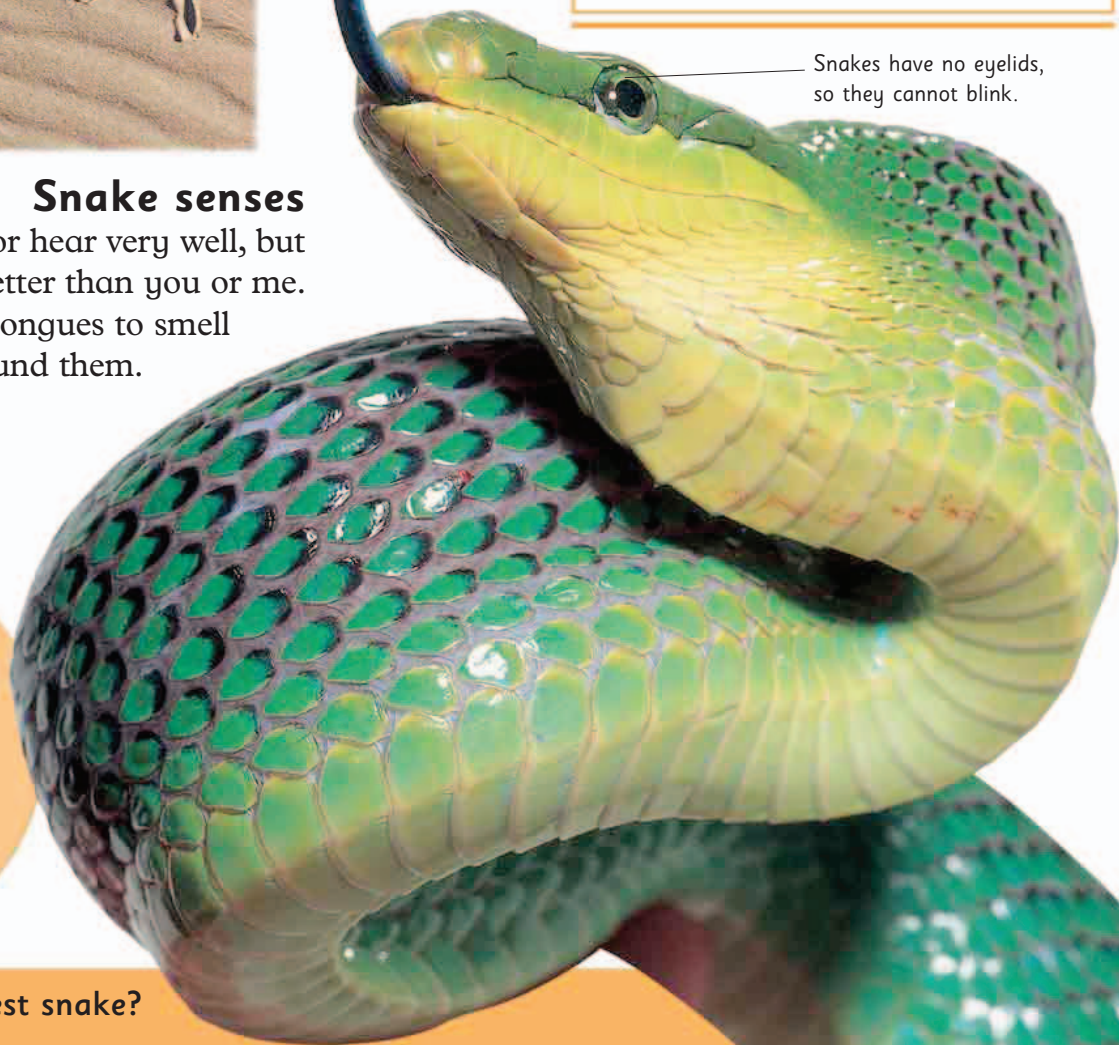
Snakes have no eyelids, so they cannot blink.

## Snake senses

Snakes can't see or hear very well, but they can smell much better than you or me. They use their forked tongues to smell and taste the air around them.

## Turn and learn

Snake defence:  
pp. 92-93  
Snake-like eel:  
p. 149



Some tree snakes have ridges on their bellies, which help them to grip onto branches.

### Tree climbers

Many snakes live in trees, coiling themselves around the branches. They tend to have long tails to help them climb and balance.



*Snakes have very bendy bodies.*

### Snakes everywhere

Snake body shapes are adapted to where they live. Ground snakes have heavy bodies to slide through soil, while sea snakes have oar-like tails for swimming.

Tree snakes can find birds' nests in the trees using smell in order to attack and eat the chicks.

### Hibernating

Snakes can't control their body temperature very well so those that live in cold climates often have a long sleep, or hibernation, during the winter. They can survive for many months without eating.

Most sea snakes, such as this sea krait, are incredibly venomous.



Garter snakes



### Laying eggs

Snakes lay eggs but most do not make good parents. The python coils itself around its eggs to keep them warm, but most snakes leave them, so the young must fend for themselves.



The thread snake – it is not much bigger than a worm.

# Attack and defence

All snakes eat animals, including smaller snakes. But other animals also find snakes a tasty meal, so they have to be experts at defending themselves as well as hunting for food.



When danger threatens, the cobra rears up its head and hisses. If this doesn't frighten the enemy away, it strikes.



## Protection

Snakes have various ways to protect themselves. Some snakes, such as the forest pit viper above, have long fangs containing deadly venom. When threatened, they bite.

## Forms of defence

Snakes have many other defences that protect them from enemies.



**Playing dead:** the grass snake lies with its mouth open pretending to be dead.



**Camouflage:** this viper's colouring camouflages it among the leaves.

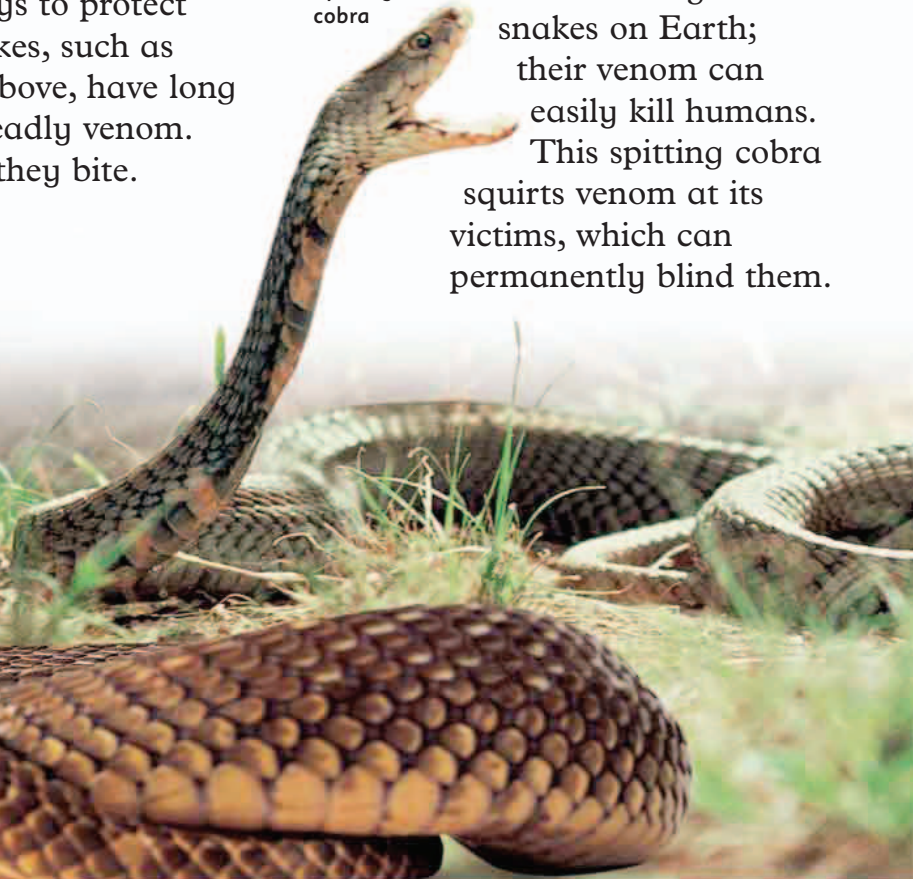


**Rattles:** the rattlesnake shakes its tail making a loud warning noise.

## Attack

Cobras are among the most dangerous snakes on Earth; their venom can easily kill humans. This spitting cobra squirts venom at its victims, which can permanently blind them.

Spitting cobra



### Cunning

Snakes creep up on their victims then lunge at them incredibly quickly. They kill larger victims before they eat them, either by injecting venom or crushing them.

Green cat snake

Many snakes are well camouflaged against their background, which makes it easier for them to stalk victims.



Snakes can eat so much in one meal that they don't have to feed for weeks.

### Eating habits

Snakes eat pretty much anything that moves, from ants and snails to goats and crocodiles. The egg-eating snake can swallow eggs bigger than its head! It then squeezes the insides out and vomits up the shell.

Egg-eating snake

The snake's jaws are elastic and stretch wide to allow it to eat big animals.



The egg is squashed by muscles inside the snake's body.



### A tight squeeze

Constrictors, such as this anaconda, wrap themselves around their victims and squeeze them until they can't breathe. This snake will eat this large alligator whole!

### Turn and learn

How lizards defend themselves against enemies:  
pp. 88-89



# Crocodiles and alligators

Lurking beneath the water are the monsters of the reptile world. Meet the wild, ferocious crocodilians.

This animal is a caiman, a type of alligator that lives in Central and South America.



## Fierce cros

Crocodilians are large, meat-eating reptiles that live in water, but sometimes hunt on land as well. They all have very powerful jaws and teeth.

Crocodilians have three eyelids on each eye – one acts like goggles underwater.

## Crocodilians

There are three types of crocodilians.



**Gharial:** this crocodilian has a long thin snout.



**Alligator:** it has a shorter, broader snout and lives in the Americas.



**Crocodile:** unlike the alligator, it has teeth showing when its mouth is closed.



*Crocodilians cannot chew.*

## Water beasts

Crocodiles and alligators live in water and are very good swimmers. Their eyes and nostrils are on top of their head so that they can see, breathe, and hunt with the rest of their bodies underwater.

Spectacled caiman

Most crocodilians live in freshwater rivers and lakes, although a few species also venture out to sea.

## Day to day

Crocodilians lead fairly lazy lives. During the morning and evening they lie on banks basking in the sun with their mouths open. This helps them to warm up or cool down. They spend the night in the water.





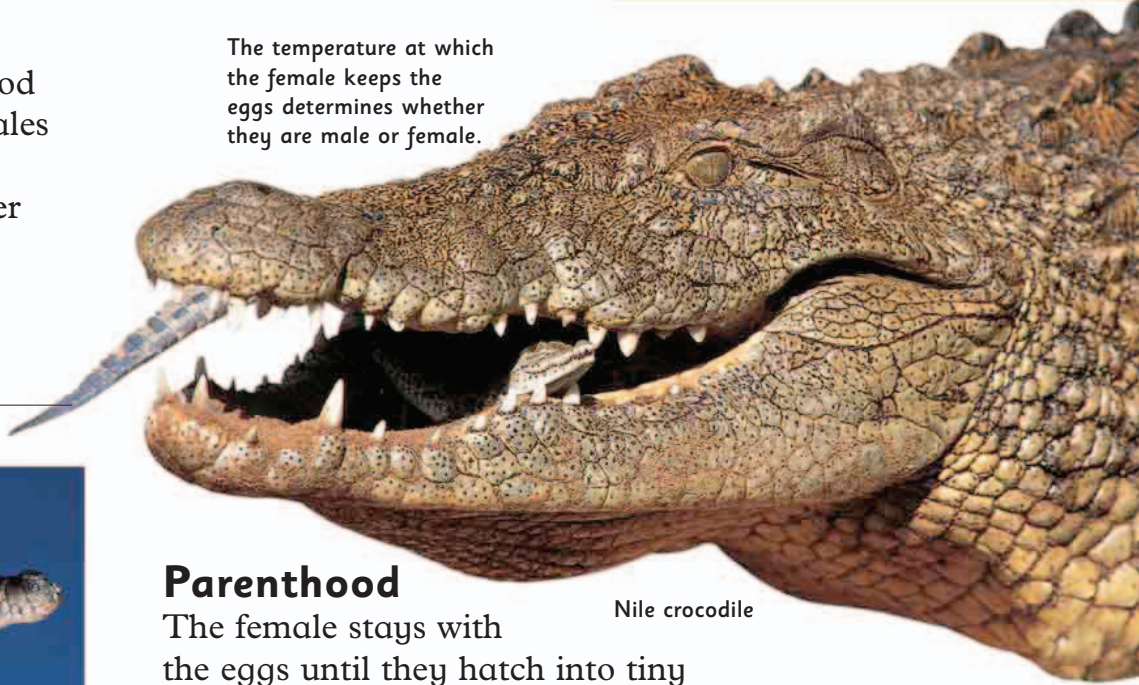
## Parenting

Crocodylians make very good parents. Males attract females by bellowing and blowing bubbles. The female lays her eggs near the water and guards them fiercely.

Baby crocodile being carried by its mother



The temperature at which the female keeps the eggs determines whether they are male or female.



## Parenthood

The female stays with the eggs until they hatch into tiny versions of their parents. Often the mother will then pop the babies into her mouth and carry them to the safety of the water.

Nile crocodile

They shake and tear meat.



## Turn and learn

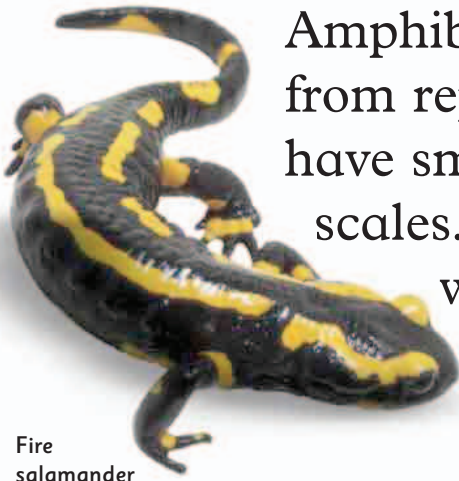
Other reptiles that enjoy the water – turtles:  
**pp. 84-85**

## A large appetite

Crocodylians are some of the world's great meat-eaters. Often, like this crocodile, they wait at the water's edge for an animal to take a drink, then they attack, grabbing it with their massive jaws. They can kill animals bigger than themselves.

Crocodiles and alligators only eat about 50 meals a year.

# The world of amphibians



Fire salamander

Amphibians are different from reptiles in that they have smooth skin with no scales. They are born in water, then live on land or in water when they grow up.

## Amazing skin

Most adult amphibians, such as this salamander, can breathe through their skin as well as their lungs. In order for the skin to breathe it has to be kept moist, which is why most amphibians like to live near water.

## Amphibians

There are three main types of amphibians.



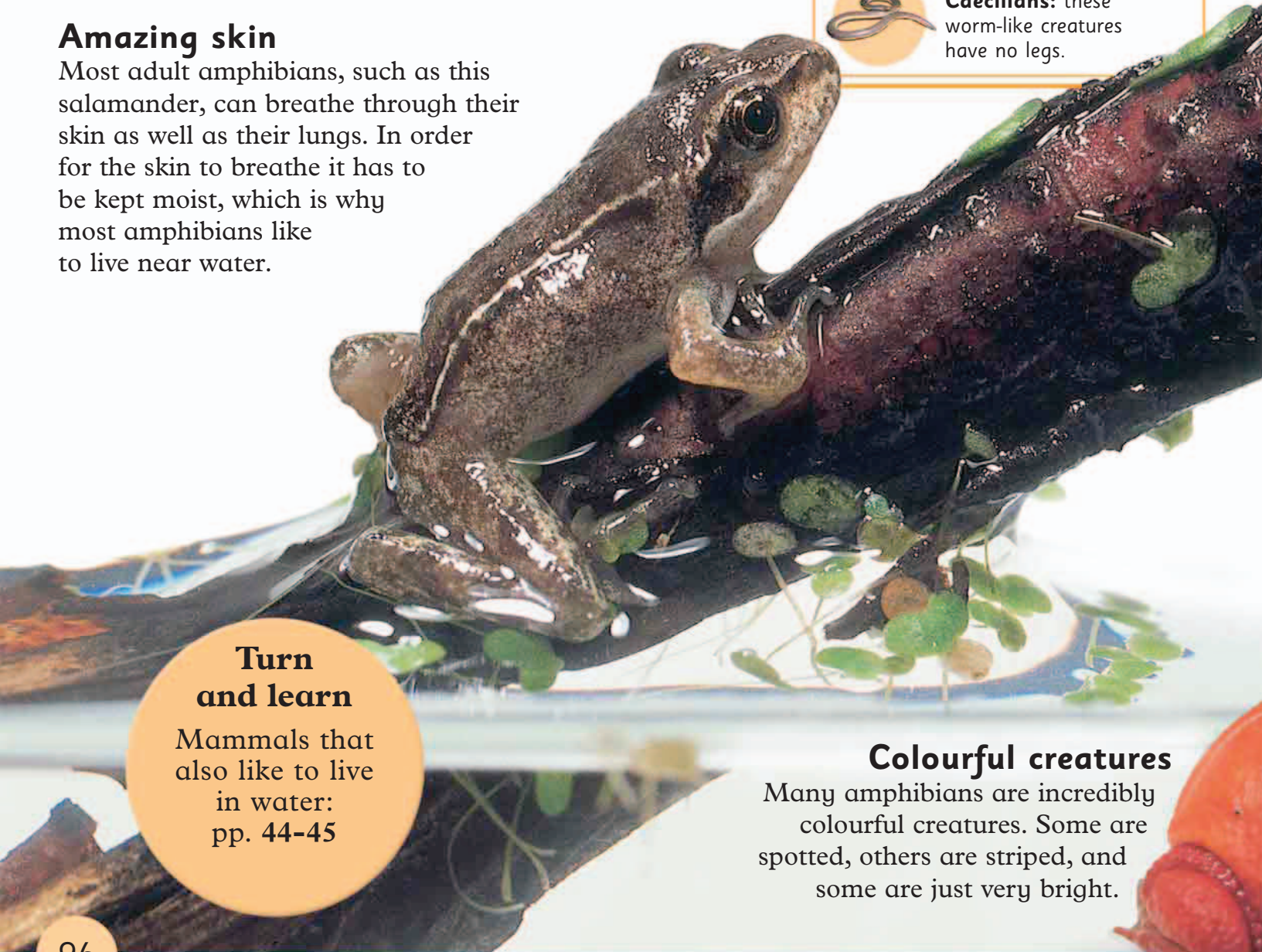
**Frogs and toads:** these amphibians have no tail and big back legs.



**Newts and salamanders:** these lizard-shaped animals live on land or in water.



**Caecilians:** these worm-like creatures have no legs.



## Turn and learn

Mammals that also like to live in water:  
pp. 44-45

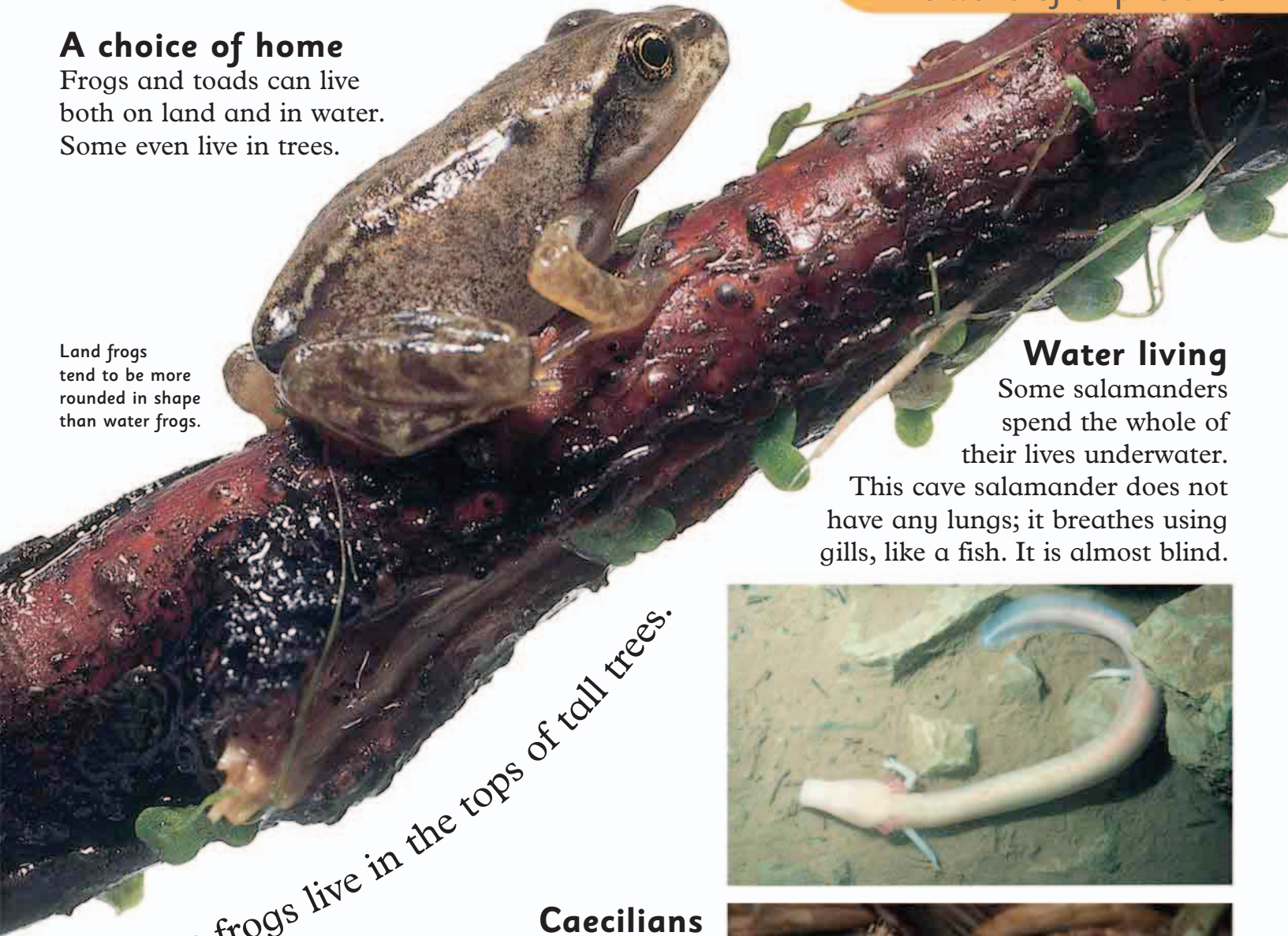
## Colourful creatures

Many amphibians are incredibly colourful creatures. Some are spotted, others are striped, and some are just very bright.

### A choice of home

Frogs and toads can live both on land and in water. Some even live in trees.

Land frogs tend to be more rounded in shape than water frogs.



### Water living

Some salamanders spend the whole of their lives underwater.

This cave salamander does not have any lungs; it breathes using gills, like a fish. It is almost blind.



Some frogs live in the tops of tall trees.

### Caecilians

Legless caecilians are rarely seen by humans because they live either underwater or underground. They have a pointed head, which they use as a shovel.



Tomato frogs



If an animal is poisonous it is often a very bright colour that warns predators.

### Travelling parents

Each spring salamanders, newts, frogs, and toads lay their eggs in ponds or streams. Some travel 5 km (3 miles) to get there.

Common newt





# Frogs and toads

Frogs and toads have short, tubby bodies and large heads with bulging eyes. They have no visible neck and most have a very wide mouth. Frogs and toads live in lots of different habitats around the world.

Frogs often have longer back legs than toads.



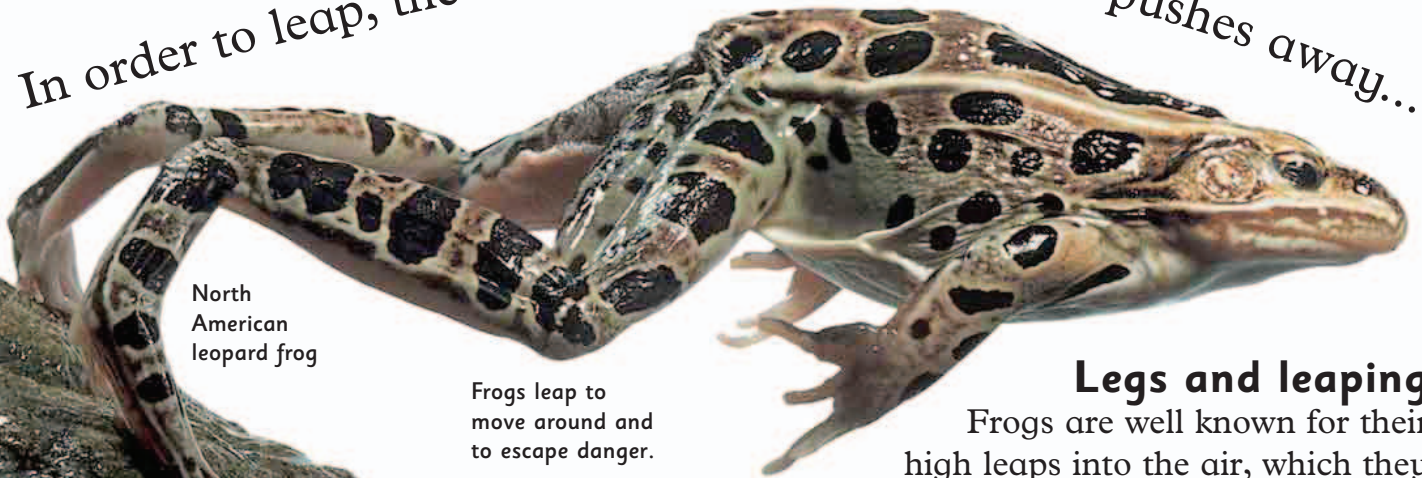
White's tree frog



## Frog or toad?

There are not many differences between frogs and toads. Toads tend to have warty skin, while frogs have smooth skin.

*In order to leap, the frog straightens its legs and pushes away...*



North American leopard frog

Frogs leap to move around and to escape danger.

## Legs and leaping

Frogs are well known for their high leaps into the air, which they make using their muscular back legs. Because these are longer than the front ones, they stay folded until it's time to jump!

## Making more frogs

Each spring, thousands of frogs return to the water to find a mate and lay their eggs. Large clumps of these eggs, called spawn, are laid together, covered in jelly to protect them.



Tadpoles live under water until they are frogs.



Spawn



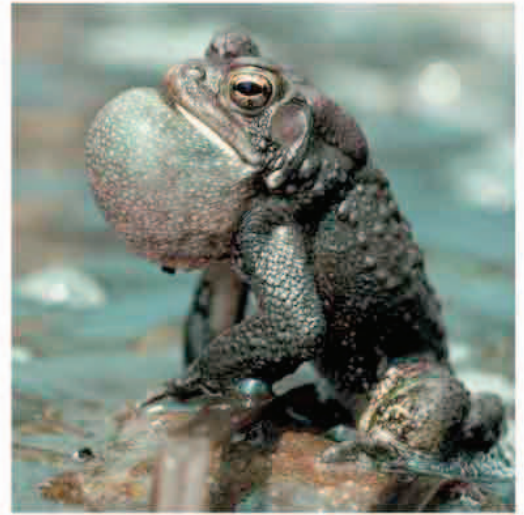


Toads' feet are less webbed than frogs'.

Oriental fire-bellied toad

### Time for a chat

Frogs and toads are big talkers. They croak to attract females and alarm enemies. This toad has an inflatable vocal sac – a big piece of stretchy skin that helps make an extra-loud sound.



### Running frogs

Not all frogs leap to move around. These African running frogs live in grassy areas where they prefer to remain low, so they raise their body off the ground and run.

The African running frog is in the crouching position.

To move, it raises itself up and takes long strides forwards.



Webbed feet

### In the water

Frogs and toads are very good swimmers. They have webbed feet, which help them move quickly through the water. They swim by bending their legs in and out, just like people do in the breaststroke.



... from the ground.

Frogs often dive into water for safety.

### Junior frogs

Frog and toad eggs hatch into tadpoles, which are completely different from adults. They look like tiny fish with no legs and a long tail. Over four months, the tadpoles gradually grow legs, lose their tails, and turn into miniature frogs.



When a frog is fully formed, it can leave the water.

Tadpoles have gills to breathe with, a bit like fish. They develop lungs when they become frogs.

Most frogs and toads abandon their eggs, so the tadpoles must look after themselves.

# Hunting and hiding

Frogs and toads eat small animals. But they also make an ideal meal for others because they have no fur, feathers, or claws. They have clever ways to avoid becoming food.

## Finding a meal

Frog and toad adults are meat-eaters. They have very wide mouths so they can eat quite big animals.



This toad sits and waits for animals to simply walk past it. It then opens its mouth and swallows them whole.

Ornate horned toad



## A sticky end

Frogs and toads have sticky tongues that grab onto prey. They can shoot these out, grab the insect or small mammal, and swallow it whole! They have to blink when they swallow – their eyeballs help to push the food down the throat.

This four-eyed frog has fake eyes on its bottom to make it look like a big animal.



## Defence

Frogs and toads have many defences: some use poison, some use camouflage, and others can almost fly!



## Handle with care

Some frogs, like this poison dart frog, are highly poisonous or taste disgusting when eaten. They tend to be very brightly coloured – nature's way of warning enemies off.



European common frog

Tree frogs have huge sticky pads on their feet that help them to grip onto trees.

Tree frogs can change direction in the air.

### Leaping to safety

Some tree frogs are like acrobats. This Wallace's tree frog has webbed feet. When it feels threatened, it leaps into the air, spreads its toes, and uses them as a parachute to glide from branch to branch.

Wallace's tree frog



Asian horned toad

### Spot the toad

The Asian horned toad has one of the best defences. It simply becomes invisible, using camouflage. Its body is flat, like a leaf, and exactly the same colour. Even the flaps over its eyes are leaf-shaped.

### Turn and learn

Defence tactics of insects:  
pp. 114–115

# Salamanders and newts

These animals may look like lizards, but they have far more in common with frogs and toads. They have smooth skin and they love the water.

Newts and salamanders have slender bodies and long tails.

Most newts and salamanders live in cool, damp forests.

They must keep their skin damp in order to breathe.

## Newt or salamander?

Newts and salamanders are very similar animals. However, while all newts live on land but breed in water, many salamanders spend their whole lives in the water.

This newt lives under rocks or in caves to keep its skin moist.



## Getting around

These creatures normally move slowly but they can move quickly when in danger. They crawl over land and at the bottom of ponds. Newts sometimes swim near the surface of the water.



This North American tiger salamander can grow to 40 cm (15 in).

## Meat habits

Salamanders and newts are insect- and worm-eaters who like to eat fresh prey. They find their food using smell and sight. Salamanders have long tongues that flick out to catch prey.



This Mandarin salamander is eating an earthworm.

## Egg laying

Eggs are laid in the water, and when they hatch, they look very much like frog tadpoles. Unlike frogs, however, they keep their tails when they grow up and gain legs. They live in the water until adulthood.



Great crested newt

## Colourful displays

Many newts and salamanders are brightly coloured. The male sometimes shows off his colours to females when looking for a mate.



These Alpine newts are performing a courtship dance.



## Half-formed

Mexican axolotls are salamanders that have never quite changed fully into adults, but have remained half-formed. They live underwater and are sometimes kept as pets.



The Japanese giant salamander can grow to 2 m (6 ft) long!

# Creepy-crawlies

In this book, creepy-crawlies consists of all the animals that don't belong to the other sections. All creepy-crawlies are invertebrates.



Cave spider



Black housefly



Lacewing



Spider wasp



Common housefly



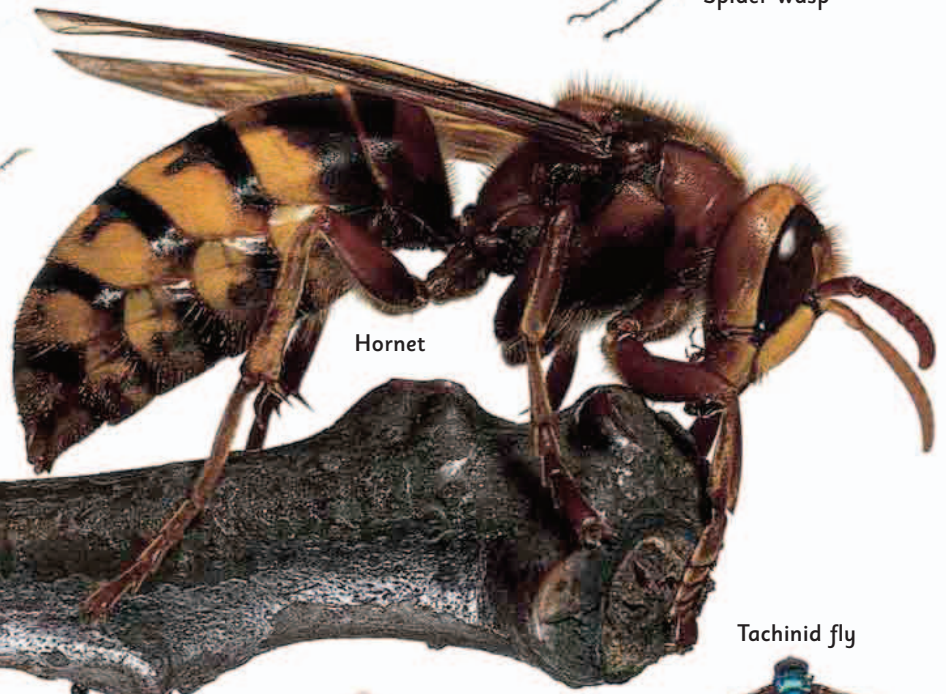
Bush cricket



Red giraffe weevil



Flea



Hornet



Tachinid fly



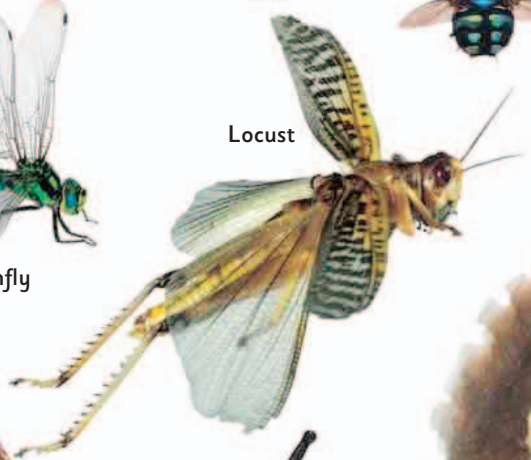
Caterpillar



Cardinal beetle



Dragonfly



Locust



Giant land snail



Spiny-bellied orb weaver spider



Blue morpho butterfly



Golden emperor moth



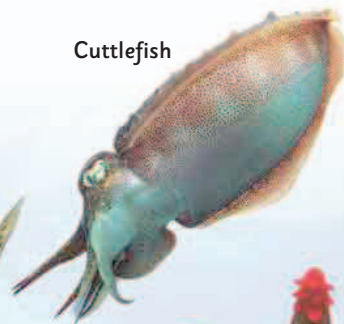
Large yellow underwing moth



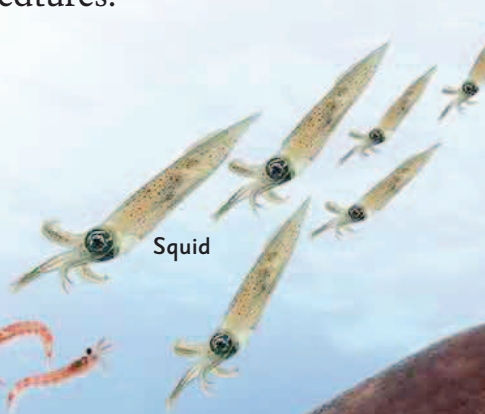
Queen Alexandra's birdwing butterfly

### Spineless creatures

Invertebrates include all the different insects, plus other small land animals, such as spiders and snails, and extraordinary-looking sea creatures.



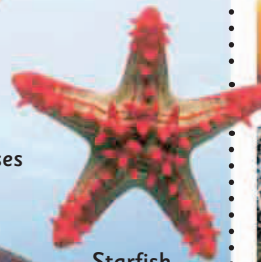
Cuttlefish



Squid



Krill



Starfish

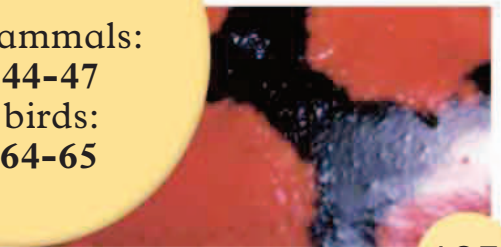
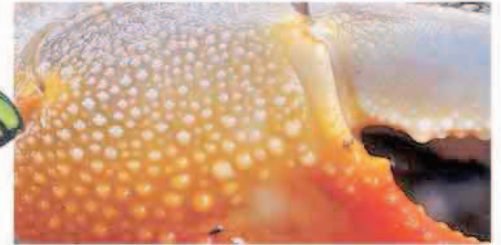
The marine creepy-crawlies include octopuses and starfish.

Common octopus



### Picture detective

Take a look through the creepy-crawly pages and see if you can spot where these pictures come from.



### Turn and learn

Sea mammals:  
pp. 44-47  
Sea birds:  
pp. 64-65

# The world of insects

A huge majority of creepy-crawlies are insects. In fact, there are more types of insect in the world than any other animal. They are absolutely everywhere. Some are almost too small to see while others are surprisingly large.

Most insects have two pairs of wings.



Beetle

## What is an insect?

You can tell if a creepy-crawly is an insect because insects always have six legs. They also have three body parts – a head, a thorax, and an abdomen.



When a pile of dung appears in Africa, dung beetles are on the scene in minutes.

## Nature's recycling service

Although many people dislike insects and they can be pests, they are also essential to our world. In fact, we could not live without them. For instance, dung beetles do a very good job cleaning up dung.

The beetles roll perfect balls of dung in which they lay a single egg. When the egg hatches, the baby eats the dung.



Dung beetle

## Useful insects

Here are some other ways that insects are useful to us.



**Red food dye:** this food colouring is made from the bodies of scale insects.



**Silk:** believe it or not, the silk you wear is made by silk-moth caterpillars!



**Honey:** if there were no bees in the world, we would have no honey.



**Food:** in many cultures around the world, insects such as grubs are a nutritious meal.

## Pest control

Sometimes insects, such as aphids, eat huge amounts of our crops. The best way to get rid of them is to introduce another insect that likes to eat them. Ladybirds are often used for aphid pest control.

Aphid

Introducing insects that eat other insects is called biological pest control.

Ladybird



## As old as an insect

We know that insects existed 40 million years ago because some were trapped in a tree resin called amber, which hardened and preserved them.

Aphids breed so quickly that it is difficult to control them.

## Turn and learn

Beetles:  
pp. 120-121  
Bees:  
pp. 122-123

# Egg to adult

The one thing insects are very, very good at is making more insects. They all start off as eggs, then grow up in lots of strange and different ways.

## Metamorphosis

When they're born, many insects look nothing like their parents. They have to go through three stages – egg, larva, and pupa – before they become adults. This process is called metamorphosis.

Dragonflies have to shed their outer skin in order to grow.



Every insect in the world lays eggs.



## Stages 1 and 2: egg and larva

The butterfly lays her eggs and they hatch into larvae. The larva of a butterfly is called a caterpillar. It eats and eats enough leaves until it gets fat.

## Small changes

Some insects are born only a little different from their parents. With dragonflies, the main difference is that their babies live completely under water; as the babies grow, they develop air tubes for breathing air, and wings for flying.

## Turn and learn

Butterflies:  
pp. 118-119

Beetles:  
pp. 120-121

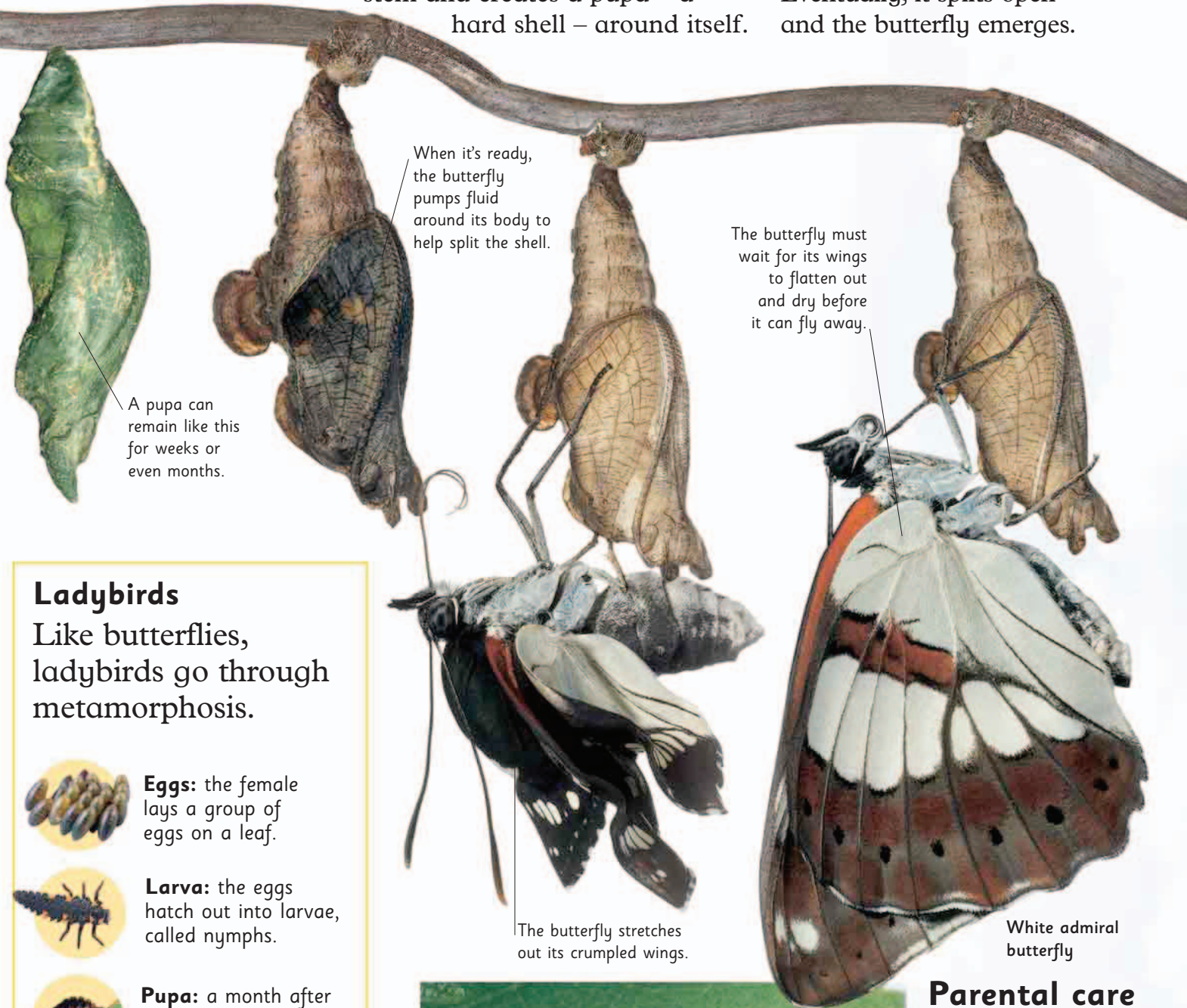
The caterpillar has to find a safe place to make its pupa.

### Stage 3: pupa

When the caterpillar is big enough, it sheds its skin, fastens itself to a plant stem and creates a pupa – a hard shell – around itself.

### Stage 4: adult

Inside the pupa an amazing change takes place. Eventually, it splits open and the butterfly emerges.



A pupa can remain like this for weeks or even months.

When it's ready, the butterfly pumps fluid around its body to help split the shell.

The butterfly must wait for its wings to flatten out and dry before it can fly away.

The butterfly stretches out its crumpled wings.

White admiral butterfly

### Ladybirds

Like butterflies, ladybirds go through metamorphosis.



**Eggs:** the female lays a group of eggs on a leaf.



**Larva:** the eggs hatch out into larvae, called nymphs.



**Pupa:** a month after hatching, each larva builds itself a pupa.



**Young ladybird:** A week later, a yellow adult emerges.



**Adult:** After a while the yellow colour turns to red with black spots.



### Parental care

Most insects abandon their eggs after they have laid them. However, unlike others, shield bugs care for and fiercely protect their babies.

# On the move

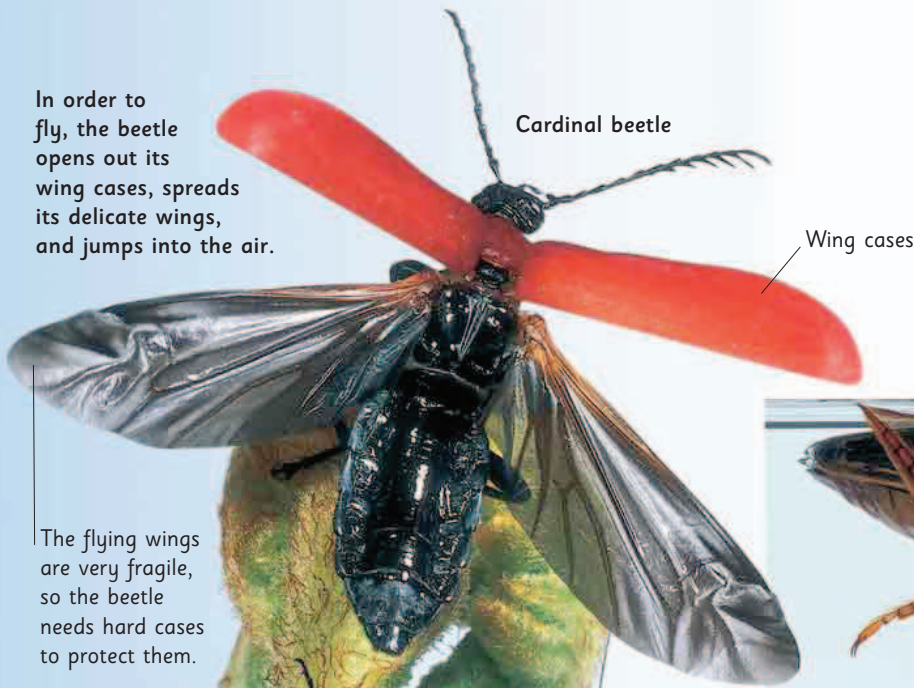
Insects are very good at moving around. Many run, others fly, some jump, and a few even swim!

## Flying

All flying insects have two pairs of wings, but they use them in different ways. Beetles fly with one pair while the second, harder pair folds over the top to protect them.

In order to fly, the beetle opens out its wing cases, spreads its delicate wings, and jumps into the air.

The flying wings are very fragile, so the beetle needs hard cases to protect them.



## Other wings

Here are some more ways insects use their wings. Many are very good air acrobats.



**Housefly:** flies only use one pair of wings. The other pair look like sticks.



**Dragonfly:** it uses both pairs and can operate each side separately.

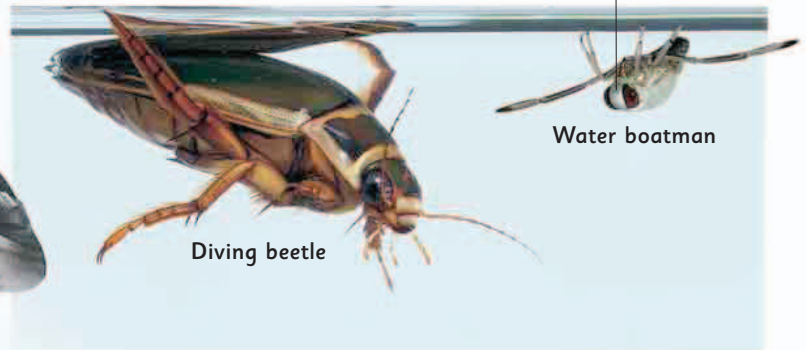


**Lacewing:** this insect can use four wings separately and can fly backwards.



**Hoverfly:** the hoverfly beats its wings so fast you can barely see them.

This water boatman hangs upside down beneath the surface.



Diving beetle

Water boatman

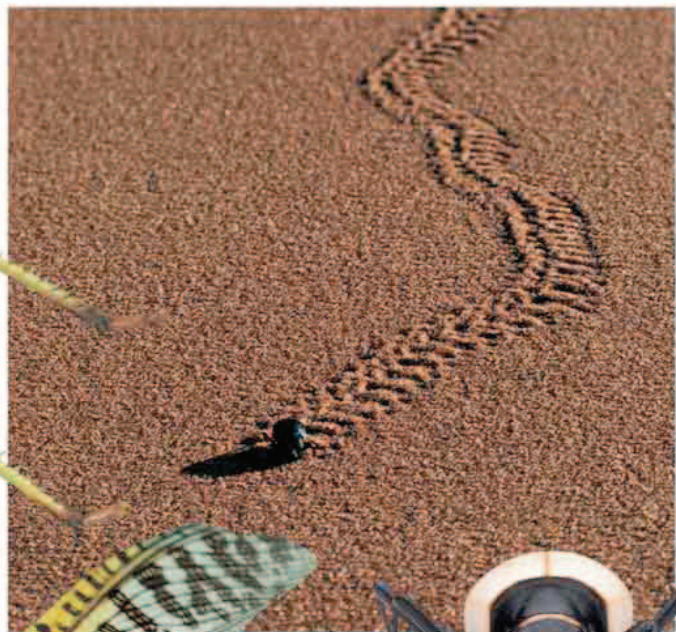
## Swimming

Some insects spend much of their time under water, using their legs like paddles. Diving beetles have special hairs on their legs that splay out in the water and help them swim.

Caterpillars can loop up steep twigs.



Darkling beetles can run at 1 m (3 ft) per second.

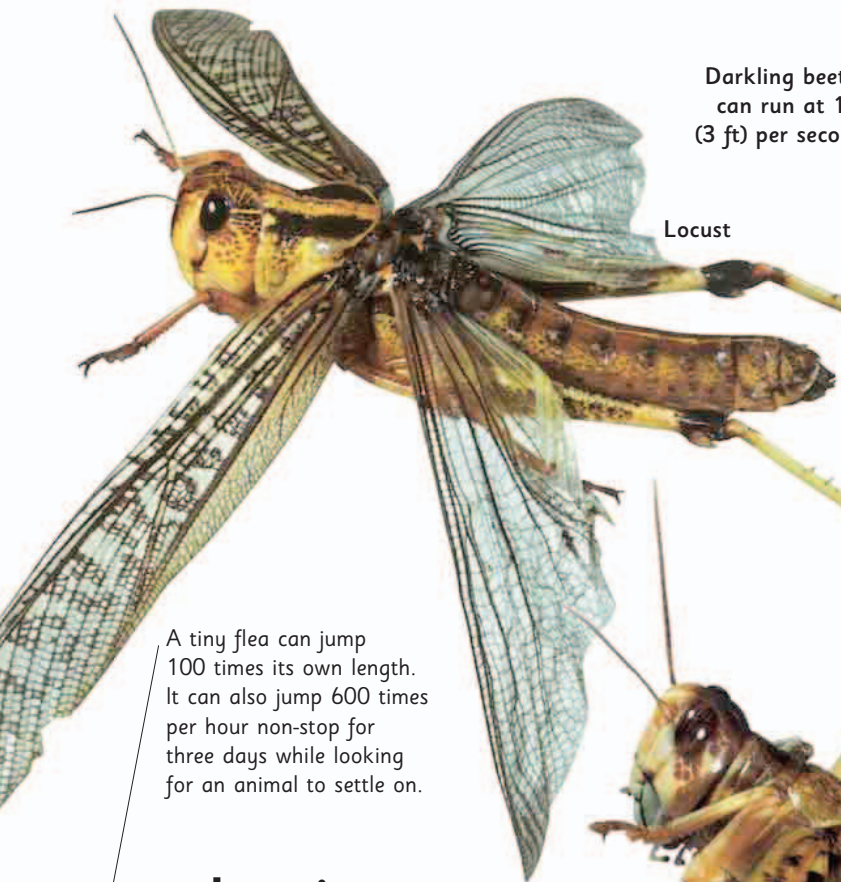


Darkling beetle

### Running

Insects' legs reflect where they live. Beetles that live under bark have short legs that don't get in the way. Darkling beetles have long legs that let them race across hot sand in the desert.

Locust



A tiny flea can jump 100 times its own length. It can also jump 600 times per hour non-stop for three days while looking for an animal to settle on.

### Jumping

Some insects can jump huge distances by using their back legs as powerful springs. If a grasshopper is disturbed, its catapult-like legs help it to get away.

Locusts, a kind of grasshopper, can jump up to 1 m (3 ft) high.

### Turn and learn

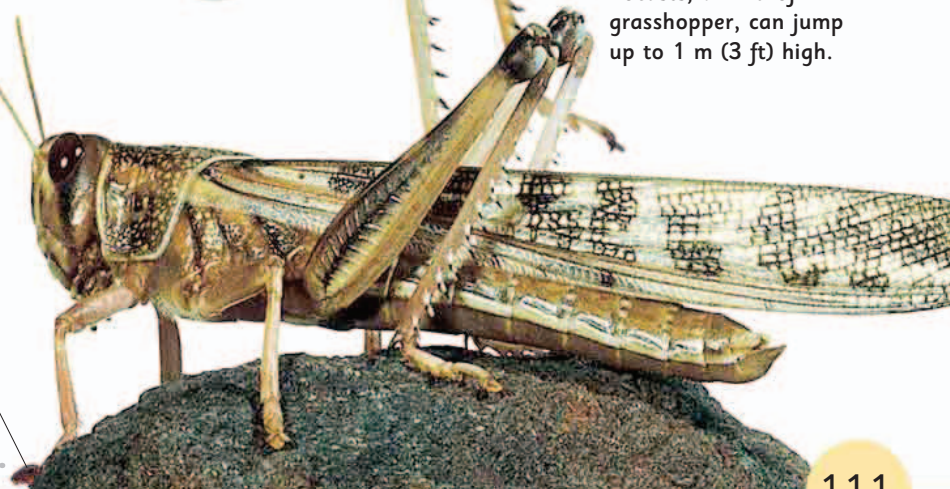
Caterpillars pp. 108-109

Flies: pp. 126-127

These caterpillars have suckers at either end of their bodies to hold onto, and loop up, twigs.



Flea



# Eating habits

Insects eat a wide range of foods. Some are meat-eaters and some are vegetarians, but most spend their time eating. Insects have mouthparts for either biting and chewing or piercing and sucking.

## Meat-eaters

Many insects eat other insects and have to find cunning ways to catch their meals. This praying mantis hides among leaves and then strikes.

The praying mantis can sit still for a long time waiting for its meal to walk past.

This hummingbird moth has a long tongue to suck nectar with. It feeds while it is flying.



## Vegetarians

Most insects are vegetarians and munch or sip constantly during their lives. Some like to bite and chew food such as leaves; others suck liquid, such as flower nectar, through their tongues.

Antlion larva is sometimes called a "doodlebug".



## Meaty meals

The antlion larva buries itself underground with its open mouth facing the sky and simply waits. When an ant runs over the hole, it falls straight into the antlion's jaws and is eaten swiftly.

Caterpillars take a long time to digest food.

### Treacherous teeth

Caterpillars are typical vegetarian biters and chewers. They have strong jaws that can get through tough leaves. It is thought that insects eat about 5 per cent of all leaves in the world.

### Turn and learn

Butterflies and moths: pp. 118-119

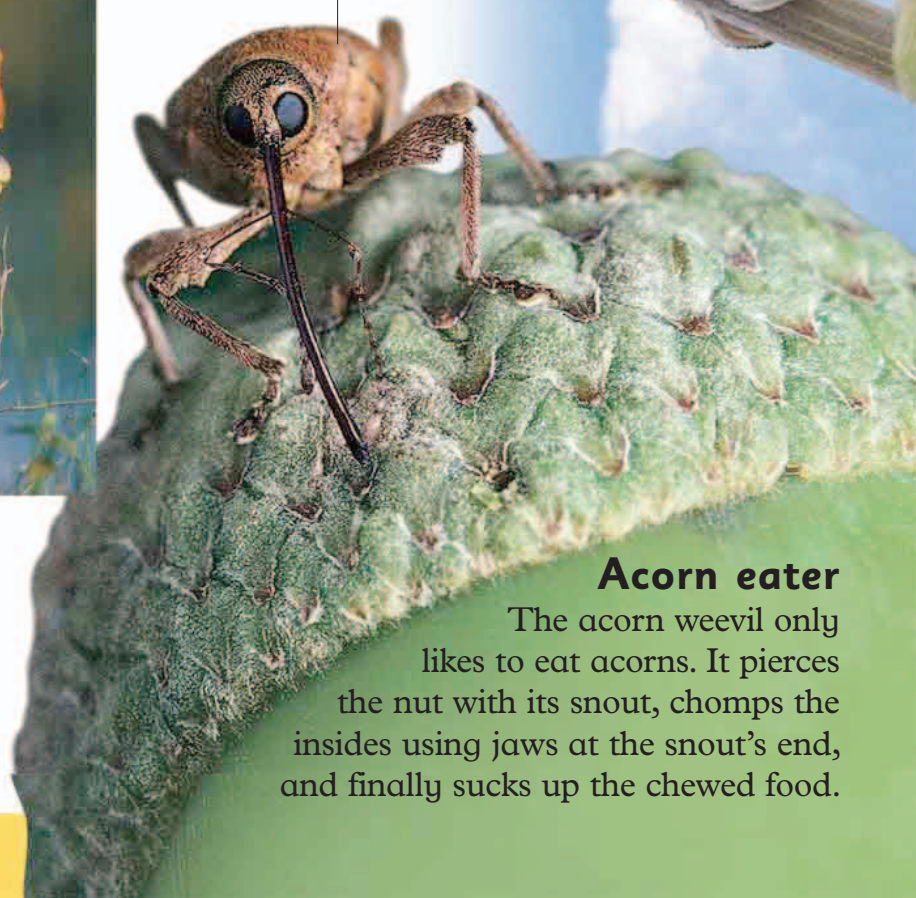
A butterfly lays her eggs on a leaf that will be the caterpillar's first meal – it doesn't have to travel very far to find food.

This weevil has drilled a hole in an acorn.



### Alligator tears

A butterfly has a long tongue called a proboscis, which it uses to sip liquids. The flambeau butterfly has very strange taste in food; it likes to sip alligators' tears. What a brave insect!



### Acorn eater

The acorn weevil only likes to eat acorns. It pierces the nut with its snout, chomps the insides using jaws at the snout's end, and finally sucks up the chewed food.

They grab them out of the air.

# Defence

Many insects make delicious meals for other animals. So, it is very important that they have some defence against the enemy.

## Camouflage

A good way for insects to “disappear” is to hide amongst plants. This white orchid mantis is hiding in plants that are the same colour as it is. Can you find it?

Orchid mantis



The orchid mantis can change colour from pink to white depending on what colour flower it is on.



## Lost among leaves

This katydid, a kind of bush cricket, looks so much like a leaf that it even has veins on its back. All it has to do is keep very still.

The butterfly's “eye”



## Turn and learn

How fish defend themselves:  
pp. 148-149



This ladybird's blood is seeping from its knees.

### Don't eat me!

Brightly coloured insects are often poisonous or taste really nasty. The ladybird bleeds bitter-tasting blood from its knees when disturbed.



Any enemy that tries to eat this ladybird will soon spit it out – and avoid bright red insects in the future.

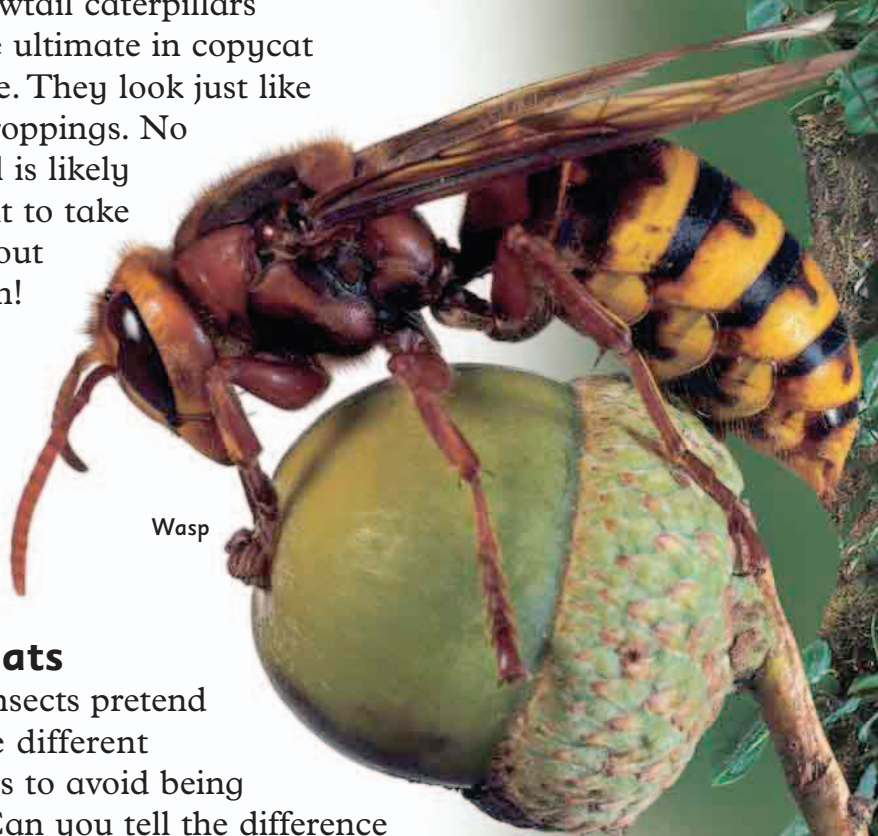
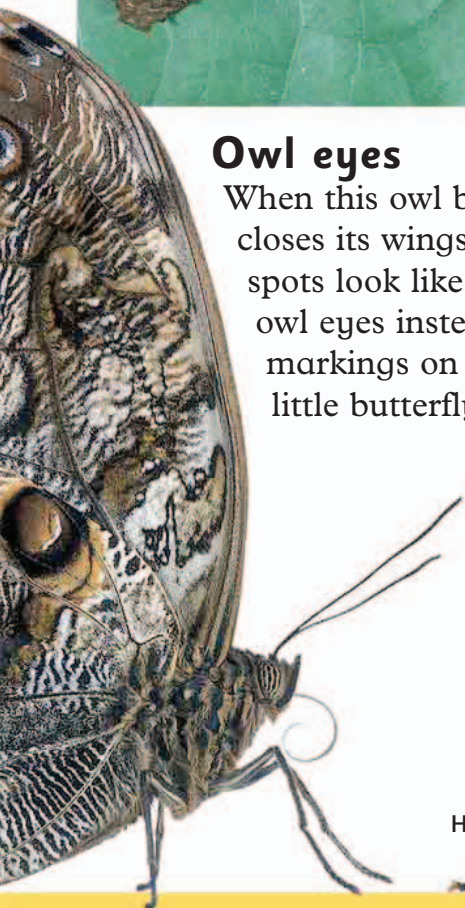


### I'm not eating that!

Swallowtail caterpillars are the ultimate in copycat defence. They look just like bird droppings. No animal is likely to want to take a bite out of them!

### Owl eyes

When this owl butterfly closes its wings, its spots look like eerie owl eyes instead of the markings on a tasty little butterfly.



Wasp

### Copycats

Many insects pretend they are different creatures to avoid being eaten. Can you tell the difference between the wasp and the hoverfly just by looking at them?



Hoverfly

The harmless hoverfly copies the wasp in the hope that it looks like it may have a sting.

# Pests and plagues

Insects are small but they can do a huge amount of damage. It may be hard to believe, but these are some of the most dangerous creatures alive.

Cockroaches have tough bodies and are very difficult to kill.

## Unwanted guests

Once cockroaches move into your home they are very difficult to get rid of. They eat rotten food and spread diseases around the house. They also make a house smell.



Cockroach

### Turn and learn

Tiny animals that live on your body and can make you ill:  
pp. 140-141

## Some more pests

Humans have a hard time controlling pests. For thousands of years, we have been trying to find ways to get rid of them.



**Colorado beetle:** this little beetle can destroy entire potato fields.



**Common clothes moth:** these moths love to eat woollen clothes.



**Longhorned beetle:** these beetles can destroy entire forests.



## Head lice

The head louse is a tiny insect that grips onto your hair so tightly that it is tricky to remove. It drinks blood from your head and makes your scalp itchy. Its eggs are called nits.



Close-up of a headlouse's claws.



### Hungry locusts

When the rains fall in Africa, millions of locusts sometimes gather together and move in huge groups, or swarms. They eat everything in sight and there are so many of them that they blot out the sunlight.



Tsetse fly



### Bloodsuckers

The tsetse fly is a blood sucker. It pierces the skin of humans and other animals and sucks their blood. Here you can see the fly with an empty and a full tummy. It spreads a disease called sleeping sickness.

Only female mosquitoes drink your blood.

Male mosquitoes drink nectar from flowers, and juices from plants.

If a mosquito sucks blood from a sick person, it will pass the illness on to the next person it bites.

Mosquito



### Keep away!

Believe it or not, the mosquito has killed more people on Earth than any other animal. When it bites, it can spread a dangerous disease called malaria.

Malaria kills thousands of people every year.

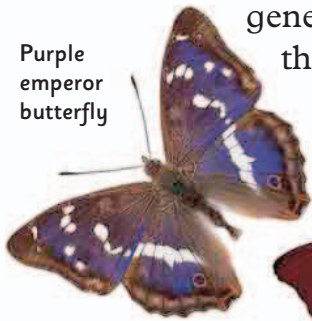
# Butterflies and moths

Butterflies and moths are unique insects because their wings are covered in tiny scales. They look alike but there are a few slight differences.

## Which is which?

Butterflies have club-shaped antennae, or feelers, and moths tend to have feathery or plain antennae. Butterflies are also generally more colourful than moths.

Purple emperor butterfly



Red glider butterfly

## Resting

Butterflies come out by day and moths emerge at night. When moths rest they open their wings, while butterflies rest with their wings closed.

Eighty-eight butterfly

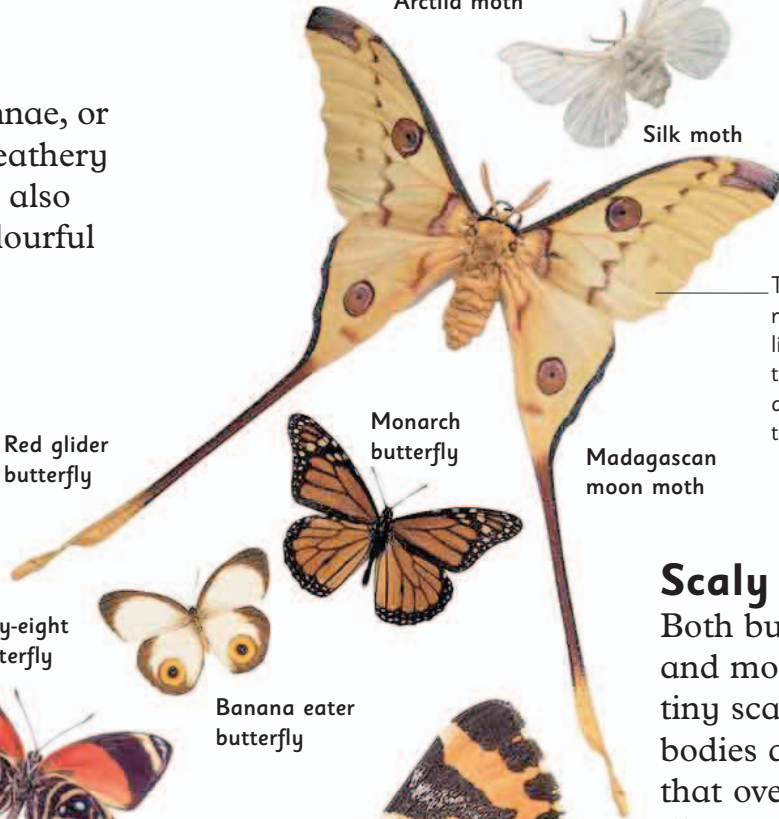


Banana eater butterfly



Monarch butterfly

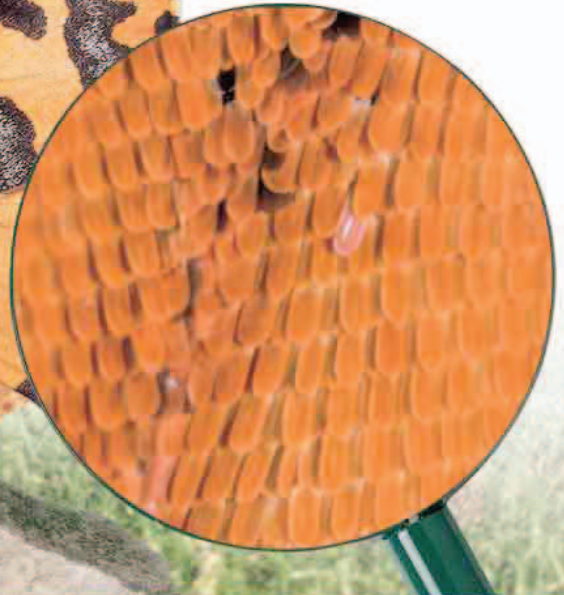
Madagascar moon moth



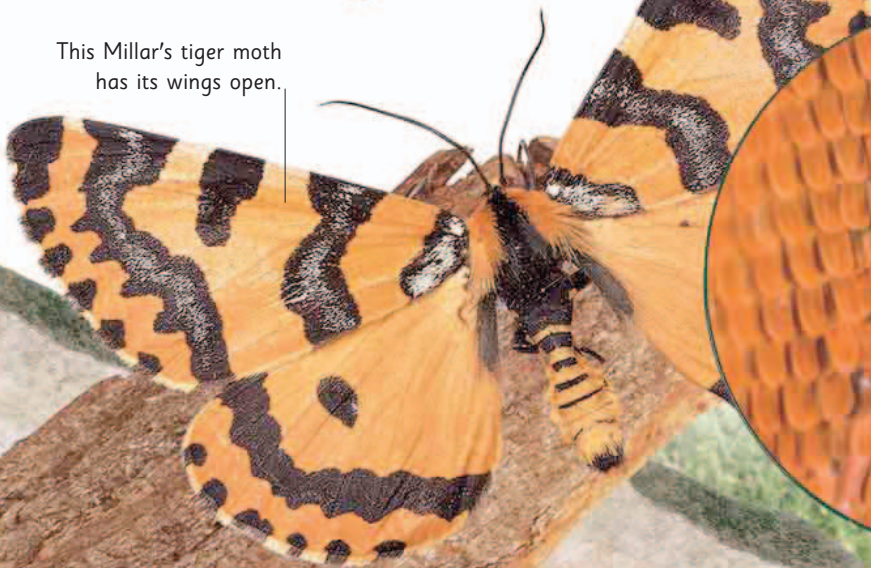
This moon moth has no mouth as it only lives long enough to lay eggs, and doesn't have time to eat before it dies.

## Scaly skins

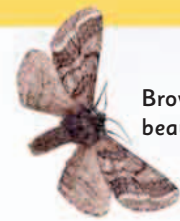
Both butterflies and moths have tiny scales on their bodies and wings that overlap like tiles on a roof.



This Millar's tiger moth has its wings open.



This peacock butterfly has its wings closed.



Brown brindled beauty moth



Hartig's brahmaea moth



Arctiid moth



Silk moth



### Incredible migration

The monarchs are unusual butterflies. When the cold winter sets in they undertake an incredible journey. They travel from Canada to the fine weather in California, USA, and Mexico, and can cover 130 km (80 miles) in a day.



Trees are often covered in monarch butterflies as they rest.

### Tasty titbits

Caterpillars can make tasty snacks for some animals, so they have cunning ways of fooling their enemies.



**Puss moth caterpillar:** it rears its colourful head when threatened.



**Elephant hawk-moth caterpillar:** it can change the shape of its body to look like a snake.



**Postman caterpillar:** it is covered in long spines.

Antennae are used for smelling.

Caterpillars spend most of their time eating.



### Eating

Butterflies and moths hatch as caterpillars, which eat in a completely different way to the adults.

Butterflies keep their tongues rolled into a coil until they want to eat. They then unroll it and use it like a straw.

### Hungry caterpillar

Caterpillars have strong jaws, which they use to chew leaves. When they become butterflies their mouthparts are different – instead they have a long tongue, or proboscis, which they use to sip liquid.

Tongue, or proboscis

### Turn and learn

How caterpillars change into butterflies:  
pp. 108-109



# Beetles and bugs

These amazing creatures can be found all over the world, from mountain tops to scorching deserts.

## Beetles

Beetles are the most heavily armoured of all insects. They have biting and chewing mouthparts.



The African Goliath beetle is the biggest beetle in the world.

The diving beetle uses its legs as paddles.



## Diving beetles

Most beetles live on land, but the diving beetle catches its food – tadpoles and even small fish – in the water. In order to breathe it tucks a bubble of air under its wings before every dive.

## Beetles

Beetles are often bright and colourful.



**Scarab:** this beautiful golden scarab is found in South America.



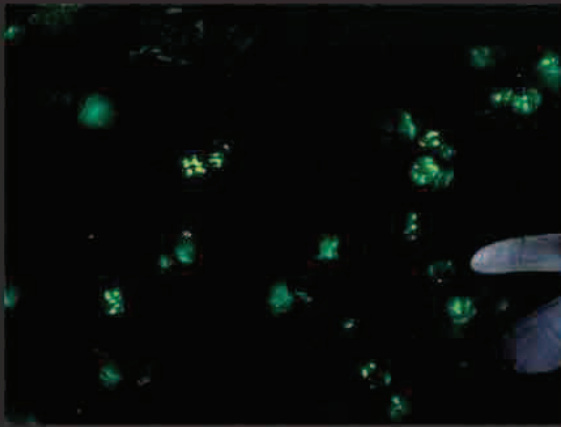
**Chafer beetle:** these lovely beetles vary hugely in size and colour.



**Weevil:** this bright blue weevil is found in Papua New Guinea.



**Frog beetle:** frog beetles have colourful bodies with a metallic, shiny look.



Glowworms can sometimes be seen at night glowing and flashing in their thousands.



Glowworms are found all over the world.

### Glow in the dark

Glowworms are not worms, they are beetles. They have a special organ in their bodies that lights up in the dark. They flash their bodies at night to communicate with each other.



### Bugs

Members of the bug family look quite like beetles, but they have a feeding tube that pierces and sucks up their food. They cannot bite and chew.



### Bugs

They are small, but some can be quite aggressive!



**Shield bug:** it is known as the "stink bug" because it can let out a foul smell.



**Coreid bug:** this bug waves the flaps on its legs to scare predators.



**Aphid:** this little creature is a pest. It attacks garden plants.



**Assassin bug:** it kills other insects and sucks their insides out.

### Clicking cicadas

Cicadas, a type of bug, are the noisiest of insects. They can be heard up to 1.5 km (1 mile) away. They make their noise by vibrating drum-like pads on the side of their tummies.



### weird or what?

The deathwatch beetle eats through wood. When it wants to attract another beetle's attention, it bangs its head against the wood. Sometimes people hear the tapping in their houses.

Some cicada species can live for up to 17 years!

# Bees and wasps

You may think bees and wasps simply buzz a lot and sting, but they are actually some of the most intelligent insects around.



## Bees

Bumblebees and honeybees live in large colonies, working together as a group. Worker bees spend much of their lives gathering nectar from plants, which they turn into honey.

Bumblebees do not produce large amounts of honey.



Worker bees cannot lay eggs. Only the queen provides new babies.

Honey is their food.

## Class system

Bee societies have three classes within their colony.

**Queen:** each bee colony has a queen who lays up to 100 eggs a day.



**Drone:** there are only ever a few drones – males – with the queen.



**Worker:** all of the workers are female. They collect the nectar.



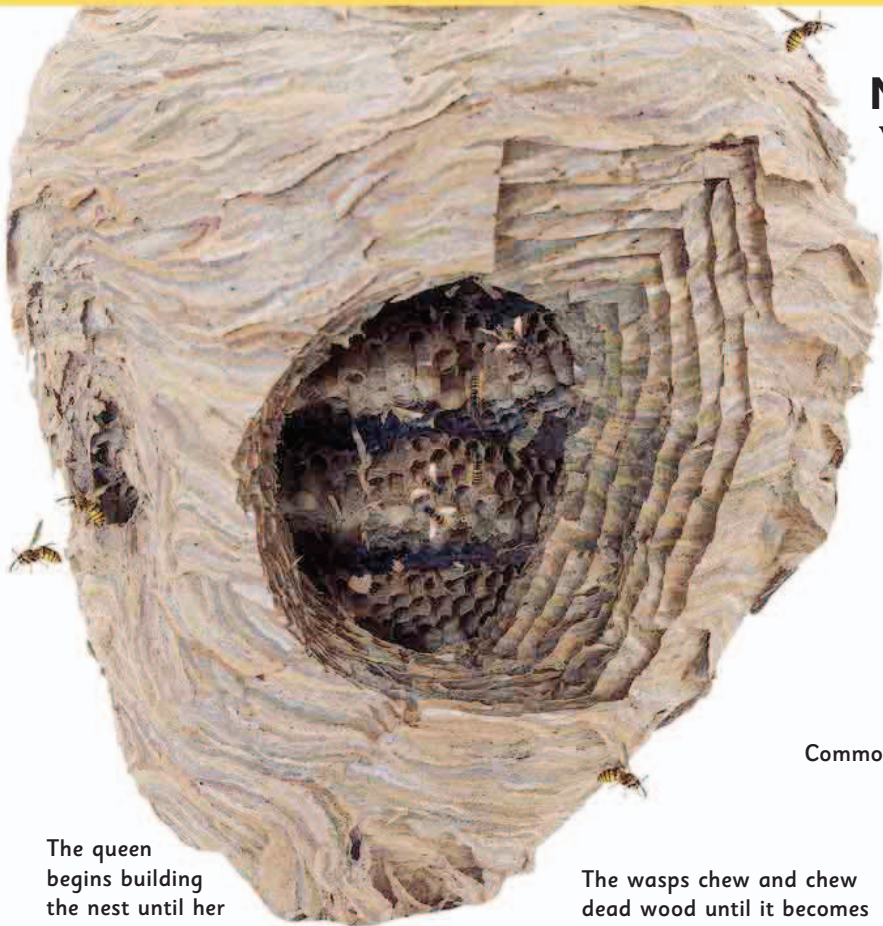
## weird or what?

When a honeybee knows that a flower is full of nectar, it does a special wagging dance to show other worker bees where to go to collect it.

## Comb

A honeybee's home is a miniature city made of wax, produced by the bees, in cell shapes. This is called a honeycomb. Some cells hold a baby larva and some hold honey.





The queen begins building the nest until her first babies are big enough, after which they take over.

The wasps chew and chew dead wood until it becomes pulpy. It then dries into paper.

## Nests

Wasps either live alone (solitary wasps) or in large groups (social wasps). Those that live together build large nests made out of dead wood that they chew into paper.

Bees and wasps have powerful biting mouthparts.



Common wasp

## Wasps

There are many different families of wasps. Most adults have a narrow waist between their second and third segments, and large eyes.

## Stings

Wasps and bees have yellow and black stripes that warn people they are venomous. They only sting when they feel threatened or they are defending their home.



## Living alone

Many wasps do not live in groups, but prefer to live alone. They are called solitary wasps. They are mostly parasitic, laying their eggs on other insects.

Ichneumon wasp (solitary)



## Moving in swarms

When a new queen is born, she will leave with a group of wasps to build and rule her own nest. The wasps all fly off together in a group called a swarm. In this picture they are resting.



# Ants and termites

There are more termites and ants on Earth than any other type of insect – there are trillions of them! They live in groups called colonies.



Ant



## Termites

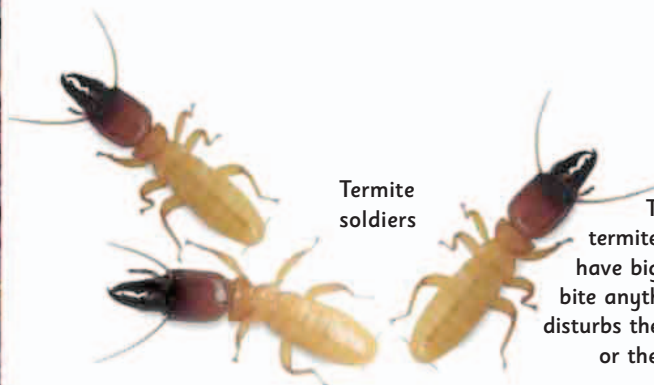
Termites live in hot, tropical areas. Each colony has a queen who is the chief and she has a king. Workers clean and feed, and soldiers guard.



In some species, the queen grows into a huge egg-laying machine, producing 30,000 eggs in a day!

## Ants

There are many different types of ant, one or more living in almost every part of the world. These are leaf-cutter ants, which collect leaves and turn them into food.

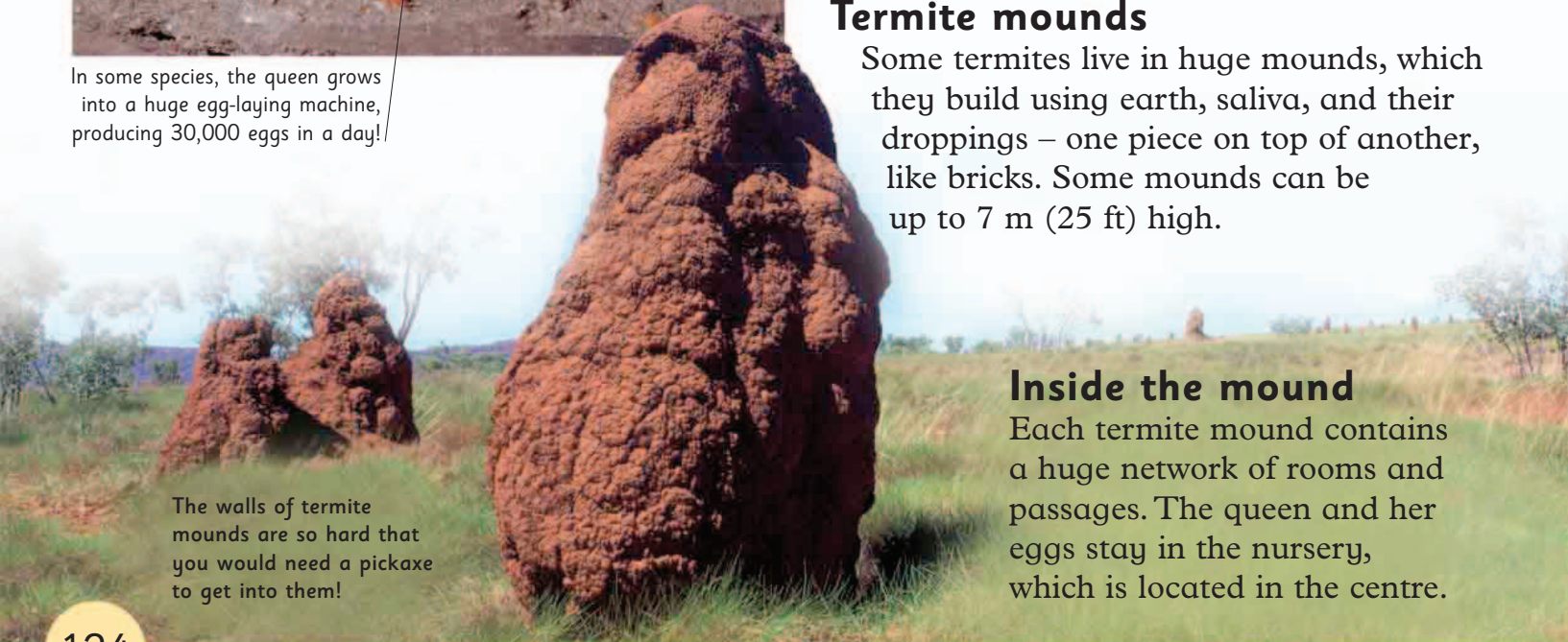


Termite soldiers

The fierce termite soldiers have big jaws to bite anything that disturbs their queen or their home.

## Termite mounds

Some termites live in huge mounds, which they build using earth, saliva, and their droppings – one piece on top of another, like bricks. Some mounds can be up to 7 m (25 ft) high.



The walls of termite mounds are so hard that you would need a pickaxe to get into them!

## Inside the mound

Each termite mound contains a huge network of rooms and passages. The queen and her eggs stay in the nursery, which is located in the centre.

## Working together

Some ants and aphids – a type of bug – are very good at keeping each other happy. The aphids give off a sweet liquid that the ants like to sip, so in return the ants guard the aphids and protect their eggs for them.

Ants and aphids often live on trees together.

## Turn and learn

Aphids and other bugs:  
pp. 120-121

There are 12,000 different kinds of ant in the world.

## Living larder

Honey pot ants live in the desert. The workers fill chosen ants with nectar, which they turn to honey and store in their big tummies. When food is short they vomit it up and feed the colony with it. The honeypots are too big to move.



Wood ants live in these enormous colonies.

# Flies

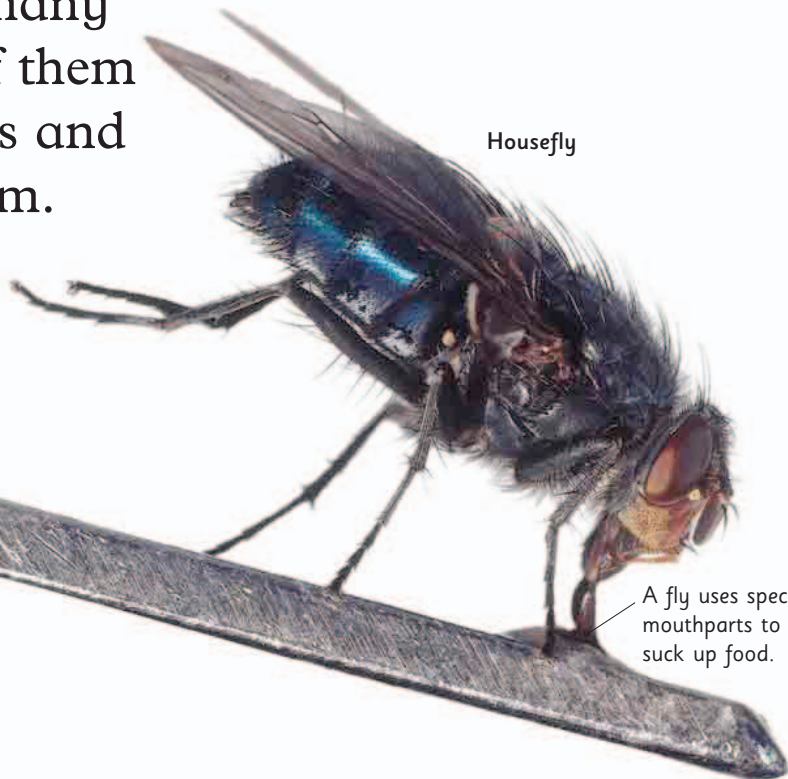
There's no escaping them – flies are all over the place. Lots of people hate them because many spread diseases and a lot of them bite. But flies have their uses and we couldn't live without them.

## Disease carriers

Flies like rotting food and their sticky feet can carry bacteria from one piece of food to another, which can spread nasty diseases.



A fly vomits on food to turn it to liquid, and then sucks it up.



Housefly

A fly uses special mouthparts to suck up food.

## Fly babies

Flies often lay their eggs, which hatch into maggots, in manure or rubbish. Unlike adults, maggots do not have wings and they chew rotten food rather than suck it up. They eventually turn into pupas, then flies, just like caterpillars turn into butterflies or moths.



Maggots

## Flight

Flies are very good flyers, which is why they are difficult to swat. This hoverfly can beat its wings up to 1,000 times per second!

Sometimes it changes direction so quickly that it seems to disappear.



## Turn and learn

Other pests:  
pp. 116-117  
Metamorphosis  
pp. 108-109





## Sticky feet

The housefly has sticky feet that allow it to walk up walls and across ceilings. It rubs its feet together to get dust and dirt off, which helps keep them sticky.

## A fly's uses

If there were no flies in the world, there would be a lot more rotting food and dead animals around. Although we may think they are nasty, they actually do a very good job eating rubbish.

## Fly collection

There are many species of fly and they come in all shapes and colours.



**Tachinid fly:** these flies are small, bristly, and often brilliantly coloured.



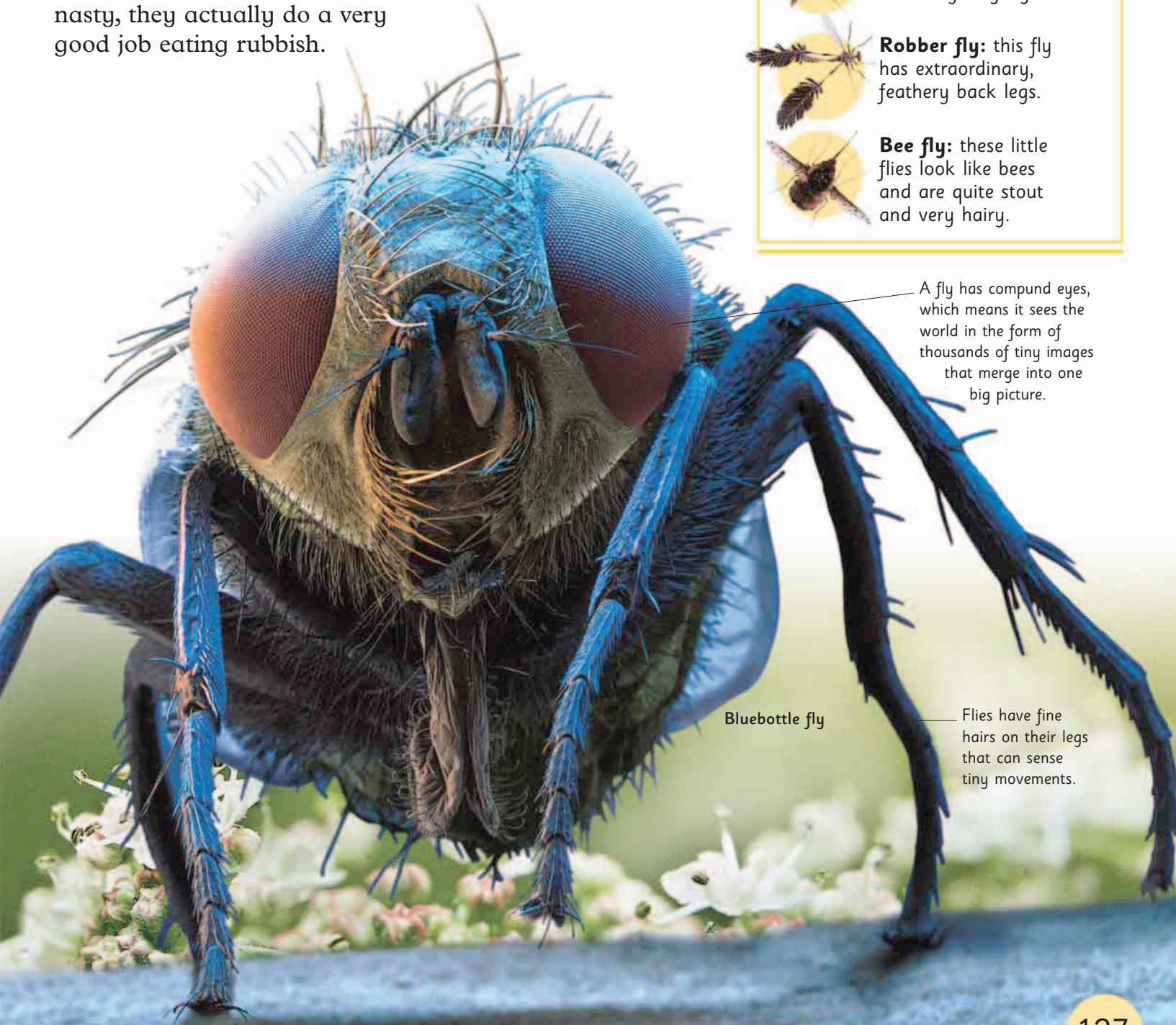
**Crane fly:** this fly is better known as daddy-long-legs.



**Robber fly:** this fly has extraordinary, feathery back legs.



**Bee fly:** these little flies look like bees and are quite stout and very hairy.



A fly has compound eyes, which means it sees the world in the form of thousands of tiny images that merge into one big picture.

Bluebottle fly

Flies have fine hairs on their legs that can sense tiny movements.

# Other creepy-crawlies

There are many creepy-crawlies scuttling around our planet that are not insects. Some live on land, others live in fresh water or the sea. They come in all sorts of weird and wonderful shapes.

## Arachnids

Spiders, scorpions, ticks, and mites belong to a land-dwelling family called arachnids. All arachnids have eight legs and two body parts.

Tarantula



**Turn  
and learn**

Spiders and  
scorpions:  
pp. 130-131



## The worm family

Segmented worms, such as earthworms, are simple animals that have a head at one end, a tail at the other, and lots of segmented body parts in between. They live on land or in water.

Despite their reputation, most spiders are harmless to humans.

A tarantula has hairs on its legs that can cause irritation to humans. When the spider is annoyed, it flicks them out at the enemy.

**Odd sea creatures**

The sea contains some very strange animals. Here are a few:



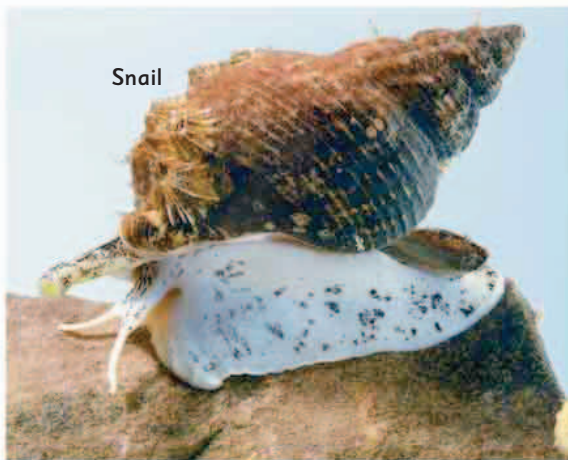
**Sponge:** these animals were once thought to be plants.



**Starfish:** most starfish have five arms to crawl across the sea floor.



**Anemone:** these flower-like sea animals have no brains.



Snail

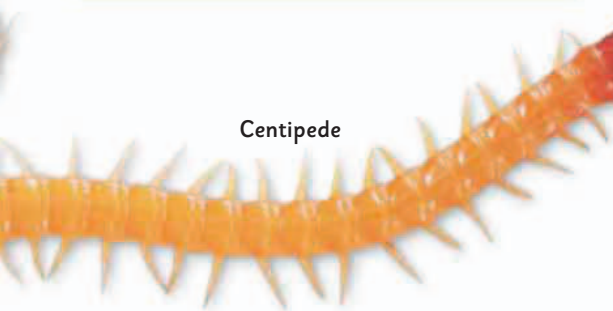
Snails are found on land and in the sea.

**Molluscs**

Slugs, snails, squid, and oysters are molluscs. Some live on land and some live in water.



The octopus, which is also a mollusc, is a very intelligent creature.



Centipede



Millipede

Centipedes have one pair of legs on each segment and millipedes have two pairs on each.

**Centipedes and millipedes**

If you try counting the legs on an insect and you find there are too many, the chances are you have found a centipede or millipede. They have lots and lots of legs.

**Crustaceans**

Most crustaceans, such as lobsters, crabs, and shrimps, live in water. Only woodlice live on land. They often have a shell and their eyes are on stalks.



Lobster

# Spiders and scorpions



Spiders and scorpions are the best-known members of the arachnid family. They are two of the most feared creatures on Earth, despite the fact that most do not attack humans.

## Spiders

There are about 40,000 species of spider in the world. They can all bite, but most are not dangerous to humans.

Of all spiders, jumpers have the best eyesight.



Jumping spider

This is the silk line that the jumping spider attaches to something before it jumps.

The jumping spider spots a fly and leaps, attached to a line of silk,

## Scorpions

Scorpions live in warm climates and feed on insects. A scorpion holds its prey with its big pincers and paralyses it with the sting on the end of its tail, which it bends right over its back.

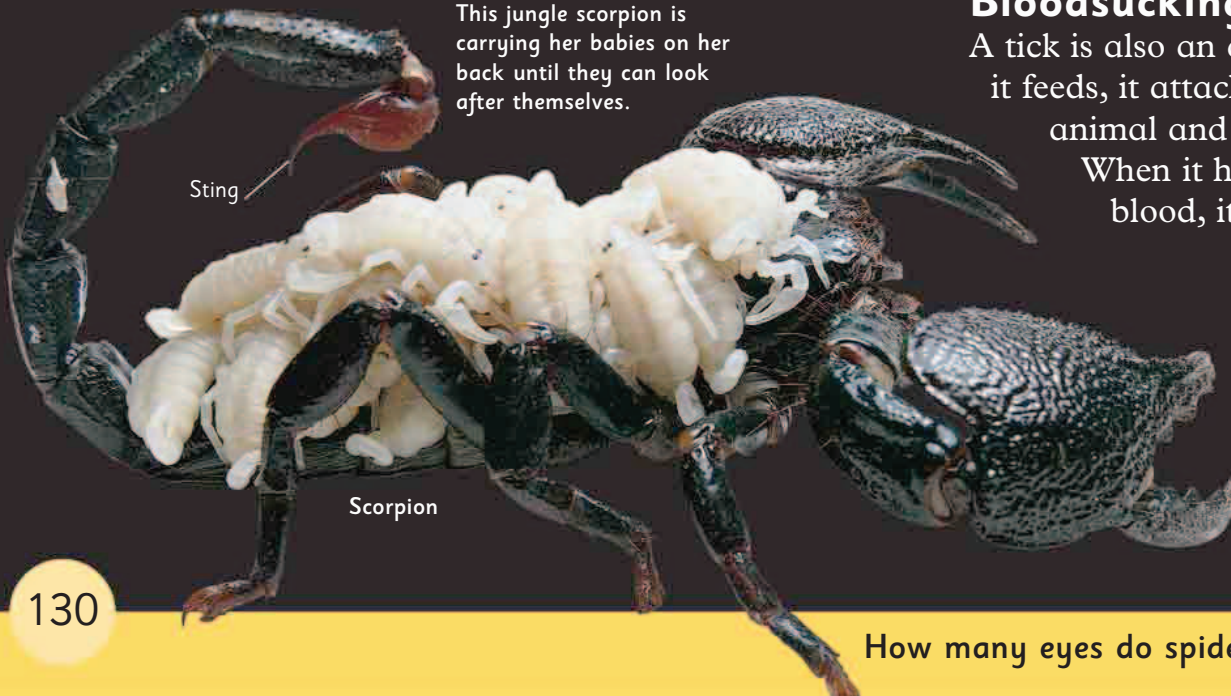
Ticks are so small that you can barely see them.



## Bloodsucking ticks

A tick is also an arachnid. When it feeds, it attaches itself to an animal and bites the flesh. When it has drunk enough blood, it drops off.

This jungle scorpion is carrying her babies on her back until they can look after themselves.



Sting

Scorpion

Some scorpions grow to lengths of 15 cm (6 in).

### Webs

All spiders produce silk from inside their abdomen. Most weave nests or webs with it, while jumping spiders use it to anchor themselves to one object while they leap to another.



Spiders build their webs and wait patiently for insects to fly into them. They then wrap the insects in jackets of silk, and eat them.

Water spiders even make underwater webs that keep an air bubble in place.



### Water spiders

Most spiders live on land but a few, such as the water spider, live underwater. To breathe, it traps air inside a bubble, which it anchors to plants.

Most spiders remain with their eggs, looking after them until they have hatched.

*so quickly that the fly doesn't have a chance to escape.*

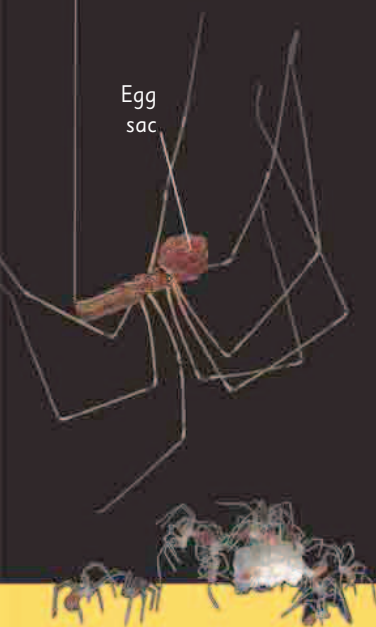
### Turn and learn

Bloodsuckers: pp. 116-117  
Vampire bats: pp. 30-31

### Eggs and babies

Spider's silk is also used to build nests or to attach eggs to the spider to carry around. This spider, however, holds the eggs in her jaws until they hatch.

Egg sac



# Strange land creatures

There are lots of interesting creepy-crawlies living in the undergrowth. Some are large, others small, some have lots of legs, and some no legs at all.



The shell of the snail is attached to its back.

Snail

A garden snail's shell always coils in a clockwise direction.

Giant tiger centipede



## Centipedes

The word centipede means "100 feet", but actually centipedes have a lot fewer. Giant tiger centipedes are found in jungles. They eat spiders and insects, which they kill with venom.

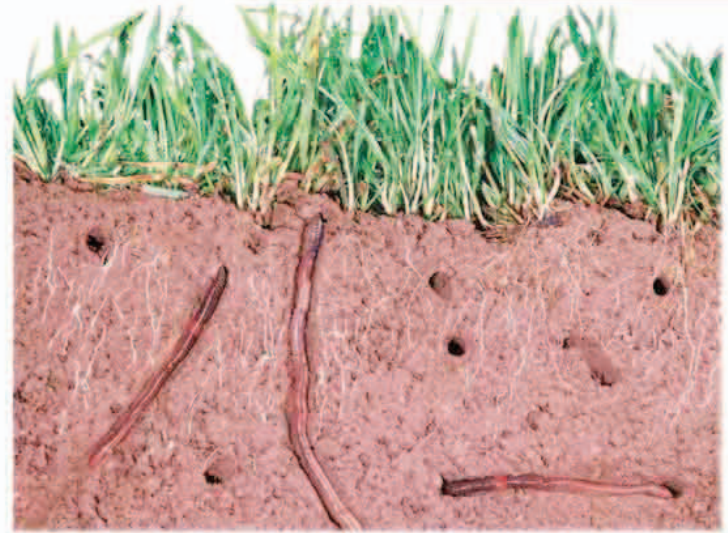


When pill woodlice are frightened, they curl up into tight balls.



## Woodlice

Woodlice may look like insects but they are actually related to crabs and lobsters. They live in dark, damp places to avoid drying up and eat rotten leaves and wood.



## Earthworms

Earthworms are long, thin creatures that live underground. They push their way through the soil eating rotting plants and animals.



Slugs and snails have one muscly foot that they use to walk around on.



Some millipedes roll into balls if they sense danger.



## Millipedes

Millipedes have lots of legs – sometimes as many as 300! But this does not mean they run fast. They have to move their legs in waves to stop them from hitting each other.



Slug

## Slimy slugs

Slugs are similar to snails but they have no shell. They move by sliding over slime that they squeeze out through their foot. Sometimes they leave a shiny trail behind them.

Slugs spend the day hiding and feed at night.

## Turn and learn

Sea slugs and sea snails:  
pp. 136-137

A leech is a type of worm that sucks blood from animals.



The Giant African snail can grow to the size of your forearm.

# Sea crustaceans

It's easy to see how these creatures got their name – they are covered in hard plates that act like a crust. Most crustaceans live in water.



## Crusty creatures

The lobster, like other crustaceans, has a hard skeleton on the outside of its body and two eyes on stalks, called antennae. Lobsters spend their time walking across the sea floor.

## Crabs

Crabs are armed with a pair of pincers that can nip very hard when they feel threatened. They live on the seashore as well as the sea bed.

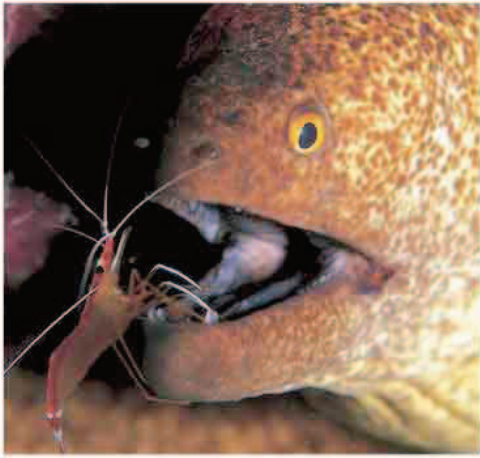
The crab's eyes are at the end of these stalks.

Crabs use their pincers to crack the shells of other animals and to pick up food.

Fiddler crab







### Cleaning up

Some shrimps get their food in a very unusual way – by cleaning the mouths and scales of willing fish. They use their delicate pincers to pick out dead skin and tiny creatures.

### Barnacles

On many seashores, millions of barnacles cling to rocks. They start life as tiny larvae; when they settle on a rock they fasten themselves to it, grow a hard case around themselves and stay there for life.



Fleshy brown barnacles

This type of barnacle has wavy legs that catch food in the water.



### Red crab alert!

Christmas Island in the Indian Ocean has a community of about 100 million red crabs. Each year at the same time every single crab crosses the island to lay its eggs on the beach. What a traffic jam!

The crabs start walking when the rains come to the island.

### Finding a home

Hermit crabs have softer bodies than other crabs, so to protect themselves they hunt for empty shells to live in. Often the crabs fight for a good shell.



Hermit crabs

### Turn and learn

Land crustaceans:  
p. 133

# Sea molluscs

Sea molluscs come in many weird and wonderful shapes. Who would have thought that octopuses and scallops were related? Some live on land, others live in water.



Octopus

## Clever clogs

Octopuses and squid have large brains and are very intelligent. All octopuses and squids have eight arms.

### Meet the family

Squid and cuttlefish are the nearest relatives to octopuses.



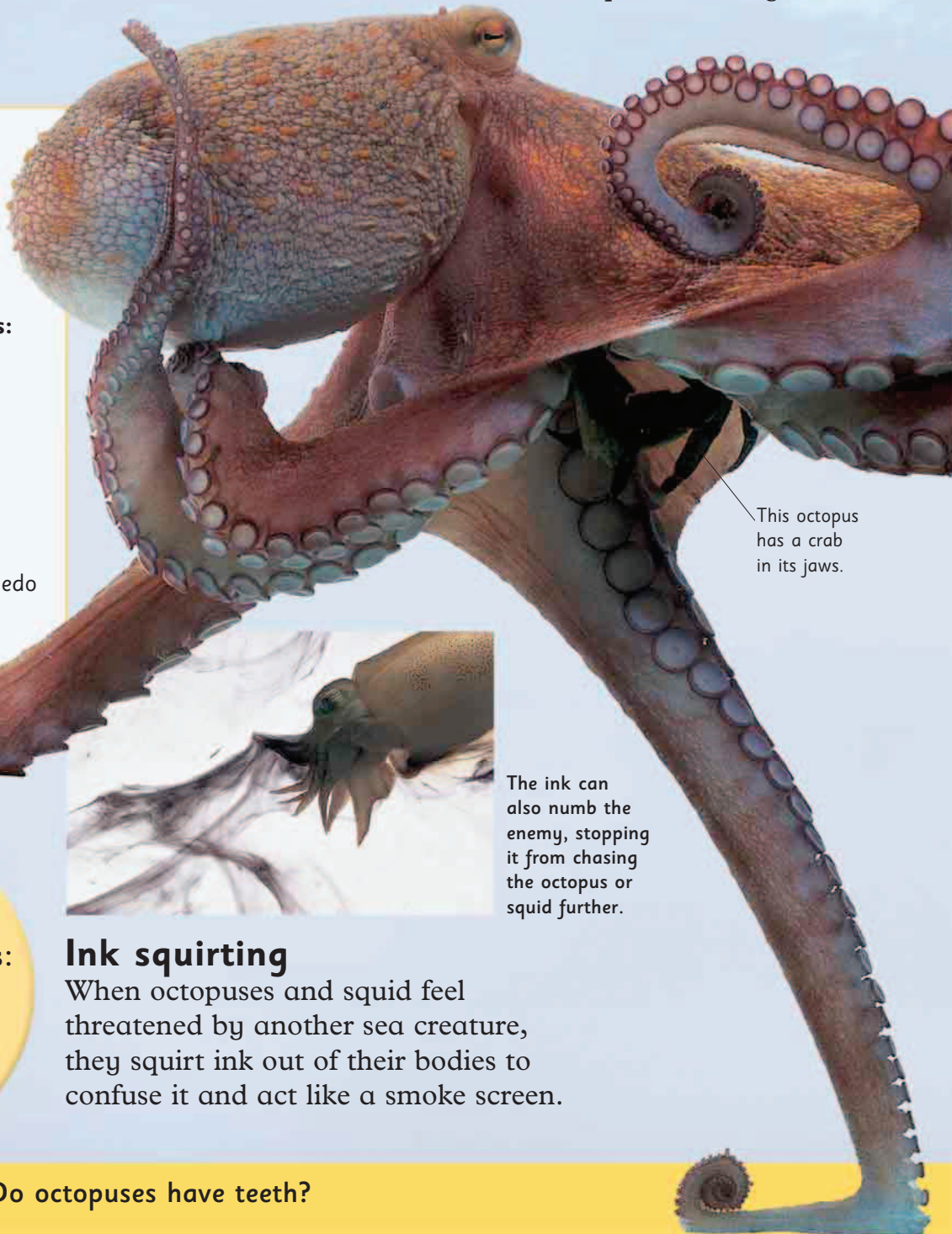
**Blue-ringed octopus:** this octopus can change colour and has a deadly venom.



**Cuttlefish:** these molluscs have eight short arms and two longer tentacles.



**Squid:** squid are torpedo shaped and can swim very fast indeed.



This octopus has a crab in its jaws.



The ink can also numb the enemy, stopping it from chasing the octopus or squid further.

### Turn and learn

Reptiles with shells:  
**pp. 84-85**  
Land slugs:  
**pp. 132-133**

### Ink squirting

When octopuses and squid feel threatened by another sea creature, they squirt ink out of their bodies to confuse it and act like a smoke screen.

## Sea snails

Conches, whelks, and winkles are all sea snails. They have shells and can commonly be seen clinging to rocks. Most eat plants, but some eat other small sea creatures.



Whelk

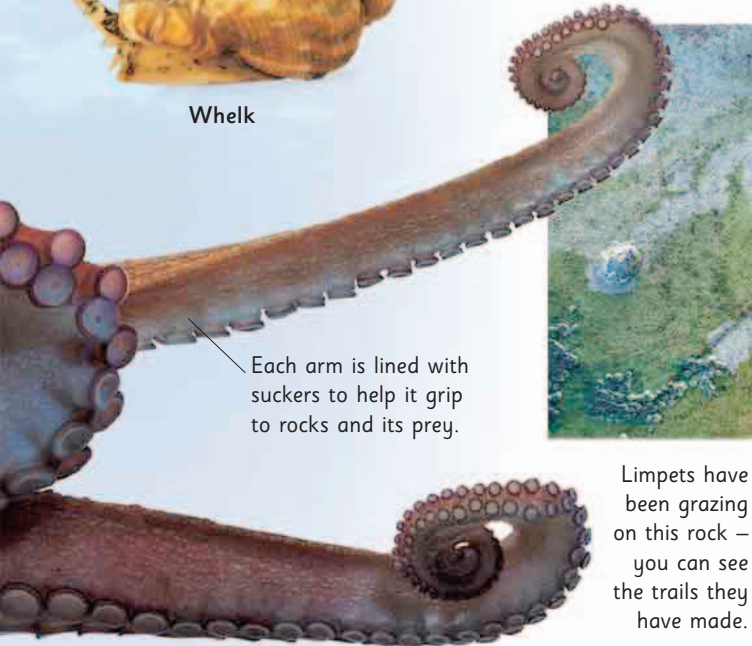


## Sea slugs

Strangely enough, some slugs live under water. Like their cousins, they have no shells for protection. Some are poisonous, while others camouflage themselves from predators, such as this lettuce slug.

## Limpets

Limpets have cone-shaped shells that protect them. They cling to rocks and graze on algae, a type of plant, wandering around using their muscular foot.



Each arm is lined with suckers to help it grip to rocks and its prey.



Limpets have been grazing on this rock – you can see the trails they have made.



Limpet

Limpets can often be seen in clusters on rocks.

## Two-hinged shells

Oysters, mussels, scallops, and clams all have a shell that is hinged into two parts that can open and close. They open them to suck food in and breathe, and keep them tightly shut to protect themselves.



Giant clam

## Quick scallop

Queen scallops can move surprisingly quickly through the water. They clap the two parts of their shell together and this movement propels them forwards.



The black dots around the shell are eyes.



Queen scallop

No, but they have sharp beaks.

# Brainless wonders

There are a lot of very strange sea creatures. Some don't even look like animals at all. The one thing all the animals on these pages have in common is that they have no brains.

## The coral reef

Believe it or not, coral is an animal, or rather, lots of tiny animals – called polyps – stuck together. They create hard outer skeletons that form their home and give coral its hard ridges.



Some sponges can grow so big that divers can swim inside them.

## Sponges

Sponges look like plants but are actually animals, even though they are attached to the seabed. The bright colours often make the seafloor look like an underwater garden.

## Sea urchin

This spiky creature may look harmless but you wouldn't want to step on one. Sea urchins are covered in sharp spines that protect their soft bodies.

Sea urchins

Sea urchins have tube-shaped feet and can walk across the seafloor.

**Turn and learn**

Venomous sea creatures:  
pp. 148-149

## Starfish

Most starfish have five arms that stick out from the centre. They have some strange-looking relations too.



**Starfish:** almost all starfish look like this one, with five arms.



**Sunstar starfish:** this starfish is unusual – it has 12 arms.



**Grey starfish:** this starfish has red nodules all over it.



**Brittlestar:** it has longer arms than a starfish and moves more easily.



**Sea cucumber:** this starfish cousin has 8 to 30 feet around its mouth.



## Jellyfish

A jellyfish is an unusual creature – it has no brain, no bones, and no heart! It moves through the water like a big umbrella, opening and closing to move along.

Jellyfish



The tentacles of the box jellyfish act like fishing lines to catch food.

The jelly-like body is called the bell and its stomach is underneath it.



This starfish is eating a mussel.



The starfish pushes its stomach through its mouth and into the shell to eat it.

## Sea anemones

Sea anemones look like pretty sea flowers, but they can give lethal stings to small animals. They use their venomous tentacles to stun fish before they eat them.

## Eating habits

The mouth of a starfish is underneath its body. It uses its arms to crack open mussel shells, then eats up the creature inside.



Dahlia anemones

# The world of microlife

Some creepy-crawlies, whether insects or other tiny creatures, are so small that you can't see them unless you look through a microscope. They are everywhere, however – even in your eyelashes!

Some plankton are as big as your fingernail, others are too small to see.

## Unwelcome guests

Tiny animals like to share our body with us. Some are helpful guests but others we would rather get rid of, like this head louse.

Head louse

Eyelash mite

Head lice make your scalp itch.


## Eyelash mites

Like everyone else in the world, you have had tiny mites living on your eyelashes since you were a baby. They are harmless but can make your eyes itch a little.

Some of these tiny bacteria give you a very sick tummy.

## Turn and learn

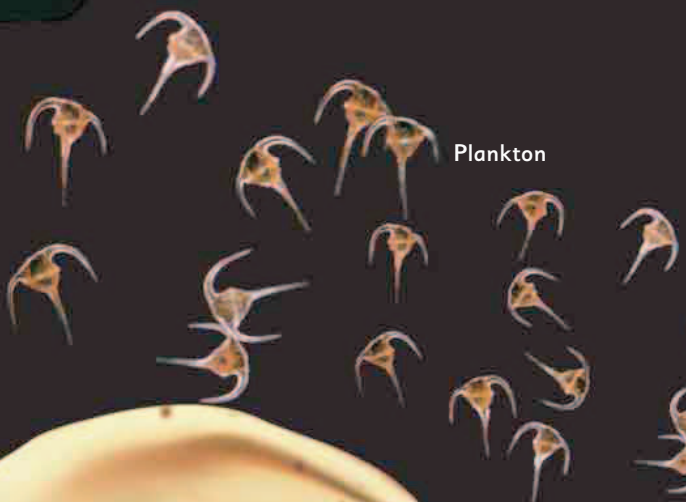
Pests and plagues:  
pp. 116-117



A lot of plankton, like this larva, are the babies of many kinds of sea creatures.

## Sea microlife

The sea is full of plankton, a group of different microscopic creatures. There are so many of them that the sea is like a big, thick plankton soup. Many fish eat plankton and still there are plenty more.




Some huge whales eat only tiny plankton.

Plankton


## Bacteria

There are about 300 types of bacteria that live on your teeth! Although they are technically not animals, they are some of the smallest creatures alive.



This is the tip of a needle (magnified many times) and the tiny orange specks are bacteria. Some of them can make you ill, but most are friendly.

## House dust mites



These ferocious-looking creatures are so small that you can't see them. But they are all around you. Dust mites live in your home and love to eat the dead, flaky skin that you shed around the house. Some people are allergic to them.

House dust mite

Your bed already has about 1 million of them in it!

# Fish

Fish truly dominate the waters of the world. They come in many shapes and sizes, from huge whale sharks to strange seahorses and fish so tiny you can barely see them.



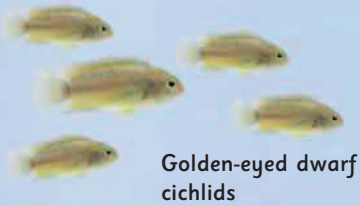
Yellow tang



Long-nosed gar



Zebra pipefish

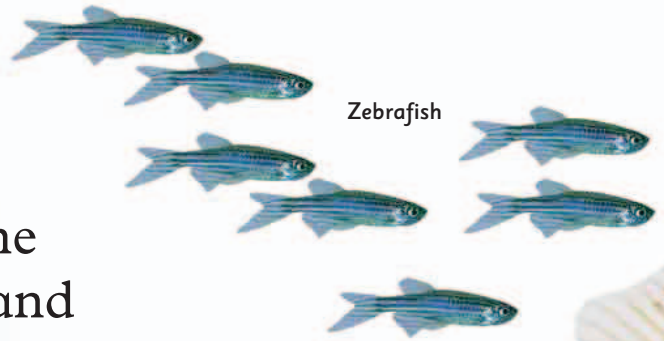


Golden-eyed dwarf cichlids



Emperor angelfish

Sticklebacks



Zebrafish



Cuban hogfish



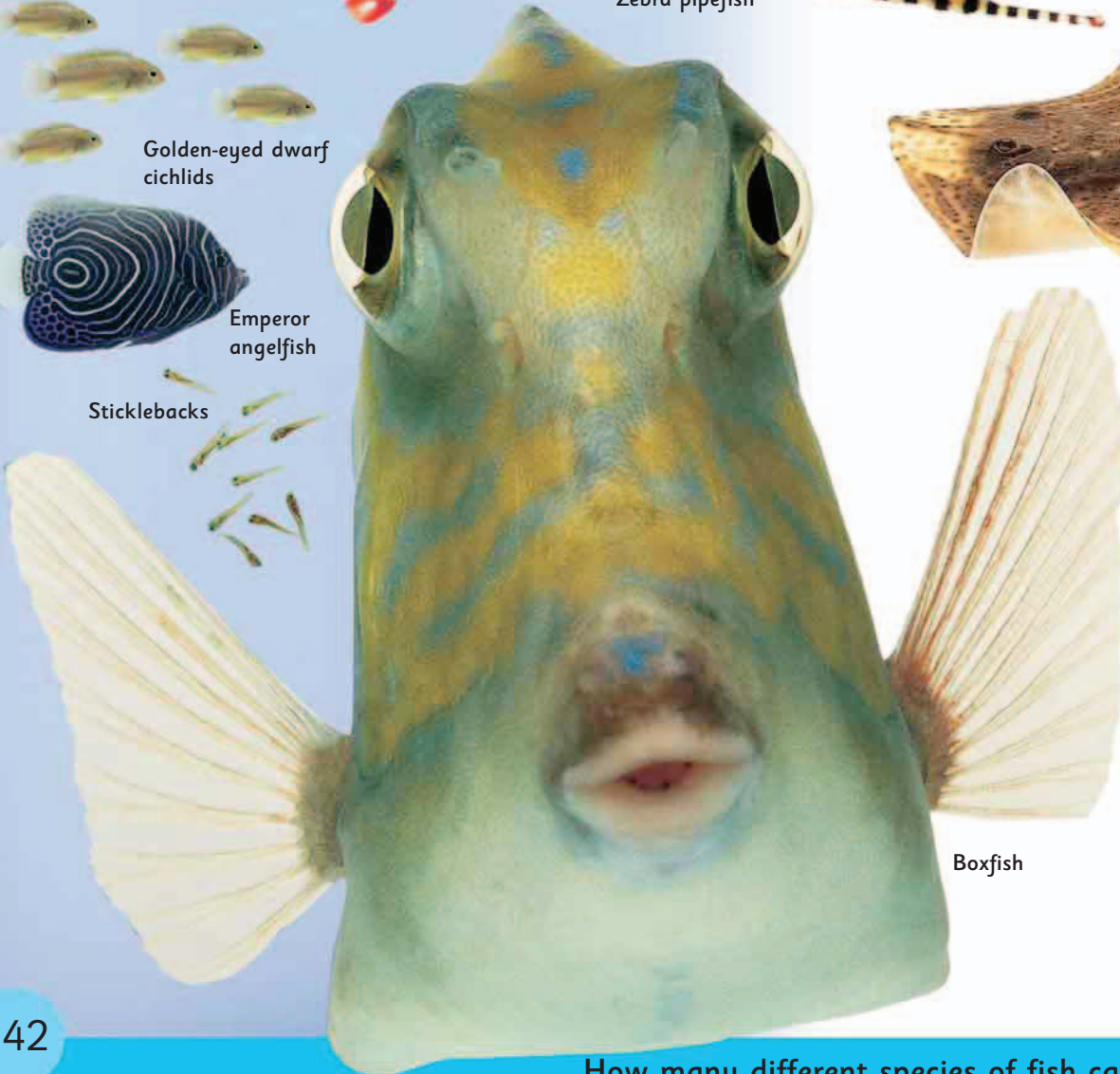
Royal gramma



Thornback ray

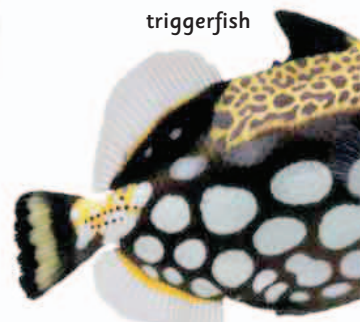


Three-striped dwarf cichlids



Boxfish

Clown triggerfish







Copperband butterfly fish

Yellow wrasse

John Dory

Ram cichlid

Goldfish

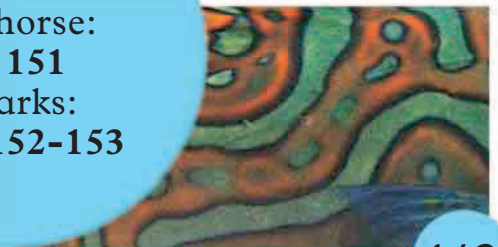
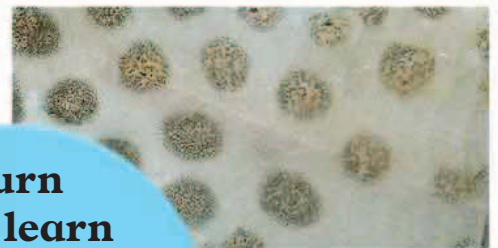
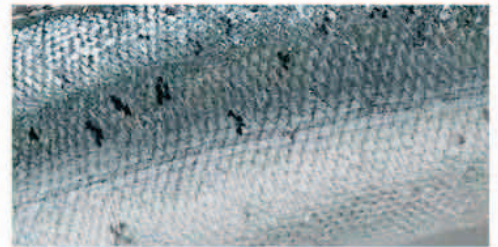
Seahorse

### Bony fish

Most fish are bony, which means they have a hard skeleton inside them. Sharks are not bony fish, but have a skeleton made of cartilage – a material that is softer than bone.

### Picture detective

Take a look through the fish section and see if you can spot the owners of these colourful skins.



### Turn and learn

Seahorse:  
p. 151  
Sharks:  
pp. 152-153

# The world of fish

Fish have been around for 400 million years! They live in seas, rivers, and lakes. Wherever you find water, you can bet there are plenty of fish swimming around.

## Types of fish

There are over 30,000 types of fish, which fall into three groups.



**Bony fish:** 95 per cent of the fish in the world are bony fish with hard skeletons.



**Cartilaginous fish:** rays, skates, and sharks make up this group.



**Jawless fish:** only hagfish and lampreys fall into this small group.

Pyjama cardinalfish

Bony fish have a skeleton with a skull, ribs, and a backbone.

Fish skin, made up of scales, is slimy to let them slip through water easily.

The gills lie behind the eyes.

Fish have fins that keep them upright when they swim.

The tail of a fish sweeps from side to side to push the fish forwards.

## Gills

Like other animals, fish need to take in oxygen in order to live. But, unlike us, they can breathe underwater using their gills. Fish gulp in water and their gills filter the oxygen out of it.

Mudskipper



## Fish out of water

Mudskippers are one of the few kinds of fish that can survive out of water. They have special gills that take oxygen from air or water. They skip along mudflats using their fins as elbows.



## The art of swimming

Many fish swim like snakes slide – they wriggle in an “s” shape. Their whole bodies move from side to side and their tails flick to push them forwards. Their fins help to steer them.

## Scales

Most fish are covered in hundreds of scales that overlap like roof tiles. Tiny animals can get under the scales and harm them, so fish let others give them a regular clean.

Mandarin fish



Colours can be used for camouflage or to attract a mate.

Some fish can turn on their sides and roll right over. A few can even swim upside down!

Carp



## Colour

Fish come in all colours and patterns. Freshwater fish and those living in cooler waters tend to be duller in colour. Tropical fish are sometimes incredibly bright and beautiful.



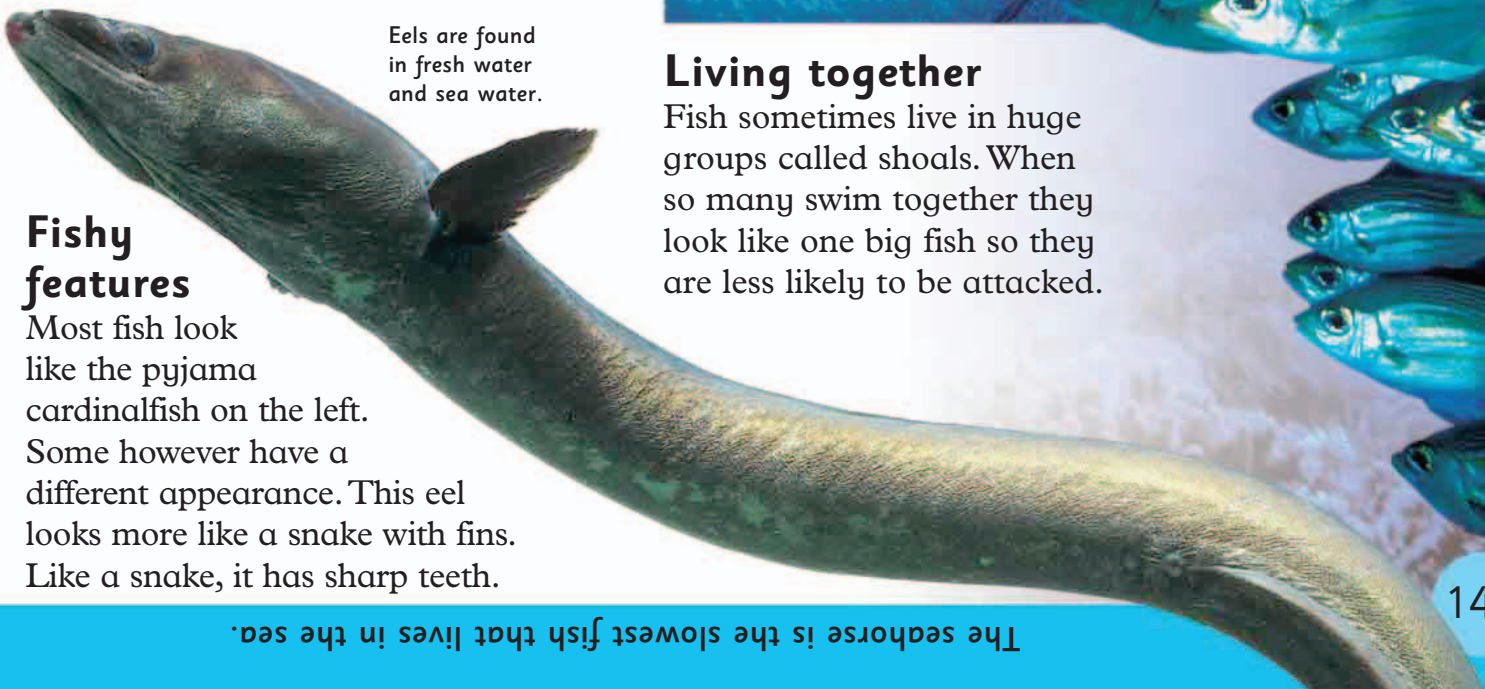
## Living together

Fish sometimes live in huge groups called shoals. When so many swim together they look like one big fish so they are less likely to be attacked.

## Fishy features

Most fish look like the pyjama cardinalfish on the left. Some however have a different appearance. This eel looks more like a snake with fins. Like a snake, it has sharp teeth.

Eels are found in fresh water and sea water.



The seahorse is the slowest fish that lives in the sea.

# Finding food

Most fish are meat-eaters, which means everyone is eating everyone in the water. It's a very dangerous place!

## Electric eel

This eel has three electric organs in its body. It catches prey by giving them electric shocks. These can stun or kill a fish and send a human to the hospital!



## Fish eat fish

The sea is one great big food chain. Tiny plankton are eaten by small fish and big fish eat the smaller ones.



**Plankton:** plankton contains tiny creatures that live near the surface.



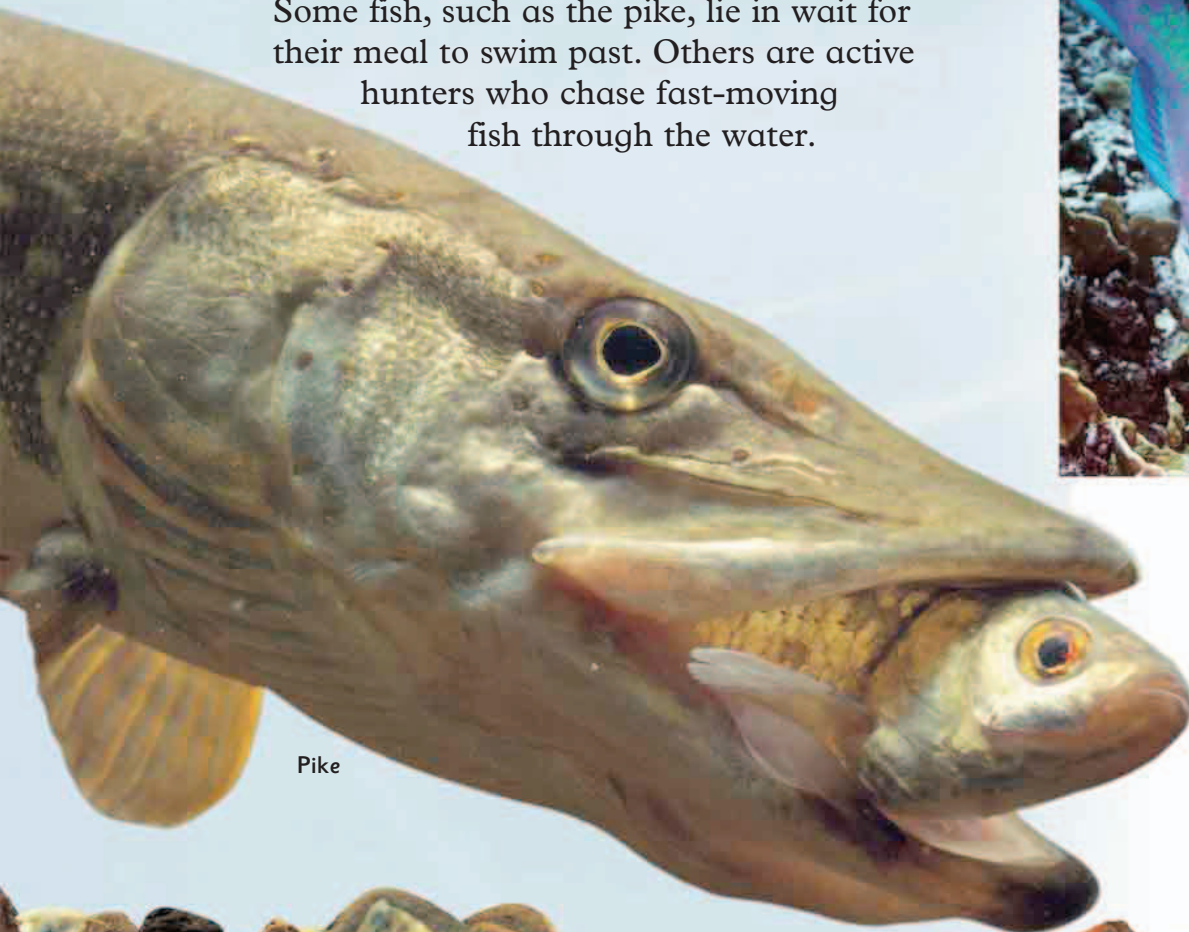
**Herring:** small fish like herring like to eat the tiny plankton.



**Salmon:** larger fish, such as salmon, eat the smaller fish, and they get eaten by sharks!

## Catching prey

Some fish, such as the pike, lie in wait for their meal to swim past. Others are active hunters who chase fast-moving fish through the water.



Pike



## Parrot fish

Parrot fish have a "beak" like a parrot's, which is made from teeth. They use it to gnaw at the coral they eat.



Fish are attracted to the glowing bait that sits right by its mouth.

### The angler fish

A deepwater angler does what fishermen do. Attached to its head is a glowing “rod and bait” that attracts small fish. When one of them gets close, it gets gobbled up!



Archerfish can snap insects out of the air.



Archerfish

**Turn and learn**  
 Ultimate meat-eaters of the sea – sharks: pp. 152-153

### Archerfish

Most fish feed in water, but a few can catch food out of water too. The archerfish shoots water at insects, making them fall into the water, and then eats them. It can also leap into the air and pick insects off branches.

An experienced adult can shoot out a stem of water four times its own length.



### Piranhas

Piranhas have a fearsome reputation. Their razor-sharp teeth can strip the flesh from animals in minutes. Piranhas eat fruit and seeds as well as animals.



Piranhas work in groups to tear creatures to pieces.

Piranhas



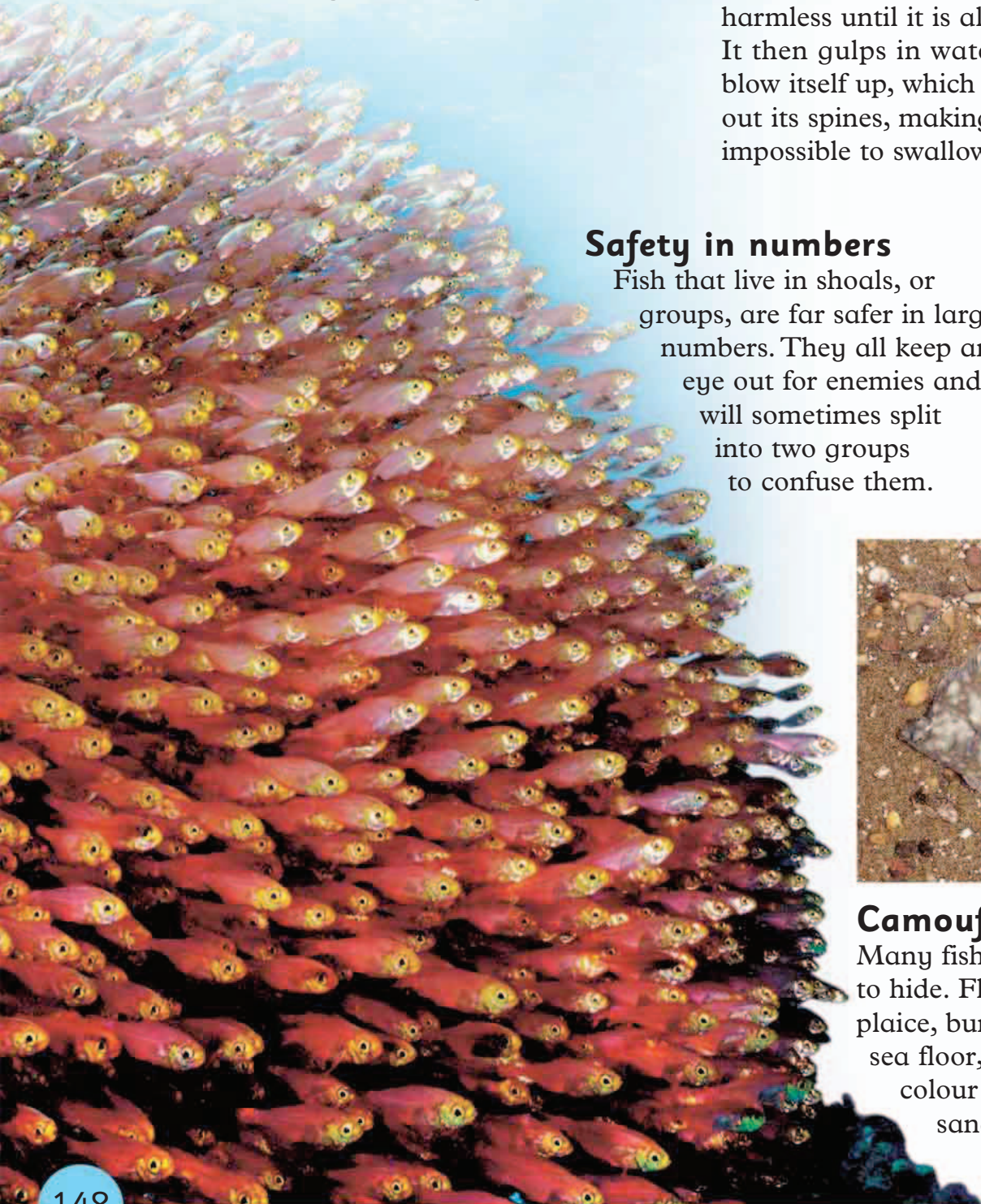
It is extremely dangerous for animals, humans included, to swim in water filled with piranhas.



The deep-sea viperfish has extra teeth in its throat to help push its food down.

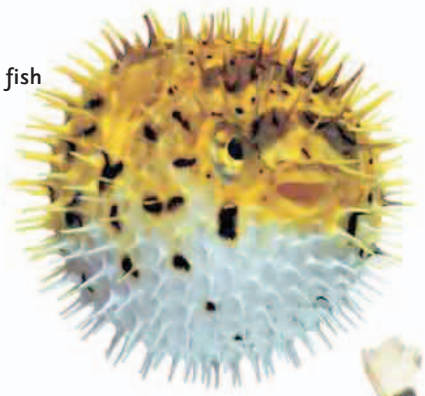
# Staying alive

So many water creatures feed on fish, that they all have to be careful – or very cunning – to make sure they don't get eaten.



Porcupine fish

The flat porcupine fish usually looks like any other fish in the tropical seas.



## Ballooning up

The porcupine fish seems harmless until it is alarmed. It then gulps in water to blow itself up, which pushes out its spines, making it impossible to swallow.

## Safety in numbers

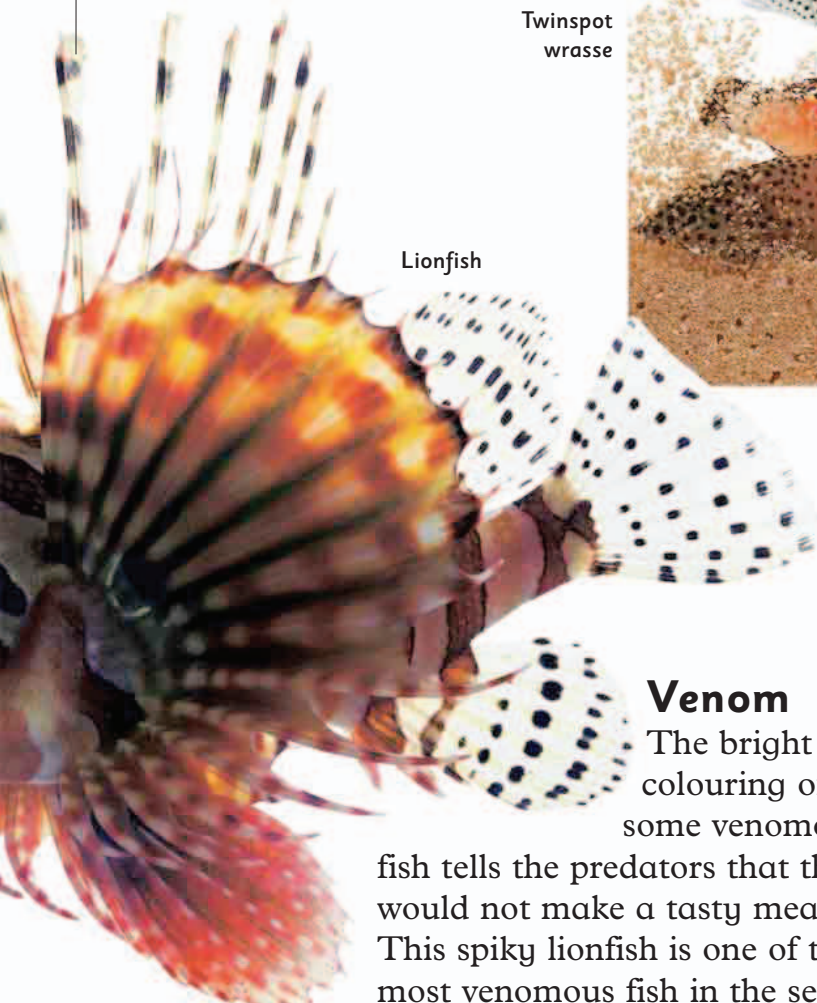
Fish that live in shoals, or groups, are far safer in large numbers. They all keep an eye out for enemies and will sometimes split into two groups to confuse them.



## Camouflage

Many fish use camouflage to hide. Flatfish, such as this plaice, bury themselves on the sea floor, then change their colour to blend into the sand and the stones.

The bright stripes on a lionfish warn other creatures off: the venom in its fins can be deadly.



Lionfish

Twinspot wrasse



### The con artist

The twinspot wrasse tries to fool its enemies. There are two big spots on its body that look like eyes. It buries itself in the sand and just shows the spots, making it look like a large, frightening fish.

### Friend or foe?

These clownfish use venomous sea anemones for protection; the venom doesn't seem to affect the fish, who dive in when danger approaches.

### Venom

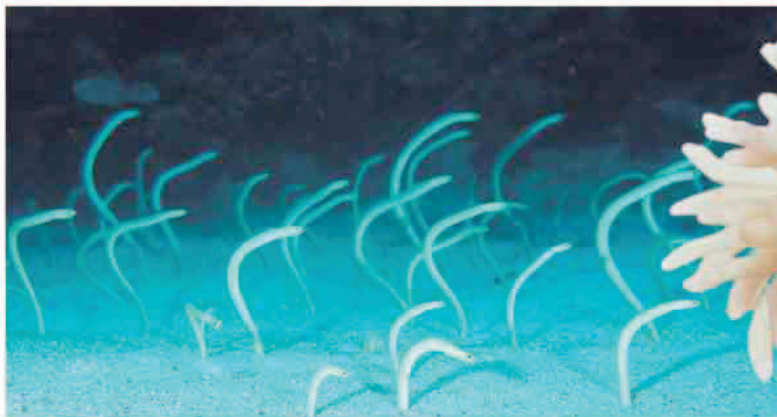
The bright colouring of some venomous fish tells the predators that they would not make a tasty meal. This spiky lionfish is one of the most venomous fish in the sea.



Clownfish

### Turn and learn

Insect defence: pp. 114-115

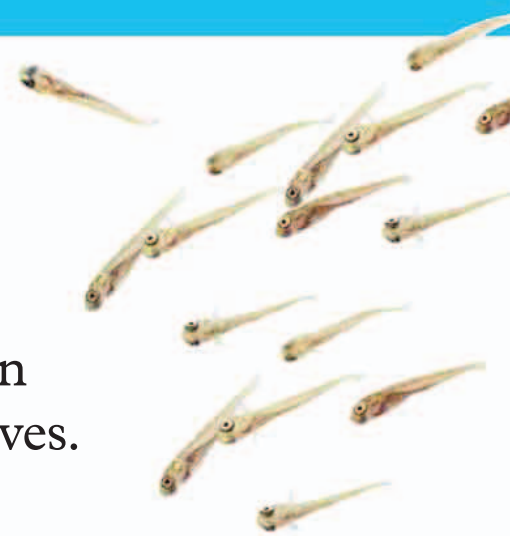


### Hidey holes

Garden eels dig holes in the sand. During the day they hang out looking like a field of sea grass catching small fish. When threatened they dive back into their holes.

# Making more fish

Most fish don't make very good parents – they lay their eggs in the water and abandon them, leaving their young to fend for themselves. Some, however, do stick around.



Baby sticklebacks



## Courting

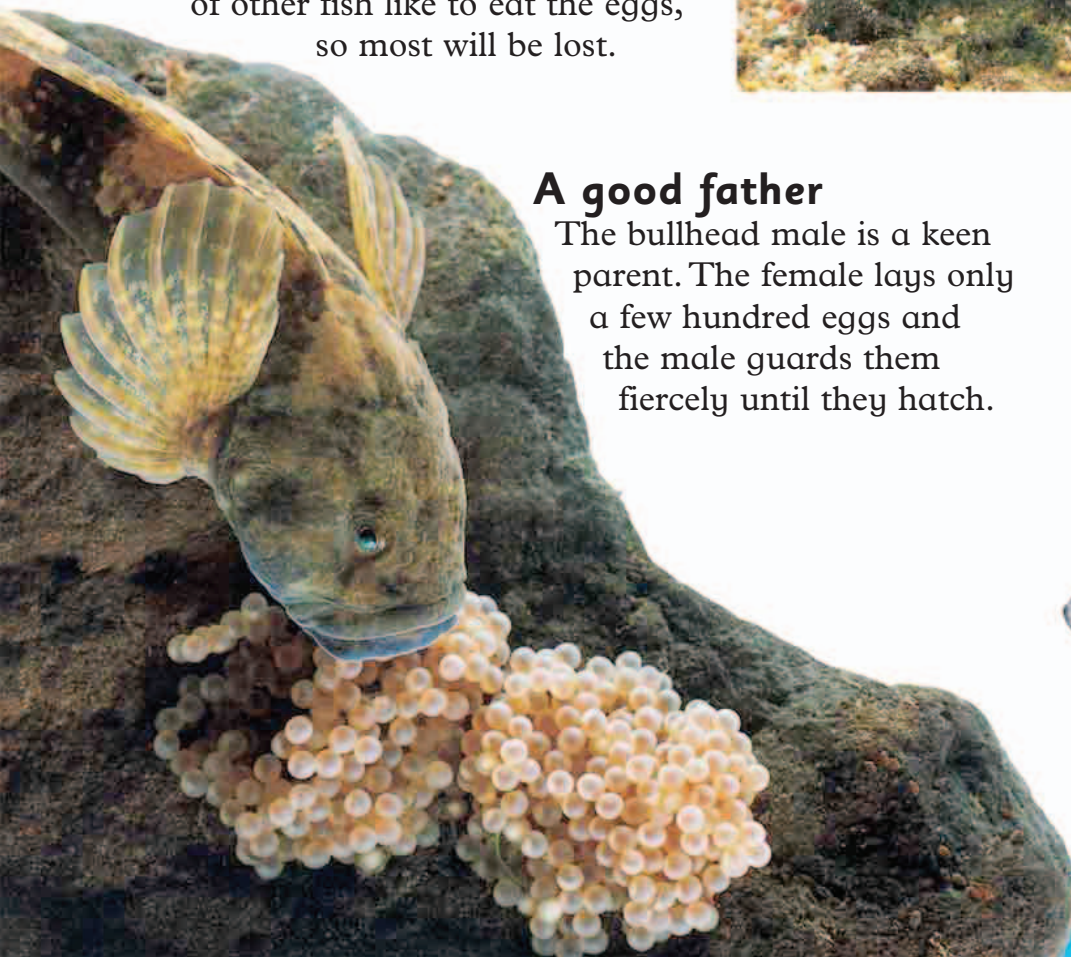
Some male fish make more of an effort to attract a female than others. The male stickleback builds a nest, then his tummy turns red to attract a female.



The male stickleback guards his eggs until they hatch.

## Millions of eggs

Most fish lay eggs. Perch, like many other fish, lay an enormous number in the hope that some will hatch out. A lot of other fish like to eat the eggs, so most will be lost.



## A good father

The bullhead male is a keen parent. The female lays only a few hundred eggs and the male guards them fiercely until they hatch.

## Hatching out

Most fish hatch into tiny larvae – fish that are not fully formed. They gradually grow a skeleton, fins, and organs. At this small stage they can't protect themselves easily.



Which fish lays the most eggs?





When the male wants to eat, he spits the eggs out.

### The ultimate protection

The yellowhead jawfish father has a foolproof way to protect his eggs. After the female has laid them, he keeps them inside his mouth until they hatch.



The father seahorse keeps the babies inside his pouch until they can defend themselves.

Seahorses

### Seahorses

The seahorse is very unusual indeed – the female lays the eggs inside a pouch on the male’s tummy and then the male gives birth to the babies!



A seahorse keeps itself in one position by wrapping its tail around a plant.



### The incredible journey

Some fish have a special place where they lay their eggs. The salmon lives in the sea but travels as far as 1,500 km (1,000 miles) up rivers to lay its eggs in the same place it was born. It even swims up waterfalls to get there.

**Turn and learn**  
Other animals that lay eggs in the water:  
**pp. 98-99**

## Shark types

There are many different types of sharks. Some look very different to the common torpedo shape.



**Leopard shark:** it has golden spotted skin that camouflages it well.



**Saw shark:** its long nose has razor-sharp teeth down it, like a saw.



**Hammerhead:** this shark has a rectangular head with eyes at each end.



**Wobbegong:** it has weedy flaps around its nose for camouflage.

Many people think that great whites are the most dangerous animals in the sea, but they rarely attack humans.

Great white shark

# Sharks and rays

A shark's fin poking out of the water is enough to send a chill down your spine. But they also fill fish with fear – sharks are the largest and most successful meat-eaters in the sea.

## Bendy bones

Sharks and rays do not have bones. Instead their skeleton is made of soft, bendy cartilage – the same stuff that's in your nose and ears.



Black-tipped reef shark

## Born in a purse

Some sharks start life as a tiny adult in an egg case, which looks a bit like a handbag. This case is attached to seaweed and the baby shark grows inside for about six to nine months.



Egg case

Empty egg cases are known as mermaid's purses.

## A lethal smile

The massive jaws of the great white shark contain a terrifying set of sharp teeth, which often fall out as they tear flesh. A shark may lose 30,000 teeth in a lifetime. They are, however, always replaced with new sharp ones.

What is the largest fish in the world?



### The gentle giant

Although all sharks eat meat, not all of them eat big prey. This basking shark is an underwater giant but eats only the tiniest creatures. It gulps huge amounts of water and filters tiny animal plankton from it.

Rays' mouths are underneath their bodies. They have very strong teeth to crush shells with.



Rays swim by flapping their side fins just like wings.

### Rays

Rays are sharks' cousins, but unlike their relatives, they are flat, and live mostly on the seabed, in shallow, warm water.



Spotted ray

### Turn and learn

Large sea animals that feed by filtering tiny animals:  
pp. 46-47



### Spot the eyes

Most rays are coloured to match the seabed, but they also bury into the sand for extra camouflage. Blue spotted stingrays bury themselves with just their eyes showing when they rest.



Some rays, such as stingrays, have spines on their tails that can sting a predator.

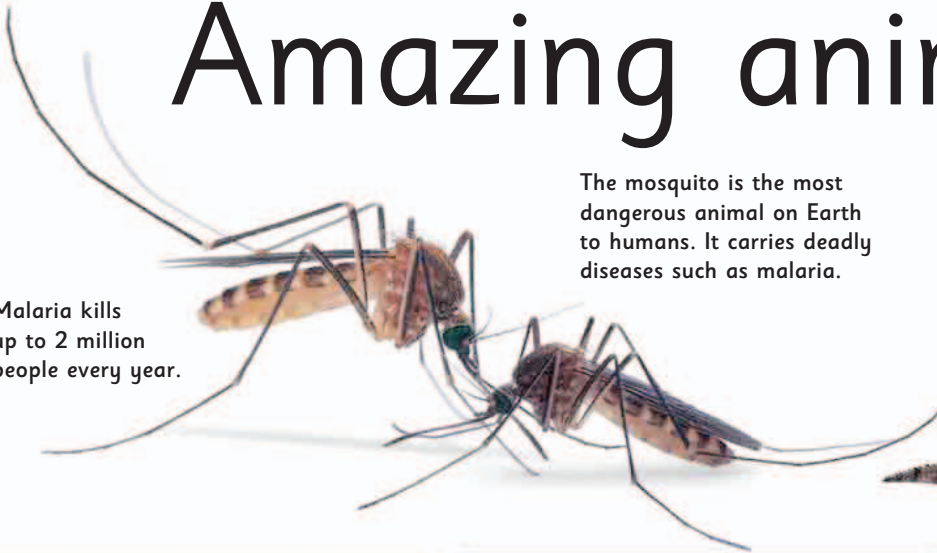
### Monster of the deep

The manta ray is the monster in the family, sometimes stretching 6 m (20 ft) across – that's almost the length of a bus! Some swim in small shoals, but most live alone.

# Amazing animal facts

Malaria kills up to 2 million people every year.

The mosquito is the most dangerous animal on Earth to humans. It carries deadly diseases such as malaria.



## Mammals

The mammal section includes the largest, loudest, and tallest animals in the world.



**Largest land animal:** the African bush elephant is the largest land animal.



**Smallest land mammal:** the pygmy white-toothed shrew is the smallest land mammal in the world.



**Loudest land animal:** the loudest land animal is the howler monkey.



**Tallest animal:** the tallest animal on Earth is the giraffe.

## Birds

The bird section contains the incredible record breakers of the flying world.



**Largest wingspan:** the wandering albatross has a wingspan of 3 m (11 ft).



**Smallest bird:** the tiniest bird is the bee hummingbird.



**Fastest diver:** the fastest air diver is the peregrine falcon.



**Largest bird:** the largest bird in the world is the ostrich.

## Reptiles and amphibians

This section can claim the oldest animals in the world, and some of the most venomous too.



**Largest reptile:** the saltwater crocodile can be up to 7 m (23 ft) long.



**Oldest reptile:** there has been one tortoise who lived for 150 years!



**Deadliest snake:** the carpet viper is responsible for the most human deaths.



**Largest toad:** the cane toad would sit happily on a dinner plate – and fill it.



**Largest amphibian:** the giant salamander is as big as an average man.

The cheetah is the...



**Creepy-crawlies**

The creepy-crawly section contains some of the most extraordinary-looking animals on Earth.



**Largest moth:** The atlas moth is often mistaken for a bird. It is 30 cm (12 in) wide.



**Biggest eye:** the giant squid has the largest eye of any living animal.



**Largest spider:** the Goliath bird-eating spider would easily cover a plate.



**Most legs:** the animal with the most legs is the millipede – some have 750!

The three-toed sloth of South America is the slowest mammal on Earth.

This sloth has an average ground speed of 2 m (6½ ft) per minute. But in the trees it can double that speed.



**Fish**

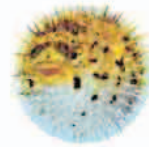
Fish dominate the water world – and the majority of the Earth is covered in water.



**Most fish eggs:** the ocean sunfish can lay 30 million eggs at one spawning.



**Largest fish:** the whale shark is the largest fish in the world.



**Prickliest fish:** as well as spines, porcupine fish also have sharp teeth.

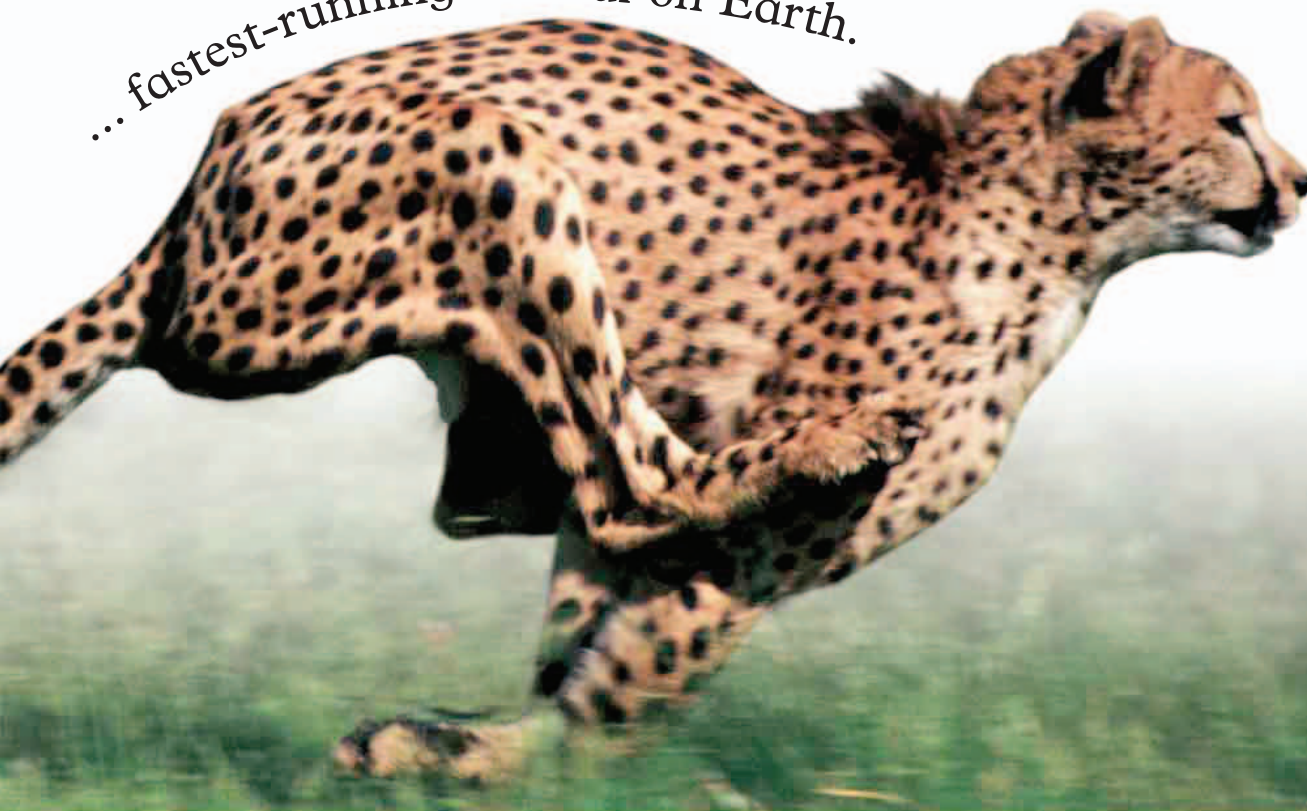


**Largest freshwater fish:** the European catfish is the largest freshwater fish.



**Fastest fish:** the sailfish can swim faster than the cheetah can run (see below).

... fastest-running animal on Earth.

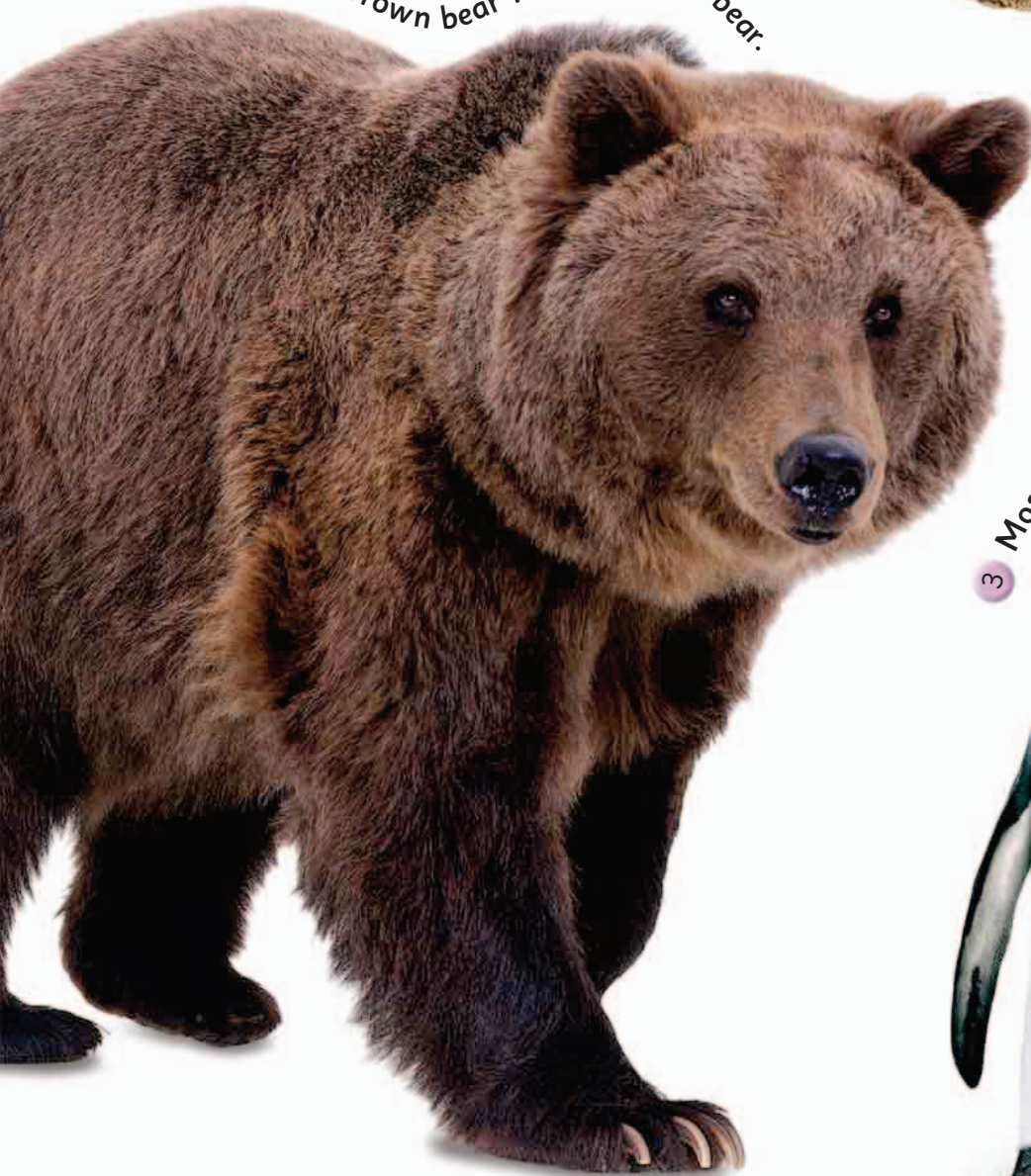


Cheetahs run amazingly fast. When they are chasing prey on level ground, they can reach speeds of over 100 kph (62 mph) in short bursts.

# True or false?

Can you work out which of these facts are real, and which ones are completely made up?

1 The brown bear is the largest bear.



2 Snakes use their tongues to smell.



3 Most penguins live in the Arctic.



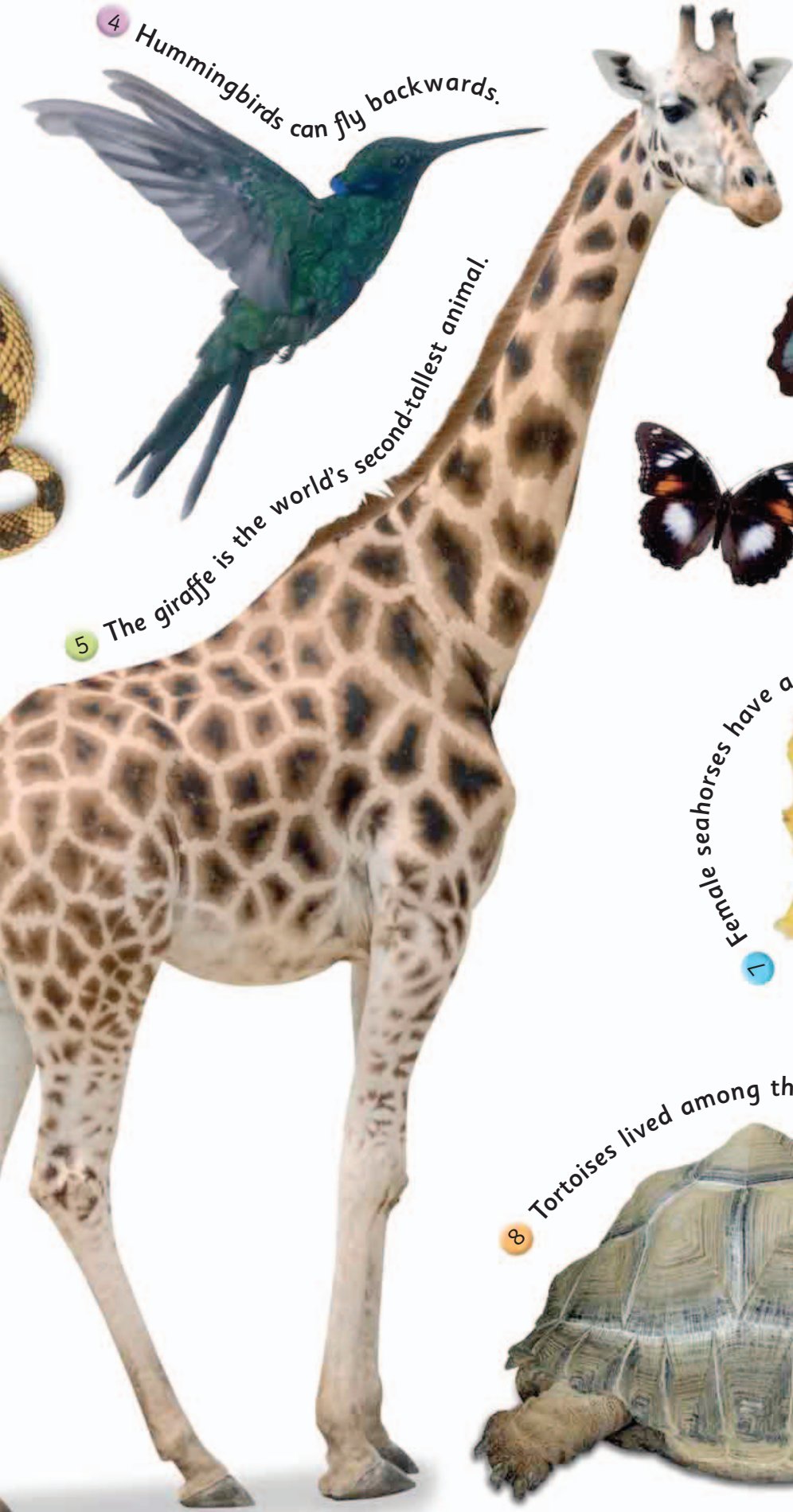
4 Hummingbirds can fly backwards.



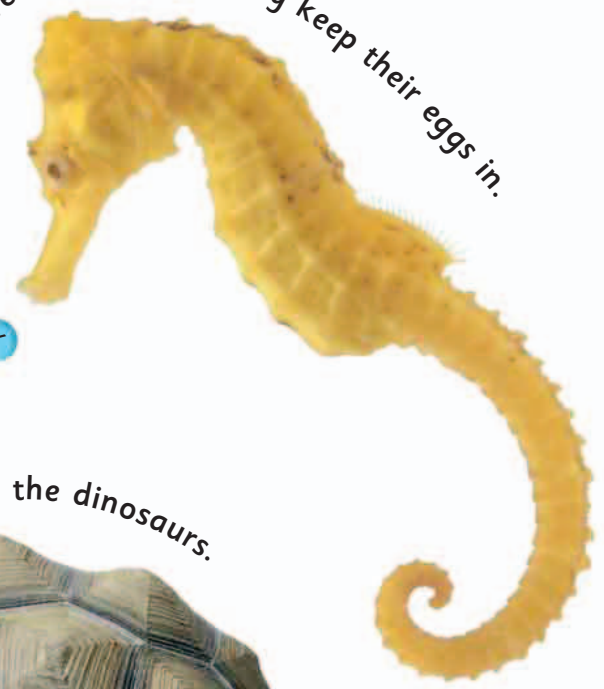
6 Butterflies rest with their wings closed.



5 The giraffe is the world's second-tallest animal.



7 Female seahorses have a pouch that they keep their eggs in.



8 Tortoises lived among the dinosaurs.



# Quiz

Test your knowledge of animals with these tricky quiz questions.

1 What is a group of lions called?

- A: Troop                      B: Pride  
C: Clan                        D: Pack

2 How many pairs of legs does an insect have?

- A: 2                              B: 3  
C: 4                              D: 5

3 What type of bear is this?



- A: American black          B: Spectacled  
C: Sun                         D: Brown

4 Which member of the parrot family cannot fly?

- A: Pileated parrot          B: Kakapo  
C: Blue lorikeet            D: Brown lory

5 Where do tigers live?



- A: Africa                      B: North America  
C: South America          D: Asia

6 What are vultures famous for?



- A: Digging                    B: Growling  
C: Scavenging              D: Dancing

7 Snakes don't have...



- A: Teeth                      B: Tongues  
C: Eyelids                    D: Nostrils



8 How many legs does an octopus have?



- A: 6
- B: 7
- C: 8
- D: 9

9 Mammals that carry their young in pouches are called...

- A: Marsupials
- B: Primates
- C: Monotremes
- D: Rodents

10 How many toes do ostriches have on each foot?

- A: 2
- B: 3
- C: 1
- D: 5

11 What is the loudest land animal on Earth?



- A: Howler monkey
- B: Gorilla
- C: Orang-utan
- D: Baboon

12 I am an arachnid. What could I be?

- A: Frog
- B: Spider
- C: Crab
- D: Insect

13 How long have fish lived on Earth?



- A: 200 million years
- B: 300 million years
- C: 400 million years
- D: 500 million years

14 A juvenile frog is called a...



- A: Nymph
- B: Tadpole
- C: Maggot
- D: Kitten

15 How long can a hippo hold its breath?

- A: 2 minutes
- B: 3 minutes
- C: 4 minutes
- D: 5 minutes

16 I am the world's largest fish. What am I?

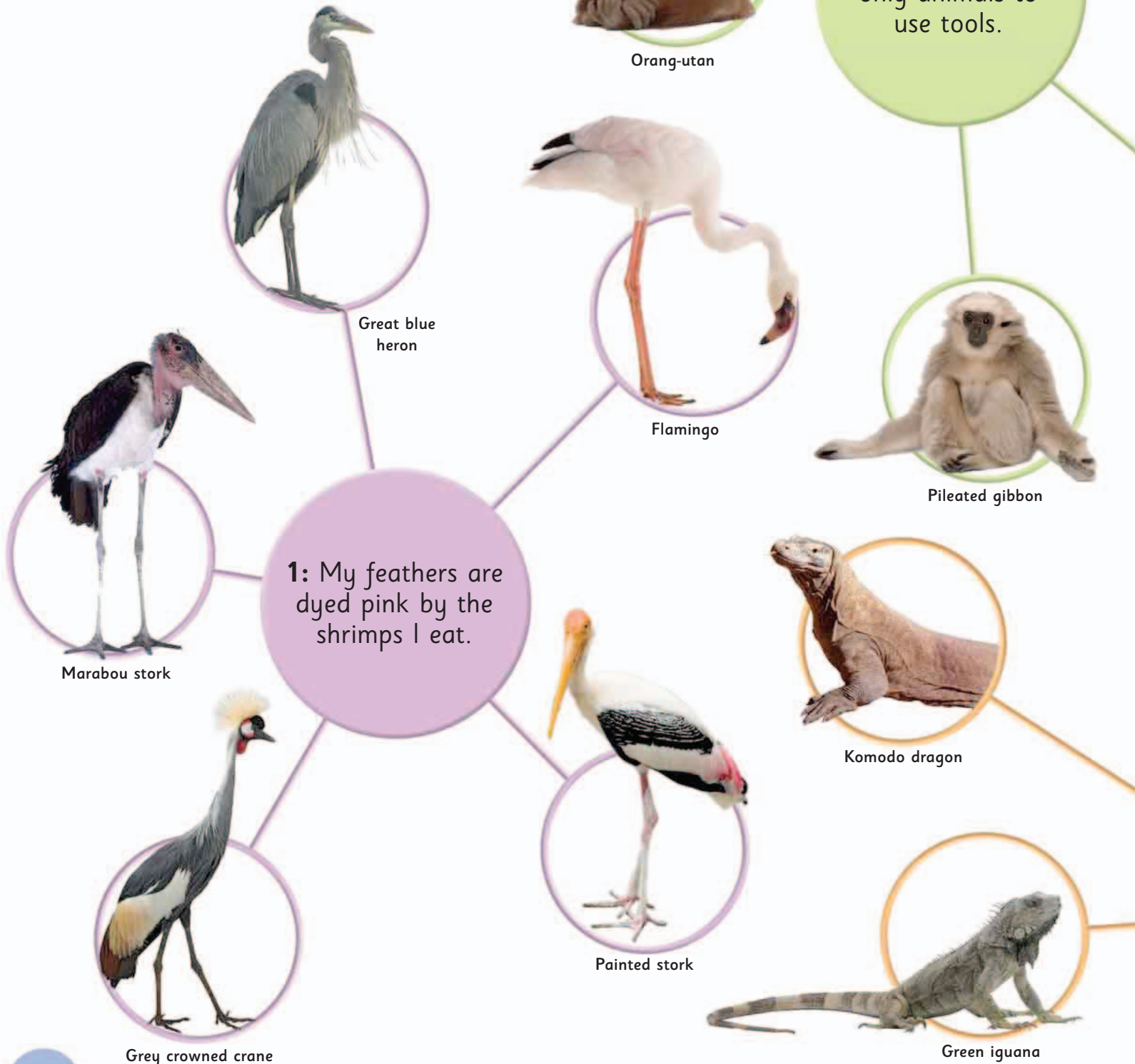
- A: Sunfish
- B: Basking shark
- C: Manta ray
- D: Whale shark

17 Which bird has the longest wingspan?

- A: Albatross
- B: Golden eagle
- C: Ostrich
- D: Andean condor

# Who am I?

Can you work out which animal is being talked about from the clue?





Gorilla



Flea



Praying mantis

**3:** I can jump 100 times my own length.



Stag beetle



Chimpanzee



Lionfish



Clownfish

**5:** I hide among poisonous sea anemones to protect myself from predators.



Australian frilled lizard



Turquoise dwarf gecko

**4:** I am the largest lizard in the world.



Veiled chameleon



Porcupine fish

**1:** Every winter this animal travels all the way from cold Canada to warm Mexico.

**2:** This animal, which lives in the Arctic Circle, can hold its breath for up to two minutes underwater.

**3:** This European animal uses its amazing eyesight and hearing to hunt at night.

**5:** This North African animal has two toes that are widely spaced for walking on sand.

**8:** This Amazonian animal is brightly coloured to warn off predators.

**9:** This Antarctic animal is specially camouflaged to make it hard to see underwater.

# Where in the world?

Discover where each animal lives by matching the descriptions with the pictures.



Camel



Barn owl



Great white shark



Polar bear



Tuatara



Koala



**4:** This Asian animal eats bamboo shoots.

**7:** This underwater hunter may lose 30,000 teeth in a lifetime.

**6:** This Asian animal hides from predators amongst plants.

**10:** This African animal hunts animals that come down to the water's edge to drink.

**12:** This New Zealand animal can live for more than 100 years.

**11:** This Australian animal eats eucalyptus leaves and sleeps for up to 19 hours a day.



Crocodile



Giant panda



Monarch butterfly



Orchid mantis



Penguin



Poison dart frog

# Glossary



**abdomen** Rear part of the body of an insect, spider, or crustacean

**amphibian** Animal that can live in and out of water

**antennae** Pair of long, thin feelers on the heads of insects and some non-insects

**arachnid** Animal with simple eyes and eight legs, such as a spider or scorpion

**bacteria** Group of tiny living organisms with just one cell

**baleen** Brushlike fringe in the mouths of certain whales. It is used to strain plankton out of seawater when they eat

**blubber** Thick layer of fat in whales and other sea mammals that helps them stay warm in the water

**breeding** Process by which males and females mate and produce offspring

**camouflage** Colours or patterns on an animal's body that help it blend into its surroundings so it is hidden from view

**carnivore** Animal that mainly eats meat. A lion is a carnivore

**cartilage** Flexible, tough tissue in the skeletons of some animals. A shark's skeleton is made up of only cartilage

**compound eyes** Type of eye that has many light-sensitive surfaces. Each surface sees part of an image. Most adult insects have compound eyes

**courtship** Way in which animals behave to find and attract a partner for mating

**crustacean** Invertebrate, such as a crab or lobster, that has two antennae or feelers and a hard outer body. This group lives mostly in water

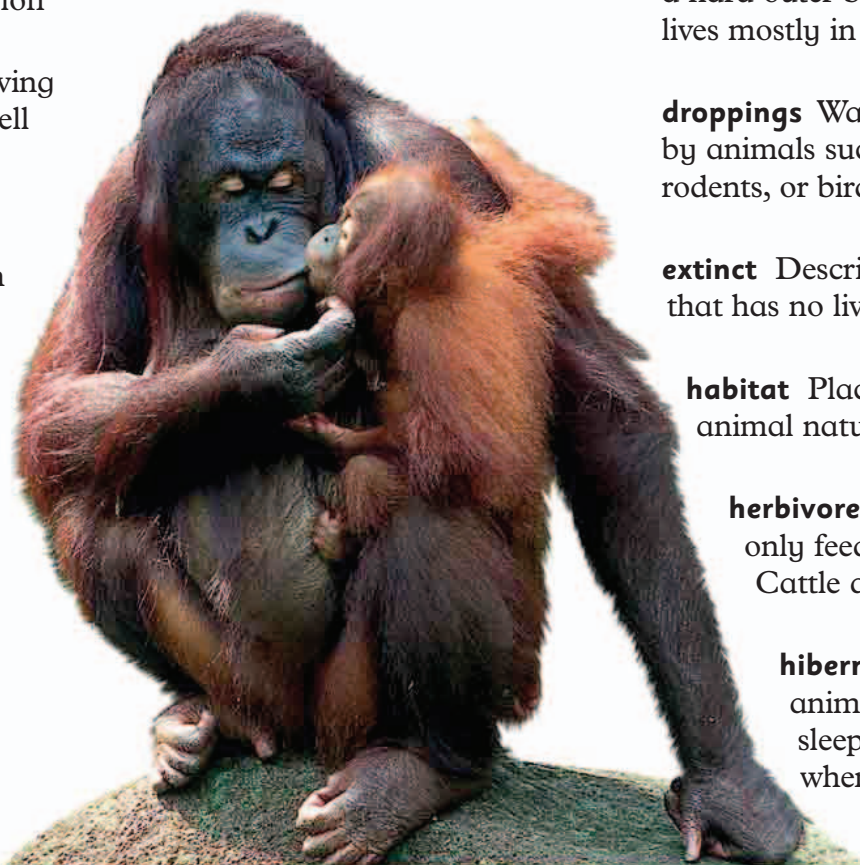
**droppings** Waste produced by animals such as insects, rodents, or birds

**extinct** Describes a species that has no living members

**habitat** Place where an animal naturally lives or grows

**herbivore** Animal that only feeds on plants. Cattle are herbivores

**hibernation** When animals, such as bats, sleep throughout winter, when food is scarce



**invertebrate** Animal, such as an earthworm, that does not have a backbone

**larva** Young form that hatches out of the eggs of insects. They usually look very different from their parents. For example, a caterpillar becomes a butterfly

**mammal** Warm-blooded animal whose body is covered in fur (or hair) and who produces milk to feed its young

**marsupial** Type of mammal whose females have pouches to carry their young

**metamorphosis**  
Major change that happens to the bodies of certain animals as they grow from babies to adults. Tadpoles turn into frogs through metamorphosis

**migration** Long-distance, seasonal journey made by some animals to find food, warmer weather, or to breed

**mollusc** Invertebrate that has a soft body without any divided parts, often covered by a shell. A snail is a mollusc

**non-insect** Any invertebrate that is not an insect, such as starfish, centipedes, and worms

**parasite** Animal that lives on or inside another species in order to feed off it

**plankton** Tiny creatures that live in water in huge numbers. They serve as food for sea animals

**predator** Animal that hunts other animals for food

**primate** Mammals that have hands and feet that can grasp, a large brain, and good vision. Gorillas are primates

**reptile** Cold-blooded animals that breathe through lungs, usually lay eggs, and are covered with scales or bony plates. Snakes are reptiles

**scales** Thin, flat, and hard plates that cover the bodies of certain animals, such as reptiles and fish

**scavenger** Animal, such as a hyena or vulture, that feeds on the remains of dead animals

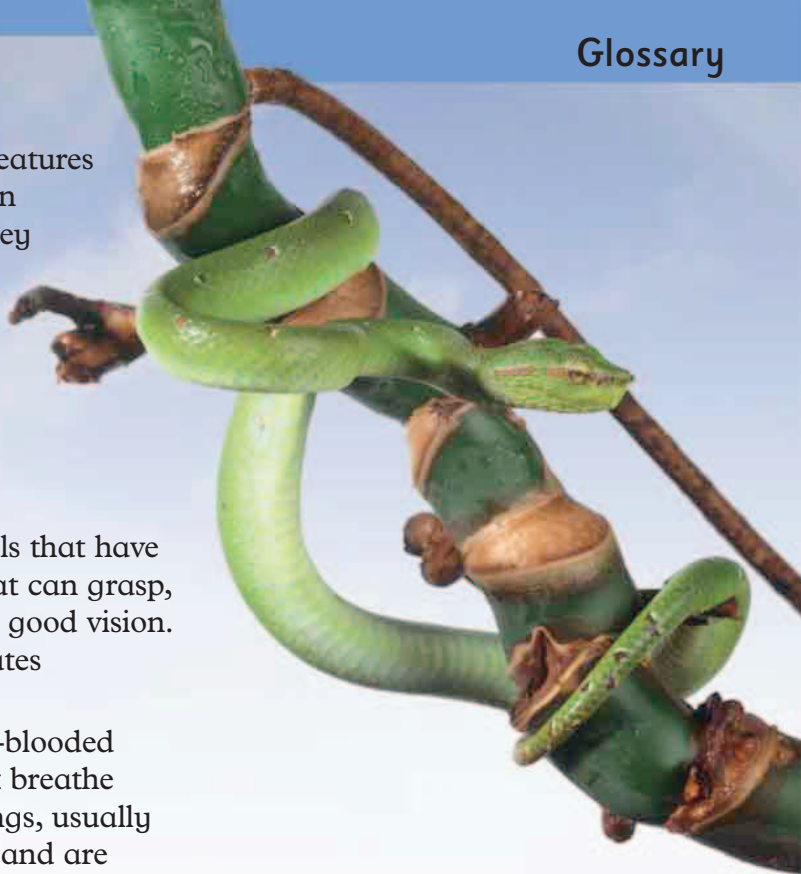
**shoal** Large number of fish swimming together

**species** Type of living thing that can breed with others of the same type

**thorax** Middle part of an insect's body to which the wings and legs are attached

**venomous** Describes animals that use poisonous fangs or stings to kill or paralyse their prey and enemies

**vertebrate** Animals that have a backbone and an internal skeleton



# Index

**A** aardvark 25  
 albatross 64  
 alligators 94-95, 113  
 amphibians 4, 5, 80-81, 96-97, 154  
 angler fish 147  
 animals 4  
 Antarctic skua 67  
 anteaters 26  
 antlers 37  
 ants 26, 124-125  
 apes 12-13  
 aphids 107, 121, 125  
 arachnids 128  
 archerfish 147  
 Arctic tern 76  
 armadillo 25  
 asses 41  
 axolotl 103

**B** baby birds 56, 57  
 baby fish 150-151  
 baby mammals 7, 8, 21, 31, 33, 47  
 baby reptiles 85, 91, 95  
 bacteria 126, 141  
 badgers 25  
 barnacles 135  
 bats 9, 30-31  
 bears 20-21  
 bees 122-123  
 beetles 4, 106, 110, 111, 116, 120-121  
 big cats 15, 16-17  
 birds 4, 5, 48-57, 154  
 birds of prey 52, 68-69, 77  
 bloodsuckers 30, 118-119, 130  
 blue whale 46  
 booby 53  
 bugs 120-121  
 bushbaby 11  
 butterflies 108, 109, 113, 115, 118-119  
 buzzards 69, 76

**C** caecilians 96, 97  
 caimans 94  
 camels 36, 43  
 camouflage 92, 114, 148  
 caterpillars 108, 109, 110, 113, 115, 119

cats 9, 14-15, 16  
 cattle family 38-39  
 centipedes 129, 132  
 chameleons 87, 89  
 chicks 56, 57, 59, 67, 71, 75  
 chimpanzees 13  
 cobras 92  
 cockroaches 116  
 cold-blooded 80  
 coral 138  
 cormorants 64, 79  
 courtship 52-53, 75, 150  
 crabs 129, 134, 135  
 cranes 52, 53  
 creepy-crawlies 4, 5, 104-105, 106, 155  
 crocodiles 83, 94, 95  
 crocodylian family 82, 94  
 crustaceans 129, 134-135  
 cuttlefish 136

**D** deer 37  
 defence (amphibians) 100-101  
 defence (fish) 148-149  
 defence (insects) 114-115  
 defence (reptiles) 88, 92  
 disguise 119, 148  
 dogs 18-19  
 dolphins 9, 47  
 dragonflies 108, 110  
 duck-billed platypus 9  
 ducks 51, 62  
 dung beetle 106

**E** eagles 51, 68  
 earthworms 128, 133  
 echidna 27  
 eels 145, 146  
 egg-eating snake 93  
 eggs (amphibians) 98, 103  
 eggs (birds) 55, 56, 57, 65, 67, 70, 74, 79  
 eggs (fish) 150, 151  
 eggs (insects) 108, 109, 131  
 eggs (mammals) 9, 27  
 eggs (reptiles) 82, 85, 87, 95  
 elephants 9, 34-35

**F** feathers 50  
 fish 4, 5, 142-145, 155  
 flamingos 63  
 fleas 111  
 flies 110, 126-127  
 flight 50, 110, 126  
 flightless birds 78-79  
 flying squirrel 30  
 foxes 19  
 freshwater birds 62-63  
 frogs 96, 97, 98-101

**G** gamebirds 74-75  
 geckos 86, 87  
 geese 62, 76  
 giant panda 21  
 gibbons 13  
 gila monster 89  
 giraffes 42  
 glowworms 121  
 gorillas 8, 12v  
 gulls 64, 65

**H** hares 24  
 headlice 116, 140  
 hedgehogs 27  
 herons 51, 63  
 hibernation 91  
 hippopotamus 43  
 honeypots ants 125  
 hoofed mammals 36-43  
 horns 37, 39  
 horses 36, 40-41  
 house dust mites 141  
 hoverflies 110, 115  
 hummingbirds 54, 60, 76  
 hyenas 22

**IJK** insects 106-117  
 jaguar 17  
 jellyfish 139  
 joeys 33  
 kangaroos 32, 33  
 kingfishers 62  
 koalas 32  
 komodo dragon 89



**L** ladybirds 107, 109, 115  
 larva 108, 109  
 lemurs 10  
 leopards 16, 17  
 limpets 137  
 lions 15, 16  
 lizards 82, 83, 86-89  
 lobsters 129, 134  
 locusts 111, 117

**M** maggots 126  
 mammals 4, 5, 6-9, 154  
 manatees 45  
 marsupials 32-33  
 meerkats 23  
 metamorphosis 108  
 mice 29  
 migration 76, 119  
 millipedes 129, 133  
 minks 22, 23  
 mites 128, 140, 141  
 moles 9, 25  
 molluscs 129, 136-137  
 mongoose family 23  
 monkeys 10-11  
 mosquitoes 117  
 moths 118-119  
 mudskippers 144

**NO** narwhals 47  
 nests, nesting (birds) 53,  
 54-55, 56, 61, 65, 74  
 newts 96, 97, 102-103  
 octopuses 129, 136  
 opossums 33  
 orang-utans 13  
 ostriches 51, 78  
 otters 45  
 owls 70-71  
 oysters 129, 137

**P** pandas 21  
 pangolin 26  
 parrot family 73  
 peacocks 53, 75  
 pelicans 64

penguins 66-67, 79  
 pests 116-117  
 pheasants 53, 74, 75  
 pigs 36  
 piranhas 147  
 plankton 46, 140, 141, 146, 153  
 polar bears 9, 20, 21  
 porcupine fish 148  
 primates 8, 10  
 puffins 65  
 pupa 109

**R** rabbits 24  
 raccoons 23  
 rats 28  
 rays 152-153  
 reindeer 37  
 reptiles 4, 5, 80-83, 154  
 rheas 79  
 rhinoceros 36, 43  
 rodents 28-29

**S** salamanders 96, 97, 102-3  
 salmon 146, 151  
 scallops 137  
 scorpions 128, 130-131  
 sea anemones 129, 139  
 sea birds 64-67  
 sea lions 44  
 sea slugs 137  
 sea snails 137  
 sea snakes 91  
 seahorses 151  
 seals 44  
 sharks 143, 152-153  
 sheep 39  
 shells 82, 83, 84-85, 132, 137  
 shoals 145, 148  
 shrews 27  
 shrimps 129, 135  
 skeletons 8, 143  
 skunks 23  
 slow worms 82, 86  
 slugs 129, 133, 137  
 snails 129, 132, 137  
 snakes 82, 83, 90-93

snow petrel 67  
 songbirds 51, 58-59  
 spiders 128, 130-131  
 sponges 129, 138  
 springbok 39  
 squid 129, 136  
 starfish 129, 139  
 stoats 22  
 sun bear 21  
 swallows 60, 61  
 swans 53, 57, 62, 66  
 swifts 60, 61

**T** tadpoles 99  
 tapirs 36  
 Tasmanian devil 32  
 termites 26, 124-125  
 thorny devil 89  
 ticks 128, 130  
 tiger 17  
 tiger beetle 111  
 toads 96, 97, 98-101  
 tortoises 82, 83, 84, 85  
 toucans 72  
 travelling birds 51, 76-77  
 tree frogs 101  
 tsetse fly 117  
 tuataras 82, 83  
 turtles 84, 85

**VWZ** vampire bat 30  
 vultures 69  
 walrus 45  
 warm-blooded 9  
 warthog 36  
 wasps 122-123  
 waterbirds, waterfowl 51,  
 56, 62-63  
 weasel family 22, 23  
 weaver birds 53, 54  
 whales 46, 47  
 wolves 18, 19  
 woodlice (woodlouse) 133  
 woodpeckers 51, 55  
 worm family 128  
 zebras 41

# Picture credits

The publisher would like to thank the following for their kind permission to reproduce their photographs:

(Key: a-above; c-centre; b-below; l-left; r-right; t-top)

**Alamy Images:** Photo 24/Brand X Pictures 12tl; Byron Schumaker 121r; D. Robert Franz/Imagestate 18br; Esa Hiltula 19cl; Focus Group/Lynne Siler 42cr; Marin Harvey 12b; Mark Hamblin 19tl; Mark J. Barrett 40l; Maximilian Weinzierl 121ca; Paul Horsted/Stock Connection, Inc 91cbr; Steve Bloom Images 13r; Tom Brakefield/Stock Connection Inc 32-33b.

**Ardea London Ltd:** 53tc; Becca Saunders 152claa; Chris Knights 69cbr, 74clb; D. Parer & E. Parer-Cook 46tr; Donald D. Burgess 55tr; G. Robertson 66tr, 67tr; Jean Paul Ferrero 41tr, 133tr, 134-135cb; Joanna Van Gruisen 154cr; John Cancelosi 54br; Kenneth W. Fink 13b, 21clb, 72bl; M. Watson 54tr, 95cl; Pat Morris 25tr, 97cr, 124tr, 146ca; Peter Steyn 87cr; Stefan Meyers 52-53b; Steve Hopkin 115tl; Valerie Taylor 139c, 146cr, 155cb. **Corbis:** 72-73bc; Anthony Bannister; Gallo Images 107c, 130cr, 150br; Bohemian Nomad Picturemakers 155br; Bryan Knox; Papilio 123bl; Buddy Mays 155tr; Carol Hughes; Gallo Images 106b; Chase Swift 37c; Chinch Gryniewicz; Ecoscene 131t; D. Robert & Lorri Franz 9tr; Dan Guravich 119tc; David A. Northcott 154-155b; Douglas Faulkner 44-45c; Douglas P. Wilson; Frank Lane Picture Agency 140tr, 141tl, 141cr; Fritz Polking; Frank Lane Picture Agency 113clb; Galen Rowell 9r; George D. Lepp 118br; Herb Watson 4cla; Joe McDonald 9bc, 30tl, 99tr; Karl Ammann 41cl; Kennan Ward 46cbr; Kevin Schafer 10tr; Lynda Richardson 123cb; Martin Harvey 33br, 85cr; Mary Ann McDonald 22tl; Michael & Patricia Fogden 52cl, 94tr; Paul A. Souders 51cr, 124-125b; Paul Funston; Gallo Images 106cl; Peter Johnson 124cl; Tim Davis 21tr; Tom Nebbia 78-79b; W. Perry Conway 28br, 29tr, 33t; Wolfgang Kaehler 53cr, 53bl, 79cr.

**Dorling Kindersley:** Andy Crawford and Kit Houghton 36tr; Barnabas Kindersley 64bl; Barrie Watts 29bl, 56bl; Franklin Park Zoo 8ca; Gables 68cr; Jane Burton 61bc; Jerry Young 53tl, 63tc, 63cbr, 64bc, 74-75bc, 76cbrb, 79cl, 80cbl, 84clb, 85cla, 85cl, 101clb, 101cb, 110cr, 130tl, 130bl, 143tc; Kim Taylor 58cr; Mike Linley 100cr; NASA 70tc; Natural History Museum 4r, 47craa, 50bcl, cbl, 51clb, 55bc, bccr, bcr, 55cla, claa, 71cb, 74bc, 84cl, 118tr, 118cra, 118cl, 118car, 118cbl, 120cbr, 121clb, 121bl, 135tr; Paignton Zoo 39tc;

Paradise Park Cornwall 78tr; Philip Dowell 79tr; Philip Enticknap 76cbr; University College 8tl; Weymouth Sea Life Centre 139cl; Jerry Young / Jerry Young 162bc, Philip Dowell / Philip Dowell 162bl, Natural History Museum, London 163bc, 164tr, Rollin Verlinde 154cl. **Getty Images:** Cousteau Society 145cbr; David Nardini 148l; Douglas D. Seifert 153b; Georgette Douwma 145r; JH Pete Carmichael 91t; John Downer 35br; Natalie Fobes 151bl; Peter David 147tl; Tim Davis 66l; Frank Kraemer / Photographer's Choice RF 163fbr. **Dreamstime.com:** Dragoneye 157l, Eric Isselee 161tr, Isselee 51br, 163br, Saskia Massink / Saspantout 119cra, Peter Leahy / Pipehorse 165br. **Fotolia:** Eric Isselee 158tr, 160cr, 162br, 163bl; **Robert Harding Picture Library:** 92ca. **Image Quest Marine:** Carlos Villoch 151tl; James D. Watt 138l, 152cla; Nat Sumanatameya 135tl; Scott Tuason 138cr. **FLPA - Images of Nature:** David Hosking 63tr; G Moon 77cl; Mike Jones 57clb; Minden Pictures 64cl, 64br, 77t; S. Charlie Brown 61clb; S Maslowski 62bl; Steve Young 65cl.

**Masterfile UK:** Albert Normandin 40-41b. **National Geographic Image Collection:** Bill Curtsinger 84c; J. Eastcott/Y.Eastcott Film 20cr; Raymond Gehman 94bl; Robert Madden 59cl; Roy Toft 20-21b; Tim Laman 101r. **Nature Picture Library Ltd:** Alan James 153tl; Anup Shah 95br; Brandon Cole 152bl; Bruce Davidson 120c; Conrad Mauf 89c; Dan Burton 133tl; Fabio Liverani 103cr; Georgette Douwma 145tl; Jurgen Freund 91clb; Pat de la Harpe 95tr.

**N.H.P.A.:** Andy Rouse 9clbb, 16cr, 17tl, 17cl, 36cbr, 46-47b; Ann & Steve Toon 16bl, 23br; Ant Photo Library 33cb, 125br; Anthony Bannister 24-25, 92-93cb, 111tr; B Jones & M Shimlock 47bc, 149bl; Christophe Ratier 78cr; Dan Griggs 114cb; Daniel Heuclin 26tr, 27c, 32tr, 96cra, 97crb, 154br; David & Irene Myers 46cl; E A Janes 39bl; Eric Soder 14l; G.I Bernard 116cbr; Gerard Lacz 23clb, 45bl; Hellio & Van Ingen 37tl, 117tl; Henry Ausloos 18bl; J & A Scott 9tl, 16-17b, 38ca; James Warwick 70cr;

Jany Sauvanet 26bl, 147clb; John Buckingham 98bc; John Shaw 14bc, 23bl, 75br; Karl Switak 90cl; Kevin Schafer 11tr, 54, 67b; Laurie Campbell 65r, 82bl; LUTRA 146bl, 150cla; Manfred Danegger 24bc; Marin Wendler 15br; Mark Bowler 42tr; Martin Harvey 15bl, 34cl; Martin Wendler 93clb; Melvin Grey 57r; Mirko Stelzner 73r; Nick Garbutt 10bl, 36bl; Norbert Wu 45tr; Rich Kirchner 67c; Rod Planck 117b; Roger Tidman 31t; Stephen Dalton 11br, 23clbb, 30br, 30-31c, 31br, 60br, 61cr, 71t, 87tl, 87clb, 101tl, 103bl, 120bl, 122l, 126-127b, 130cra, 131br; Stephen Krasemann 43cl; T Kitchin & V Hurst 22tr. **Oxford Scientific Films:** 35tc, 113br, 131c; Adam Jones 62-63b; Alan Root/SAL 26cbr; Bert & Babs Wells 32cra; Bob Bennett 39cla; Brian Kenney 13tl, 112tr; Carol Farneti Foster 14cra; Clive Bromhall 13c; Daniel Cox 18tl, 65tl; F. Polking/OKAPIA 62bc; Frank Schneidermeyer 15tr; James H Robinson 112br; Javed Jaffeji 23ca; John Downer 76-77b; John Forsdyke 116br; Jorge Sierra Antinolo 10c; Judd Cooney 77cb; Kim Kesterskov 64t, 154c; Leonard Lee Rue 11tl; Lon E Lauber 76cra; London Scientific Films 108l; Mark Hamblin 37bl, 65br; Michael Dick/AA 10cr; Michael Fogden 60c, 89bl; Michael H. Francis/OKAPIA 40cbr; Mike Powles 43cr; Paolo Fioratti 39clbb; Partridge Films Ltd 31cr; Patti Murray/AA 115cl; Paulo de Oliveira 36cla; Peter Hawkey/SAL 76ca; Richard Packwood 38tr; Rob Nunnington 39tr; Robert Tyrell 60bl, 154cb; Roger Brown 32cr; Satoschi Kuribayashi 121tl; Stan Osolinski 11bl, 37cr, 38-39b, 42c; Thomas Haider 44l; Tom Ulrich 39clb, 39claa; Wendy Shattil and Bob Rozinski 23tl; Zig Leszczynski/AA 47tl.

**Science Photo Library:** 140cr, 140bl; Dr Tony Brain 141bl; Eye of Science 127c, 141br; Rod Planck 25bl. **Still Pictures:** James Gerholdt 99cr; Klein 32c; Martin Harvey 42-43b.

All other images © Dorling Kindersley  
www.dkimages.com

## Acknowledgements

**Dorling Kindersley would like to thank:** Ben Morgan for his extensive knowledge on the subject, Lynn Bresler for compiling the index, Lorrie Mack for proofreading, and Janet Allis, Cathy Chesson, Jacqueline Gooden, and Cheryl Telfer for design assistance.

