



Tiger giant centipede



Giraffe



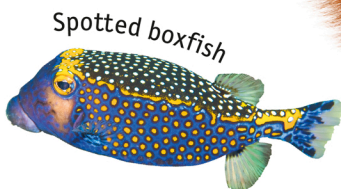
Lyle's flying fox



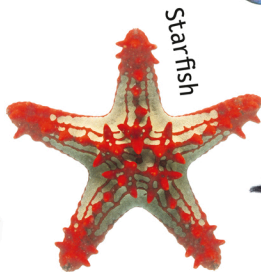
Banded snake



Eurasian red squirrel



Spotted boxfish



Starfish



Tarantula



Green-striped tree dragon



Elongated tortoise

THE ANIMAL BOOK

A visual encyclopedia of life on Earth



Cairns birdwing



Brittlebill



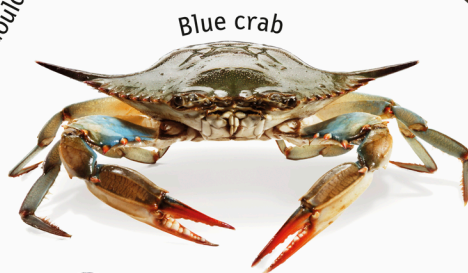
Jungle nymph



Gouldian finch



King penguin



Blue crab



Cuban crocodile



Poison-dart frog

THE ANIMAL BOOK







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A visual encyclopedia of life on Earth





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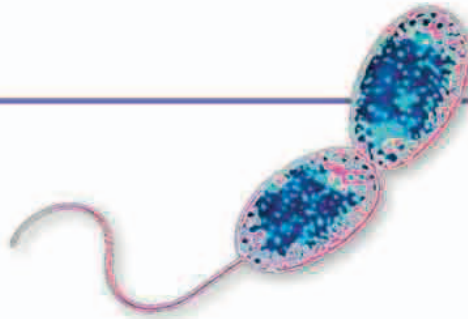
CONTENTS

Foreword 8

Tree of life 10

Microscopic life 12

Bacteria	14
Single-celled life	16
Zooplankton	18
Seaweeds	20



Fungi 22

Mushrooms	24
Sac fungi and lichens	26
Cup fungi	28



Plants 30

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



Invertebrates 48

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



Insects

80

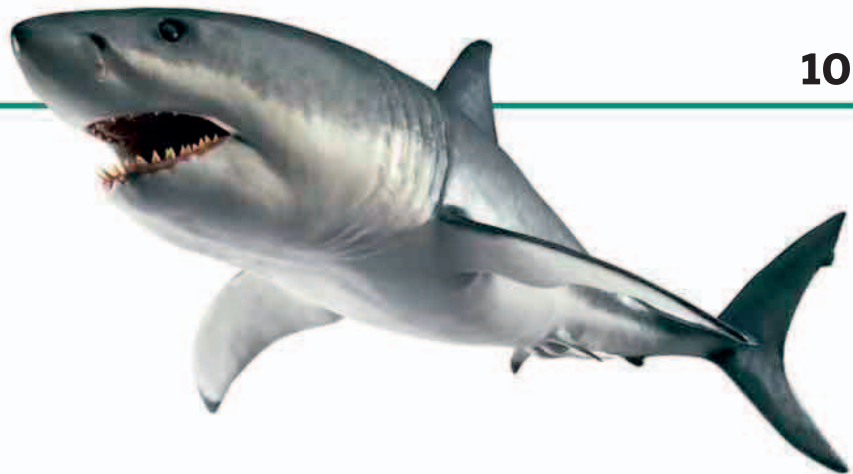
Dragonflies and damselflies	82	Beetles	92
Stick insect	84	Butterflies and moths	94
Crickets and grasshoppers	86	Slug moth caterpillar	98
True bugs and treehoppers	88	Flies	100
Praying mantis	90	Bees, wasps, and ants	102



Fish

104

Sharks, rays, and skates	106
Whale shark	110
Saltwater fish	112
Black-striped salema	118
Deep-sea fish	120
Freshwater fish	122



Amphibians

126

Frogs and toads	128
Tree frogs	134
Salamanders and newts	136



Reptiles

138

Turtles and tortoises	140
Lizards	144
Komodo dragon	148
Snakes	150
African bush viper	154
Crocodiles and alligators	156



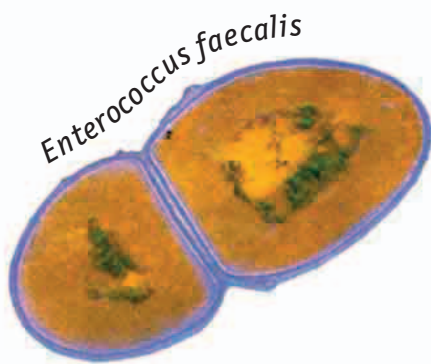
Ostriches and relatives	160	King vulture	186
Gamebirds	162	Ducks, geese, and swans	188
Pigeons and doves	164	Penguins	190
Parrots and cockatoos	166	Emperor penguins	192
Military macaw	168	Storks, ibises, and herons	194
Cuckoos and turacos	170	Pelicans and relatives	196
Owls	172	Flamingos	198
Barred owl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



Mammals

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





Enterococcus faecalis



Fly agaric



Flame lily

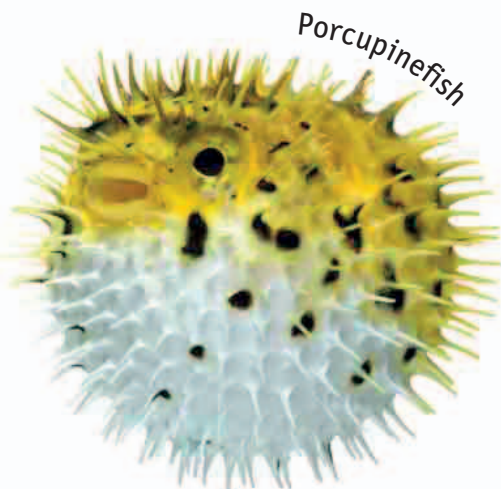
Foreword

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

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

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

Some species are good at surviving in today's world, but unluckily many are not. They are harmed by hunting, pollution, and deforestation, or by changes in their habitats as wild places are taken over by humans. Some of the world's most vulnerable animals have already become extinct, and many more are in danger of joining them.

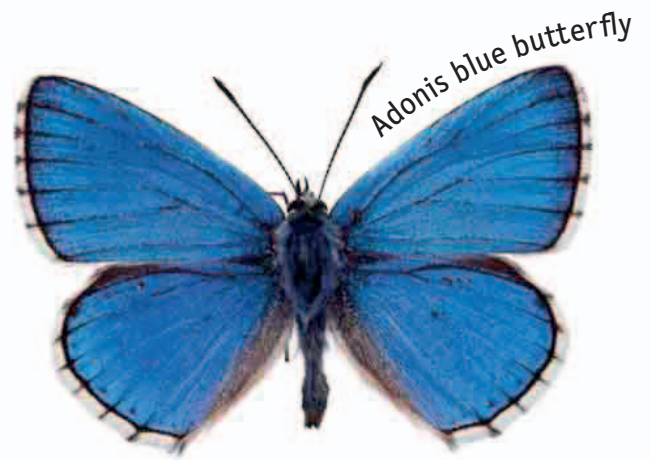


Porcupinefish



Cane toad

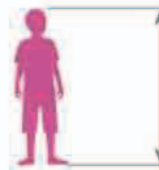




That's why conservation is more important than ever before. By helping individual animals and protecting their habitats, scientists and volunteers have already brought many species back from the brink of extinction. These success stories include some of the world's favourite animals, such as the giant panda and the humpback whale, and lots of less-known species, from the peregrine falcon and American alligator to the golden lion tamarin. You can find out more about them in this book, and you can help them yourself by joining conservation organizations, such as the World Wildlife Fund (WWF). By getting involved, you can help to ensure life on Earth remains beautiful, varied, and exciting.

David Burnie

Throughout this book you will find scale boxes which show the sizes of living creatures compared to you.



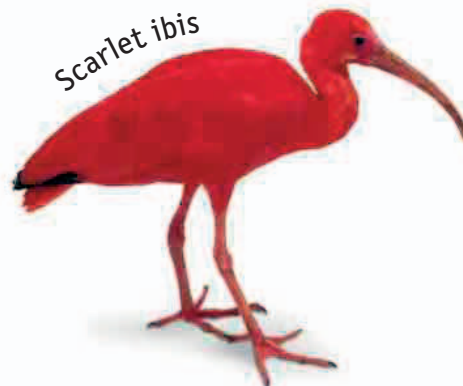
child = 145 cm (57 in) tall



hand = 16 cm (6 in) long

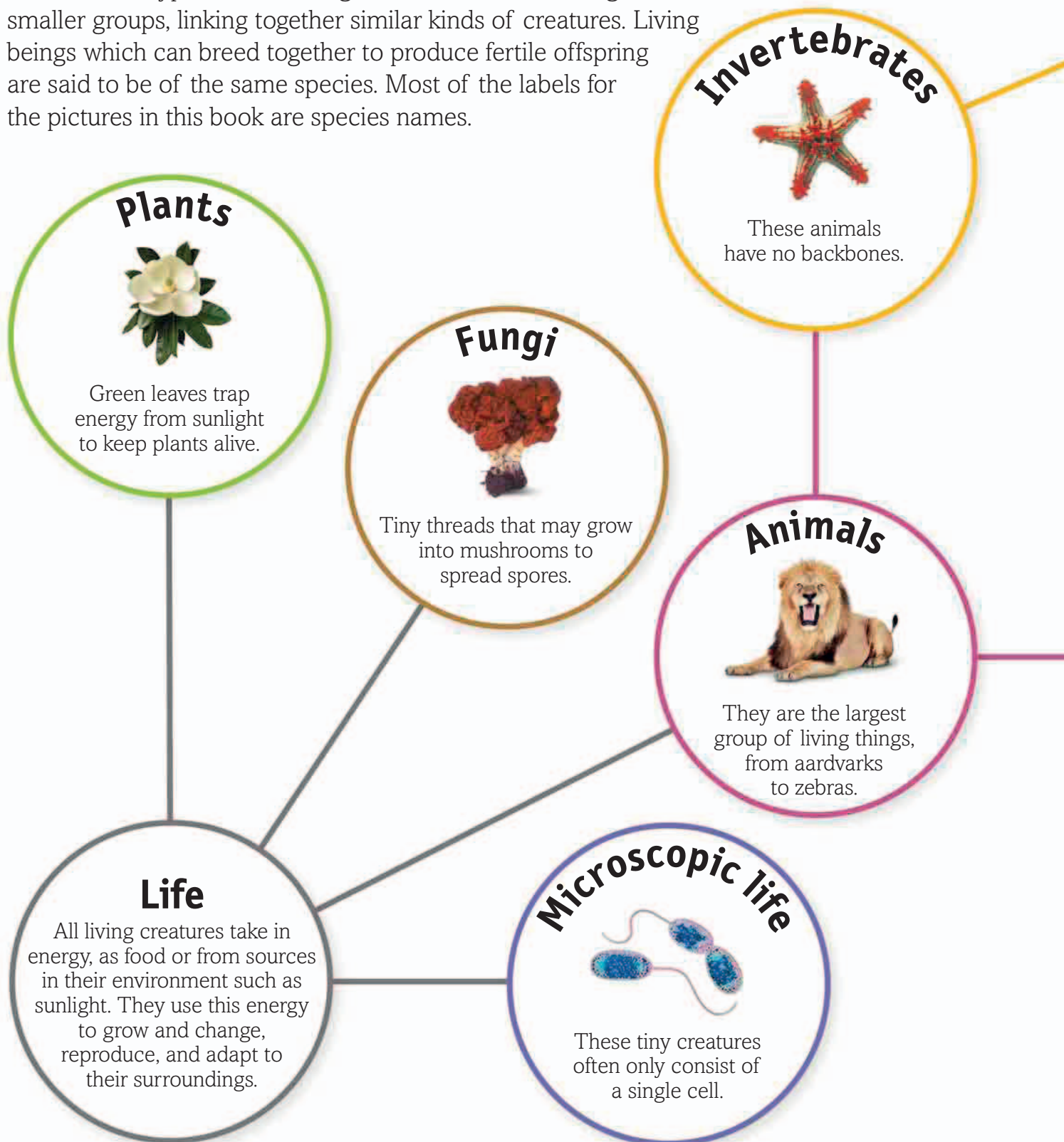


thumb = 3.5 cm (1 1/3 in) long



The Tree of Life

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



Insects



Insects are the most successful group of invertebrates.

Birds



Feathers make these vertebrates unique.

Mammals



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

Reptiles



These cold-blooded vertebrates have scaly skin.

Vertebrates



Animals with backbones are called vertebrates.

Amphibians



These vertebrates live partly in water and partly on land.

Fish



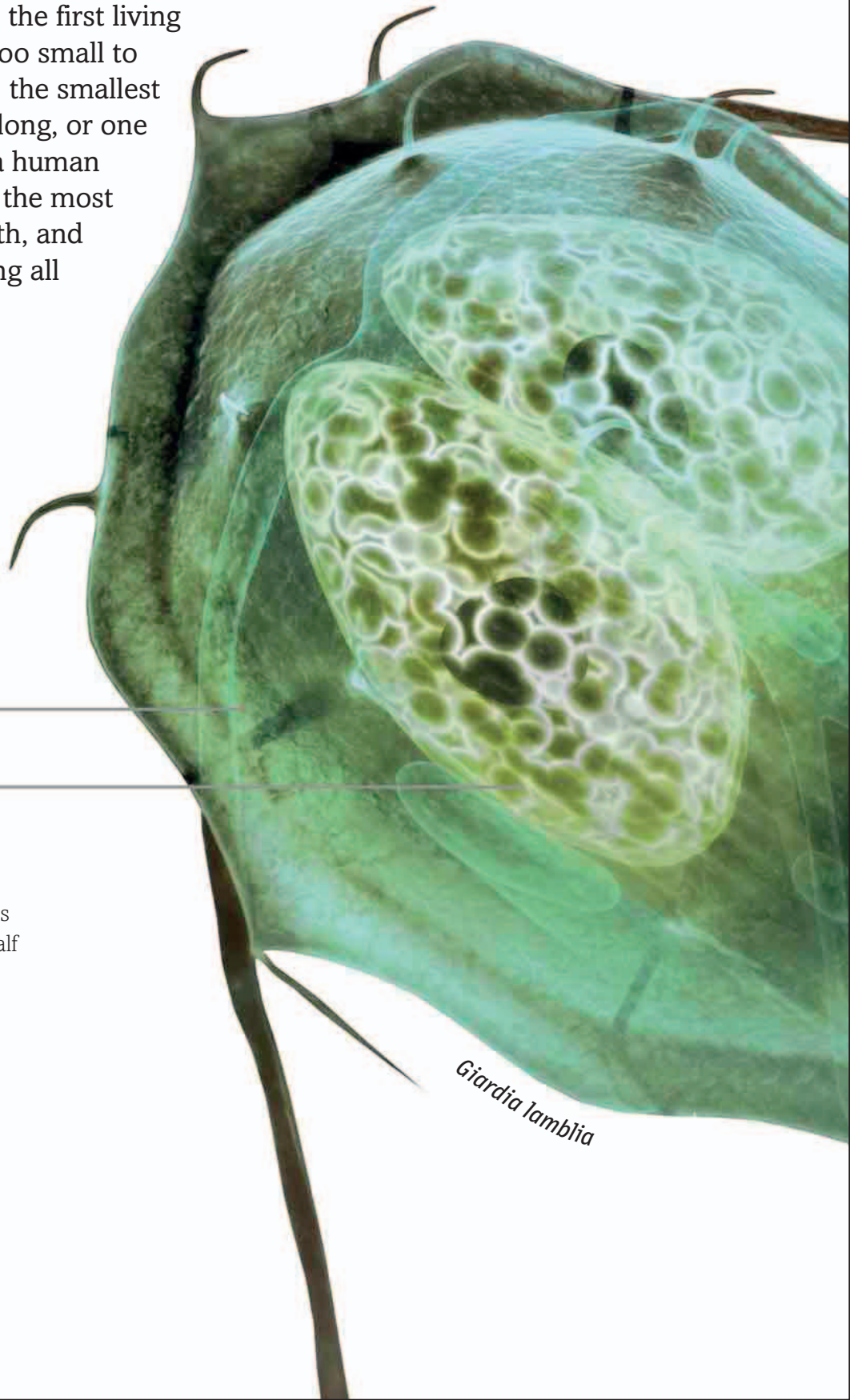
Underwater vertebrates, fish breathe through gills.

Microscopic life

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

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

Nucleus › This structure contains the cell's DNA, its genetic code. Micro-organisms breed by splitting in half to create two clones, each with a copy of the same DNA.



Giardia lamblia

Features

- Were the first living creatures on Earth



- Are so small they can only be seen through a microscope



- Are often made up of a single cell



- Often breed by splitting themselves in two



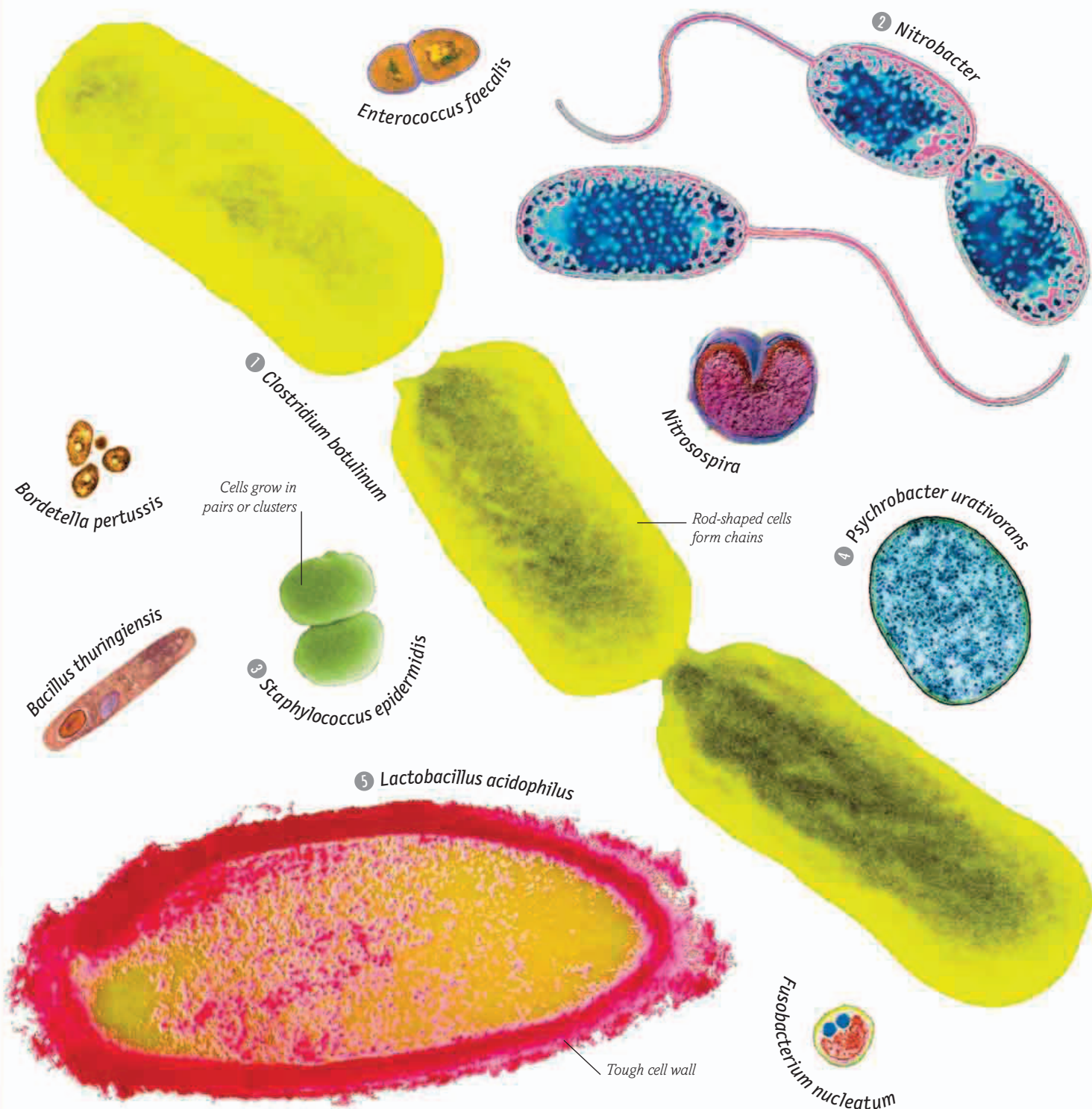
- Sometimes cause diseases, but many are essential to life



Flagellum › Many micro-organisms move using these tail-like structures, which often spin like propellers. Sometimes they work like sense organs to detect changes in temperature or acidity.

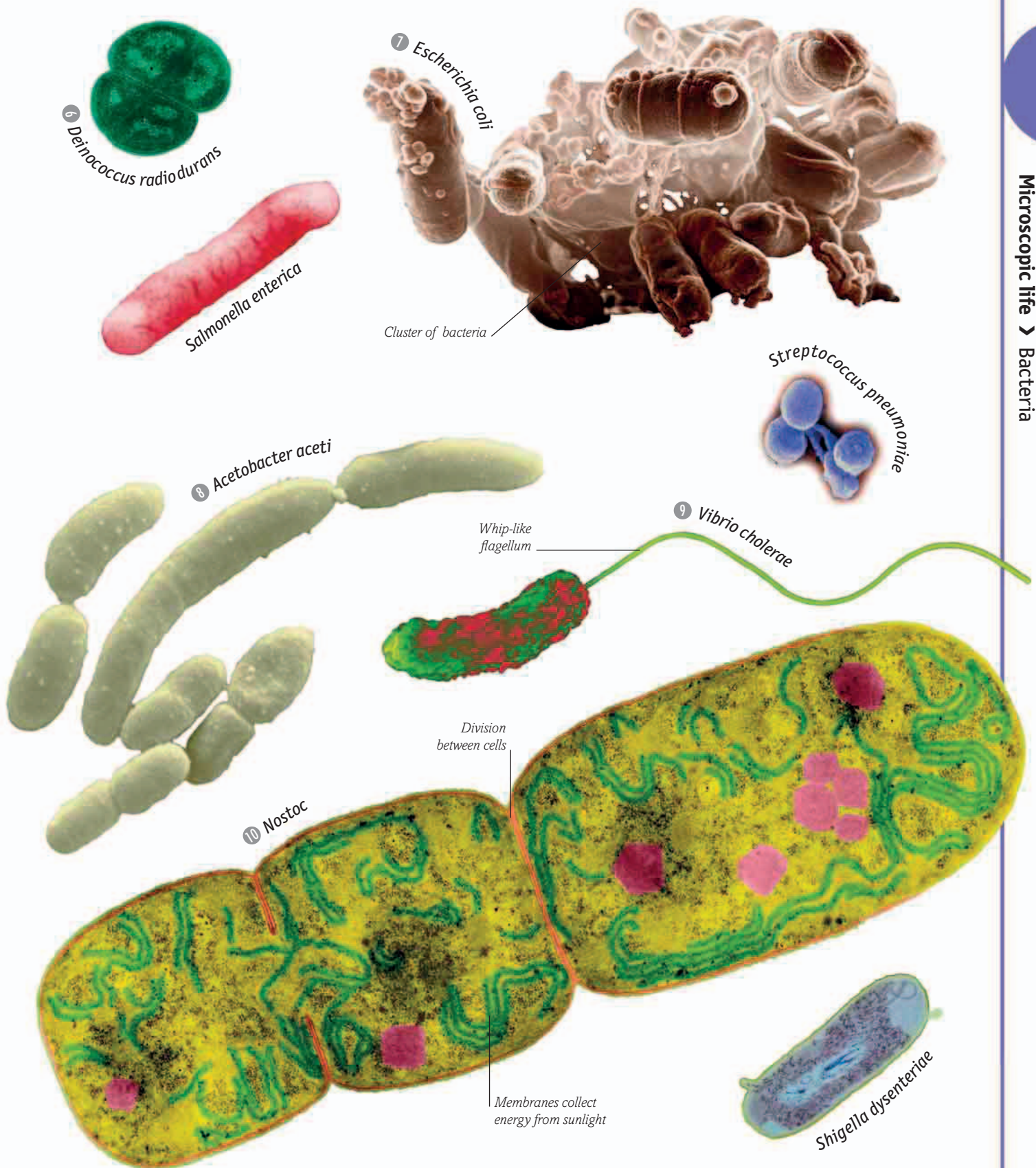
Membrane › This thin outer layer keeps the cell together. It allows useful chemicals to enter and waste to flow out. Some micro-organisms have an extra protective layer called a cell wall.

Bacteria



Bacteria are the smallest and simplest living things. There are about 5 million trillion trillion of them on Earth, each made of a single cell. They live almost everywhere, from hot springs and seabed ooze to animal intestines and plant roots. Many are essential partners for other living things, but some can cause deadly diseases if they get out of control. **Clostridium botulinum** ① normally lives in

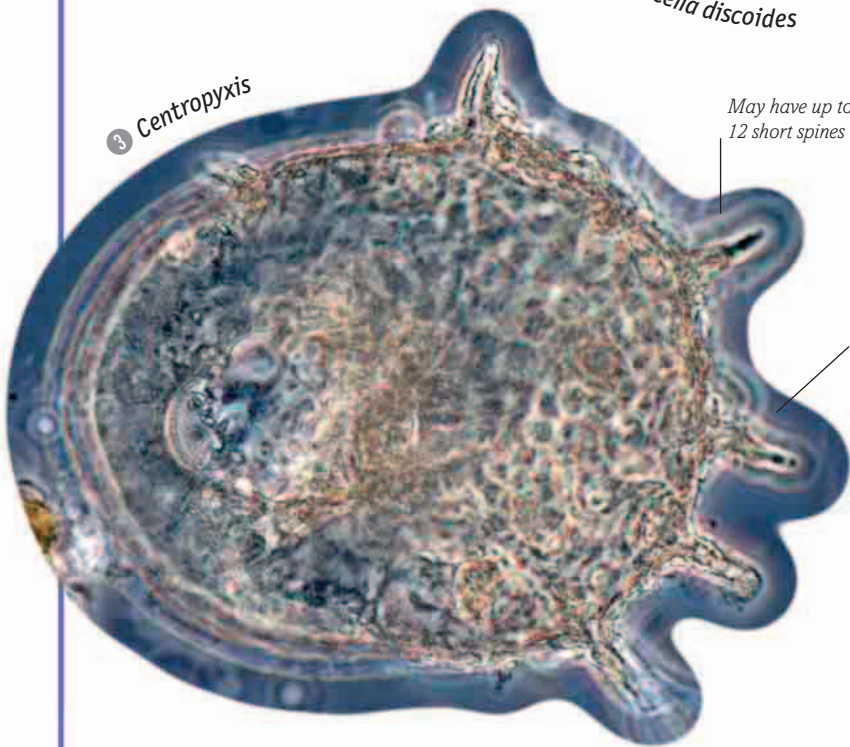
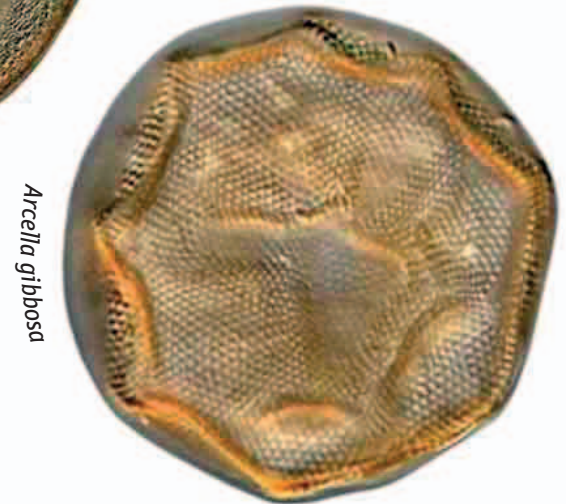
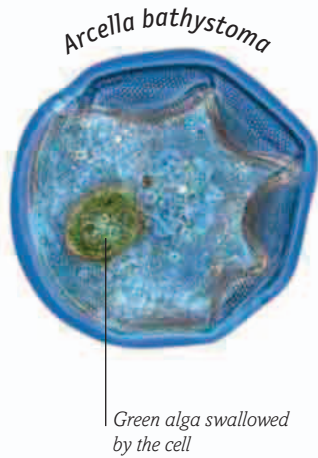
the soil, but it produces a poison that can paralyze or kill animals including humans. Like all bacteria it can breed at a phenomenal rate by repeatedly dividing in two. **Nitrobacter** ② fertilizes soil and water, helping plants and animals to grow. It swims by spinning a long hair, or flagellum, and can move 50 times its own length in a single second. **Staphylococcus epidermidis** ③ lives on the surface of human skin. Normally



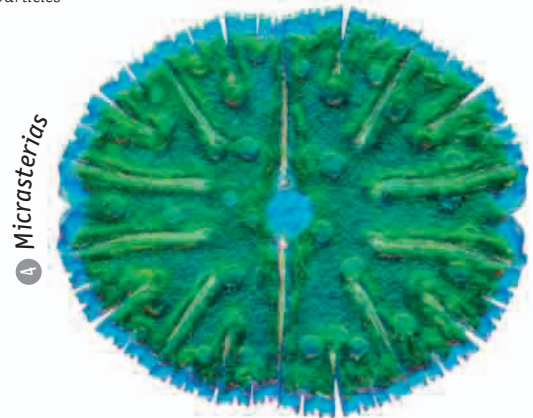
it is harmless, but it can cause life-threatening infections if it gets inside the body. *Psychrobacter urativorans* 4 contains its own antifreeze, and can live in very cold conditions, while *Lactobacillus acidophilus* 5 grows well in warm milk and is used for making yogurt. *Deinococcus radiodurans* 6 is one of the world's toughest bacteria. It can survive intense cold, strong acids, and enough radiation to kill a human

being 1,000 times over. *Escherichia coli* 7 is one of the most common bacteria in human intestines. Normally it is harmless, but some strains produce food poisoning. *Acetobacter aceti* 8 is used to make vinegar, but *Vibrio cholerae* 9 causes cholera if it contaminates water or food. *Nostoc* 10 grows in damp places. It forms long chains and lives by collecting the energy in sunlight, just like a plant.

Single-celled life

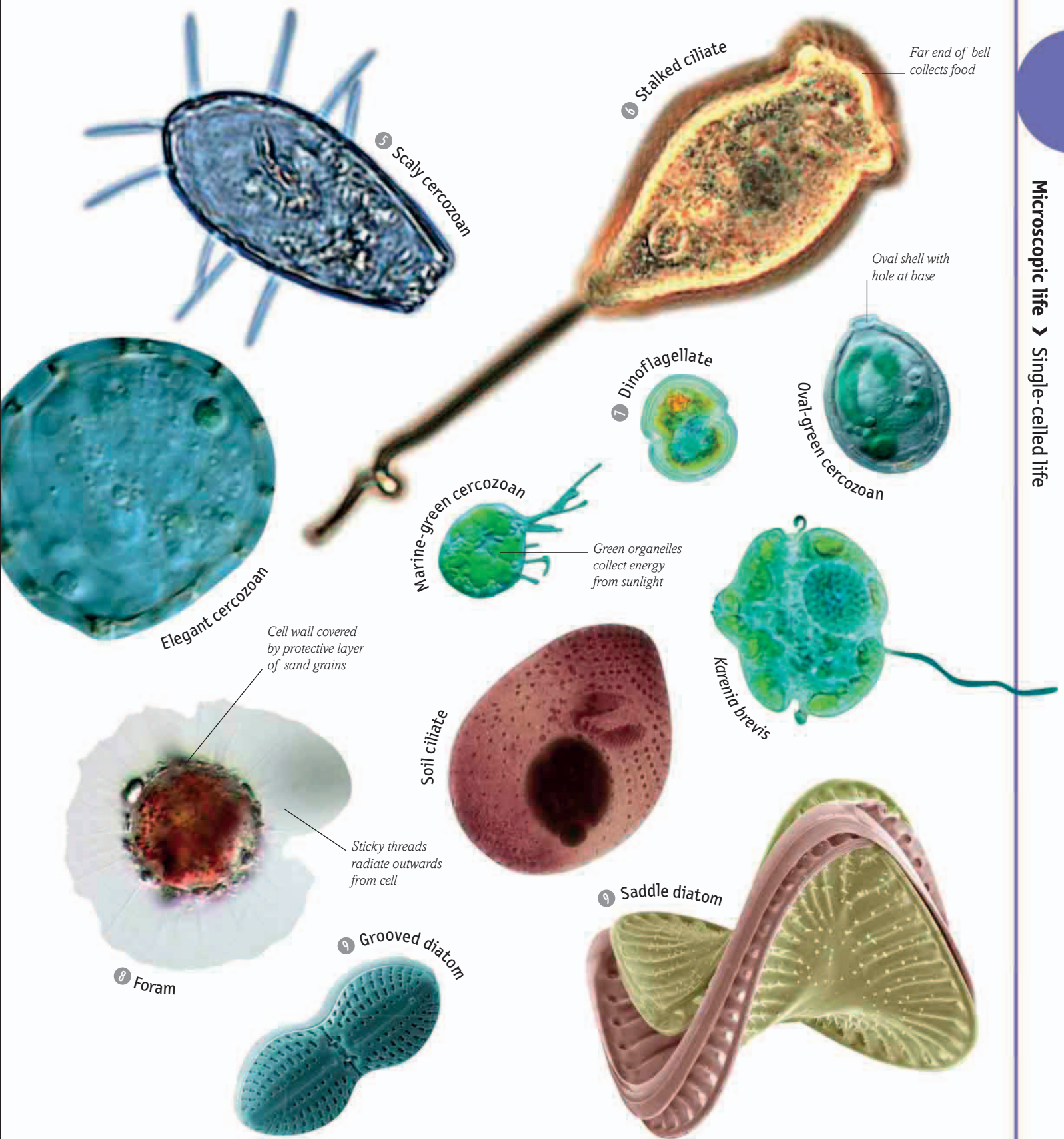


Shell made of mineral particles



The smallest living creatures on Earth are made up of a single cell. Bacteria are the most numerous, but another group, called protists, contains a bewildering variety of life. They are mostly bigger and more complicated than bacteria. Some protists are like animals, while others are more like tiny plants. A few are like both at the same time. *Arcella discoides* 1 is a protist that lives in water,

inside a yellowish-brown rounded shell. Its jelly-like body reaches out through a hole, trapping any food that drifts by. *Protacanthamoeba* 2 also has a shell. Like many single-celled creatures it can reproduce by dividing in two. *Centropyxis* 3 lives in lakes and marshes. Its shell is made up of tiny mineral particles stuck together with a special glue, and has short, stubby spines. *Micrasterias* 4 is a



green alga with a cell made of two matching halves. It lives like a plant by collecting the energy in sunlight, and its presence sometimes turns lakes and ponds bright green. **Scaly cercozoa** 5 have oval-shaped shells covered with flat silica plates, while the **stalked ciliate** 6 has an inverted bell-shaped body on a slender stalk. If its bell is touched, the stalk coils up like a spring, quickly pulling the body out

of harm's way. **Dinoflagellates** 7 live mainly in the sea, and many of them are poisonous. Sometimes they explode in numbers, causing "red tides" that kill millions of fish. **Forams** 8 have round cells with a starburst of sticky threads. **Diatoms** 9 have silica cells and use sunlight to grow. They are the most important part of plankton, the huge mass of life that drifts in fresh water and the seas.



ZOOPLANKTON

Zooplankton are fragile creatures that drift or swim gently through the water. Many species, such as the ones in this picture, are so tiny that they can only be seen through a microscope. Some live as plankton all their lives, while others are the larvae of larger creatures such as fish and crustaceans. Zooplankton are essential to life in the sea and fresh water because so many other animals feed on them.



Size > Range from microscopically small up to several metres long. **Habitat** > Oceans, seas, lagoons, lakes, rivers, and other water bodies. **Distribution** > Worldwide **Diet** > Algae, smaller zooplankton, plant plankton, bacteria, and particles of debris. **Breeding** > Most produce eggs. Many tiny species live for only a few weeks. In some species, such as *Daphnia*, the females

may release eggs every two to three days. **Predators** > A wide range of water-dwelling animals eat zooplankton, including fish, crustaceans, molluscs, and corals. Larger kinds are food for sea birds and for animals such as seals, sharks, and whales. **Conservation status** > Vulnerable to warming of the oceans or increased exposure to ultraviolet light from the sun.

Seaweeds

SCALE

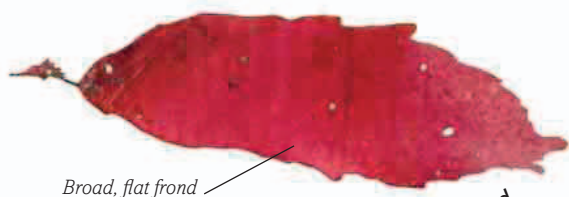


① Toothed wrack



Broad, flat frond

② Broad weed



Flat, leathery fronds

④ Irish moss

③ *Chondria dasyphylla*

⑤ Sea oak



Air-filled pods or bladders

Seaweeds look like plants, but they are actually simple organisms called algae, with fronds that take in nutrients from seawater. Some are tiny, but the biggest are as tall as a five-storey office block. Most seaweeds are firmly attached to rocks, and some are incredibly tough, taking a tremendous battering from the waves. **Toothed wrack** ① is an olive-brown seaweed from

the North Atlantic Ocean. It grows on rocks that are uncovered at low tide. Found in temperate areas, **broad weed** ② looks like a big red leaf. ***Chondria dasyphylla*** ③ lives along shores worldwide. Like most red seaweeds it lives below the low-tide mark and sometimes grows on animal shells. **Irish moss** ④ is another red seaweed, with flat, branching fronds. It contains a substance called



carrageenan, which is used to thicken yogurt and ice cream. A large, dark-brown seaweed, **sea oak** 5 has lots of feathery fronds. It often grows in rock pools and has air-filled pods that help it to float. **Sea lettuce** 6 is a green seaweed that grows worldwide on mudflats and sheltered rocks. Its crumpled fronds are sometimes collected and used as food. **Sea beech** 7 has paper-thin red fronds, while **Polysiphonia**

lanosa 8 is a red seaweed shaped like mossy tufts. It grows on other seaweeds instead of on rocks. **Wireweed** 9 is a fast-growing brown seaweed that originally comes from Japan. It has accidentally been spread to many other parts of the world. **Coral weed** 10 has a crunchy feel. It grows in rock pools and is reinforced with minerals, making it harder for sea animals to eat.



Mushroom › Some fungi grow structures such as mushrooms above the ground. These develop to spread spores, tiny cells which float off and grow into new fungi.

Fungi

Fungi mostly exist as tangles of microscopic threads called hyphae. Some kinds grow into mushrooms to spread their spores. The threads spread into the organic matter on which they grow, breaking them down into food. By doing this, fungi recycle dead plants and animals, turning them into nutrients that other organisms can re-use.



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

Fly agaric

Gills › These thin, fragile membranes are where the spores develop. They fill the space under the cap so that they can produce as many spores as possible.

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

Fungi

Features

- Mostly grow as bundles of tiny threads



- Gain energy by breaking down other living things



- Scatter spores, which can grow into new fungi



- Grow structures such as mushrooms to spread spores

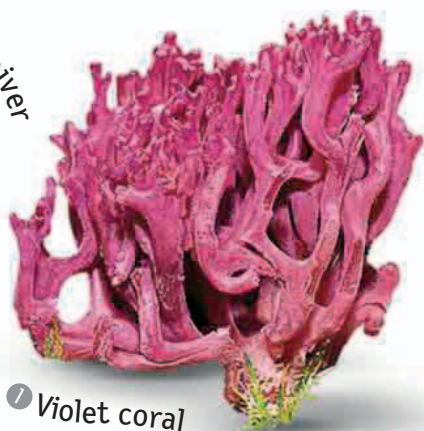


Mushrooms

SCALE



Amethyst deceiver

Bright
colouring
fades with age

1 Violet coral

Petticoat mottlegill



2 Pink waxcap

Fleshy, waxy,
pink gills

3 Red cage fungus

Cage bursts
from "egg"

Lawyer's wig

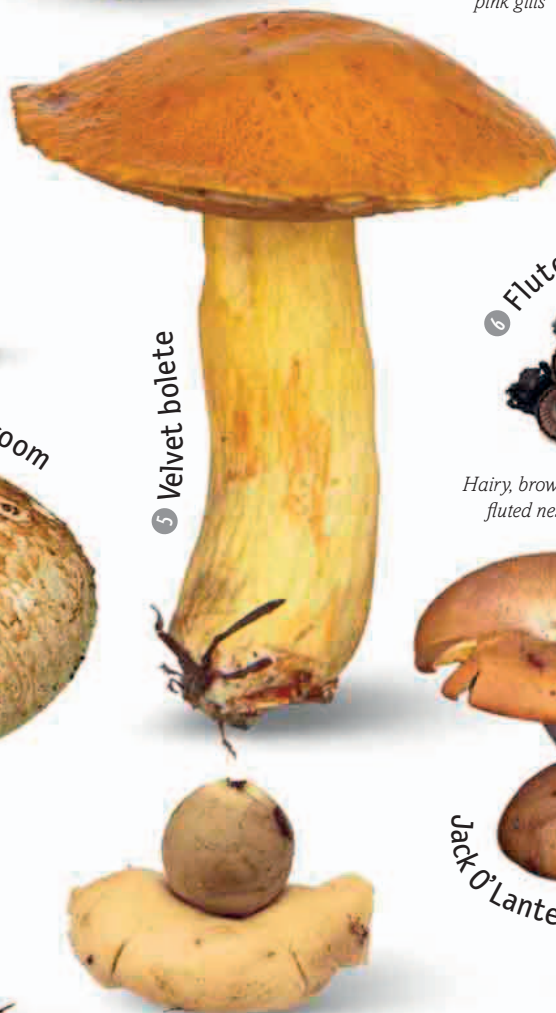


Earpick fungus

4 Cultivated mushroom



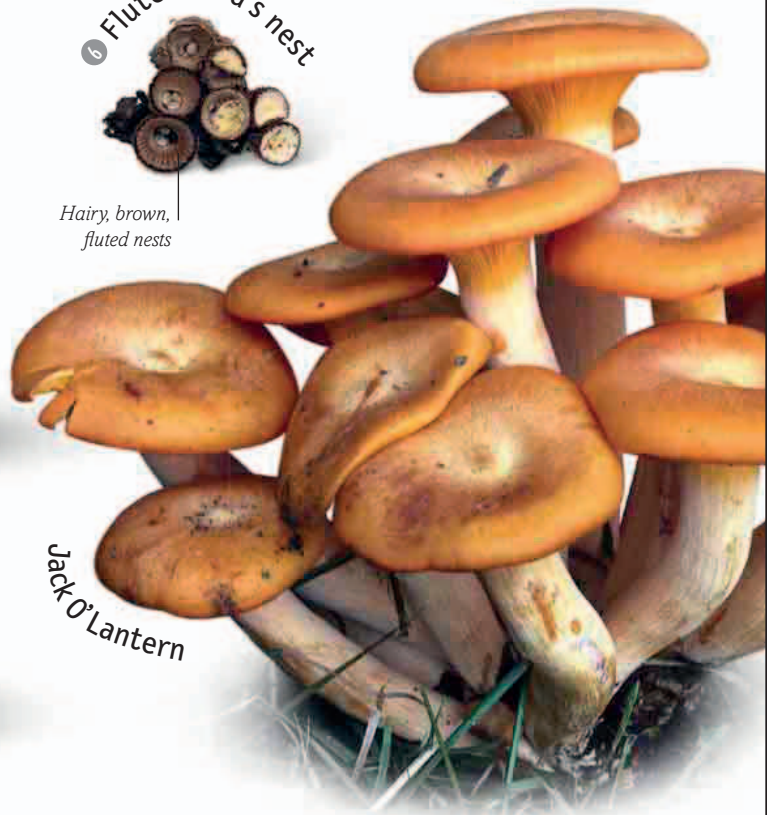
5 Velvet bolete



6 Fluted bird's nest

Hairy, brown,
fluted nests

Jack-O'-Lantern



7 Sessile earthstar



Most mushrooms grow in damp places, from grassy fields to shady woodlands with lots of fallen leaves. Their purpose is to scatter tiny seed-like spores, so that fungi can spread. Some mushrooms have unusual colours that really stand out. **Violet coral** 1 has brightly coloured coral-like branches, while the **pink waxcap** 2 has a rosy cap on a pale stalk. The unusual **red cage fungus** 3 has

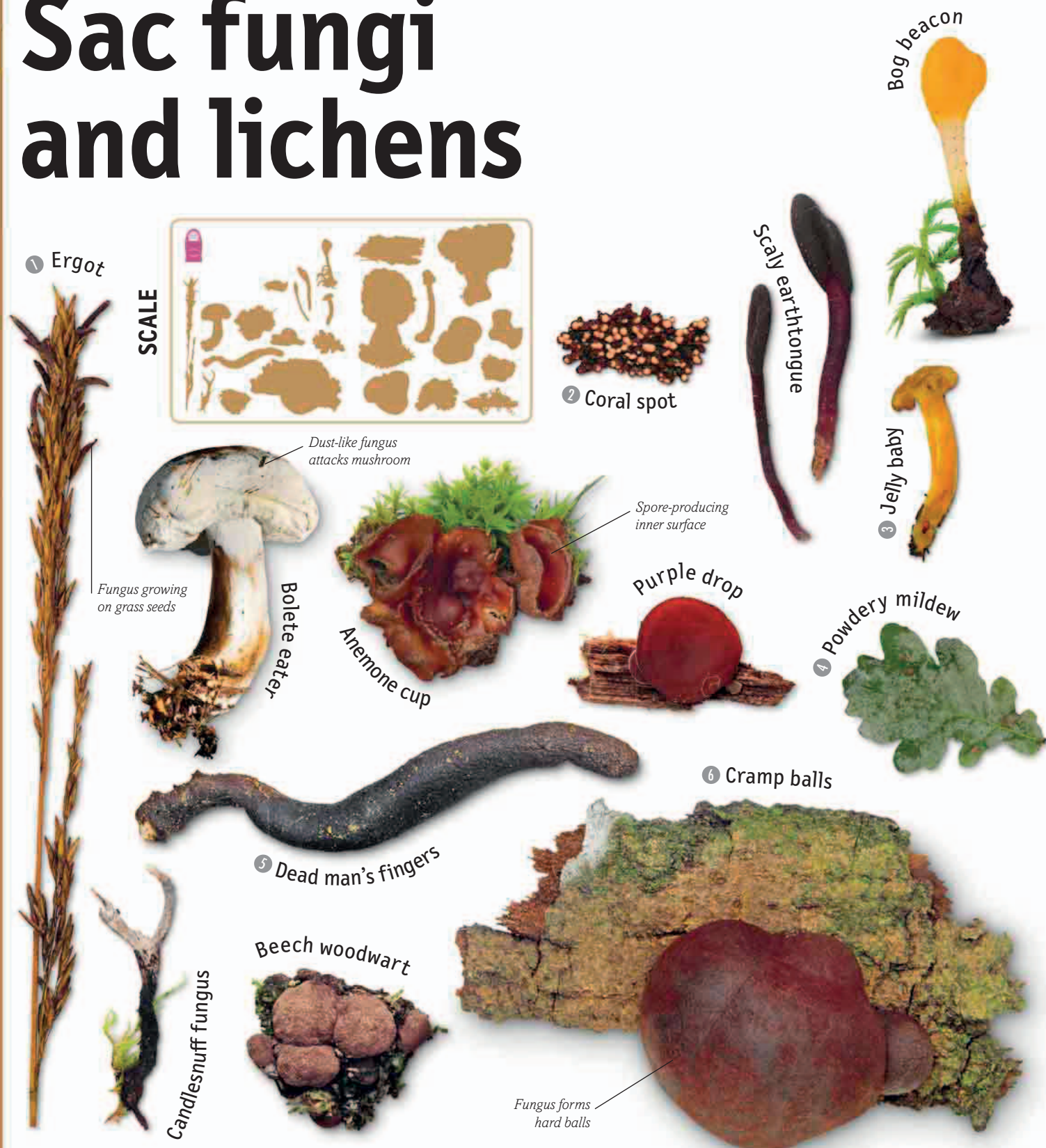
a crimson mesh-like structure, which hatches from a small whitish "egg". The creamy white **cultivated mushroom** 4 is grown around the world for food. Most mushrooms, including the **velvet bolete** 5, make spores that are blown away in the wind. The **fluted bird's nest** 6 has a different way of spreading. It makes packets of spores inside tiny cups. If a raindrop lands in one of the cups, the packets



splash out, landing up to 1 m (3 ft) away. The **sessile earthstar** 7 spreads its spores in a similar way, puffing them out of a papery sac when it is hit by raindrops. While some mushrooms, such as the **chanterelle** 8, are good to eat, other types are deadly poisonous. The most dangerous of all mushrooms is the **death cap** 9, since it is highly toxic and looks similar to edible kinds. Some fungi are difficult to

mistake because of their size, colour, shape, or smell. The poisonous **fly agaric** 10 is easy to spot with its bright red-and-white cap. The odour of the smelly **stinkhorn** 11 carries for long distances. The smell attracts flies, which spread the stinkhorn's spores. The biggest mushroom of all is the **giant puffball** 12, which can measure more than 1 m (3 ft) across, and weigh as much as 20 kg (44 lb).

Sac fungi and lichens

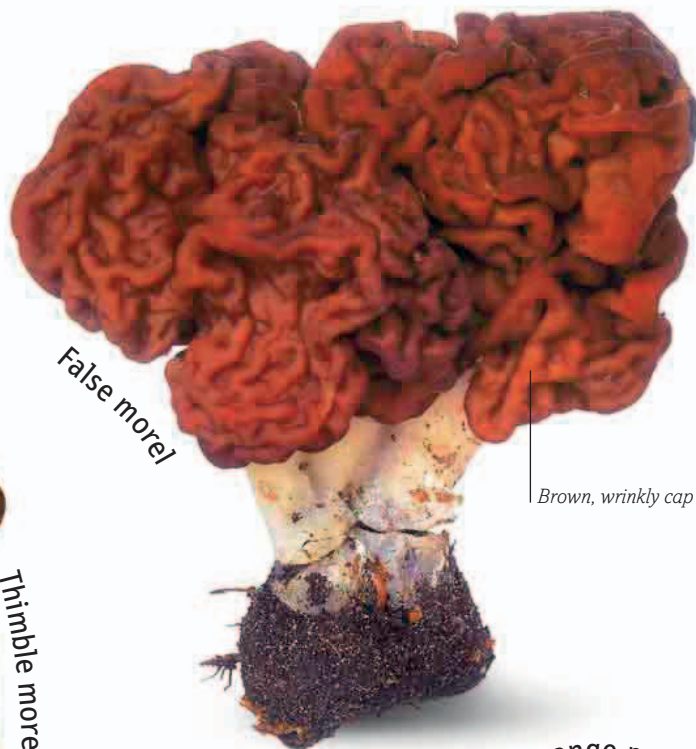


Sac fungi make their spores in tiny containers or sacs, which break open when they are ripe. The sacs are much too small to see, but the fungi that produce them have lots of strange and interesting shapes. Many live on dead wood or rotting plants, but **ergot** **1** grows on grasses and cereals such as rye and wheat. It produces a powerful poison that can be deadly if it gets into bread. **Coral spot** **2** attacks

damp wood, while the **jelly baby fungus** **3** grows in clumps among fallen leaves. Both are harmless, but **powdery mildews** **4** are a headache for farmers and gardeners because they attack all kinds of living plants. The first signs of trouble are white spots on the leaves, showing where the fungus is at work. **Dead man's fingers** **5** and **cramp balls** **6** both feed on dead wood. Unlike most fungi,



Common eyelash



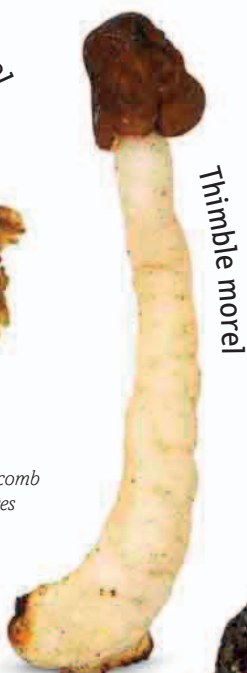
False morel

Brown, wrinkly cap



7 Morel

Honeycomb produces spores



Thimble morel



8 Périgord truffle



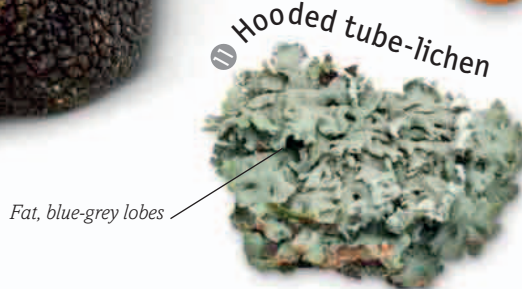
9 Orange peel fungus



Cellar cup



10 Common wall lichen



11 Hooded tube-lichen

Fat, blue-grey lobes



12 Oakmoss lichen

they are hard to the touch. The **morel** 7 looks unappetizing with its sponge-like cap, but is valued for its delicious taste. The **Périgord truffle** 8 is even more highly prized. It grows underground beneath oak trees, and has to be sniffed out by specially trained pigs or dogs. **Orange peel fungus** 9 grows on bare ground and has a vivid orange colour that makes it easy to spot. Lichens are living partnerships

between fungi and algae or bacteria. They grow very slowly but can live to be hundreds of years old. The **common wall lichen** 10 is flat and brightly coloured and grows on bare rock, particularly near the sea, while the **hooded tube-lichen** 11 is common on trees, rocks, and walls. **Oakmoss lichen** 12 lives on the bark of oak trees. It has a woody smell and is used for making perfumes.



CUP FUNGI These strange bowls are actually a variety of cup fungus, a group of sac fungi that grow into eye-catching shapes. The cups produce sacs full of spores that are scattered about by wind and rain. In some varieties, these sacs absorb water and swell up until they burst, catapulting the spores out. The biggest cups make an audible pop when this happens, and the spores can sometimes be seen as a faint cloud.



Size > Up to 30 cm (12 in) across **Habitat** > Moist, dead wood in tropical or subtropical forest. **Distribution** > Tropical and subtropical areas worldwide, from the USA, Central and South America, and Africa to Southeast Asia. **Diet** > Dead and rotting wood. Like all fungi, they feed by breaking down organic matter in their environment. This

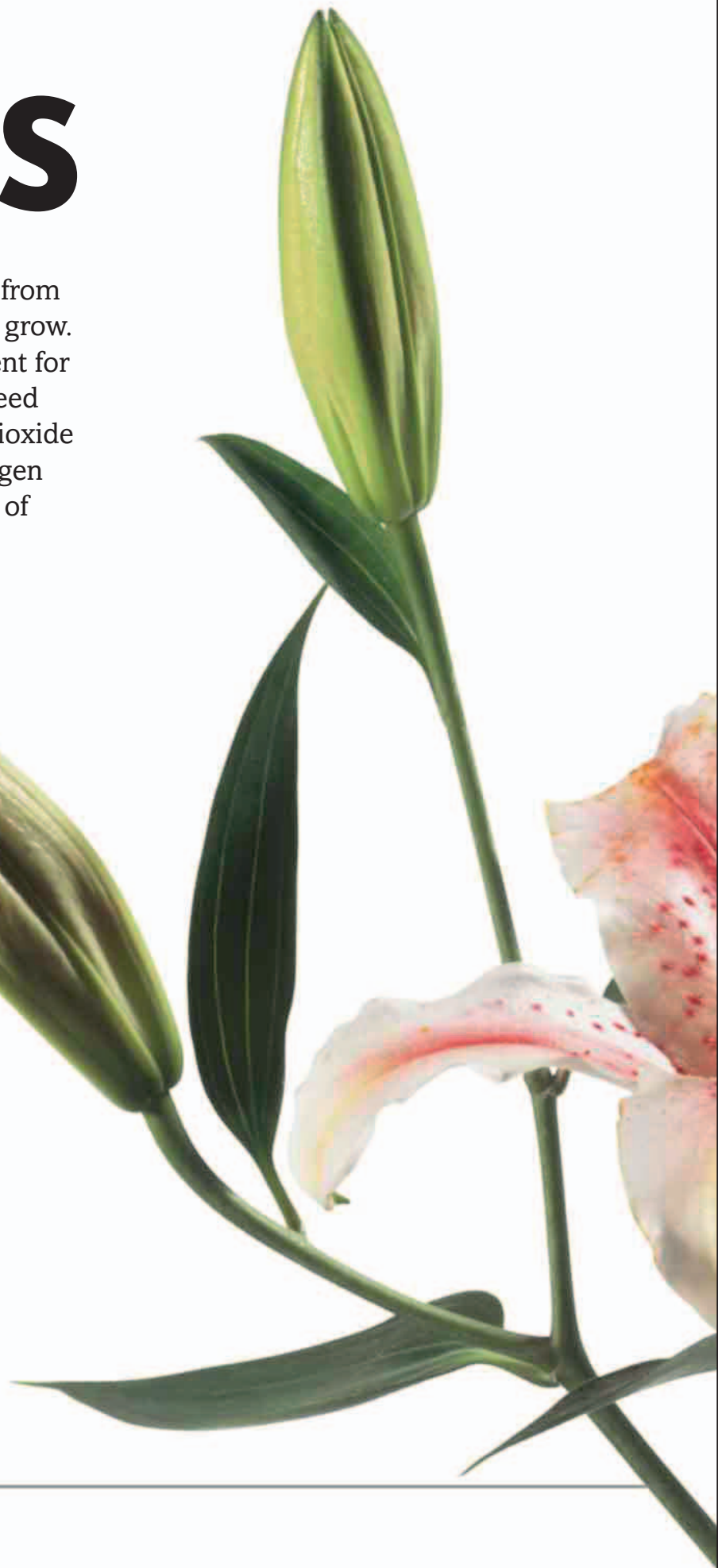
can be useful for getting rid of dead plants and animals, but harmful where the fungus grows through living creatures. **Breeding** > The fungus consists of a network of threads that mostly grow underground. The cup develops only to spread spores, cells a bit like seeds that grow into new colonies of threads. **Number of species** > About 230.

Plants

Plants have the ability to trap energy from sunlight, using it to make food and to grow. By doing this they provide nourishment for themselves and for the animals that feed on them. Plants also absorb carbon dioxide from the atmosphere and release oxygen to replace it, maintaining the balance of gases animals need to survive.

Stargazer lily

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



Plants

Features

- Collect energy from sunlight and use it to grow



- Have cells with walls made of microscopic fibres



- Commonly have flowers to produce and fertilize seeds



- Include the longest-living things



- Provide food and oxygen that supports much of life on Earth.



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

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

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



Liverworts and mosses

SCALE



4 White fork moss



2 Crystalwort

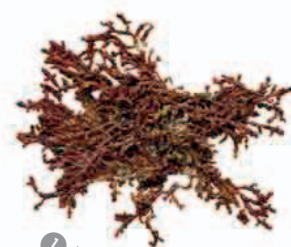


Common tamarisk moss

Finely divided stems



Greater whipwort



1 Even scalewort

Spore-producing structures



3 Common liverwort

Two ranks of main leaves



Greater featherwort

5 Fire moss



Found mainly in damp places, liverworts and mosses are the world's simplest plants. They don't have roots or flowers, and they spread by making microscopic spores instead of seeds. Some of them could easily sit on a fingernail and even the biggest are only waist-high. Liverworts are often shaped like flat ribbons and keep dividing in two as they grow. Most kinds are green but **even scalewort** 1 is often red or

brown. It grows on tree trunks and rocks, usually in the shade. **Crystalwort** 2 lives on wet mud or on the surface of ponds. It is sometimes used in aquariums for sheltering newly hatched fish. **Common liverwort** 3 is often seen in gardens. In the summer it is covered with growths like tiny palm trees, which make and then scatter its spores. Mosses have thin leaves and wiry stems and often grow in clumps. Many kinds,

Cypress-leaved plait moss

Cape thread-moss

Common pocket moss

5 Swan's-neck
thyme moss

Rosette of
small branches

7 Blue-leaved bog moss

8 Common hair-cap moss

Narrow,
pointed leaves

9 Ostrich-plume feather moss

including the **white fork moss** 4, turn grey or white if they dry out but become green again within minutes if it rains. **Fire moss** 5 makes its spores in capsules shaped like matchsticks. It grows on walls and on burned ground. **Swan's-neck thyme moss** 6 is common in woods, while **blue-leaved bog moss** 7, or sphagnum, grows in waterlogged places. This moss can hold more than 20 times its own weight in

water and slowly forms peat, a brown, soil-like material, when it dies. **Common hair-cap moss** 8 is one of the world's tallest mosses, growing in springy tussocks up to 60 cm (24 in) high. Its stems are stiff and unbranched, with narrow pointed leaves. **Ostrich-plume feather moss** 9 gets its name from its stems, which look like tiny feathers or ferns. It lives in forests in the far north of Europe and Canada.

Ferns

SCALE



① Whisk fern



Silvery stripes
give this
fern its name



Silver brake



Black maidenhair fern

② Horsetail



Branches in rings

Glossy,
tongue-shaped fronds

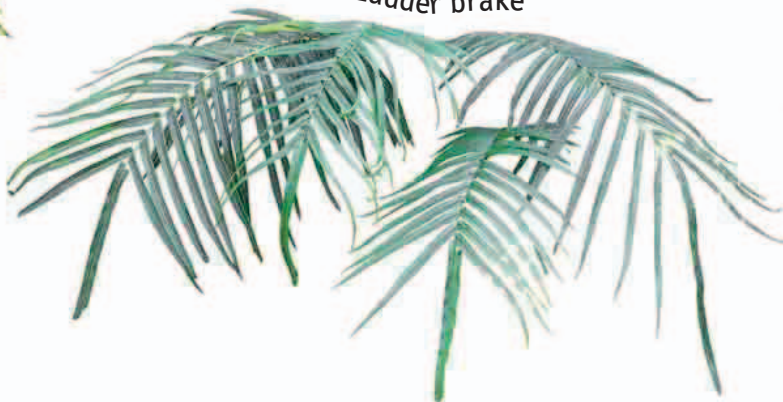


④ Hart's-tongue fern



③ Ostrich fern

Ladder brake



Long before the age of the dinosaurs, ferns and their relatives were the biggest plants on Earth. Today they still include some tree-like varieties more than 15 m (50 ft) tall, but most ferns grow much closer to the ground. All these plants spread by making tiny spores instead of seeds, and most of them have feathery fronds that unroll as they grow. The **whisk fern** ① is a primitive plant with brush-like stems.

It starts life underground, using fungi to help it get food from the soil. **Horsetails** ② have hollow stems with rings of bright green branches. They contain sharp crystals of silica and were once used for scrubbing pots and pans. The **ostrich fern** ③, found in the Northern Hemisphere, grows near streams and rivers, while the **hart's-tongue fern** ④ grows on shady banks and old walls. **Common staghorn ferns** ⑤



live in the forests of the Southern Hemisphere, where they grow on the trunks of trees. Their fronds trap rain and falling leaves, making private compost heaps that help them to grow. **Hard fern** 6 has two types of fronds: feathery ones that catch sunshine, and much narrower ones that spread its spores. Most ferns live in damp places, but **cliff brake** 7 grows in rocky crevices in South Africa, and has wiry black

stems that are good at coping with drought. **Royal fern** 8 is an impressive plant with a rosette of spreading fronds. It is sometimes grown in gardens, but **bracken** 9 is a notorious weed. Fast growing and poisonous to animals, it spreads by underground runners, and can form patches more than 500 m (1,640 ft) across. It is found on every continent except Antarctica and on islands far out to sea.

Conifers

SCALE



① Cedar of Lebanon

Needles grow
in dense clusters

Western juniper

Caucasian fir

Grand fir

Needles
grow in pairs

② European yew

Cones turn red
and soft when ripe

③ Maritime pine

⑤ Monkey puzzle

Sharp, closely
packed leaves

④ Golden larch

Conifers include the world's tallest, heaviest, and oldest trees. They do not grow flowers, and they make their seeds in cones. Most conifers are evergreen, with tough, waxy leaves that are good at coping with hot summer sunshine as well as freezing winter winds. The **cedar of Lebanon** ① comes from the Middle East and is often planted in parks. It has huge branches that spread out

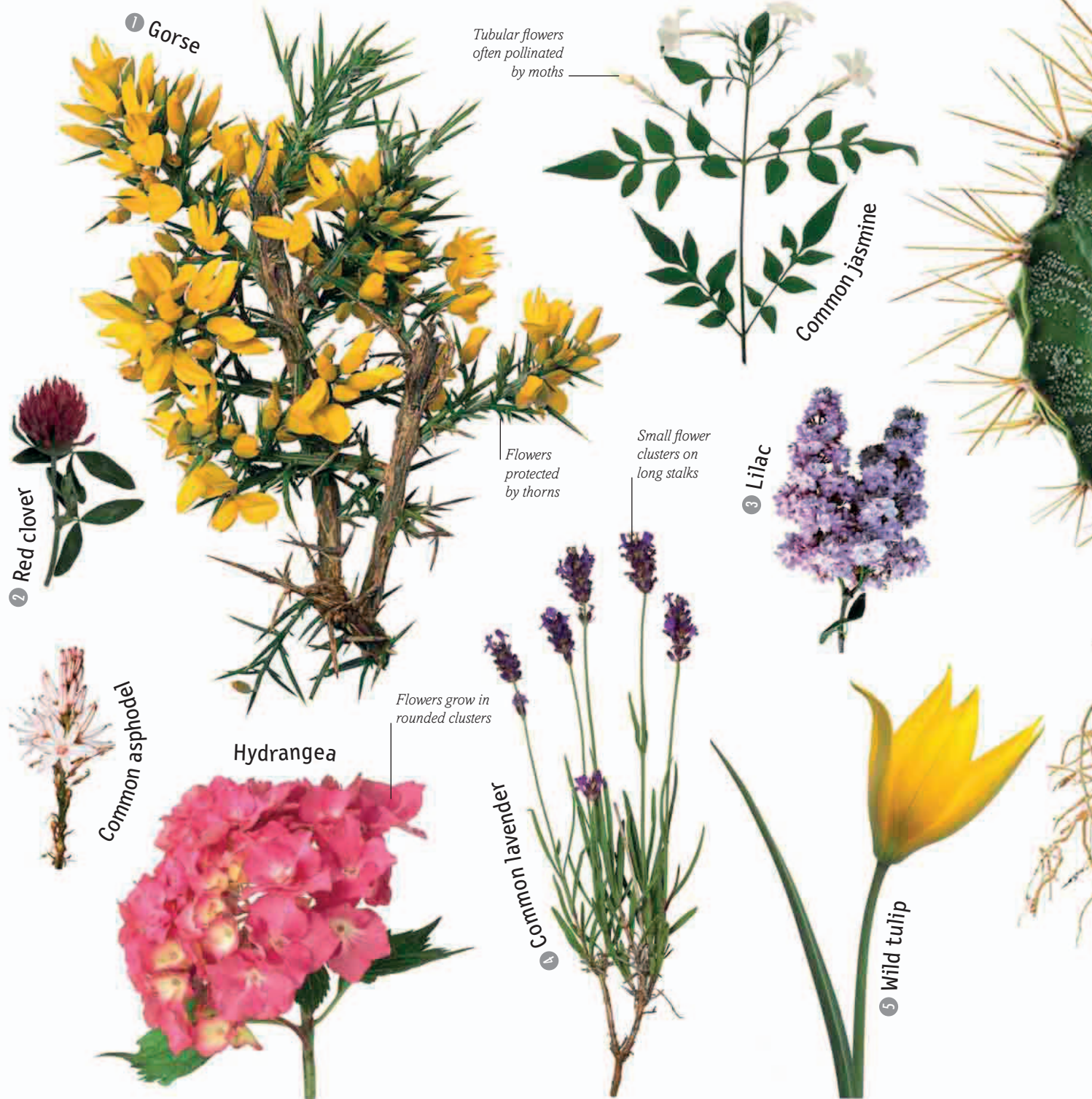
like shelves, and short, needle-like leaves. Common in Europe and the Middle East, the **European yew** ② has tiny cones that look like bright red berries. They are poisonous to many animals, but birds feed on them, helping the trees to spread. The **maritime pine** ③ grows wild in southern Europe. It is full of sticky resin, which oozes out if its bark is cut. The **golden larch** ④ comes from China. It sheds all its leaves



in late autumn and sprouts new ones in spring. The **monkey puzzle** 5 from South America has sharply pointed leaves and an umbrella-like shape when it is fully grown. The **European silver fir** 6 has upright cones, which disintegrate when they are ripe instead of falling to the ground. **Giant sequoias** 7 from California are some of the largest living things on Earth. They can weigh more than 2,000 tonnes

and their fireproof bark is up to 75 cm (30 in) thick. The **sitka spruce** 8 comes from North America's west coast but is now grown all over the world as a timber tree. The **Scots pine** 9 is one of the world's toughest trees and the most widespread conifer. It grows right across Europe and Russia, including places where winter temperatures hit -60°C (-76°F), far colder than a deep freeze.

Flowering plants



Flowers come in an incredible variety of shapes. Some are bigger than a washing-up bowl, but the smallest could fit through the eye of a needle with room to spare. Many plants grow flowers to spread their pollen and to scatter their seeds. Like most flowering plants, **gorse** ① attracts insects, which carry its pollen as they wander from plant to plant. It grows its seeds in pods that suddenly snap

open when the seeds are ripe. **Red clover** ② is often grown to feed farm animals and to help fertilize the soil. Found on scrubby hill slopes in southeastern Europe, **lilac** ③ has strongly scented flowers. An evergreen shrub of dry Mediterranean scrub habitats, **common lavender** ④ is full of fragrant oils. **Wild tulips** ⑤ have yellow flowers that grow from bulbs. Widespread in Europe, they are close



relatives of cultivated tulips, which are grown as garden flowers. The **monk's hood cactus** ⑥ is adapted for life in very dry conditions. It has spines instead of leaves and a juicy water-storing stem. Like most cacti, it has shallow roots, which soak up water during rare periods of rain.

Wild carrot ⑦ is the ancestor of the carrots that we eat. Grasses are flowering plants, but they use the wind to spread

their pollen, and their flowers are often small. They include wild plants, such as the **cock's foot grass** ⑧, as well as domestic cereals, such as wheat and rice, which are the world's most important foods. The **bee orchid** ⑨ is a little plant from a giant family. Its flowers mimic female insects, such as bumblebees, and spread pollen by attracting male insects looking for a chance to breed.

SCALE



Flowers open
at dawn



Morning glory

10 Apothecary's rose



Fan of four to
five flowers

Strawberry



11 Bird-of-paradise plant

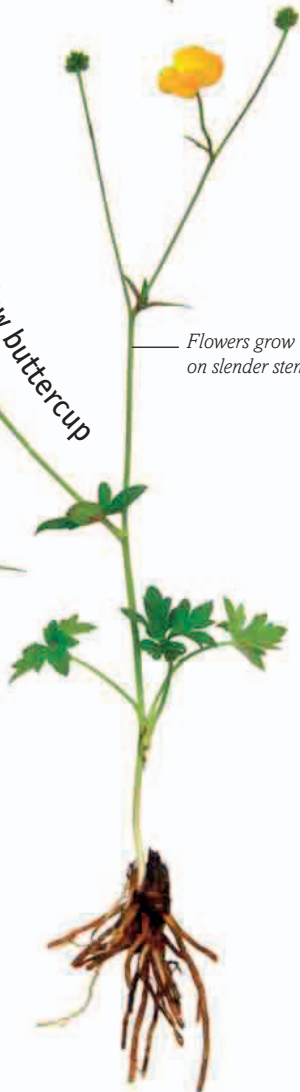
12 Monkshood



Flowers in
tall column

Meadow buttercup

Flowers grow
on slender stems

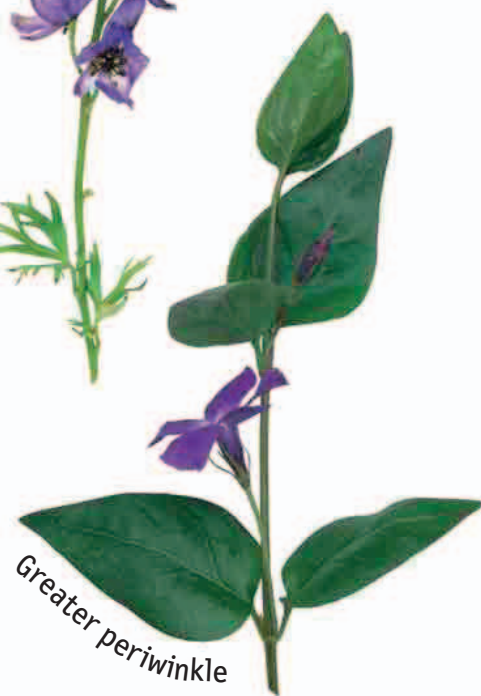


Ring of spines
beneath flowerhead

13 Milk thistle



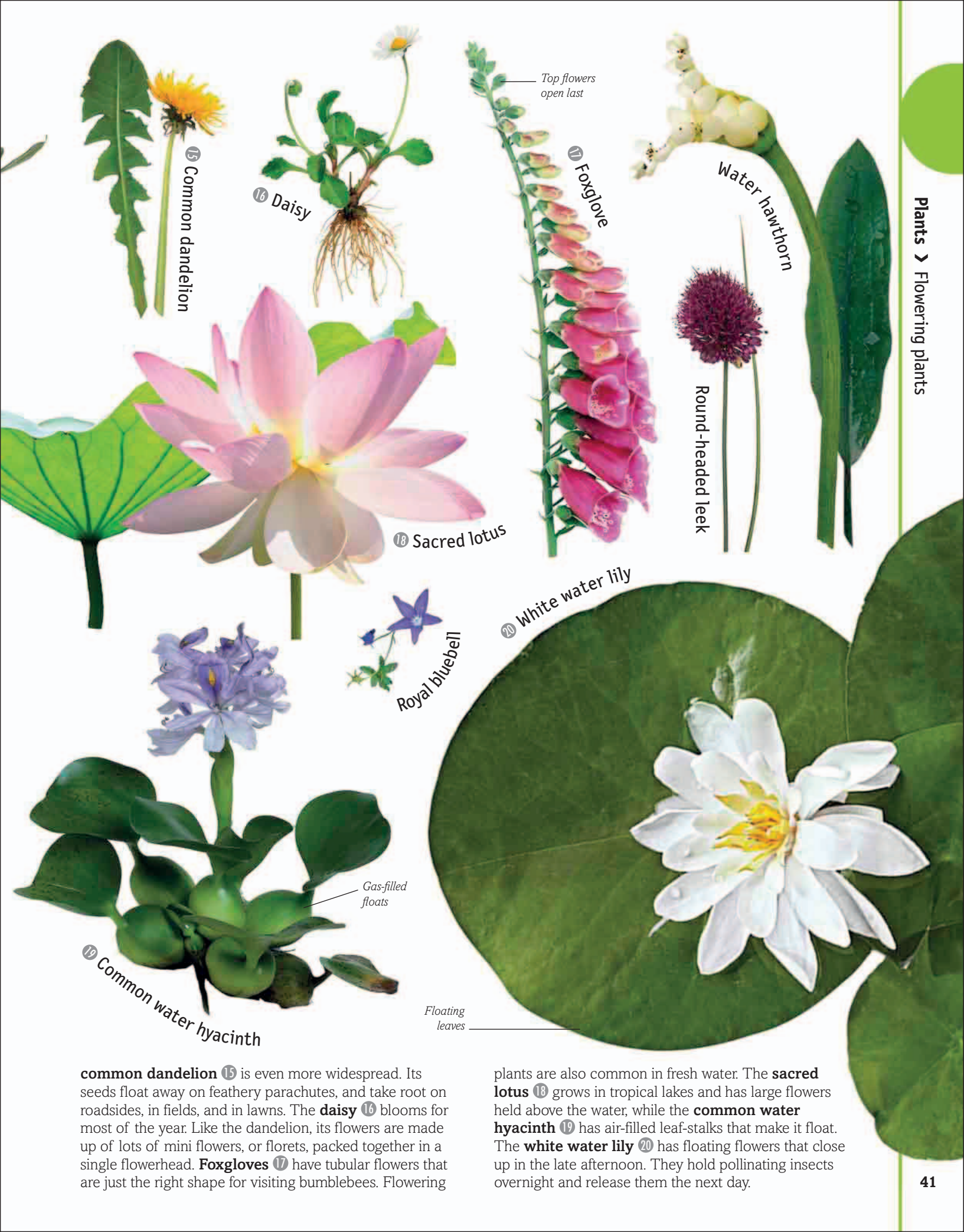
14 Common poppy



Greater periwinkle

Many flowering plants are grown for their eye-catching blooms. There are more than 100 wild kinds of roses and thousands of cultivated varieties. The **apothecary's rose** 10 is one of the oldest. It has been grown in gardens for at least 750 years. The **bird-of-paradise plant** 11 from South Africa is also grown for its spectacular flowers. In the wild they are pollinated by

sunbirds, which carry pollen on their feet. Plants are also visited by hungry animals, so some use special defences to survive. **Monkshood** 12 is protected by powerful poisons, while **milk thistle** 13 has sharp spines that keep hungry animals at bay. The **common poppy** 14 is a frequent weed in fields. Its seeds can survive in the soil for many years and they start growing as soon as the ground is ploughed. The



15 Common dandelion

16 Daisy

Top flowers open last

17 Foxglove

Water hawthorn

Round-headed leek

18 Sacred lotus

Royal bluebell

20 White water lily

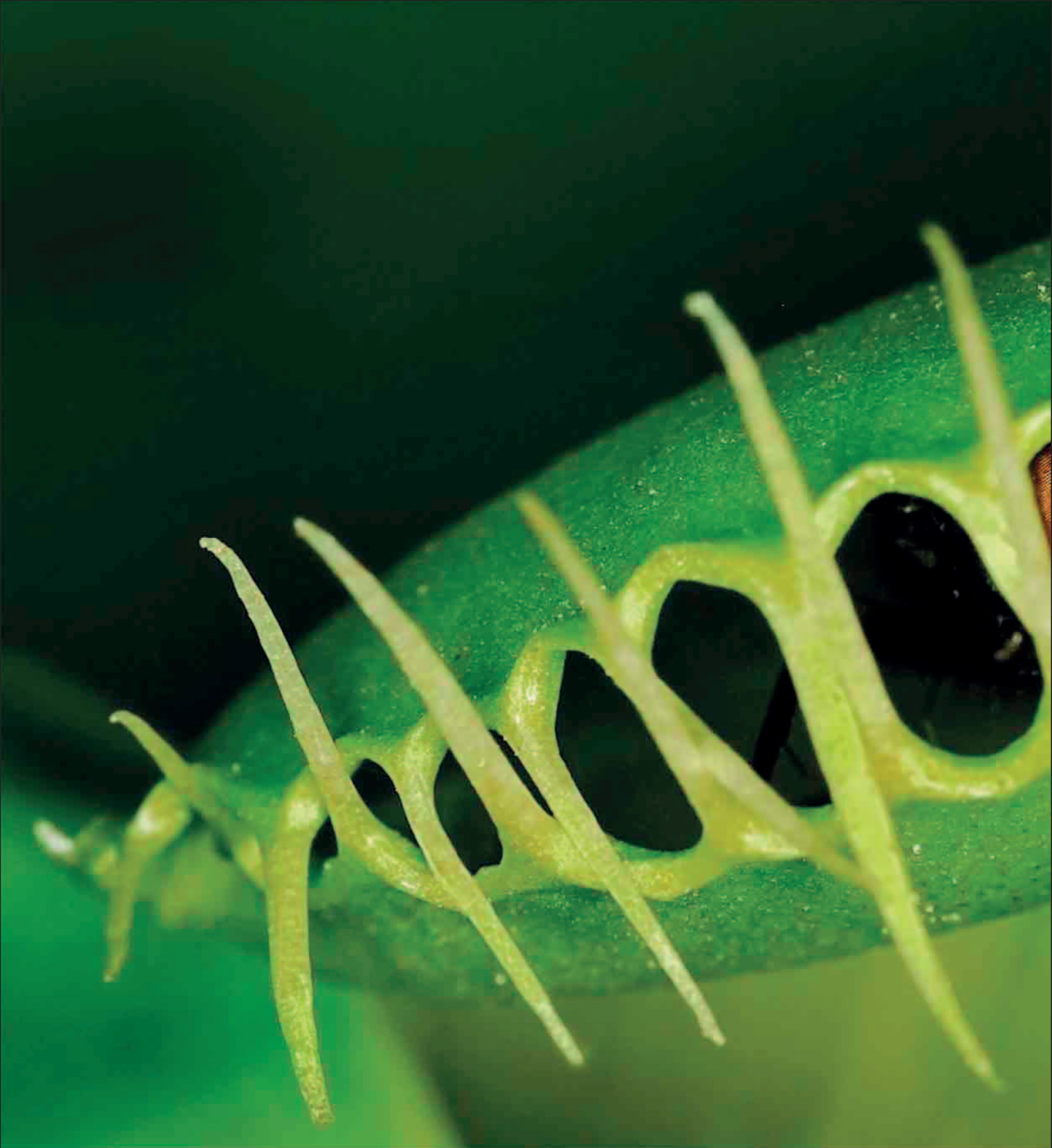
Gas-filled floats

19 Common water hyacinth

Floating leaves

common dandelion 15 is even more widespread. Its seeds float away on feathery parachutes, and take root on roadsides, in fields, and in lawns. The **daisy** 16 blooms for most of the year. Like the dandelion, its flowers are made up of lots of mini flowers, or florets, packed together in a single flowerhead. **Foxgloves** 17 have tubular flowers that are just the right shape for visiting bumblebees. Flowering

plants are also common in fresh water. The **sacred lotus** 18 grows in tropical lakes and has large flowers held above the water, while the **common water hyacinth** 19 has air-filled leaf-stalks that make it float. The **white water lily** 20 has floating flowers that close up in the late afternoon. They hold pollinating insects overnight and release them the next day.



VENUS FLYTRAP A flesh-eating plant that catches prey in its “jaws” is the stuff of nightmares, but the Venus flytrap is only a threat to flies and spiders. The hinged leaves gape open like a big, red mouth, attracting prey with their bright colour. If an insect or a spider lands on “trigger” hairs on the surface, the leaf snaps shut, trapping the prey inside. The plant then releases juices to digest its food.



Size › Up to 30 cm (12 in) tall **Habitat** › Wet, boggy areas of peat or sandy soil. **Distribution** › Coastal areas of North and South Carolina in the southeastern USA. **Diet** › Like other plants, the Venus flytrap gets energy from sunlight. It evolved to be carnivorous as it often grows in poor soil and needs the extra nutrients that it can get from insects. **Breeding** › Bears

clusters of white flowers from May to June. The small, black seeds may be dispersed in water or picked up by birds.

Lifespan › Up to 30 years if cultivated. **Predators** › Slugs, birds, rodents, and tiny insects such as aphids and thrips, which suck the plant's juices. **Conservation status** › At risk due to habitat loss and over-collection for the exotic plant trade.

Broadleaved trees



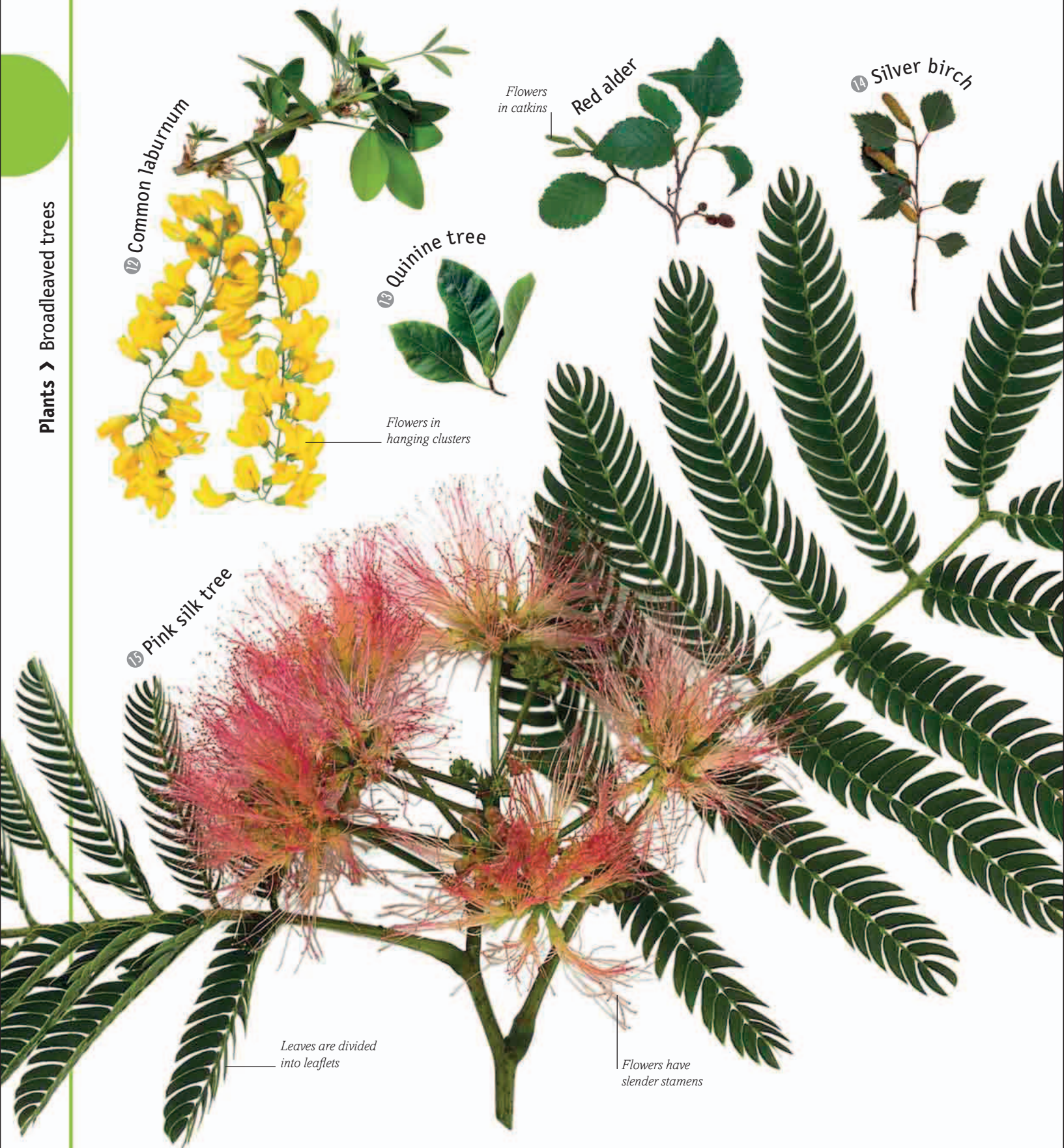
Unlike conifers, broadleaved trees are flowering plants. There are thousands of different kinds, from mighty giants in wild forests to small, ornamental garden trees. In warm parts of the world, most broadleaved trees are evergreen. Where winters are cold, they often shed their leaves in the autumn and grow a new set in spring. The **common fig** ① is a small broadleaved tree with tiny flowers

hidden inside a special bud. When seeds start to develop, the bud ripens into a fig. The **sugar maple** ② tree from North America is famous for its stunning autumn colours. In spring its sweet sticky sap is harvested to make maple syrup. The European **common ash** ③ is a fast-growing tree with winged seeds, while the **foxglove tree** ④ has beautiful mauve flowers that appear before its leaves. **Mango trees** ⑤ come from



South Asia. Like many trees, they hide their seeds in sweet, fleshy fruits. Animals that eat the fruit spread the seeds to new areas. The **cocoa tree** 6 originally comes from Central and South America. Cocoa is made from its seeds, which grow inside fleshy pods. **Ylang-ylang** 7 from Southeast Asia has richly scented flowers that are used for making perfumes. **Common walnut** 8 produces valuable timber and nutritious

nuts, while the **common pear** 9 from Europe is the ancestor of pears grown to eat. **Holly** 10 is a small evergreen tree with very prickly leaves. Holly trees are either male or female. In winter, female ones produce bright red berries, which are eaten by birds. **Lemon trees** 11 come from Asia. Their fruit contain lots of citric acid, a chemical that gives them their sharp but mouth-watering taste.



Broadleaved trees produce many useful substances as well as some that can be harmful. **Common laburnum** 12 contains a deadly poison, while the **quinine tree** 13 contains a drug that can be used to treat malaria. It grows in South America, and quinine is extracted from its bark. **Silver birch** 14 is a hardy tree, living in very cold climates in northern Europe and Asia. Its flowers grow

in catkins, which scatter tiny seeds in the wind. The **pink silk tree** 15 has large, feathery leaves and flowers in upright tufts. It is sometimes called the “sleep tree” because its leaves fold up at dusk and open again at dawn. The **Spanish chestnut** 16 is a slow-growing tree with edible nuts. These grow inside prickly cases and are often roasted instead of being eaten raw. The **Judas tree** 17 has rounded,



heart-shaped leaves and beautiful purple-pink flowers that appear in spring. These flowers grow in clusters and often sprout directly from the trunk. The **English oak** ¹⁸ is a long-lived tree with very hard timber, which was once used to build sailing ships. Like other oaks it has tiny flowers in trailing catkins, and its seeds are acorns, which grow in scale-covered cups. The **pomegranate** ¹⁹ is a spiny, shrubby

tree with large, bright-red flowers. It produces tasty fruit that contain hundreds of seeds. **Avocado trees** ²⁰ originally come from Mexico and the West Indies, but they are now grown in warm places across the world. They have small creamy flowers and pear-shaped fruit with a single, very large stone. In the wild, avocados fall off the tree when they are still hard and ripen on the ground.

Invertebrates

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



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

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

Animals

Invertebrates

Features

- Do not have backbones or a bony skeleton



- Often have a hard outer coating (exoskeleton)



- Often hatch out from eggs



- Often hatch as larvae, changing shape to become adults



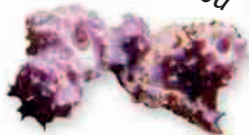
Exoskeleton › Many invertebrates have a hard outer casing called an exoskeleton. It supports their internal organs, helps them move around, and provides protection. The exoskeleton does not stretch, so the creature has to shed its skin as it grows.

Mexican red-kneed tarantula

Spiny hairs › Small animals such as invertebrates make tasty morsels for larger predators, so many have evolved defence systems. This tarantula can release stinging hairs from its legs, which stick into its attacker's skin, causing pain and itching.

Sponges

SCALE

*Leuconia nivea**Niphates alba*

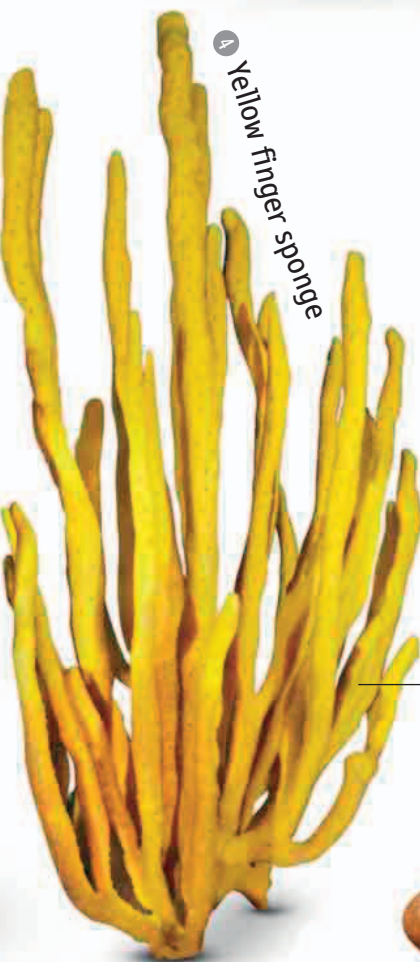
② Lemon sponge



purse sponge



⑤ Boring sponge



④ Yellow finger sponge



① Red tree sponge

③ Breadcrumb sponge



Water is pumped
out through volcano-
shaped holes

Clathrina clathrus

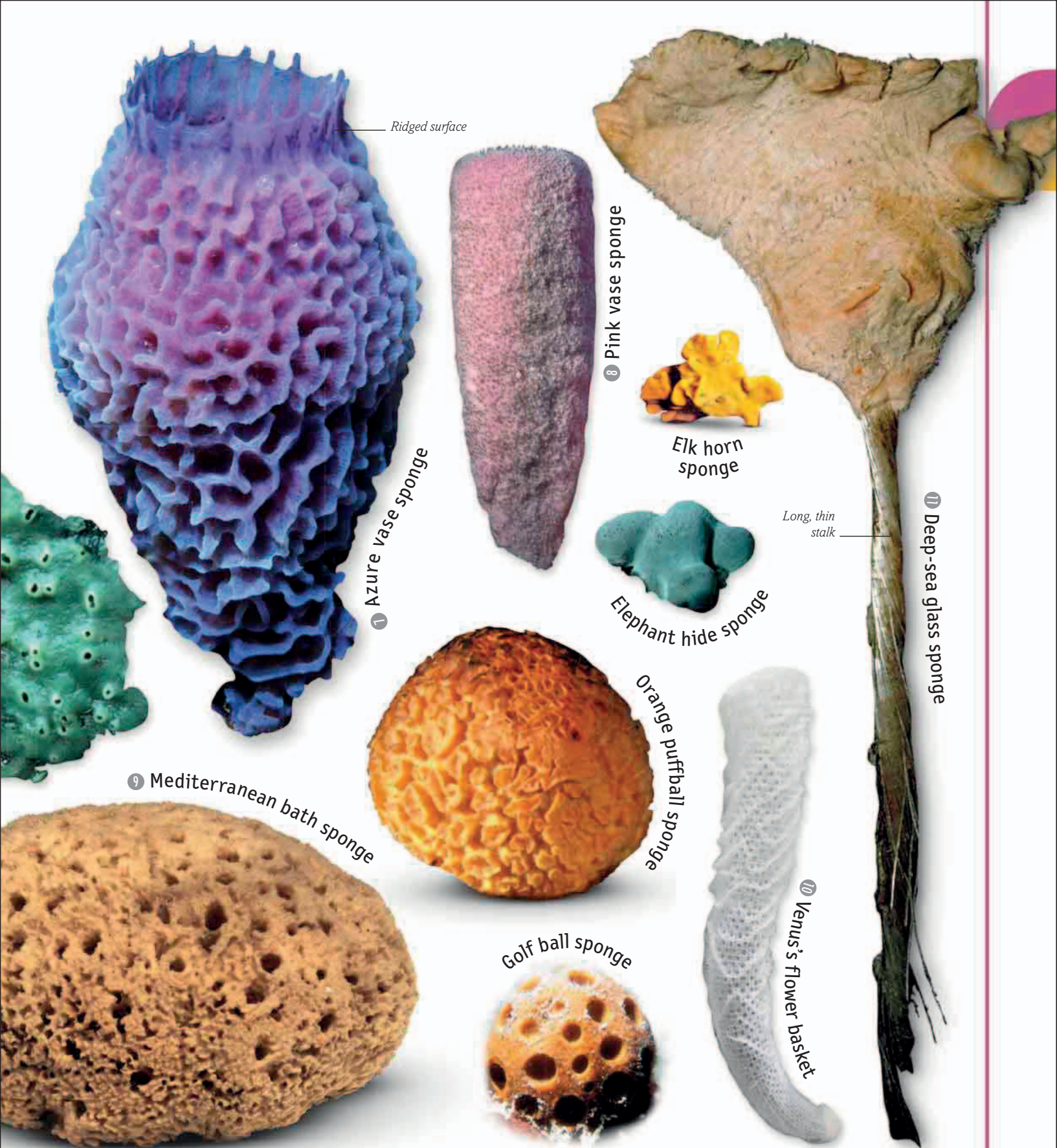
Perforated
surface

⑥ Red purse sponge



Found mainly in the sea, sponges are some of the world's simplest animals. They don't have heads, tails, eyes, or even mouths. Instead of moving about, they pump water through pores in their bodies and filter out tiny particles of food. Sponges don't have bones, but their bodies are often reinforced by mineral crystals and fibres, which give them a crunchy or spongy feel. Some sponges, such as the

red tree sponge ①, grow upwards like underwater plants. Others, such as the **lemon sponge** ②, are almost spherical, while some, such as the **breadcrumb sponge** ③, grow as a crust on rocks. The **yellow finger sponge** ④ grows in upright columns, peppered with pores. The European **boring sponge** ⑤ uses acids to tunnel through shells and solid rock. Growing on shallow reefs in Malaysia and Indonesia, the



Ridged surface

1 Azure vase sponge

8 Pink vase sponge

Elk horn sponge

Long, thin stalk

11 Deep-sea glass sponge

Elephant hide sponge

Orange puffball sponge

10 Venus's flower basket

Golf ball sponge

9 Mediterranean bath sponge

red purse sponge 6 resembles a miniature balloon. Water flows in through its sides and out through the narrow opening at the top. Vase sponges work in the same way, but are much larger. The **azure vase sponge** 7 and **pink vase sponge** 8, both from the Caribbean, can be up to 45 cm (1½ ft) high, but the world's tallest vase sponges grow bigger than a fridge, and are known to live for more than

100 years. The **Mediterranean bath sponge** 9 lives on the shallow seabed. Its extra-springy skeleton makes it perfect for washing with, once it has been cleaned. Most sponges grow near the surface of the sea, but **Venus's flower basket** 10 lives deep down. Like the **deep-sea glass sponge** 11, it has an intricate skeleton made of silica, which lasts long after the sponge has died.

Jellyfish, anemones, and corals

SCALE



Blue jellyfish

Flexible stalks appear like underwater bushes

1 White-spotted jellyfish

2 Sea wasp

Box-shaped body

Hula skirt siphonophore

Purple lace "coral" hydroid

3 Moon jellyfish

Upside-down jellyfish

Gas-filled float blown along by the wind

Sea strawberry

4 Portuguese man o'war

Kidney sea pen

Long, transparent tentacles

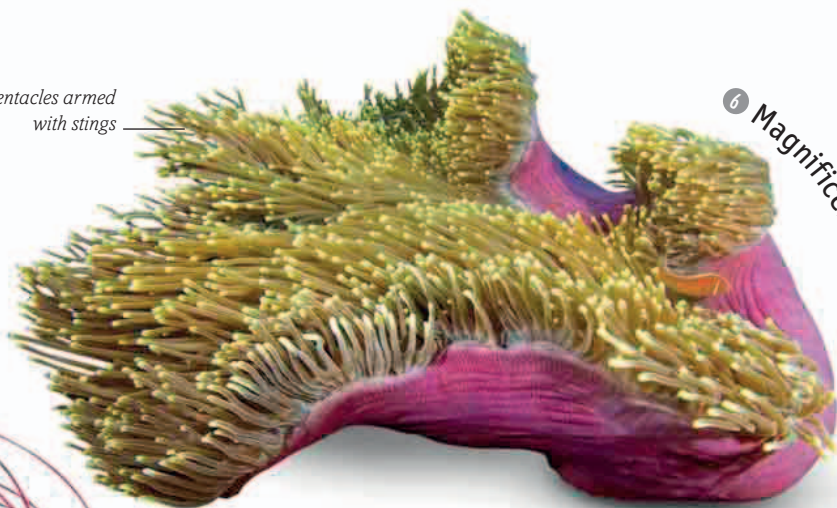
Armed with stinging tentacles, jellyfish and their relatives catch and kill prey. All of them are soft-bodied, although many corals protect themselves by building hard cases or tubes. Most kinds, including the **white-spotted jellyfish** 1, have mild venom, but the deadly **sea wasp** 2 from Australia and Southeast Asia can kill humans who brush against its tentacles. The poison acts within seconds,

and stings continue to work even when the tentacles are pulled away. The **moon jellyfish** 3 lives close to coasts all over the world. It is quite compact, but the **Portuguese man o'war** 4 has tentacles up to 50 m (164 ft) long, almost the length of four buses. Its powerful venom makes it nearly as dangerous as the sea wasp. The **red coral** 5 has a brightly coloured skeleton, which is sometimes made into



5 Red coral

Tentacles armed with stings



6 Magnificent sea anemone

Mushroom coral



Snakelocks anemone



7 Red sea whip

Common dead-man's fingers



Common tube anemone



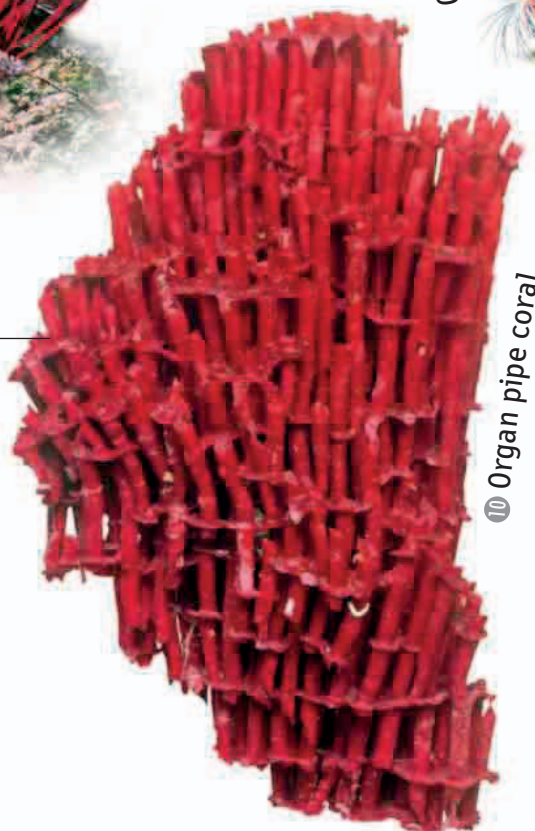
8 Common sea fan



Flat mesh of branches

Parallel chalky tubes

9 Orange sea pen



10 Organ pipe coral

Carnation coral



jewellery. Sea anemones have extra-thick tentacles, with stings that work like harpoons. The **magnificent sea anemone** 6 is one of the biggest, growing up to 1 m (3 ft) wide. It lives on coral reefs and its tentacles often shelter brightly coloured clownfish, which are immune to its stings. The **red sea whip** 7 has thin stalks that bend in the current, while the **common sea fan** 8 has large flaps held at

right-angles to the current. This maximizes water flow towards the sea fan and allows it to get the most food. The **orange sea pen** 9 has two food-collecting lobes and a swollen "root" that anchors it in the seabed. When touched, it vanishes into a burrow in the sand. The **organ pipe coral** 10 gets its name from its bright red, pipe-shaped tubes. It is found in shallow waters in the Indian and Pacific Oceans.



PACIFIC SEA NETTLE

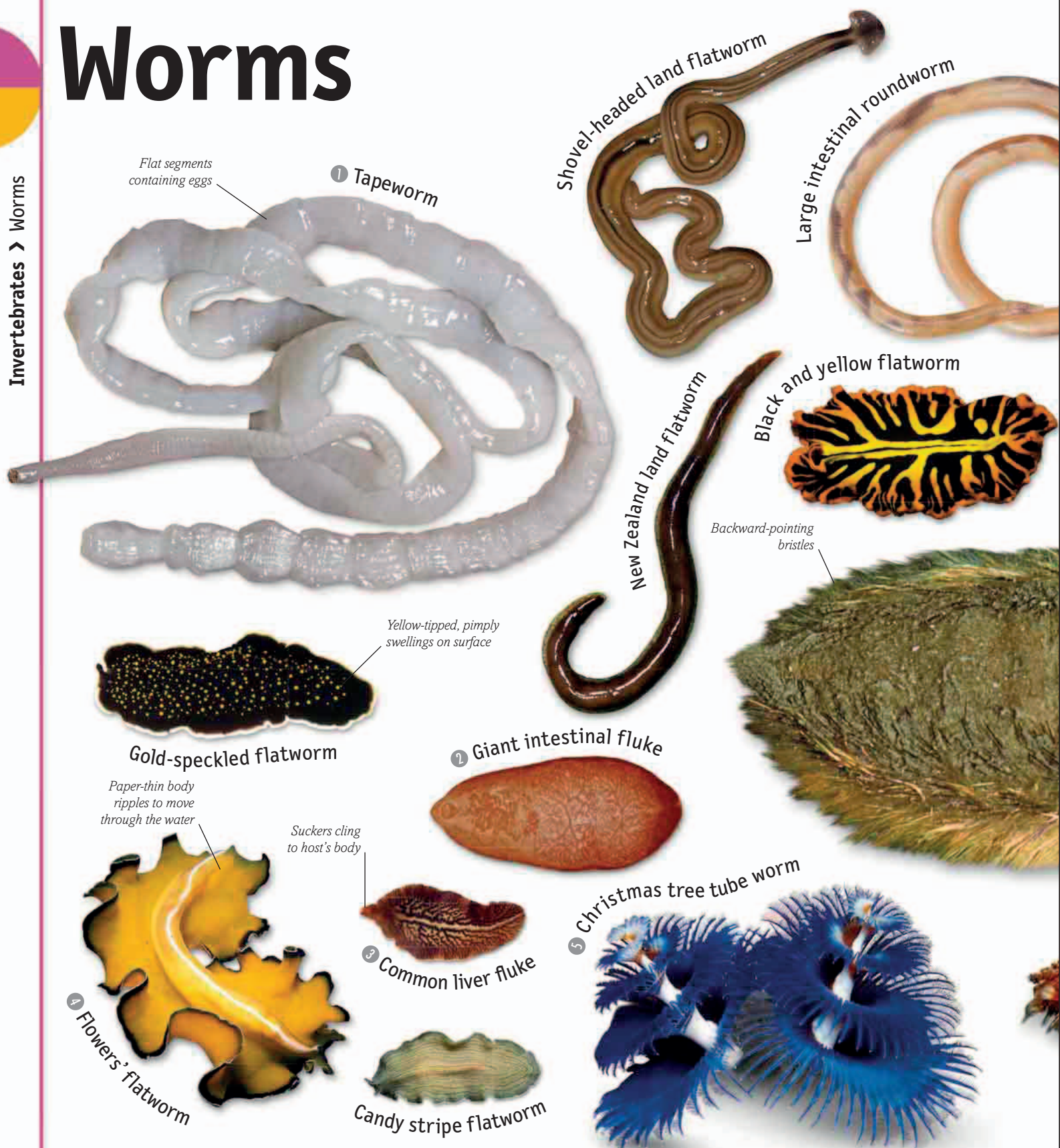
With their soft, golden bells and fine, trailing tentacles, these jellyfish look harmless. But they are carnivores. Their tentacles are equipped with millions of tiny barbs which inject poison into anything they touch. The venom paralyzes prey, which is fed into a mouth under the sea nettle's bell. Although it can give humans a painful sting, this jellyfish is rarely dangerous to us.



Size > Bell up to 45 cm (18 in) across; tentacles and arms up to 4.6 m (15 ft) long **Habitat** > Surface waters of the Pacific Ocean in autumn and winter, deeper waters in spring and summer. **Distribution** > West coast of Canada, the USA, and Mexico. Also found around Japan. **Diet** > Small fish, crustaceans, and other jellyfish. **Breeding** > Eggs

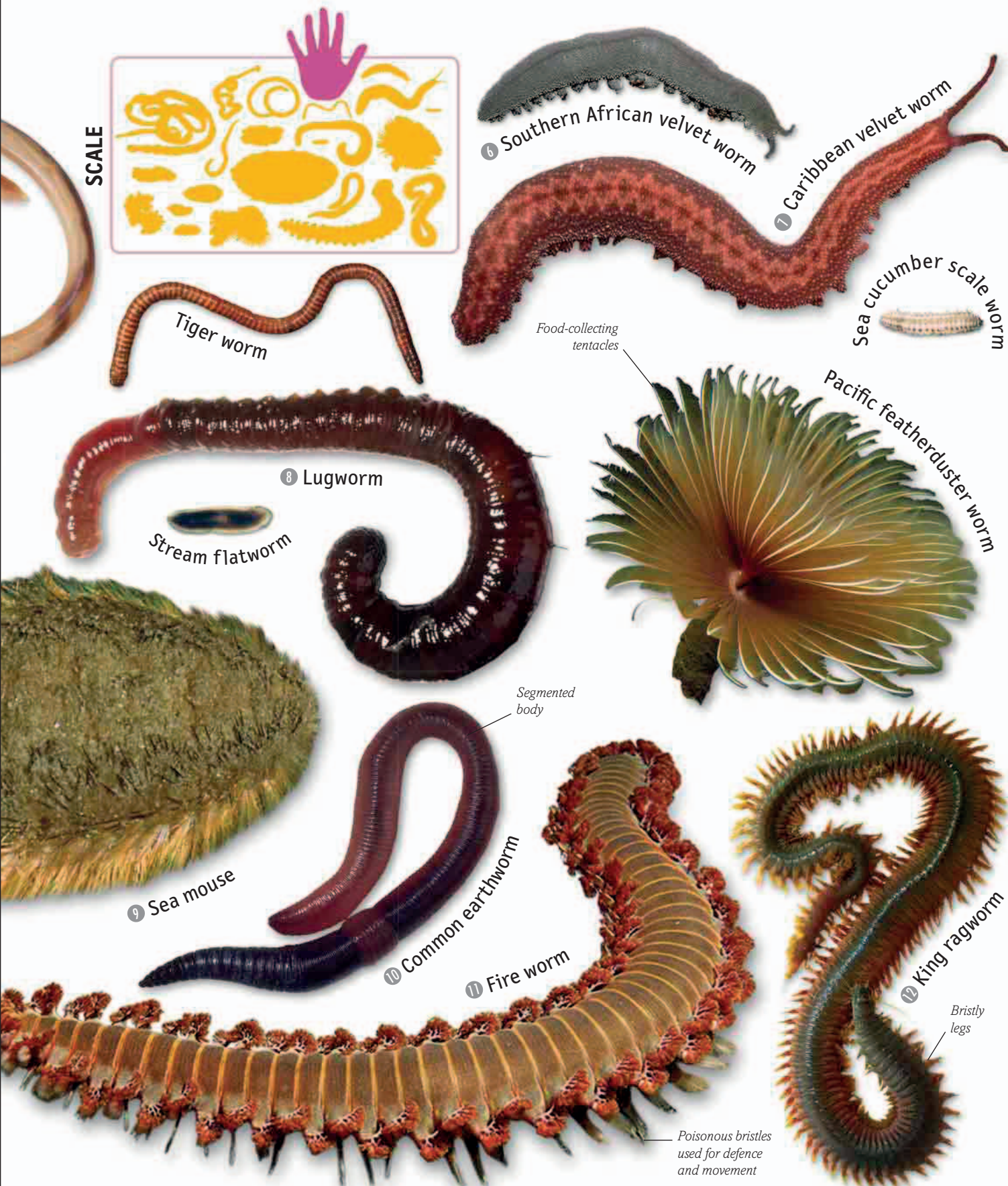
hatch into larvae. These grow into stationary structures called polyps, from which new jellyfish grow. **Lifespan** > Up to a year in the wild and up to 18 months in captivity. **Predators** > Sea turtles and fish. **Conservation status** > The species is not under threat. In fact, in some areas they swarm in large numbers.

Worms



The word “worms” describes many different kinds of creatures. Most of them have flat or round bodies with a head and tail. While some are smaller than a full stop, worms also include the world’s longest and skinniest animals, stretching further than an Olympic-size swimming pool. Worms usually live in water or wet places, but many are parasites of other creatures. **Tapeworms** ① feed inside the

intestines of animals such as cats, pigs, and humans, and can grow to many metres in length. Several leaf-shaped flatworms, such as the **giant intestinal fluke** ② and **liver fluke** ③, also infect people, sometimes causing serious diseases and even death. Fortunately, most other worms are harmless, although their bright colours warn predators that they have a nasty taste. **Flowers’ flatworm** ④ lives on coral reefs and ripples

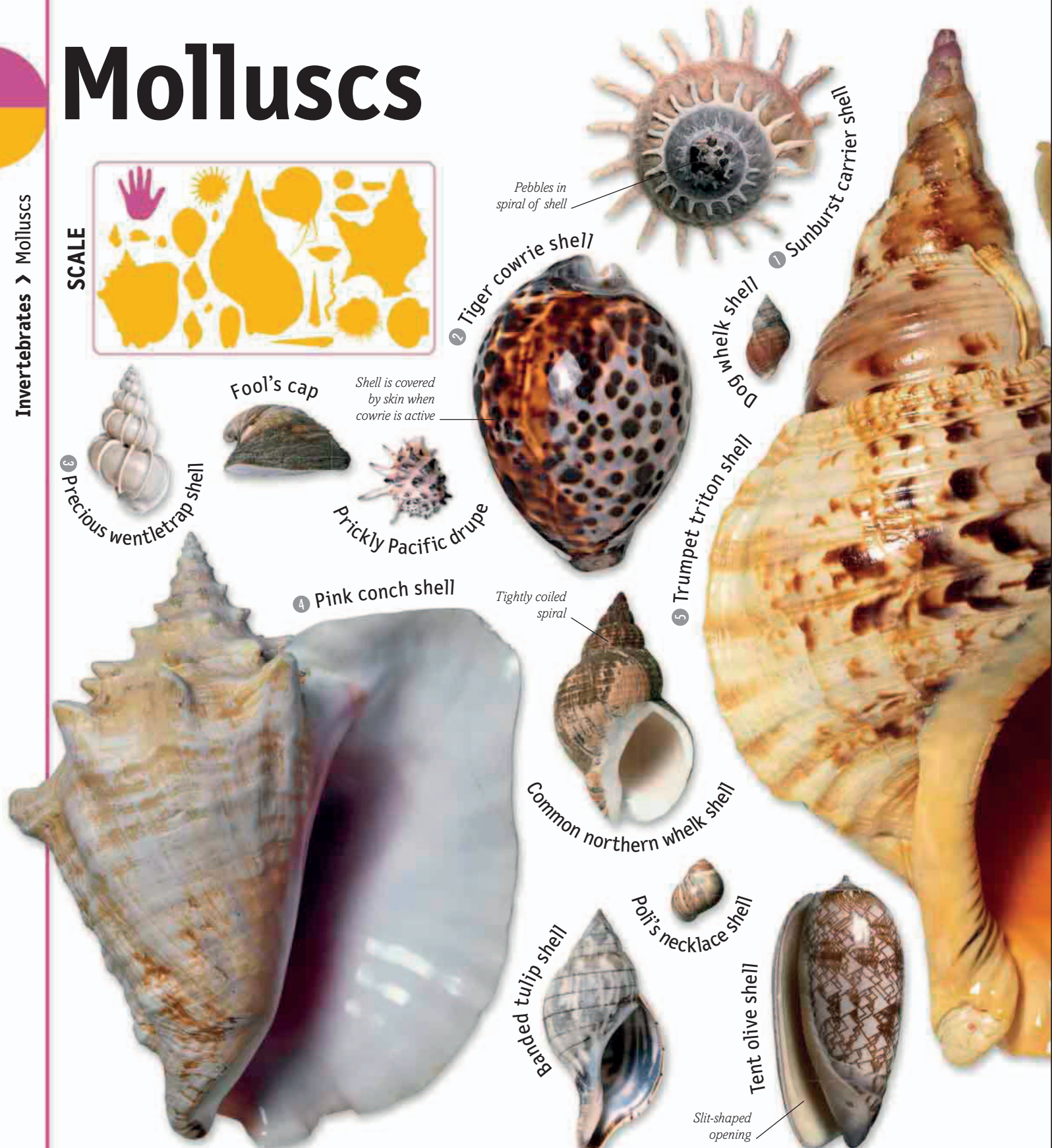


its body as it swims. The **Christmas tree tube worm** 5 stays in the safety of a burrow. It collects food with a spiral tuft of tentacles, which instantly fold up and disappear if a predator comes nearby. **Southern African velvet worms** 6 and **Caribbean velvet worms** 7 have short, stumpy legs. They creep along the forest floor, and capture their prey by spraying it with sticky threads. **Lugworms** 8 live in burrows

on beaches and mud-flats. The **sea mouse** 9 has a bristly body for digging through sand. Best known of all worms, the **common earthworm** 10 helps to make the soil fertile by burrowing through it and eating dead leaves and other waste. The **fire worm** 11 has poisonous bristles that help it to crawl over rocks and coral reefs. The **king ragworm** 12 eats seaweed and carrion using its two pincer-like teeth.

Molluscs

SCALE



Molluscs are amazingly varied animals, ranging from fast-moving squid, to clams, slugs, and snails. Most of them live in water and have shells. Clams and their relatives have two-part shells joined by a hinge. If danger strikes, the shell snaps shut, protecting the animal inside. Snails and their relatives have spiral shells. Like clam shells, they keep growing, so their owners never have to move

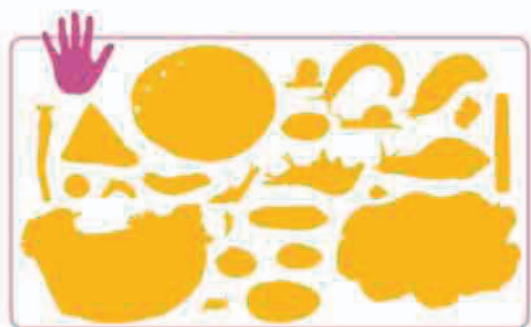
house. The **sunburst carrier** **1**, a sea snail, fastens pebbles to its shell, using them as camouflage. The **tiger cowrie** **2** has an egg-shaped shell with a beautiful pattern and glossy sheen. The **precious wentletrap** **3** has a ribbed shell. It preys on anemones and corals, using cutting jaws. Found in tropical oceans, the **pink conch** **4** and **trumpet triton** **5** are two of the largest sea snails. The pink conch grazes on



seagrass and seaweed, while the triton is a predator, attacking starfish and other slow-moving prey. It hunts at night and paralyzes its victims with poisonous saliva before beginning to feed. Like most apple snails, the **channelled apple snail** 6 has gills, and lives in fresh water. The **common mussel** 7 lives just below the waterline on rocky shores, using its gills to filter out small particles of food. The

common pelican's foot 8 creeps across mud and sand on the seabed. Its shell has extensions that resemble webbed feet. The **edible oyster** 9 and the **great scallop** 10 are often harvested to eat. Mussels and oysters glue themselves to rocks using sticky threads. Scallops lie on the seabed. If a predator tries to creep up on them, they swim away by clapping their shells open and shut.

SCALE



⑪ Philippine watering pot

Chalky,
grit-covered
tube

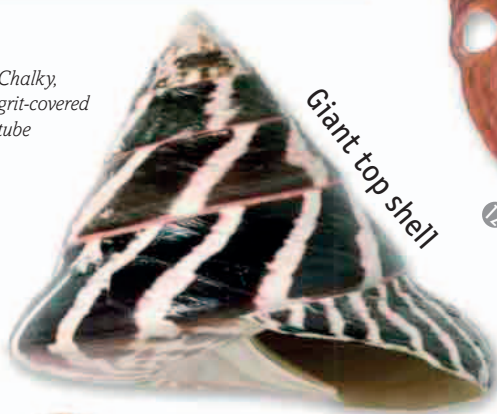
⑬ Common limpet



⑭ Black-margined sea slug



Giant top shell



⑫ Red abalone shell



⑮ Varicose sea slug



Variable neon sea slug



⑯ Spanish dancer



Common sea angel

Gills for
breathing

Red callista

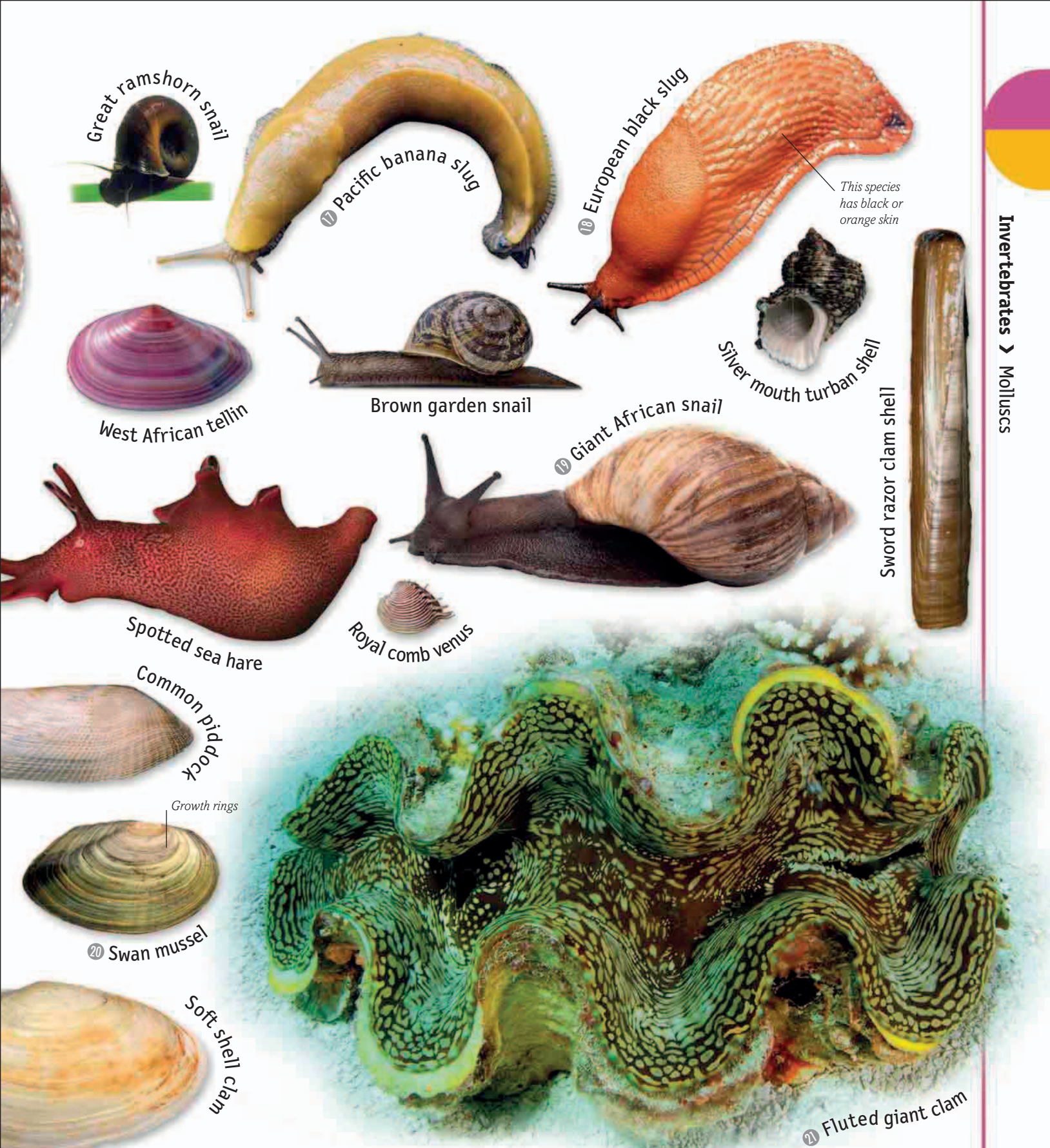


Opalescent sea slug



Some molluscs, such as the **Philippine watering pot** ⑪, do not need to move, because they sieve their food out of the water. But many others, including the **red abalone** ⑫, creep about on a muscle-packed sucker that works like a foot. The red abalone grazes on algae, and its grip is incredibly strong. When threatened, it clamps its shell to the rock and is almost impossible to dislodge. The

common limpet ⑬ is much smaller, but just as tough. It clings to wave-battered rocks and can withstand the fiercest winter storms. Sea slugs, or nudibranchs, have a foot but no shell. They are famous for their brilliant colours. Many kinds, such as the **black-margined sea slug** ⑭, have a tuft of gills on their backs and a pair of tentacles that look like miniature horns. The black-margined sea slug feeds on sponges. So do



the **varicose sea slug** 15 and the **Spanish dancer** 16, a giant sea slug that swims by rippling its body, making it look like a dancer wearing a skirt. Molluscs are also common on land, particularly in damp areas. The **Pacific banana slug** 17 and the **European black slug** 18 live in cool climates but the **giant African snail** 19 is a tropical species that has become a major pest in warm parts of the

world because of its large appetite and fast breeding. Back in the water, clams are molluscs with hinged shells. A few, such as the **swan mussel** 20, grow in rivers and streams, but most, including the **fluted giant clam** 21, live in the sea. Like its big brother the giant clam, it contains microscopic algae that live in its flesh. These algae produce nutrients, which contribute to the clam's food supply.



GIANT CLAM

The giant clam is the world's heaviest shelled animal, and possibly the largest species that has ever lived. It has a huge, thick shell formed of two parts, with a deeply folded edge. The edges of the inner body, or mantle, are often a beautiful iridescent blue-green or gold, and can be seen when the shell opens to feed. It is a myth that a giant clam can catch and swallow people, because a clam will only close, slowly, if it is attacked.



Size > Shell up to 1.5 m (5 ft) long **Weight** > Up to 200 kg (440 lb) **Habitat** > The clams anchor themselves on sand or coral rubble in reefs or in lagoons. **Distribution** > Tropical areas of the Indian and western Pacific Oceans and South China Sea. **Diet** > Giant clams filter plankton out of the sea using their gills. They also get nutrients from plant-like algae

called zooxanthellae that live inside their mantle tissues. **Breeding** > Giant clams expel sperm and eggs into the ocean. The eggs develop into larvae called veligers, which swim freely and hunt for food. **Predators** > Sea stars, snails, some fish, and humans. **Conservation status** > Vulnerable due to harvesting for food and the aquarium trade.

Squid, octopuses, and cuttlefish



SCALE



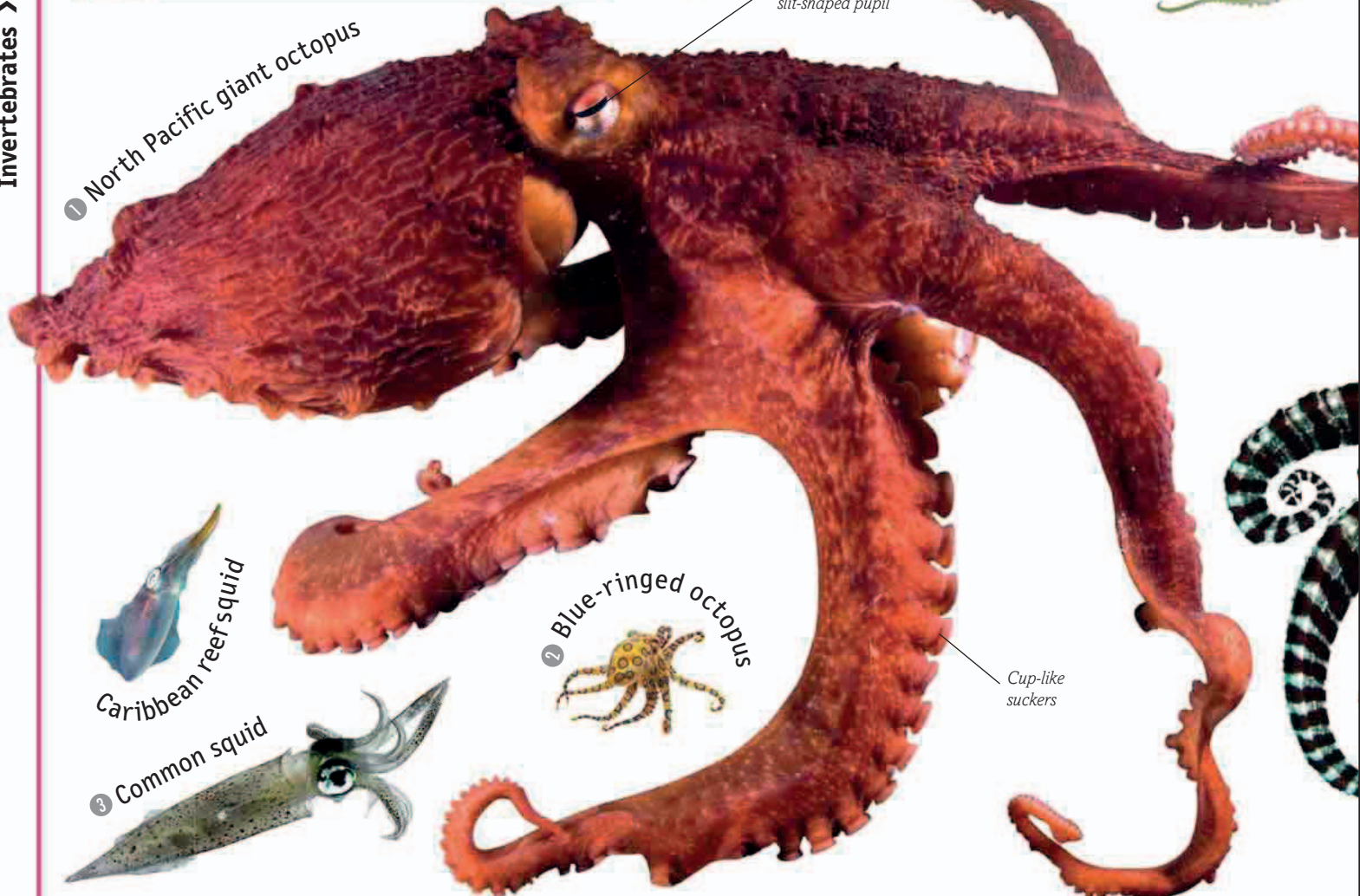
Broadclub cuttlefish



Dumbo octopus



Horizontal, slit-shaped pupil



1 North Pacific giant octopus

Caribbean reef squid

3 Common squid

2 Blue-ringed octopus

Cup-like suckers

Unlike other molluscs, squid and their relatives are fast-moving hunters with keen senses and big brains. Octopuses have eight arms covered in suckers. Squid and cuttlefish also have eight arms, plus two long tentacles which shoot out to catch their prey. Many of these animals can change colour in seconds, helping them to hide. The **North Pacific giant octopus** 1 hunts on the seabed. Like many

octopuses, it can squirt clouds of black pigment into the water to confuse predators. Fully spread out, its legs can measure over 4 m (13 ft) from tip to tip. Far smaller, but much more dangerous, the **blue-ringed octopus** 2 has a highly toxic bite. It can kill humans, although it usually swims away. The **common squid** 3 has a streamlined body with prominent side fins, and lives in the open sea. Like other squid, it zooms



backwards by sucking in water and squirting it out in a jet. Jet propulsion is also important for octopuses when they need to make a quick getaway. The **whip-lash squid** **4** hovers in deep water, waiting for prey with its long tentacles extended. The **chambered nautilus** **5** has a spiral shell and about 90 tentacles which tightly grip its prey. Mostly found in shallow waters, the **Atlantic octopus** **6** spends the daytime in rocky

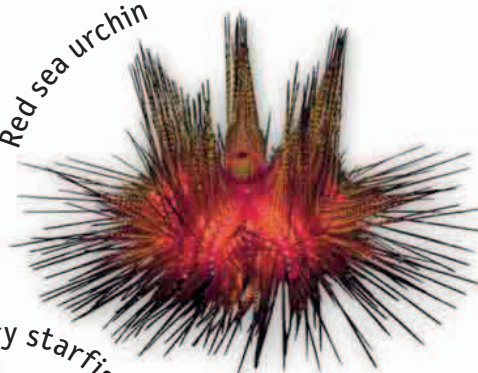
lair and hunts after dark. The **Australian giant cuttlefish** **7** and **common cuttlefish** **8** cruise over the shallow seabed looking for crabs and other prey. The extraordinary **mimic octopus** **9** is one of the few octopuses that hunt while the sun is up. As well as changing colour, it can disguise itself to resemble more than a dozen different animals, making it look more dangerous than it really is.

Starfish, urchins, and sea cucumbers

SCALE



Red sea urchin



Indo-Pacific cushion star



Common brittle star



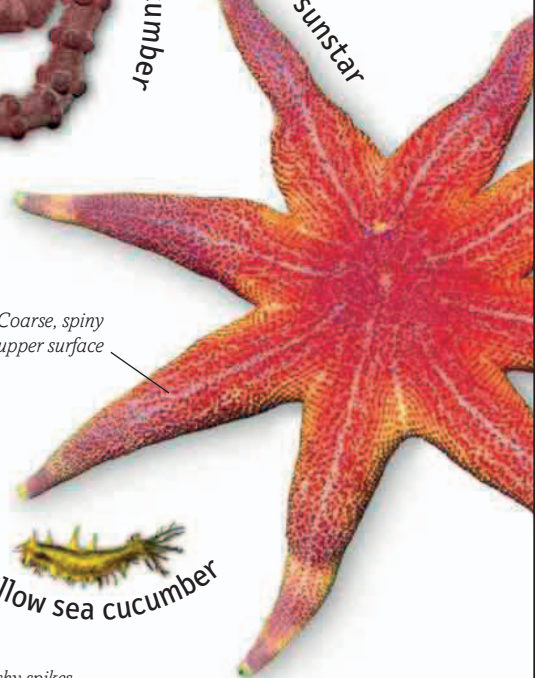
Bloody Henry starfish



Vermiform sea cucumber



Purple sunstar



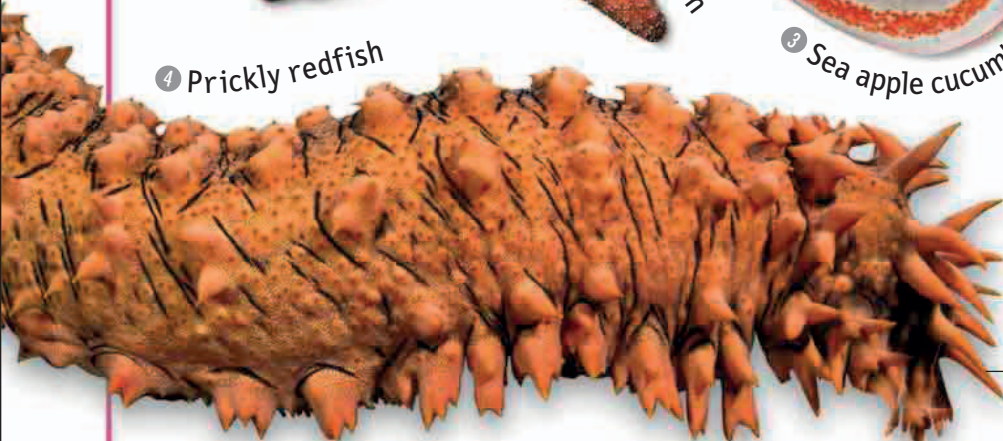
Ochre starfish



Sea apple cucumber



Prickly redfish



Coarse, spiny upper surface

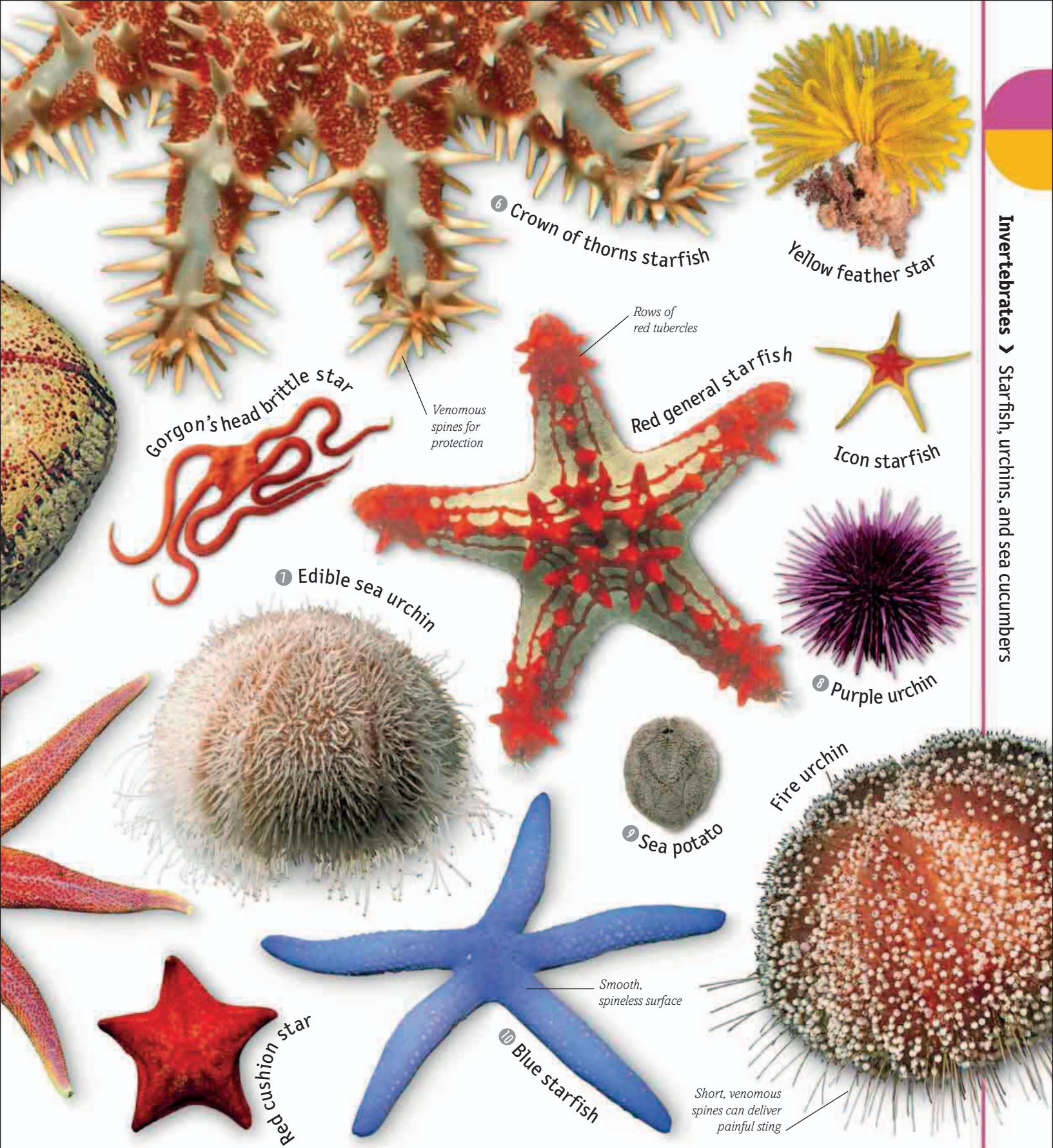
Yellow sea cucumber



Fleshy spikes

Found only in salt water, starfish and their relatives are unique in many ways. Most of these slow-moving creatures have five arms branching out from the centre of their bodies. They have skeletons or cases made of hard, chalky plates. The **common brittle star** ① moves by snaking its arms, but most animals in this group move around using hundreds of little tubes, which act as feet.

The **ochre starfish** ② feeds on mussels and other molluscs, using the tubes to grip its prey. Sea cucumbers collect food using a ring of tentacles around their mouths. The **sea apple cucumber** ③ is a highly poisonous reef-dweller. It has bright colours warning predators not to attack. Other species, such as the sausage-shaped **prickly redfish** ④, are coloured to match the sand. The **Indo-Pacific cushion star** ⑤ becomes



short-armed as it gets bigger, eventually maturing into a dumpy cushion shape. It often grazes on coral. The notorious **crown of thorns starfish** 6 is a large species with venomous, thorny arms. It can devastate reefs with its voracious appetite for coral. Sea urchins creep over rocks and reefs, scraping up food with their downward-pointing mouths. The **edible sea urchin** 7 has short spines and a rounded

case, while the **purple urchin** 8 has extra-long spines that easily break off. The **sea potato** 9 burrows into seabed mud, and has bristly spines and a streamlined shape. Sea urchins use their spines for self-defence, while sea cucumbers squirt out a mass of sticky threads. The **blue starfish** 10 and its relatives have a different kind of protection: if any of their legs are bitten off, they slowly grow back.

Centipedes and millipedes

SCALE



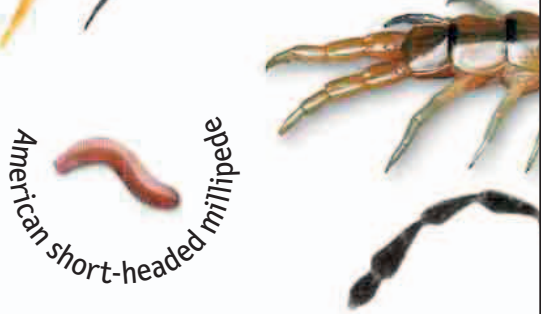
Tiger giant centipede



Megarian banded centipede



American short-headed millipede



Tanzanian flat-backed millipede



Sonoran tiger centipede



Banded stone centipede



Brown snake millipede



American giant millipede



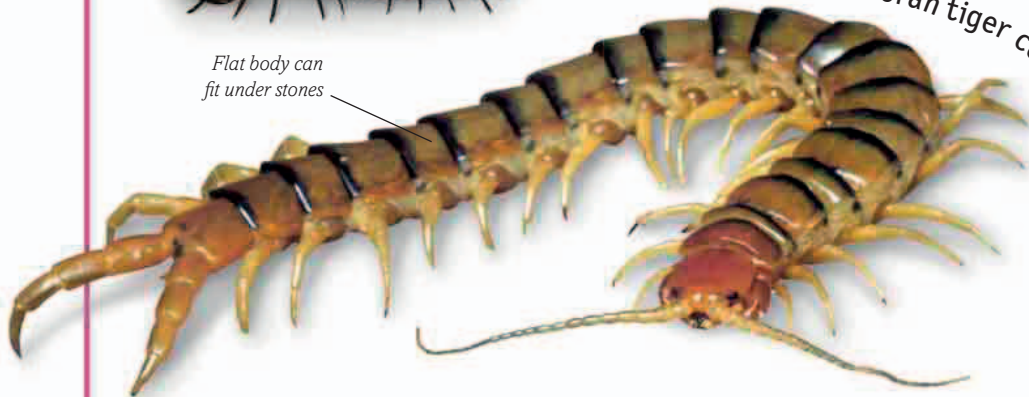
Brown stone centipede



Black giant pill millipede

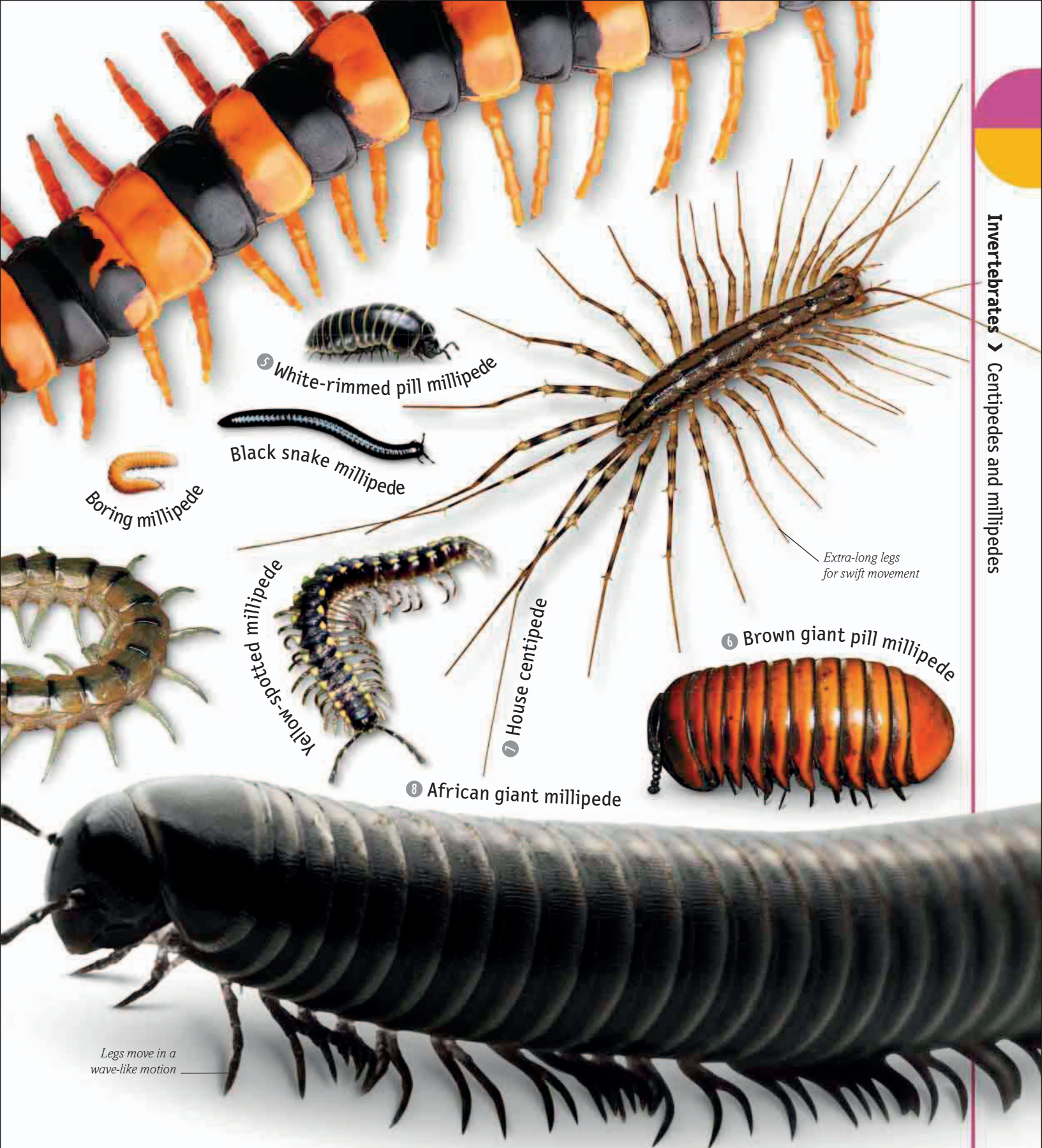


Flat body can fit under stones



Centipedes and millipedes belong to a group of animals called arthropods, which have legs with joints and a hard body case. Millipedes are slow-moving vegetarians, but centipedes are agile predators, with keen senses and poisonous fangs. **Yellow earth centipedes** ① hunt underground. With their bendy bodies and short legs, they squeeze between particles of soil. If they are dug

up, they quickly wriggle away. The Indian **tiger giant centipede** ② is one of the biggest, growing up to 25 cm (10 in) long. It can easily kill small rodents and can give humans an extremely painful bite. Centipedes have two legs on each segment of their body, but millipedes have four. The **American giant millipede** ③ can have more than 200 legs. Like other millipedes, it grows extra pairs every time it moults,



or sheds its skin. Pill millipedes are short and stubby, and often have 50 legs or fewer. They get their name because they can tuck in their legs and roll up into a ball. The **black giant pill millipede** ④ comes from Madagascar, while the **white-rimmed pill millipede** ⑤ is found in Europe. The **brown giant pill millipede** ⑥ from the forests of Borneo is one of the biggest pill millipedes. Fully rolled up, it is about

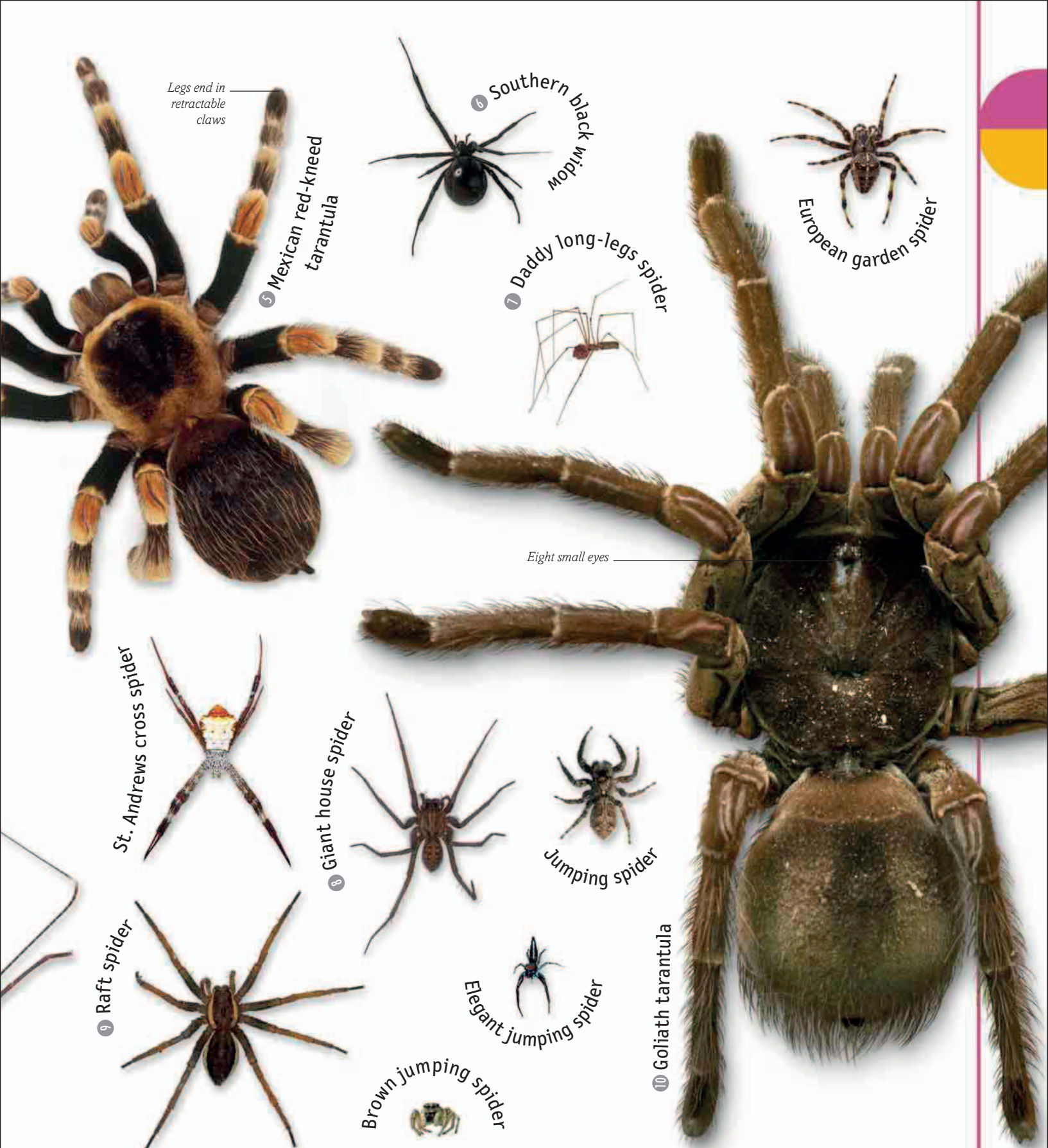
the size of a golf ball. Most centipedes hunt outside, but the **house centipede** ⑦ often comes indoors. With its long legs, it is an amazingly fast sprinter, scuttling up walls and ceilings to catch spiders and other prey. With over 300 legs, the **African giant millipede** ⑧ is one of the largest millipedes. If threatened by predators, it releases a foul-smelling liquid to persuade them it is not nice to eat.

Spiders and relatives



Many people are scared of spiders, but the world would be very different without them. These eight-legged animals are super-efficient hunters. Out of many thousands, scientists have found only one kind that feeds on plants. Close relatives of spiders include sun spiders, whip spiders, and harvestmen, as well as ticks, mites, and scorpions. The **chaco tarantula** ① lives in a burrow by day

and comes out to feed after dark. Like all spiders, it kills its prey by injecting venom through a pair of fangs. The **marbled orb weaver** ② catches flying insects by spinning wheel-shaped webs, but the **goldenrod crab spider** ③ sits on top of flowers where it ambushes bees and butterflies. **Audouin's trapdoor spider** ④ lurks in a silk-lined burrow, equipped with trip-lines and a camouflaged lid. If anything



touches a trip-line, the spider flings open the lid and grabs its prey. The **Mexican red-kneed tarantula** **5** is a forest-dwelling spider, and a popular pet. It grows slowly and can live for more than 20 years. The **southern black widow** **6** from North America is far smaller but more dangerous. Females are much bigger than males, and they can give people a fatal bite. The **daddy long-legs spider** **7** often

lives indoors, and so does the **giant house spider** **8**, a species that spins funnel-shaped webs. **Raft spiders** **9** lie in wait by the edges of ponds and pools where they catch tadpoles and small fish. The enormous **Goliath tarantula** **10** from South America eats insects, rodents, frogs, and even bats. It is one of the biggest spiders in the world, with a leg span as big as a dinner plate.

SCALE



12 Sydney funnel-web spider

sac spider



11 Brazilian wandering spider



crab-like spiny orb-weaver



Eight walking legs

Silk egg sac carried by female



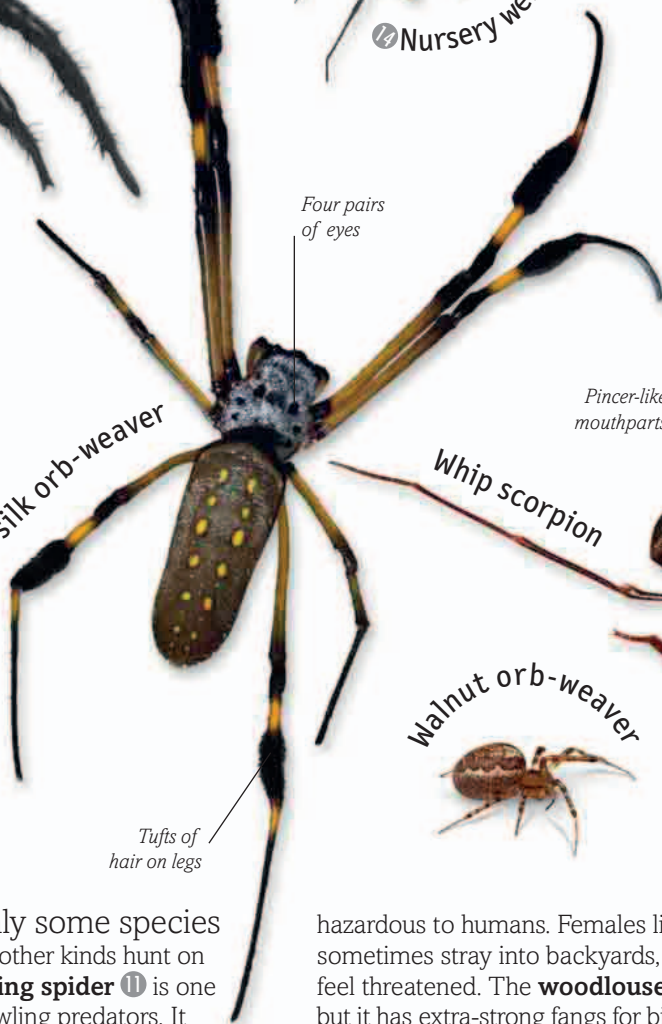
14 Nursery web spider

13 Woodlouse spider



Four pairs of eyes

16 American golden silk orb-weaver



Lone star tick



15 Cave spider



Pincer-like mouthparts

Whip scorpion



Walnut orb-weaver



Tufts of hair on legs

All spiders make silk, but only some species spin webs to catch their prey. Many other kinds hunt on the ground. The **Brazilian wandering spider** 11 is one of the most dangerous of these prowling predators. It roams through forests after dark, and sometimes wanders into urban areas where it clambors over people as they sleep. The **Sydney funnel-web spider** 12 from Australia is also

hazardous to humans. Females live in burrows, but males sometimes stray into backyards, and will bite humans if they feel threatened. The **woodlouse spider** 13 is much smaller, but it has extra-strong fangs for biting into the hard body cases of woodlice. **Nursery web spiders** 14 and **cave spiders** 15 make silk sacs to carry their eggs, while the **American golden silk orb-weaver** 16 uses its silk to build some of the world's



17 Giant desert hairy scorpion

Chilean burrowing scorpion

18 Yellow thick-tail scorpion

20 Imperial scorpion

19 Gold scorpion

Common European scorpion

Red velvet mite

Pincers grip prey

Sting raised to threaten enemies

Pincers covered with sensitive hairs

biggest webs. Shaped like cartwheels, and more than 1 m (3 ft) across, the webs are strong enough to catch hummingbirds and even frogs. Like spiders, scorpions have eight legs, but they also have a pair of pincers and a poisonous sting in their tails. The **giant desert hairy scorpion** 17 is the largest kind in North America. Like other scorpions, it uses its pincers to tear apart its prey, while its sting is mainly for self-defence. The

yellow thick-tail scorpion 18 is smaller, but its venom is much more powerful. It comes from the Sahara Desert and the Middle East. **Gold scorpions** 19 also live in the same part of the world, but the **imperial scorpion** 20 is a forest species from tropical Africa. It is one of the biggest scorpions, measuring up to 25 cm (10 in) long. Although it looks menacing, its sting is not much stronger than that of a wasp.



SEA SPIDER Sea spiders belong to a group of marine animals called Pantopoda, meaning “all legs”. Their legs are so long compared to their tiny bodies that they have to keep some of their internal organs inside them. This strikingly coloured yellow-kneed sea spider comes from coral reefs off the coast of Australia. It is only a few centimetres across, but larger specimens can grow up to 90 cm (35 in) from tip to tip.

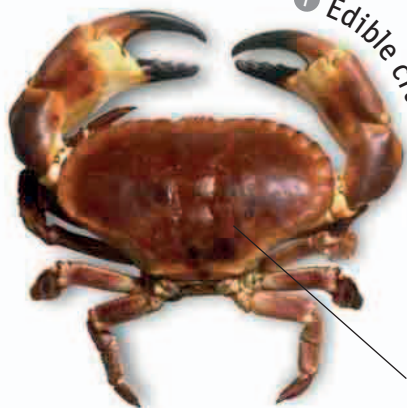


Size > 1 mm–90 cm ($\frac{1}{25}$ in–35 in) **Habitat** > Seabed; smaller species live in shallow water, while larger sea spiders live in the deep waters of the Antarctic Ocean. **Distribution** > Seas and oceans worldwide **Diet** > Soft-bodied animals such as sea sponges, anemones, and coral polyps. The sea spider uses its sucking mouthpart, or

proboscis, to extract fluids from the prey, or breaks off pieces and puts them in its mouth. **Breeding** > The eggs hatch into larvae. In most species the larvae float around freely as they grow. In some they live on their father's front legs, while in others the larvae live as parasites in animals such as coral polyps or clams.

Crustaceans

① Edible crab



Thick carapace

② Red reef hermit crab



③ White-spotted hermit crab



Abdomen hidden inside shell

④ Blue swimming crab



Wide, flattened carapace

Pincers used for catching prey

Freshwater crab



Anemone porcelain crab



Velvet swimming crab



⑤ Warty box crab



⑥ Christmas Island red crab



Painted pebble crab



Legs with a single claw

Crustaceans are not common on land, but they flourish in fresh water and the sea. They include lobsters, shrimps, and prawns, and also hundreds of different kinds of crabs. Some crustaceans swim in gigantic swarms, but crabs usually roam the seabed or scuttle over the shore. The **edible crab** ① has an extra-tough shield, or carapace. Its powerful pincers can crack open mollusc shells, and crush

human fingers, too. The **red reef hermit crab** ② and **white-spotted hermit crab** ③ have small pincers, and live in shells borrowed from other animals. Like other hermit crabs, they change shells as they grow. Each time these crabs move home, they carefully check their new shell to make sure that it is exactly the right fit. **Blue swimming crabs** ④ have back legs that work like paddles. These crabs like

SCALE



sponge crab



Short hind legs

spotted coral crab



Pear-shaped body

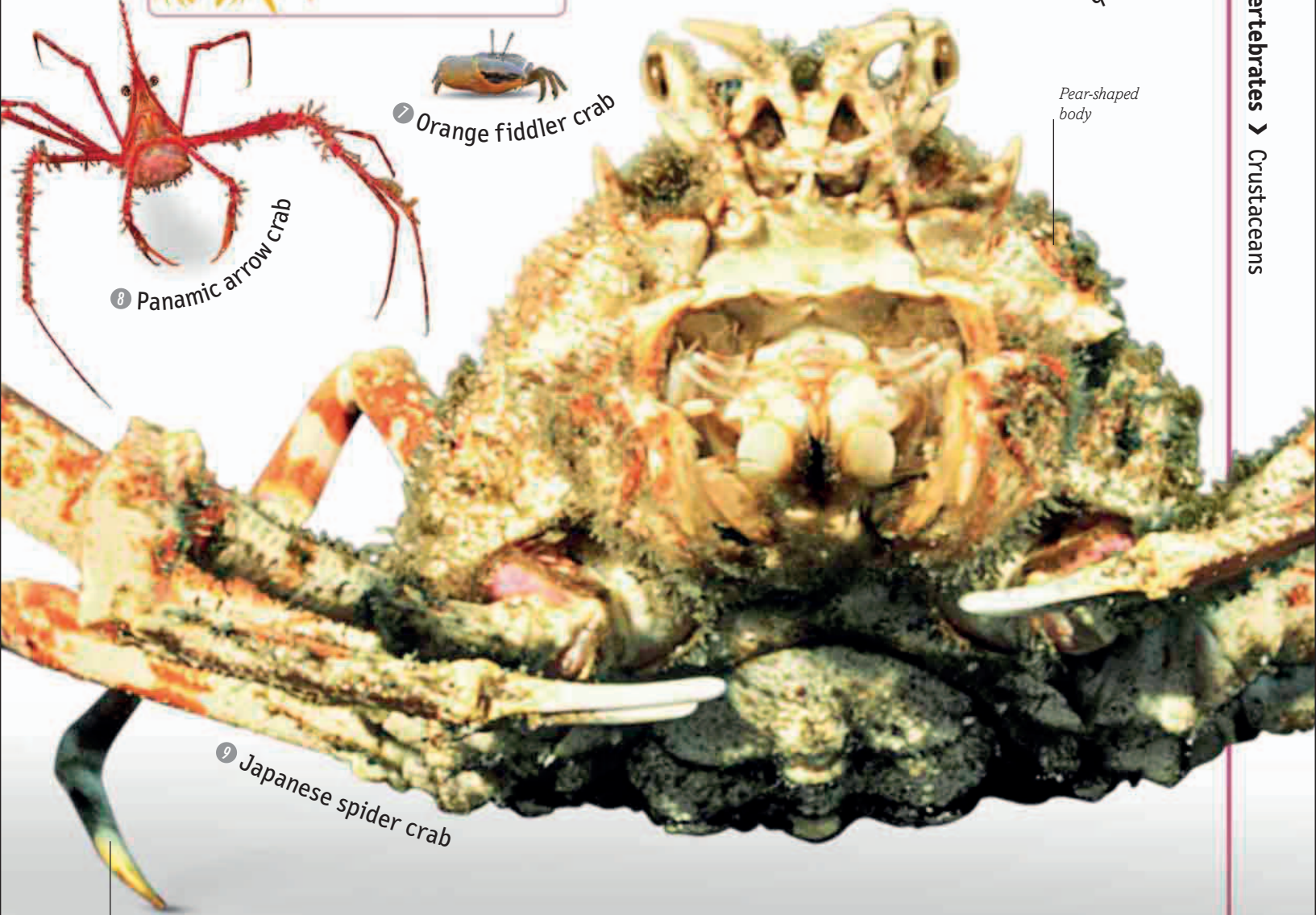
7 Orange fiddler crab



8 Panamic arrow crab



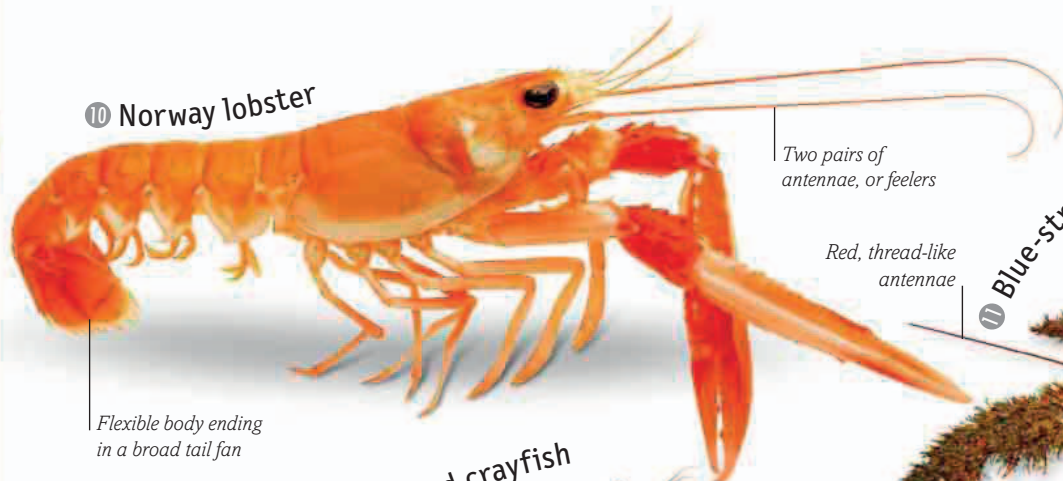
9 Japanese spider crab



Heavily armoured legs and body

spending time on sandy or muddy coastlines. **Warty box crabs** 5 burrow in seabed sand. They shield their faces with their claws, giving them the alternative name, the shame-face crab. **Christmas Island red crabs** 6 live in tropical forests, surrounded by the Indian Ocean. During the breeding season, millions of them emerge from the forest and march to the coast, where they mate and lay their eggs.

Orange fiddler crabs 7 make burrows in mangrove swamps. Males have a tiny claw for feeding and a giant one for signalling to females across the mud. The **Panamic arrow crab** 8 lives on reefs, while the **Japanese spider crab** 9 prowls the seabed. Measuring up to 4 m (13 ft) across, this amazingly leggy animal is the world's biggest crustacean, with a lifespan of up to 100 years.



11 Blue-striped squat lobster



White-clawed crayfish



12 Reef lobster



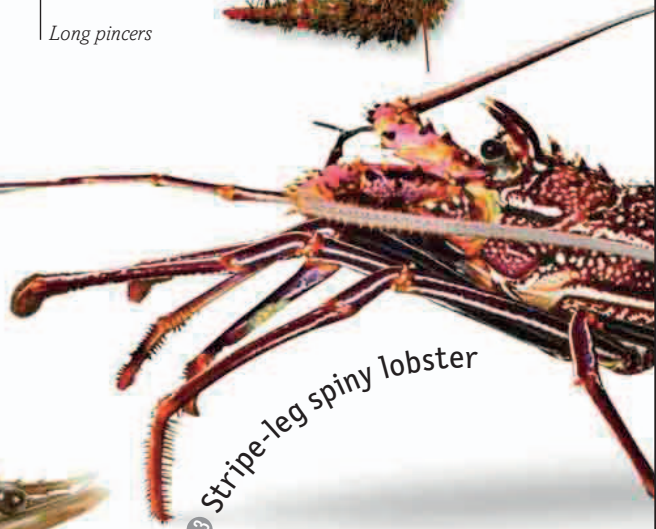
Aesop shrimp



Tiger prawn



13 Stripe-leg spiny lobster



14 Antarctic krill



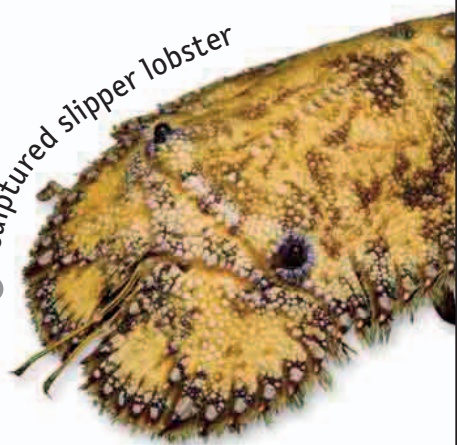
Regal slipper lobster



Giant acorn barnacle

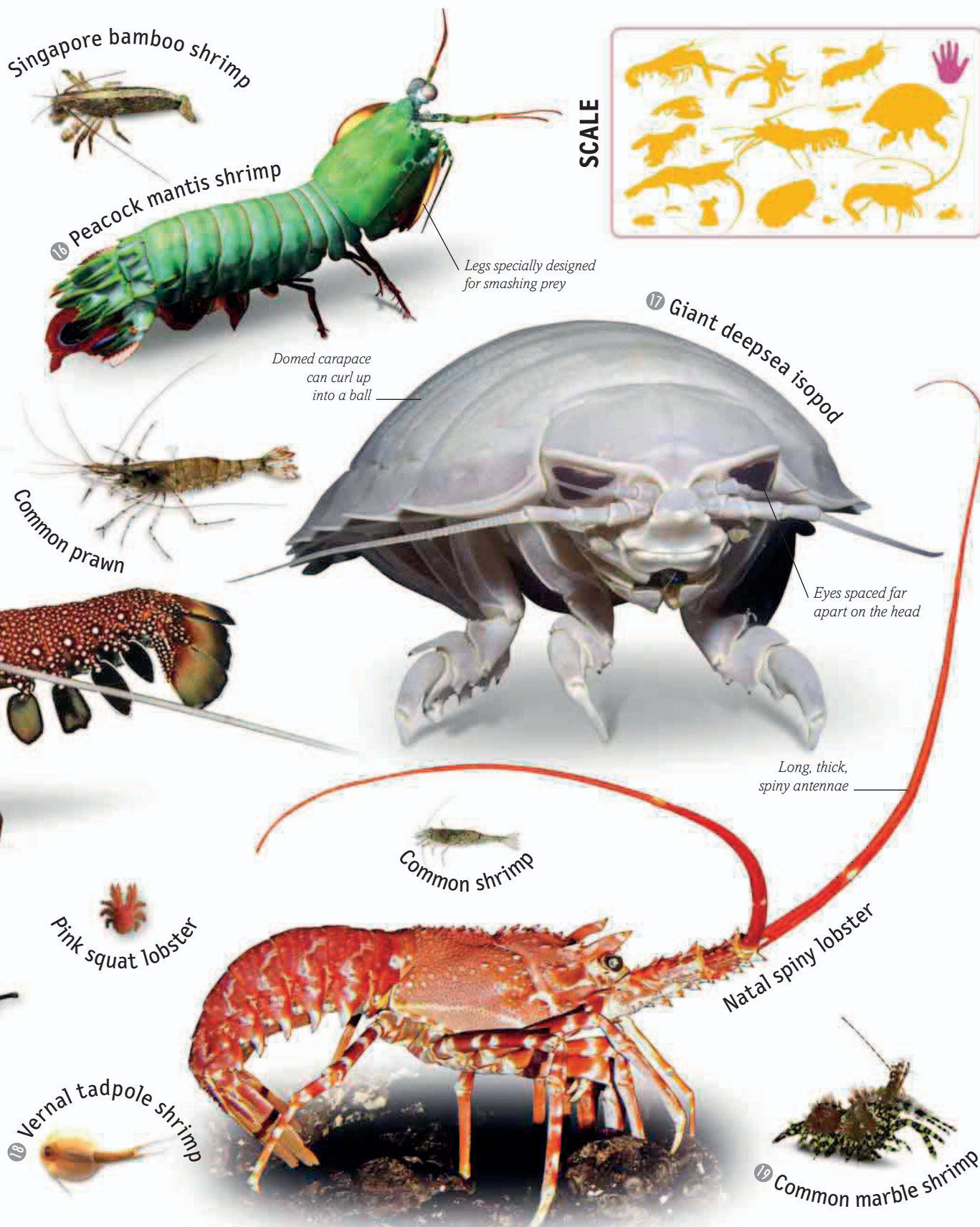


15 Sculptured slipper lobster



Lobsters, shrimps, and prawns are crustaceans with long bodies and lots of legs. The **Norway lobster** 10 lives in a burrow, and feeds at night on live animals and dead remains. **Blue-striped squat lobsters** 11 are close relatives of crabs. Like other squat lobsters, they have 10 legs, but the last leg pair is small, and tucked away under their tails. **Reef lobsters** 12 are brightly coloured, which makes them popular

aquarium pets. The **stripe-leg spiny lobster** 13 has extra-long antennae that can make a creaky, clicking sound to scare predators away. If it is cornered, it swims backwards at high speed. **Antarctic krill** 14 live in the icy Southern Ocean, in swarms that can stretch for kilometres in every direction. These finger-sized crustaceans are a vital food for penguins, seals, and whales, including the blue whale, which can



swallow more than 4 tonnes of krill per day. The **sculptured slipper lobster** 15 has a rounded shape, and blends in against seabed sand. The **peacock mantis shrimp** 16 is a predator with a knockout punch. Using its front legs, it smashes open snail shells and crabs, and can even shatter the glass of aquariums. The **giant deepsea isopod** 17 scavenges food on the sea floor, occasionally feeding on live prey. Since

light is extremely faint in deep sea, this isopod has large antennae to help it feel its way around. **Vernal tadpole shrimps** 18 from California breed in short-lived freshwater pools. The adult shrimp die when the pools dry up, but their eggs can survive for up to 10 years, hatching when it rains. The **common marble shrimp** 19 is brown with green spots during the day, but turns red at night.

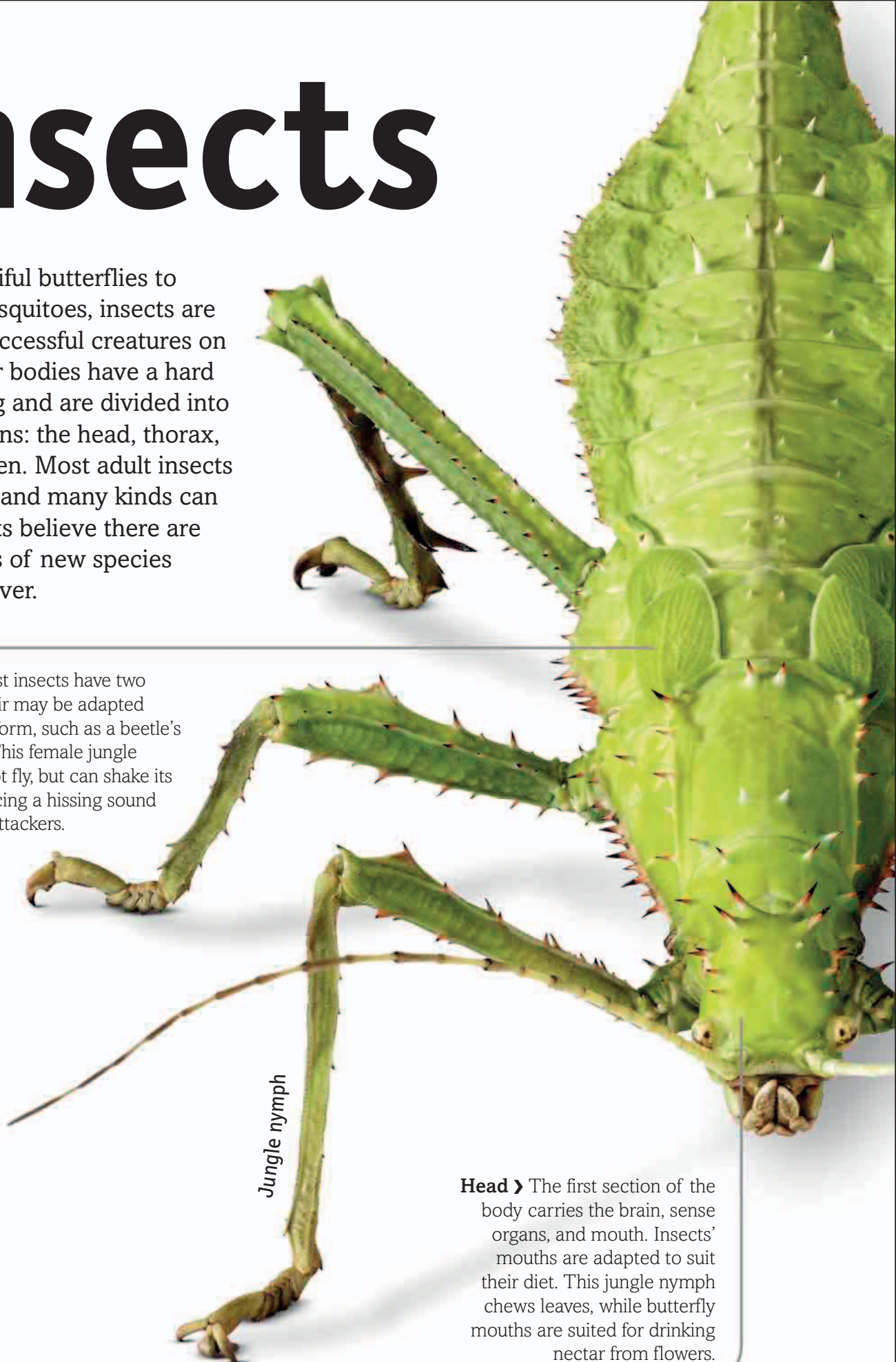
Insects

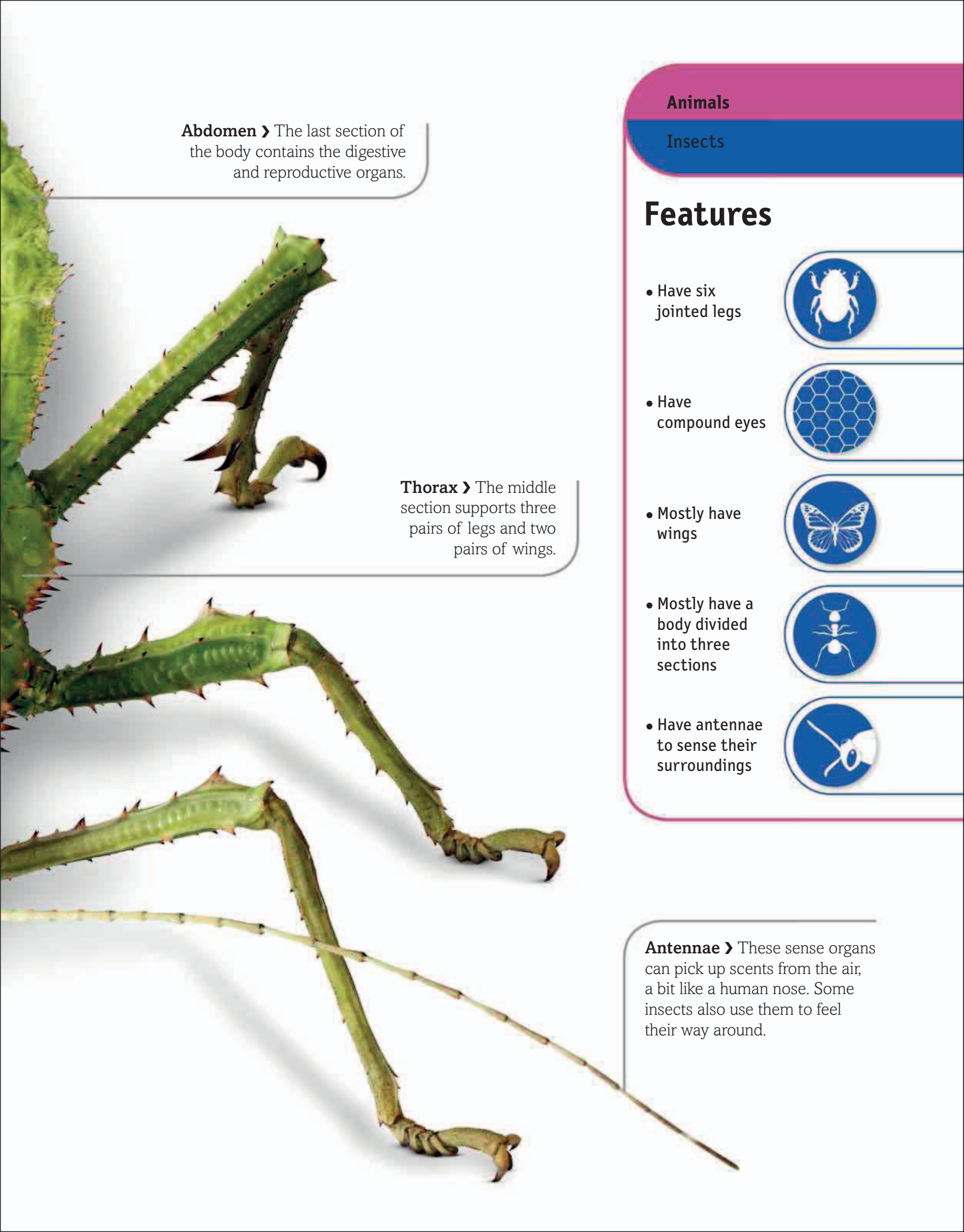
From beautiful butterflies to buzzing mosquitoes, insects are the most successful creatures on Earth. Their bodies have a hard outer casing and are divided into three sections: the head, thorax, and abdomen. Most adult insects have wings and many kinds can fly. Scientists believe there are still millions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

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

Jungle nymph

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





Abdomen › The last section of the body contains the digestive and reproductive organs.

Thorax › The middle section supports three pairs of legs and two pairs of wings.

Animals

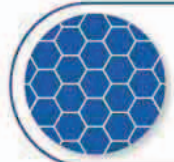
Insects

Features

- Have six jointed legs



- Have compound eyes



- Mostly have wings



- Mostly have a body divided into three sections



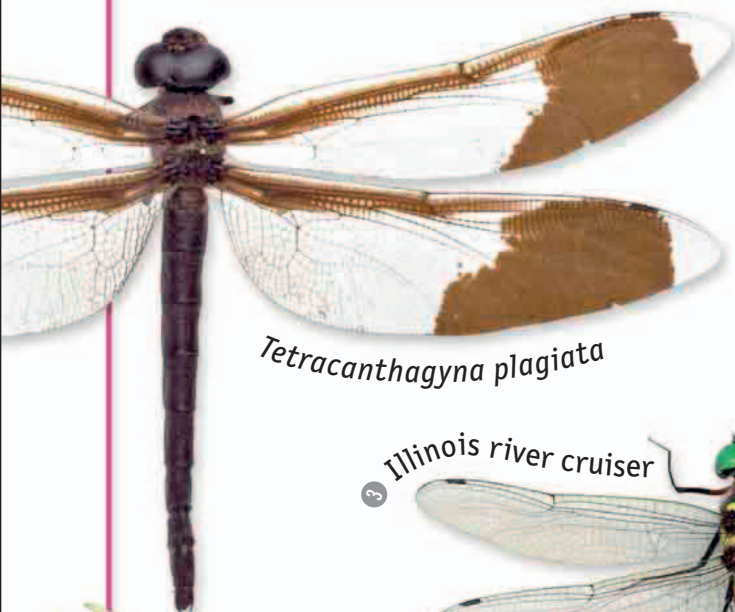
- Have antennae to sense their surroundings



Antennae › These sense organs can pick up scents from the air, a bit like a human nose. Some insects also use them to feel their way around.

Dragonflies and damselflies

SCALE



Tetracanthagyna plagiata

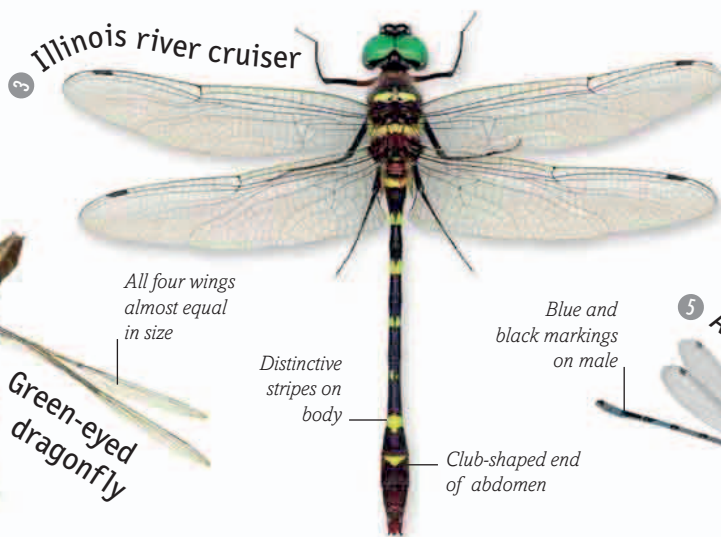


① Common green darner



② Southern hawk dragonfly

Large wings
for speedy flight



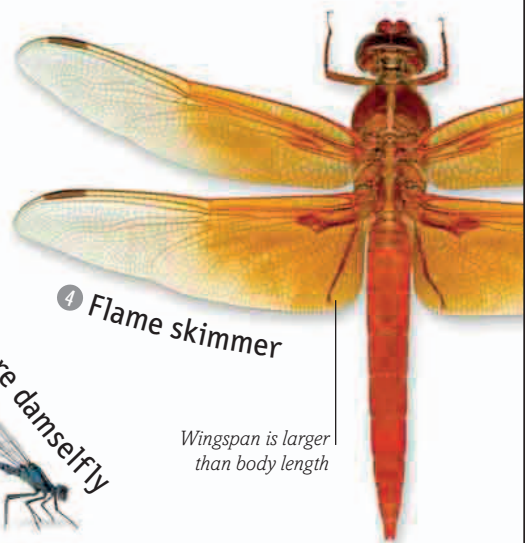
③ Illinois river cruiser

All four wings
almost equal
in size

Distinctive
stripes on
body

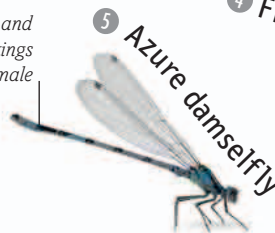
Club-shaped end
of abdomen

Green-eyed
dragonfly



④ Flame skimmer

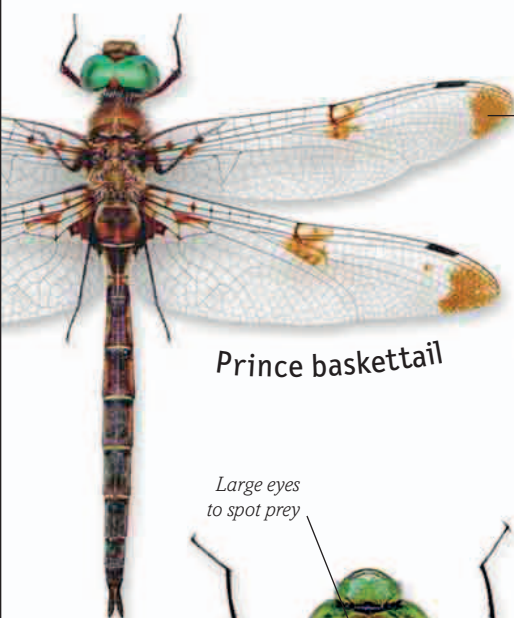
Wingspan is larger
than body length



⑤ Azure damselfly

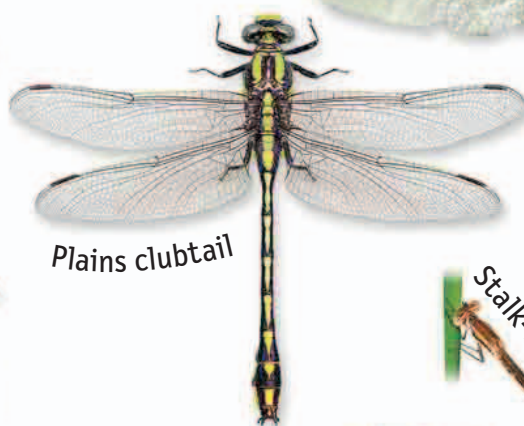
Speeding through the air on transparent wings, dragonflies and damselflies chase insects for food. Dragonflies are robust with rounded heads, whereas damselflies are more slender with broader heads. Both have extra-large eyes for spotting anything that moves and can zoom sideways and even backwards as they close in for a kill. Their young, known as nymphs, are also hunters. They grow up underwater, and

use stealth and camouflage to catch their prey. The **common green darner** ① flies over streams in North America. Its stiff wings stick out sideways when it rests. The **southern hawk dragonfly** ②, from Europe, breeds in small ponds. It hunts away from water, and approaches people that come nearby. The **Illinois river cruiser** ③ patrols rocky streams and rivers, while the **flame skimmer** ④ prefers warm water,

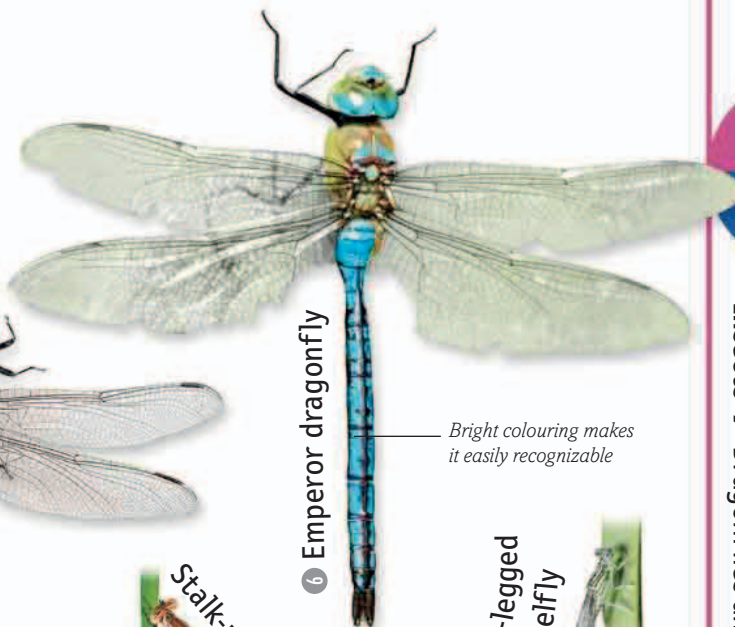


Prince baskettail

Colourful markings to attract a mate



Plains clubtail



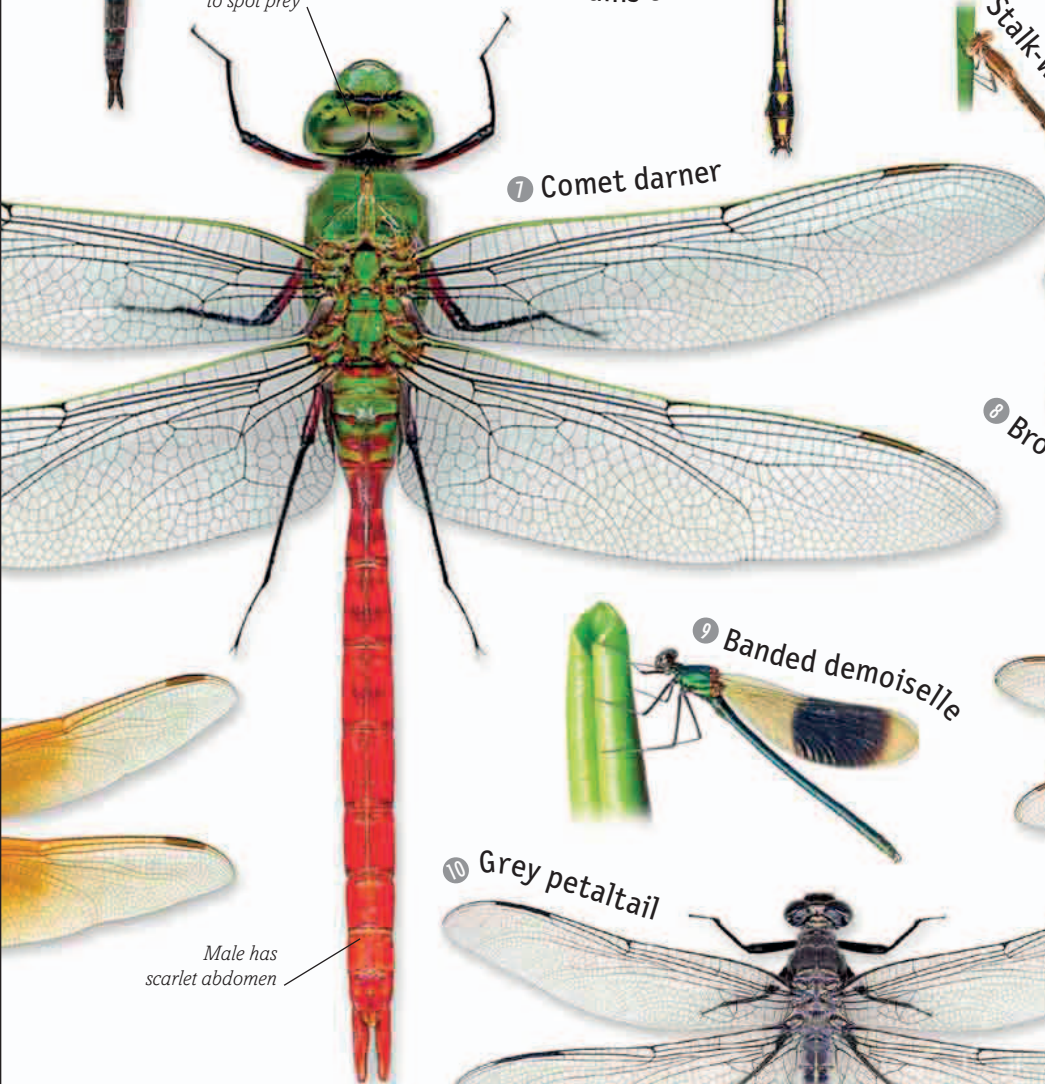
Emperor dragonfly

Bright colouring makes it easily recognizable

White-legged damselfly



Stalk-winged damselfly



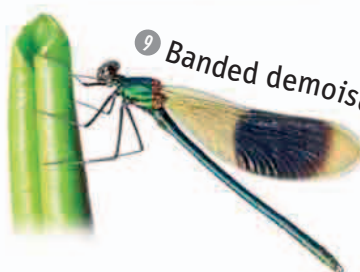
Comet darner

Large eyes to spot prey

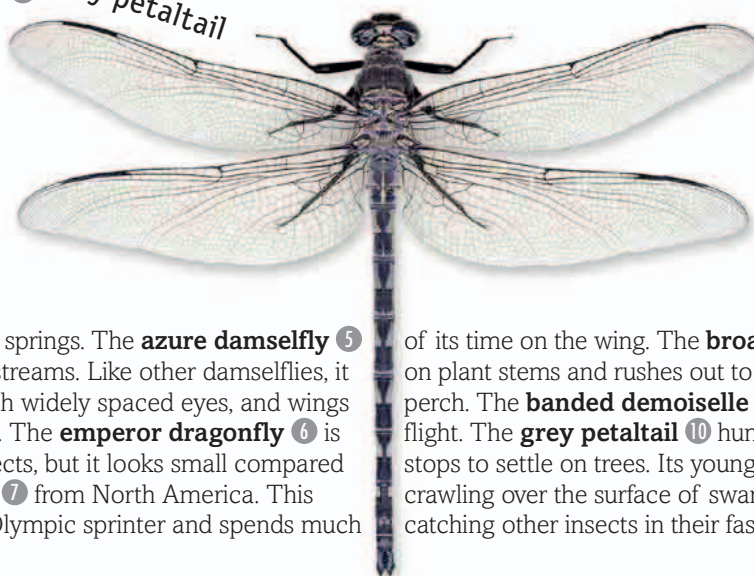
Broad-bodied chaser



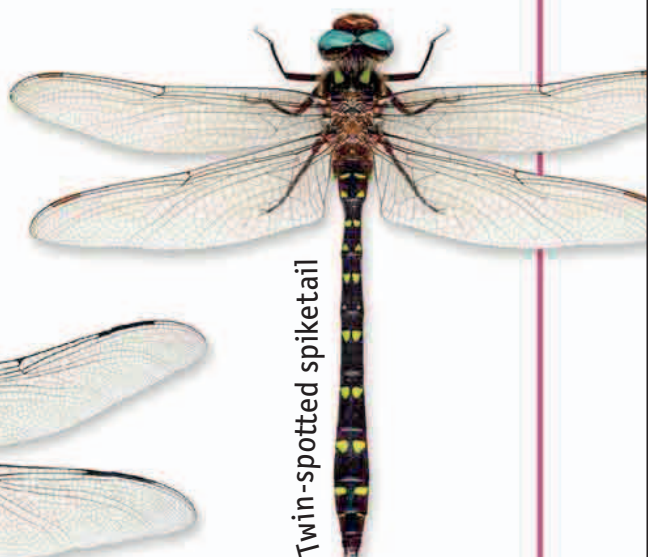
Banded demoiselle



Grey petaltail



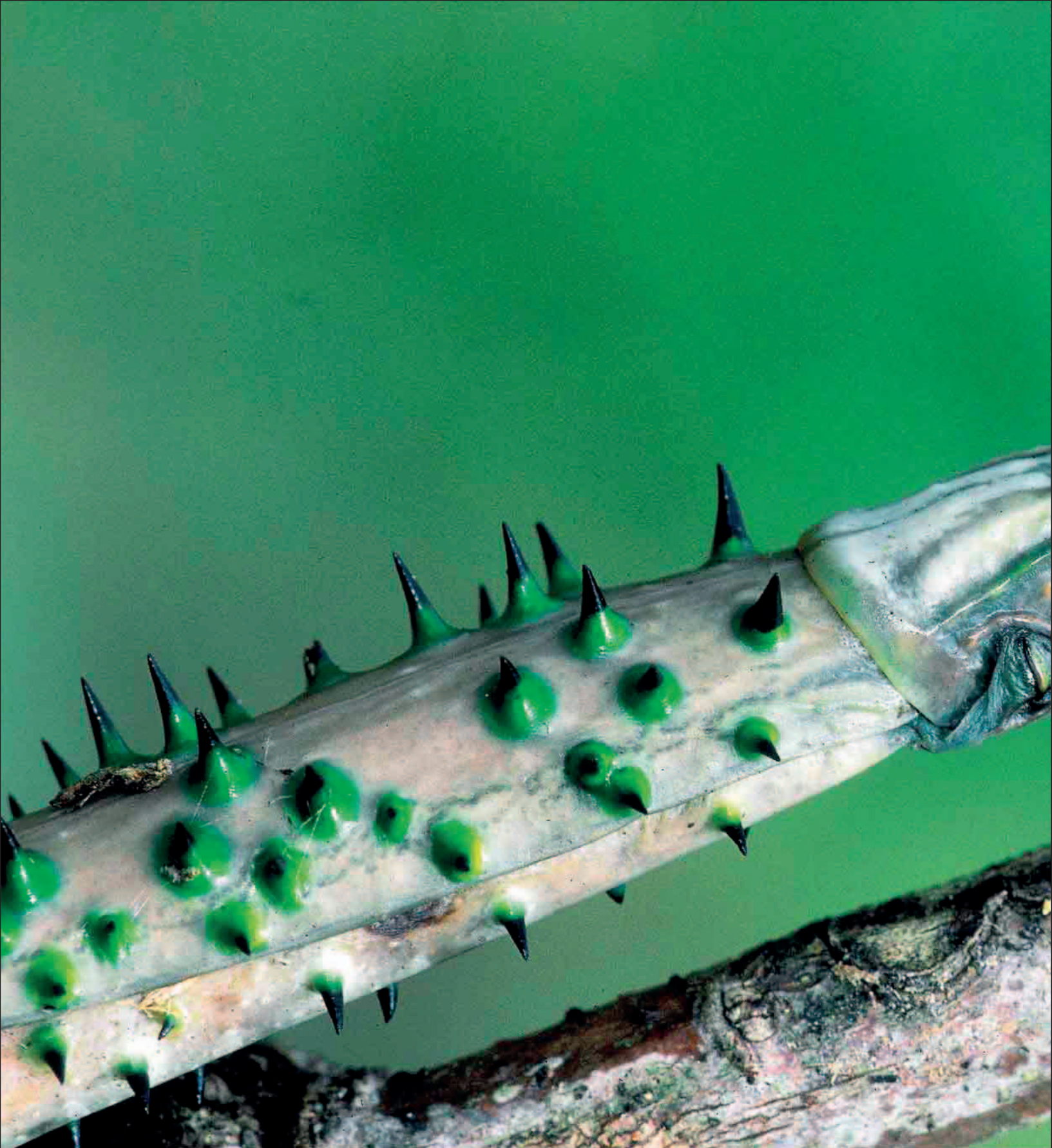
Twin-spotted spiketail



Male has scarlet abdomen

sometimes hunting over hot springs. The **azure damselfly** 5 breeds in small ponds and streams. Like other damselflies, it has a very slender body, with widely spaced eyes, and wings that fold back when it lands. The **emperor dragonfly** 6 is one of Europe's largest insects, but it looks small compared to the giant **comet darner** 7 from North America. This dragonfly can outpace an Olympic sprinter and spends much

of its time on the wing. The **broad-bodied chaser** 8 rests on plant stems and rushes out to grab passing insects from its perch. The **banded demoiselle** 9 has a flitting, butterfly-like flight. The **grey petaltail** 10 hunts over swamps and often stops to settle on trees. Its young are ferocious predators, crawling over the surface of swamps on damp nights and catching other insects in their fast-moving jaws.



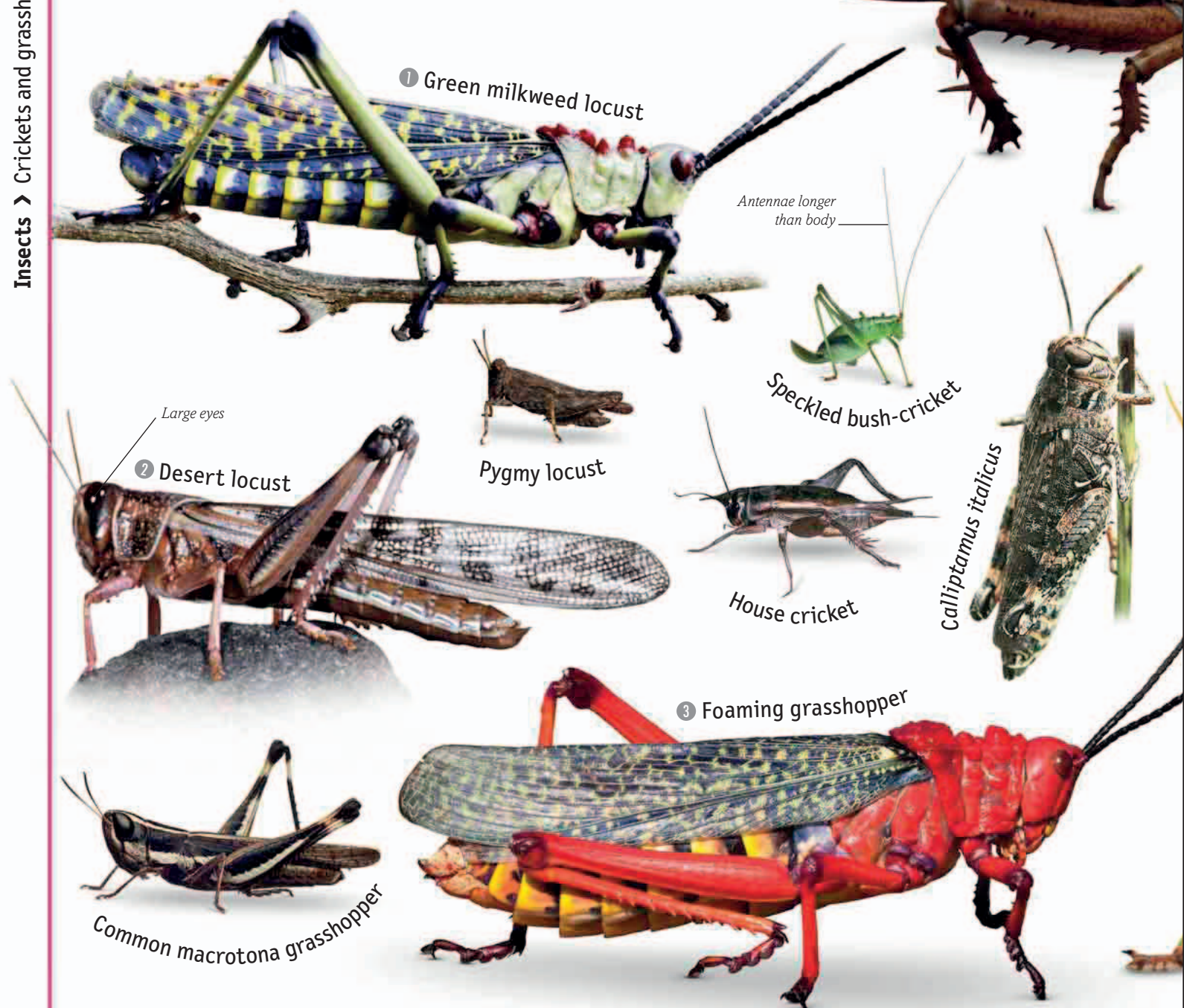
STICK INSECT Masters of disguise, stick insects sit quietly on tree branches, looking exactly like dead twigs or green shoots so that predators don't notice them. There are thought to be more than 3,000 species across the world, ranging from tiny leaf and twig shapes up to "branches" 55 cm (22 in) long. This stick insect from Madagascar resembles a thorny bramble shoot, a very unappetizing prospect for predators.



Size > 2.5–55 cm (1–22 in) **Weight** > Up to 65 grams (2¼ oz)
Habitat > Rainforests and jungles. **Distribution** > Tropical and subtropical areas of Southeast Asia and Australia, also Madagascar, South and Central America, and southern USA. Some species also found in mainland Europe as well as the British Isles. **Diet** > Leaves of trees and shrubs and berries.

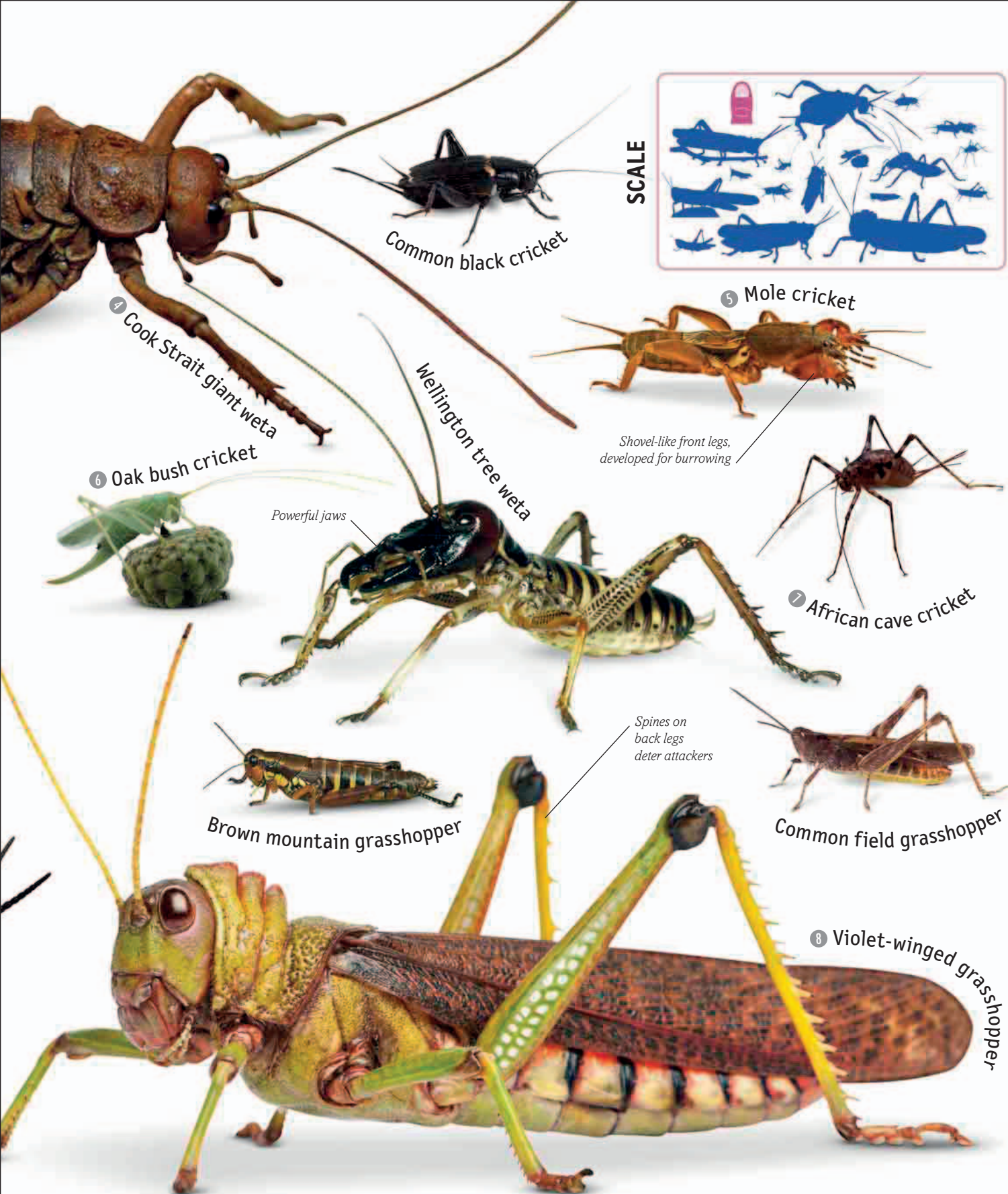
Breeding > Females lay live eggs on their own or by mating with males. The eggs hatch into nymphs, which moult several times as they grow into adults. **Lifespan** > From a few months to a few years. **Predators** > Birds, small reptiles, and rodents. Defences include camouflage, sharp spines, flashing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

Crickets and grasshoppers



With their powerful back legs, crickets and grasshoppers are some of the best jumpers in the insect world. They are also some of the loudest, rubbing their legs or wings to make high-pitched sounds. Many live on their own, but locusts are famous for migrating in enormous swarms. The African **green milkweed locust** ① is one of the biggest of these insect travellers, while the **desert**

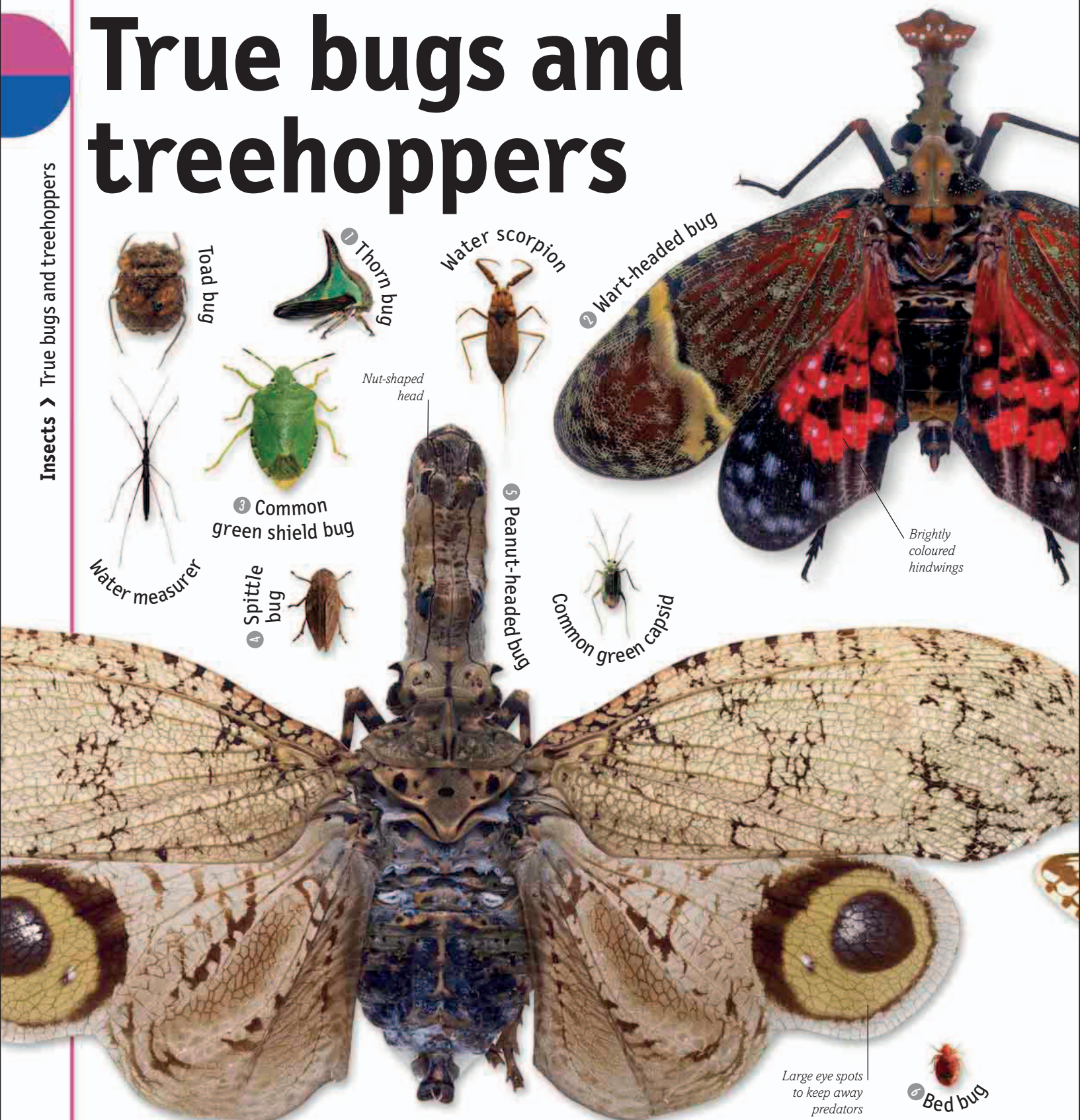
locust ② holds the record for numbers. Some of its swarms contain more than 30 billion insects, which is four times the number of people on Earth. Most grasshoppers rely on camouflage for protection. The **foaming grasshopper** ③, however, oozes poisonous froth from behind its head, while its day-glow colours warn that it is dangerous to eat. Adult grasshoppers usually have two pairs of wings, but some



crickets are wingless and cannot fly. The biggest of these include wetas from New Zealand. The **Cook Strait giant weta** ④ is almost as large as a mouse. If it is threatened, it raises its spiny back legs over its head, making it look ready for a fight. Most crickets and grasshoppers feed on plants, but some species are predators and scavengers. Some others even feed on their own kind. The **mole cricket** ⑤ spends its life in

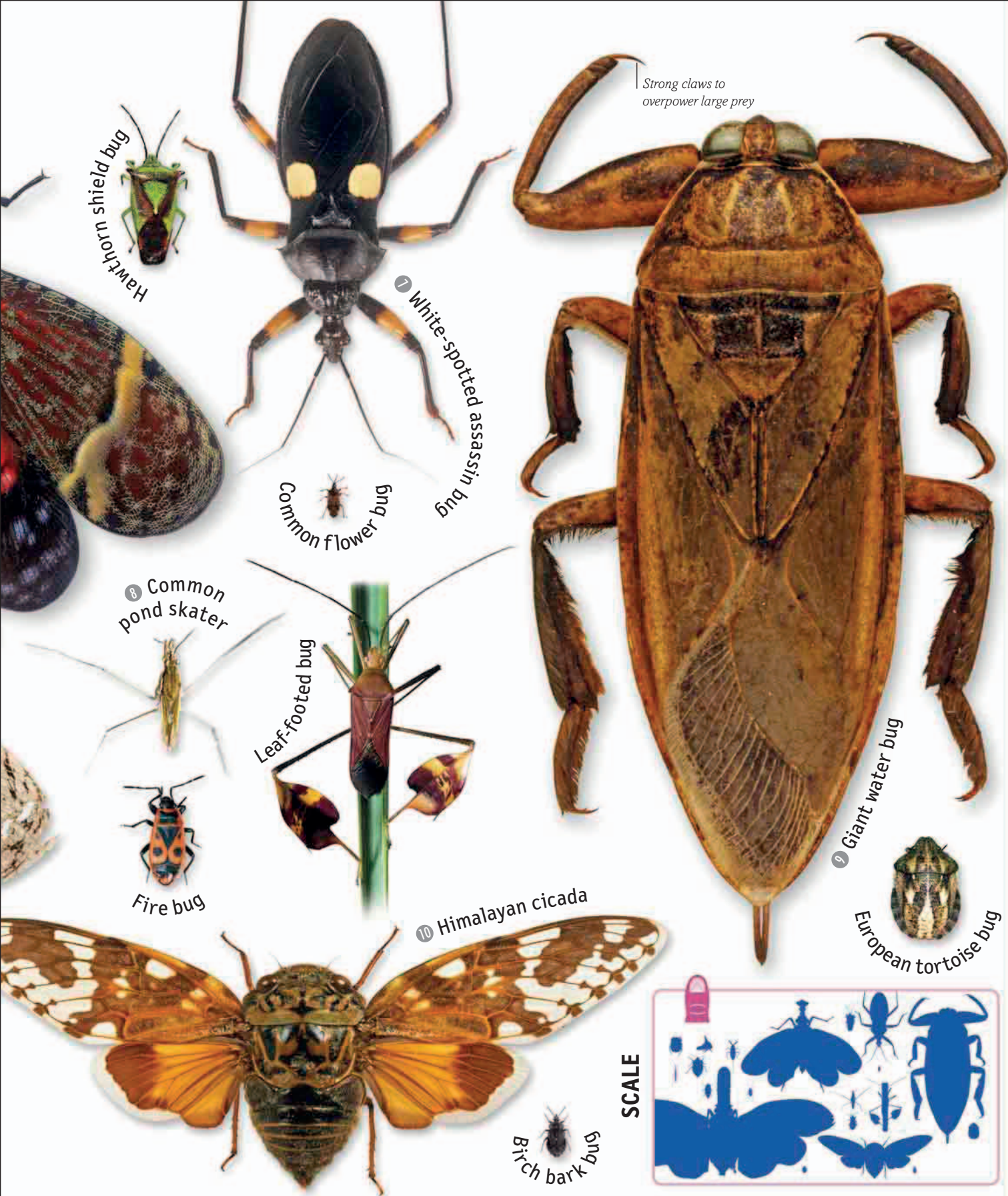
underground burrows, feeding on worms, roots, and grasses. Like real moles, it has massive front legs that work as shovels. The **oak bush cricket** ⑥ is a hunter, while the **African cave cricket** ⑦ feeds on almost anything, from bat droppings to carrion. The huge **violet-winged grasshopper** ⑧ comes from South America. Measuring up to 12 cm (5 in) long, it is even bigger than some birds.

True bugs and treehoppers



True bugs are a special group of insects that live in fresh water as well as on land. They have sharp mouthparts for sucking up liquids. Some feed on plant sap, while others eat blood or fluids from their partly digested prey. Sap-sucking bugs feed in the open, and often use camouflage to hide. The **thorn bug** ① has an amazingly realistic spike that looks just like a thorn. Tropical species,

such as the **wart-headed bug** ②, can be bigger than some butterflies. This bug has brightly coloured hindwings to startle enemies that get too close. The green colour of the **common green shield bug** ③ helps it to blend in among leaves. Young **spittle bugs** ④ shelter inside nests of foam, which protect them from hungry birds. The **peanut-headed bug** ⑤, another tropical species, has large eye spots on its



hindwings to confuse predators. The **bed bug** (6) is a flightless parasite, which emerges after dark to suck human blood. Many predatory bugs ambush their prey. On land they include the **white-spotted assassin bug** (7) and its many relatives. In fresh water, predatory bugs are even more common. Some, such as the **common pond skater** (8), live on the water's surface, attacking other insects that crash

land. A strong swimmer, the **giant water bug** (9) is big enough to prey on frogs and fish. It can even give humans a painful bite. Most bugs are silent, but some make amazingly loud sounds. Male **Himalayan cicadas** (10) attract females by making a deafening courtship song. Like other cicadas, they sing when they are adult, but the rest of their lives is spent feeding on roots underground.



PRAYING MANTIS

With strange angular features and triangular heads, praying mantises look almost like creatures from another planet. They are instantly recognizable by their long, folded front legs, held up together as if in prayer. These can lash out with astonishing speed to catch hold of live prey. Some species, such as this Thai boxer praying mantis, are brightly coloured, but most blend in with their surroundings.

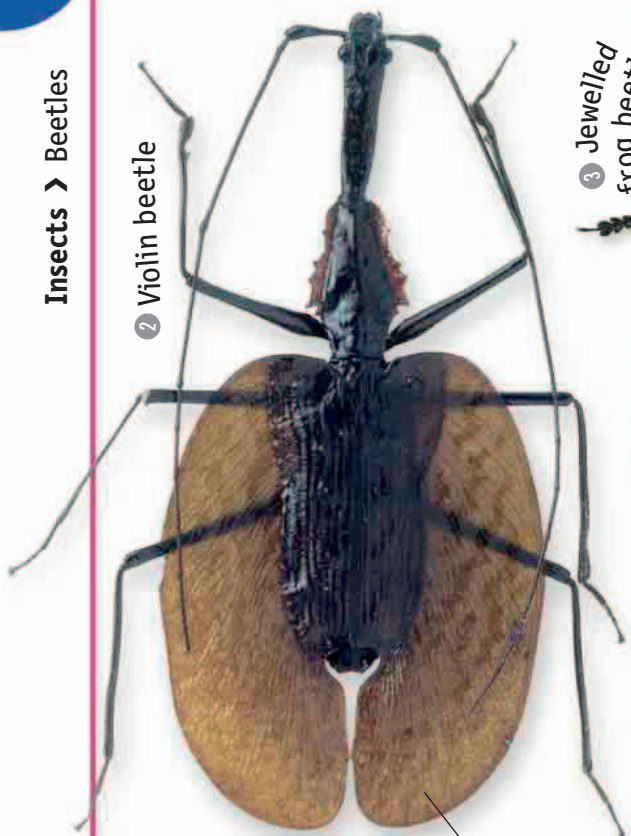


Size > 1.2–15 cm ($\frac{1}{2}$ –6 in) **Weight** > up to 10 g ($\frac{1}{3}$ oz)
Habitat > Rainforests and jungles. **Distribution** > Tropical areas, especially Africa, Southeast Asia, and Australia. Also South and Central America and the southern USA. Some species are also found in Europe, Central Asia, and Japan.
Diet > Flying insects such as moths, grasshoppers, flies,

and other mantises. Females eat males after, or even during, mating. **Breeding** > Females lay hundreds of eggs in an egg case stuck to a plant or buried in the ground. Eggs hatch into nymphs. **Lifespan** > 10–12 months. **Predators** > Large birds, frogs, chameleons, snakes, bats, and monkeys. Mantises protect themselves by camouflage.

Beetles

2 Violin beetle



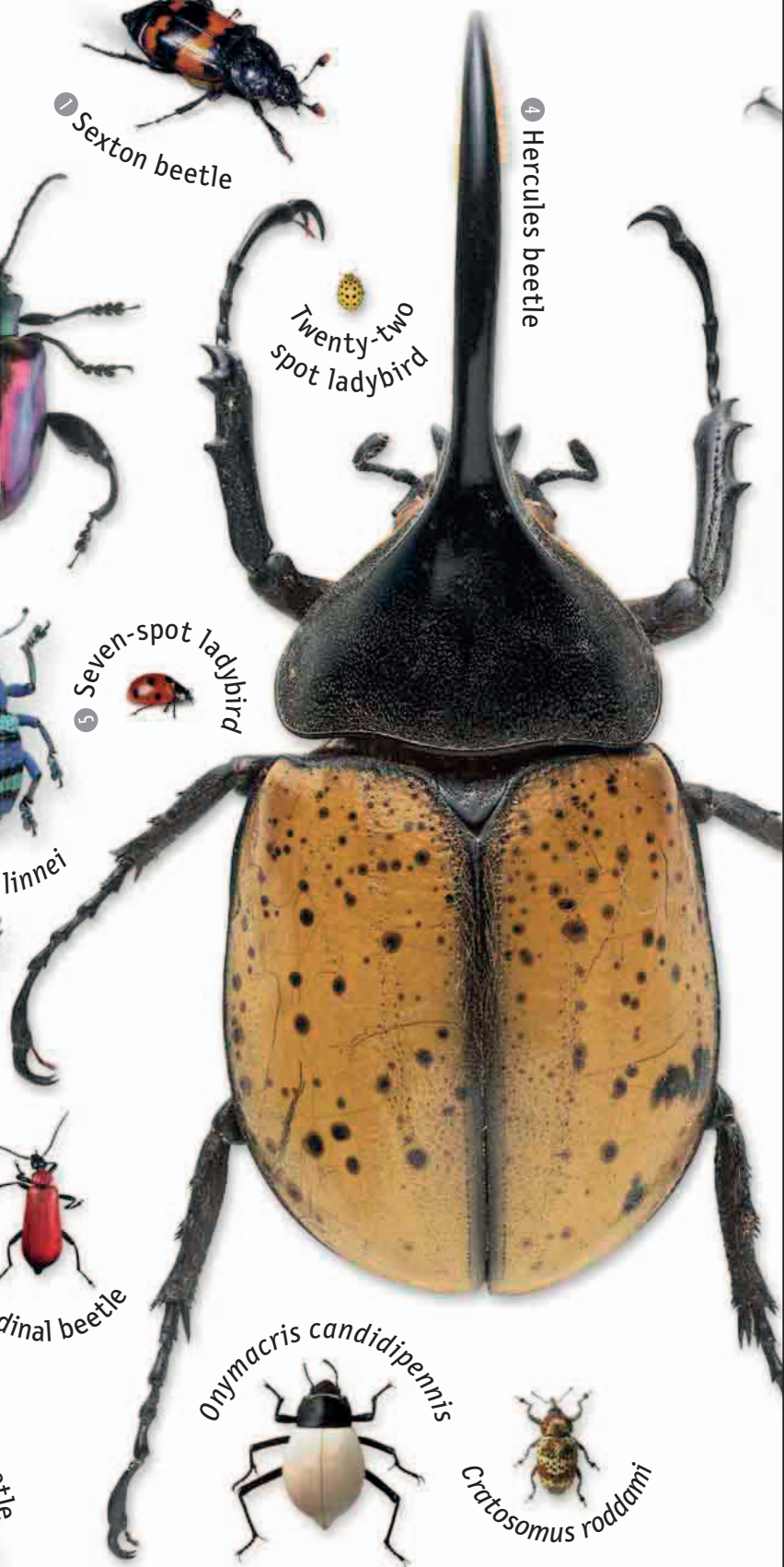
3 Jewelled frog beetle



1 Sexton beetle



4 Hercules beetle



Twenty-two spot ladybird



5 Seven-spot ladybird



Eupholus linnei

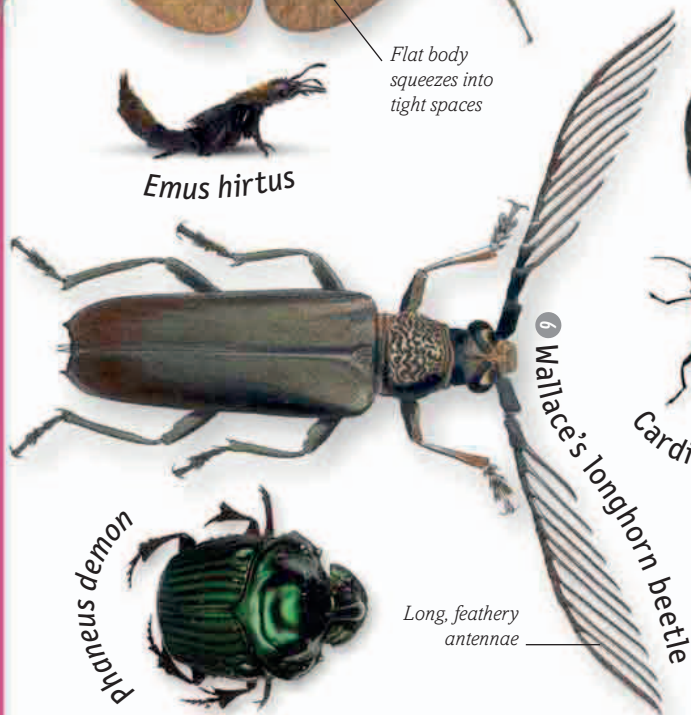


Flat body
squeezes into
tight spaces

Emus hirtus



6 Wallace's longhorn beetle



Cardinal beetle



Phanaeus demon



Long, feathery
antennae

Onymacris candidipennis

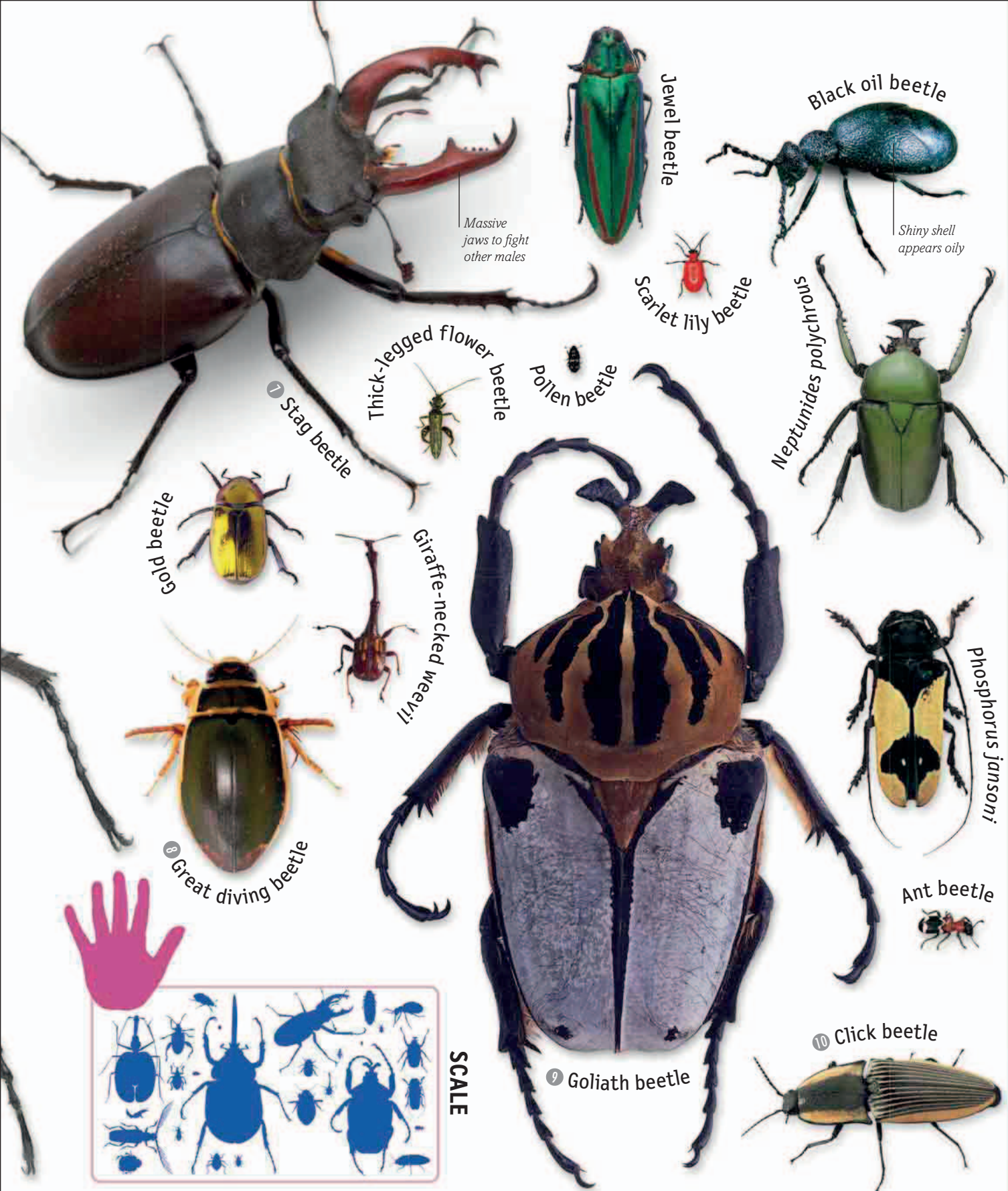


Cratosomus roddami



With around 400,000 species, beetles make up by far the largest group of insects. They start life as larvae, also known as grubs. Adults usually have two pairs of wings. Their front wings, called elytra, are specially hardened and fit over the hindwings like a case. Beetles eat a huge range of different foods. The **sexton beetle** 1 buries the dead bodies of small birds and rodents such as mice. The female

lays eggs in these remains, so her grubs have their own private food supply. The **violin beetle** 2 squeezes its flat body under tree bark, where it feeds on other insects and snails. The grubs of the **jewelled frog beetle** 3 grow up inside plant stems. Beetles vary greatly in size. While the smallest could easily fit on the head of a pin, the biggest kinds, such as the **Hercules beetle** 4, can be more than



15 cm (6 in) long. The **seven-spot ladybird** 5 feeds on aphids, making it a useful ally for farmers and gardeners. **Wallace's longhorn beetle** 6 grubs bore into living trees, while **stag beetle** 7 grubs live in rotting wood. They stay hidden for up to six years, before turning into adults. Adult males fight with their antler-shaped jaws and the winner gets a chance to mate. The **great diving beetle** 8 is found

in ponds and streams, where it swims with back legs that work like a pair of oars. It eats tadpoles and even small fish. Measuring up to 10 cm (4 in) long, the **goliath beetle** 9 is the heaviest insect in the world. Its grubs can weigh up to 100 g (3½ oz). Beneath the soil's surface, **click beetle** 10 grubs, known as wireworms, chew their way through roots. They can cause serious damage to crops.

Butterflies and moths



1 Wallich's owl moth



Garden tiger



Adonis blue



Diva moth



2 Queen cracker



Regent skipper



Snout moth



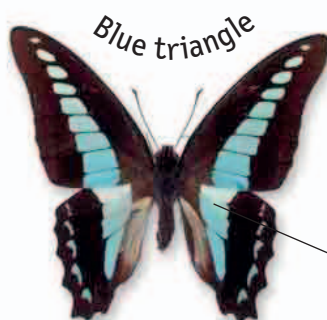
Australian magpie moth



3 Apollo



Oak eggar



Blue triangle



Blue tharops



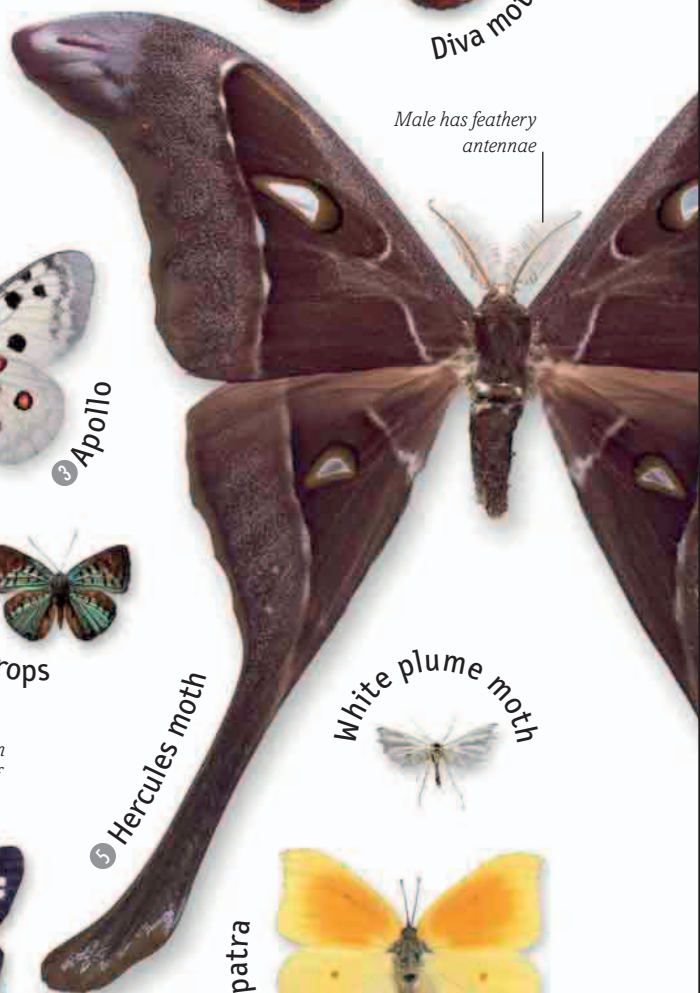
4 Madagascan sunset moth



Six-spot burnet



Coppery dysphania



5 Hercules moth



White plume moth



Cleopatra

Unlike other insects, butterflies and moths are covered with thousands of tiny scales, which create vivid patterns. Butterflies are often brightly coloured, while moths are usually drab. Most moths, including **Wallich's owl moth** 1, fly by night and use their camouflaged markings to hide during the day, but some fly by day and have eye-catching wings. Male **queen cracker** 2 butterflies click

their wings when they fly as a way of marking their territory. **Apollo** 3 butterflies often live in cold climates on mountains, but far more butterflies and moths come from warm parts of the world. Often mistaken for a butterfly, the beautiful **Madagascan sunset moth** 4 is a daytime flyer. The **Hercules moth** 5 is one of the largest species, measuring up to 34 cm (13 in) across. From Papua New Guinea,



Purple emperor



Green dragontail



Hornet moth

Hornet colouring
deters predators



1 Monarch butterfly



Guava skipper



Tiger pierid



Clara's satin moth



Big greasy butterfly

8 Indian leaf butterfly



Narrow tail
mimics leaf stalk



9 Silk moth



Polyphemus moth

False eyes
frighten attackers



Small copper

10 American moon moth



Long
hindwing tail



Duke of Burgundy fritillary



Rajah Brooke's birdwing

Queen Alexandra's birdwing 6 is the world's biggest butterfly with a wingspan of up to 31 cm (12 in). It flies high up, and in the past collectors used shotguns to knock it out of the trees. The North American **monarch butterfly** 7 is the greatest traveller, flying 4,500 km (2,800 miles) from Mexico as far north as Canada to breed. When winter comes, it flies all the way back again to escape the cold. **Indian leaf**

butterflies 8 are easy to spot with their wings open, but look just like dead leaves with them closed. **Silk moths** 9 have been bred in captivity for thousands of years. Silk is made by unwinding the cocoons that shelter their caterpillars. The **American moon moth** 10 lives for less than a week as an adult. Like many other moths, it only eats as a caterpillar. Adults do not have working mouths.

⑪ Purple mort bleu



Blue night butterfly



SCALE



Silver-spotted ghost moth



⑫ Acacia carpenter moth



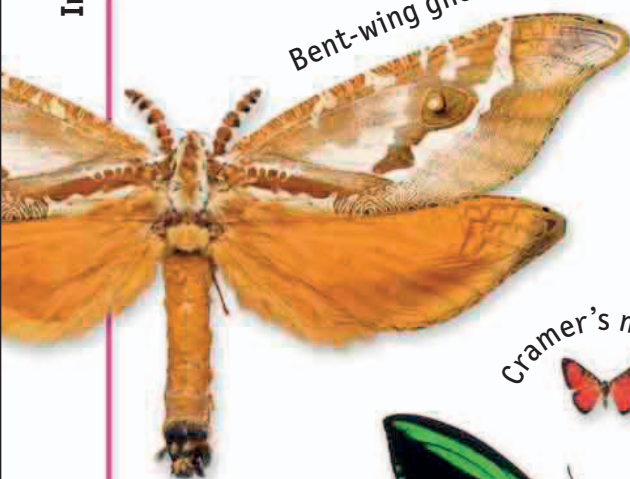
White admiral



Large emerald



Bent-wing ghost moth



⑬ Tiger swallowtail



Drinker moth



Cramer's mesene

Narrow tail
on hindwing

Ilia underwing

Elephant hawk moth



Cairns birdwing



⑭ Zebra swallowtail



⑮ Swallowtail



⑯ Scarce swallowtail



California dog-face



Black-veined white



Butterflies and moths live their lives in four stages: egg, caterpillar, pupa, and adult. The caterpillar stage is the main feeding period, and butterflies and moths are often very choosy about their food. The **purple mort bleu** ⑪, from Central and South America, grows up on bamboo leaves, while in Australia caterpillars of the **acacia carpenter moth** ⑫ bore their way into wattle or acacia trees.

The **tiger swallowtail** ⑬ from North America lays its eggs on many kinds of plants, but the **zebra swallowtail** ⑭ always picks out pawpaw trees. The **swallowtail** ⑮ and **scarce swallowtail** ⑯ have caterpillars with inflatable coloured "horns". The horns suddenly appear if the caterpillar is touched, and they have a repulsive smell that helps to keep predators away. The **common morpho** ⑰, from Central



and South America, has striking, bright blue wings. The butterfly was once collected for use in jewellery because its blue colour does not fade even after it has died. The huge **Atlas moth** **18**, found in Southeast Asia, has the largest wing area of any butterfly or moth. At over 400 cm² (62 sq in), it is the size of a dinner plate. The **verdant sphinx** **19** and its relatives are some of the fastest fliers. Narrow wings and

streamlined abdomens help these moths to attain top speeds of more than 35 kph (22 mph). The **owl butterfly** **20** gets its name from the huge eyespots on its hindwings. They give it a scary "face", making birds think twice before risking an attack. The **giant Agrippa** **21** has the biggest wingspan of any insect. The largest giant Agrippa moth on record measured 36 cm (14 in) from tip to tip.



SLUG MOTH CATERPILLAR Butterflies and moths begin life as wingless larvae called caterpillars. Some of these are hard to spot but others, such as this slug moth caterpillar from Papua New Guinea, are brightly coloured and bizarrely shaped. You might expect such a colourful creature to develop into an equally striking adult, but fully developed slug moths are often dull in colour.



Size > Variable, but small **Habitat** > Lowland forest, swamps, and mangroves. **Distribution** > Tropical, subtropical, and some temperate areas, including the eastern USA, sub-Saharan Africa, South and Southeast Asia, and Australasia. **Diet** > In many species adults have no mouthparts. They do all their eating as caterpillars, devouring the leaves of plants such as

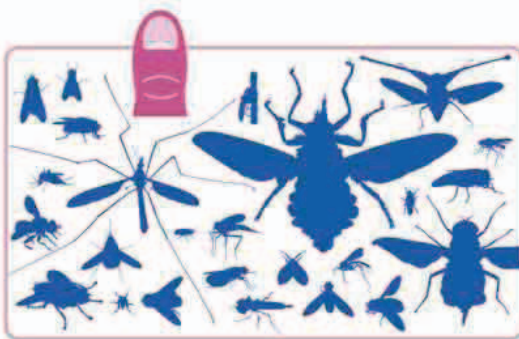
figs. Some species are seen as pests as they eat crops.

Breeding > Caterpillars retreat into hard, round cocoons, from which they emerge as adult moths. Adults mate and lay eggs that will hatch into new caterpillars. **Predators** > Parasitic flies and wasps. Pest species may be killed by humans.

Number of species > About 1,000 slug moth species.

Flies

SCALE

*Syrphus ribesii*

① House fly



② Bluebottle fly

③ Mosquito

*Sicus ferrugineus*

⑤ Bee fly

Long tongue
for feeding
at flowersSlender
abdomen

⑥ Bat fly

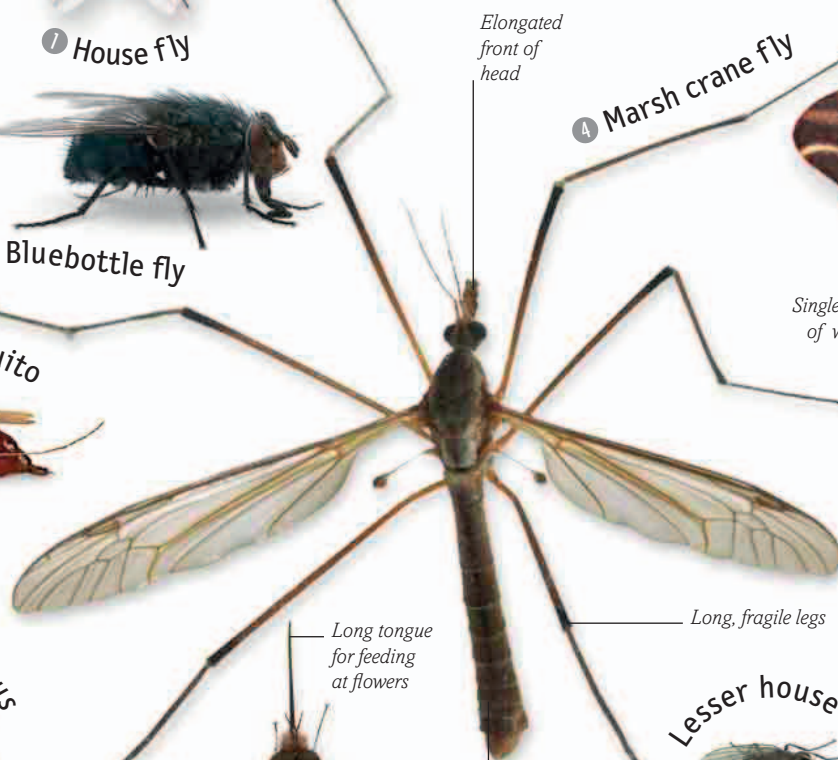


Flat, wingless body

⑦ Drone fly

Sticky body
helps to carry
pollen to plants

④ Marsh crane fly

Elongated
front of
headSingle pair
of wings

Marsh snipe fly



Savannah tsetse fly



Buzzer midge



St Mark's fly

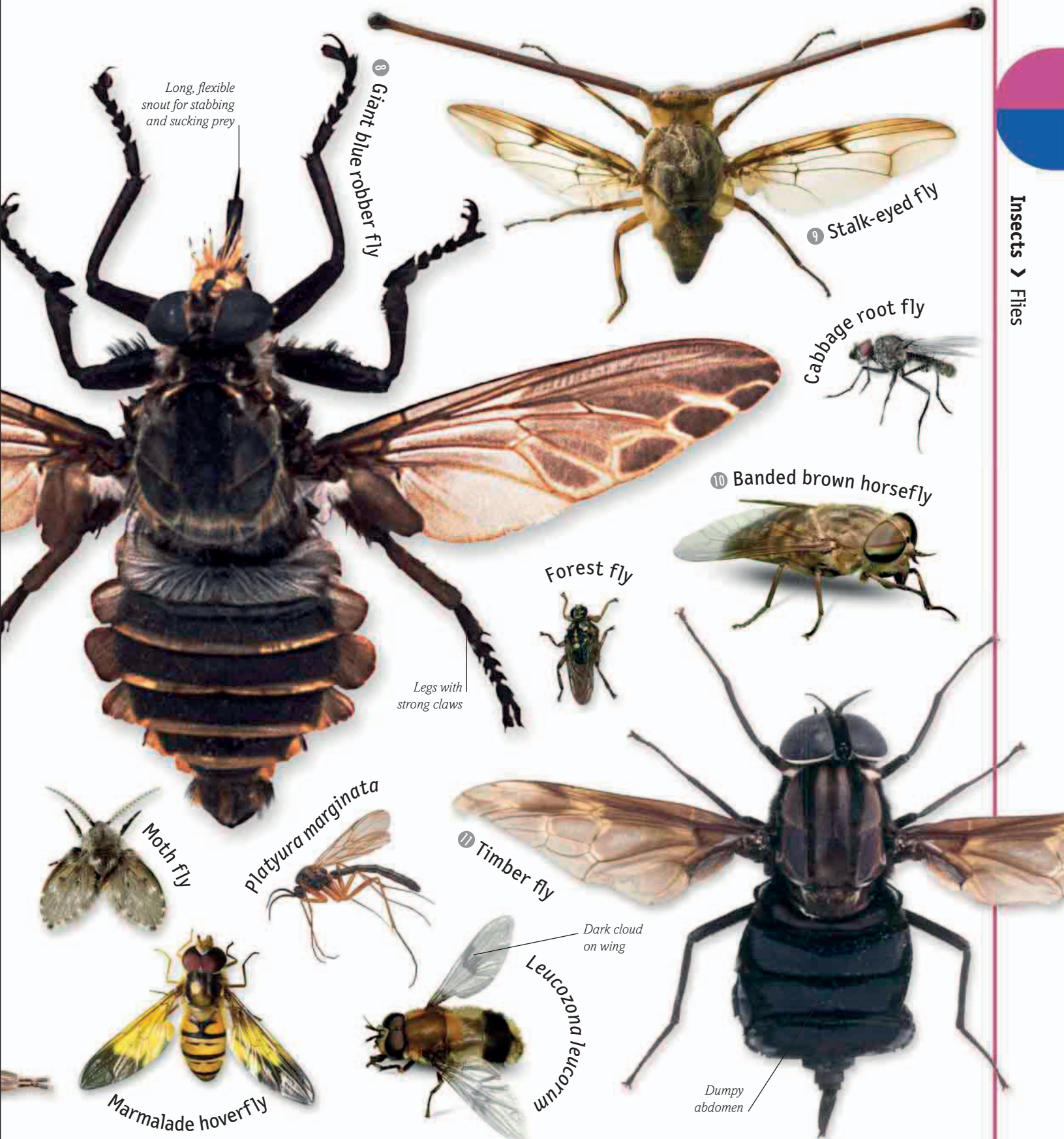


Flesh fly



Flies include some of the world's most helpful insects, as well as some of the most harmful ones. Many of them have bristly bodies, and most have just one pair of wings. In place of the rear wings, they have a pair of tiny knobs. These work like an aircraft's gyroscopes, keeping the fly stable in the air so it can perform extreme aerobatics. These include landing upside down and hovering steadily

in mid-air. The humble **house fly** ① is the best-known of these insects, with an annoying habit of flying indoors. It eats anything sweet and spreads germs as it feeds. The **bluebottle fly** ② lays its eggs on meat and carrion, which its maggots burrow into, eating as they go. **Mosquitoes** ③ have sharp mouthparts and drink blood by piercing the skin of other animals. In some parts of the world they carry parasites



that can cause malaria and other killer diseases. The **marsh crane fly** 4 has extra-long legs that break off if it is touched. **Bee flies** 5 do a useful job by pollinating flowers. The **bat fly** 6 has no wings. It does not need them because it spends its adult life in the fur of bats. **Drone flies** 7 are very good at mimicking honey bees. Like bee flies, they are effective pollinators. The awesome-looking **giant blue**

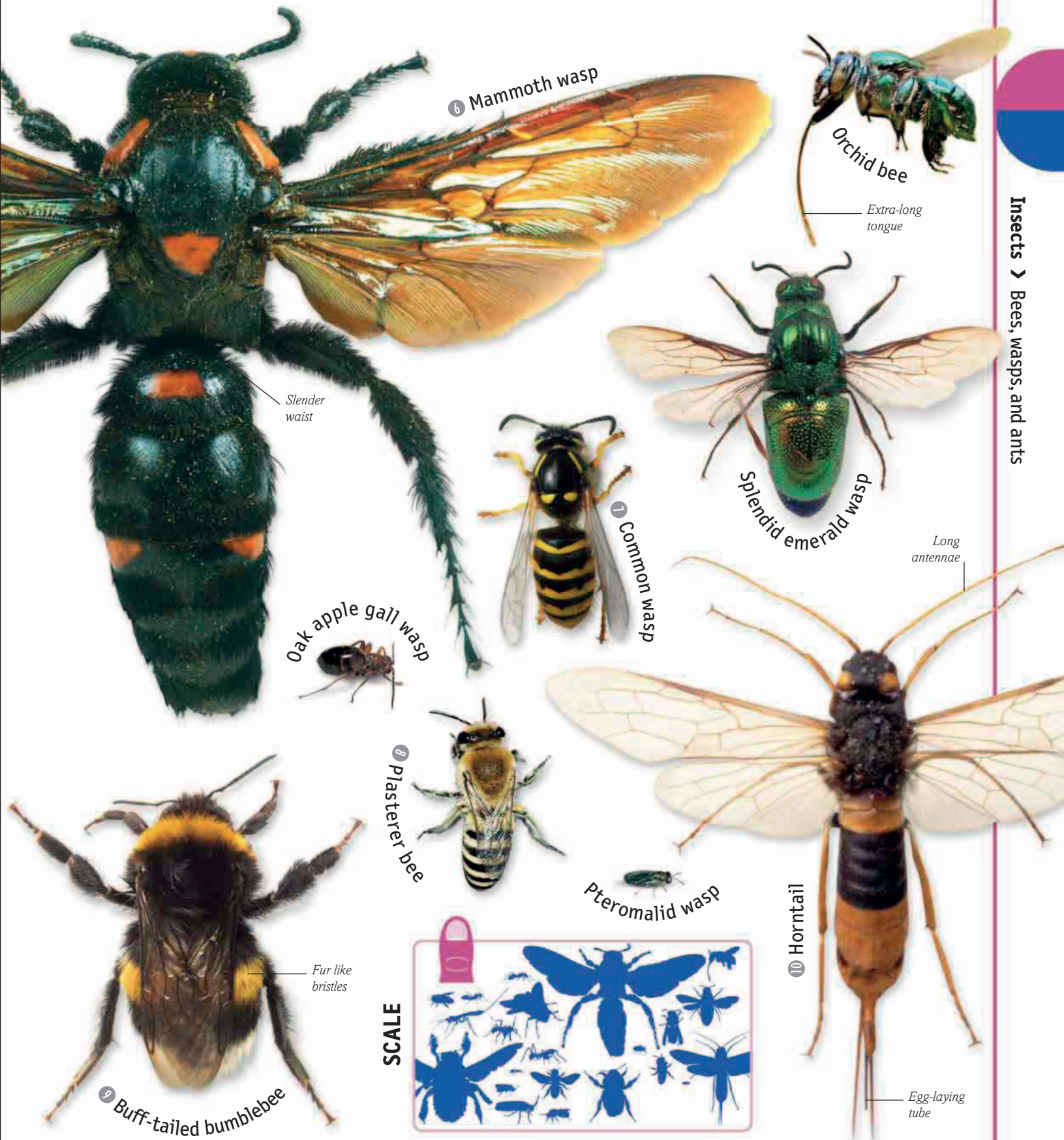
robber fly 8 from Australia grabs other insects on the wing, and flies with a distinctive buzzing sound. Male **stalk-eyed flies** 9 have bizarre heads with eyes set far apart. In the breeding season, males stand head to head, and the one with the widest eyes wins. The **banded brown horsefly** 10 bites horses, and sometimes humans, too, but **timber flies** 11 are harmless and do not feed at all as adults.

Bees, wasps, and ants



Bees and their relatives are very useful insects. Although many of them pack a painful sting, they help farmers by pollinating crops and killing pests. Apart from sawflies, they all have slender waists and most have two pairs of transparent wings. **Honey bees** ① live in nests containing thousands of workers ruled by a single queen. The queen lays the eggs, while the worker bees build the nest, collect food,

and care for the young. **Army ants** ② also live together but do not make a permanent home. Instead, millions of them rush across the rainforest floor, grabbing small animals with their powerful jaws. The **great carpenter bee** ③ feeds on nectar from flowers, and lays its eggs in tunnels in dead wood. Like other bees, it uses its sting only if attacked. **Leaf-cutter ants** ④ make giant nests underground, and feed on a special

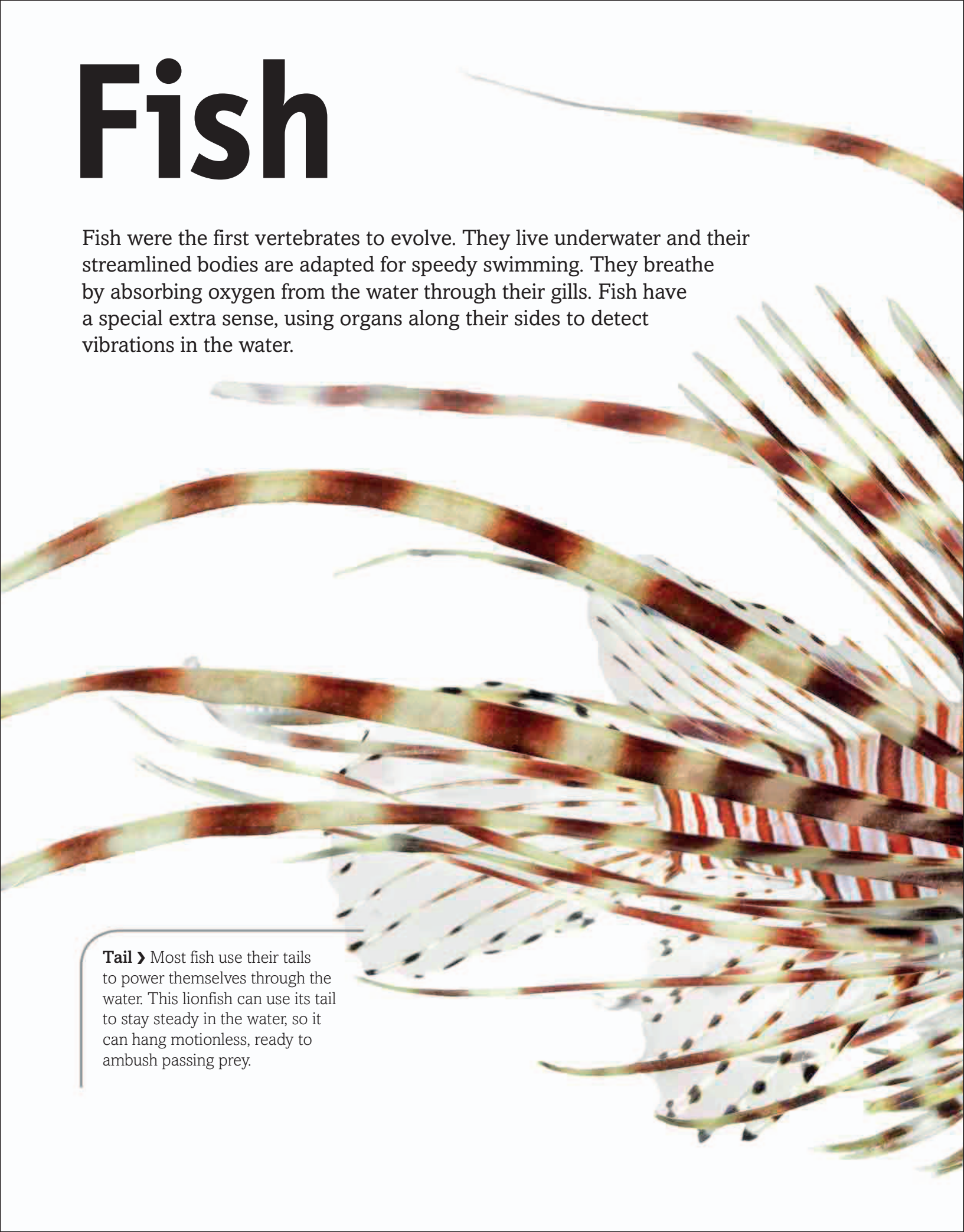


fungus which they grow on chewed-up leaves. These ants are harmless, but some others are not. Tropical **fire ants** 5 have a vicious sting that feels worse than a burn. The **mammoth wasp** 6 is a predator. It paralyzes the grubs of scarab beetles and lays eggs on their bodies, so its young have a private food supply. **Common wasps** 7 make papery nests, and help to get rid of pests by hunting insects to feed their

young. **Plasterer bees** 8 and **buff-tailed bumblebees** 9 nest in the ground. Plasterer bees waterproof the walls of their nests with a fluid from their bodies. Bumblebees have furry insulation which lets them fly in the cold days of early spring. They are good crop pollinators. The **horntail** 10 looks dangerous, but cannot sting. Females lay their eggs in pine trees, and their grubs feed by chewing through wood.

Fish

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



Tail ▶ Most fish use their tails to power themselves through the water. This lionfish can use its tail to stay steady in the water, so it can hang motionless, ready to ambush passing prey.

Animals

Fish

Features

- Mostly lay eggs to reproduce



- Live underwater



- Absorb oxygen from the water using gills



- Swim with the help of fins and a tail



- Are mostly cold-blooded



Fins > Fish fins consist of bony spines linked by membranes. The fish uses them to steer its body through the water. In some species they are adapted for other purposes such as burrowing into mud or sand to hide.

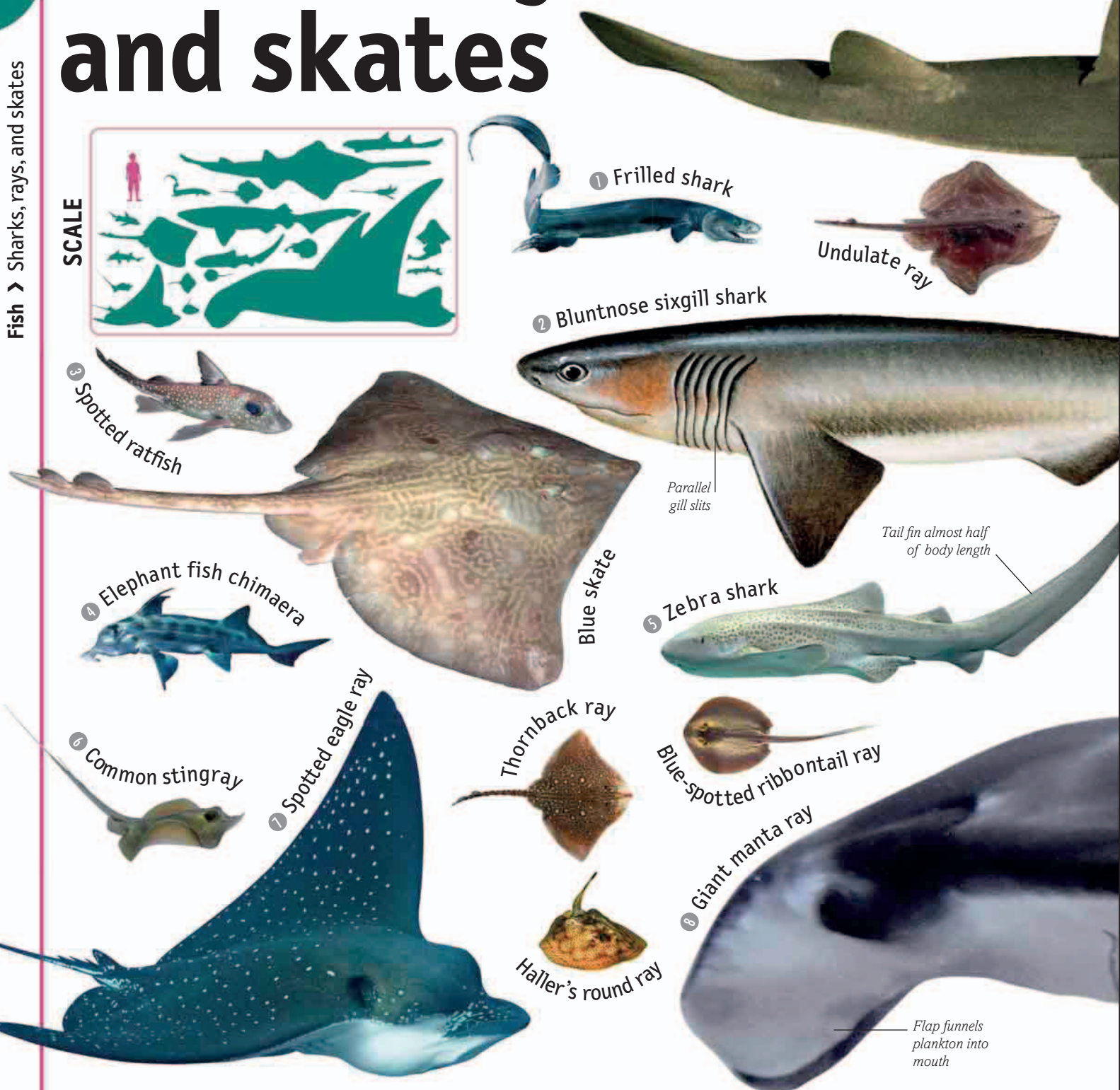
This lionfish can inject venom through spines in some of its fins.

Red lionfish

Gills > Like all animals, fish need oxygen to survive, which they absorb from the water using gills. As the fish swims, water constantly flows across a stack of fine membranes inside the gills, through which oxygen passes into the fish's bloodstream.

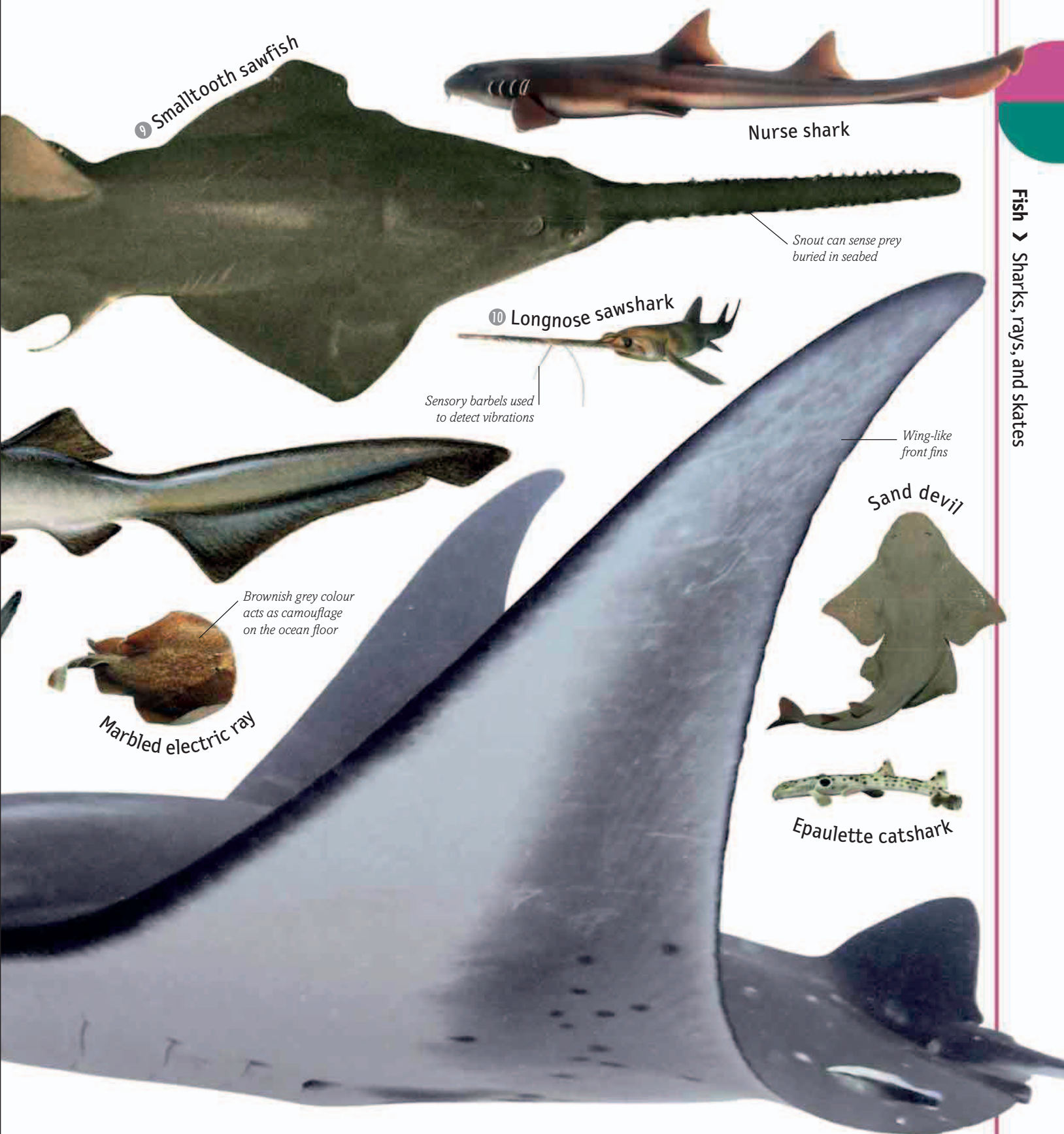
Sharks, rays, and skates

SCALE



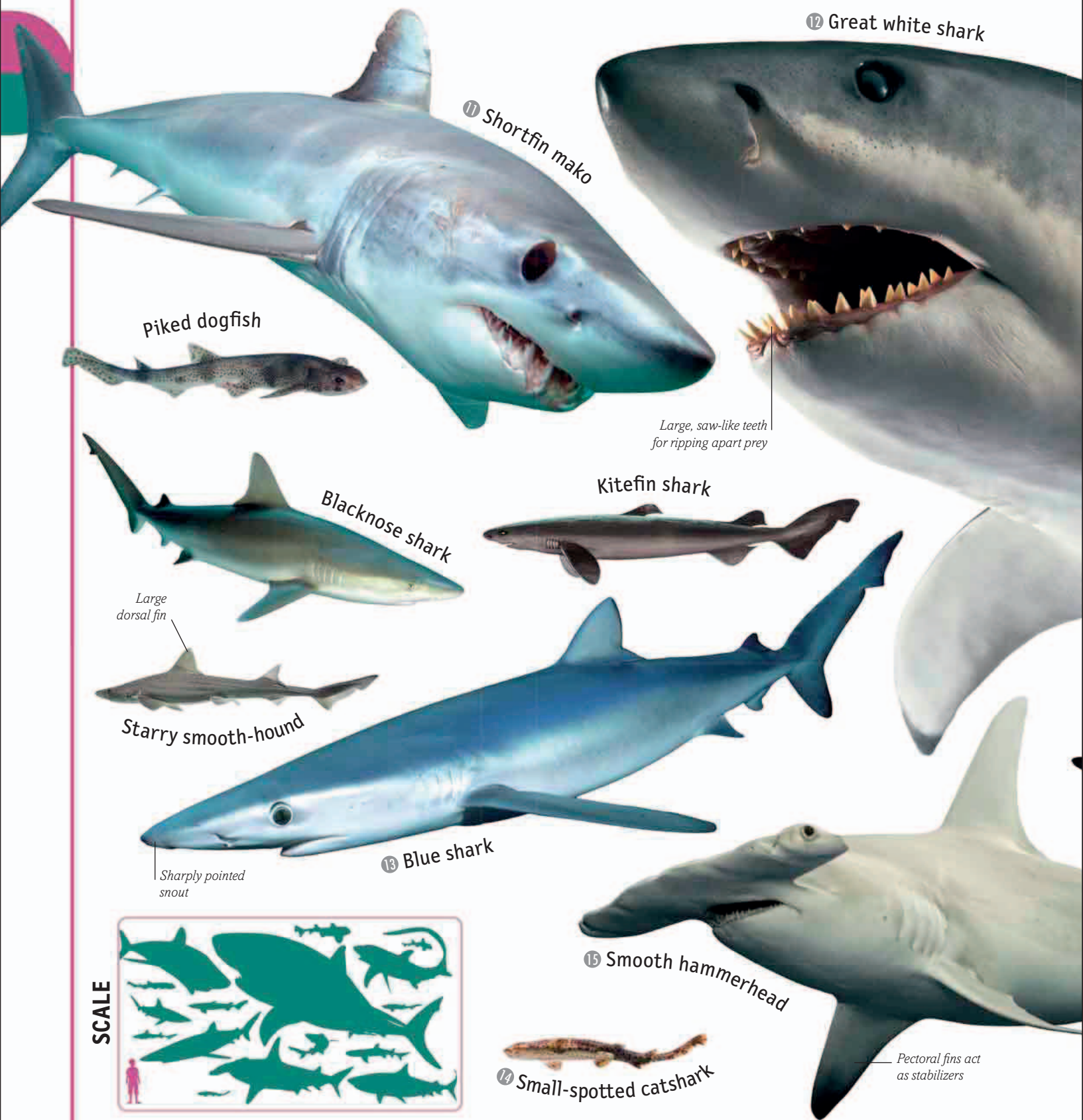
Razor-sharp teeth and powerful jaws make sharks the most fearsome hunters in the seas. Like skates and rays, they have skeletons made of cartilage or gristle. **Frilled sharks** ① and **bluntnose sixgill sharks** ② live in deep water, but many other sharks live near the surface, in open water or close to the shore. Most sharks have a streamlined body and several rows of sharp teeth, which are constantly

replaced throughout their lives. Their relatives chimaeras, a group of blunt-headed fish, have teeth that last the whole of their lives. The **spotted ratfish** ③ and **elephant fish chimaera** ④ use their flat teeth for crushing molluscs and crabs. Some sharks have to swim non-stop to breathe, but **zebra sharks** ⑤ spend the day resting on the seabed, waking up to hunt after dark. Skates and rays have wing-like front fins



and mouths on their undersides. Some kinds, including the **common stingray** 6, have a venomous spine in their tails. Accidentally treading on these fish can be very dangerous. In some cases, a single jab from a spine can kill a person. Rays swim by beating their front fins like a bird's wings. The **spotted eagle ray** 7 feeds on seabed animals, while the **giant manta ray** 8 scoops up plankton as it "flies" through the open sea.

Measuring up to 9 m (30 ft) across, this colossal but harmless fish is the largest ray in the world, with an exceptionally big brain. The **smalltooth sawfish** 9 is a rare and unusual ray with a toothed snout like a saw. It uses this to dig up animals in the seabed and to slash at other fish that come nearby. The **longnose sawshark** 10 looks similar, but is much smaller, with two barbels, or feelers, attached to its snout.



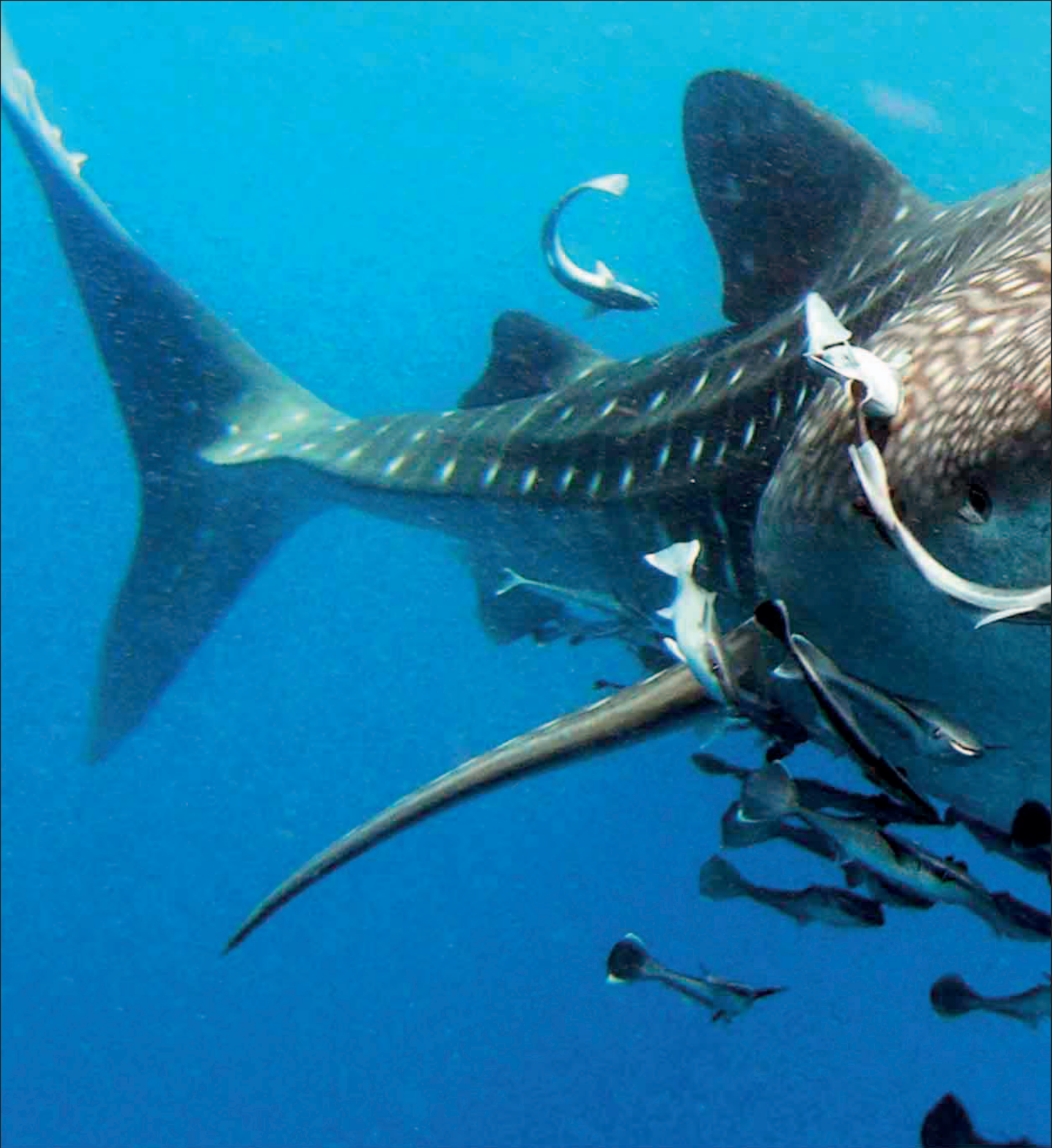
Some of the world's biggest sharks roam the open seas. The **shortfin mako** 11 is one of the fastest of these tireless hunters. In short bursts, it can swim at more than 70 kph (43 mph). Makos feed mainly on fast-swimming fish and squid, but the **great white shark** 12 has a taste for seals, dolphins, and occasionally humans, too. Growing up to 7 m (24 ft) in length, and weighing as much as 2 tonnes,

this gigantic and much-feared predator typically attacks from below, and sometimes bursts out of the water as it slams into its prey. The beautifully streamlined **blue shark** 13 travels thousands of kilometres a year, between the places where it feeds and the places where it breeds. Like most large sharks it gives birth to live young. **Small-spotted catsharks** 14 and their relatives lay eggs with leathery cases. Called



“mermaid’s purses”, they can take over a year to hatch. The **smooth hammerhead** 15 belongs to a family of sharks with strange T-shaped heads. Its eyes are at each end of the head, enabling it to see all around as it swims. **Port Jackson sharks** 16 and **horn sharks** 17 live on the seabed. They have downward-facing mouths and flat back teeth, which crunch up molluscs and other hard-bodied animals. The

thresher shark 18 is an open-water predator. Its extra-long tail works like a whip, stunning other fish and making them easy to catch. **Blacktip reef sharks** 19 and **whitetip reef sharks** 20 rarely harm humans, but the **bull shark** 21 is a notorious man-eater, with a habit of swimming up rivers and cruising close to the shore. Despite its size, up to 3.4 m (11 ft) long, it can hunt in water just 1 m (3 ft) deep.



WHALE SHARK By far the largest fish in the world, the whale shark has a huge mouth that stretches almost as wide as its whole body, armed with up to 300 rows of tiny teeth. However, despite its fearsome appearance, this gentle giant feeds on plankton. In fact, it is often followed by shoals of smaller fish that keep the shark clean by eating bacteria and debris from its mouth.



Size > 7–12 m (23–40 ft). Some may grow even larger.
Weight > Up to 18½ tonnes **Habitat** > Tropical and warm temperate seas. They migrate thousands of kilometres every year. **Distribution** > Pacific, South Atlantic, and Indian Oceans. **Diet** > Plankton, small fish, and crustaceans. Whale sharks feed by taking in water then pushing it through their

gills to filter out the food. **Breeding** > The female carries up to 300 embryos and gives birth to live young. **Lifespan** > Unknown but thought to be up to 150 years. **Predators** > Adults have no enemies except humans. Other sharks, sailfish, and killer whales may attack the young. **Conservation status** > Vulnerable due to hunting.

Saltwater fish



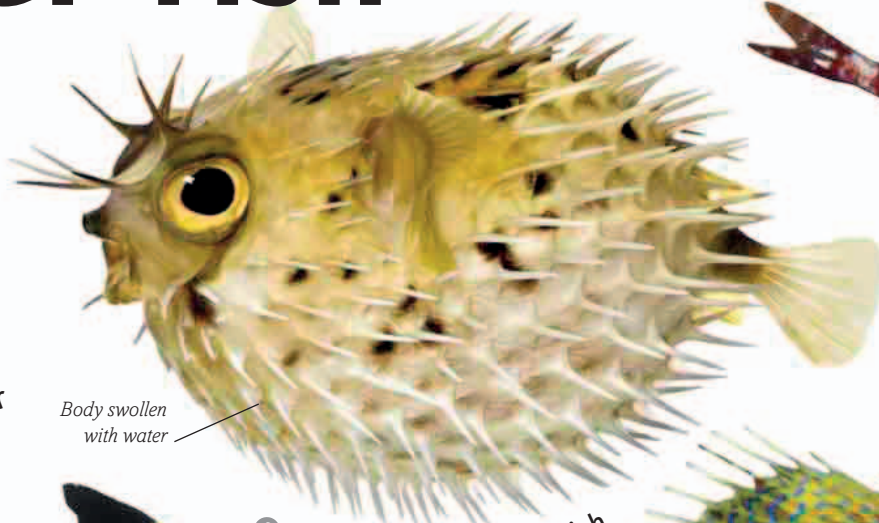
① Spotted boxfish



White-spotted puffer



Warty frogfish



② Long-spine porcupinefish



③ Clown triggerfish

Spiny front
fins can grip
seaweed



④ Sargassumfish

Large mouth has
blunt teeth adapted
for crushing prey



⑤ Zebra moray

Spotted garden eel

Tail burrows into
sand as anchor

Saltwater fish come in a mind-boggling variety of shapes, sizes, and colours, and scientists discover many new kinds every year. Rays and sharks have rubbery (cartilaginous) skeletons, but most saltwater fish have bony skeletons and are covered in scales. The **spotted boxfish's** ① scales fit together like armour plating, while the **long-spine porcupinefish** ② has scales with sharp spines. If it feels threatened, this fish

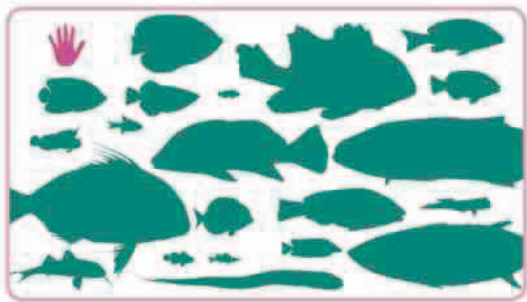
swallows lots of water and turns into a prickly ball. The **clown triggerfish** ③ lives in the Indian and Pacific Oceans and jams itself in coral reefs if danger comes its way. It feeds by crunching up sea urchins and other hard-shelled animals. The **sargassumfish** ④ lives in floating seaweed around the world. Even in broad daylight, its incredible camouflage makes it almost impossible to see. The **zebra moray** ⑤



comes out to feed at night. To firmly grip its prey, it has a second set of jaws in its throat, which can spring forward into its mouth. **Needlefish** 6 live near the surface of the sea. Large specimens have been known to spear people by jumping on to boats. The **red lionfish's** 7 striped colours warn predators that this fish is venomous. It defends itself by spreading out its poison-tipped fins. The **stonefish** 8

can give humans a lethal jab with its venomous spines. The **yellow seahorse** 9 swims with its body upright. Like other seahorses it is one of the world's slowest fish, with a maximum speed of just a few metres an hour. Male **coral toadfish** 10 make strange grunting or whistling sounds to attract females. After the females have laid their eggs, the males guard them until the young fish hatch and swim away.

SCALE



11 Emperor angelfish



Royal angelfish



12 Banded archerfish



Royal gramma



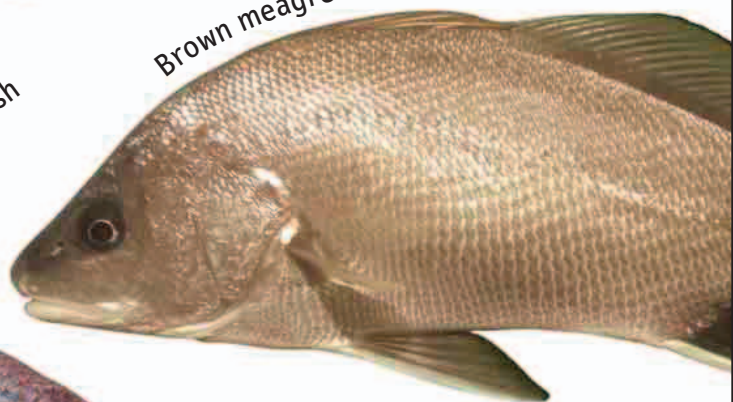
Long dorsal fin
raised like a sail

Butterfly blenny



Ochre-striped cardinalfish

Brown meagre



14 Powder-blue surgeonfish



Longnose hawkfish

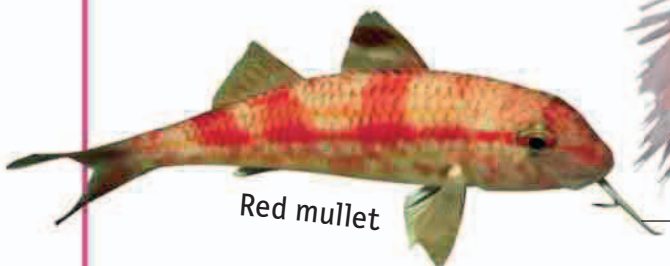


Slender body
fits in burrow

15 Clown anemonefish



Red mullet



Fleshy barbels help
detect buried prey

More fish live on coasts and coral reefs than anywhere else in the seas. The **emperor angelfish** 11 and its relatives are some of the most colourful reef-dwellers with vivid markings that change as they mature. **Banded archerfish** 12 live in estuaries in Southeast Asia. They look for insects on overhanging branches and knock them off by squirting a jet of water from their mouths. The **blue-spotted**

seabream 13 eats animals on the seabed, while the beautiful **powder-blue surgeonfish** 14 feeds mainly on algae and underwater plants. Surgeonfish look harmless, but when attacked they fight back using two sharp blades on either side of their tails. The **clown anemonefish** 15 hides in the tentacles of sea anemones. Unlike other fish, it is not harmed by their stings. **Common bluestripe snappers** 16



Harlequin sweetlips

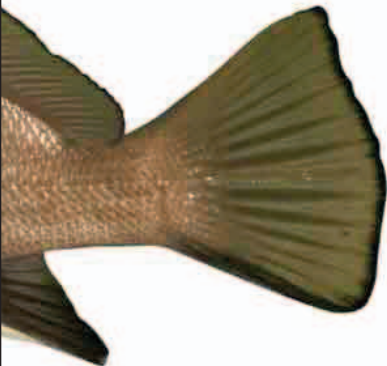


16 Common bluestripe snapper



17 Harlequin tuskfish

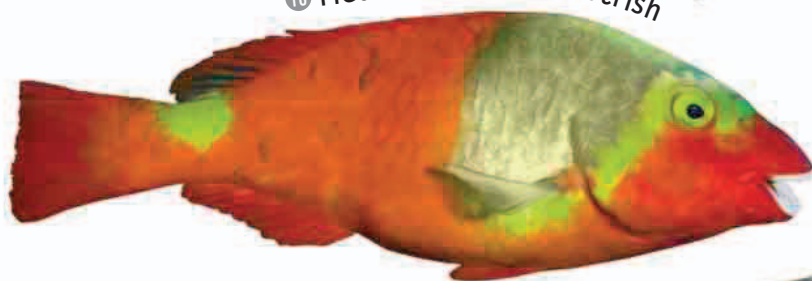
*Bold pattern
camouflages eyes*



Bluefish



18 Mediterranean parrotfish



Foxface rabbitfish



19 Atlantic mudskipper



Red bandfish



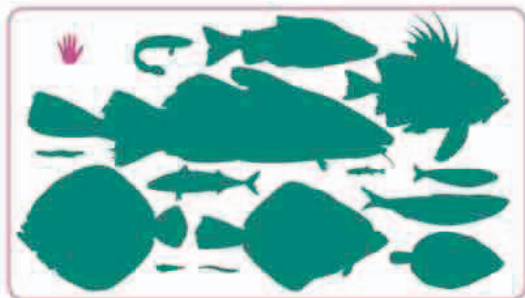
20 Albacore tuna



live on coral reefs. They move in fast-swimming shoals by day, dispersing at night to feed. **Harlequin tuskfish** 17 flip stones over with their teeth to get at small animals hiding underneath. The **Mediterranean parrotfish** 18 crunches up food with its beak-shaped mouth. Like many other parrotfish it starts out life as female, but may change into a male as it grows older. **Atlantic mudskippers** 19 live in

mangrove swamps where they climb up roots or hop across the mud. Their front fins work like stubby legs, and they can survive out of the water by breathing air through their skin. The **albacore tuna** 20 belongs to a family of high-speed swimmers with muscle-packed bodies and long, razor-like fins. Unlike most fish, tunas are warm-blooded, and can hurtle through water at up to 80 kph (50 mph).

SCALE



21 Shore rockling



Snake-like body

Three fins on back

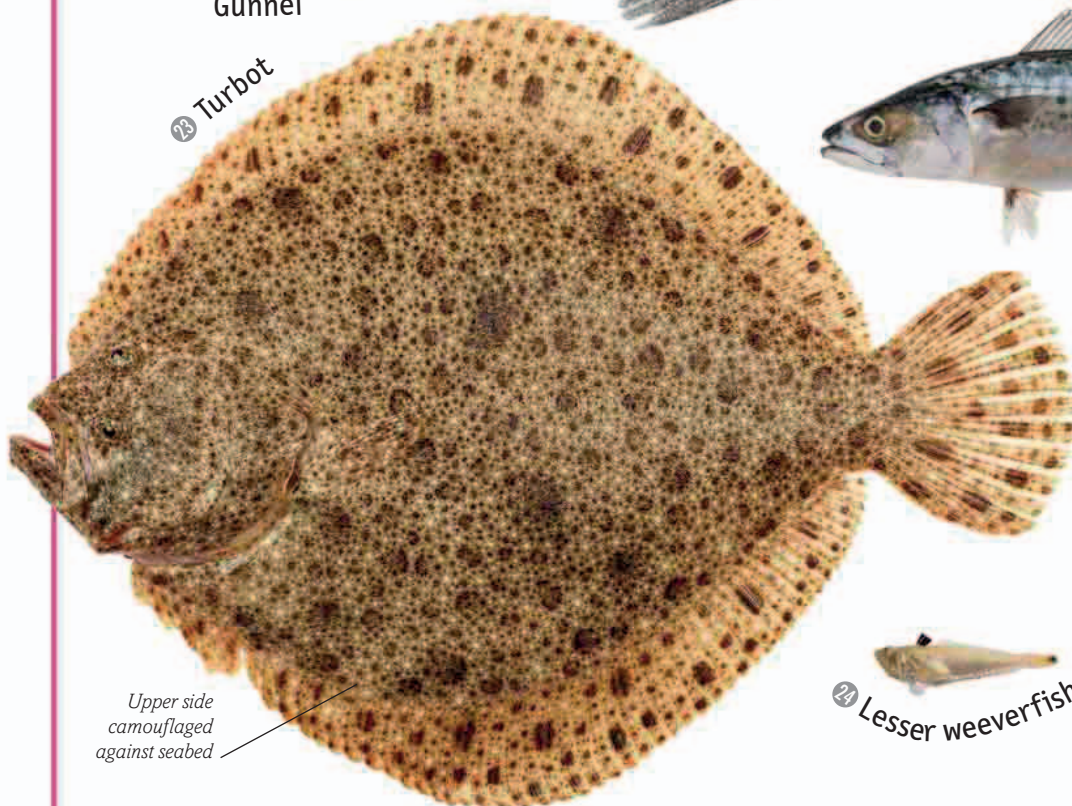


Slippery body without scales



Gunnel

23 Turbot



Upper side camouflaged against seabed

22 Atlantic mackerel



24 Lesser weeverfish

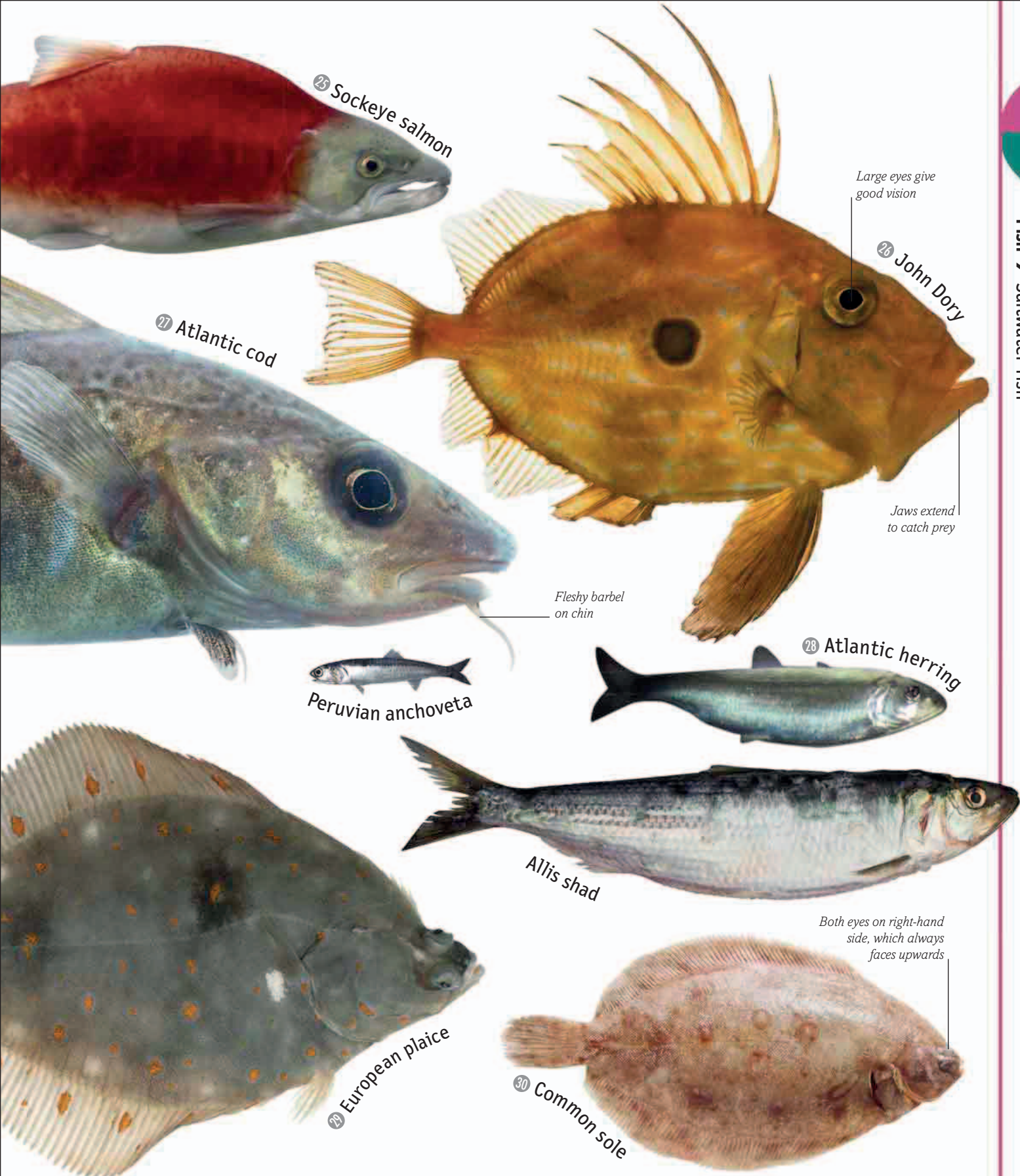


Small sandeel



Sea fish thrive in cold water because it is often full of food. **Shore rocklings** 21 search for shrimps and crabs in rock pools using sensitive whiskers or barbels. **Atlantic mackerels** 22 live in the open sea. Like tunas they have muscle-packed bodies and a streamlined shape for speeding through the water. They have to keep swimming, as they rely on the flow of water to breathe. **Turbot** 23 and other flatfish

live on the seabed. Very young flatfish look like other fish. As they grow up, one eye moves around their heads until, as adults, they swim on one side with both eyes facing up. The **lesser weeverfish** 24 also lives on the bottom, with its body half-buried near the shore. This venomous fish has spines on its back, which it raises to defend itself against predators. It can even give humans a painful sting. **Sockeye salmon** 25 spend



their adult lives in the northern Pacific Ocean but return to fresh water to breed. In some rivers, thousands of sockeyes fight their way upstream, creating a feast for fish-eating eagles and bears. The **John Dory** ²⁶ looks big when seen from the side, but it is good at sneaking up on other fish because its body is as thin as a human hand. The **Atlantic cod** ²⁷ and **Atlantic herring** ²⁸ are often fished for food. Cod can produce

5 million eggs every time they breed, but their numbers have plummeted due to overfishing. Herrings are some of the most common fish in seas. A single shoal can contain more than a billion members, attracting predators such as seals, whales, and larger fish. The **European plaice** ²⁹ and **common sole** ³⁰ are two flatfish that are highly prized as food. Both of them often hide on the seabed by covering themselves with sand.



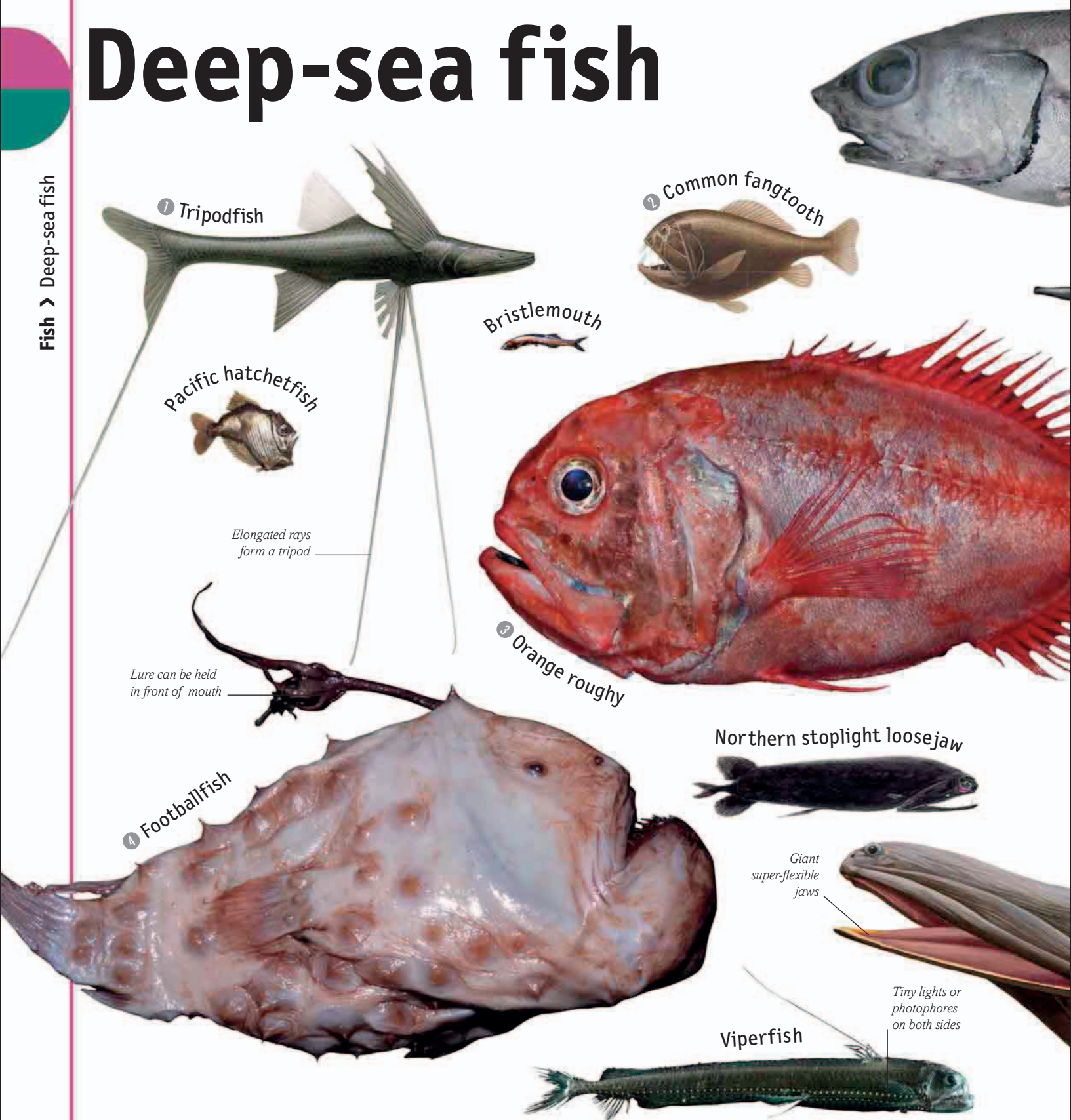
BLACK-STRIPED SALEMA These tropical fish are found in waters around the Galápagos Islands. They form huge schools of hundreds or thousands. When a predator approaches, the school bunches into a tight cluster known as a bait ball. By swarming together, splitting, and changing direction in a flash, these fish try to confuse predators, making it difficult for them to attack.



Size > Up to 30 cm (12 in) long **Habitat** > Reefs and rocky areas in shallow waters. They gather in large shoals during the day, but disperse at night. **Distribution** > Eastern Pacific Ocean, only around the Galapagos Islands. **Diet** > Plankton and fish larvae **Breeding** > The female releases eggs that float freely in the ocean. These eggs hatch into tiny larvae

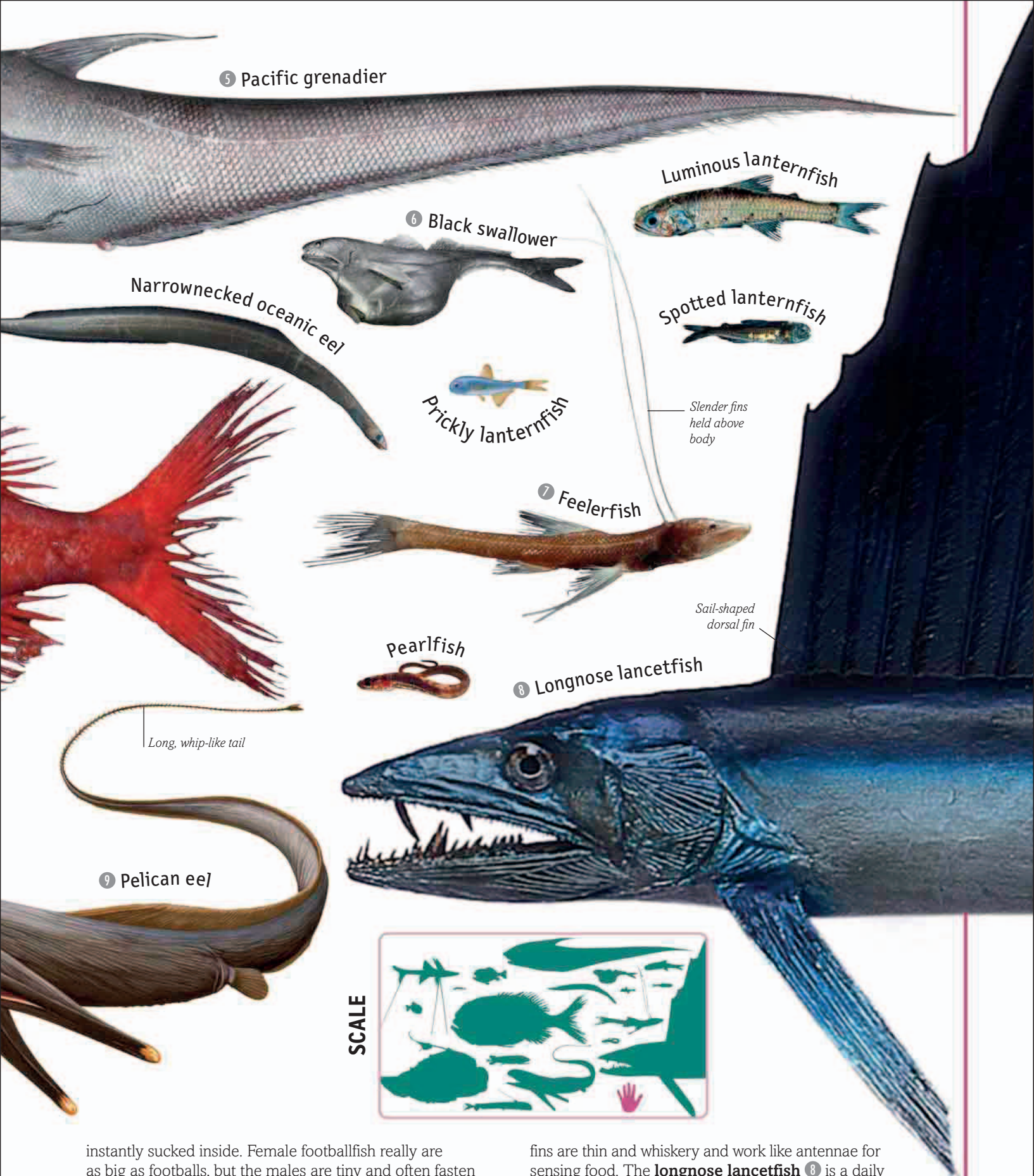
without scales or fins, which slowly develop into young fish. **Predators** > Dolphins, seals, penguins, and sharks. **Conservation status** > Vulnerable due to changes in its environment. Recently, a weather system called El Niño has disrupted the oceans around the Galapagos, increasing water temperatures, which may affect fish like these.

Deep-sea fish



The deep sea is dark, silent, and bitterly cold. The fish that live here have evolved strange shapes to survive. Food is hard to find, so deep-sea fish cannot waste any chance to catch a meal. The **tripodfish 1** perches above the seabed, propped up by three long rays that stick out from its fins. It faces into the current and catches small animals that drift by. The **common fangtooth 2** lives at

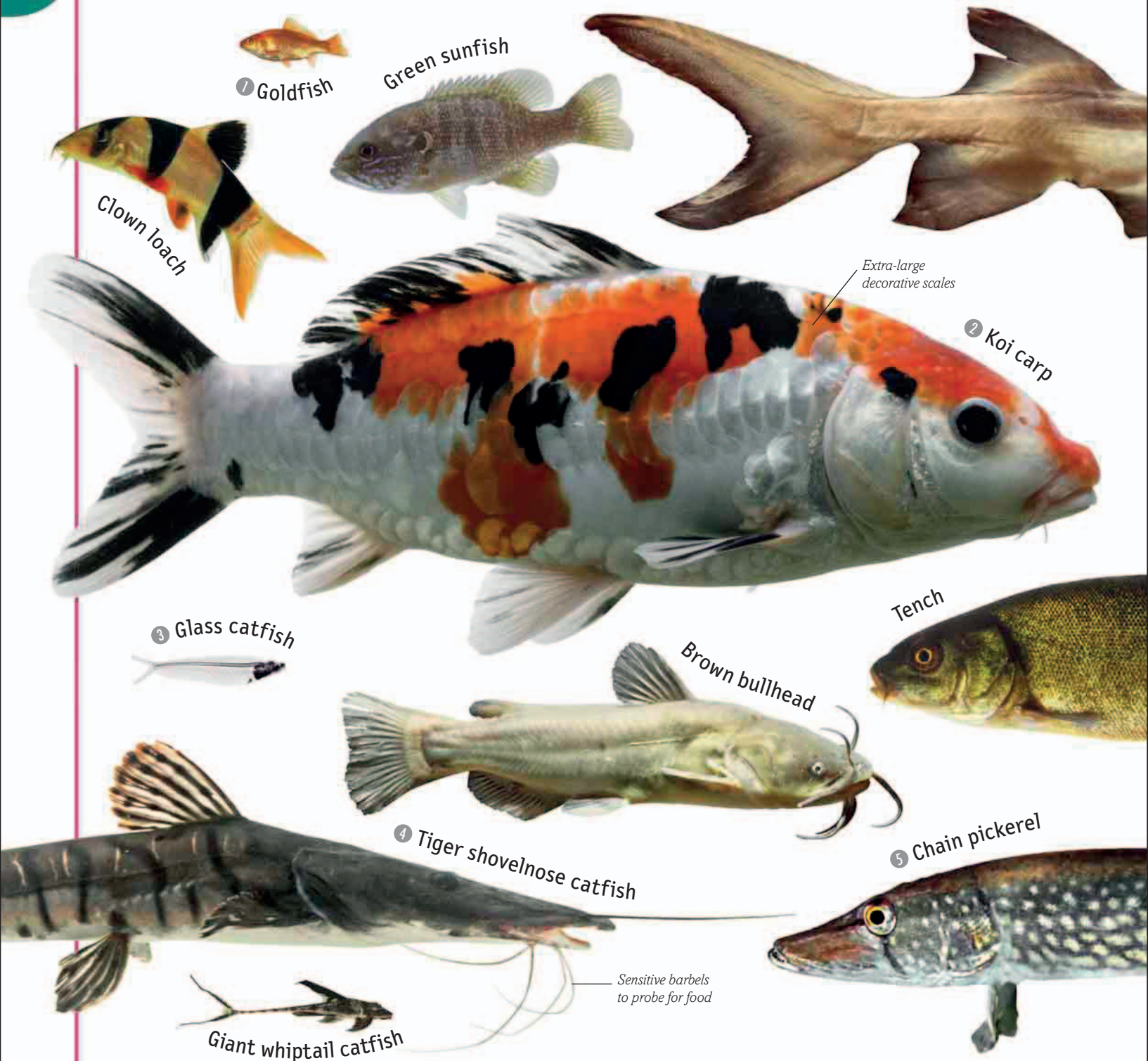
depths of up to 5,000 m (16,400 ft). It feeds on smaller fish, grabbing them with its needle-like fangs and swallowing them whole. The **orange roughy 3** gathers over ocean ridges and underwater mountains. It grows very slowly and can live to be 150 years old. **Footballfish 4** attract their prey using luminous lures that dangle in front of their mouths. If other fish come near to investigate, they are



instantly sucked inside. Female footballfish really are as big as footballs, but the males are tiny and often fasten themselves to the females as parasites. The **Pacific grenadier** 5 cruises over the ocean floor, gently rippling its long, rat-like tail, while the **black swallower** 6 has a super-stretchy stomach and can gulp down prey larger than itself. **Feelerfish** 7 stay close to the ocean floor. Their front

fins are thin and whiskery and work like antennae for sensing food. The **longnose lancetfish** 8 is a daily visitor to the deeps. It hides in the dark by day, coming closer to the surface to feed when night falls. The **pelican eel** 9 has enormous jaws but tiny teeth. It uses its mouth like a scoop to catch its prey. Like the black swallower, it has an expandable stomach to deal with over-sized meals.

Freshwater fish



Fish live in a huge variety of freshwater habitats, from lakes and rivers to streams and ponds. They can be found in hot springs where the water temperature is a steamy 40°C (104°F), and in chilly caves hundreds of metres underground. The smallest fish, even the fully grown ones, are not much bigger than a grain of rice, while the biggest are as long as a family car. Some freshwater fish,

including the **goldfish** ① and **koi carp** ②, have been raised in captivity for hundreds of years. There are many varieties of both these fish, and the rarest koi carp can be worth more than \$1 million. Catfish are common freshwater fish, particularly where the water is murky or the current is slow. The **glass catfish** ③ from Southeast Asia has a transparent body. The South American **tiger shovelnose catfish** ④ has



Longsnout distichodus

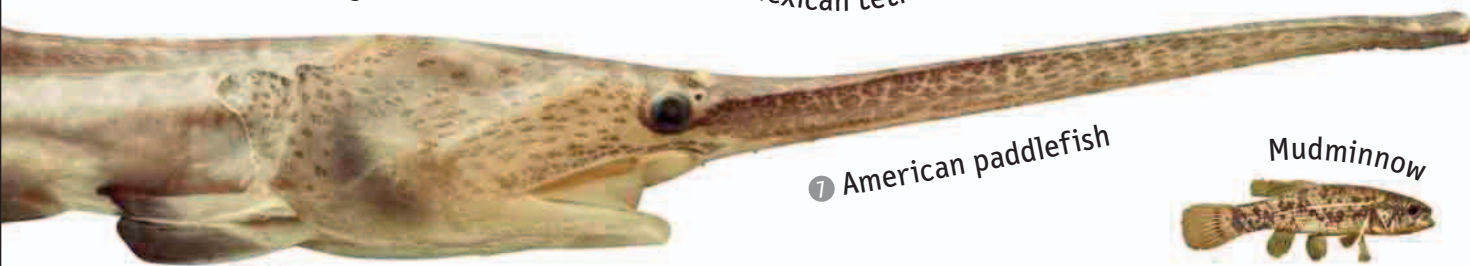
This cave-dwelling species has no eyes



Mexican tetra



6 Red piranha



7 American paddlefish



Mudminnow



8 Tigerfish

Prominent jaw with sharp teeth

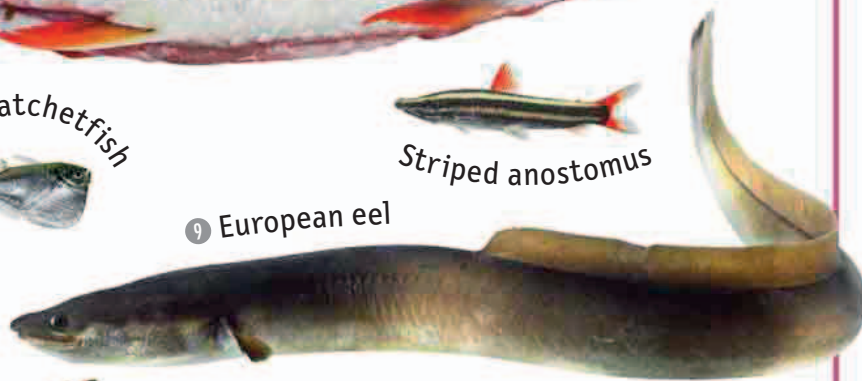


River hatchetfish



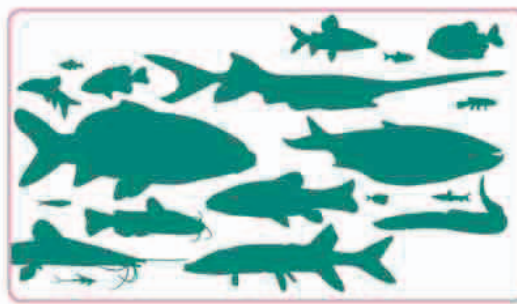
Striped anostomus

9 European eel



Large rear fins help the fish to hover in one spot

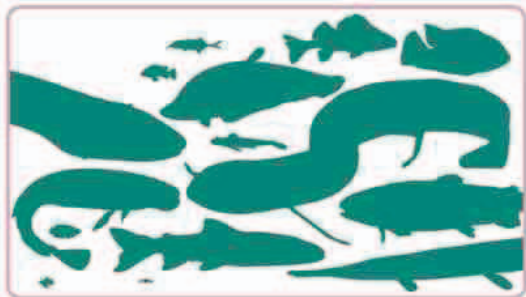
SCALE



long barbels that probe the riverbed for food. The **chain pickerel** 5 is an ambush hunter. It lurks in the shallows and lunges at other fish with a powerful flick of its tail. The **red piranha** 6 from South America usually eats fish, worms, and crustaceans, but a large group of red piranhas can attack big mammals, stripping away chunks of flesh with their razor-sharp teeth. The **American paddlefish** 7 looks

ferocious, but it feeds only on tiny animals filtered out by its gills. **Tigerfish** 8 are fierce predators from Africa's rivers. They are famous for putting up a tremendous fight if hooked. The **European eel** 9 is a long-distance migrant. It spawns in the Sargasso Sea, in the North Atlantic Ocean, and its tiny young travel all the way back to Europe's rivers, an epic journey of up to 6,000 km (3,700 miles).

SCALE



Long lower
jaw used to
probe for food

10 Elephantnose fish

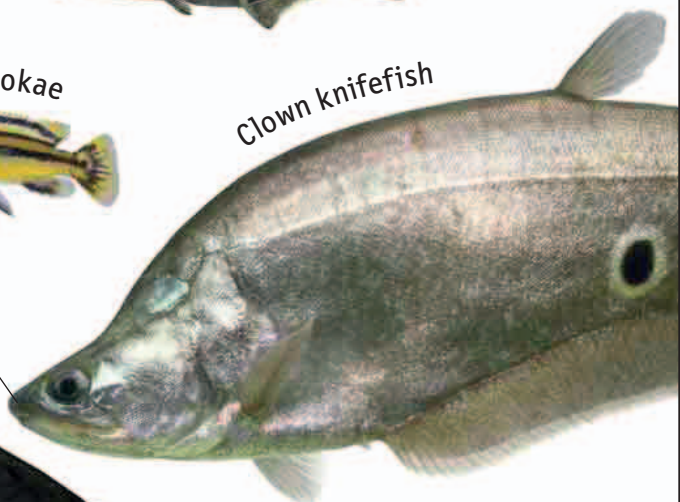


Chipokae



Mouth can
gulp air in
stagnant water

Clown knifefish

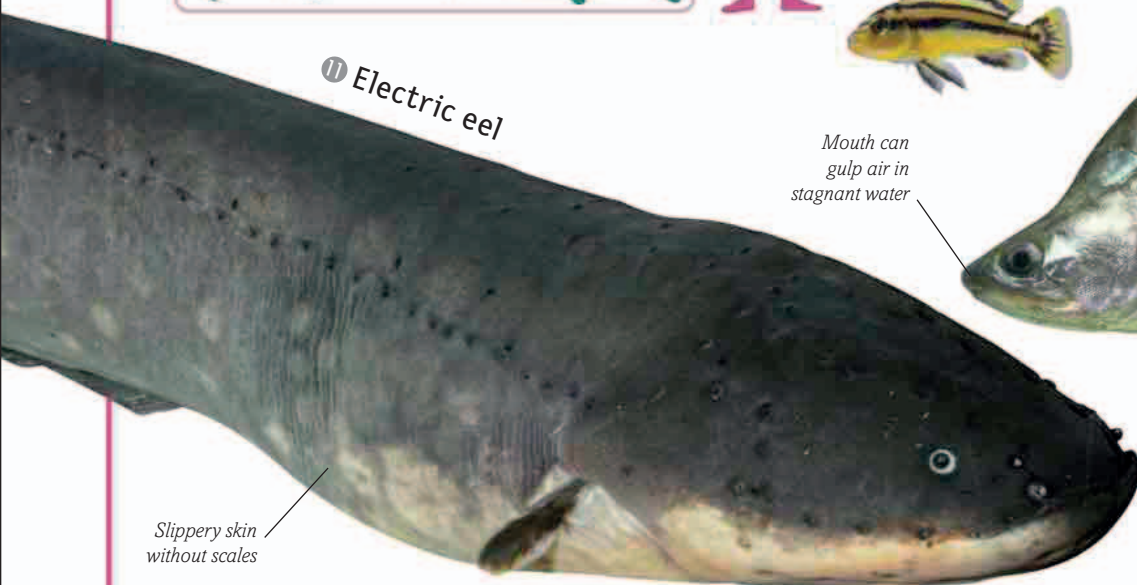


12 Foureyed fish

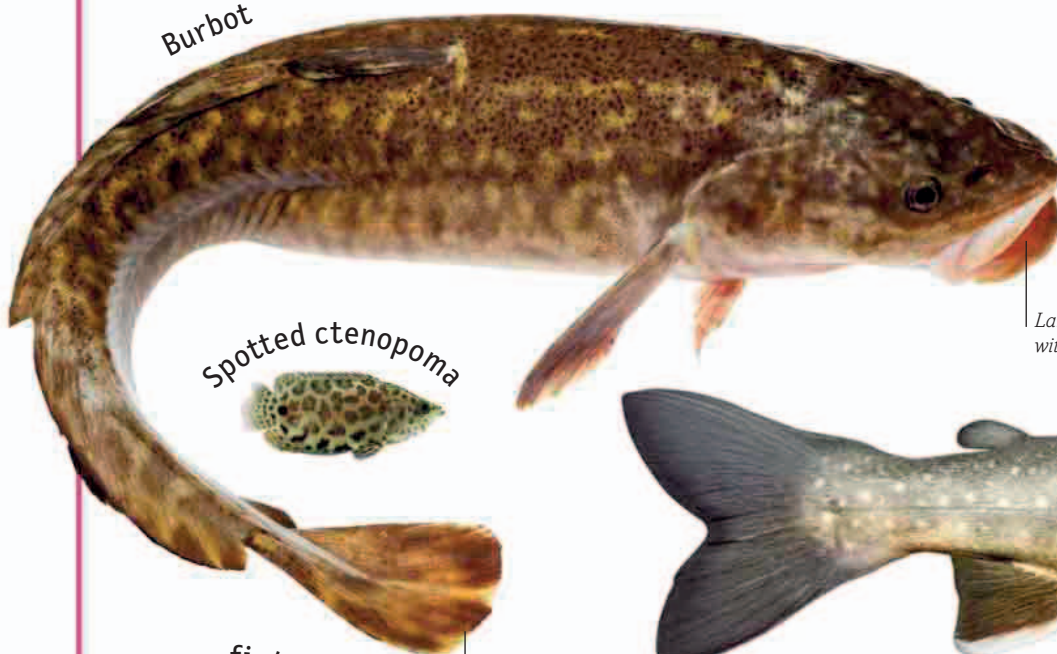


11 Electric eel

Slippery skin
without scales



Burbot



Spotted ctenopoma



Large mouth
with strong jaws



13 Siamese fighting fish



Thin, rounded tail

Zebrafish



14 Arctic char



Many freshwater fish have special skills that help them to survive. The **elephantnose fish** 10 from tropical Africa lives in murky rivers. It finds its way by giving off weak electric signals and probes for food using its long lower jaw. The **electric eel** 11 from South America uses electricity to find and kill prey. It can give a jolt of up to 650 volts, enough to knock a person off their feet. The

foureyed fish 12 has eyes that are divided into two, letting it see clearly above and below the waterline. **Siamese fighting fish** 13 are small but famously aggressive. When two males clash, they sometimes fight to the death. Far away from the tropics, the **Arctic char** 14 lives in icy rivers and cold lakes. It is one of the world's most northerly freshwater fish, surviving as close as 800 km (500 miles) from the North



15 European perch



16 Nile tilapia

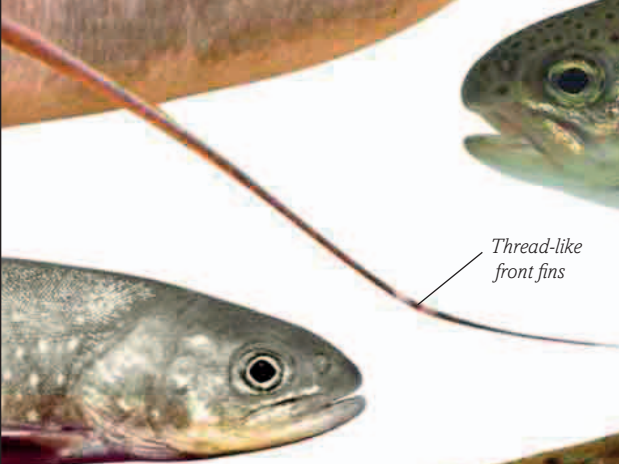


17 African lungfish



Blade-shaped tail

18 Rainbow trout



Thread-like front fins

19 Longnose gar

Pole. The **European perch** 15 is a patient predator, lying in wait for its prey. It lays eggs in long ribbons and fastens them to underwater plants. A distant relative of the European perch, the African **Nile tilapia** 16 breeds in a very different way. The female scoops up her eggs, up to 2,000 at a time, and holds them in her mouth until they hatch and her young swim away. **African lungfish** 17 live in lakes and swamps

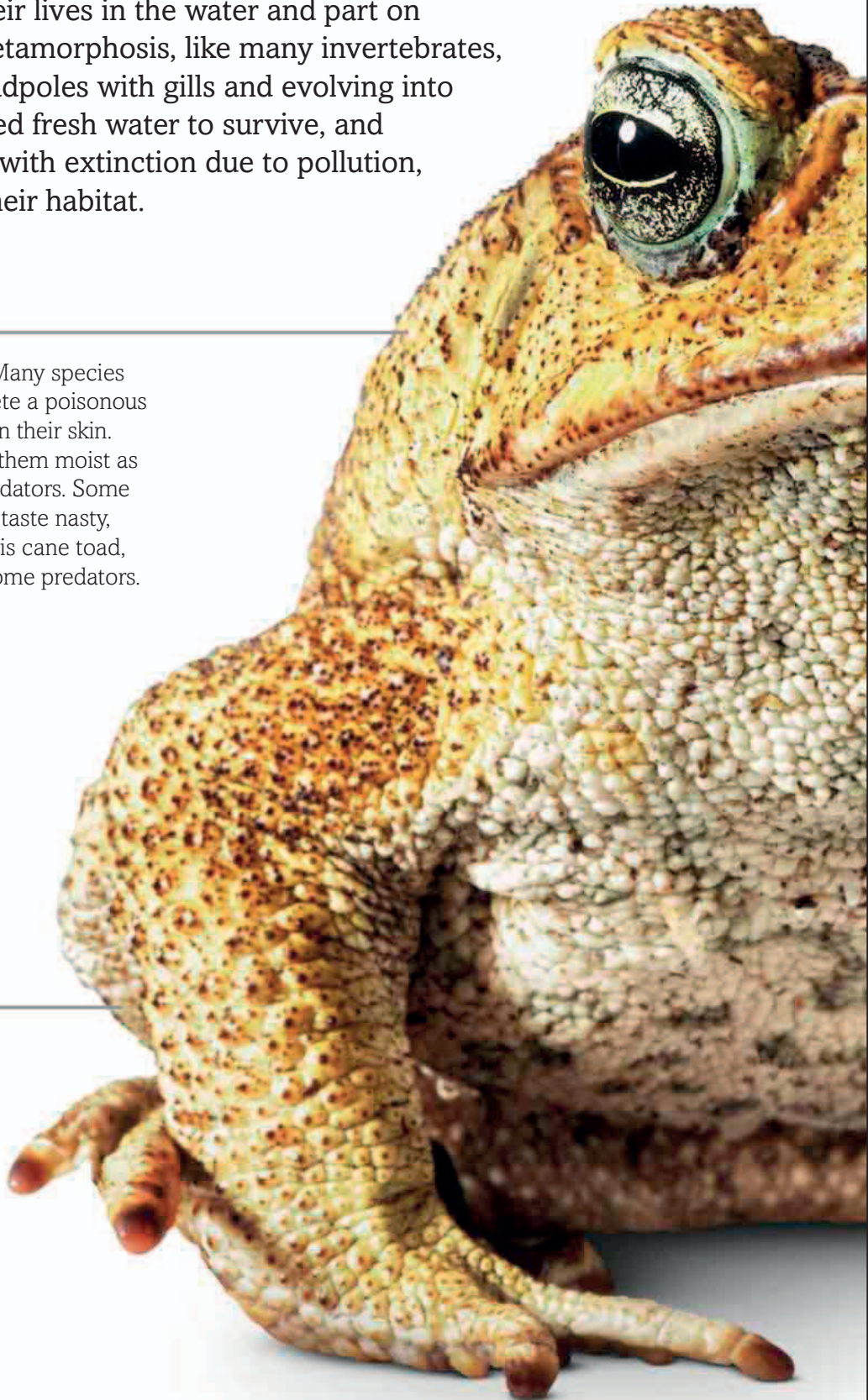
that can dry out for months at a time. They seal themselves up in cocoons of mud and survive by breathing air. The **rainbow trout** 18 originally came from North America but has been introduced into lakes and rivers in many other parts of the world for food and sport. Another American fish, the **longnose gar** 19 bursts out of hiding to stab other fish with its needle-sharp teeth.

Amphibians

Amphibians spend part of their lives in the water and part on land. Some kinds undergo metamorphosis, like many invertebrates, starting out as water-based tadpoles with gills and evolving into air-breathing adults. They need fresh water to survive, and many species are threatened with extinction due to pollution, disease, and destruction of their habitat.

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

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





Cane toad

Animals

Amphibians

Features

- Usually lay eggs to reproduce



- Have moist skin, and may die if they dry out



- Often spend much of their lives in water



- Some hatch as tadpoles, and change shape to become adults



- Are cold-blooded



Legs › Some amphibians only have legs as adults. These kinds hatch out from eggs as tadpoles, tiny swimming creatures with tails. As the tadpoles mature, legs grow out of their bodies and their tails shrink and disappear.

Frogs and toads



② Giant broad-headed treefrog

① Lemur frog



A grub makes a tasty morsel



Tongue flips out to catch prey



③ Australian green treefrog



Suckers on all toes

Fringe-limbed treefrog



④ Amazon milk frog



⑤ Paradoxical frog

Orange-legged leaf frog



Yucatan casque-headed treefrog



⑥ Solomon Islands horned frog



SCALE

Frogs and toads look very different to other amphibians, with their stubby bodies and long back legs. Frogs are usually sleek and slippery, but most toads have dry, warty skin. Nearly all of these animals start life as tadpoles, changing shape as they grow up. The **lemur frog** ① from Central America hunts insects by night and hides under leaves during the day. Like other treefrogs, it is an expert

climber with slender, sucker-tipped toes. The **giant broad-headed treefrog** ② lives in South American forests. It clings to tree trunks and branches, while the **Australian green treefrog** ③ sometimes climbs into houses, where it makes itself at home in water tanks and kitchen sinks. The **Amazon milk frog** ④ lays its eggs in rain-filled tree-holes. It lives high in the treetops and hardly ever comes to the



ground. The South American **paradoxical frog** 5 spends its life in lakes and pools. It gets its name from its monster tadpoles, which are up to four times the adult's length. The **Solomon Islands horned frog** 6 has a pointed snout and horn-like projections above its eyes, camouflaging it perfectly among fallen leaves. The **European common toad** 7 hunts all kinds of small animals, including beetles, snails, and slugs.

The rare **golden mantella** 8 frog from Madagascar is brilliantly coloured, warning predators that it has poison-covered skin. The **Malayan tree toad** 9 is one of the few true toads that lives off the ground. The enormous **cane toad** 10 gulps down mice and even snakes. Originally from Central America, this ravenous predator has become a major pest in Australia and other parts of the world.

Common parsley frog



11 European common frog



12 Golden poison-dart frog



13 Granular poison-dart frog



Yellow-banded poison-dart frog



Dyeing poison-dart frog



Three-striped poison-dart frog

14 Edible frog



15 Wood frog



16 American bullfrog



Tungara frog

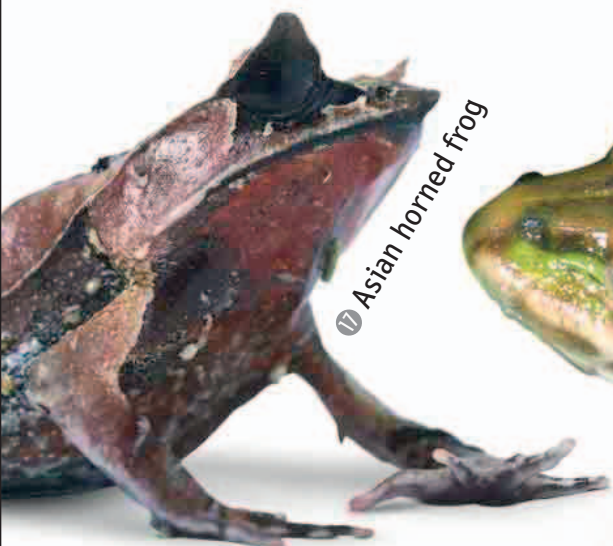


SCALE



Toads usually move by crawling, but frogs often hop and jump. In emergencies, the **European common frog** 11 can leap more than seven times its own length, equivalent to a human athlete clearing a school bus without a run-up. In Central and South America, tiny poison-dart frogs climb up trees or hop over the rainforest floor. Their bright colours are a warning to predators to stay

away. The **golden poison-dart frog** 12 is the deadliest, with enough poison to kill two African elephants, while the **granular poison-dart frog** 13 is one of the smallest, and could easily fit inside a matchbox. In the past, native Americans used these frogs to make poison hunting darts, which is how they got their names. In the breeding season, frogs and toads often make loud calls. Male **edible frogs** 14



17 Asian horned frog



18 Indian bullfrog



Bolifamba reed frog



Giant stump-toed frog



19 Painted toad



Rajamally wart frog

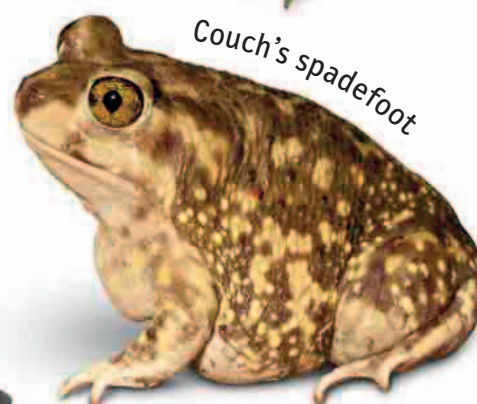


Common skittering frog



20 Tomato frog

Sticky, bright red skin to ward off predators



Couch's spadefoot

Foullassi banana frog



21 Tinker reed frog

and **wood frogs** 15 sound like quacking ducks, while the male **American bullfrog** 16 sounds more like a mooing cow. This massive frog swallows almost anything it can cram into its mouth, including smaller frogs, young turtles, and small water birds. The "horns" and the brown colour of the **Asian horned frog** 17 help it blend in among fallen leaves. The **Indian bullfrog** 18 leaps into water if it is disturbed.

It usually climbs out after a few minutes, but can stay underwater for several hours. **Painted toads** 19 and **tomato frogs** 20 live on land and come out to feed at night. Their skin is covered with a glue-like substance, which helps to protect them from attack. **Tinker reed frogs** 21 from Africa lay their eggs on waterside plants. Their tadpoles wriggle down into the water after hatching.

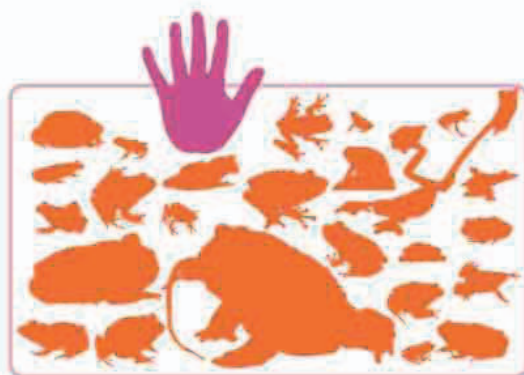
② Mexican burrowing toad



Spotted-thighed poison-dart frog



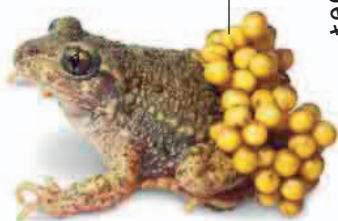
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Oriental fire-bellied toad



Eggs wrapped around male's hind legs

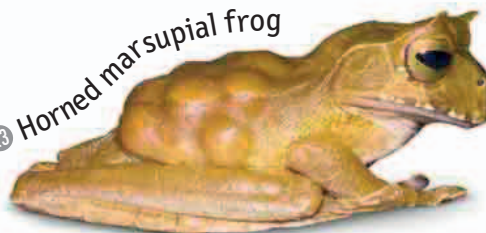


②④ Midwife toad

Painted frog



②③ Horned marsupial frog



②⑤ Fleischmann's glass frog

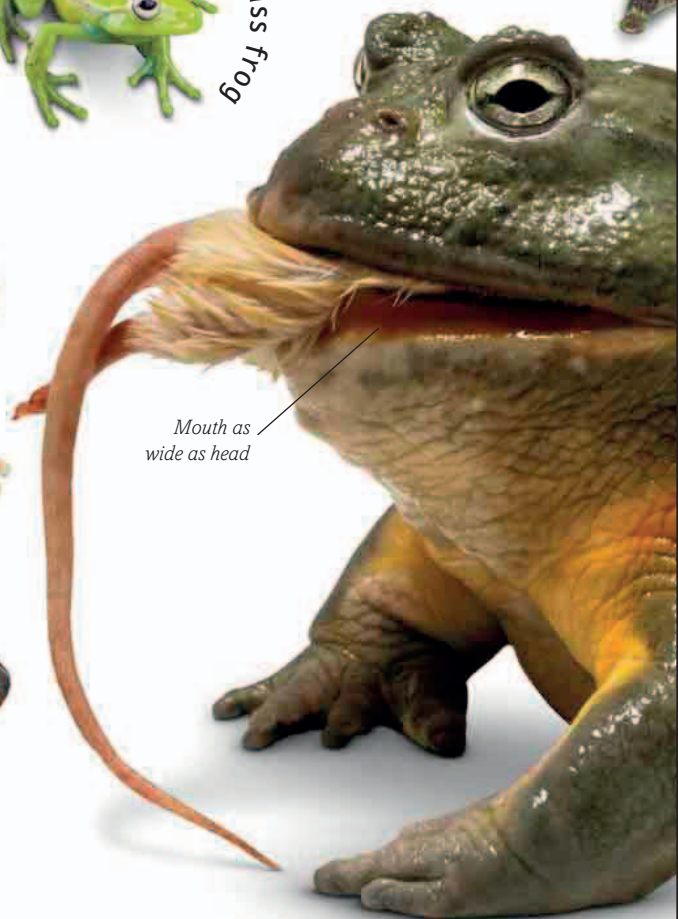


②⑥ Ornate horned frog

Big-headed rain frog



Mascarene ridged frog



Mouth as wide as head

Frogs and toads have lots of different shapes, and varied lifestyles that help them to survive. If threatened, the **Mexican burrowing toad** ② can blow itself up to resemble a small balloon. It lives underground and feeds on ants, coming to the surface only when it breeds. The **horned marsupial frog** ②③ has a strange way of breeding that lets it stay high up in trees. The female carries her eggs in a pouch

on her back. Instead of producing tadpoles, they hatch directly into baby frogs. The **midwife toad** ②④ is so called because the male carries the female's eggs. When the eggs are ready to hatch, he takes them to water so that the tadpoles can swim away. **Fleischmann's glass frog** ②⑤ lives in trees. On its underside, its tiny beating heart can be seen through its transparent skin. The **ornate horned frog** ②⑥ is a sit-and-



wait hunter from the grasslands of Argentina. Camouflaged by its green and brown markings, it lurks in muddy ground and grabs anything edible that comes nearby. The **desert rain frog** ²⁷ lives and breeds among Namibian sand dunes, hiding beneath the surface during the day. **Wallace's flying frog** ²⁸ glides through the forests of Southeast Asia on its webbed feet. **Fraser's clawed frog** ²⁹ from Africa

stays in water all its life. It has a flat body, sensitive fingers, and upward-facing eyes. The **African bullfrog** ³⁰ lives in grassland and savanna. Big and aggressive, it sometimes eats its own kind. It spends the dry season underground. Males of this species defend their eggs fiercely until they hatch. The **common spadefoot toad** ³¹ digs burrows with its back legs, and spends half the year hidden away.



TREE FROGS

There are more than 900 known species of tree frogs, most of which live high up in the branches of tropical rainforests. These red-eyed tree frogs are easy to recognize, thanks to their startling colouring. Their bright eyes are thought to surprise predators and discourage them from attacking. However, during the day they often keep their eyes shut, relying on their green skin to camouflage them among forest leaves.

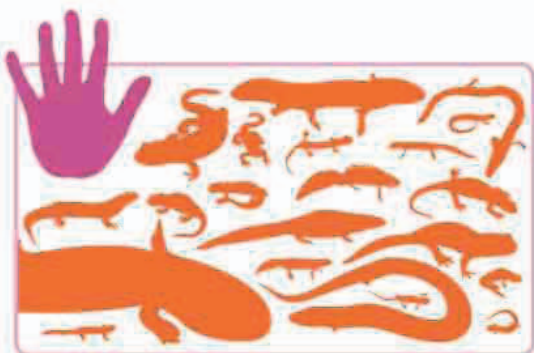


Size > Up to 7 cm (2¾ in) **Habitat** > Trees and shrubs near water in warm, tropical forests and jungles. **Distribution** > Central America **Diet** > Insects such as crickets, flies, and moths, also worms and spiders. **Breeding** > Females lay a batch of 50 eggs on a leaf over water. This process is repeated several times. The eggs hatch after about

five days and tadpoles fall into the water. **Lifespan** > Up to five years. **Predators** > Many climbing and flying birds, reptiles, and mammals, including snakes and monkeys. Fish may prey on tadpoles. **Conservation status** > Numbers of some species are declining where their forest habitats are being cut down.

Salamanders and newts

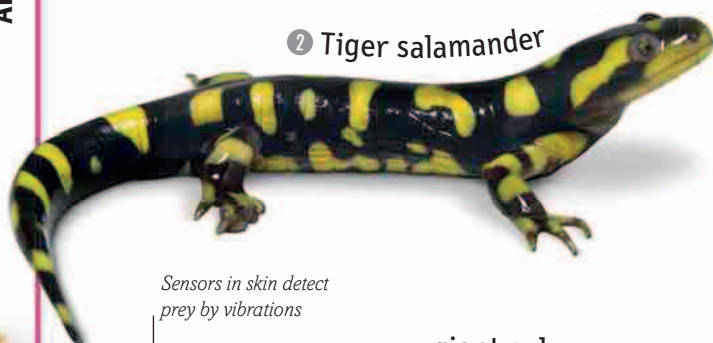
SCALE



① Fire salamander



Lorestan newt



② Tiger salamander



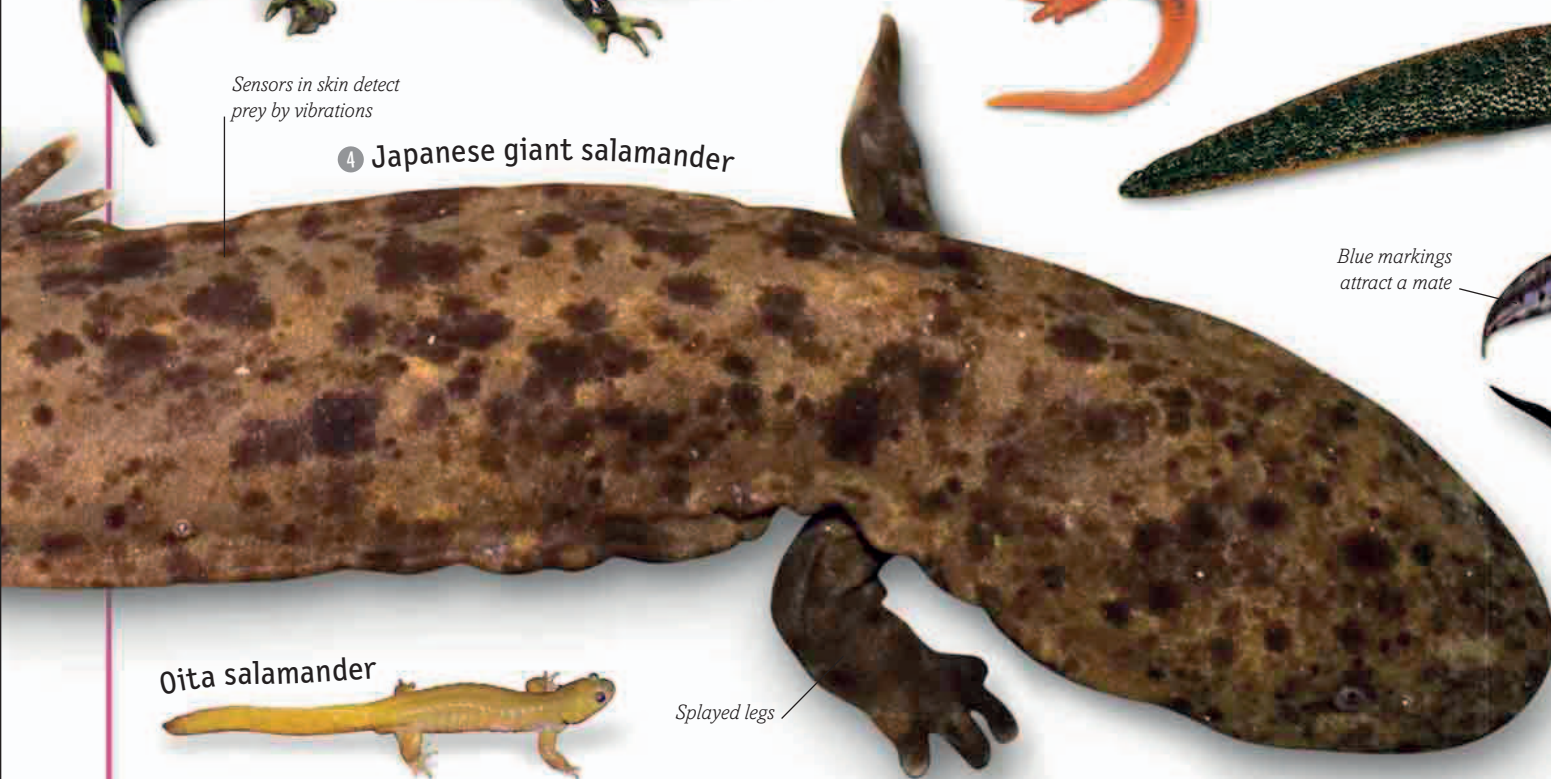
③ Crocodile newt



Spotless stout newt

Sensors in skin detect prey by vibrations

④ Japanese giant salamander



Blue markings attract a mate

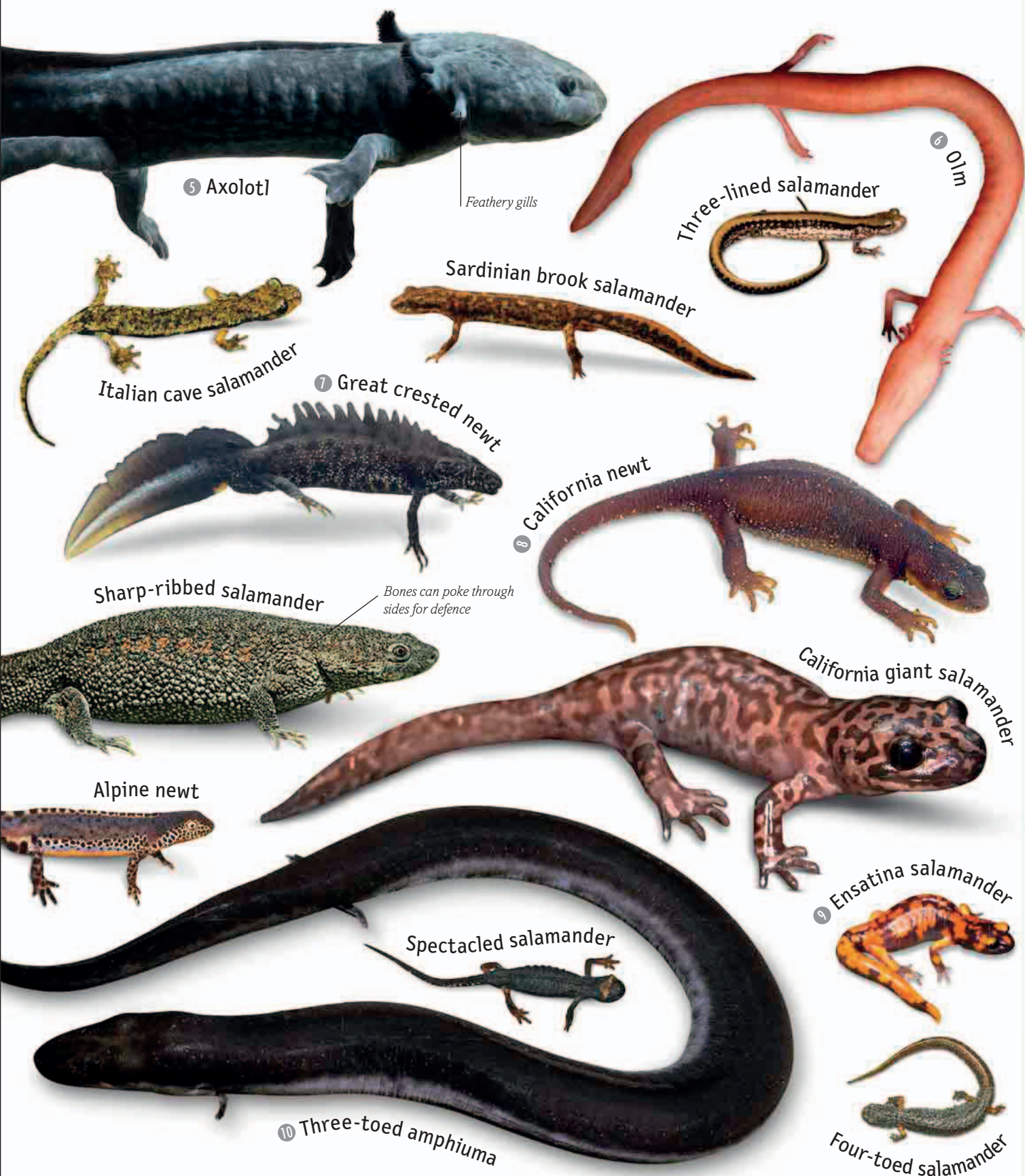
Oita salamander



Splayed legs

With their slender bodies and long tails, salamanders and newts look very different from frogs and toads. Many are well camouflaged, but others, including the **fire salamander** ① and **tiger salamander** ②, have bright warning colours. This shows other animals that they are poisonous and best left alone. Some species spend all their lives on land, but most return to water to mate and

lay their eggs. The Asian **crocodile newt** ③ heads for ponds at the beginning of the monsoon, while the **Japanese giant salamander** ④ is fully aquatic and never leaves its watery home. Measuring up to 1.5 m (5 ft) long, this huge, wrinkly-skinned amphibian feeds on fish and freshwater insects, and hunts after dark. Young salamanders and newts breathe using feathery gills. Some salamander species, such as the



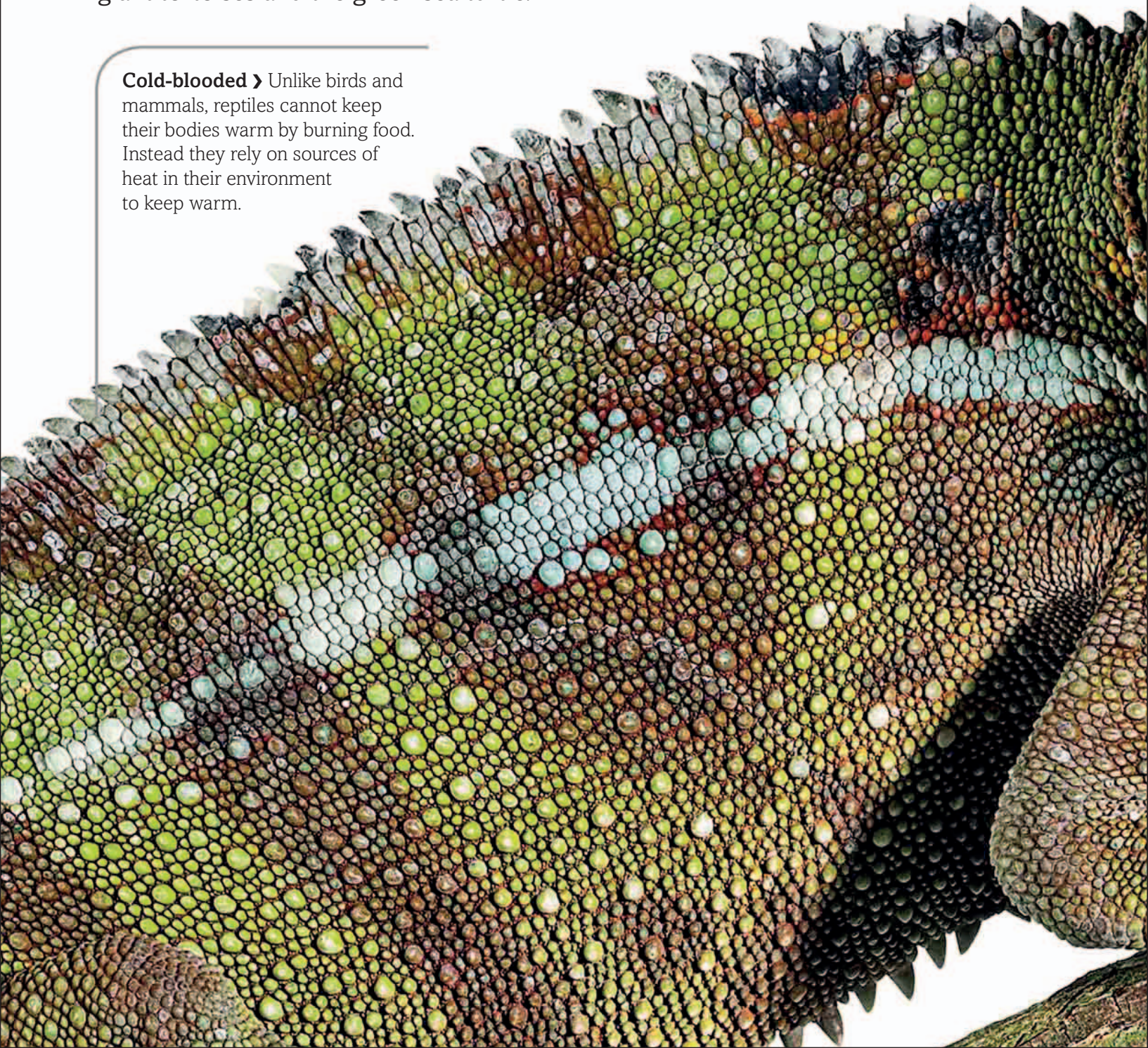
axolotl 5 and **olm** 6, keep their gills throughout their lives. If the axolotl loses a body part, it can regrow the entire part within months. The olm lives in dark, flooded caves. Extremely slender and totally blind, it finds its food by smell and touch. **Great crested newts** 7 breed in ponds, and have elaborate courtship displays. The male grows his impressive crest in spring and uses it to attract females waiting to lay their eggs.

On land, salamanders and newts live in damp woodlands and rocky places, and hunt mainly after dark. During the summer, many species, such as the **California newt** 8 and **Ensatina salamander** 9, keep moist by hiding under rotting logs. The **three-toed amphiuma** 10 buries itself in mud, and makes a waterproof cocoon. This slimy, snake-like amphibian has tiny legs but a powerful bite.

Reptiles

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

Cold-blooded ▶ Unlike birds and mammals, reptiles cannot keep their bodies warm by burning food. Instead they rely on sources of heat in their environment to keep warm.



Animals

Reptiles

Features

- Mostly lay eggs to reproduce



- Have dry, scaly skins



- Are mostly meat-eaters



- Mostly live in warmer climates



- Are cold-blooded



Scaly skin › As well as skin, reptiles have an outer layer of protective armour. Lizards and snakes are covered in scales. Turtles, tortoises, crocodiles, and alligators have scutes, horny layers of skin backed by bony plates.

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

Panther chameleon

Legs › Most reptiles have four legs. Some groups, such as snakes, have no legs at all. They move by pushing against the ground with their flexible bodies.

Turtles and tortoises

Blanding's turtle



Golden coin turtle



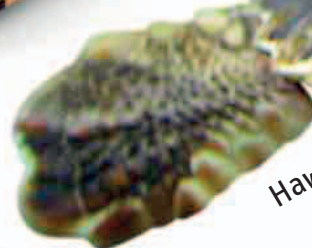
① Yellow-margined box turtle



② Red-bellied turtle



Hawksbill sea turtle



Jaws can cut fish in two

Red-eared slider



④ Leatherback sea turtle



Rubbery shell

③ Carolina box turtle



Saltwater terrapin



⑤ Common snapping turtle



Hooked beak delivers a powerful bite

With their domed shells and beak-like mouths, turtles and tortoises are easy to recognize. The **yellow-margined box turtle** ① has a hinge on the underside of its shell. If danger strikes, it quickly pulls in its head and legs, and shuts itself away. The American **red-bellied turtle** ② likes sunning itself near the shore, while the **Carolina box turtle** ③ escapes the heat by retreating into cover or by

burying itself in mud. Turtles and tortoises come in many sizes. The smallest ones are not much bigger than a baseball, but the record-breaking **leatherback sea turtle** ④ can weigh as much as a small car. It is one of the greatest travellers in the animal world, swimming vast distances with its large flippers. Sea turtles live mainly in tropical oceans, but freshwater turtles live in rivers and lakes, where they eat



Big-headed turtle



Chinese soft-shelled turtle



Painted turtle



European pond turtle



Matamora



False map turtle



Asian leaf turtle



Common snake-necked turtle



Mississippi mud turtle



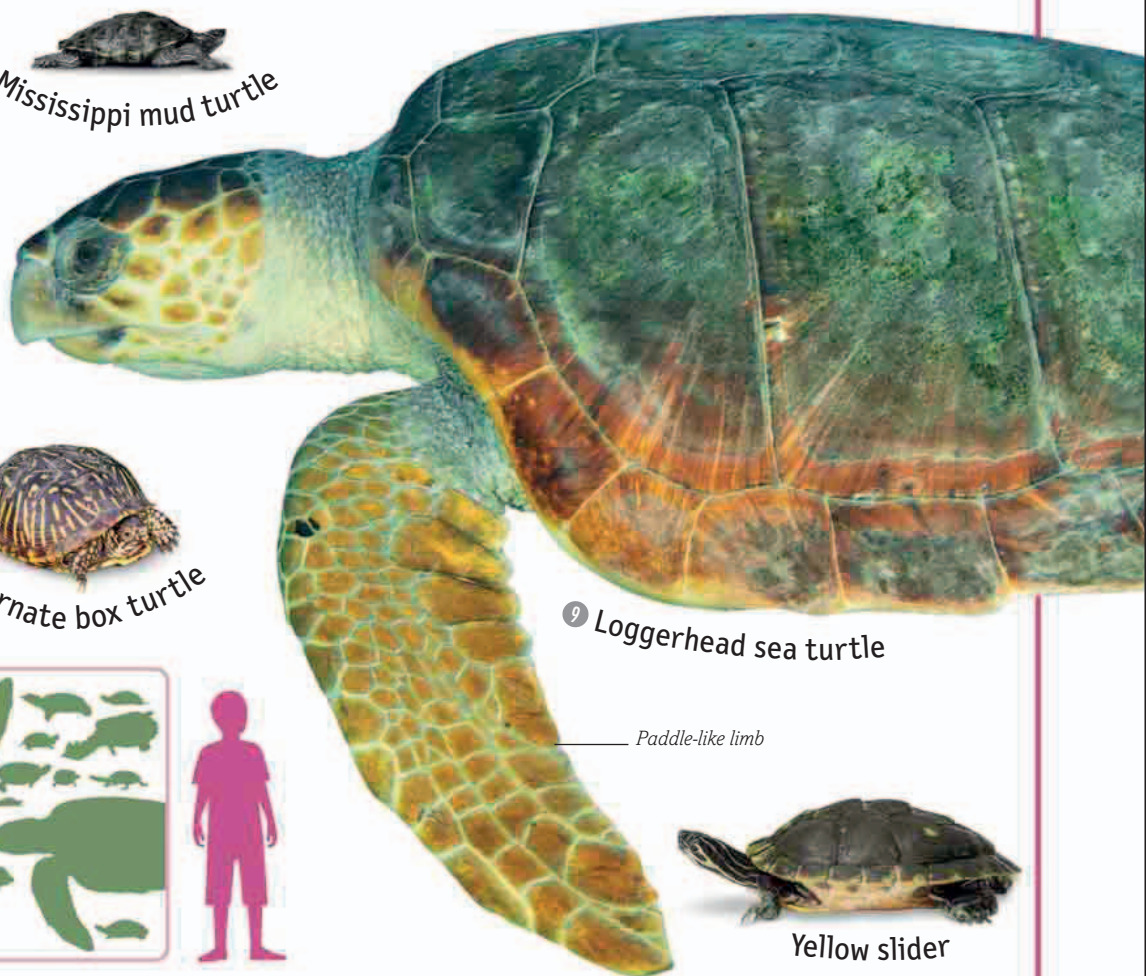
Alligator snapping turtle



Common musk turtle



Ornate box turtle



Loggerhead sea turtle

Paddle-like limb



Yellow slider

SCALE



plants or animal prey. The **common snapping turtle** ⑤, from North America, is one of the world's biggest freshwater turtles. It lurks in the mud at the bottom of rivers and lakes. The **Chinese soft-shelled turtle** ⑥ has a nose like a snorkel, and spends most of its time in the water. Turtles and tortoises breed by laying eggs. Freshwater kinds, such as the **painted turtle** ⑦, lay theirs in holes not far from the water's edge. The

female **alligator snapping turtle** ⑧ leaves the water in spring to lay eggs, whereas the male spends most of his time at the bottom of rivers or lakes. Sea turtles, including the **loggerhead** ⑨, dig nests in sandy beaches. After hatching, the young turtles dig their way to the surface and then scuttle towards the sea. It is a dangerous time, and many are caught by predators before they reach the water's edge.

SCALE



⑪ Hermann's tortoise

Saddle shape allows tortoise to raise its head



⑩ Red-footed tortoise

Sharp jaw for cutting through food

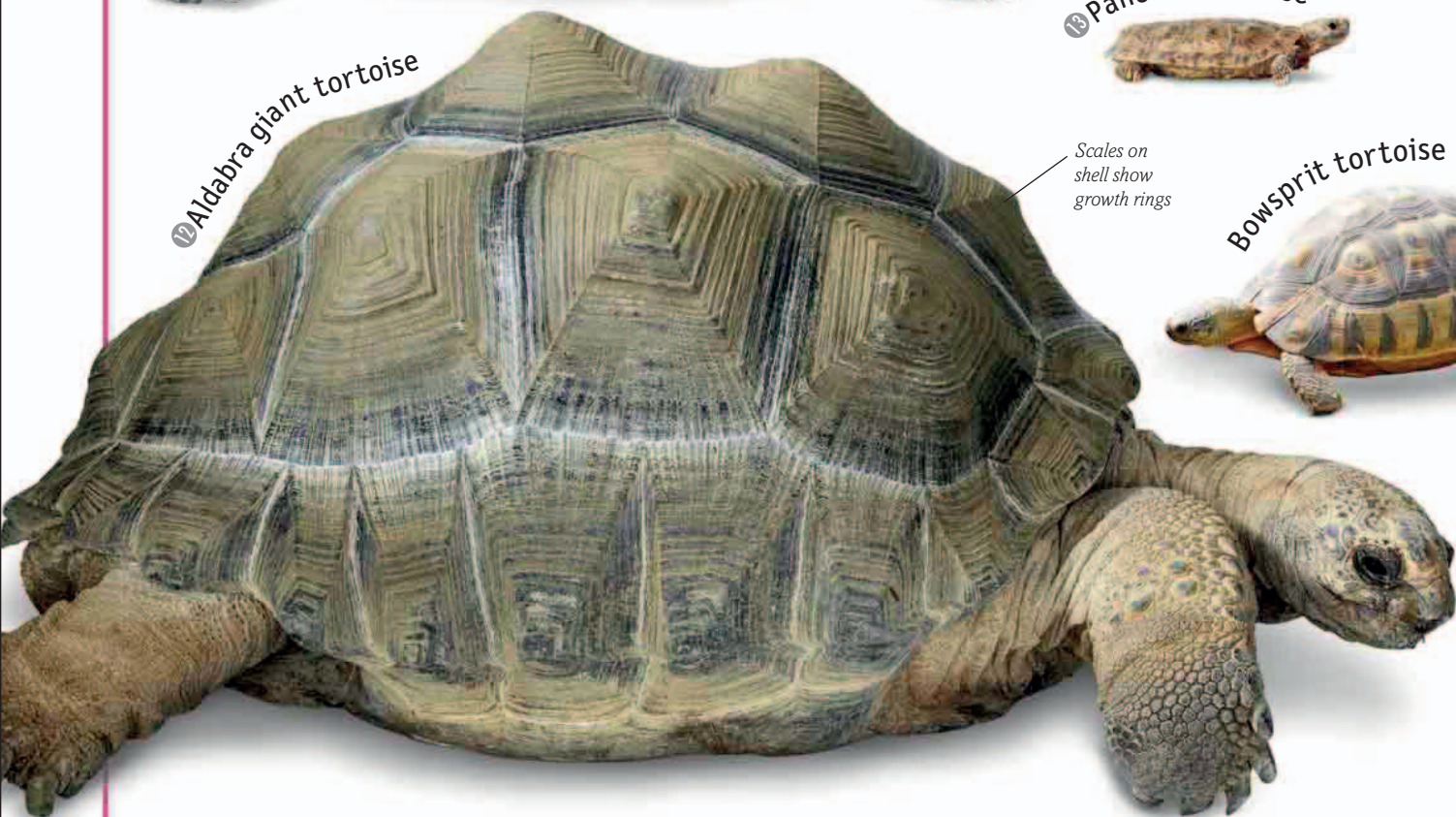


⑬ Pancake tortoise



Scales on shell show growth rings

⑫ Aldabra giant tortoise



Bowsprit tortoise

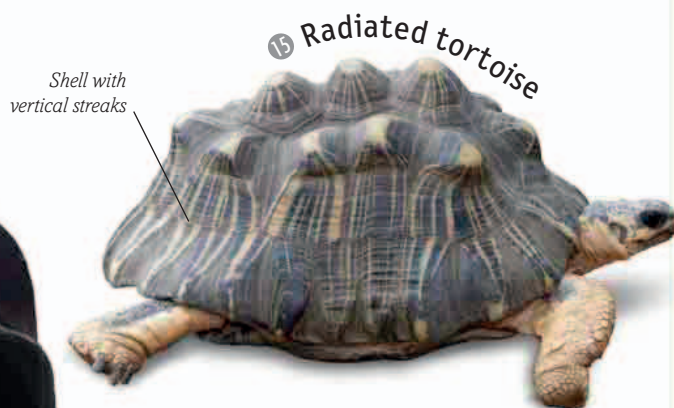


Tortoises are close relatives of turtles, but they have stronger legs and spend all their lives on land. Like turtles, tortoises breed by laying eggs. Most of them are vegetarian, although some, including the South American **red-footed tortoise** ⑩, also eat small animals and dead remains. Tortoises are famous for being slow, but to make up for this, they can be amazingly long-lived. The

Hermann's tortoise ⑪, for example, has a lifespan of 50 years, while the **Aldabra giant tortoise** ⑫ from coral islands in the Indian Ocean can survive for more than two centuries. One recently died in captivity at the astonishing age of 255. Most tortoises have high shells, which predators find hard to break. The African **pancake tortoise** ⑬ is almost flat, which allows it to hide in rocky cracks to avoid



14 Galápagos tortoise

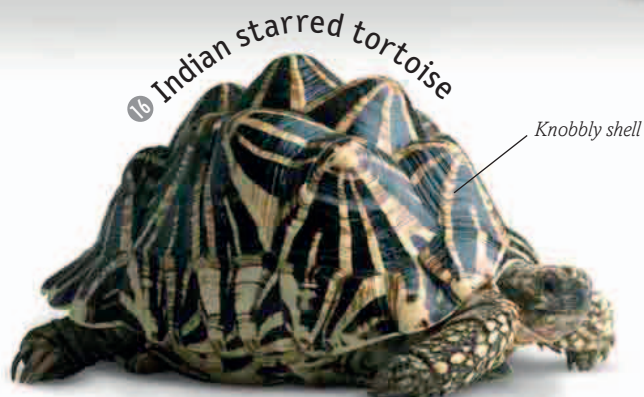


15 Radiated tortoise

Shell with vertical streaks



Elongated tortoise



16 Indian starred tortoise

Knobby shell



Serrated hinge-back tortoise



Wood turtle



17 Spur-thighed tortoise



18 Desert tortoise



Leopard tortoise

predators. It has the tiniest families, as it lays just one egg at a time, although it usually breeds several times each year. **Galápagos tortoises** 14 live on islands in the Pacific Ocean. They are as large as the Aldabra giant tortoise, and often have shells with a saddle-shaped front. This lets them stretch their necks high up to munch prickly cacti, their primary food. **Radiated tortoises** 15, from Madagascar,

have shells with raised knobs, but the lumpiest shell belongs to the **Indian starred tortoise** 16, which has star-like markings that hide it in dry grass. The **spur-thighed tortoise** 17 from Europe and North Africa has bony projections on its hind legs. It lays up to 20 eggs at a time, while the **desert tortoise** 18, found in small burrows in the deserts of North America, lays as few as four eggs.

Lizards



SCALE

Slender toes for climbing trees

① Emerald skink

Green anole

Cape girdled lizard

Shiny, beadlike scales

② Gila monster

Desert horned lizard

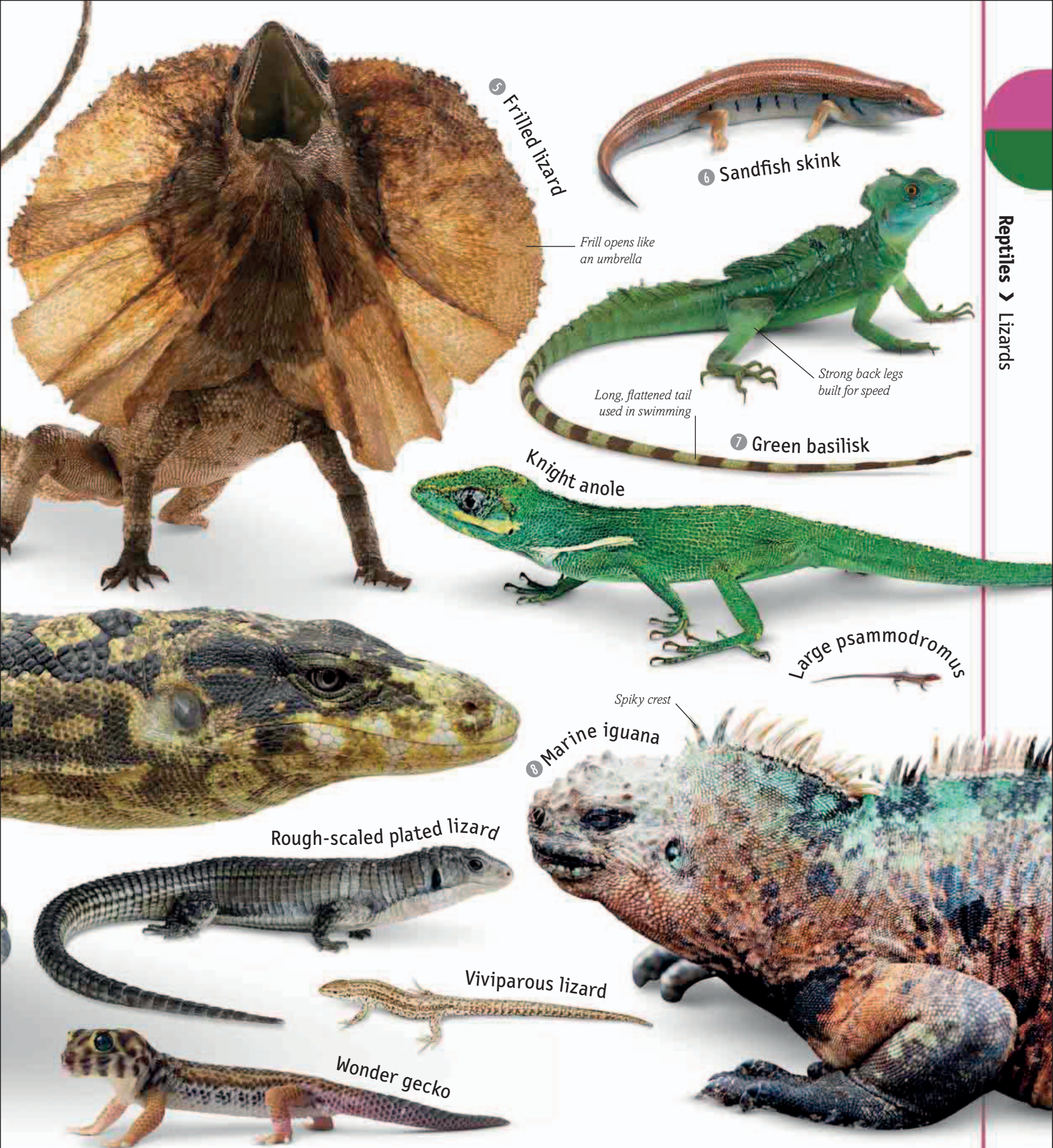
③ Asian water monitor

④ Madagascar day gecko

Toes with sharp claws for climbing

There are more than 4,000 lizard species in the world, more than all other reptiles put together. Most of them hunt small animals, and most lay eggs, although some give birth to live young. The **emerald skink** ① preys on insects. It spends most of its time on tree trunks, while the heavy-bodied **Gila monster** ② stays on the ground. Found in North American deserts, the Gila monster is one

of the few lizards with a poisonous bite. Fortunately, it is a slow mover, so attacks on people are very rare. The fierce **Asian water monitor** ③ grows up to 2 m (6½ ft) long. A good swimmer, it hunts all sorts of animals, from fish and frogs to crabs. The **Madagascar day gecko** ④ is mostly found on trees and belongs to a family of lizards famous for their “sticky” toes. Like other geckos, it can cling to almost



5 Frilled lizard

6 Sandfish skink

Frill opens like an umbrella

Long, flattened tail used in swimming

7 Green basilisk

Knight anole

Large psammmodromus

Spiky crest

8 Marine iguana

Rough-scaled plated lizard

Viviparous lizard

Wonder gecko

any surface, and can even hunt upside down. When faced with danger, many lizards shed their tails. This distracts their enemies while they run away. The Australian **frilled lizard** 5 has a different technique to protect itself. It stands its ground and opens up its frill, making it look much more threatening than it really is. The North African **sandfish skink** 6 dives for safety, disappearing into the desert sand

by "swimming" through it. The **green basilisk** 7 from Central America has the most impressive escape trick of all. Standing on its back legs, it runs over the surface of lakes and streams, before swimming away from the predator. Found in the Galapagos Islands, the **marine iguana** 8 is the only lizard that feeds in the sea. It uses its blunt jaws to tear seaweed from underwater rocks.



9 Common leopard gecko

10 Slow worm

11 Common scaly foot

Solomon Islands skink

Berber skink

Mediterranean gecko

12 Green iguana

Italian wall lizard

Moorish gecko

13 Parson's chameleon

Tail can wrap around branches

Colorado desert fringe-toed lizard

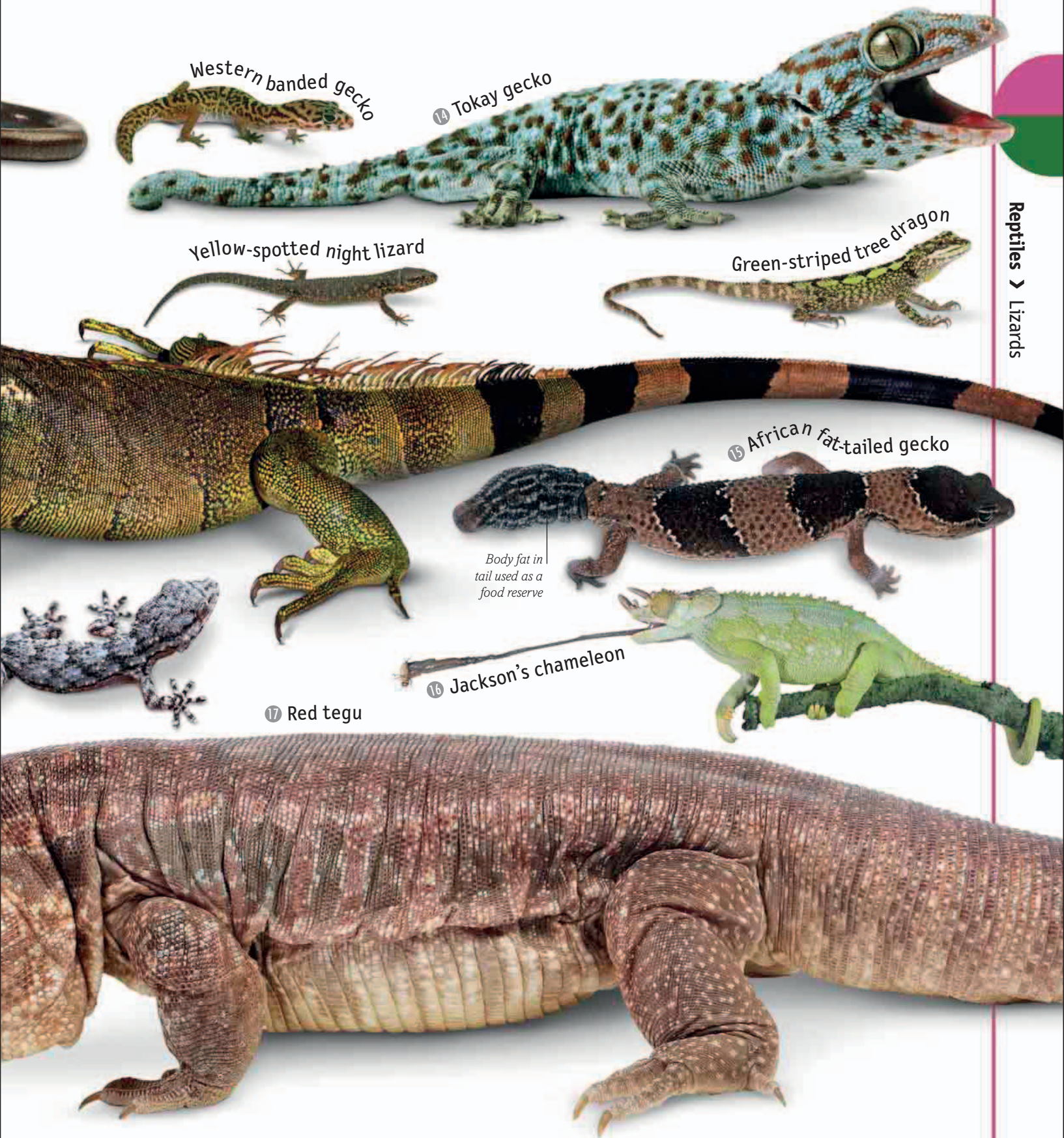
SCALE



Fringe-toed lizard

Geckos are widespread in warm parts of the world, where there are plenty of insects for them to hunt. One of the most popular reptile pets, the **common leopard gecko** 9 from South Asia is easy to look after. This small gecko has an amazingly loud call for an animal just 20 cm (8 in) long. The **slow worm** 10, from Europe, has no legs at all while the **common scaly foot** 11, from Australia,

looks like a snake with tiny leg flaps. Both these lizards hunt insects and spiders, finding their prey on the ground. The Central American **green iguana** 12 is a much bigger reptile, with a spiky crest. Although it looks dangerous, it feeds mainly on plants and often climbs high up trees. Chameleons are even better climbers and hardly ever come to the ground. **Parson's chameleon** 13 from Madagascar



Western banded gecko

14 Tokay gecko

Yellow-spotted night lizard

Green-striped tree dragon

15 African fat-tailed gecko

Body fat in
tail used as a
food reserve

16 Jackson's chameleon

17 Red tegu

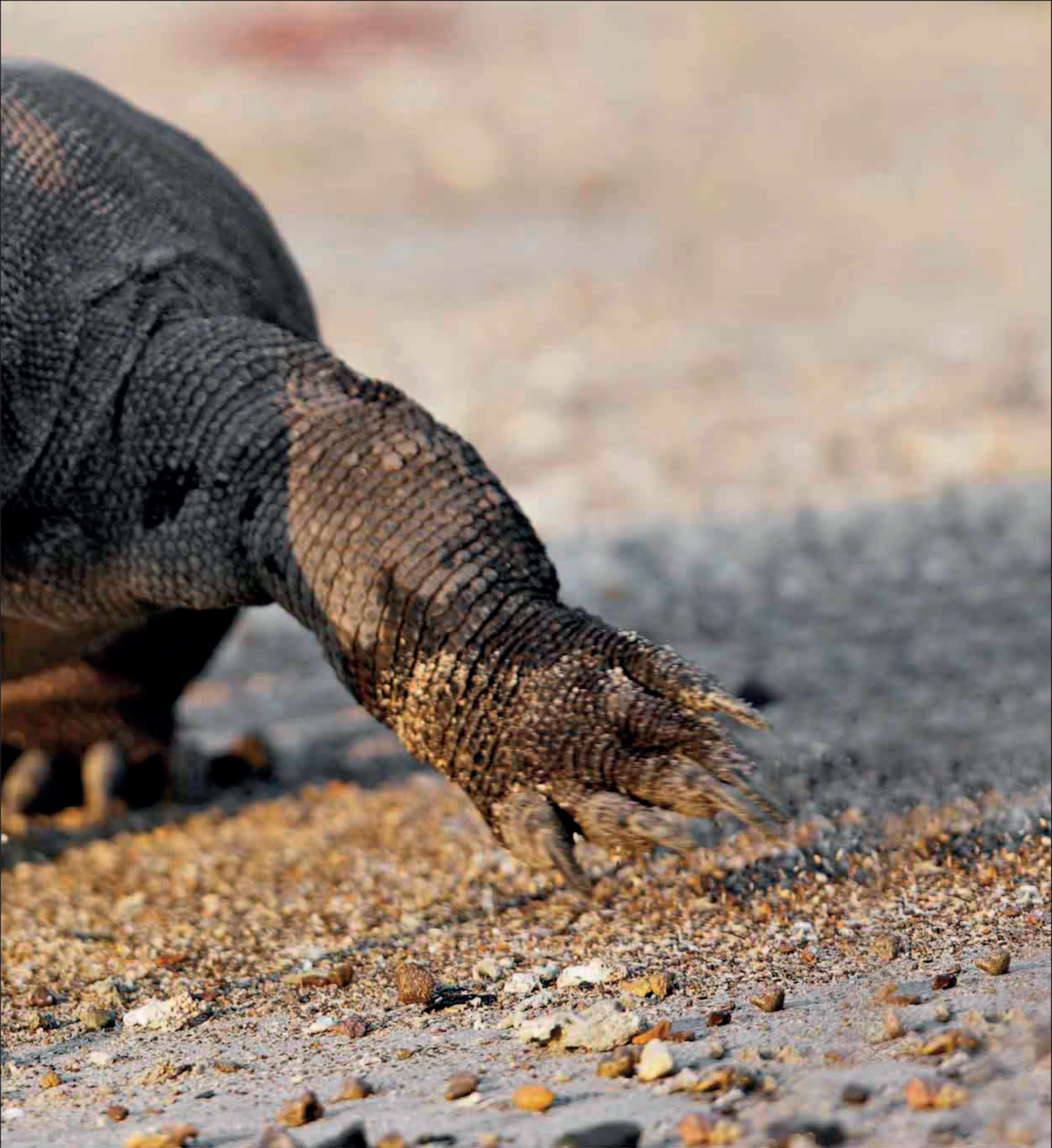
is the largest chameleon. It creeps along branches using its feet and its tail and catches insects by shooting out its unbelievably long, sticky tongue. Like other chameleons, its eyes swivel in all directions, and it can change colour to match its background or to show its mood. The **tokay gecko** 14 gets its name from its harsh “to-kay” call. This large gecko from Southeast Asia lives in houses and often

hunts indoors. **African fat-tailed geckos** 15 live in deserts. Unlike other geckos, they do not have sticky toes, and rarely climb. **Jackson's chameleon** 16 lives in East Africa. The males of this species are identified by the three horns on their snouts. The **red tegu** 17 is one of the biggest lizards in South America. A predator and a scavenger, it sometimes steals chickens from farms.



KOMODO DRAGON

Like a creature out of a horror film, the Komodo dragon lurches over the ground in search of carrion and live prey. The world's largest lizard, it has a poisonous bite, and can smell food more than 5 km (3 miles) away by flicking out its forked tongue. It can swallow small prey whole and knock down bigger animals with a swipe of its powerful tail, killing them with a bite to the throat.



Size > Up to 3.1 m (10 ft) long **Weight** > Males up to 90 kg (198 lb); females weigh about half as much. **Habitat** > Tropical forest and scrub. Adults live on the ground, but young dragons are more agile and live in trees to stay safe. **Distribution** > Indonesian islands of Komodo, Rinca, Padar, and western Flores. **Diet** > All kinds of carrion and live prey, including wild

pigs, water buffalo, snakes, and lizards. **Lifespan** > About 30 years **Top speed** > 20 kph (12 mph), but only in short bursts. **Predators** > Adults have no natural enemies. Young dragons may be eaten by snakes, birds of prey, and even other dragons. **Conservation status** > Komodo dragons are threatened by hunting and by forest and scrub clearance.

Snakes

SCALE



2 Mole viper



Red spitting cobra

Red colour darkens with age

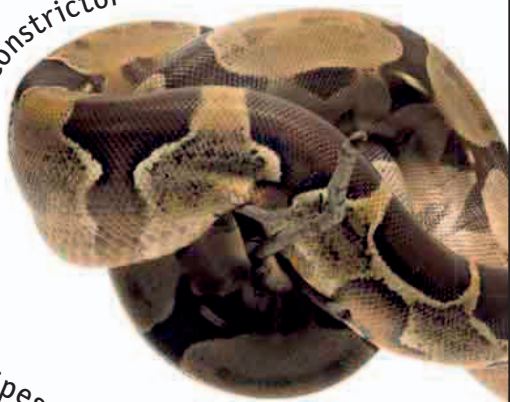


Asp viper



3 Desert death adder

4 Boa constrictor



Ceylonese pipesnake



East African sand boa

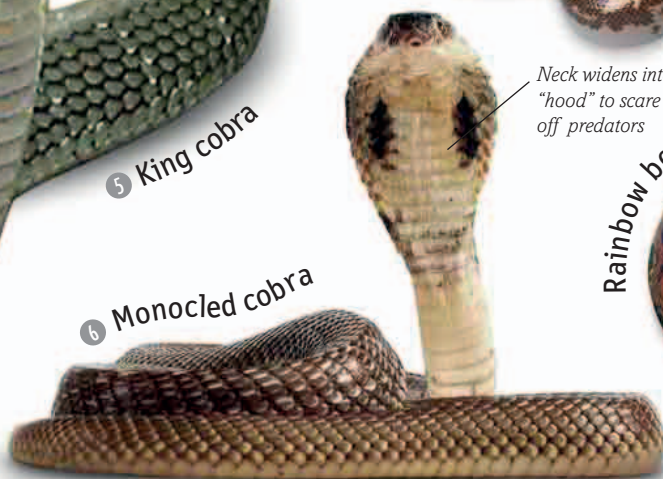
Neck widens into "hood" to scare off predators

Rainbow boa

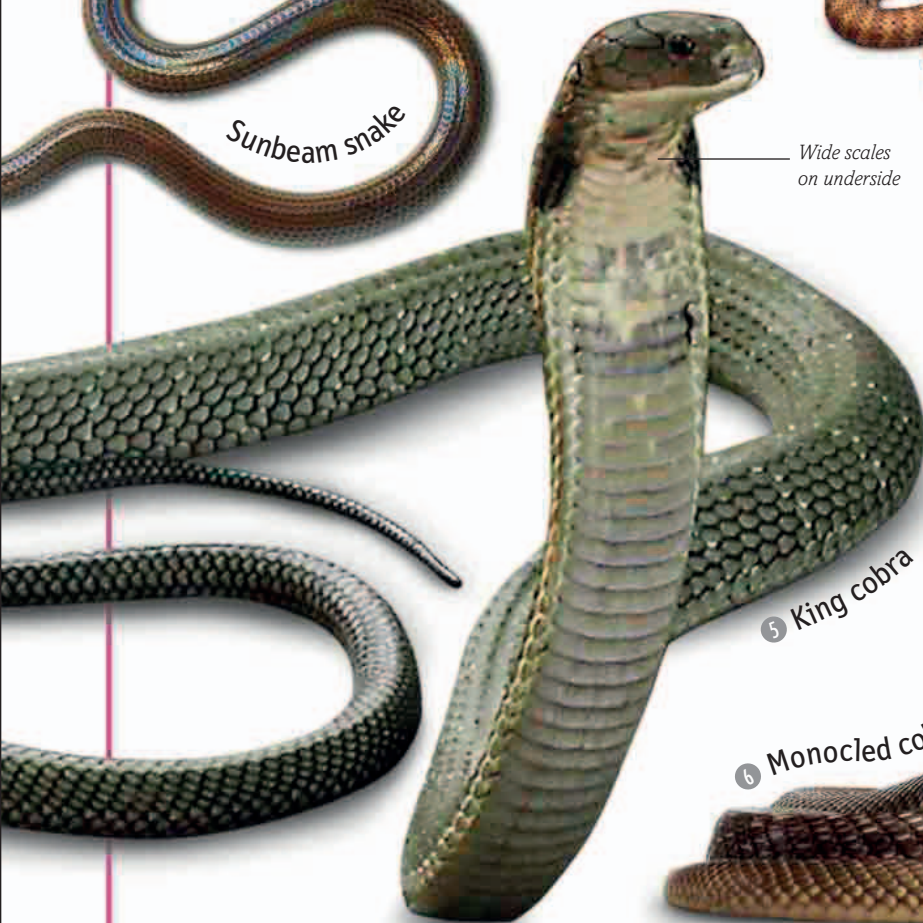


5 King cobra

6 Monocled cobra



Sunbeam snake



With their sleek, shiny bodies and needle-sharp fangs, snakes often trigger panic and fear. Most kinds are harmless to humans, but venomous ones kill more than 20,000 people a year. All snakes are legless, and nearly all eat live prey. Their amazingly flexible jaws and stomachs let them swallow animals much wider than themselves. The African **Gaboon viper** ① waits to ambush its prey with record-breaking fangs

up to 5 cm (2 in) long. In a single bite, it can inject enough venom to kill a baboon or an antelope. The African **mole viper** ② catches small animals underground, while the extremely venomous **desert death adder** ③ from Australia attracts food by using the thin, worm-like tip of its tail as a lure. The **boa constrictor** ④ from Central America is non-venomous and kills by muscle power alone. Like other



7 Western diamond-backed rattlesnake

"Rattle" made of dry skin

Desert horned viper

Dusty colour provides camouflage

8 Green anaconda

Central American coral snake

9 Eurasian blindsnake

Rosy boa

10 Yellow-lipped seakrait

constrictors, it coils around its prey, tightening its grip while the victim slowly suffocates. Boas feed mainly on mammals and birds, but the Asian **king cobra** 5 is an expert at eating other snakes. At 5 m (16 ft) long, it is the biggest venomous snake on Earth. The **monocled cobra** 6 expands its neck into a "hood" when threatened, while the North American **western diamond-backed rattlesnake** 7 makes a rattling sound with

its tail to warn off enemies. The mighty **green anaconda** 8 is one of the world's longest and heaviest snakes, weighing more than 100 kg (220 lb). At the other extreme, the **Eurasian blindsnake** 9 is often less than 30 cm (12 in) long. It feeds on ants, spiders, and centipedes. Most snakes are good swimmers. The **yellow-lipped seakrait** 10 spends its life in tropical seas, coming to land only when it is time to breed.



Some snakes give birth to live young, but most breed by laying eggs. Female **blood pythons** 11 from Southeast Asia coil around their eggs to keep them warm. The mother stays with her eggs for up to three months, and does not eat until her young have hatched. The **green tree python** 12 from Australasia is a superb climber, but the Asian **banded flying snake** 13 is even better at moving

about in trees. It jumps from tree to tree, gliding up to 100 m (330 ft) by stretching out its body and flattening its underside. The **Burmese python** 14 is one of the longest snakes in the world, measuring up to 7 m (23 ft) from head to tail. Like all pythons and rattlesnakes, it has heat sensors on its head, letting it “see” warm-blooded prey even when it is completely dark. The brightly patterned **California**



mountain kingsnake 15 looks venomous, but its colours are a trick and it is actually non-poisonous. Other snakes use different kinds of self-defence. The **pine snake** 16 from North America squirts out horrible-smelling fluid when threatened, while the European **grass snake** 17 turns upside down with its tongue hanging out and pretends to be dead. The South American **false water cobra** 18 has a dangerous

bite, and warns away enemies in the same way as a true cobra by widening its neck. In places with cold winters, snakes hide away and hibernate. Most hide on their own, but North American **garter snakes** 19 gather together in hundreds in underground dens. They come to the surface in spring and squirm in tangled masses as they fight for the chance to mate.



AFRICAN BUSH VIPER This small but deadly snake hunts mostly at night. Although it eats small animals, its venom can cause serious illness or even death in humans. However, this hasn't stopped people from keeping it as a pet. This snake is sometimes called the variable viper because it exists in a variety of colours, including green, yellow, red, and orange, and because it may change colour as it matures.



Size › Males average 65 cm (26 in) in length; females average 71 cm (28 in) **Habitat** › Bushes and shrubs in tropical forests and other densely vegetated areas. **Distribution** › West and Central Africa **Diet** › Small nocturnal mammals such as rodents and shrews, small birds, frogs, and reptiles. **Breeding** › Mating occurs in the rainy season. Females give

birth to up to nine live young, abandoning them immediately afterwards. The young are venomous and able to hunt for themselves from birth. **Lifespan** › 10–20 years in the wild. Captive vipers may live longer. **Predators** › Adult African bush vipers have few if any predators. They may eat the young of their own species.

Crocodiles and alligators

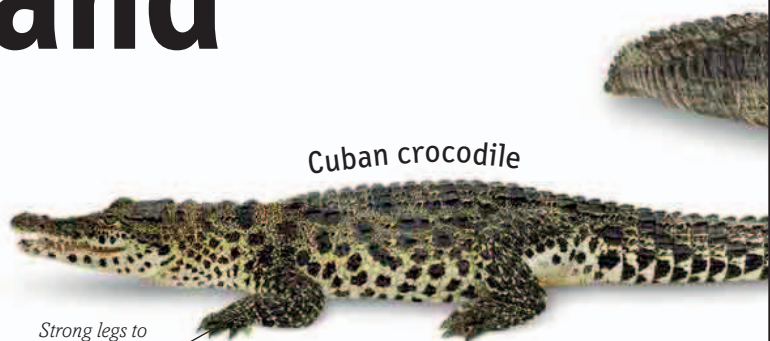
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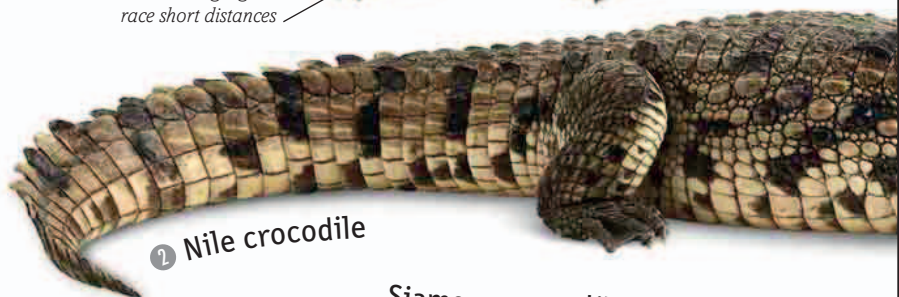
1 Dwarf crocodile



Cuban crocodile
Strong legs to race short distances



2 Nile crocodile



Siamese crocodile



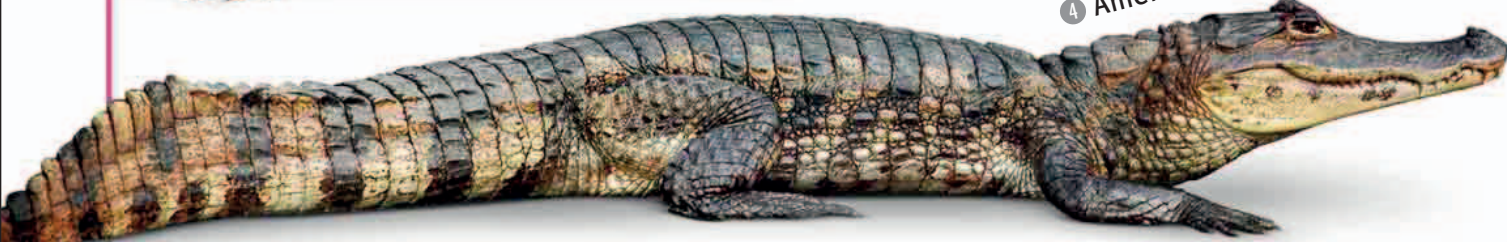
3 Saltwater crocodile



Nostrils at tip of snout



4 American crocodile



Skin armoured with bony plates

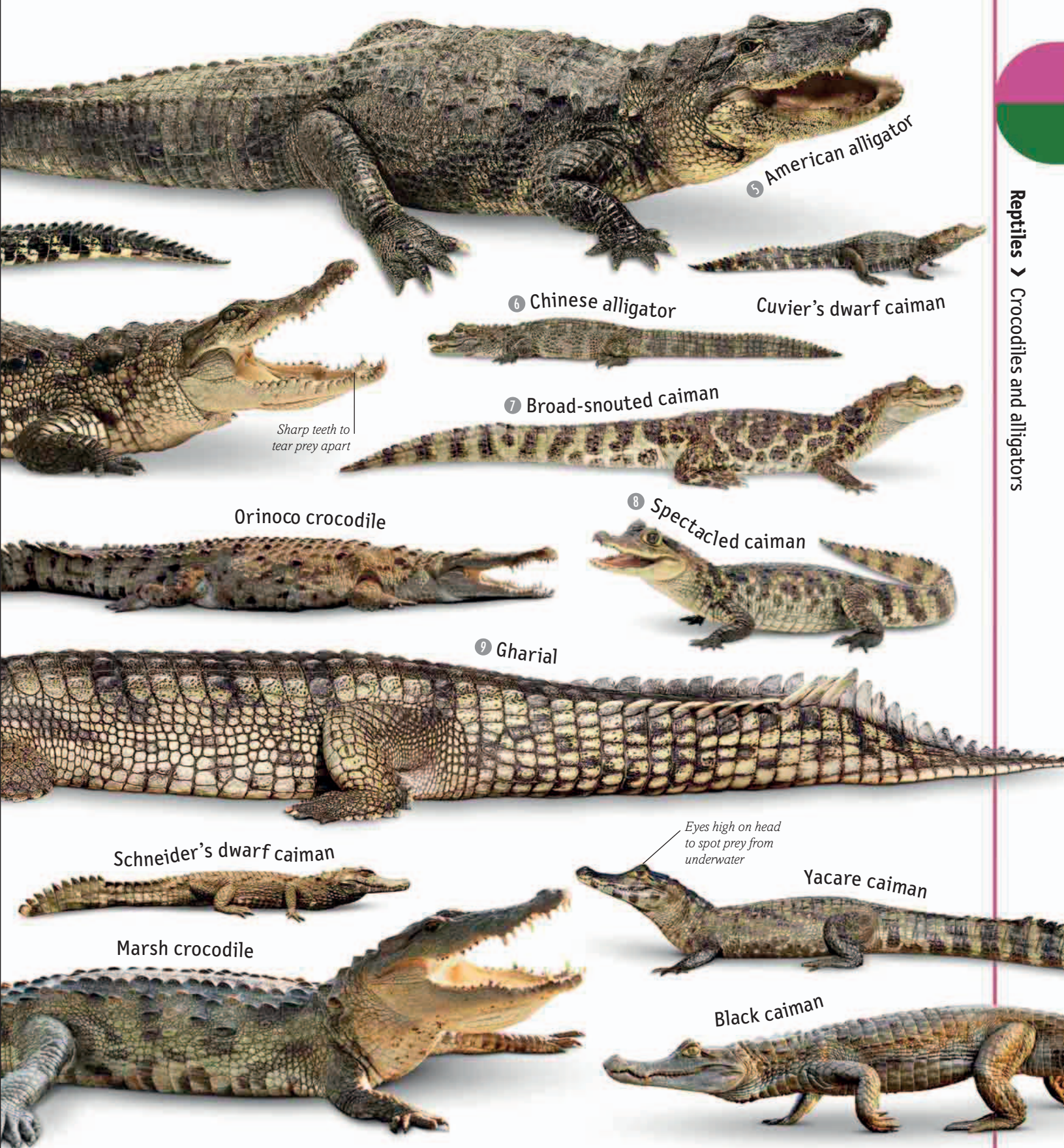


Australian freshwater crocodile



Lurking in rivers, lakes, and sheltered shores, crocodiles and alligators use stealth and muscle power to ambush and kill their prey. Even the smallest kinds, such as the African **dwarf crocodile** 1, have scales like armour plating, while the largest can smash open boats with their giant jaws. Crocodiles swallow small animals whole. They tear bigger ones apart, after pulling them underwater so

they drown. The African **Nile crocodile** 2 often lies in wait near the banks of rivers and water holes, where it attacks animals coming to drink. Females are devoted parents, guarding their eggs and carrying their young to water once they have hatched. Found in Australia and Southeast Asia, the **saltwater crocodile** 3 is the biggest reptile in the world. Measuring up to 7 m (23 ft) long, it is



a notorious man-eater, often attacking after dark. The **American crocodile** ④ feeds mainly on fish, while the **American alligator** ⑤ eats all kinds of animals, from frogs to deer. Like the rare **Chinese alligator** ⑥, it can be told from true crocodiles by the shape of its head, and by the way its teeth fit together when its mouth is closed. Caimans are relatives of alligators from Central and

South America. The **broad-snouted caiman** ⑦ lives in marshes and swamps, while the **spectacled caiman** ⑧ lives on coasts, as well as in inland lakes and rivers. The critically endangered **gharial** ⑨ is a unique fish-eating species from India, with extremely narrow jaws and dozens of sharply pointed teeth. It lives in deep rivers and finds its prey mainly by touch.

Birds

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

Rüppell's vulture

Beak > Birds use their beaks as their main tool. This vulture's beak is adapted for tearing flesh, but other birds use theirs as drills, saws, or even sieves.



Feathers > Different types of feather have different uses. Warm, fluffy down feathers keep the bird warm. Long, stiff feathers grow on the wings to direct the air in flight. Many species grow brightly coloured feathers to attract a mate.

Features

- Lay eggs to reproduce



- Have beaks instead of teeth



- Are covered in feathers



- Have wings and most can fly



- Are warm-blooded



Wings > All birds have wings, although not all of them can fly. The wings flap with great force to lift the bird off the ground. Once in the air, some birds simply hold their wings out to soar like a glider, while others can perform amazing aerobatics.

Ostriches and relatives

SCALE



1 Ostrich

Great spotted kiwi

North Island kiwi

Tokoeka

2 Emu

3 Northern cassowary

Wings used for balance while running

Males have pink necks

Long bill to forage for worms

Two-toed foot

Standing more than 2.5 m (8 ft) tall and weighing up to 160 kg (350 lb), twice as much as a man, **ostriches** ① are the world's biggest birds. Ostriches cannot fly but they are the fastest animals on two legs, with a cruising speed of 70 kph (45 mph). They live in Africa and feed on seeds and fruit, swallowing stones as big as golf balls to help them grind up their food. **Emus** ②, from Australia, are almost

as big, with feathers that look like shaggy fur. They have tiny wings, and three toes on each foot, where ostriches have two. Thousands of emus sometimes gather together in flocks, crossing deserts and raiding farmland in search of food. The **northern cassowary** ③ and **southern cassowary** ④ are rainforest birds from Australia and New Guinea, with a helmet-like crest on their heads. They live on their own and



can be dangerous if cornered, kicking out with their claws. Rheas come from South America. Males are hard-working parents, sitting on the eggs and taking care of the stripy chicks. **Lesser rheas** 5 live in flocks of up to 30 birds. During the breeding season, males fight for attention of female partners. Kiwis come from New Zealand and are chicken-sized, flightless birds with long beaks. They live in

forests and feed at night, sniffing out insects and worms. Some are very rare. The **little spotted kiwi** 6 lives on offshore islands, safe from predators. **Greater rheas** 7 live in flocks of up to 100. Males use impressive wing displays to attract potential mates. The **ornate tinamou** 8 and **elegant crested tinamou** 9 also come from South America. They can fly, but prefer to run away from danger instead.

Gamebirds

SCALE



Chukar partridge



① Red junglefowl



Strong feet
kick aside
fallen leaves

② Wild turkey



Fan-shaped tail
in display

Inflatable
neck sac

③ Greater prairie chicken



Male has
red wattles

Chestnut-bellied hill partridge



Palawan peacock-pheasant



⑤ Bare-faced curassow



Bearded guan

④ Satyr tragopan



Vulturine guineafowl



Spruce grouse



Gamebirds are often good fliers, but the majority of them spend most of their lives on the ground. They peck at seeds and small animals, and scratch up food with their feet. Unlike most other birds, they don't like washing in water, but they love taking a dust bath to keep their feathers clean. The **red junglefowl** ① from southern Asia looks and sounds just like a farmyard rooster, with its

"cock-a-doodle-do" call. It is the distant grandparent of chickens, which are the most common birds on Earth. Found in North America, the **wild turkey** ② is another large gamebird that has been tamed. Gamebirds live in a variety of habitats. Some, such as the **greater prairie chicken** ③, live in open grassland, but others are found in forests, mountains, or wind-swept Arctic tundra. The **satyr**



tragopan 4 lives in cool forests high in the Himalayan mountains. Most gamebirds roost, or sleep, in trees, but the **bare-faced curassow** 5 feeds above ground, too. Male gamebirds are often much more eye-catching than females. Male **Lady Amherst's pheasants** 6 are stunningly coloured, and **Siamese firebacks** 7 have red faces and a feathery crest. **Indian peacocks** 8 have extraordinary

plumes that open like a fan, attracting peahens. Most gamebirds nest on the ground, and some produce incredible numbers of eggs. One **grey partridge** 9 laid 25 eggs at one time, which is a world record for any bird. Females usually sit on the eggs to incubate them, but Australian **malleefowl** 10 bury their eggs inside a nest that looks like a huge compost heap. The heap warms the eggs until they hatch.

Pigeons and doves

SCALE

Shaggy blue
"mane"

Nicobar pigeon



① Mourning dove



European turtle dove



White-tipped dove

Long, tapering tail
separates it from
similar species

③ African green pigeon

Multicoloured
beak

② Woodpigeon



⑤ Pheasant pigeon

Large legs
and toes

④ Pink pigeon



Pied imperial pigeon



Key West quail-dove



Pigeons and doves include many common birds, as well as others that are very rare. They have rounded bodies and short legs, and their heads often bob backwards and forwards when they walk. All of them are vegetarians, and many, including the **mourning dove** ① and **woodpigeon** ②, live near fields and farms, which provide a steady supply of food. Pigeons and doves are

mostly brown or grey, but some tropical kinds are much more colourful. They include the **African green pigeon** ③, which clammers about in trees like a parrot, and the very rare **pink pigeon** ④ from the island of Mauritius in the Indian Ocean. The pink pigeon almost became extinct in the 1990s, but was rescued by conservationists when just 10 birds were left in the wild. The **pheasant pigeon** ⑤ from New Guinea



has strong legs and feeds on the ground, while the **wompoo fruit dove** 6 lives high up in rainforest trees. It swallows fruit whole and scatters the seeds in its droppings, helping trees to spread. Pigeons and doves are found in dry places, too. The crested **spinfex pigeon** 7 lives in the rocky hills of central Australia and feeds on the seeds of desert grasses. The commonest of all, the **domestic pigeon** 8 thrives in

urban areas, where it dodges traffic, nests on buildings, and eats scraps of leftover food. The tiny **diamond dove** 9 from Australia is often seen in pairs or small groups, feeding on the ground. It is only 20 cm (8 in) long. At the other extreme, the **southern crowned pigeon** 10 from New Guinea weighs as much as a chicken. It is one of the biggest pigeons in the world, measuring up to 75 cm (30 in) long.

Parrots and cockatoos

Australian king parrot



Olive-headed lorikeet



1 Pacific parrotlet



2 Blue-and-yellow macaw



Chattering lory



Princess parrots



3 Grey parrot



4 Budgerigar



5 Kakapo

Sharp beak
shreds bark
and leaves

Eastern rosella

Crest can
be raised
or lowered

6 Sulphur-crested cockatoo

Parrots are some of the world's brainiest, noisiest, and most colourful birds. Most of them live in tropical forests, although a few favour open habitats. They use their curved beaks to crack open nuts and seeds, and they vary greatly in size. The tiny **Pacific parrotlet** 1 is smaller than a sparrow, but the bigger ones, such as the **blue-and-yellow macaw** 2, can be nearly 1 m (3 ft) from head to tail. Big or

small, all parrots have strong feet with fleshy toes. They use them for climbing about and for holding their food. The African **grey parrot** 3 and the **budgerigar** 4, from Australian grasslands, are amazingly good at mimicking human speech. One record-breaking budgerigar learned more than 1,700 words, while trained grey parrots can answer questions and even count. Found in New Zealand,

SCALE



Red-fronted parakeet



10 Kea



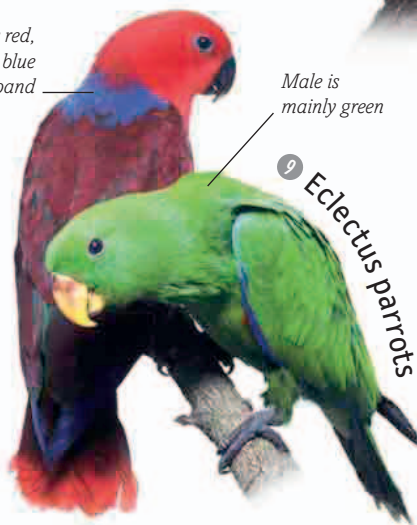
Blue-headed parrot



Female is red,
with blue
neck band

Male is
mainly green

9 Eclectus parrots



Red-fan parrot



Yellow-collared lovebird



Scarlet macaw



Long, sharply
pointed crest

7 Cockatiels



Tail as long
as body

8 Galah



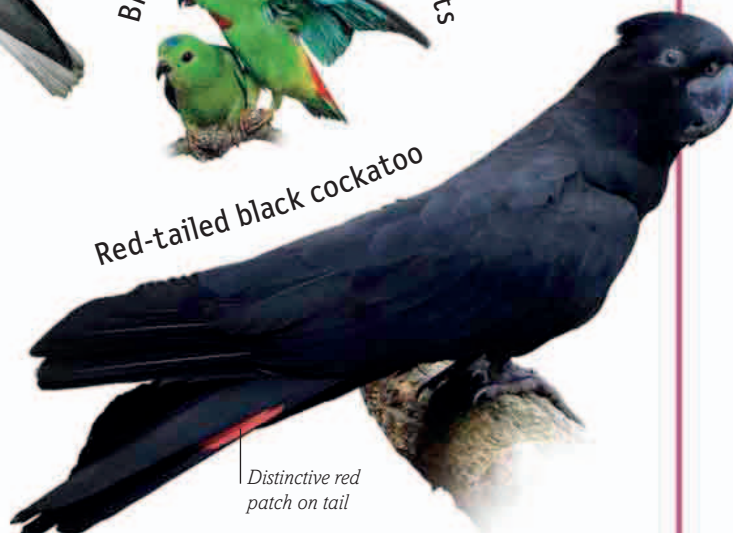
Blue-crowned hanging parrots



St Vincent parrot



Red-tailed black cockatoo



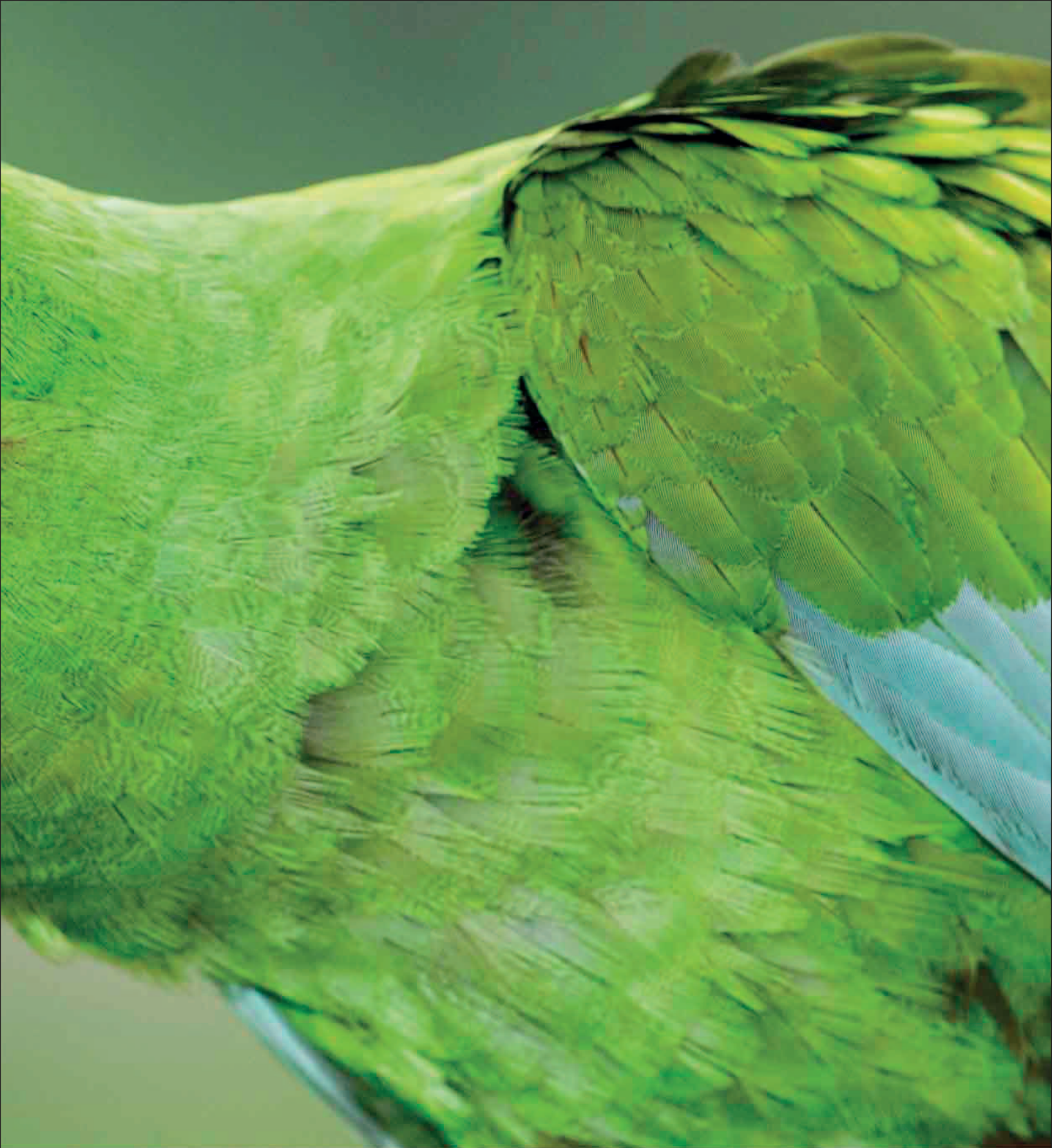
Distinctive red
patch on tail

kakapos 5 are the world's rarest and heaviest parrots. They cannot fly, and come out only at night. These slow-moving birds are easily caught by predators, and only about 125 kakapos are left in the wild. Cockatoos are parrots with feathery crests. Found in Australia and New Guinea, the **sulphur-crested cockatoo** 6 sometimes flies into city gardens and parks, while the **cockatiel** 7, like the budgerigar,

lives in dry scrub and grassland. Most parrots nest in tree-holes, and many, including the **galah** 8, pair up for life. Male and female parrots often look the same, but **eclectus parrots** 9 are so unlike that they were once thought to be different kinds of bird. The **kea** 10 lives in the mountains of New Zealand. Unusually for a parrot, it eats almost anything, including live animals and carrion.



MILITARY MACAW One of the largest and most dazzling members of the parrot family, the military macaw has spectacular plumage, with a bright green body, shimmering sky-blue wingtips, and scarlet patches on its head and tail. Its large beak is adapted for picking fruit and cracking open nuts. Highly intelligent and sociable, it is popular in zoos and is sometimes kept as a pet, although it can be noisy!



Size > Body length up to 75 cm (30 in) **Wingspan** > Up to 1.1 m (3 ft 6 in) **Weight** > Around 900 g (2 lb) **Habitat** > Lowland tropical forests and semi-arid woodland. Lives in large flocks, nesting in treetops or on cliff faces. **Distribution** > Central America and northern South America. **Diet** > Fruit, vegetables, berries, nuts, and seeds. In the Amazon rainforest,

they sometimes eat clay from river banks, possibly to remove toxins they have swallowed in their food. **Breeding** > They perform complex courtship flights and mate for life. **Lifespan** > Up to 60 years in the wild. **Predators** > Large mammals, some reptiles, primates, and birds of prey. **Conservation status** > Threatened by habitat loss and illegal trade in cage birds.

Cuckoos and turacos



2 Pheasant-cuckoo



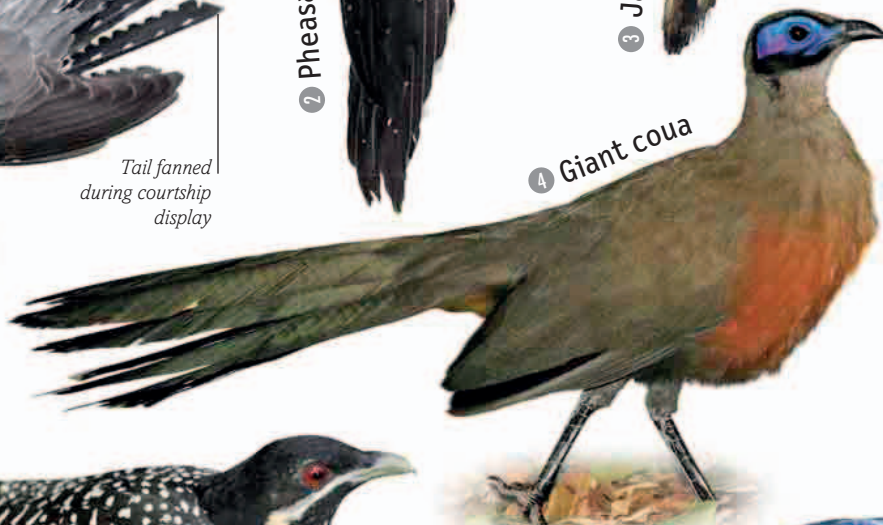
3 Jacobin cuckoo



5 Grey go-away bird



4 Giant coua



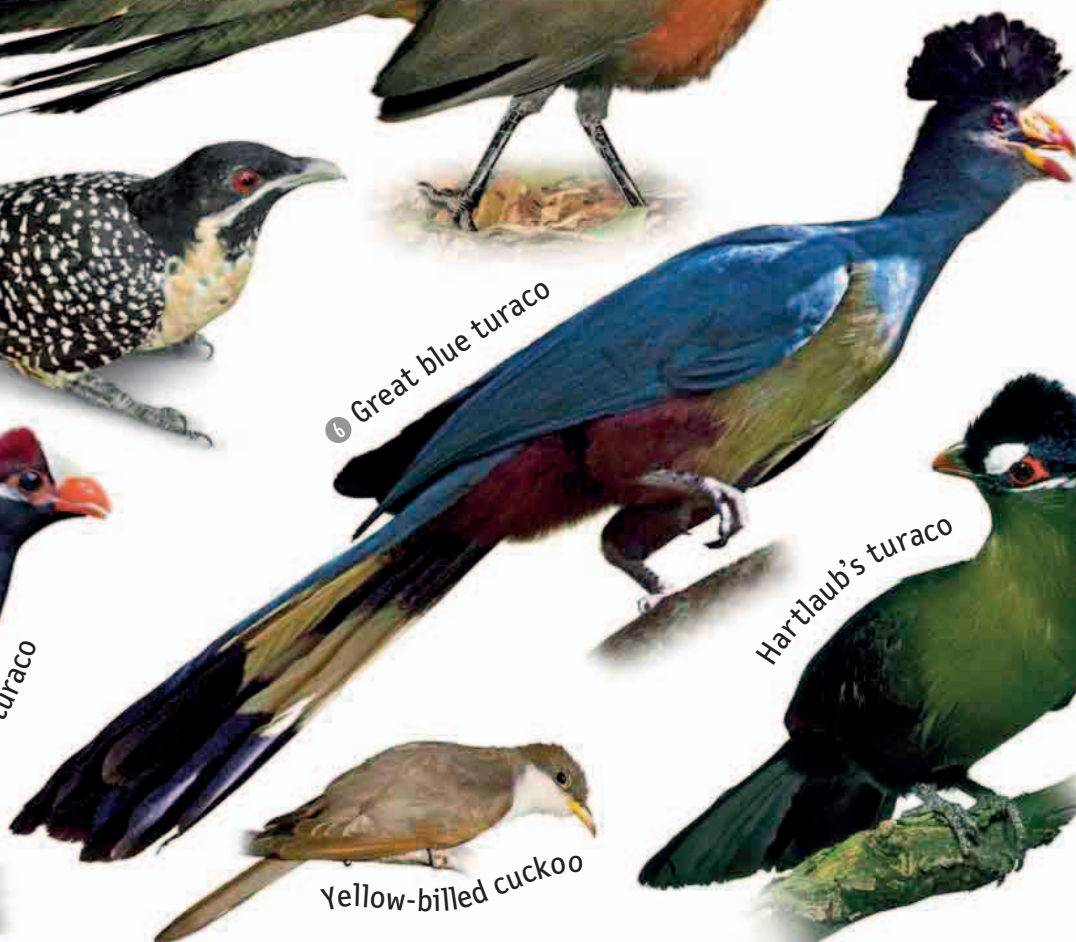
Common koel



Klaas's cuckoo



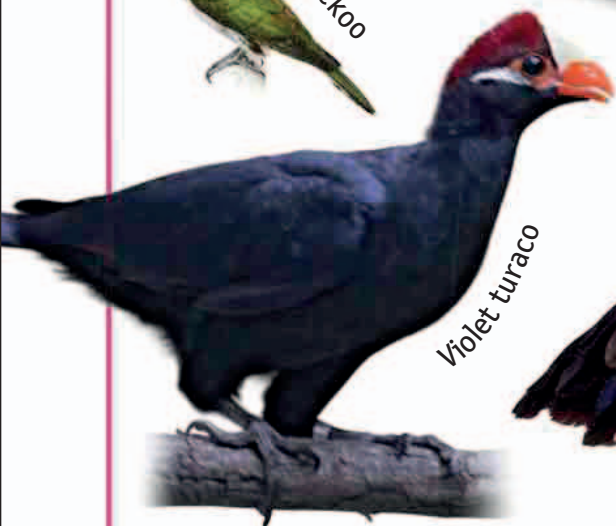
6 Great blue turaco



Hartlaub's turaco



Violet turaco



Yellow-billed cuckoo



Raising a family is hard work for birds because they have to build a nest and look after their young. Many cuckoos skip these tasks by laying their eggs in other birds' nests. The nests' owners do not realize that they have been tricked, and raise the young cuckoos themselves. The **common cuckoo** ① is one of the best-known of these birds, with a loud "cuc-oo" call that gives it its name. It

breeds in Europe and Asia and spends the winter in Africa, undertaking a yearly journey of up to 15,000 km (9,300 miles). The **pheasant-cuckoo** ② from Central and South America and the **jacobin cuckoo** ③ from Africa and Asia also cheat when they breed, but the **giant coua** ④ from Madagascar makes its own nest in trees. Cuckoos feed mainly on small animals such as spiders and caterpillars, but turacos live



but turacos live mostly on fruit. Found only in Africa, they include the noisy **grey go-away bird** 5 and the **great blue turaco** 6, which feeds high up in trees. Turacos have strong feet, and they run along branches like squirrels as they look for food. The **greater roadrunner** 7, from the USA and Mexico, is an extra-large cuckoo that spends much of its life on the ground. It is a great runner, as its name suggests, with

a top speed of about 30 kph (18 mph). It sprints after lizards and snakes, battering them against rocks before swallowing them whole. The **green turaco** 8 lays two eggs in a flimsy nest, and its young clamber out among branches before they learn to fly. The **hoatzin** 9 from South America is a strange bird that feeds only on leaves. Its chicks are good climbers thanks to small claws on their wings.

Owls

SCALE



1 Ural owl



3 Black-and-white owl



Cuban pygmy owl



2 Northern hawk-owl



4 Elf owl

Long tail, like
that of a hawk

Wing feathers
muffle the
sound of flight



Tawny owl



5 Great grey owl



Black-capped screech owl



Tropical screech owl

When the sun sets, most birds settle down to sleep. Owls are the opposite, because this is when most of them start to hunt. Guided by their large eyes and super-sensitive ears, they noiselessly swoop on their prey. Owls come in many different sizes, and they live all over the world. The **Ural owl** 1 and the **northern hawk-owl** 2 are from northern Eurasian forests, while the **black-and-white**

owl 3 lives in the jungles of Central and South America. The tiny **elf owl** 4 is a desert-dweller from the southern USA and Mexico. It weighs only 40 g (1½ oz), which is much lighter than a mobile phone. The **great grey owl** 5 is nearly 50 times heavier. It has a flat, rounded face and staring yellow eyes. Its face channels sound towards its ears, letting it pinpoint small mammals on the ground,



or even under snow. The **snowy owl** 6 lives in the high Arctic region, where its white plumage makes good winter camouflage. The sun never sets during the Arctic summer, so the owl has to hunt by day. The ghostly **barn owl** 7 is one of the world's most widespread birds, and lives on every continent except Antarctica. It can hunt in total darkness, flying with slow wingbeats just a few metres above ground.

Owls are silent when they hunt, but many have strange or spooky calls. When it is alarmed, the **northern saw-whet owl** 8 makes a sound like a saw being sharpened, while the **great horned owl** 9 has a deep and echoing hoot. The **eastern screech owl** 10 is a short, stocky bird, with a large head and almost no neck. Despite its name, this owl doesn't screech, instead it whistles and trills.



BARRED OWL Named for its brown-and-white striped plumage, the barred owl is also known as the hoot owl for its distinctive, repeated call. Barred owls roost in trees during the day and hunt by night, seeking out animals such as rodents and rabbits. The feathers on their wings are specially shaped to allow them to fly almost silently so they can take their prey by surprise, swooping down to grab their victims with razor-sharp talons.



Size › Up to 51 cm (20 in) long **Wingspan** › Up to 1.1 m (43 in) **Weight** › Males about 630 g (22 oz); females about 800 g (28 oz) **Habitat** › Forests, wooded swamps, and suburbs. **Distribution** › Originally found in the eastern USA, down to Texas in the south. Now also found in California, Oregon, southwestern Canada, and Mexico. **Diet** › Rodents,

rabbits, birds, frogs, reptiles, and fish. **Breeding** › Females lay a clutch of one to five eggs. The chicks can fly at six weeks and mature at around two years. **Lifespan** › Up to 18 years in the wild. **Predators** › Great horned owls may occasionally take adult barred owls. Raccoons and weasels may eat eggs and young. **Conservation status** › Not threatened.

Hummingbirds and swifts



SCALE



① Racket-tailed puffleg



② Andean hillstar



Broad-billed hummingbird



Brazilian ruby



Hooded visorbearer



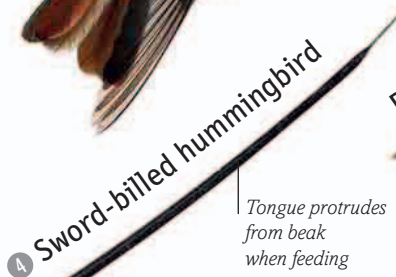
Rufous hummingbird



③ Calliope hummingbird



Buff-bellied hummingbird



④ Sword-billed hummingbird

Tongue protrudes from beak when feeding



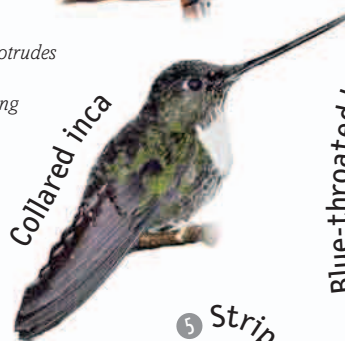
Collared inca



Blue-throated hummingbird



Ruby-throated hummingbird



Collared inca



⑤ Stripe-breasted starthroat



Lucifer hummingbird



Scale-throated hermit



Allen's hummingbird



In different ways hummingbirds and swifts break all kinds of records as they speed through the air. Beating their wings up to 70 times a second, hummingbirds zip forwards, backwards, or hover on the spot like tiny helicopters. They include species such as the **racket-tailed puffleg** ①, with its eye-catching tail plumes, and the **Andean hillstar** ②, which lives high in the Andes at up to 5,000 m

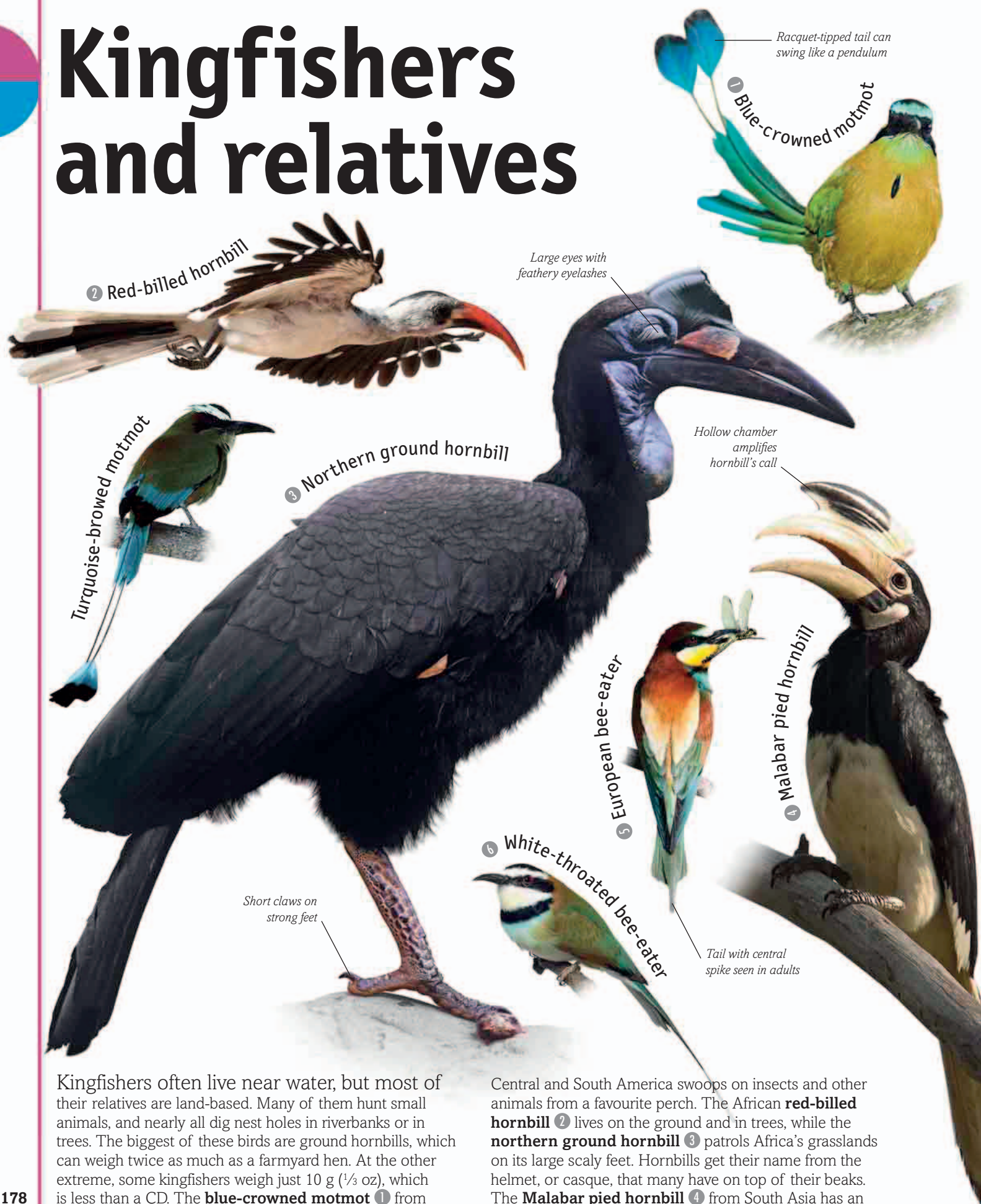
(16,400 ft). The **calliope hummingbird** ③ spends the winter in Central America but migrates northwards as far north as Canada every spring, an amazing feat for such a little bird. Most hummingbirds have long beaks that work like drinking straws to suck sugary nectar from flowers. The **sword-billed hummingbird** ④ is the only bird with a beak longer than its body. It feeds on large trumpet-shaped flowers, hovering



underneath them to get at its food. The **stripe-breasted starthroat's** 5 folded wings are much longer than its tail. The tiny **bee hummingbird** 6 from Cuba is the smallest bird in the world. Males are 5 cm (2 in) long and weigh less than a sugar cube. Hummingbirds are found only in the Americas, but swifts live all around the world. They feed on insects that they catch on the wing. The **alpine swift** 7 and

white-throated swift 8 nest in rocky crevices. Like all swifts they have tiny feet that cling but cannot hop or perch. The **common swift** 9 from Europe, Africa, and Asia is one of the world's fastest birds. It spends most of its time on the wing, and even eats, drinks, and sleeps in flight. After leaving the nest, a young swift does not land until its second or third birthday, when it starts to breed.

Kingfishers and relatives



Kingfishers often live near water, but most of their relatives are land-based. Many of them hunt small animals, and nearly all dig nest holes in riverbanks or in trees. The biggest of these birds are ground hornbills, which can weigh twice as much as a farmyard hen. At the other extreme, some kingfishers weigh just 10 g ($\frac{1}{3}$ oz), which is less than a CD. The **blue-crowned motmot** **1** from

Central and South America swoops on insects and other animals from a favourite perch. The African **red-billed hornbill** **2** lives on the ground and in trees, while the **northern ground hornbill** **3** patrols Africa's grasslands on its large scaly feet. Hornbills get their name from the helmet, or casque, that many have on top of their beaks. The **Malabar pied hornbill** **4** from South Asia has an



7 Hoopoe

Crest raised on take-off and landing

Racquet-tailed roller



Buff-breasted paradise kingfisher



8 Common kingfisher



Blue-bellied roller



Trumpeter hornbill



Flattened bill for catching insects in flight



Jamaican tody

Slender beak to probe for insects in trees



Green wood hoopoe



African pygmy kingfisher

Brown plumage camouflages the bird in trees

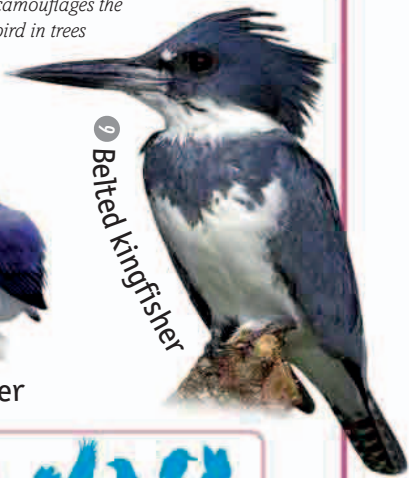


10 Laughing kookaburra



Little kingfisher

9 Belted kingfisher



pied kingfisher



yellow-billed kingfisher



SCALE

extra-large casque, and its wings make a distinct whooshing sound as it flies. **European bee-eaters** 5 and **white-throated bee-eaters** 6 are experts at catching bees while flying. After they have caught one, they wipe it against a perch to remove its sting. The **hoopoe** 7 is a migratory bird that breeds in Europe and Asia. It uses its slender beak to probe in the ground for grubs and worms. **Common**

kingfishers 8 live along rivers and streams, where they dive for fish. The North American **belted kingfisher** 9 is another waterside hunter. Like its relatives, it hits its catch against a perch before swallowing it head-first. The Australian **laughing kookaburra** 10 is the world's biggest kingfisher, with a noisy laughing call. It lives in woodland and swoops on anything that it can swallow, including insects, lizards, and snakes.

Toucans and woodpeckers

SCALE



1 Red-breasted toucan



Green-backed honeybird



3 White-whiskered puffbird



Saffron toucanet



Great barbet



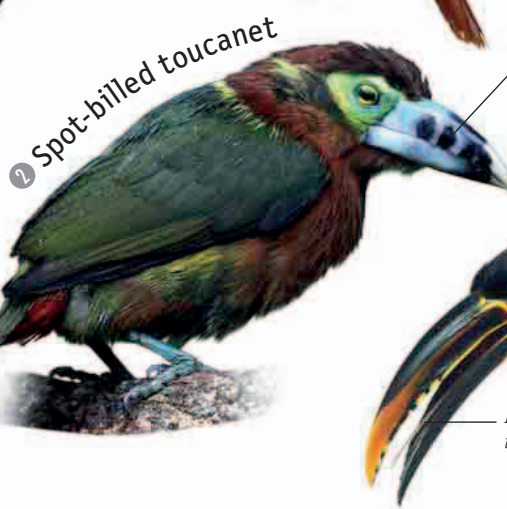
5 Collared aracari



Rusty-breasted nunlet

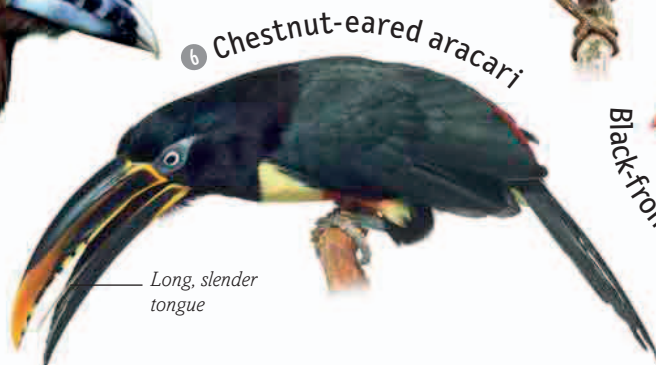


4 White-eared puffbird



2 Spot-billed toucanet

Beak has honeycomb-like air spaces



6 Chestnut-eared aracari

Long, slender tongue



Black-fronted nunbird

Toucans and woodpeckers look very different but they belong to the same group of birds. They live mainly in woods and forests, and usually nest in holes. All of them have specially shaped feet for clinging to tree trunks, but the most attention-grabbing feature of toucans is a giant multicoloured beak. The **red-breasted toucan** 1 feeds mainly on fruit. Like many toucans, its beak is filled with air

spaces, saving a lot of weight. The **spot-billed toucanet** 2 has a smaller beak but it feeds in typical toucan style. After picking a piece of fruit, it tosses it in the air and then swallows it whole. The **white-whiskered puffbird** 3 and **white-eared puffbird** 4 feed mainly on insects, and often nest in old termite mounds or in holes in the ground. Like toucans, **collared aracaris** 5 and **chestnut-eared aracaris** 6 live



Toucan-barbet



Yellow-fronted tinkerbird

7 Toco toucan



8 Northern flicker



9 Great spotted woodpecker



Beak more than half the bird's body length

Spotted piculet



Red-headed barbet



D'Arnaud's barbet

Prominent red crest is always raised

Two toes face forwards and two backwards



Northern wryneck

Rufous-tailed jacamar



Long, thin, dagger-like beak



Red-and-yellow barbet

11 Pileated woodpecker

Tail braces body against tree-trunk



Yellow-fronted woodpecker



10 Heart-spotted woodpecker



Ochraceous piculet



Yellow-bellied sapsucker

in the forests in Central and South America. They roam the treetops in small flocks and roost together in hollow trees. The **toco toucan** 7 is one of the largest birds in the toucan family. Its colossal beak allows it to reach fruit growing on the tips of branches. It also eats small animals such as insects and frogs. Some woodpeckers, including the **northern flicker** 8, feed on the ground, but most cling to tree trunks

and hammer into them with their beaks in search of insects to eat. The **great spotted woodpecker** 9 from Europe and Asia eats wood-boring grubs, while the **heart-spotted woodpecker** 10 from Southeast Asia probes for insects under bark. The North American **pileated woodpecker** 11 is one of the largest of these wood-busting birds. Despite its impressive size, it feeds mainly on ants.

Birds of prey

SCALE



Finger-like
flight feathers

2 Harris's hawk

Golden bronze
feathers, only present
on the head and nape

3 Golden eagle

Powerful wings
for heavy lifting

Lizard buzzard

Swainson's hawk

1 Bateleur

Red-tailed hawk

4 Bald eagle

African hawk eagle

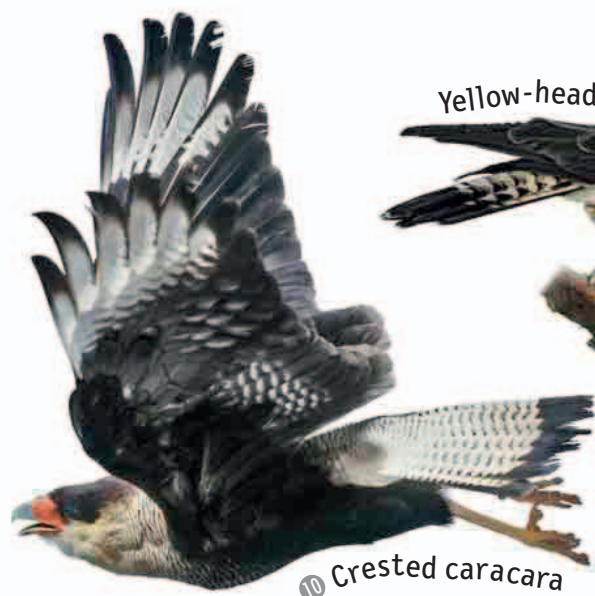
With their hooked beaks and piercing claws, birds of prey are natural killers. Most of them use their feet to grab food, and their hooked beaks to tear it apart. Some, such as the African **bateleur** ①, eat carrion as well as live prey. Vultures, on the other hand, are full-time scavengers, gulping down rotting remains. Birds of prey usually hunt alone, but the **Harris's hawk** ② from

North America is one of the few that work in teams. The **golden eagle** ③ hunts over mountains and the Arctic tundra. With its huge wings and powerful legs, it can lift prey as heavy as itself. North American **bald eagles** ④ often gather near water, where they catch live fish or eat dead ones that wash up on the shore. They build massive nests from sticks, and the biggest one on record weighed



nearly 3 tonnes. Falcons and kestrels are much smaller birds, with slim bodies and slender wings. The Australian **grey falcon** 5 dives down on other birds, while the **common kestrel** 6 hovers in mid-air before dropping on voles, insects, and even worms. The **peregrine falcon** 7 is the fastest animal on Earth. Hurling towards the ground with its wings partly folded, it can hit speeds of more than

300 kph (186 mph), which is almost as fast as a Formula 1 racing car. Found all over the world, the **osprey** 8 hunts fish, snatching them from the water's surface and then carrying them back to its perch. The African **secretary bird** 9 has extra-long legs and hunts on the ground. An expert snake-eater, it uses its wings as shields and often stamps on its prey before swallowing it whole.



10 Crested caracara



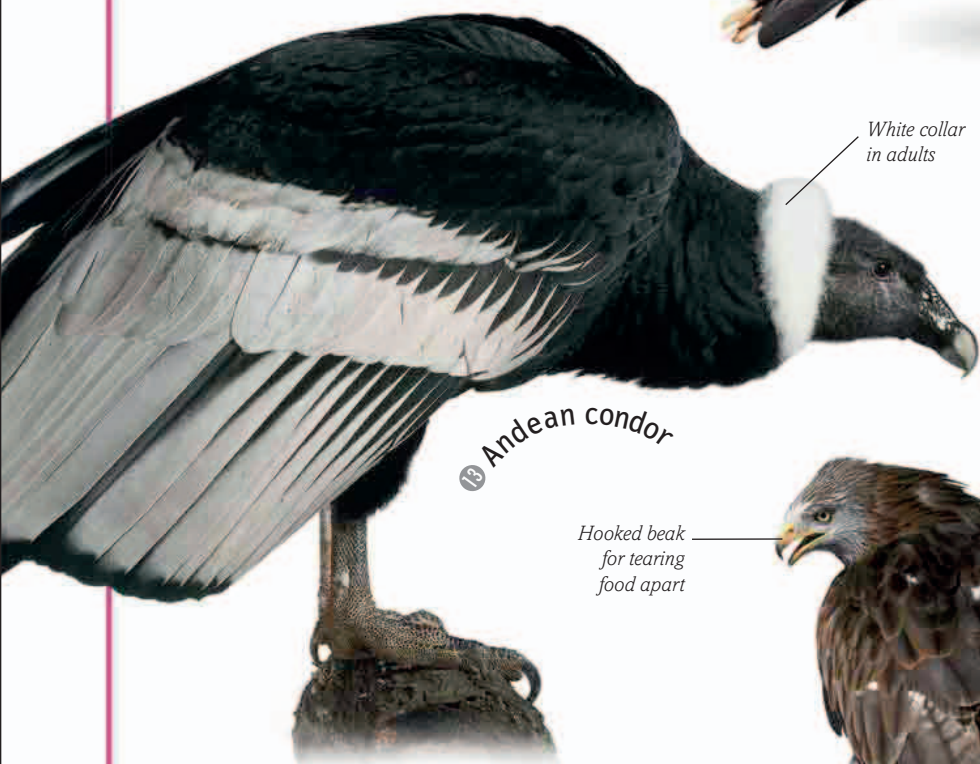
Yellow-headed caracara

Adult has
black streak
behind the eye



Striated caracara

11 Turkey-vulture



13 Andean condor

White collar
in adults

Hooked beak
for tearing
food apart



12 Black vulture



White-tailed kite

14 Red kite



15 Snail kite



Mississippi kite

SCALE



Many birds of prey won't touch food unless it is alive. Caracaras are less picky, and don't mind if their food is living or dead. The **crested caracara** 10 feeds mainly on the ground, but it also behaves like an airborne raider, chasing other birds to make them drop their prey. Most vultures have weak claws and rarely hunt for themselves. Instead they work like a clean-up squad, tracking down and feeding on dead

remains. American **turkey-vultures** 11 often feed on animals killed on roads, although **black vultures** 12 sometimes push them aside so they can get all the food for themselves. The **Andean condor** 13 from South America is the largest vulture, and one of the world's biggest flying birds. With its huge 3.2 m (10½ ft) wingspan, it soars over remote mountains and rocky shores, feeding on all kinds of animal casualties, including



stranded whales. Kites are hunters and scavengers that patrol near the ground. The **red kite** 14 often feeds on dead rabbits and birds, but the **snail kite** 15 eats freshwater apple snails. Holding them down with one foot, it uses its slender beak to pull the snails out of their shells. Africa and Asia have many vultures of their own. The **Rüppell's vulture** 16 is almost bald on its head and neck, as feathers in this area would get

clogged with blood when the bird feeds on animal carcasses. The **Egyptian vulture** 17 uses stones to crack open ostrich eggs. The **palm-nut vulture** 18 is partly vegetarian. It swallows oil-palm fruit, as well as insects, scorpions, and crabs. The **African white-backed vulture** 19 uses its large wings to soar and circle in the air, looking for carrion. Like the Rüppell's vulture, it jostles for food at big carcasses.



KING VULTURE

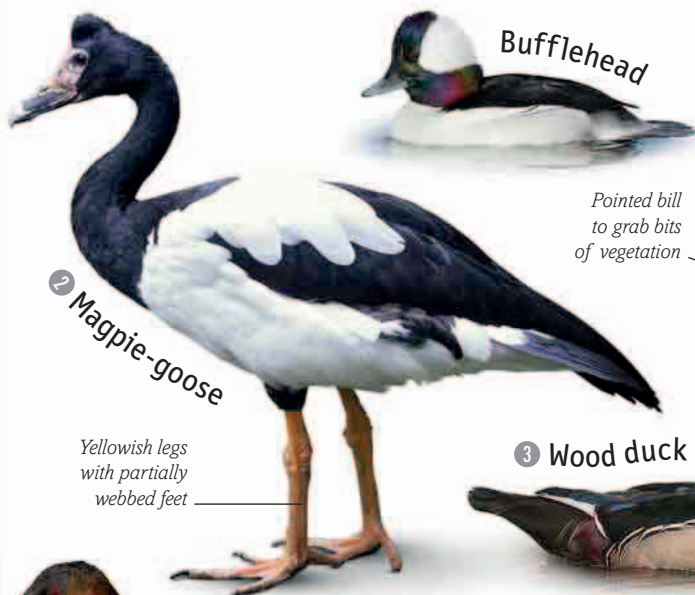
Found in Central and South America, the king vulture may have got its name from its habit of driving smaller birds away from its food. Like all vultures, this odd-looking, colourful scavenger feeds on carrion. It is one of the largest and most powerful scavenging birds, and its sharp beak and strong muscles can rip open the carcasses of dead animals that other, smaller birds cannot get into.



Size › Body up to 80 cm (32 in) long. **Wingspan** › Up to 2 m (6½ ft) **Weight** › Up to 4.5 kg (10 lb) **Habitat** › Lowland tropical forests and nearby grasslands. **Distribution** › Tropical areas of Central and South America, from Mexico to Argentina. **Diet** › Dead animals **Breeding** › Females lay one creamy white egg, which takes up to 58 days to hatch. Both

parents care for the young, feeding it with carrion which they store in a throat pouch called a crop. **Lifespan** › Unknown in the wild. More than 30 years in captivity. **Predators** › Snakes may take the eggs. Jaguars may eat sick or injured adults. **Conservation status** › Not currently in danger, but numbers are declining possibly due to habitat loss.

Ducks, geese, and swans



Male has brightly coloured head compared to drab, brown female

Indian runner



Pointed bill to grab bits of vegetation



Dark neck, with a distinct white band on chin

Canada goose



Red-breasted goose



Ducks and their relatives are expert swimmers, which is why they are also known as waterfowl. Nearly all of them have webbed feet and waterproof feathers. Most live on lakes and rivers, but some ducks, including the **king eider** 1, breed on coasts and spend the winter at sea. **Magpie-geese** 2 lay up to 12 eggs a year. Despite having large families, they face lots of predators and only a few of

the young survive. The North American **wood duck** 3 nests high up in tree-holes. Soon after the ducklings hatch, their mother leads them to water, and they have to jump all the way to the ground. The **common shelduck** 4 often breeds in rabbit burrows, but most other waterfowl nest in the open, near the water's edge. Geese feed mainly on grass, but ducks and swans usually eat while afloat. **Northern**



shovelers 5 use their flat beaks to filter small animals from water, while **red-breasted mergansers** 6 have saw-edged beaks for catching slippery fish. **Mute swans** 7 tip up on end as they swim, using their long necks to reach for food buried in mud. When threatened, these swans curve their necks and half-raise their wings to scare off attackers. The **bar-headed goose** 8 is a long-distance migrant, climbing

to over 6,000 m (19,700 ft) as it crosses the Himalayas. Waterfowl include some well-known farmyard birds. The **mallard** 9 is the most widespread duck in the world. The **domestic duck** 10, a descendant of the mallard, has been farmed for thousands of years. Found only around wet habitats, the Australian **black swan** 11 is a large, nomadic bird, which flies to lakes that fill up after rain.

Penguins

SCALE



① Galápagos penguin

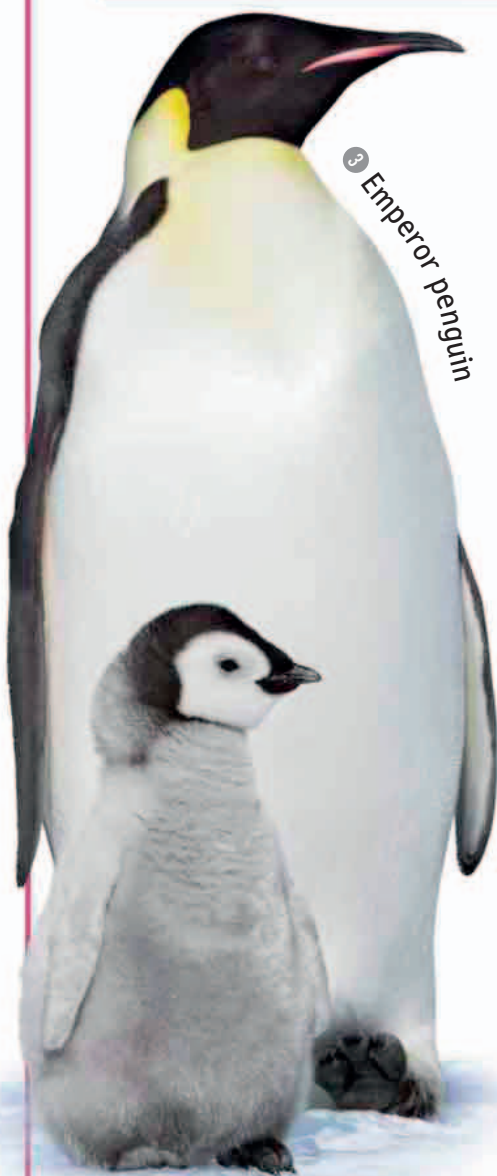


② Adélie penguin

Small, stiff wings
act like flippers



③ Emperor penguin



Snares penguin



Long, yellow
feathery crest

Rockhopper penguin



④ Little penguin



⑤ Jackass penguin



Yellow-eyed penguin



On television, in films, and in real life, penguins have true star appeal, with their upright bodies and black-and-white plumage. Penguins cannot fly, but they are superb swimmers. They use their wings like flippers to speed after fish and other prey in some of the world's coldest and stormiest seas. **Galápagos penguins** ① live in the Galápagos Islands right on the Equator. They are the only penguins to

breed in tropical waters. All other penguins live in much colder waters in the Southern Hemisphere. **Adélie penguins** ② are among the few that breed in Antarctica, building nests out of stones among the rocks in spring. Another Antarctic species, the **Emperor penguin** ③ is the biggest penguin, growing up to 1.2 m (4 ft) in height. It breeds on the ice, and males keep the eggs warm during the long polar winter by balancing



them on their feet. The females, meanwhile, stay out at sea to feed, returning to land when the chicks hatch. The **little penguin** 4, at 40 cm (16 in), is the smallest of all penguins. It nests in burrows on the shores of New Zealand and Australia, coming ashore after dark. The **African or jackass penguin** 5 gets its name from its donkey-like call. It is a close relative of the **Humboldt penguin** 6 and **Magellanic**

penguin 7, both of which nest in the far south of South America. The **king penguin** 8 looks like a smaller version of the emperor penguin. It nests on remote rocky islands in Antarctica, and incubates its eggs in the same way as the emperor penguin. The **macaroni penguin** 9 is one of several kinds of penguin with feathery crests. It comes to land to breed, but spends the rest of the year far out at sea.



EMPEROR PENGUINS These tall, stately birds are the largest of all penguin species. Emperor penguins live on pack ice and hunt in the freezing waters of the Antarctic Ocean, darting after fish with incredible agility. Their dense feathers and thick layer of fat protect them from the intense cold. On land, adults and chicks huddle together in large colonies, taking turns to enjoy the warmth at the centre of the group.



Size > About 1.15 m (3¾ ft) tall **Weight** > Up to 37 kg (81.5 lb)
Habitat > Coastal areas, islands, and pack ice. **Distribution** > Antarctica **Diet** > Fish, squid, crustaceans, and krill. **Breeding** > Emperor penguins breed once a year during winter. Females lay a single egg, then leave to find food. Males rest the eggs on their feet, covering them with a warm layer of skin called a

brood pouch. The females return once the eggs have hatched. Both parents then care for the chick. **Predators** > Adults may be eaten by killer whales, sharks, or leopard seals. The chicks may be taken by birds such as Antarctic skuas and giant petrels. **Conservation status** > Scientists suspect this species will become threatened as sea ice melts due to climate change.

Storks, ibises, and herons

SCALE



① Great egret

Yellow "saddle" on top of beak



⑥ Saddle-billed stork



② Cattle egret

Beak turns deep orange during mating season

S-shaped neck straightens to stab prey

Reddish egret

④ Eurasian spoonbill



Beak with sensitive spoon-shaped tip

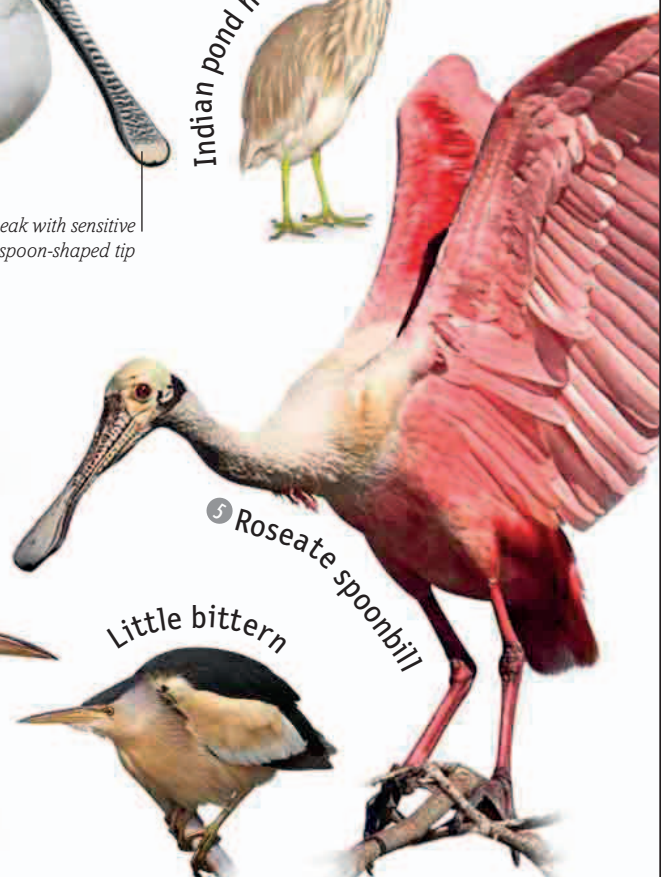
Indian pond heron



Little egret



③ Eurasian bittern



⑤ Roseate spoonbill

Little bittern



With their long beaks and even longer legs, storks and their relatives are built for hunting by stealth. Many of them stride through shallow water in search of food, but some species feed on land. The **great egret** ① waits patiently for fish and frogs and then spears them with a sudden jab of its beak. The **cattle egret** ② hunts in rough grassland, snapping up grasshoppers and other insects

stirred up by animal hooves. Bitterns hunt by the water's edge, with their necks hunched and ready to strike. The **Eurasian bittern** ③ is perfectly camouflaged to match dead reeds. If anyone comes nearby, it stands up straight and sways slowly from side to side, just like reeds blowing in the wind. **Eurasian spoonbills** ④ and **American roseate spoonbills** ⑤ catch their prey by wading through water and



sweeping their flattened beaks from side to side. If they feel food with the tip of their beak, the “spoon” instantly snaps shut. African **saddle-billed storks** ⑥ have a wingspan of up to 2.75 m (9 ft). Like other storks, they fly with their necks stretched out and their legs trailing behind. While storks and ibises usually hunt by day, night herons are active after dark. The **black-crowned night heron** ⑦ lives in wetlands all

over the world, creeping along the water's edge and ambushing its prey. **Grey herons** ⑧ live year-round in western Europe, but **European white storks** ⑨ migrate northwards every year from Africa and South Asia, soaring high on outstretched wings. The beautiful **scarlet ibis** ⑩ lives in South America and the Caribbean. It gets its amazing scarlet colour from its diet of small crustaceans.

Pelicans and relatives



Pelicans and their relatives nearly all have webbed feet, and most swim or dive to catch their food. The **shoebill** ① is an odd-one-out. It lives in African swamps, where it scoops up frogs and fish in its enormous beak. The **white-tailed tropicbird** ② and **red-billed tropicbird** ③ are always on the move. They flutter above tropical oceans, splashing down with their wings partly

folded and quickly taking off with their catch. The **great cormorant** ④ chases fish in rivers, lakes, and on coasts. It dives down beneath the surface, using its feet as propellers and steering with its wings. Like other cormorants, its feathers are not waterproof and when it has finished fishing it holds its wings out to dry. The **flightless cormorant** ⑤, from the Galapagos Islands, has stumpy wings and is the

SCALE



Hammerkop



Red-faced shag



Masked booby



Black-and-white
colouring develops
in adulthood

Brown booby



1 American white pelican



Beak has pouch
for catching fish

8 Brown pelican



Densely streaked
head

9 Magnificent frigatebird



Blue-footed booby



Blue feet impress
potential mates

European shag



10 Northern gannet



Spot-billed pelican



only cormorant that cannot fly. The **anhinga** 6, or snakebird, swims with its body below the waterline, so that only its head and neck can be seen. Pelicans are famous for the huge pouches hanging below their beaks, which they use for catching fish. The **American white pelican** 7 fishes from the surface, but the **brown pelican** 8 cruises just above the waves and dive-bombs its prey. The **magnificent**

frigatebird 9 soars over the ocean on amazingly long and slender wings. It feeds by snatching fish from the surface, or by chasing other birds so that they drop their catch. Boobies and gannets feed by diving into the sea at high speed to grab passing fish. The **northern gannet** 10 plummets from 30 m (98 ft) up. It folds back its wings as it slams through the water, disappearing with an impressive splash.



FLAMINGOS

With their amazingly long necks and legs, and their brilliant pink colouring, flamingos are easy to recognize. These greater flamingos, one of six species in the family, live in huge flocks of up to 250,000 birds, which feed, nest, and breed together. They feed by wading through the shallows with their heads partly underwater. Their specially adapted beaks have a built-in sieve to filter out tiny pieces of food.



Size > Up to 1.5 m (5 ft) tall **Wingspan** > 1.7 m (5½ ft)
Weight > Up to 4 kg (8¾ lb) **Habitat** > Lagoons, salt lakes, and shallow, muddy coasts. **Distribution** > Central and South America, Caribbean, Africa, southwest Europe, and Asia. **Diet** > Shrimps, worms, microscopic algae, and small pieces of water plants. Their pink colour is a by-product of

the flamingos' diet. **Breeding** > Females lay a single egg in a nest that looks like a miniature volcano made out of mud. **Lifespan** > 30 years in the wild, longer in captivity. **Predators** > Adults have few natural enemies, but chicks may be eaten by hyenas, birds of prey, and marabou storks. **Conservation status** > Not threatened.

Cranes and relatives



Cranes and rails look very different, but they belong to the same, very varied group of birds. All of them have long legs, and many of them have long, pointed beaks. Cranes live in the open, but rails have slender bodies so they can hide among waterside plants. The **clapper rail** ① likes mangrove swamps, while the **king rail** ② from North and Central America lives in marshes. Although these birds are

timid, many of them have noisy calls. The **common moorhen** ③ makes a loud “kurruk”, while the **water rail** ④ grunts and squeals. The **brolga** ⑤ is an Australian crane with a red band on its head. It spends its life on the move, travelling to places where it has recently rained. The **common crane** ⑥, from Europe, Asia, and Africa, is a long-distance migrant, travelling thousands of kilometres



each year. Like other cranes, it is legendary for its courtship dances and its amazingly loud trumpeting call. The **great bustard** 7 is a massive grassland bird from Europe and Asia. Males can weigh up to 21 kg (46 lb), making them some of the heaviest flying birds. **Grey crowned cranes** 8 live in Africa. Unlike most cranes they can perch, and they spend the night roosting in trees. The beautiful **red-crowned crane** 9 lives

in Russia, China, and Japan. Standing up to 1.8 m (6 ft) tall, it is one of the largest cranes, and one of the rarest, with fewer than 3,000 left in the wild. The **American coot** 10 is much more common, and can easily be seen in wetlands across North America. Coots are good swimmers, with paddle-shaped flaps on their toes. They can also be quarrelsome, often kicking and splashing when they fight.

Waders, gulls, and auks

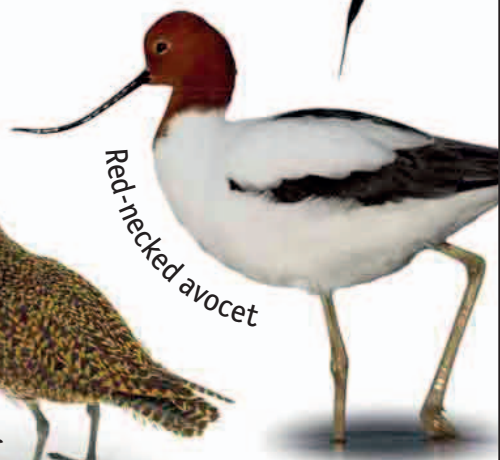
SCALE



① American black oystercatcher



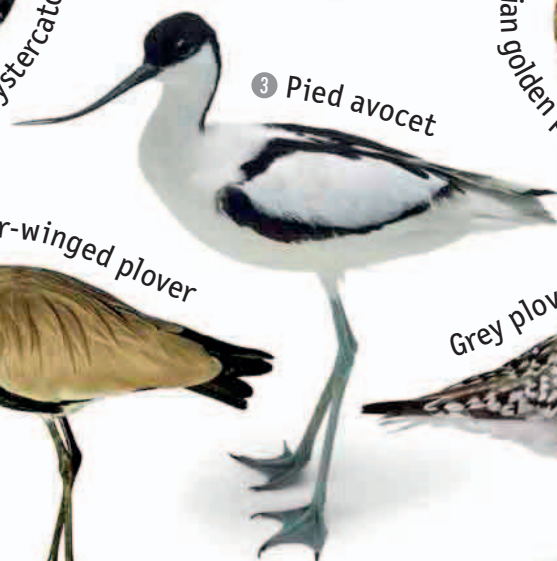
Lesser yellowlegs



Red-necked avocet



Eurasian golden plover



③ Pied avocet



② Eurasian oystercatcher

Spur-winged plover



Grey plover



Masked lapwing



Northern lapwing

Shortest legs among lapwings



⑥ Red knot



⑤ Dunlin



④ Black-necked stilt

Waders and their relatives live in marshes, on coasts, and in the open sea. Most of them lay their eggs on the ground, and some travel record distances to breed. The **American black oystercatcher** ① feeds on shrimps and worms, but is also an expert at smashing open shells of oysters and crabs. The **Eurasian oystercatcher** ② uses the same hunting technique to get at mussels and

other prey. The **pied avocet** ③ feeds by striding through shallow water and sweeping its upturned beak from side to side. The tip of its beak is amazingly sensitive, helping it catch insects, shrimps, and other small animals entirely by touch. **Black-necked stilts** ④ wade through water on pencil-thin, bright-red legs. Relative to their bodies, their legs are gigantic, and they stick out behind when these birds



sit on their eggs. The **dunlin** 5 and the **red knot** 6 breed in the Arctic tundra and then migrate south in enormous flocks. The red knot travels as far as the tip of South America and New Zealand, an epic round trip of 30,000 km (18,600 miles). The **wattled jacana** 7 from South America has giant toes for walking over lily pads in shallow lakes. The **American woodcock** 8 has 360-degree vision, thanks

to eyes near the top of its head. During their courtship displays, male woodcocks fly at just 8 kph (5 mph), a slow-flying record for a bird, equivalent to a gentle jog. The male **ruff** 9 has bright courtship plumage, with a feathery collar around its neck. The **long-billed curlew** 10 is specially equipped to pull up worms, with a curved beak more than half its body length.



11 Little auk



South polar skua



12 Razorbill

Beak flattened from side to side



Marbled murrelet



Black skimmer



Great black-headed gull



13 Tufted puffin



Black guillemot



14 Atlantic puffin



Crested auklet



15 Brown noddy



16 Arctic tern



17 Caspian tern



Greater crested tern

Short, sturdy legs



Swallow-tailed gull

Webbed feet for paddling in water

Gulls and auks are good swimmers, with waterproof feathers and webbed feet. Gulls often wander inland, but auks are true seabirds, using their wings to fly and to swim. The **little auk** 11 is the smallest auk, growing up to 19 cm (7 in) long. It has a black-and-white body and a short, stubby beak. It nests among boulders in the high Arctic and feeds in huge flocks that look like swarms of

bees. The **razorbill** 12 breeds on rocky ledges, but the **tufted puffin** 13 and **Atlantic puffin** 14 nest in cliff-top burrows. Puffins use their multicoloured beaks to catch sand eels and other fish. Holding them crosswise, they can carry up to a dozen at a time. Terns and noddies are relatives of gulls with long tails and pointed wings. The **brown noddy** 15 breeds on tropical islands, while the **Arctic tern** 16 migrates



between the Arctic and the Southern Ocean. In its 30-year lifespan, it can travel up to 2.4 million km (1.5 million miles), six times the distance from Earth to the Moon. The **Caspian tern** 17 stays close to coasts, and often breeds near lakes. Like most terns, it is a fiercely protective parent, dive-bombing anyone who comes close to its nest. Auks catch all their food at sea, but gulls often scavenge along the shore and inland.

Ross's gull 18 lives near the edge of the Arctic pack-ice and rarely strays further south. The **great black-backed gull** 19 is the biggest gull at 78 cm (31 in) long, and has a fearsome appetite. It often preys on other seabirds, and it can swallow young rabbits in a single gulp. The **common gull** 20 often follows tractors ploughing fields, swooping down to snap up worms.



ALBATROSSES Perhaps the ultimate sea birds, albatrosses spend most of their lives gliding over the oceans. They may fly hundreds of miles in a single day, and they are able to lock their enormous wings open so they can glide with little or no effort. Black-browed albatrosses, like the ones above, are the most common and widespread species, but even they are endangered by human activity.



Size › 83–95 cm (33–37 in) tall **Wingspan** › Up to 2.4 m (8 ft) **Weight** › Up to 5 kg (11 lb) **Habitat** › They spend most of the year at sea but return to land to breed.
Distribution › South Atlantic Ocean **Diet** › Crustaceans, fish, squid, and also dead penguins. They pick food from the ocean surface or dive for it, and sometimes follow trawlers

for discarded fish. **Breeding** › Albatrosses mate for life. The female lays one egg, which both parents care for. **Lifespan** › Usually about 30 years, but may live as long as 70 years.
Predators › Tiger sharks may take adults. Rats or skuas may take the eggs. **Conservation status** › Endangered, as they often die after becoming tangled in fishing lines.

Perching birds

SCALE



There are thousands of kinds of perching birds, outnumbering all other birds put together. Most are small, with special feet that lock tight when they perch, keeping them in place. During the daytime most perching birds are constantly busy as they search for food, build their nests, and look after their young. The **scarlet-chested sunbird** ① from Africa feeds on sugary nectar from flowers using a

curved beak. The **northern cardinal** ② lives in Canada, the USA, and Mexico. In the winter the male's brilliant red plumage stands out against the snow. **Blue manakins** ③ come from the rainforests of Brazil. Males attract females with elaborate dances but play no part in raising a family. The **white-throated dipper** ④ from Europe and Asia is one of the few perching birds that can dive and swim. It



feeds underwater, collecting small animals in rivers and streams. The **blue-winged pitta** 5 lives in Southeast Asia, where it eats insects on the forest floor. **Rufous horneros** 6 from South America make football-shaped nests out of mud. Both parents help in the construction, which includes a slit-shaped entrance and a curved inner corridor. Male **Andean cock-of-the-rock** 7 put all their energy into

courtship, but the females raise the young. **Bare-throated bellbirds** 8 from South America are some of the world's loudest birds, with piercing metallic calls. Male **golden bowerbirds** 9 attract partners by piling sticks around small trees. These bowers are up to 2 m (6½ ft) high, decorated with fruit and flowers. The **red crossbill** 10 has a cross-tipped beak for extracting seeds from pine cones.



Perching birds need lots of high-energy food because they are very active. **African paradise flycatchers** ① catch insects on the wing, while **eastern paradise whydahs** ② collect seeds and insects on the ground. During the breeding season male whydahs grow spectacular tail feathers that can be three times their body length. The **black-capped chickadee** ③ from North

America often visits bird feeders in the winter months. Like other chickadees it is a natural acrobat, hanging upside down from twigs as it searches for insects and spiders. The multicoloured **Gouldian finch** ④ is a seed-eater from northern Australia. It is rare in the wild but is sometimes kept as a cage bird. The **Eurasian golden oriole** ⑤ feeds mainly on fruit. Males have striking plumage but they are



Strong
perching feet

hard to see because they feed in treetops. The **lesser bird-of-paradise** **16** lives in the forests of New Guinea. Males are much more colourful than females, and they show off their finery in remarkable courtship displays. The **yellow-headed blackbird** **17** has a call that sounds like a creaky, rusty gate. It breeds in North America and forms enormous flocks in winter that often feed in fields. The **eastern**

meadowlark **18** is another North American bird, with a loud whistling call. It feeds on the ground, probing for insects with its sharply pointed beak. **Brown-headed cowbirds** **19** lay their eggs in the nests of other birds. Asian **red-billed blue magpies** **20** are nest raiders, stealing and eating other birds' eggs and chicks. They belong to the crow family, which contains the world's biggest perching birds.



Perching birds include some long-distance travellers as well as some that stay put throughout the year. The **European robin** 21 is one of the stay-at-homes. It often lives in gardens where it feeds on insects and worms. The **barn swallow** 22 catches insects in midair. It breeds in North America, Europe, and Asia but flies south when autumn arrives, a round trip of up to 20,000 km (12,400 miles).

Winter wrens 23 live across the Northern Hemisphere. In cold weather they often roost together, and more than 60 winter wrens have been found in a single nest box. The **Bohemian waxwing** 24 comes from the forests of North America, Europe, and northern Asia but sometimes migrates southwards in winter if insects and berries get hard to find. The **long-tailed tit** 25 forms busy winter flocks that flutter



through European woodlands in a single file. The thrush family is famous for its tuneful singers. They include the **Eurasian blackbird** 26, **song thrush** 27, and the North American **western bluebird** 28. Like most perching birds, the male western bluebird sings to attract females and also to warn other males to keep away. The **northern mockingbird** 29 sings for hours at a time. It copies the

songs of other birds, and even the ringtones of mobile phones. The **house sparrow** 30 has followed humans all over the Earth and is now the world's most widespread bird. It often nests under roofs and in holes in walls. House sparrows are a common sight inside supermarkets and warehouses, eating spilled food. The **Eurasian skylark** 31 feeds on the ground but sings high up in the air.



RED-BACKED SHRIKE This gruesome display is the larder of the red-backed shrike. A small but efficient hunter, this shrike is sometimes called the butcher bird because of its habit of sticking its prey on thorns. This dries out the bodies, so that they decay slowly and the bird can save them to eat later. The shrike eats larger animals such as lizards by pulling them off the thorns bit by bit.



Size > Up to 18 cm (7 in) long **Wingspan** > 26 cm (10 in)
Weight > 30 g (1 oz) **Habitat** > Heathlands and commons with thorny bushes in Europe, and dry scrublands in Africa.
Distribution > Continental Europe, western and central Asia. Winters in central-southern Africa. **Diet** > Bees, beetles, and other large insects. Also small mammals, birds, and reptiles.

It may chase and catch insects in flight or swoop at prey on the ground. **Breeding** > From late May to early July. Females lay up to six eggs. **Lifespan** > Up to eight years. **Predators** > None known. **Conservation status** > Not threatened. However, the bird has almost disappeared from the UK due to habitat loss and possibly pesticide use.

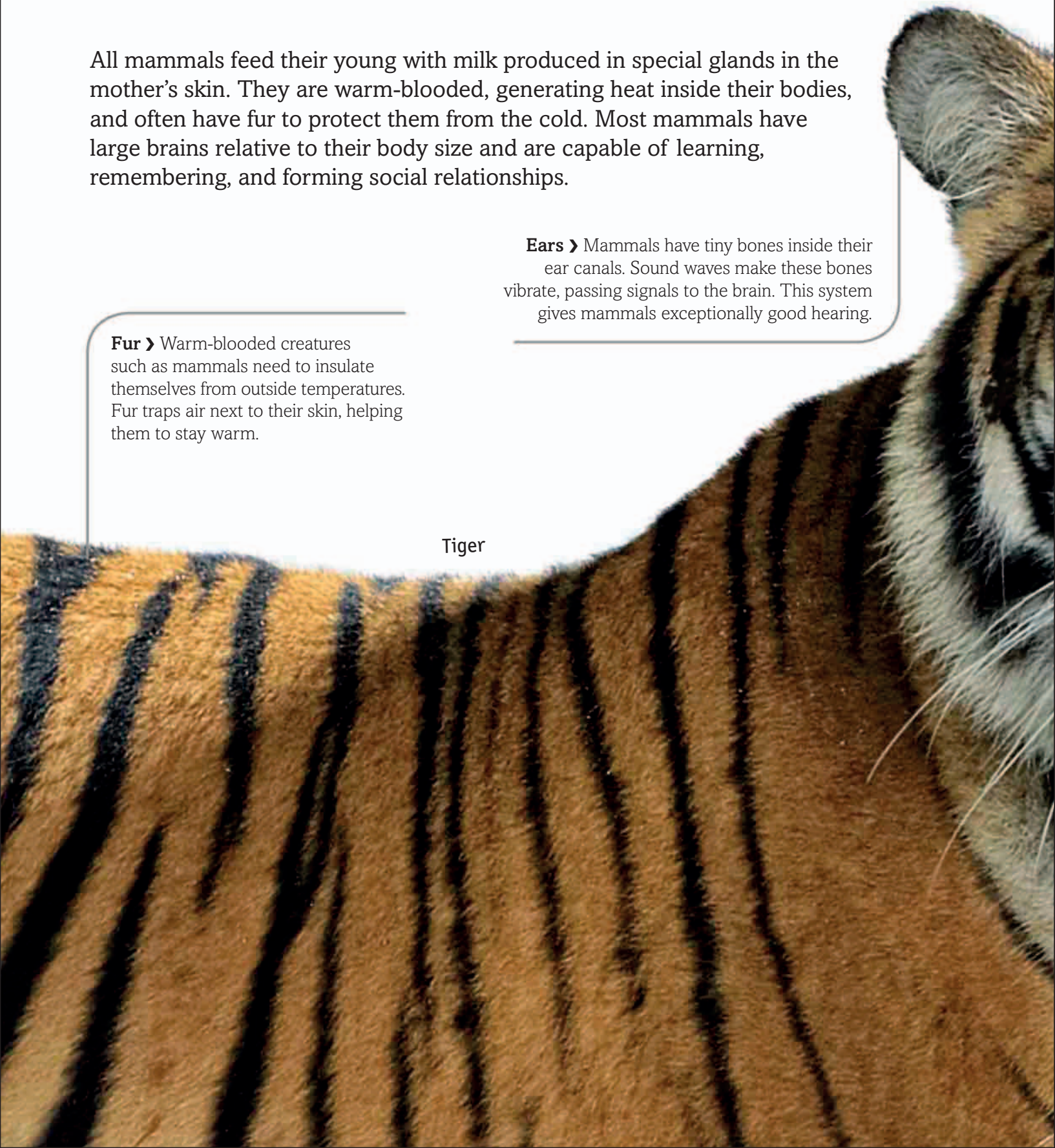
Mammals

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

Ears › Mammals have tiny bones inside their ear canals. Sound waves make these bones vibrate, passing signals to the brain. This system gives mammals exceptionally good hearing.

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

Tiger





Head › Mammals generally have larger heads and brains compared to their body size than other animals. They include the most intelligent creatures on the planet.

Animals

Mammals

Features

- Almost all give birth to live young



- Feed their young on milk



- Mostly have hair or fur



- Are warm-blooded



- Include human beings



Teeth › Mammals have a very varied diet. Some eat only plants, others eat meat, and many eat both. This tiger's long, sharp fangs are perfect for killing and eating other animals.

Mammals with pouches



③ Red-necked wallaby

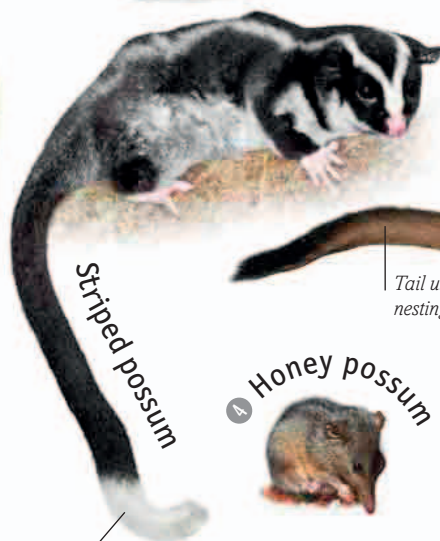
Ears swivel to pinpoint sounds



② Parma wallaby

① Virginia opossum

Long, stiff whiskers are touch-sensitive



Striped possum

Brush-tailed bettong

Tail used to carry nesting material

④ Honey possum

⑤ Sugar glider

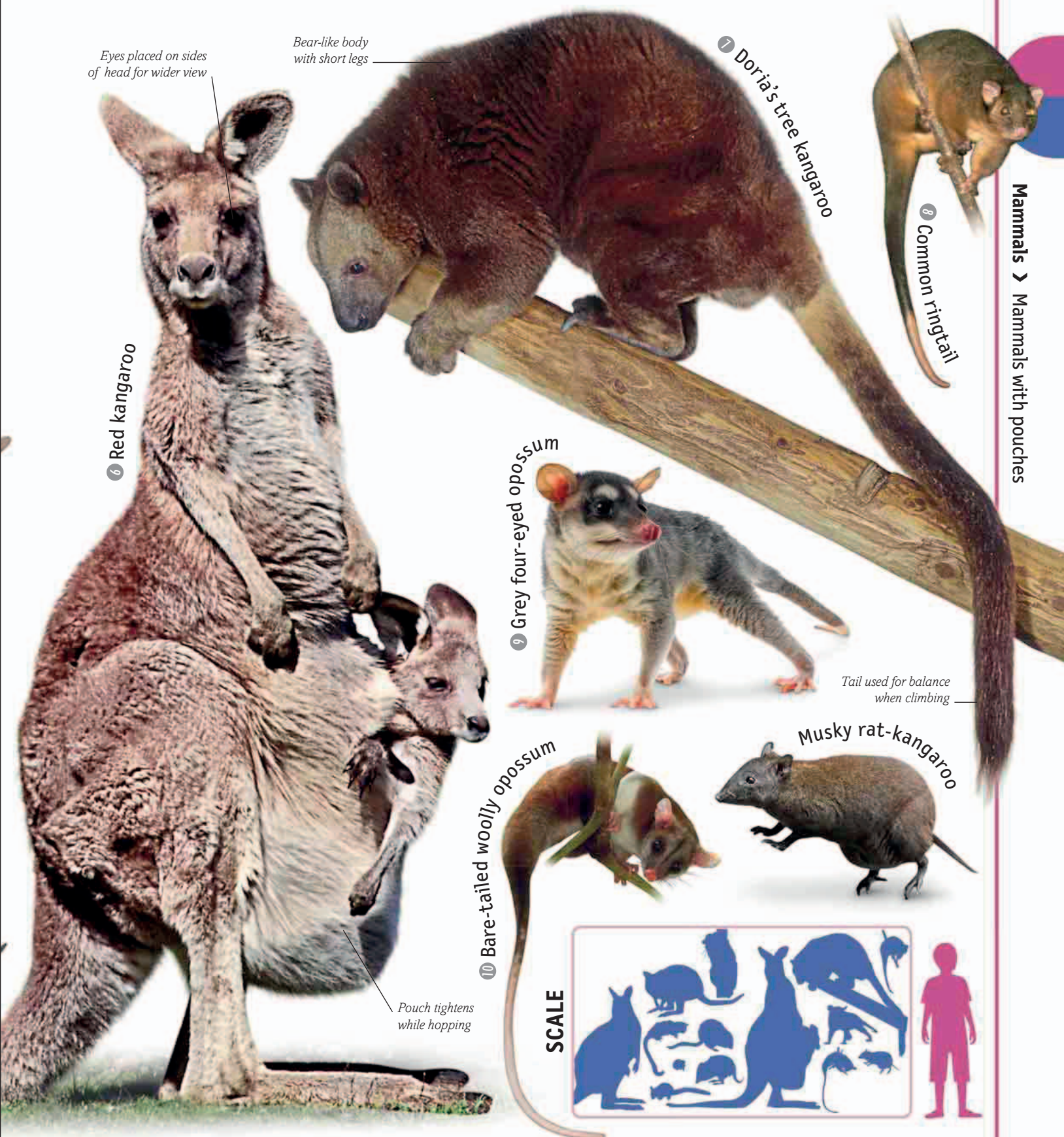
Bushy, white-tipped tail

Long-nosed potoroo

Tail acts as a prop

Instead of growing inside their mothers, these animals, known as marsupials, develop inside a pouch. They are born very early and find the pouch by crawling through their mother's fur. Some baby marsupials have their mother's pouch to themselves, but young **Virginia opossums** ① share it with up to 12 siblings, and have to hang on tight to survive. They live in the USA, Mexico, and Central America,

often straying into urban areas. Virginia opossums are good climbers and feed at night, sometimes raiding dustbins for leftover food. Marsupials also live in South America, but most of them come from Australia. The **parma wallaby** ② and **red-necked wallaby** ③ have powerful back legs for jumping, but the **honey possum** ④ has tiny paws and a slender wrap-around tail. Weighing just 14 g (½ oz), it is one of the



world's smallest marsupials, and feeds on sugary nectar from flowers. The **sugar glider** 5 eats insects, fruit, and sap. It can glide up to 50 m (164 ft) between trees, using the stretchy skin between its legs as a parachute. The **red kangaroo** 6 is the largest and fastest marsupial, with a top speed of 50 kph (30 mph). Young kangaroos, or joeys, stay in their pouch for up to six months before exploring the world outside. **Doria's**

tree kangaroos 7 from New Guinea spend their lives off the ground. The heaviest tree-climbing marsupials, they feed on leaves, flowers, and fruit. **Common ringtails** 8 also eat leaves, but the **grey four-eyed opossum** 9 and **bare-tailed woolly opossum** 10 have a more varied diet, including earthworms, insects, and birds' eggs. Both live in the Americas and feed mainly at night.

⑪ Southern hairy-nosed wombat



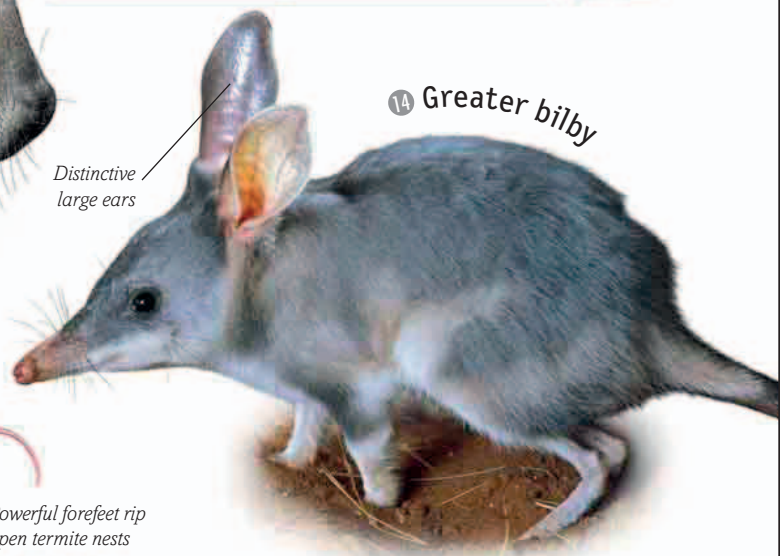
Single young carried in pouch

SCALE



⑭ Greater bilby

Distinctive large ears



⑬ Numbat

Powerful forefeet rip open termite nests



⑫ Common wombat



Australia's marsupials come in many different shapes and sizes. Some live in trees, but they also include burrowers that live and feed on the ground. The **southern hairy-nosed wombat** ⑪ digs a network of tunnels, coming out after dark to feed on grass. The burrows are handed on from one generation to the next and can be more than 50 years old. **Common wombats** ⑫ are bigger and more powerful.

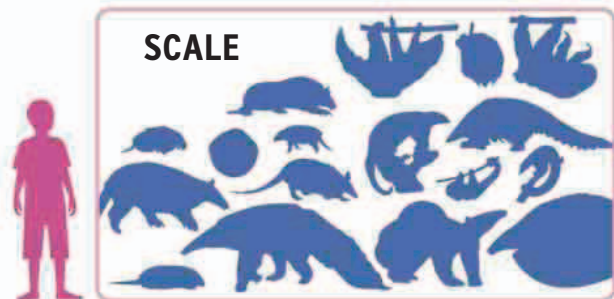
Like other wombats, they have a backward-opening pouch. This stops earth from getting in when they are digging and protects their young from roots and twigs. The **numbat** ⑬ lives in forests and feeds on termites. It can eat 20,000 of these insects a day, lapping them up with its long, sticky tongue. The **greater bilby** ⑭ is one of Australia's strangest-looking marsupials with rabbit-like ears, a pointed snout, and long,



silky fur. It lives in dry places, and digs burrows that spiral downwards like a corkscrew, making it harder for predators to get inside. The **Tasmanian devil** 15 is the world's biggest meat-eating marsupial with a thick-set body, powerful jaws, and sharp teeth. It is mainly a scavenger, swallowing the skin and even bones of dead animals. Far more appealing and much better known, the **koala** 16 lives in gum trees and feeds on

their leaves. It eats for about six hours a day and spends the rest of its time asleep. The **western quoll** 17 is active at night and hunts like a cat, while the **mountain brushtail possum** 18 lives in thick forests and sleeps in hollow trees. The **common spotted cuscus** 19 is another tree-dweller, with a tail adapted for grasping branches. The female carries her young on her back after they have left her pouch.

Armadillos, sloths, and anteaters



Northern naked-tailed armadillo



Protective plates do not cover the tail

Larger hairy armadillo



Underside covered in dense hairs

Three-banded armadillo

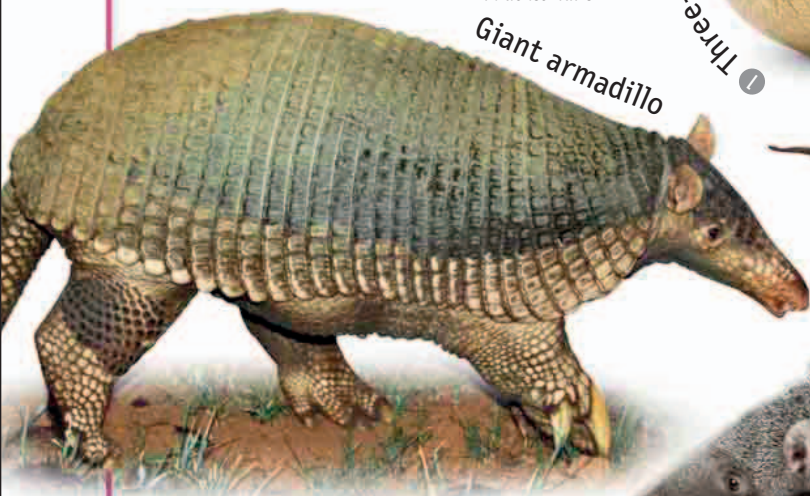


② Pichi

③ Nine-banded armadillo



④ Giant anteater



Long, toothless snout

Six-banded armadillo



Armadillos are the only mammals to have a hard, protective shell. They have flexible bands to let their bodies bend and some kinds, including the **three-banded armadillo** ①, can roll themselves up into a ball. The **pichi** ② has another way of keeping out of trouble. It wedges itself in its burrow, making it hard for predators to drag it out. Most armadillos live in Central and South

America but the **nine-banded armadillo** ③ lives as far north as the USA. Its family life is very unusual because it always has identical quadruplets each time it breeds. Armadillos feed mainly on ants and termites, although they do eat other animals such as grubs and worms. The **giant anteater** ④ is one of the biggest insect-eating mammals, swallowing up to 30,000 ants a day. It rips open anthills or



5 Southern two-toed sloth



Maned sloth



6 Brown-throated sloth

Northern tamandua



Tough armour of overlapping scales



8 Ground pangolin

7 Silky anteater



Prehensile tail used to grip branches



Long-tailed pangolin

Collared anteater



9 Indian pangolin



termite mounds with its claws and licks up its food with its sticky 60 cm (2 ft) long tongue. Sloths are distant relatives of anteaters, but they hang from branches, and feed on leaves. The **southern two-toed sloth** 5 never moves in a hurry, and the **brown-throated sloth** 6 is one of the slowest mammals in the world. Its top speed in trees is about 0.3 kph ($\frac{1}{5}$ mph) and it eats, sleeps, and even gives

birth upside down. The **silky anteater** 7 from Central and tropical South America can climb just as well as a sloth. Large, curved front claws and a prehensile tail help it to live in trees, where it nests in holes. Pangolins are unmistakable animals with their covering of overlapping scales. The African **ground pangolin** 8 and **Indian pangolin** 9 are so well protected that they can even keep lions and tigers at bay.

Hedgehogs and moles

SCALE



1 North African hedgehog



3 European hedgehog



Long ears help
in keeping cool



Long-eared hedgehog

Long, furry tail

4 Pygmy shrew



Southern African hedgehog



Eurasian water shrew



5 North American least shrew



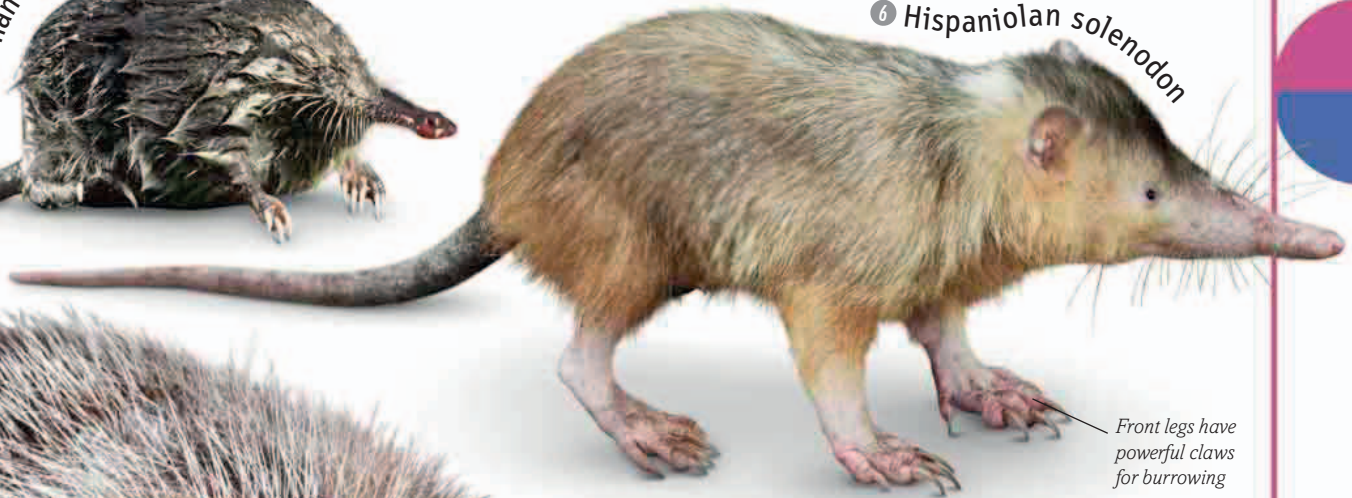
When the sun sets, hedgehogs set off to find food. Armed with up to 5,000 sharp spines, they rummage through the undergrowth, rolling up into a spiky ball if they are threatened with attack. They eat small animals, fruit, and carrion. The **desert hedgehog** 1 from Africa and the Middle East usually prefers insects and their larvae but can also tackle scorpions and venomous snakes. The **North**

African hedgehog 2 gives birth to about six babies, or "hoglets", each time it breeds. At first their spines are soft but they harden within a day. The **European hedgehog** 3 lives in lots of different habitats including farms and gardens. Despite its dumpy shape, it is a great climber, scrambling up fences and walls and dropping unharmed onto the other side. The **pygmy shrew** 4 has a vicious bite. This tiny mammal

Pyrenean desman



6 Hispaniolan solenodon



Front legs have powerful claws for burrowing

Small Japanese mole



7 Moonrat



Alpine shrew



8 European mole



Sensitive tentacles to find food



Common shrew



Bicoloured white-toothed shrew



Reddish-grey musk shrew



Tiny eyes



Northern short-tailed shrew

9 Star-nosed mole



Greater white-toothed shrew

is just 5 cm (2 in) long but can attack earthworms many times its size. The **North American least shrew** 5 is almost as small and has venomous saliva that helps it to overpower its prey. The **Hispaniolan solenodon** 6 looks like a giant shrew. It is only found on Hispaniola, an island in the Caribbean. The **moonrat** 7 from Southeast Asia is related to hedgehogs and eats fruit as well as animal prey. The **European mole** 8

lives underground and digs tunnels with its spade-like front paws. It feeds on earthworms, storing them in special "larders" and biting off their heads to stop them from getting away. The **star-nosed mole** 9 from North America looks for food with 22 pink tentacles on its nose. A good swimmer, it is amazingly quick on the draw, taking just a quarter of a second to sense and grab its food.



AFRICAN ELEPHANTS The largest land animals, African elephants are equipped with a long trunk, which they use not only for breathing, smelling, and trumpeting, but also to grip and move objects and to suck up water. Their huge ears allow heat to escape, keeping them cool. Elephants are known for their intelligence, and they form strong family relationships.



Size > Males up to 4 m (13 ft) tall; females up to 2.6 m (8½ ft) tall **Weight** > Males up to 6 tonnes and females up to 3.2 tonnes **Habitat** > Savanna **Distribution** > Sub-Saharan Africa **Diet** > Leaves and bark from trees, and grass. They can eat up to 160 kg (350 lb) of food a day. **Breeding** > Females (cows) give birth to one baby every two

to four years. Elephant herds consist mainly of females, and other members may help the mother to care for the baby. **Lifespan** > Around 60 years in the wild. **Predators** > Adults have no predators. Calves may be killed by lions, leopards, hyenas, or crocodiles. **Conservation status** > Vulnerable as they are hunted for their ivory tusks.

Rabbits, hares, and pikas



① Lop-eared rabbit



② Angora rabbit

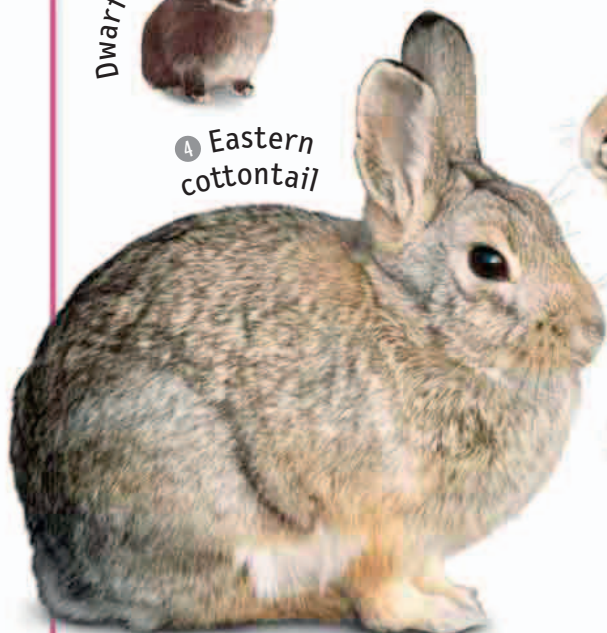
③ European rabbit



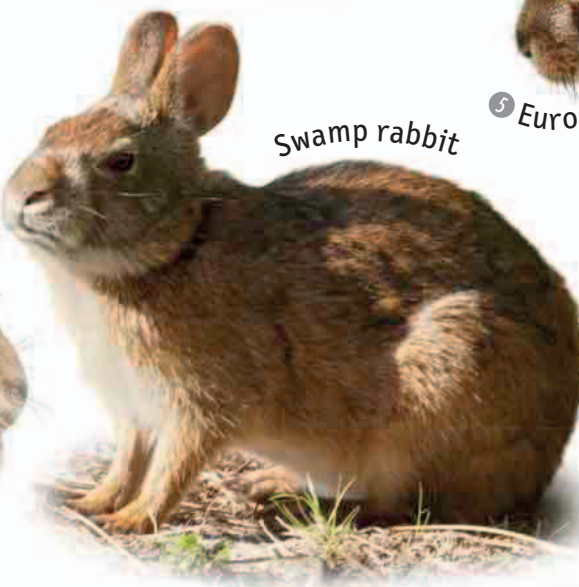
Dwarf rabbit

Soft fur can be used
to make wool

④ Eastern cottontail



Swamp rabbit



⑤ European hare



⑥ Arctic hare

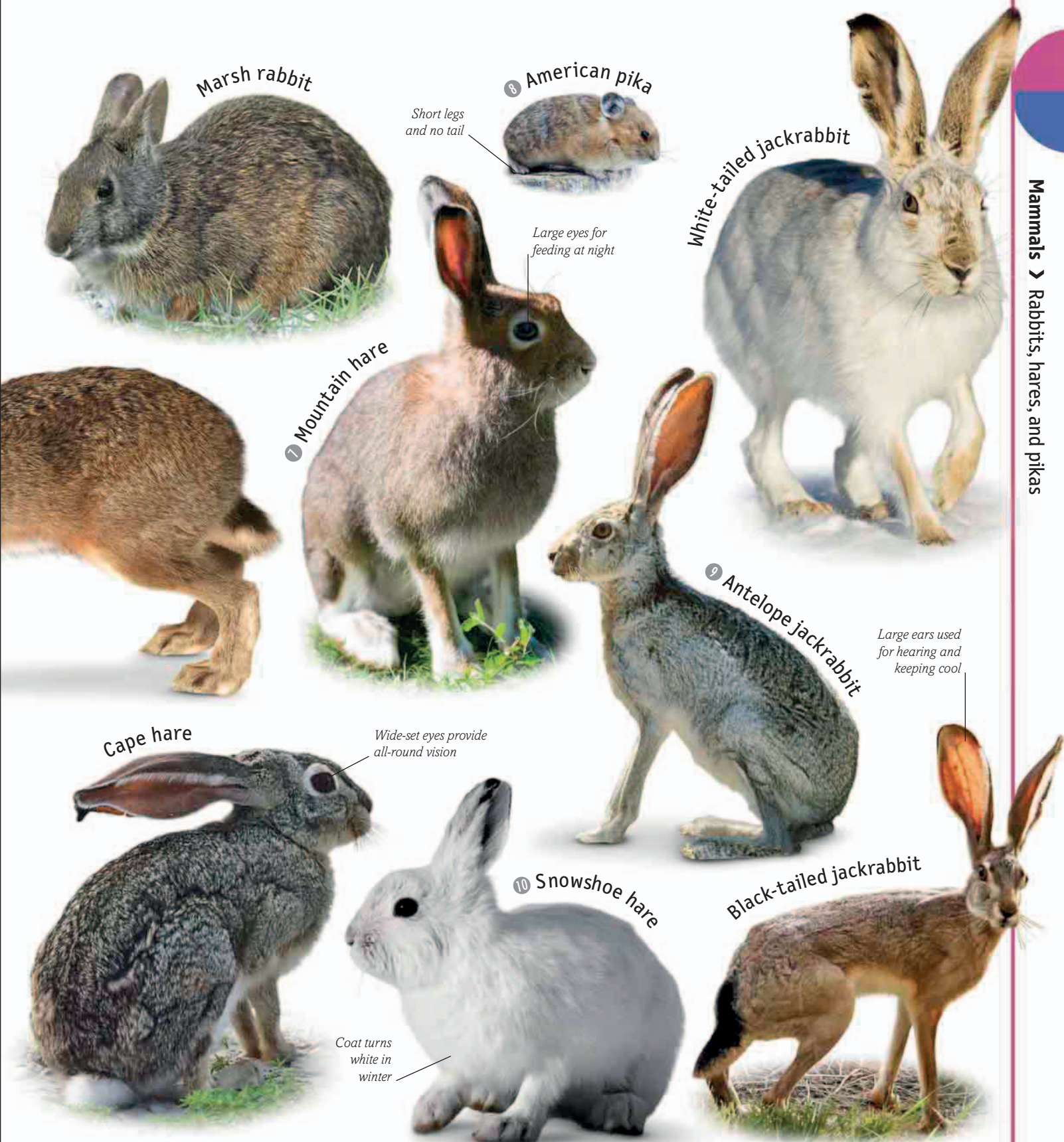


SCALE



Rabbits and hares have many predators but their keen senses and long legs give them a head start in the race for safety. At the first sign of danger, most rabbits sprint into their burrows. Hares stay above ground, bounding away at up to 80 kph (50 mph). Rabbits and hares have big ears and large front teeth, and they feed entirely on plants. There are more than 50 breeds of rabbit, including the **lop-eared**

rabbit ①, whose dangly ears can measure 70 cm (27 in) long. The **Angora rabbit** ② is valued for its long, soft hair, which is spun into yarn. These two breeds, and many others, are descendants of the **European rabbit** ③, which has been kept in captivity for hundreds of years. In the wild, European rabbits live in big burrow systems called warrens. They breed amazingly quickly, raising up to 40 babies, or “kits”, each year.



The American **eastern cottontail** 4 looks very similar to the European rabbit but breeds above ground. Hares are usually bigger than rabbits and live on their own. The **European hare** 5 stays brown all year round, but many other kinds, including the **Arctic hare** 6 and **mountain hare** 7, turn white in winter for camouflage against the snow. Pikas are relatives of rabbits and hares, but are much

smaller with shorter ears. The **American pika** 8 lives in rocky burrows high up in mountains. To survive the winter, it collects plants and dries them like tiny piles of hay, to eat when other food is scarce. The **antelope jackrabbit** 9 has the biggest ears of all wild hares. The **snowshoe hare's** 10 ears and paws are thickly furred, keeping it warm in the bitterly cold winters of Canada and Alaska.

Rodents



① Grey squirrel

Cape ground squirrel

Nimble front paws can grip food

Grizzled giant squirrel

② Eurasian red squirrel

④ Marmot

Black-tailed prairie dog

③ Southern flying squirrel

Skin "wings" used for gliding

Eastern chipmunk

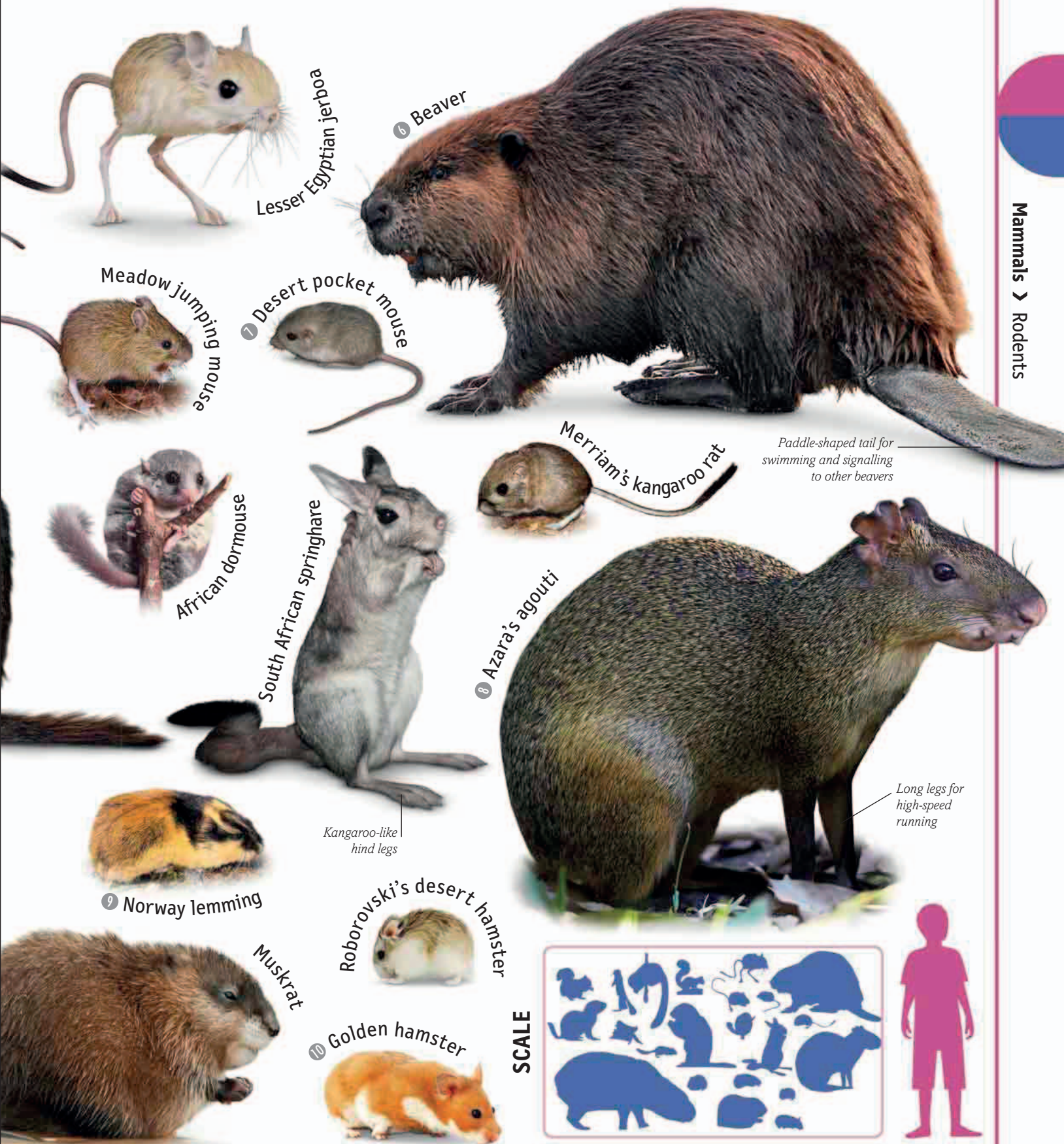
⑤ Capybara

Common vole

Long tail used for balance

Added together rodents easily outnumber all other mammals on Earth. They live almost everywhere on dry land and in fresh water too. Most rodents feed on plants. Their front teeth grow non-stop, enabling them to gnaw through their food and anything in their way. The **grey squirrel** ① is an expert climber with nimble front paws. Originally from North America, it has pushed out the **Eurasian red**

squirrel ② in many parts of the British Isles. The red squirrel uses its long tail to balance itself while jumping from one tree to another. The North American **southern flying squirrel** ③ glides between trees on folds of stretchy skin. It can travel almost 30 m (100 ft) in a single flight, landing right on target even in the dark. The **marmot** ④ lives in mountain burrows and hibernates for up to nine months every year. The world's



largest rodent is the **capibara** 5 from the swamps of South America. It grows to the size of a small pig. To escape its enemies, it dives into water and can hold its breath for up to five minutes. The **beaver** 6 is a good swimmer and is renowned for building dams. The biggest beaver dam on record, in Canada, is 850 m (½ mile) long and was first spotted by satellite. Many other rodents, such as the **desert**

pocket mouse 7, get all their water from their food. **Azara's agouti** 8 from South America has small families with just two young, but **Norway lemmings** 9 sometimes produce more than 50 babies a year. When their burrows get overcrowded, young lemmings pour across the Arctic tundra in search of food. The **golden hamster** 10 from the Middle East is very rare in the wild but millions are kept as pets.

⑪ Domestic guinea pig



Thick-set body
without tail

Long teeth used for
digging tunnels

⑫ Naked mole-rat



⑬ Chinchilla



⑭ Mara



Short,
thick spines



Harvest mouse



Pallid gerbil



⑮ Brown rat



Brazilian porcupine



Botta's pocket gopher



Wood mouse

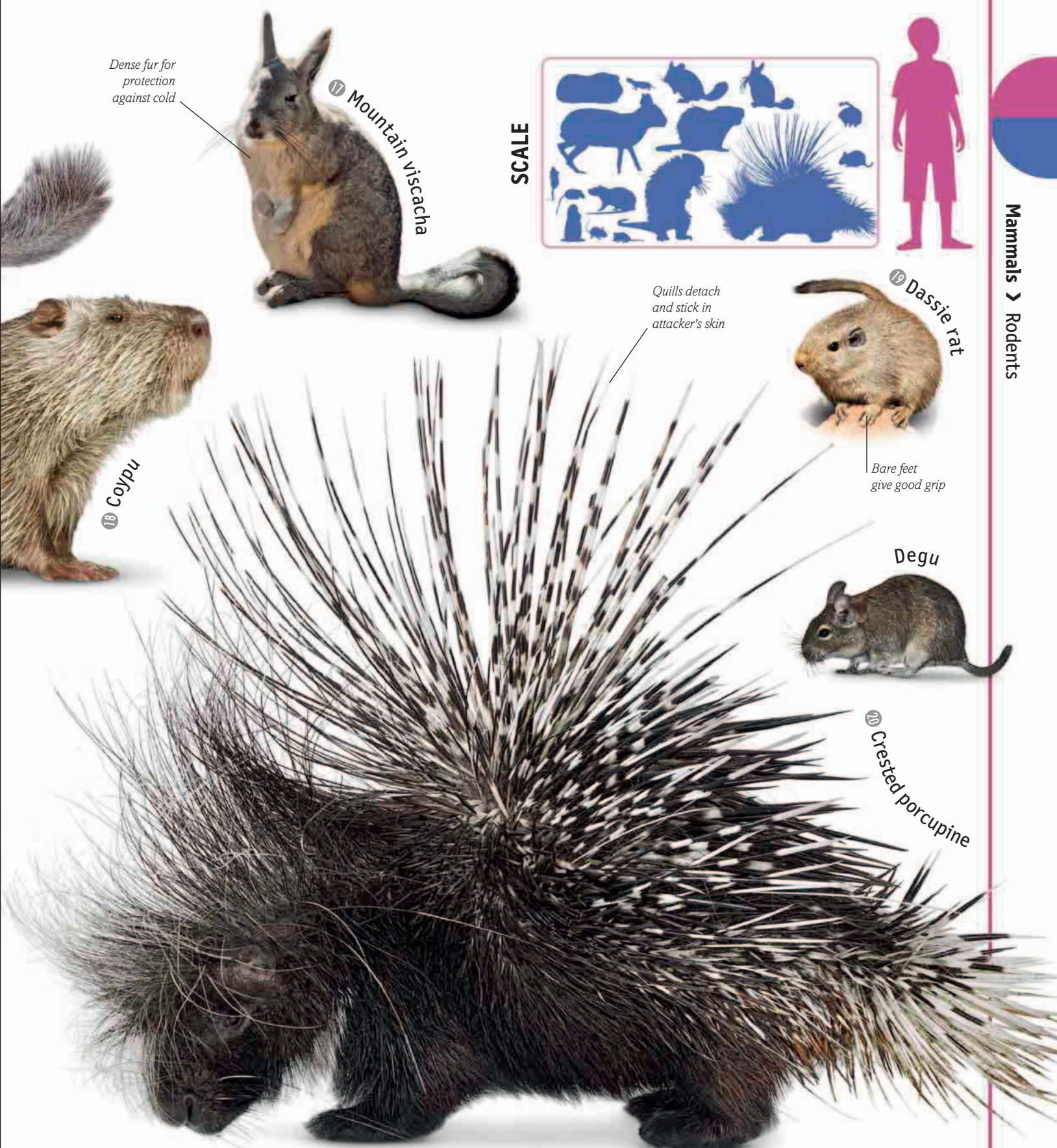


⑯ Albino house mouse



Rodents include some rare animals as well as common ones found all over the world. The **domestic guinea pig** ⑪ from South America was once raised for food but is now a popular pet, with many different breeds. The **naked mole-rat** ⑫ from east Africa lives in big families and spends its whole life tunnelling underground. It is one of the world's weirdest-looking mammals with big front teeth, bare

wrinkly skin, and tiny eyes. **Chinchillas** ⑬ have a luxurious fur coat that protects them from the cold. Found in the South American Andes, these rodents are hunted for their fur, and are now endangered in the wild. The **mara** ⑭ looks a lot like a hare. It lives in South America's grasslands and is one of the fastest rodents, bounding along at 45 kph (28 mph). The **brown rat** ⑮ is a worldwide pest. Adaptable and intelligent,



it survives in all kinds of habitats, from remote islands to urban drains. An expert climber and a good swimmer, it eats almost anything, including seeds, eggs, leather, and even soap. The **house mouse** 16 is another rodent that lives alongside people, although it keeps out of sight. It is found on every continent except Antarctica and has even been discovered aboard planes and deep down in mines. The **mountain**

viscacha 17 is a close relative of the chinchilla and lives high up in mountains. The South American **coypu** 18 feeds in lakes and swamps. African **dassie rats** 19 live in rocky hillsides. They have flat skulls and bendy ribs for squeezing into cracks. The African **crested porcupine** 20 is the world's best-armed rodent. When threatened, it charges backwards into its enemy, stabbing it with its sharp, hollow quills.

Bushbabies, lemurs, and tarsiers



Bushbabies and their relatives belong to a group of mammals called primates, which includes monkeys, apes, and also humans. Most of these animals live in trees and all of them have forward-facing eyes, allowing them to judge distances in three dimensions. Bushbabies come from Africa, but lemurs are found in Madagascar and nowhere else in the world. There are many different kinds of lemurs and each

has its own way of living. The **white-footed sportive lemur** ① feeds mainly on leaves, but **Verreaux's sifaka** ② also eats fruit, flowers, and bark. **Coquerel's sifaka** ③ is an amazingly acrobatic climber, even with a baby on board. The **Senegal bushbaby** ④ and **moholi bushbaby** ⑤ come out after dark. They can leap 25 times their own body length as they spring from branch to branch. The



7 Black-and-white ruffed lemur

Red-bellied lemur

8 Slow loris

Forward-facing eyes give good 3D vision

Pygmy slow loris

Red slender loris

Horsfield's tarsier

Head can turn through 180 degrees to keep watch behind

Spectral tarsier

Potto

Grey mouse lemur

Greater dwarf lemur

10 Aye-aye

9 Philippine tarsier

SCALE

Tail used to store fat in wet season

Slender middle finger for picking grubs out of wood

ring-tailed lemur 6 climbs well, but spends much of its time on the ground. It is very sociable and always keeps together in groups. The **black-and-white ruffed lemur** 7 is the largest lemur at 60 cm (24 in) long, but only weighs about 4 kg (9 lb), about the same as a pet cat. Lorises are plant- and insect-eaters from tropical forests in Asia. The **slow loris** 8 creeps along branches once the sun has gone

down. The **Philippine tarsier** 9 is a pocket-sized primate with enormous staring eyes. Like other tarsiers, it leaps on to insects in the dark and crunches them up with its sharp teeth. The nocturnal **aye-aye** 10 from Madagascar is the world's strangest primate, with skinny hands and scraggy fur. It feeds on fruit, eggs, and insects, and uses its extra-long middle finger to tweak out insect larvae from wood.

Gibbons, apes, and humans

SCALE



Silvery gibbon



Agile gibbon



Northern white-cheeked gibbon



2 Siamang

Arms much longer than legs



Black-crested gibbon

Cream-coloured young turns darker by two years of age



Buff-cheeked gibbon



Müller's Bornean gibbon



1 Hoolock gibbon



3 Lar gibbon



5 Western gorilla

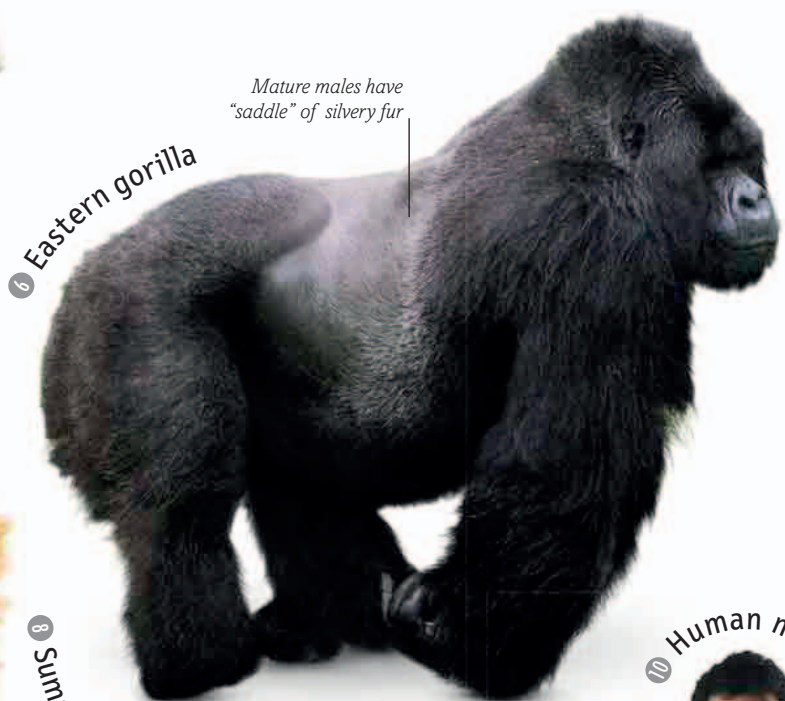


Gibbons and apes include our closest relatives in the living world. Not only are they similar to people in appearance, but they are also highly intelligent animals. The **hoolock gibbon** ① lives in South and Southeast Asia, which is where all wild gibbons are found. Like other gibbons, it uses its hands like hooks to swing from branch to branch, speeding through the forest almost as fast as a man can run. The

siamang ② is the biggest gibbon. It eats leaves and fruit, and starts the day with a loud dawn chorus that can be heard from far away. The skin on its throat is elastic and inflates to the size of a grapefruit, amplifying its amazingly loud calls. The **lar gibbon** ③ is black or brown, but **northern white-cheeked gibbons** ④ start life with creamy fur and turn darker as they grow up. Gorillas come from Africa, and spend most



1 Chimpanzee



6 Eastern gorilla

10 Human male

Human female



8 Sumatran orang-utan



Can grip with hands and feet

9 Bornean orang-utan



Bonobo



of their lives on the ground. The **western gorilla** 5 can weigh three times as much as an adult man, but the **eastern gorilla** 6 is even bigger, weighing a massive 220 kg (485 lb). Despite their size, gorillas are peaceful plant-eaters and rarely attack people unless their young are threatened. Also from Africa, the **chimpanzee** 7 is the primate most similar to us. It lives in large groups and eats all kinds of food, from termites

to monkeys, which it ambushes in trees. The **Sumatran orang-utan** 8 and **Bornean orang-utan** 9 are two fruit-eaters from Southeast Asia. Like chimps, they are highly intelligent and are good at problem-solving and making simple tools. **Humans** 10 are the only living primates that walk upright on two legs. Today there are more than 7 billion of us, spread over every land habitat on Earth.



ORANG-UTANS

These apes are some of humans' closest relatives. In fact, their name means "person of the forest" in Malay. These shy treetop dwellers are very intelligent animals. Long arms and flexible hands and feet help them to move around in trees, looking for fruit and other food. Young orang-utans stay with their mothers for up to seven years, learning the skills they need to survive as adults.



Size > Males up to 1.5 m (5 ft); females up to 1.3 m (4¼ ft) tall **Weight** > Males 50–80 kg (110–176 lb); females 30–45 kg (66–99 lb) **Habitat** > Rainforest. Orang-utans are solitary animals, but females and their offspring may be seen together. **Distribution** > Tropical forest in Borneo and in northern Sumatra, Indonesia. **Diet** > Mainly figs and other

fruit, leaves, occasionally insects, honey, and birds' eggs.

Breeding > Orang-utans start breeding in their teens. Females give birth once every eight years and infants stay with them for six to seven years. **Lifespan** > Up to 50 years in the wild and 60 years in captivity. **Predators** > Tigers **Conservation status** > Critically endangered due to habitat loss.

New World monkeys

① **Black-capped squirrel monkey**

Long tail used for balance

Common squirrel monkey

Goeldi's monkey

② **White-faced saki**

Colombian spider monkey

⑤ **Pygmy marmoset**

Long, white crest

Collared titi monkey

④ **Northern night monkey**

③ **Red bald-headed uakari**

Long waterproof fur

Common marmoset

Cotton-top marmoset

Black-bearded saki

New World monkeys come from Central and South America. Many of them have flat noses and tails that wrap around branches like an extra hand. **Black-capped squirrel monkeys** ① live in large groups in the treetops, feeding on fruit and insects. They have more than two dozen separate calls, including special alarm sounds if they spot a predator such as an eagle or a snake. The **white-faced**

saki ② has shaggy fur and feeds closer to the ground. The **red bald-headed uakari** ③ looks as if its head has been shaved. Its red face is thought to attract potential mates. Most New World monkeys feed during the day, but the **northern night monkey** ④ wakes up after dark and is most active on moonlit nights. The tiny **pygmy marmoset** ⑤ is the world's smallest monkey, weighing just five times as much

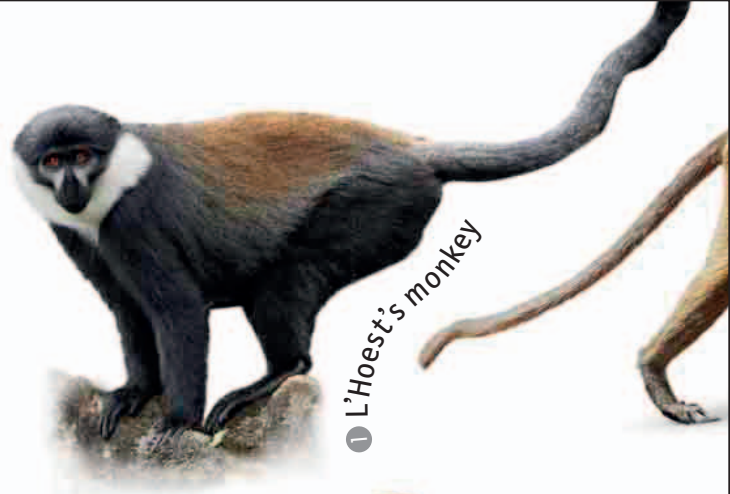
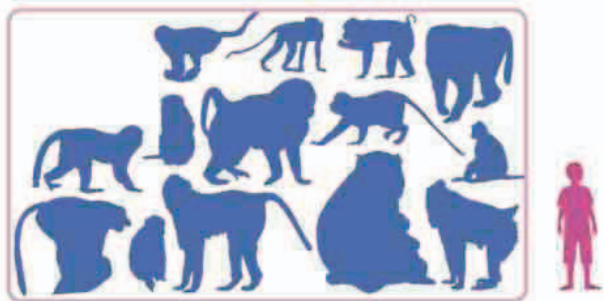


as a mouse. Like other marmosets it scampers along branches, and has hands with sharp claws. It gnaws holes in the bark of trees and licks up the sap that oozes out. The **southern muriqui** 6, also known as the woolly spider monkey, is the largest New World monkey. The **Venezuelan red howler** 7 is the noisiest land animal with a roar that can be heard up to 5 km (3 miles) away. Howlers live in trees and eat leaves.

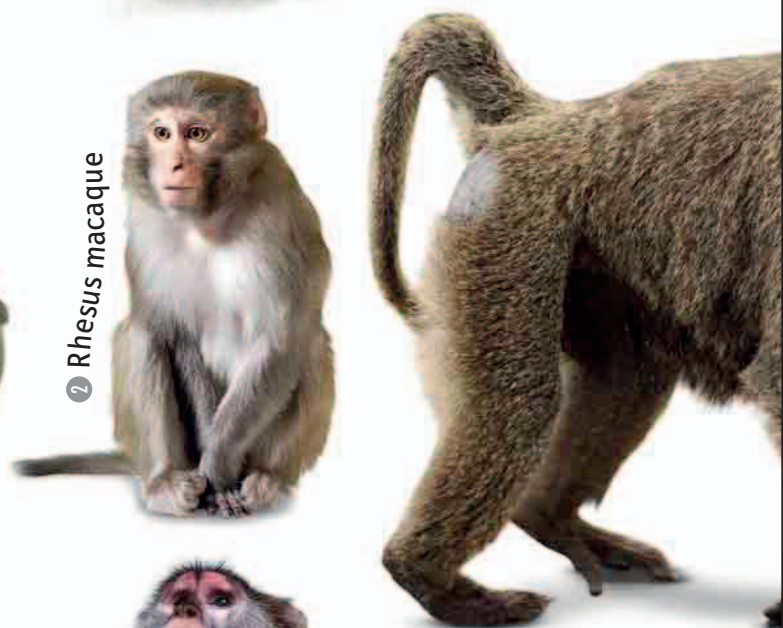
They call at dawn to claim their feeding territory high above the ground. The beautiful **golden lion tamarin** 8 is one of the most endangered monkeys in the world. It was rescued from extinction in the 1980s when fewer than 100 were left. The **grey woolly monkey** 9 stays high up in trees, but the **white-headed capuchin** 10 sometimes feeds on the ground, and is good at walking on all fours.

Old World monkeys

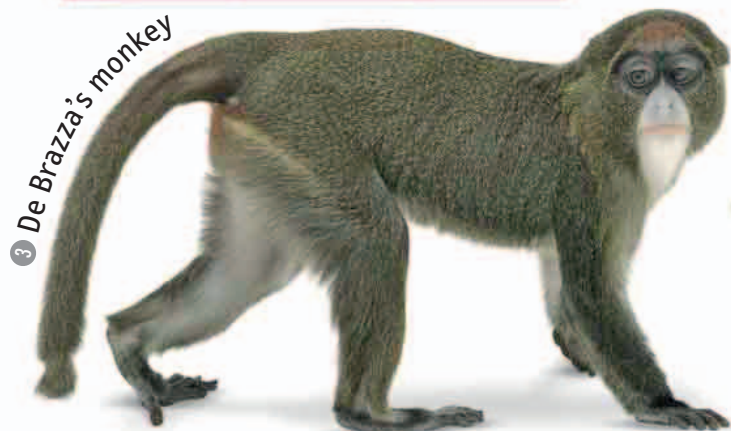
SCALE



① L'Hoest's monkey



② Rhesus macaque



③ De Brazza's monkey



④ Proboscis monkey

Blue monkey



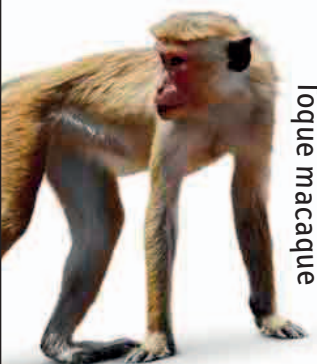
Nose is largest in males



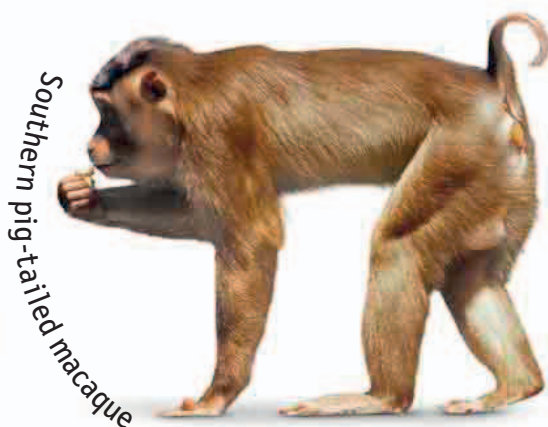
⑤ Patas monkey

Old World monkeys live in Africa and Asia, as far north as Japan. Most of them are tree-dwellers, although baboons spend much of their time on the ground. Unlike New World monkeys, they cannot grip with their tails but they include some amazingly good climbers as well as the fastest monkey on all fours. **L'Hoest's monkey** ① from Central Africa lives in mountain forests. It mainly eats fruit

and leaves and has cheek pouches for storing food. The **rhesus macaque** ② is found in South Asia, Thailand, and China. It lives in all kinds of habitats, from forests to the outskirts of towns. **De Brazza's monkey** ③ from Africa has a long, white beard, while the **proboscis monkey** ④ from Borneo has a huge, fleshy nose. Proboscis monkeys live in mangrove swamps and are great swimmers and divers.



Toque macaque



Southern pig-tailed macaque

Hamadryas baboon 1



Olive baboon 6



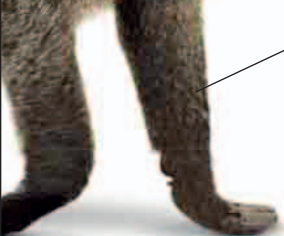
Grivet 8

Tufted grey langur



Long tail for balance

Muscular limbs for fast movement



Yellow baboon 9



Females are smaller than males

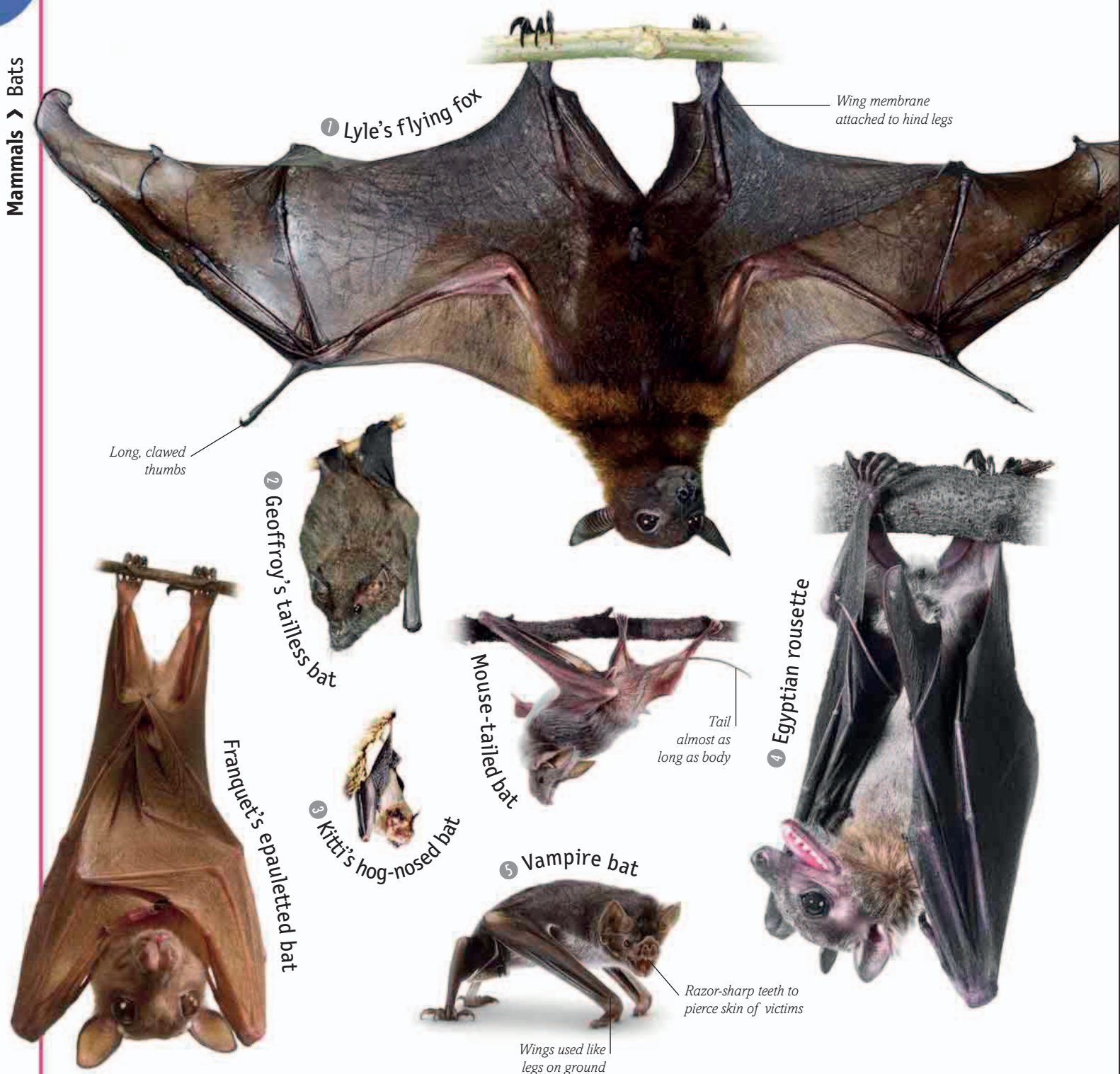


Mandrill 10

They leap from a height of 15 m (50 ft), hitting the water in a noisy belly-flop. The African **patas monkey** 5 is a ground-dweller and a great runner, with a record-breaking top speed of 55 kph (34 mph). Baboons also come from Africa but they have big teeth and a much heavier build. The **olive baboon** 6 forages in open grassland, while the **hamadryas baboon** 7 lives in rocky places. If baboons

are threatened, the biggest males face up to the enemy, giving the rest of the troop time to escape. The **grivet** 8 eats insects and plant food. Its predators include the **yellow baboon** 9, which hunts smaller monkeys for food. The multicoloured **mandrill** 10 from West Africa has a vivid blue and red face. It lives in giant troops called hordes, which can contain 800 animals, a record for any primate.

Bats



Lots of small mammals can glide, but bats are the only ones that can really fly, using muscle power to flap their wings. Their wings are made of skin stretched between amazingly slender finger bones, which can be as thin as a human hair. Small bats usually feed on flying insects but most big ones eat fruit, which they find using keen eyesight and a superb sense of smell. **Lyle's flying fox** ① is a

fruit-eater from the forests of Southeast Asia. Named after its fox-like face, it spends the daytime roosting upside down in trees, using its large clawed thumbs to move along branches. **Geoffroy's tailless bat** ② comes from Central and South America and feeds on sugary nectar with its brush-tipped tongue, but **Kitti's hog-nosed bat** ③ from Thailand and Myanmar hunts insects, snatching them out

SCALE



Proboscis bat

7 Spectacled flying fox

Body wrapped in wings when roosting

8 Wahlberg's epauletted fruit bat

9 Lesser horseshoe bat

Seba's short-tailed bat

Nose leaf helps in echolocation

Large eyes for seeing after dark

6 Large flying fox

of the air or picking them off plants. It is the world's tiniest mammal with large ears but a body as small as a bumblebee's. The **Egyptian rousette** 4 eats fruit, but the legendary **vampire bat** 5 from Central and South America drinks blood from mammals and birds. Silent and stealthy, it scuttles up to its victims on all fours, slicing through their skin with its sharp teeth and lapping up a meal of blood. The **large**

flying fox 6 is one of the world's biggest bats, with a wingspan of 1.5 m (5 ft). Like the **spectacled flying fox** 7 from Australia and New Guinea, it sets off to feed at sunset, flying up to 50 km (31 miles) in search of food. **Wahlberg's epauletted fruit bat** 8 is a fruit-eater from Africa, but the **lesser horseshoe bat** 9 is an insect-eater, with a small body and surprisingly big wings.

SCALE



 10 Common noctule bat


 11 Grey long-eared bat

*Skin between
legs and tail
aids in flight*

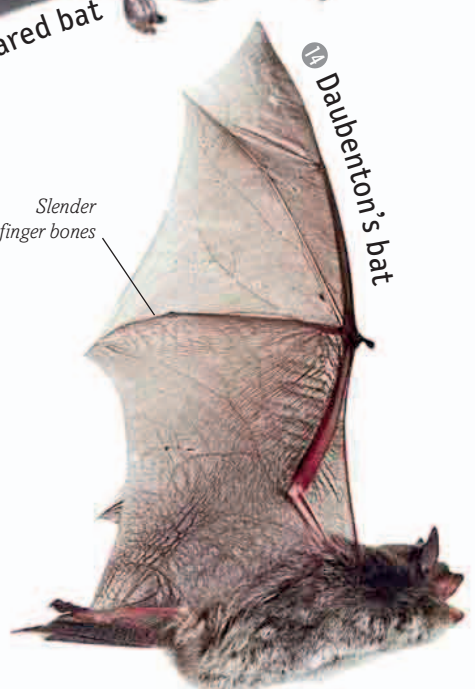
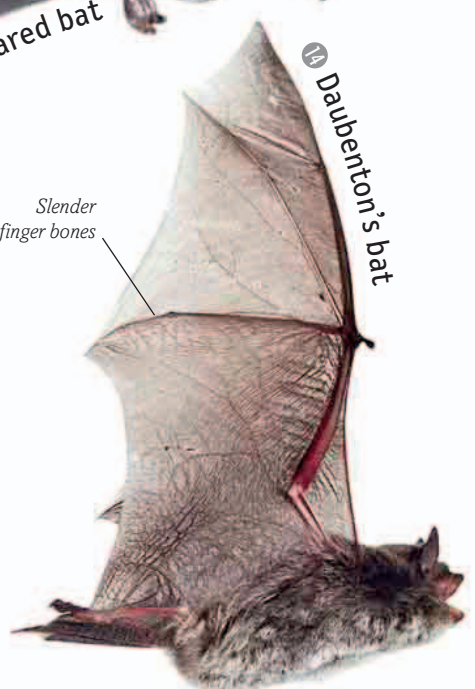


 12 Natterer's bat


 13 Broad-eared free-tailed bat


 Greater mouse-eared bat

*Slender
finger bones*



 14 Daubenton's bat


 Davy's naked-backed bat

Most of the world's micro-bats feed on flying insects, which they catch after dark. They have small eyes and find their prey by echolocation, using bursts of high-frequency sound to form an "image" of their surroundings. The **common noctule** 10 from Europe and Asia catches most of its food in the air. It also snatches insects off leaves and swoops on them on the ground. The European **grey**

long-eared bat 11 has enormous ears that are almost as long as its body. During the winter when it hibernates, it carefully tucks them away under its wings. **Natterer's bat** 12 from Europe hibernates in caves and mines. During its long winter sleep, its body temperature can drop to just 2°C (35°F) and it may breathe just once an hour. The **broad-eared free-tailed bat** 13 lives in Central and South America where it is warm all



15 European free-tailed bat



16 Common pipistrelle



17 Ghost bat



Kuhl's pipistrelle



Big brown bat



Long-eared bat



18 Spix's disc-winged bat



Suction disc for gripping leaves

Nathusius' pipistrelle



year round. It roosts in small groups, but some of its relatives sleep and breed in huge colonies, numbering a million bats or more. **Daubenton's bat** 14 scoops up insects from the surface of lakes and ponds, hunting mainly at dawn and dusk. The **European free-tailed bat** 15 spends the whole night on the wing. Like other free-tailed bats, it has a distinctive mouse-like tail. The **common pipistrelle** 16 is the smallest

bat in Europe. It often roosts in old buildings and hunts around streetlamps, catching insects that are attracted by the light. The **ghost bat** 17 is the biggest predatory species in Australia. As well as catching insects, it eats frogs, lizards, birds, and even other bats. **Spix's disc-winged bat** 18 lives in Central and South American forests. It has suction cups on its wrists and ankles for roosting underneath leaves.



HONDURAN WHITE BATS These tiny Central American bats have fluffy white fur, making them look like puffs of cotton wool. They also have eye-catching, golden-yellow ears, black wings, and a snout with a pointed top. They are often found huddled in a colony of four to eight bats roosting under a *Heliconia* leaf, which they adapt to make a tent for themselves.

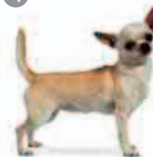


Size > 3.5–4.5 cm (1½–1¾ in) **Weight** > About 6 g (⅓ oz)
Habitat > Tropical rainforest. The bats chew through the veins of *Heliconia* leaves, so that the two sides of the leaf hang down to form a tent. They roost inside this tent, which protects them from sun, rain, and predators. **Distribution** > Lowlands of Central America. **Diet** > Fruit **Breeding** >

Females produce one baby in the rainy season. Males and females roost together until the young are born, then the males leave. The young suckle for 20–21 days. **Predators** > Snakes and small mammals such as opossums. **Conservation status** > Numbers have declined sharply in recent years due to destruction of their habitat.

Dogs, foxes, and relatives

1 Chihuahua



Dalmatian

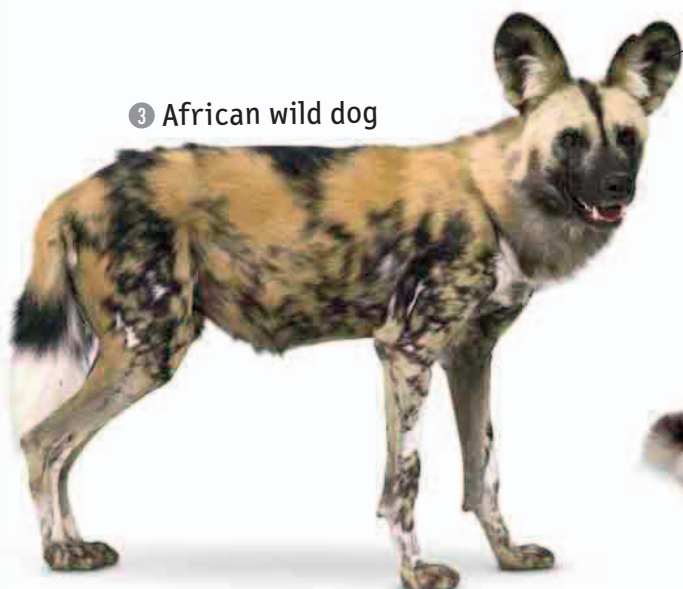


Large, rounded ears

2 Husky



3 African wild dog



Bush dog

4 Coyote



Dhole



Raccoon dog



Black face "mask" with a white muzzle

5 Dingo



Black-backed jackal



Dogs and foxes are expert hunters, although most of them also eat plants and carrion. Dogs originally developed from wolves, which people gradually learned to tame. There are now hundreds of different breeds of dog, from the tiny **chihuahua** ①, the smallest of domestic dog breeds, to the hardy **husky** ②, which is used for pulling sledges. Huskies can work in temperatures as low as -50°C (-58°F).

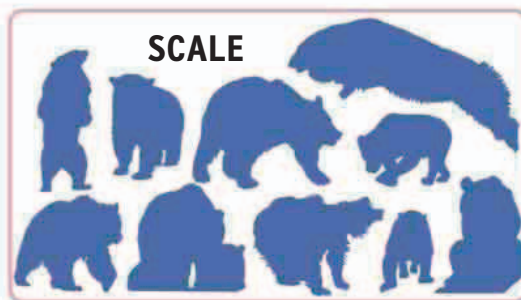
They are the only mammals, apart from humans, that have walked to both the North and South Pole. **African wild dogs** ③ live in highly organized packs, rearing young co-operatively and hunting together to kill animals much bigger than themselves. Each wild dog has its own coat pattern, which is as unique as a fingerprint. **Coyotes** ④ come from North and Central America. They hunt alone, in pairs, or in packs, and



can run at up to 65 kph (40 mph). **Dingoes** 5 were introduced into Australia from Asia by humans about 4,000 years ago. They hunt small animals on their own but band together to attack kangaroos. **Arctic foxes** 6 are specially suited to life in the far north. In winter their coat turns pure white, and they can hunt on drifting ice hundreds of kilometres out at sea. The **red fox** 7 is one of the world's most widespread predators,

occurring throughout the Northern Hemisphere. It often lives in cities, where it scavenges leftover food from bins and rubbish dumps. The North African **fennec fox** 8 is smaller than a cat. It pounces on rodents and insects, pinpointing them with its giant ears. The **grey wolf** 9 is the biggest member of the dog family. It lives in packs and communicates with an eerie howl that can be heard from far away.

Bears



① Asiatic black bear

Pale patch gives this species alternate name "moon bear"

Strong legs allow bear to walk upright



② American black bear



③ Brown bear



④ Grizzly bear

"Grizzled" hairs lighter at tip than at base

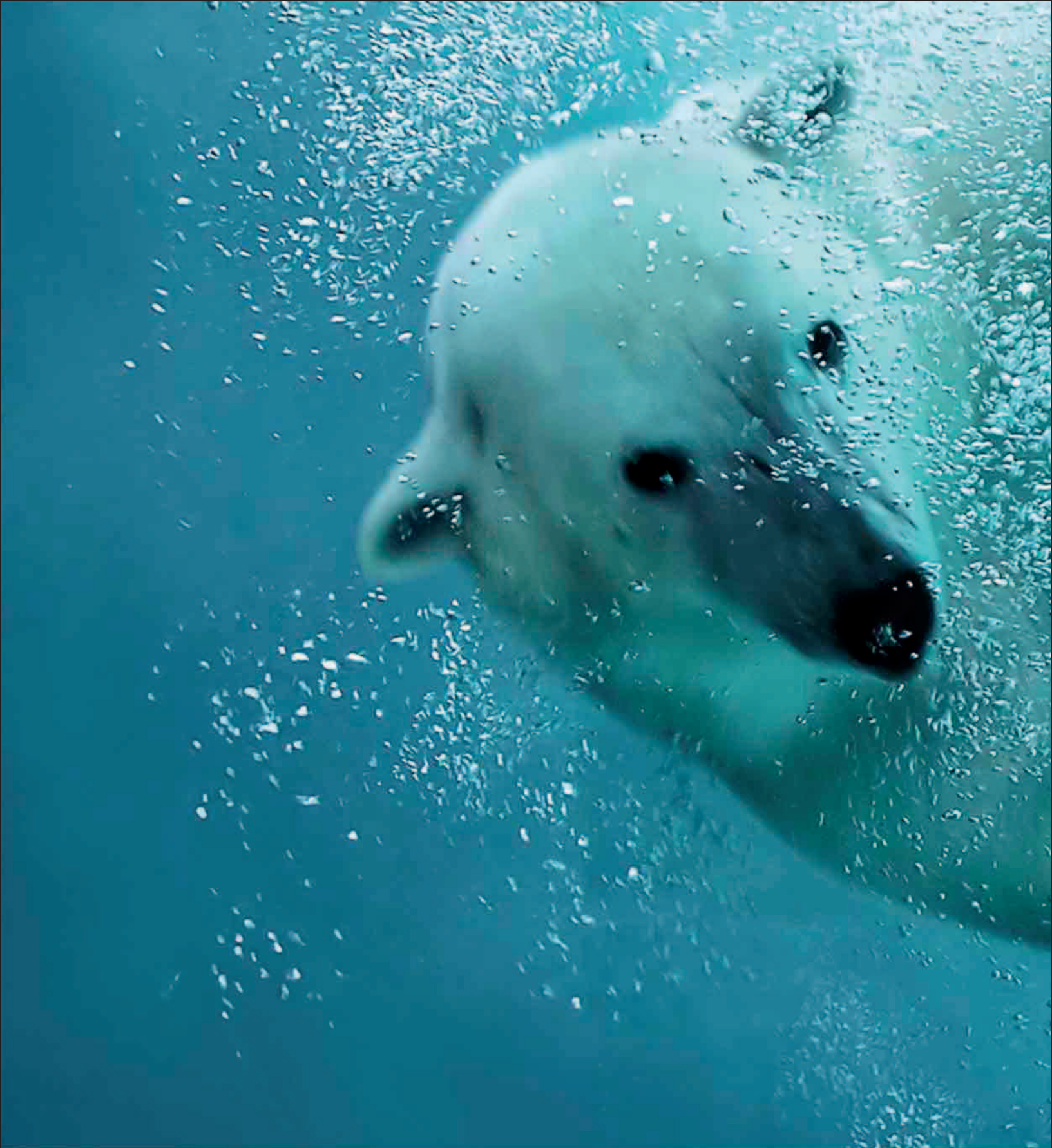
Legendary for their size and strength, bears are some of the world's biggest land mammals, with stocky bodies and flat paws. Most of them stay well away from people but some can be highly dangerous, particularly when they are hungry or protecting their cubs. The **Asiatic black bear** ① lives in forests from India to Japan. It spends more than half its life in trees and feeds on fruit, nuts, and small

animals. The **American black bear** ② is slightly bigger but also good at climbing. Like all bears, it has a superb sense of smell, and sometimes breaks into cars or campsites to get at stored food. The **brown bear** ③ is the most widespread, with several forms found in different parts of the world. Most famous is the **grizzly bear** ④, which lives in western North America. Standing up to 3 m (10 ft) tall on



its back legs, it is strong enough to drag away a moose or a horse. It eats almost anything that it can catch or collect, including deer, fish, berries, and even moths. The **Kodiak brown bear** 5 from Alaska is even bigger, but the **polar bear** 6 is the largest of all. It is the only bear that actively hunts people, although seals are its usual prey. The **sun bear** 7 and **sloth bear** 8 live in southern Asia. The sun

bear's tongue can protrude up to 25 cm (10 in) to extract food such as honey and grubs from holes and crevices. The **spectacled bear** 9 comes from forests high up in the South American Andes. It feeds on fruit, plant shoots, and meat. The **giant panda** 10 lives in central China, where it feeds entirely on bamboo. Like all bears, it has tiny cubs. They weigh only about 120 g (4 oz) when they are newly born.



POLAR BEAR This powerful Arctic predator is the largest land-based meat-eater. Instantly recognizable by its thick white fur, the polar bear is a strong swimmer and a lethally effective hunter. Its usual prey is seals, which it ambushes as they surface through holes in the ice to breathe. The polar bear is often curious about people and can be dangerous if it comes too close to human settlements.



Size > Males up to 3 m (10 ft); females up to 2.2 m (7 ft) tall, standing on their hind legs **Weight** > Males weigh 300–800 kg (660–1,760 lb); females about 150–300 kg (330–660 lb) **Habitat** > Arctic tundra and sea ice. Spends a lot of its time hunting on sea ice. **Distribution** > Arctic Circle; Canada and northern Alaska; Greenland; northern Scandinavia, Russia,

and Siberia. **Diet** > Seals, narwhals, walruses, and seabirds. They may go without food for months, living off their body fat. **Breeding** > They mate from March to May. Cubs are born from November to January. **Lifespan** > Up to 30 years. **Predators** > None. **Conservation status** > Vulnerable. Melting of ice due to climate change is reducing their habitat.

Seals and walrus



Male can inflate muzzle to look ferocious

Galapagos fur seal

1 Antarctic fur seal

3 California sea lion

Body propped up by front flippers

2 Brown fur seal

5 Steller's sea lion

4 Walrus

Southern sea lion

Seals are awkward on land but fast and graceful in the sea. All of them have streamlined bodies, and flippers instead of legs. The smallest seals are just over 1 m (3 ft) long but the biggest measure more than 4 m (13 ft) around their blubbery waists and weigh more than 3 tonnes. The **Antarctic fur seal** 1 breeds on islands in the Southern Ocean, while the **brown fur seal** 2 lives along the coasts

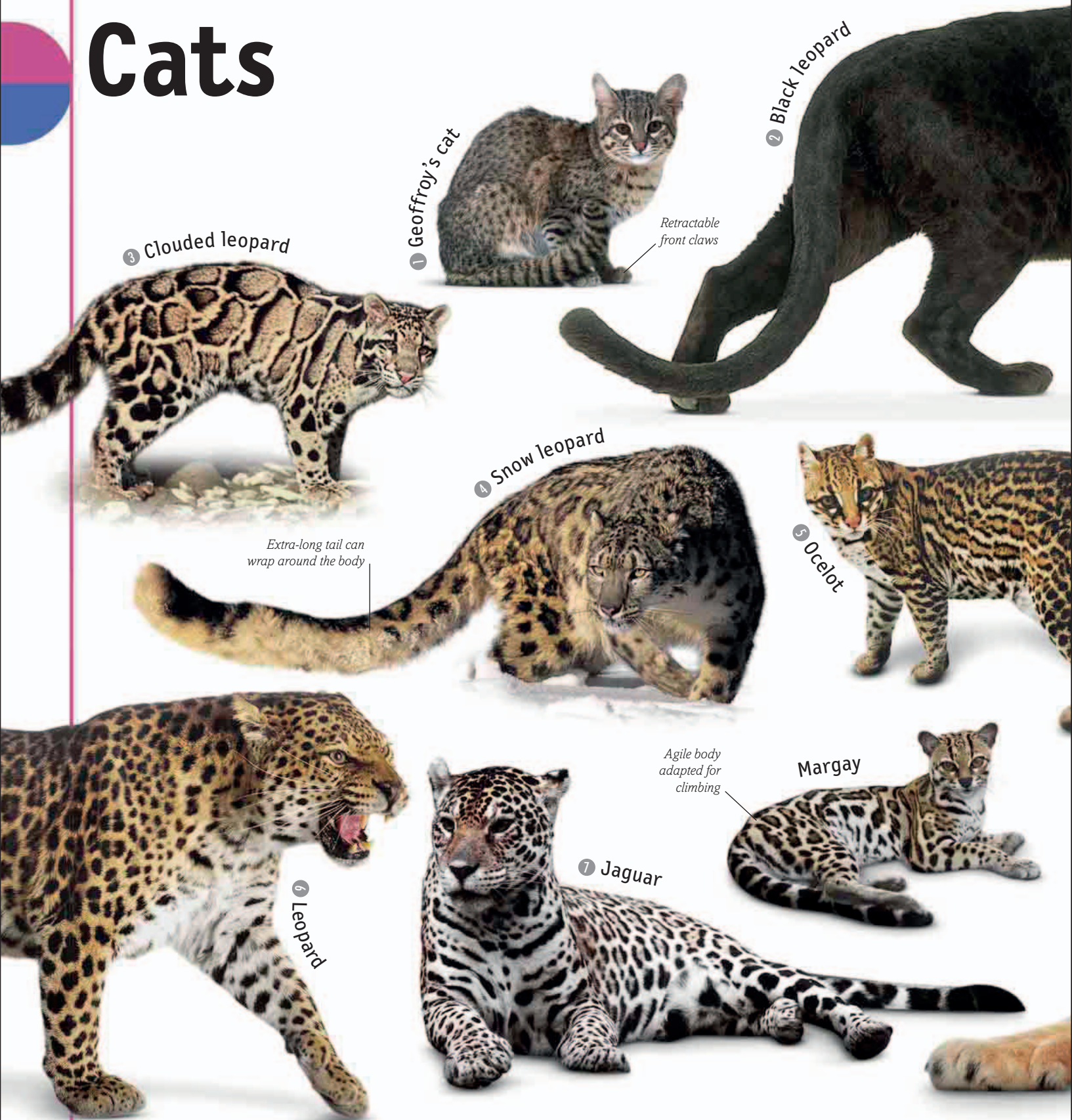
of Australia and South Africa. The **California sea lion** 3 is an expert at catching fish, and is a star performer at wildlife parks and zoos. At full speed it can swim at 40 kph (25 mph). **Walruses** 4 have huge wrinkly bodies, bristly moustaches, and white tusks up to 1 m (3 ft) long. They live in the Arctic and feed on clams and other seabed animals, sucking them out of their shells. **Steller's sea lion** 5 from the North



Pacific is the biggest of its kind. Like all sea lions and fur seals it can walk on its flippers, while other seals crawl on their stomachs when they come ashore. The **southern elephant seal** 6 is the largest seal and a record-breaking diver. It can plunge more than 2 km (1¼ miles) deep to catch fish and squid, holding its breath for an hour and a half. **Weddell seals** 7 live around Antarctica. These expert divers

specialize in long, deep dives under Antarctic ice shelves. In the winter season, they gnaw holes in the sea ice so that they can come to the surface to breathe. **Grey seals** 8 are fish-eaters from the North Atlantic, but the Antarctic **leopard seal** 9 is a ferocious killer of warm-blooded animals, including penguins and other seals. Unusually for a true seal, it uses its front flippers to swim and steer.

Cats



Sleek, stealthy, and patient, cats are natural killers. Apart from lions, most of them hunt on their own, using their claws and teeth to catch their prey. They include the fastest animals on four legs as well as some of the world's laziest predators, which snooze up to 20 hours each day. **Geoffroy's cat** 1 from South America is a typical small cat. It hunts at night, catching mammals, birds, and fish. The

black leopard 2 is a variety of the regular leopard, with unusually dark fur. The **clouded leopard** 3 gets its name from its cloud-shaped markings. It comes from the forests of South and Southeast Asia, and often hunts in treetops. The **snow leopard** 4 lives in the mountains of Central Asia, where its thick coat and wrap-around tail protect it from the cold. **Ocelots** 5 are forest cats from Central and



Dark fur with black spots

SCALE



Fishing cat

10 Tiger

8 Lion

9 Rusty-spotted cat

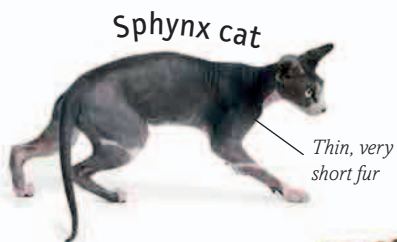
Vertical stripes for camouflage

Males have thick mane

Long legs and large feet to knock down big prey

South America. Night hunters, they prey on rodents but can climb trees to stalk monkeys and birds. **Leopards** 6 live in Africa and Asia. To safeguard their food from scavengers, they sometimes haul prey high into trees. The **jaguar** 7 is the biggest cat in the Americas. It is a good swimmer and often feeds on turtles, crushing their shells with its powerful bite. The **lion** 8 is the only wild cat that lives in groups,

known as prides. Although males are bigger than females, or lionesses, the females do most of the hunting and take sole charge of raising the young. The **rusty-spotted cat** 9 from India and Sri Lanka is the smallest wild cat, while **tigers** 10 are the biggest and the most dangerous. Tigers are found from Asia's tropical rainforests to eastern Siberia, but fewer than 5,000 are left in the wild.



12 Persian cat



11 Cheetah

13 Siamese cat



Sand cat



Jungle cat



Tabby cat



Long ear tufts

14 Cornish Rex



15 Manx cat



Pallas's cat



16 Caracal



SCALE



Most cats hunt after dark, creeping up on their prey and pouncing. The **cheetah** 11 is different because it hunts by day, relying on speed to make a kill. This lean African cat is the world's fastest sprinter. It speeds after antelope at up to 100 kph (62 mph), tripping up its victims with a swipe of its front paws. Domestic or pet cats are found all over the world, and have lived alongside people for

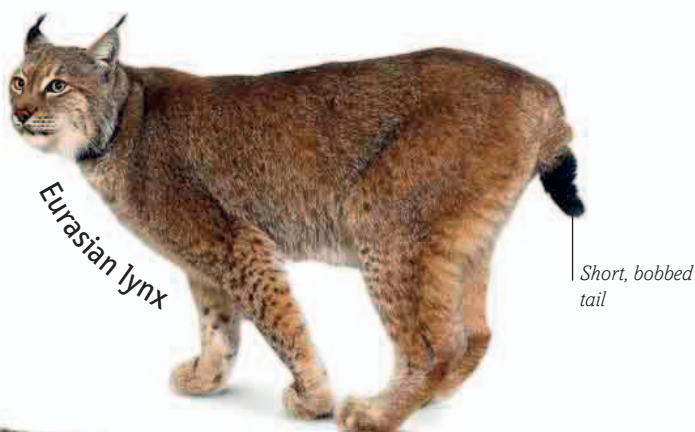
about 10,000 years. There are many different breeds, including the fluffy **Persian cat** 12, with its long hair and short muzzle, and the elegant **Siamese** 13. The **Cornish Rex** 14 has ultra-soft fur, while the **Manx cat** 15 does not have a tail. Most pet cats are good hunters and they sometimes go back to living in the wild. Both domestic and wild cats are renowned for their agility. The **caracal** 16 is a long-legged



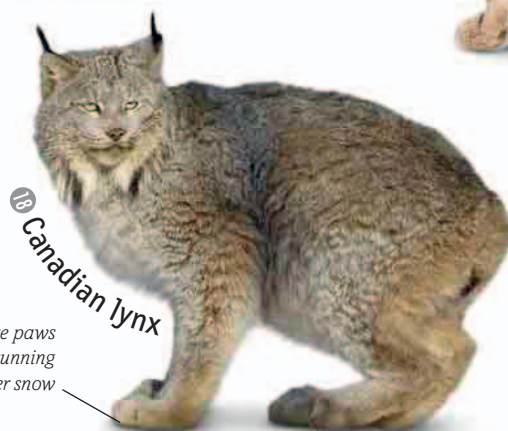
17 European wild cat



Black-footed cat



Eurasian lynx



18 Canadian lynx



Iberian lynx



Asian golden cat



Indian desert cat



19 Bobcat



20 Puma



Serval



Marbled cat

wild cat from Africa and western Asia. A stunning acrobat, it leaps up to 3.1 m (10 ft) off the ground to knock birds out of the air. The **European wild cat** 17 feeds mainly on rodents, but it also attacks ground-nesting birds, swallowing everything including their feathers and bones. Lynxes and bobcats have stubby tails and tufted ears. The **Canadian lynx** 18 is found mostly across Alaska, Canada, and in a few areas of the

northern USA. Its main prey is the snowshoe hare, while the North American **bobcat** 19 stalks and pounces on all kinds of animals, from insects to young deer. The **puma** 20, also known as the cougar or mountain lion, is one of the most widespread cats in the world, found all the way from western Canada to the tip of South America. It is normally shy but it sometimes attacks humans and can kill.



LIONS Perhaps the most famous of all wild animals, lions are instantly recognizable by their size, brownish-orange coat, and the male's bushy mane. They are renowned for their strength and ferocity. These African lion cubs are practising hunting skills, play-fighting with each other and their mother. These games may look like fun, but they teach the cubs how to stalk, ambush, and kill prey. These will be essential skills when they reach adulthood.



Size › Males up to 2.5 m (8 ft 2 in) long; females up to 1.7 m (5½ ft) long. **Weight** › Males weigh 190 kg (418 lb), females 126 kg (278 lb) **Habitat** › Hot, dry grassland, scrubland, and occasionally forests. Lions live in groups called prides. Males defend the pride's territory, which can be up to 260 km² (100 sq miles). **Distribution** › Asian lions live in the Gir Forest

in western India. African lions are found in sub-Saharan Africa. **Diet** › Antelope, zebra, and wildebeest, hunted by the females. **Predators** › None, but may be killed by rival males, hyenas, and humans. **Breeding** › Lions breed all year round. Females give birth to up to six cubs per litter. **Conservation status** › Lions are in danger due to hunting and habitat loss.

Otters, raccoons, and weasels



2 Giant otter



Large webbed paws

Asian small-clawed otter



Markings warn off attackers



Eastern spotted skunk

3 Striped skunk



4 Wolverine



Stocky, bear-like body

Greater grison



Otters and their relatives include many expert hunters as well as the smelliest mammals on Earth. They have slender bodies and short legs, with small ears and thick fur. Most of these animals catch their food on land or in fresh water. The **sea otter** 1 is the only one that lives offshore. It feeds on shellfish, breaking them open with a stone using its stomach as a worktop. The rare **giant otter** 2 from

South America's rivers is longer but lighter and has a paddle-shaped tail. North American **striped skunks** 3 have an overpowering method of self-defence. If anything or anyone comes too close, they squirt a foul-smelling liquid from glands beneath their tails. The liquid smells like a mixture of burning rubber and rotting eggs and takes days to fade away. **Wolverines** 4 live in northern parts of Canada, USA,

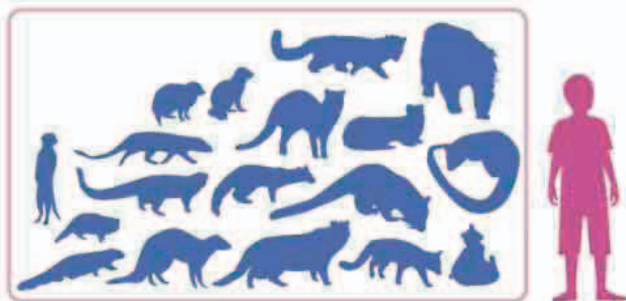


Europe, and Asia. Up to 1 m (3 ft 5 in) long, they are the world's strongest mammals for their size, capable of killing a reindeer or a moose. In North America the **raccoon** 5 is a common nocturnal visitor to gardens and backyards. Intelligent and curious, it often raids dustbins for leftover food, and catches fish and frogs in ponds. The **least weasel** 6 is the smallest meat-eating mammal. As thin as a finger, it

hunts mice in their burrows underground. **Kinkajous** 7 from South America feed mainly on fruit, while the **honey badger** 8 from Africa breaks into bees' nests. It has very thick fur, which protects it from angry bees' stings. The **Eurasian badger** 9 eats plants and animals, and lives in burrow systems called setts. Some setts contain more than 300 m (984 ft) of tunnels, and can be 100 years old.

Mongooses, civets, and genets

SCALE



① Banded mongoose



Yellow mongoose



Bushy white-tipped tail

② Meerkat



Tail with brush-like tip

③ Egyptian mongoose



Ruddy mongoose



Cape genet



Common dwarf mongoose



④ Indian grey mongoose



White-tailed mongoose



Mongooses are famous for fighting snakes, although they eat lots of other animals, including insects, lizards, birds, frogs, and even scorpions. Alert and watchful, their quick movements protect them from getting bitten or stung by their prey. They often live in groups and are generally active during the day. The African **banded mongoose** ① makes its home in old termite mounds,

while **meerkats** ② use their long front claws to burrow underground. The **Egyptian mongoose** ③ hunts in thick undergrowth and sometimes catches fish and crabs at the edge of streams and ponds. The **Indian grey mongoose** ④ often lives near towns and villages where it helps out by killing rats, snakes, and scorpions for food. Civets and genets are different to mongooses in that they usually feed at night

5 Asian palm civet



6 Binturong



Oriental civet



Sharp claws
for climbing

Small Indian civet



7 Masked palm civet



African palm civet

African civet



8 Small-spotted genet



Large eyes to
see in the dark

9 Banded linsang



and live on their own. The **Asian palm civet** 5 eats fruit and flowers as well as small animals, and stays mainly in trees. The **binturong** 6 from Southeast Asia has shaggy black fur, tufted ears, and a prehensile tail. **Masked palm civets** 7 live in forests in Southeast Asia and China. Like other civets they can squirt attackers with a powerful-smelling fluid, produced by glands at the base of their tails.

The **small-spotted genet** 8 looks like an extra-long cat with a slender tail. Found in southern Europe and Africa, it is an expert climber and often catches birds roosting in trees. In some areas it raids farms and is considered a pest. The **banded linsang** 9 from Southeast Asia has a beautifully striped and spotted coat. It nests in trees and spends most of its life off the ground.



MEERKATS These cheeky, sociable animals are related to mongooses. Meerkats live in groups called mobs. They dig burrows to protect them from the hot African sun and from predators. Mobs feed and hunt together, with some meerkats acting as lookouts, standing on their hind legs to watch for danger. If a predator approaches, the lookout gives a warning cry and the whole mob dives for cover.



Size > Up to 60 cm (24 in) long. Males are slightly larger than females. **Weight** > Up to 1 kg (35 oz) **Habitat** > Open plains, dry, hot grasslands, and savanna. **Distribution** > Southern and southwestern Africa **Diet** > Insects, birds and birds' eggs, lizards, rodents, and fruit. **Lifespan** > 5–15 years in the wild. **Breeding** > Meerkats breed all year round, but

more so in warmer months between August and March. Usually only the dominant female breeds. She may have up to four litters a year, with two to four young per litter. Males and siblings help raise the young, teaching them hunting and survival skills. **Predators** > Hawks, eagles, and jackals. **Conservation status** > Not currently in danger.

Rhinos and tapirs

① African black rhinoceros



② Javan rhinoceros

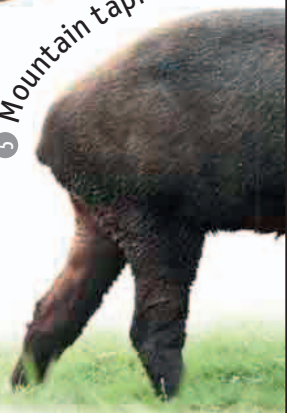


Long front horn

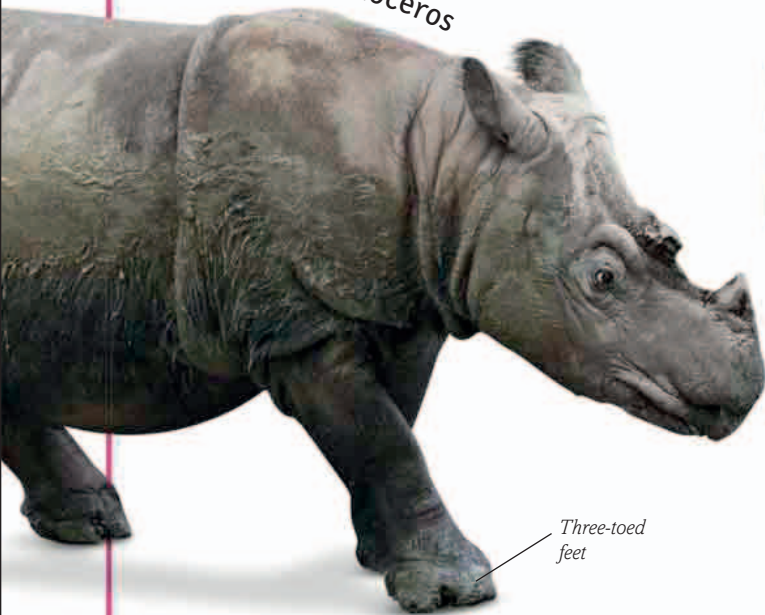
④ Indian rhinoceros



⑤ Mountain tapir



③ Sumatran rhinoceros



Three-toed feet

After elephants, rhinos are the world's largest land animals, with barrel-shaped bodies and thick, folded skin. They have few natural enemies but most rhinos are threatened by illegal hunting for their horns. The **African black rhino** ① weighs up to 1.5 tonnes. Notorious for its poor eyesight and bad temper, it feeds on leaves and twigs using its flexible upper lip, and does not like being disturbed. They eat twigs and leaves,

which they grasp with their flexible upper lips. The **Javan rhino** ② and **Sumatran rhino** ③ are found in the forests of Indonesia. Javan rhinos have a single horn, and are some of the rarest mammals in the world, with fewer than 50 left in the wild. Sumatran rhinos are also critically endangered. They have two horns and are born with a wiry coat of brown fur. Smallest of all rhinos, they can still grow to a height of 1.5 m (5 ft). The



6 Baird's tapir



SCALE



8 Malayan tapir



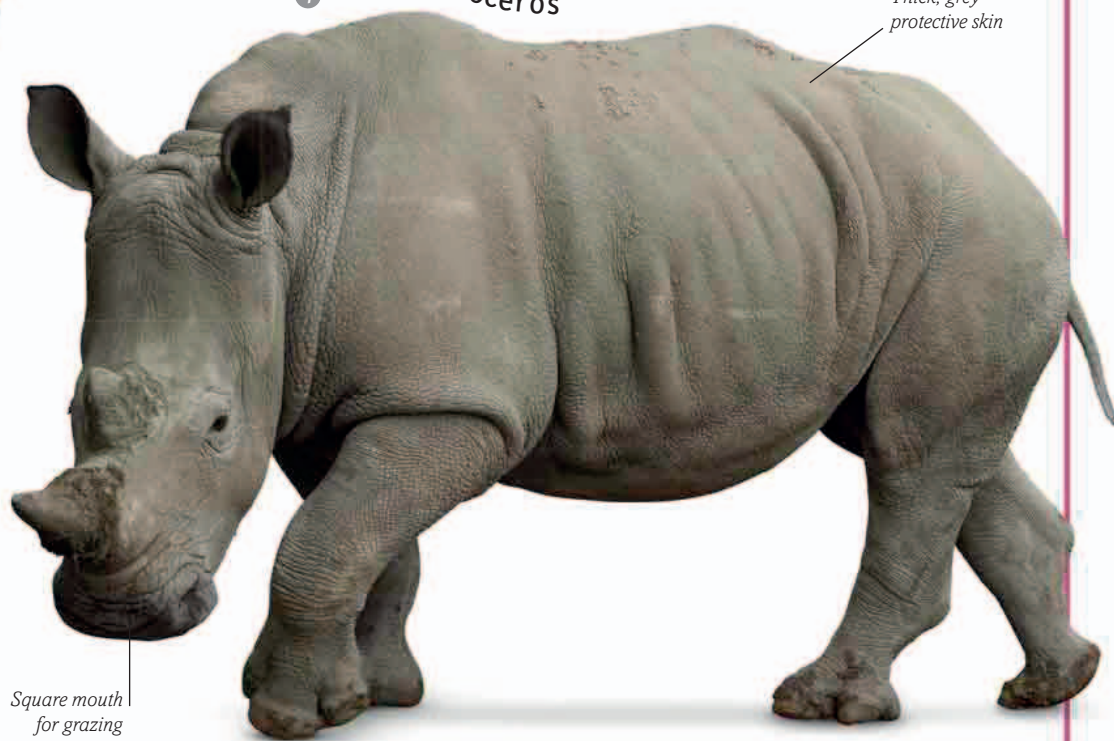
7 South American tapir

Long, flexible snout to grasp leaves overhead



9 White rhinoceros

Thick, grey protective skin



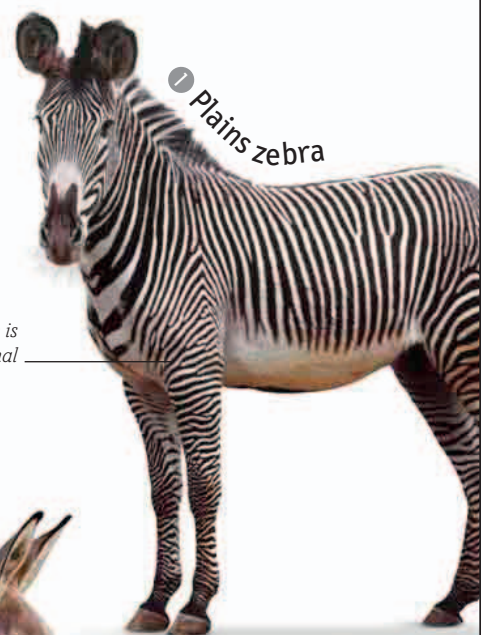
Square mouth for grazing



Indian rhino 4 is the biggest Asian species, with a single horn and armour-plated skin. It lives in tall grasslands, and almost became extinct in the early 1900s, when fewer than 200 were left. About 3,000 live in India today, protected by armed guards. Tapirs are distant relatives of rhinos, with long noses like miniature trunks. They eat fruit and leaves and find their food mainly by smell. The **mountain tapir** 5, **Baird's**

tapir 6, and **South American tapir** 7 come from Central and South America. The largest of all, the **Malayan tapir** 8 is the only Asian species, and the only one that is black and white when fully grown. The African **white rhino** 9 is the giant of its family. It has two horns and can weigh almost 3 tonnes. Despite its colossal size, it is astonishingly quick and agile, galloping at nearly 50 kph (31 mph).

Horses and relatives



1 Plains zebra

Stripe pattern is unique to each animal



2 Grant's zebra

Upright mane

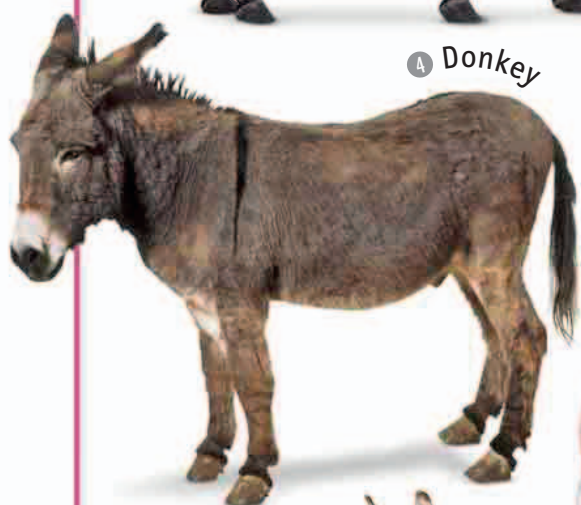
3 Somali wild ass



Striped legs



6 Przewalski's horse

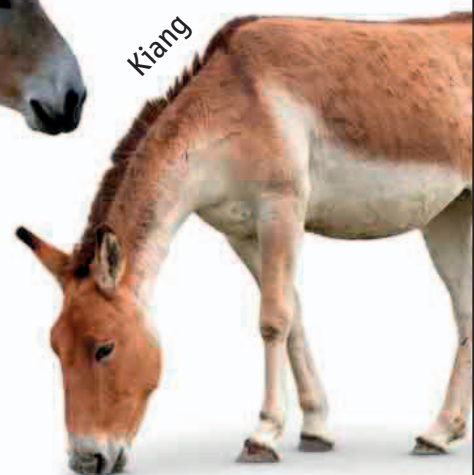


4 Donkey

5 Persian onager



Kiang



Khur



The horse family contains some of the fastest and best-known mammals in the world. They live in herds and have very good eyesight and hearing. At the first sign of danger they quickly gallop away. Zebras are wild animals and so are most asses, but donkeys and horses were tamed thousands of years ago. The **plains zebra** 1 is the biggest wild member of the horse family, with narrow

stripes and a white underside. It lives in East Africa, and is in danger of dying out, with fewer than 5,000 alive in the wild. **Grant's zebra** 2 also comes from East Africa. It is the smallest zebra, growing up to 1.4 m (4½ ft), and has thick stripes and a black upright mane. The **Somali wild ass** 3 lives in the rocky deserts of northeast Africa. It is the ancestor of the **donkey** 4, a sure-footed animal used by humans to



carry burdens in many parts of the world. The **Persian onager** ⑤ is a wild ass from Asia and is now found only in Iran. **Przewalski's horse** ⑥ from Mongolia is the last true wild horse in the world. It almost died out in the 20th century, but is slowly recovering thanks to the work of conservationists. The **mule** ⑦ is a hybrid, or mixture, between a male donkey and a female horse. However, there are also more than

1,000 pure horse and pony breeds. The **Shire horse** ⑧, bred in Britain, is one of the biggest and the best at pulling loads. The heaviest Shire horse on record, born in 1848, weighed more than 1.5 tonnes. Today, Shire horses are quite rare, but some are still used in forestry. **Arab horses** ⑨ are the fastest breed, and are used in horse racing. The most valuable can fetch a price of more than \$10 million.



PLAINS ZEBRAS

They may look like peaceful creatures, but zebras can be vicious when it comes to defending themselves or their territory. Males sometimes fight for a chance to breed with females, kicking out and biting at each other. Even predators such as lions and cheetahs have to be careful around zebra herds, as they can be injured or even killed in battles with large males.



Size > Up to 1.4 m (4½ ft) tall **Weight** > Males weigh around 360 kg (794 lb); females around 320 kg (705 lb)
Habitat > Grasslands and open savannas. They usually keep close to water holes. In the dry season, they move in huge herds to find food and water. **Distribution** > Southern Africa **Diet** > Grass, occasionally shrubs. **Breeding** > Plains

zebras breed all year round. Foals are often born in the rainy season, and can walk within an hour of being born. **Lifespan** > 15–20 years in the wild. **Predators** > Lions, cheetahs, leopards, and hyenas. Zebras may team up with each other or even with other species such as wildebeest, for protection against predators.

Cows, antelope, and sheep

SCALE



① Gaur



② Texan longhorn

*Horns are hollow,
with a bony base*



③ Yak

*Long hair for
keeping warm*

Lowland anoa

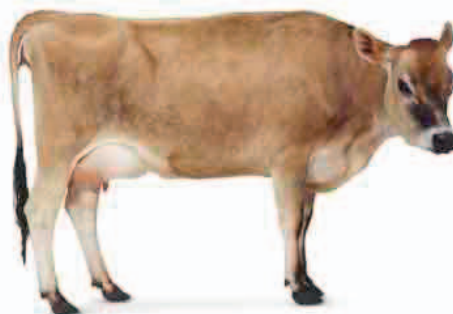


*Thick winter coat
falls off in summer*

④ American bison



Jersey cow



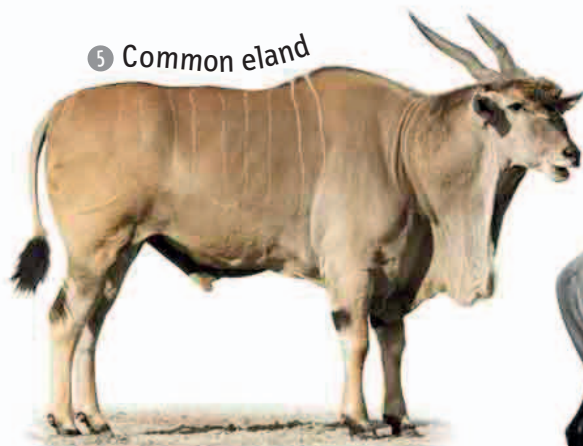
Cattle and their relatives all have hooves, and special stomachs for digesting leaves and grass. Some of them live on their own, but most keep together in herds. The **gaur** ① is the largest kind of wild cattle, weighing up to 20 times as much as an adult man. It comes from the forests of tropical Asia and has few natural enemies apart from tigers and crocodiles. Domesticated cattle such as the **Texan**

longhorn ② can be almost as big. This breed has some of the world's biggest horns, measuring an incredible 3 m (10 ft) from tip to tip. The **yak** ③ comes from the mountain pastures of Central Asia, while the **American bison** ④, or buffalo, is a grassland animal from the Great Plains in Canada and the USA. At one time there were more than 50 million of these massive grazers, but after years of hunting only about 500,000



Sitatunga

Feet have two main hooves



5 Common eland



Nilgai



Greater kudu



Addax



6 Gemsbok

Horns have knobbly rings



Bohor reedbuck



7 Common waterbuck



Stripes provide camouflage

Zebra duiker



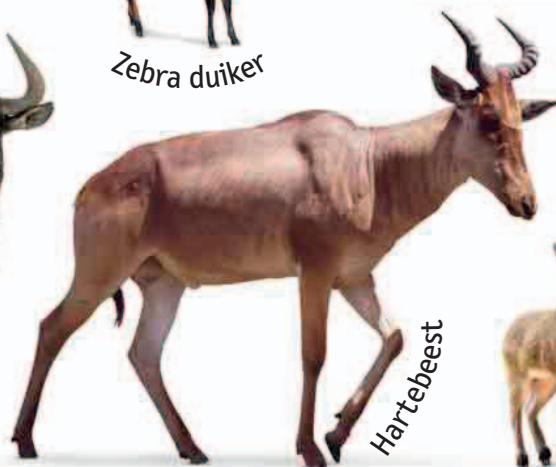
Sable antelope



8 African buffalo



9 Wildebeest



Hartebeest

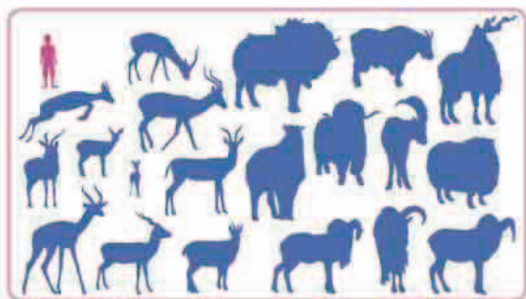


10 Klipspringer

are left. Antelope live in Africa and Asia. The African **common eland** 5 is one of the biggest kinds. It is a gentle animal and is sometimes farmed. **Gemsboks** 6 live in the deserts of southern Africa. Like most antelope, both males and females have horns. The **common waterbuck** 7 lives in grassland and woods but runs into lakes and swamps when threatened. The **African buffalo** 8 is one of the biggest and most

dangerous grassland animals. Adult males can even kill lions and demolish cars. **Wildebeest** 9 are some of the commonest African antelope, migrating in huge herds that follow the yearly rains. Each migration involves up to 1.5 million wildebeest and thousands of other animals including zebras. The **klipspringer** 10 lives on rocky outcrops in eastern and southern Africa. Its rubbery hooves give it a good grip.

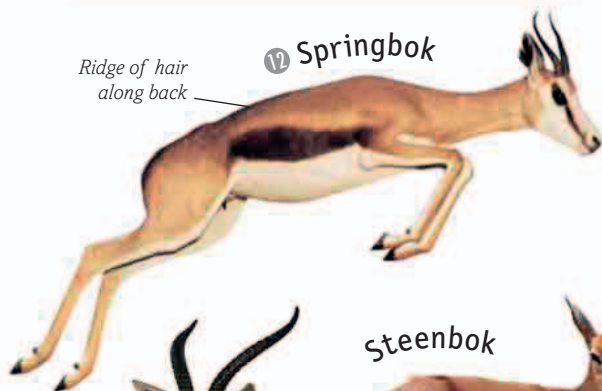
SCALE



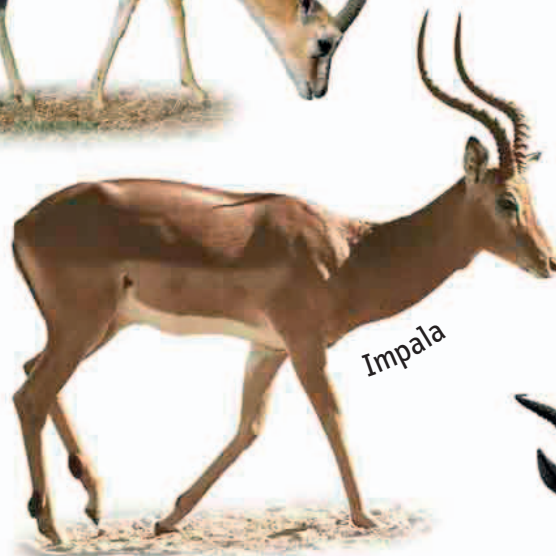
11 Thomson's gazelle

Ridge of hair
along back

12 Springbok



Impala



Steenbok



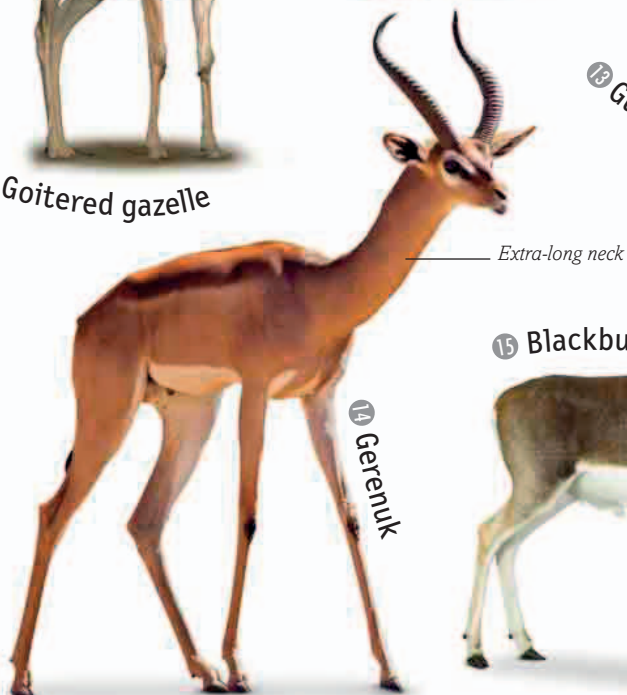
13 Günther's dik dik



Grant's gazelle



Goitered gazelle



Extra-long neck

15 Blackbuck

14 Gerenuk



Alpine chamois



There are more antelope in Africa than anywhere else in the world. **Thomson's gazelle** 11 lives in East Africa's grasslands, where it often mixes with herds of zebras and wildebeest. It keeps a constant lookout for predators, sleeping in five-minute bursts for just an hour every day. The **springbok** 12 from southern Africa can leap more than six times its own length. Males lock horns during

the breeding season, when they fight for the right to mate. **Günther's dik dik** 13 is a miniature antelope that lives in shrubby places, while the **gerenuk** 14 stands on its back legs to feed in shrubs and trees, helped by its long, slender neck. The **blackbuck** 15 lives in India and Nepal. Females are mainly brown, but males are black and white with spirally-twisted horns. The **muskox** 16 is named after the strong



16 Muskox



17 Mountain goat

Sharp hooves have soft inner pads for better grip



Markhor



Takin



Angora goat

Wool is used to make mohair, a costly fabric

Thick, curved horns longer in males

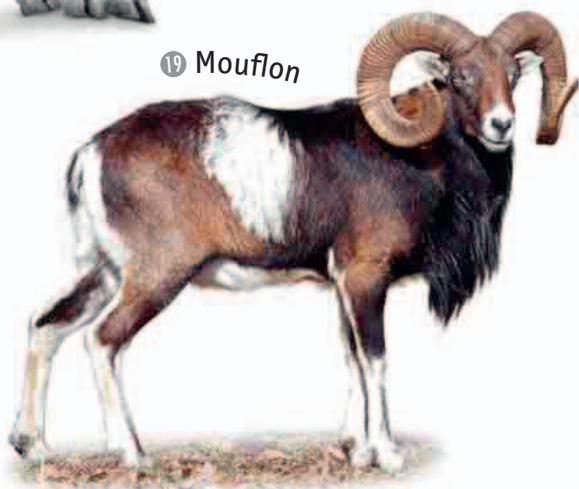


18 Alpine ibex



Cotswold sheep

Curved horns



19 Mouflon



Barbary sheep

20 Bighorn sheep



smell emitted by males during the breeding season. It looks like a buffalo, but is actually a relative of wild goats and sheep. It lives in the high Arctic and has a thick, shaggy coat to protect it from the intense winter cold. The North American **mountain goat** 17 is a fearless and agile climber. It can leap along narrow ledges just a few hours after being born. The **Alpine ibex** 18 is just as sure-footed. It lives high

above the treeline in the European Alps, and is famous for its horns, which can be up to 1 m (3 ft) long. The **mouflon** 19 from Europe and Asia is the wild ancestor of sheep that live on farms. Male **bighorn sheep** 20 from North America use their horns to fight with their rivals. They crash head-on with enormous force and their fights can last several hours until one of the contestants walks away.



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



Size > Up to 1.7 m (5½ ft) tall **Weight** > Males up to 4.5 tonnes; females up to 1.5 tonnes **Habitat** > Shallow lakes, rivers, swamps, and grassland around these areas. **Distribution** > Sub-Saharan, Eastern, and Central Africa. **Diet** > Grass, reeds, and small shoots of plants. **Breeding** > Hippos breed about once every two years and have just one

calf each time. The calves suckle for nearly a year and can do so even underwater. **Lifespan** > About 50 years. **Predators** > Adults have no predators apart for humans. Young hippos may be eaten by crocodiles, lions, and hyenas. **Conservation status** > Numbers have fallen sharply in recent years due to habitat loss and because they are hunted for their teeth.

Pigs, peccaries, and deer

SCALE



1 Piétrain pig



2 Wild boar



Long snout for rooting up food

4 Buru babirusa



3 Collared peccary

Pale white neck collar



Bearded pig



Red river hog



White-lipped peccary



Developing antlers covered in velvety skin

Sambar



5 Warthog



Two pairs of tusks

Roe deer



Red-brown summer coat turns dense and grey in winter



Pigs come in many shapes and colours.

Domestic varieties are raised for their meat in farms across the world. The spotty **Piétrain** 1 pig, originally from Belgium, is one popular variety. Domestic pigs have descended from the **wild boar** 2. With its bristly fur and bulldozer-like snout, this formidable creature digs up roots, burrowing animals, and also crops in fields. It originally comes from Europe,

North Africa, and Asia, but has been released in many other places where it is sometimes a serious pest. The **collared peccary** 3 is found from southern USA to South America and is similar to a wild boar. The **Buru babirusa** 4 from Indonesia has some of the strangest tusks of any pig. It has two growing out of its mouth and two more growing upwards through its snout. The **warthog** 5 lives in Africa's grasslands.



Like other wild pigs it can be dangerous if cornered, particularly if it has piglets to protect. Pigs eat almost anything, but deer are vegetarians, feeding on leaves, lichens, and bark. Most male deer have antlers, which they shed and regrow each year. The **fallow deer's** 6 antlers are flat like the palm of a hand, but the **wapiti** 7 has branching antlers that end in sharp points. Every autumn, male wapiti or stags clash

head-on in a trial of strength that decides who gets a chance to breed. The tiny **Java mouse deer** 8 is the world's smallest hoofed mammal, no bigger than a rabbit, while the **moose** 9 is by far the largest deer, with a record weight of more than 800 kg (1,760 lb). Moose live on their own, but **reindeer** 10 are much more sociable. In the Canadian Arctic, half a million of them can travel in a single herd.

Camels, llamas, and giraffes

SCALE



① Dromedary

Round feet
with two toes

② Bactrian camel

Shaggy beard
on throat

④ Okapi

Striped upper legs

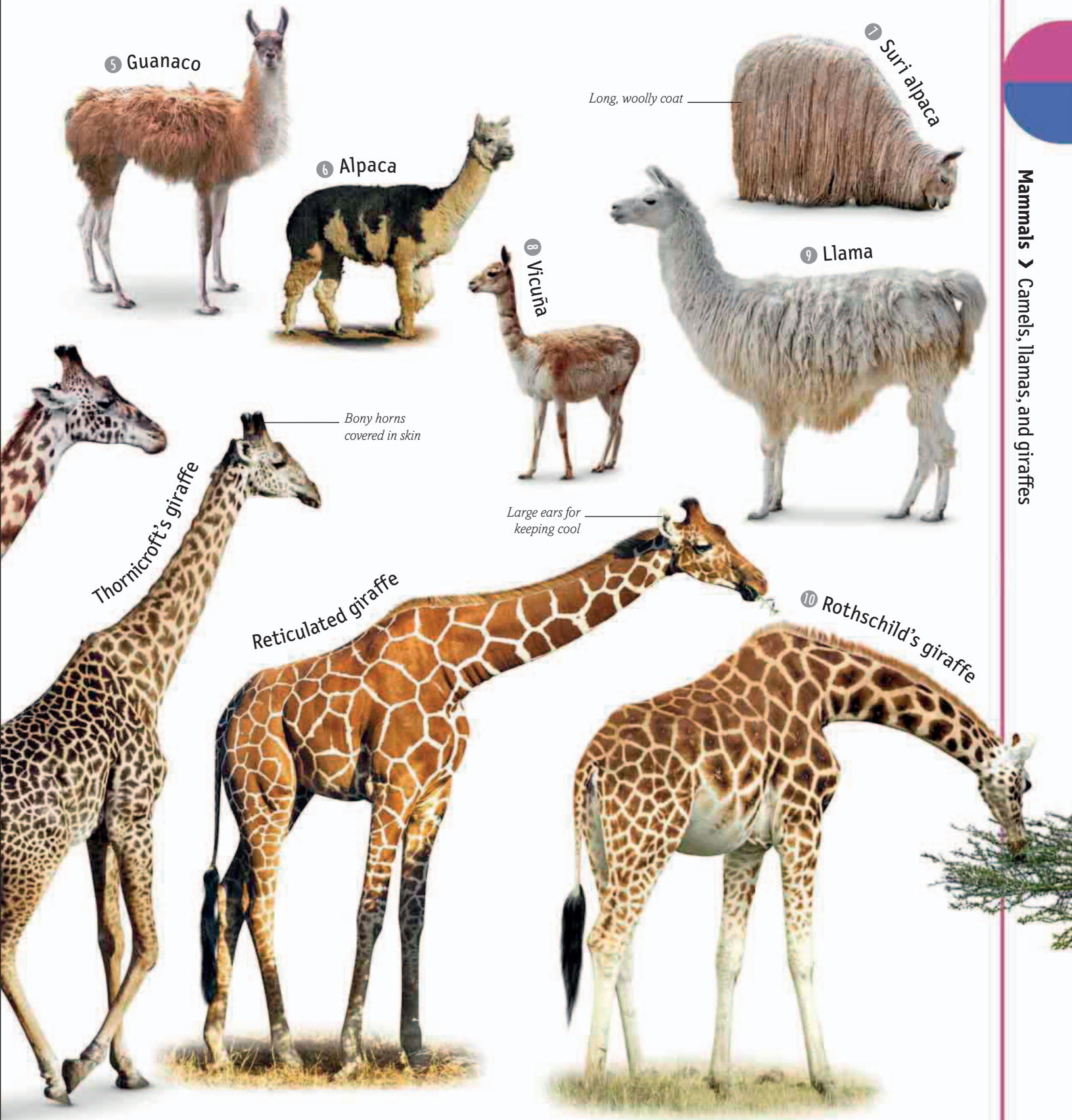


③ Masai giraffe



For thousands of years, the one-humped camel or **dromedary** ① has been used as a working animal in North Africa and the Middle East. Nicknamed the “ship of the desert”, it can go for two weeks without drinking, and when it does find water it can swallow enough to fill four kitchen sinks. Its hump stores an emergency reserve of fat, and it has cushioned feet that stop it from sinking in the desert

sand. The **Bactrian camel** ② from Central Asia is even tougher because it has to cope with extreme winter cold. It has two humps instead of one and a thick winter coat that falls off when spring arrives. Giraffes are the world’s tallest animals. They live in Africa’s tree-studded grasslands, feeding on leaves and twigs that other mammals cannot reach. The **Masai giraffe** ③ is the largest, with a record height of



6 m (20 ft). The **okapi** 4 from Central Africa is a forest-dwelling relative of giraffes, while the **guanaco** 5 belongs to the camel family. It lives high in the Andes like the South American **alpaca** 6. Alpacas are raised for their silky fleece. Some breeds have short coats but **suri alpacas** 7 can have a fleece so long that it trails along the ground. All alpacas are descendants of the **vicuña** 8. This wild grazer, also from

the Andes, can survive at 5,000 m (16,400 ft), a height that would leave many people gasping for breath. The **llama** 9, a tame relative of the guanaco, is used for carrying burdens on narrow mountain paths. Back in Africa, **Rothschild's giraffe** 10 is easily recognizable with its big spots and long white "socks" on its lower legs. Loss of habitat has threatened its existence, with fewer than 670 left in the wild.



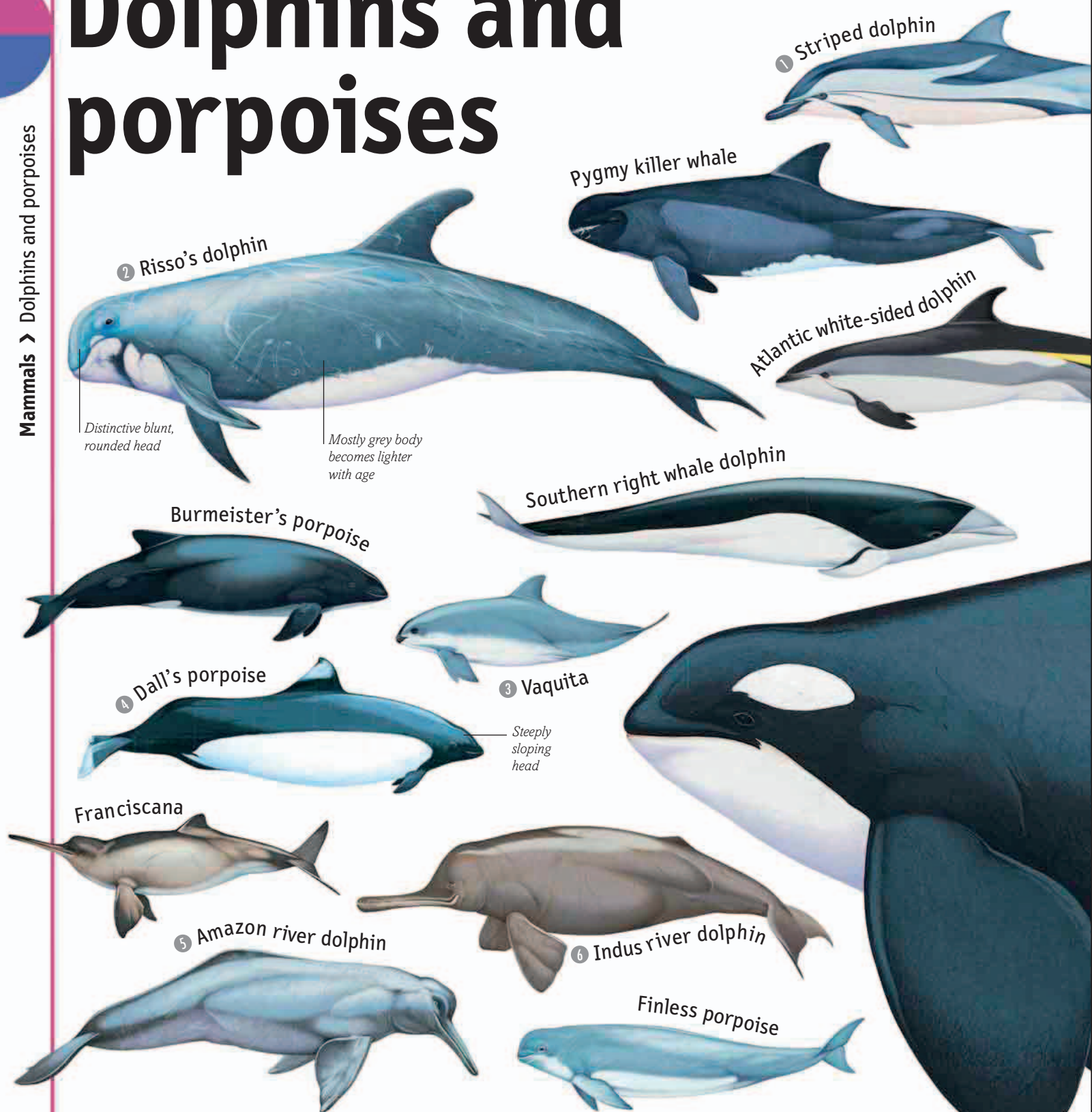
GIRAFFES With their amazingly long necks reaching into the treetops, giraffes are the tallest living animals. They have only seven bones in their necks, the same number as humans. Their long, slender legs allow them to gallop as fast as a horse, but become a problem when they have to bend down to drink. Giraffes also have long, bluish-purple tongues, and horn-like growths on their heads. Each giraffe can be recognized by its unique pattern of blotches.



Size > Males up to 6 m (20 ft); females up to 4.7 m (15½ ft) tall **Weight** > Males weigh up to 1.6 tonnes; females up to 1.1 tonnes **Habitat** > Grassland, savanna, and open woodland. **Distribution** > Sub-Saharan Africa **Diet** > Giraffes mainly feed on acacia trees. They have tough mouths and tongues to cope with the thorns. **Breeding** > Giraffes breed in the rainy season,

and calves are born in the dry season. Females give birth standing up, and a calf can walk within an hour of being born. **Lifespan** > About 25 years in the wild. **Predators** > Lions, but young giraffes may also be killed by leopards, hyenas, wild dogs, and crocodiles. **Conservation status** > Numbers of some giraffe species are reducing due to habitat loss.

Dolphins and porpoises



Dolphins and porpoises are related to whales, but they are smaller and faster, with sharply pointed teeth. Some live alone but most travel in groups called pods or schools. Intelligent and playful, they communicate with clicks and whistles. Like some whales, dolphins use sound waves to find their food. The **striped dolphin** ① lives worldwide, mainly where the sea is warm. It feeds on fish and squid, and

often surfs the bow-waves in front of fast-moving boats.

Risso's dolphin ② has a flattened head instead of a beak. As it gets older, its body often becomes scarred from fighting with other dolphins and grappling with squid. Porpoises are usually shorter than dolphins, with barrel-shaped bodies and blunt jaws. The tiny **vaquita** ③ is one of the rarest and smallest species, measuring just 1.2 m (4 ft) long, while **Dall's**



porpoise 4 is the fastest with a top speed of about 55 kph (34 mph). The **Amazon river dolphin** 5 has small eyes and the **Indus river dolphin** 6 is almost blind. Both these dolphins live in fresh water and rely on sound waves to hunt. The **bottlenose dolphin** 7 is smart and agile, making it a popular performer at aquariums. It frequently interacts with humans in the wild, too. **Commerson's dolphin** 8, on the

other hand, is a much rarer species from icy southern seas. The **killer whale** 9, or orca, is by far the biggest member of the dolphin family, weighing up to 7 tonnes. A cunning and quick-witted predator, it attacks other dolphins and whales, and sometimes tips up ice floes to make seals slide into the sea. It is even known to attack seals on beaches, using large waves to wash itself back out to sea after grabbing its prey.

Whales



① Beluga whale

② Narwhal



Single tusk with left-handed twist

Southern right whale

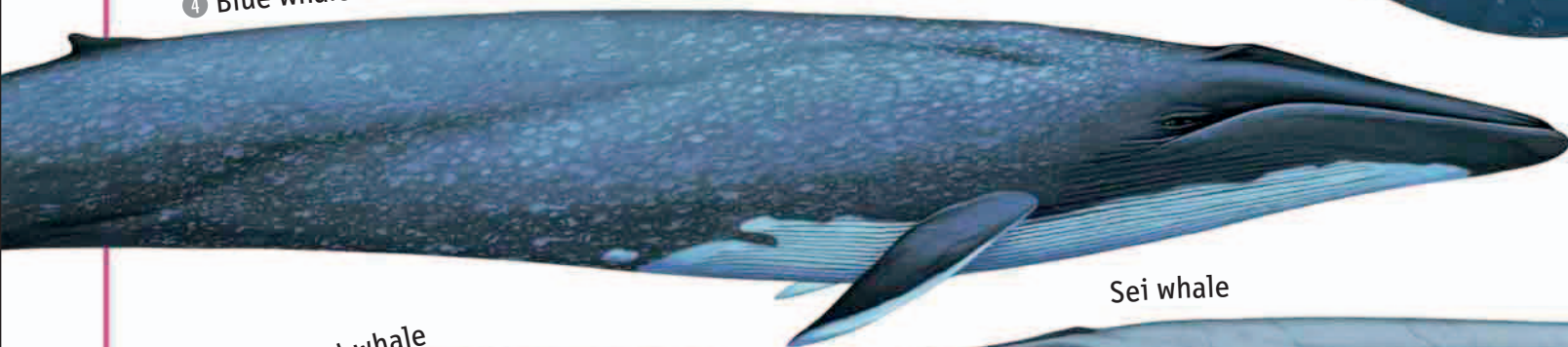


Irregular white patches on underside

③ Humpback whale



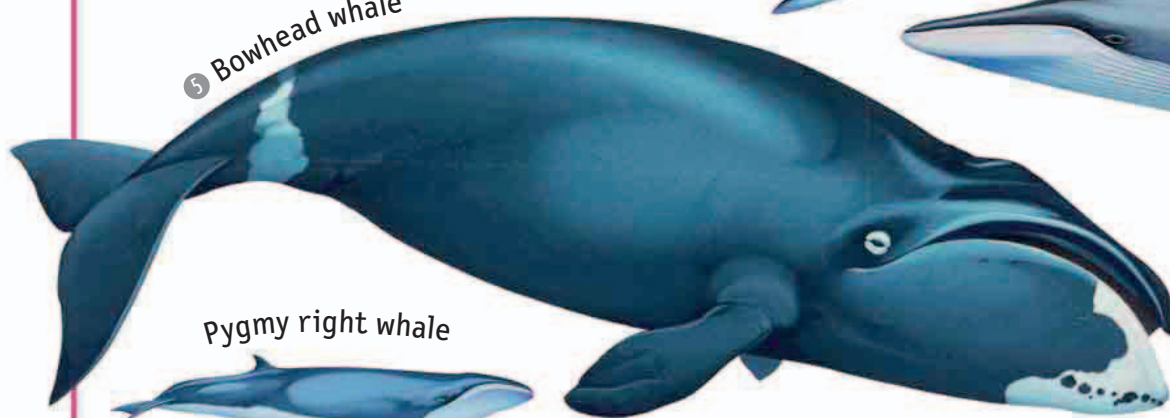
④ Blue whale



Sei whale



⑤ Bowhead whale



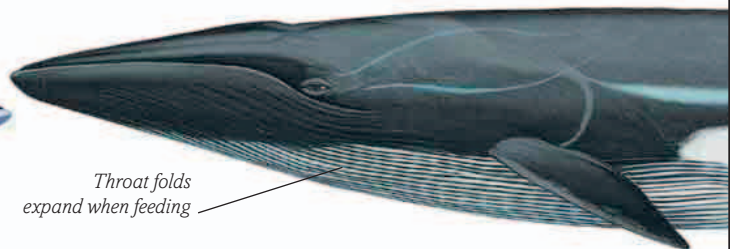
Minke whale



pygmy right whale



⑥ Fin whale



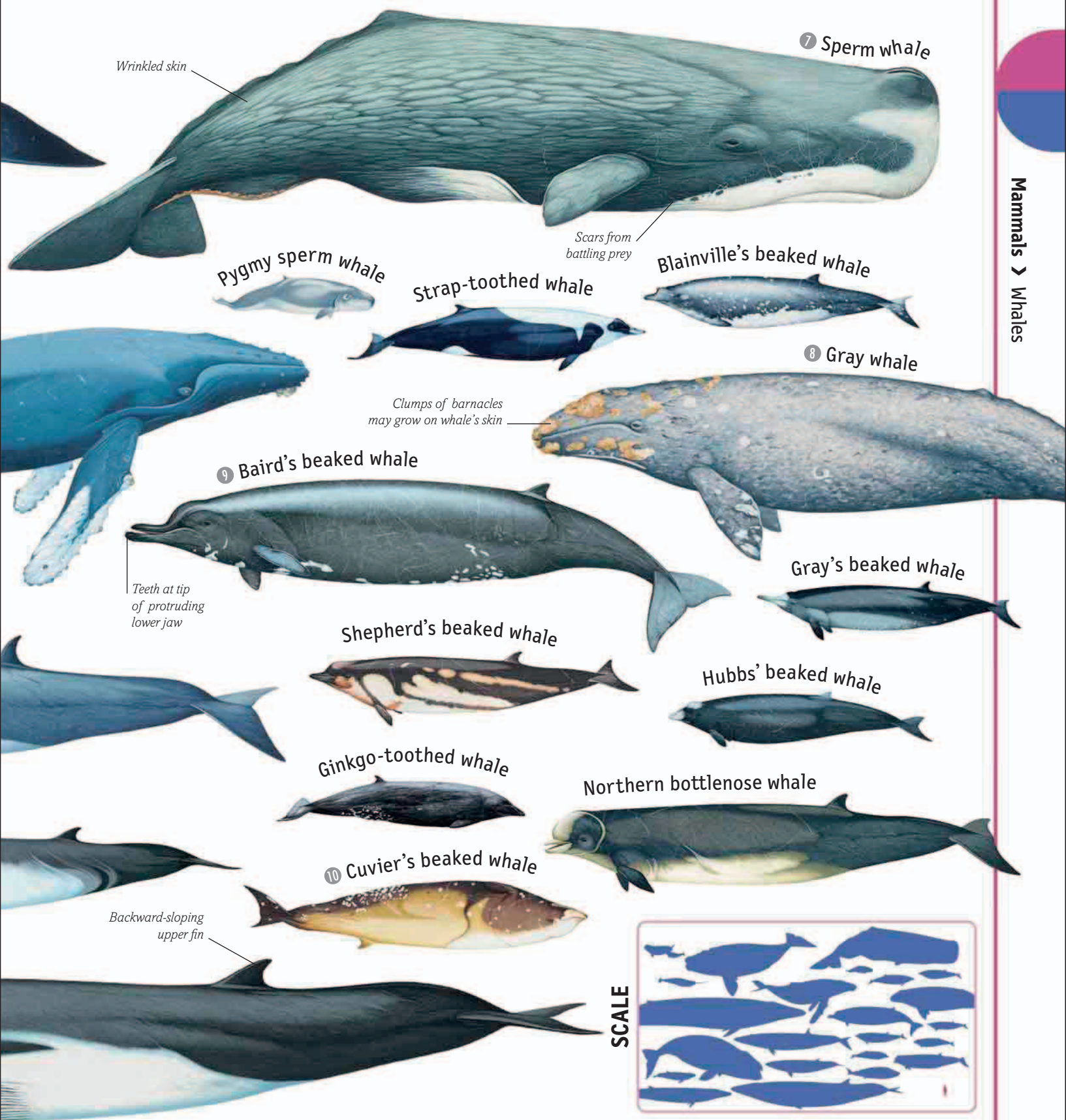
Throat folds expand when feeding

Bryde's whale



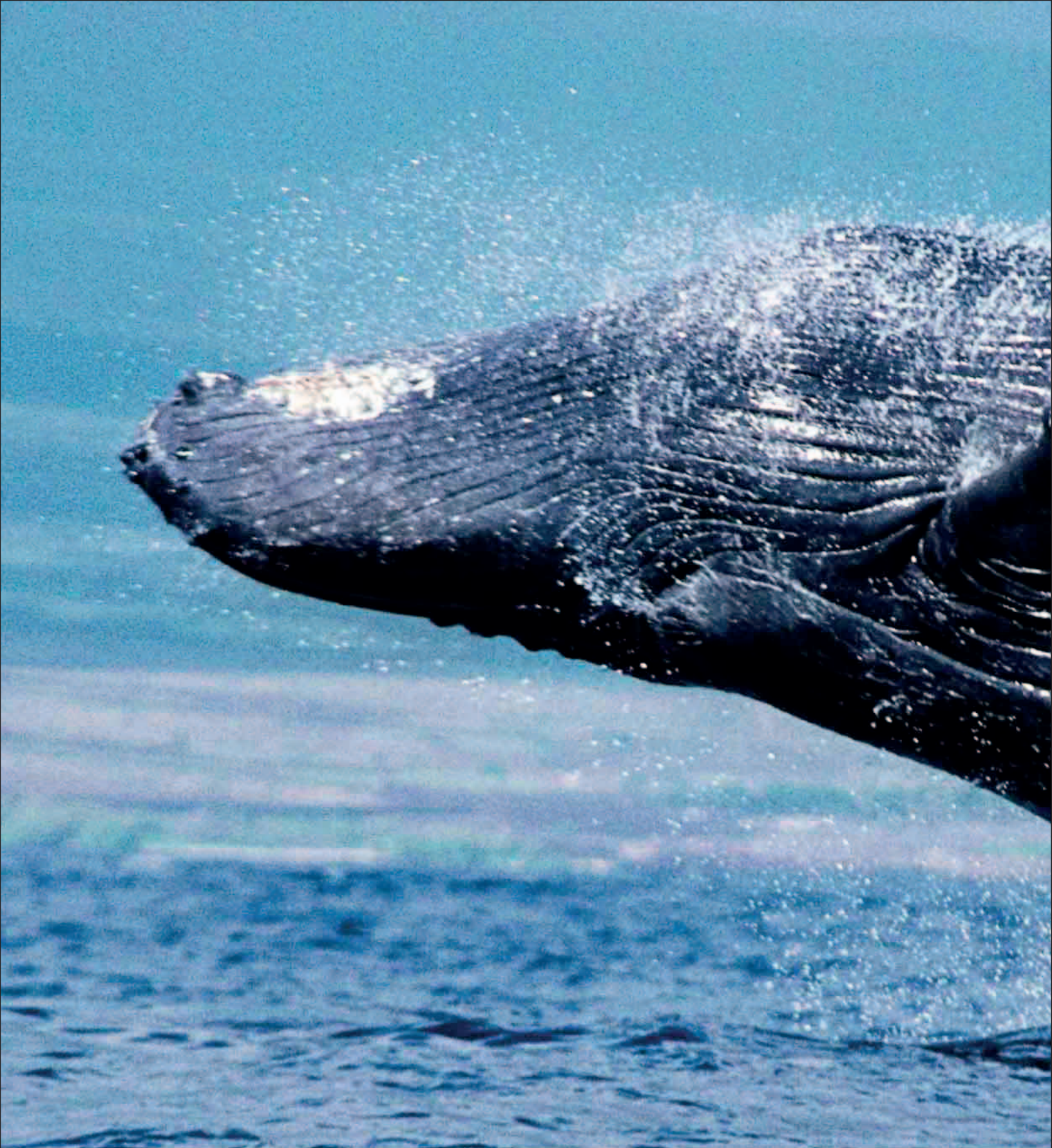
For more than 30 million years, whales have roamed the open seas. They include some of the biggest animals that have ever lived. They breathe air through blowholes on top of their heads and swim by beating their flukes, or horizontal tails. The **beluga** ① and **narwhal** ② are two small whales from the Arctic. Belugas have white skin that blends with Arctic ice floes. Narwhals have a long twisted tusk,

which they were hunted for in the past. The tusks were sold as “unicorn horns” and were thought to have magical powers. The **humpback whale** ③ is a fish-eater and an incredible acrobat. It sometimes bursts right out of the water, crashing back onto the surface with a massive splash. The humpback is much longer than a bus, but it is only half the size of the **blue whale** ④, the largest animal on Earth. This mega-



mammal weighs about 150 tonnes, which is more than the heaviest dinosaur, and grows up to 27 m (89 ft) long. It feeds on tiny animals called krill, filtering them out of the water, swallowing up to 8 billion every day. The **bowhead whale** 5 and **fin whale** 6 are also filter-feeders, but the **sperm whale** 7 is the world's biggest hunter-killer with a huge head and about 50 enormous teeth. It feeds on giant squid, diving

up to 3,000 m (9,840 ft) beneath the waves to find prey. The **gray whale** 8 makes the longest migrations of any mammal, a round trip of 20,000 km (12,430 miles) from Alaskan waters to warmer waters off Mexico. Beaked whales feed in seabed canyons, sucking up squid and fish. **Baird's beaked whale** 9 is the biggest of these mysterious animals while **Cuvier's beaked whale** 10 is the most widespread.



HUMPBACK WHALE These whales are famous for the males' complex, haunting songs, which carry for thousands of kilometres through the ocean. Humpback whales are remarkably agile for their size. They can push themselves right out of the water, twisting in the air to land on their backs with an enormous splash. This movement is known as breaching. Many whales do it, but scientists do not know why.



Size › Males up to 14 m (46 ft) long; females up to 16 m (52½ ft) long **Weight** › Up to 40 tonnes **Habitat** › Ocean; humpback whales breed in warm tropical and subtropical waters but migrate to cooler waters to feed. **Distribution** › Oceans and coastal areas across the world. **Diet** › Plankton, krill, and small fish, which they filter out of the water.

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

INDEX

A

abdomens 81, 97
 adders 150
 African bush vipers 154–155
 African savannah elephants 226–227
 agoutis 231
 albatrosses 206–207
 algae 16–17, 20, 27, 61
 alligators 139, 156, 157
 alpacas 285
 alpine swifts 177
 anacondas 151
 anemone cups 26
 anemonefish 114
 anemones 53, 114
 angelfish 114
 Angora rabbits 228
 aningas 196, 197
 anteaters 222–223
 Antelope jackrabbits 229
 antelopes 277, 278
 antennae 78, 79, 81, 121
 antlers 283
 ants 102–103, 222
 antshrikes 208
 apes 236–237
 apollos 94
 Arab horses 273
 aracarís 180–181
 armadillos 222
 arthropods 48
 ash trees 44
 asses 272
 atlas moths 97
 auks 204
 avocets 202
 axolotls 137
 aye-ayes 235
 azure vase sponges 51

B

babies *see* young
 babirusas 282
 baboons 242–243
 bacteria 14–15, 27
 badgers 265
 bald eagles 182–183
 banana slugs 61
 bandicoots 221
 barbets 180, 181
 barn owls 173
 barnacles 78
 barred owls 174–175
 bateleurs 182
 bats 244–247, 248–249
 bat flies 100, 101
 beaks 158
 birds 168, 176, 180, 181, 195, 198, 202
 whales 291
 bears 252–253, 254–255
 beavers 231
 bed bugs 88, 89
 bee-eaters 178, 179
 bee flies 100, 101
 bee hummingbirds 177
 bees 102–103
 beetles 92–93, 103
 bellbirds 209
 beluga whales 290
 bettongs 218
 big cats 258–261, 262–263
 bilbies 220–221
 binturongs 267
 birch trees 46
 birds-of-paradise (birds) 210, 211
 birds-of-paradise (plants) 40
 bird's nests (fungi) 24–25
 birds of prey 182–185

birth 217

 mammals 222, 223, 224, 227, 228, 239, 255, 263, 269, 287
 reptiles 144, 152, 155
 sharks 108, 111
 bitterns 194
 black bears 252
 black-browed albatrosses 206–207
 black leopards 258
 black rhinoceros 270
 black-striped salemas 118–119
 black swans 189
 black widow spiders 71
 black vultures 184
 blackbirds 211, 213
 blind animals *see* sight
 blindsnakes 151
 blood pythons 152
 bloodsuckers 88, 89, 100, 245
 blue whales 290–291
 bluebirds 213
 bluebottle flies 100

boa constrictors 150–151

boars 282
 bobcats 261
 bones 137, 158, 216, 244, 286
 bonobos 237
 boobies 197
 boring sponges 50–51
 Bornean orang-utans 237
 bottlenose dolphins 289
 bowerbirds 209
 bowhead whales 290, 291
 box turtles 140
 boxfish 112
 brackens 35
 brains 126
 intelligence 217, 226, 237, 288
 breadcrumb sponges 50
 bream 114
 breathing 104, 106, 115, 126
 lungs 139
 mammals 226, 231, 246, 257, 280, 290
 breeding *see* birth, reproduction



brittle stars 64, 65
 brolgas 200
 brown bears 252, 253
 brown noddies 204
 brown rats 232–233
 budgerigars 166
 buffaloes 276, 277
 bugs 88–89
 bull sharks 109
 bullfrogs 130, 131, 133
 bumblebees 103
 burbots 124
 burrows
 badgers 265
 marsupials 220, 221
 moles 225
 rabbits 188, 228
 spiders 70
 bushbabies 234–235
 bustards 201
 butterflies 94–97
 buzzards 182–183

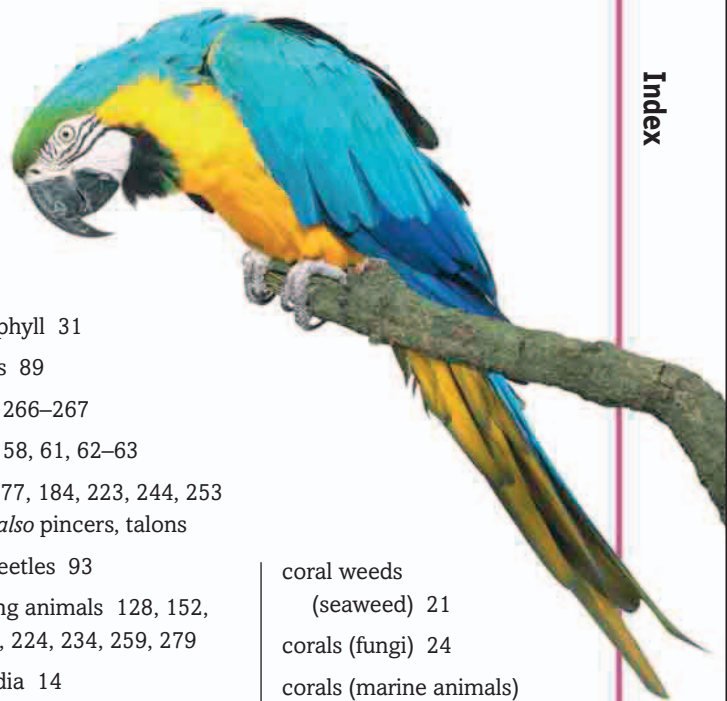
C

cacti 39
 caimans 157
 calls
 birds 173, 179, 200, 201,
 209, 211, 213
 bugs 89
 frogs 130–131

primates 236, 240, 241
 whales 292
 camels 284
 camouflage 58, 94, 112,
 as eyes 88–89, 95, 97
 as plants 85, 88, 129,
 134, 194
 against snow 173, 229, 253
 stripes 259, 277
 cane toads 126–127
 caps (fungi) 22
 capsids 88
 capuchins 241
 capybaras 230–231
 caracals 260–261
 caracaras 184
 carapaces 49
 carnivores (meat-eaters) 43,
 54, 139, 217
 carpenter bees 102
 carpenter moths 96
 carps 122
 cases 52, 80 *see also* shells
 cassowaries 160–161
 catbirds 209
 caterpillars 95, 96, 98–99
 catfish 113, 122
 cats 258–261, 262–263
 catsharks 107, 108
 cedar trees 36
 centipedes 68–69
 chachalacas 163
 chaffinches 209
 chambered nautilus 65
 chameleons 138–139,
 146–147
 chanterelles 25
 chars 124–125
 cheetahs 260, 274
 chestnut trees 46, 47
 chickadees 210
 chickens 162
 chihuahuas 250
 chimaeras 106
 chimpanzees 237
 chinchillas 232, 233
 chipmunks 230

chlorophyll 31
 cicadas 89
 civets 266–267
 clams 58, 61, 62–63
 claws 77, 184, 223, 244, 253
 see also pincers, talons
 click beetles 93
 climbing animals 128, 152,
 219, 224, 234, 259, 279
 clostridia 14
 clouded leopards 258
 clover 38
 coats 250, 264, 285
 fur 103, 216, 228, 229, 232,
 253, 265
 cobras 150, 151, 153
 cockatiels 167
 cockatoos 166, 167
 cocks-of-the-rock 209
 cocoa trees 44, 45
 cod 116–117
 cold-blooded animals 105,
 127, 138
 collective nouns *see* groups
 colonies 192, 247, 248
 colours 31, 154, 198
 to attract food 42, 120
 to attract mates 83,
 159, 240
 as camouflage 64, 88, 107,
 131, 147
 as mimicry 65
 as warnings 22, 56, 66, 86,
 88, 113, 129, 130, 136
 comet darners 83
 communication *see* calls
 conches 58–59
 condors 184
 conifers 36–37
 constrictors 150–151
 coots 201
 coral spots (fungi) 26

coral weeds
 (seaweed) 21
 corals (fungi) 24
 corals (marine animals)
 52–53
 cormorants 196–197
 Cornish Rexes 260
 cottontails 228, 229
 couas 170
 coucals 171
 cougars 261
 courtship *see* mating
 cowbirds 211
 cows 276
 coyotes 250–251
 coypus 233
 crab spiders 70
 crabs 76–77
 crakes 201
 cramp balls 26–27
 cranes 200–201
 crickets 86–87
 crocodile newts 136
 crocodiles 156–157
 crossbills 209
 crows 211
 crustaceans 18, 48, 76–79
 ctenopomas 124
 cuckoo-doves 165
 cuckoos 170–171
 cup fungi 28–29
 curassows 162, 163
 cushion stars 64–65
 cuttlefish 62, 63
 cytoplasm 12



D

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

dragonflies 82–83
 dromedaries 284
 ducks 188–189
 dunlins 203

E

E. coli 15
 eagles 182–183
 ears 216, 224, 226, 228, 229, 246, 251
 hearing 172, 216, 229, 272
 earthworms 57
 echolocation (sound waves) 246, 288, 289
 eels 112, 121, 123, 124
 eggs 51, 105, 127, 159
 amphibians 132, 135, 139
 birds 163, 170, 187, 193, 211
 fish 108–109, 117, 119
 insects 91, 92, 96, 100, 102, 103
 invertebrates 79
 plankton 19
 reptiles 143, 152
 egrets 194
 elands 277
 electric eels 124
 electric shocks 124
 elephants 226–227
 elks (wapitis) 283
 emperor penguins 190, 192–193
 emus 160
 endangered species *see* threatened species
 energy from sunlight 15, 17, 30, 31, 43
 ergots 26
 evolution 104
 exoskeleton 49
 see also shells, skeletons
 extinction 126, 164, 241, 271
 see also threatened species
 eyes 81, 101, 109, 116, 124, 147
 as markings 88–89, 95, 97
 see also sight

F

falcons 183
 fallow deer 283
 fangs 70, 72, 150, 217
 see also teeth
 feathers 159, 162, 174, 185, 196, 210
 feeding 43, 75, 96, 160, 264, 284, 286
 bloodsuckers 88, 89, 100, 245
 see also scavengers
 feet 133, 162, 193, 197, 208
 hooves 276, 277, 279, 283
 fennec foxes 251
 ferns 34–35
 ferrets 265
 fighting 93, 114, 124, 153, 161, 201
 mammals 226, 266, 274, 278, 279, 288
 finches 209, 210
 fin whales 291
 fins 105, 107, 113, 121
 fire ants 103
 fire salamanders 136
 fire worms 57
 firs 36, 37
 flagella 13
 flamingos 198–199
 flatworms 56
 fleeces *see* coats
 flickers 181
 flies 100–101
 flightless birds 160, 161, 167, 190, 196–197
 flightless insects 80, 87, 89, 101
 flippers 140, 257
 flocks 161, 198, 211
 flowering plants 31, 38–41
 flowering trees 44–47
 fly agaric 22–23, 25
 fly catchers 208, 210
 flying foxes 244, 245
 flying squirrels 230
 food storage 187, 197, 214, 242, 284
 footballfish 120
 foxes 250, 251
 foxgloves 41, 44
 francolins 163
 freshwater fish 122–125
 frigatebirds 197
 frogs 128–133, 134–135
 fruit bats 245
 fruit trees 44–45, 47
 fruitbodies (fungi) 23
 funnel-web spiders 72
 fur 103, 216, 228, 229, 232, 253, 265
 coats 250, 264, 285
 fur seals 256

G

galahs 167
 gallinules 201
 gamebirds 162–163
 gannets 197
 gars 125
 gazelles 278
 geckos 144, 146, 147
 geese 188
 gender changes 115
 genders, differences between
 birds 163, 167, 169, 211
 fish 121
 invertebrates 71
 mammals 237, 243, 259, 278
 genetids 266–267
 gerbils 232



gharials 157
ghost bats 247
giant clams 62–63
giardia lamblia 12–13
gibbons 236
gills 23, 105, 126, 136–137
giraffes 284–285, 286–287
gliding animals 133, 159,
206, 219
go-away birds 170, 171
goats 279
goldfish 122
gophers 232
goliath beetles 93
goliath tarantulas 71
gorillas 236–237
gorses 38
goshawks 185
grasshoppers 86–87
greater flamingos 198–199
grebes 201
grivets 243
groups
colonies 192, 247, 248
flocks 161, 198, 211
herds 227, 275, 276, 277,
278, 283
hordes 243

mobs 268
packs 250, 251
prides 259
schools 118–119, 288
swarms 55, 78, 86
grouse 162, 163
growth rates 20, 27, 35,
71, 120
growth rings 61, 142
grubs *see* larvae
guanacos 285
guans 162, 163
guillemots 204
guinea pigs 232
guineafowls 162
gulls 204–205

H

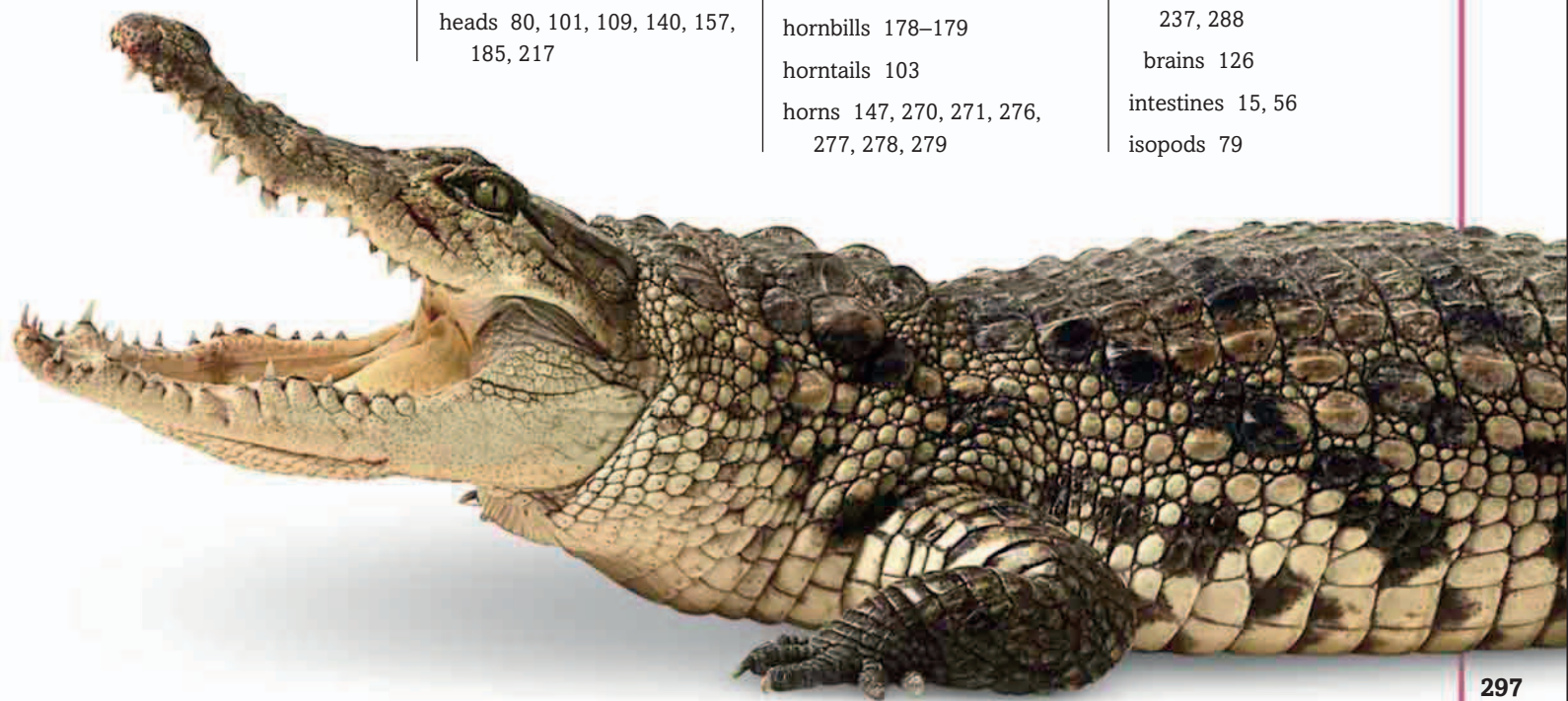
habitats 14, 122, 162,
233, 237
loss of 43, 126, 169, 187,
215, 239, 263, 281, 287
hammerkops 197
hamsters 231
hands 236
hares 228–229
harriers 185
harvestman spiders 70
hawks 182
heads 80, 101, 109, 140, 157,
185, 217

hearing 172, 216, 229, 272
hearts 132
hedgehogs 224, 225
height 33, 34, 51, 160,
190, 198
mammals 227, 239, 252,
255, 270, 281 284–285
herbivores (plant-eaters) 80,
217, 237
herds 227, 275, 276, 277,
278, 283
hermit crabs 76
herons 194, 195
herring 117
hibernation 153, 230, 246
sleep 177, 221, 223, 246,
278, 280
hinnies 273
hippopotamuses 280–281
hoatzins 171
hogs 282
holly trees 45
Honduran white bats
248–249
honey bees 102
honeybirds 180
honeyeaters 210
hoopoes 179
hooves 276, 277, 279, 283
hordes 243
hornbills 178–179
horntails 103
horns 147, 270, 271, 276,
277, 278, 279

antlers 283
horseflies 101
horses 272, 273
horseshoe bats 245
horsetails 34
house centipedes 69
house flies 100
house mice 232, 233
hoverflies 101
howler monkeys 241
humans 237, 250
hummingbirds 176, 177
humpback whales 290,
292–293
humps 284
hunterman spiders 70
huskies 250
hyacinths 41
hybrid animals 273
hydroids 52
hyphae 22

I

ibexes 279
ibises 195
iguanas 145, 146–147
impalas 278
intelligence 217, 226,
237, 288
brains 126
intestines 15, 56
isopods 79



J

jacamars 181
 jacanas 203
 jackals 250
 jackrabbits 229
 jaguars 258, 259
 jays 211
 jellyfish 52, 54–55
 John Dories 117
 jungle nymphs 80–81

K

kakapos 166, 167
 kangaroos 219
 keas 167
 kestrels 183
 killer whales 289
 king vultures 186–187
 kingfishers 179
 kinkajous 265
 kites 184, 185
 kiwis 160, 161
 koalas 221

koels 170
 komodo dragons 148–149
 kookaburras 179
 krill 78–79

L

laburnum trees 46
 ladybirds 92, 93
 langurs 243
 lanternfish 121
 larch trees 36–37
 larks 211, 213
 larvae
 fish 118
 insects 92, 98, 103
 invertebrates 48, 55, 63, 75
 plankton 18
 lavender 38
 leaves 31, 42, 249
 legs
 amphibians 127
 birds 160, 202–203
 insects 81, 86, 87, 90,
 93, 101

invertebrates 48, 49, 64,
 66–67, 78
 mammals 237, 286
 reptiles 139, 140

legspan 71

lemon sponges 50

lemon trees 45

lemurs 234–235

length 83, 91, 109, 119,
 149, 155

 birds 169, 175, 187, 215

 invertebrates 55, 63, 75

 mammals 263, 269, 293

leopards 258–259

lichens 27

life stages 96
 see also eggs, larvae

lifespans 43, 85, 91, 120, 135

 birds 169, 175, 199, 205,
 207, 215

 invertebrates 51, 55, 77

 mammals 227, 239, 269,
 275, 281, 287, 293

 reptiles 142, 149, 155

lilac 38

lilies 30–31, 39, 41

limpets 60

linsangs 267

lionfish 104–105, 113

lions 259, 262–263

liverworts 32–33

lizards 138, 144–147

llamas 285

loaches 122

lobsters 78, 79

locusts 86

lop-eared rabbits 228

lorikeets 166

loris 235

lovebirds 167

lungs 139 *see also* breathing

lynx 261

M

macaques 242–243

macaws 166, 167, 168–169

mackerel 116

maggots 100

magpie-geese 188

magpies 211

mallards 189

malleefowl 163

mammoth wasps 103

manakins 208

mandrills 243

maple trees 44

maras 232

markings 88–89, 95, 97, 114,
 143, 258 *see also*
 camouflage, colours

marmosets 240–241

marmots 230

marsupials 218–221

martens 265

martins 212

mating

 calls 89, 130–131, 201, 213

 competing for 93, 101, 153,
 161, 274, 278, 283

 displays 113, 137, 161, 163,
 169, 203, 208, 209, 211

 and eating 91

 for life 167, 207

see also birth, reproduction

meerkats 266, 268–269

membranes 13, 15, 23, 105

merlins 183

metamorphosis 48, 126



Mexican red-kneed tarantulas 48–49
 mice 231, 232, 233
 midges 100
 migration
 birds 170, 176, 189, 200–201, 203, 204–205, 212
 fish 108, 111, 123
 insects 86, 95
 mammals 277, 291
 mildews 26
 military macaws 168–169
 millipedes 68–69
 mimicry 39, 63, 65, 95, 101, 166, 213
 mink 265
 minnows 123
 mites 73
 mobs 268
 mockingbirds 213
 mole-rats 232
 moles 225
 molluscs 58–61, 62–63, 64–65
 mongooses 266
 monkey puzzles 36, 37
 monkeys 240–243
 moonrats 225
 moorhens 200
 moose 282–283
 mosquitoes 100–101
 mosses 32–33
 moths 94, 95, 96, 97
 motmots 178
 mourning doves 164
 mouths 75, 80, 98, 100, 110, 121, 125
 fangs 70, 72, 150, 217
 see also teeth
 mudskippers 115
 mules 273
 mullets 114
 mushrooms 23, 24–25
 muskrats 231
 mussels 59, 61
 mute swans 189

N

naked mole-rats 232
 narwhals 290
 Natterer's bats 246
 natterjack toads 129
 nautilus 63
 needlefish 113
 necks 143, 151, 189, 198, 278, 286
 nests
 birds 163, 170, 180, 182–183, 190, 209, 211, 212
 insects 88, 102, 103
 mammals 248
 reptiles 141
 newts 136–137
 nocturnal animals
 birds 172, 173
 insects 89, 94
 invertebrates 59
 mammals 240, 247, 265, 280
 northern cardinals 208
 noses *see* smell
 nucleus 12
 numbats 220
 nunbirds 180
 nunlets 180
 nymphs 80–81, 82, 85, 91

O

oak trees 47
 ocelots 258–259
 octopuses 62–63
 okapis 284, 285
 olms 137
 onagers 272, 273
 opossums 218, 219
 possums 218–219, 211

orang-utans 237, 238–239
 orb-weaver spiders 70, 72–73
 orcas 289
 orchids 39
 organs 12, 49, 74, 81, 104
 brains 126
 ears 216, 224, 226, 228, 229, 246, 251
 eyes 81, 101, 109, 116, 124, 147
 hearts 132
 intestines 15, 56
 lungs 139 *see also* breathing
 stomachs 121, 150, 276
 senses 13, 48, 81, 104 *see also* smell, sight, hearing
 orioles 210–211
 ospreys 183
 ostriches 160
 otters 264–265
 owls 172–173, 174–175
 oxygen 104–105
 see also breathing
 oystercatchers 202
 oysters 59

P

Pacific sea nettle 54–55
 packs 250, 251
 pandas 253
 pangolins 223
 panther chameleons 138–139
 Pantopoda 74
 parakeets 167
 parasites 56, 75, 89, 100–101, 120
 parental care
 amphibians 132, 133
 birds 161, 187, 193, 207

 fish 113, 125
 mammals 216, 227, 238, 249, 250, 259, 262, 269
 reptiles 152, 155, 156
 parrotbills 213
 parrots 166–167, 168–169
 partridges 163
 peacocks 162, 163
 peccaries 282
 pelicans 196, 197
 penguins 190–191, 192–193
 perch 125
 perching birds 208–213, 214–215
 pests 61, 99, 129, 232–233, 267, 282
 pets 146, 154, 168, 232, 250, 273, 282, 284, 285
 pheasants 162, 163
 pichi armadillos 222
 piculets 181
 pigeons 164–165
 pigs 27, 282–283
 pikas 229
 pill millipedes 68, 69
 pincers 73, 76 *see also* claws, talons





pine trees 36, 37
 pipesnakes 150
 pipistrelle bats 247
 piranhas 123
 pittas 208, 209
 plaice 117
 plankton 17, 18–19
 plasterer bees 103
 plovers 202
 poison-dart frogs 130, 132
 poisonous animals
 amphibians 126, 129, 130, 136
 fish 113
 fungi 22, 25, 26
 insects 86
 invertebrates 52, 54, 57, 59, 66, 68, 73
 plants 35, 36, 40, 46
 reptiles 144, 148
 microscopic life 14, 17
 see also venomous animals
 polar bears 253, 254–255
 polecats 265
 pollen 31, 38
 pollinators 39, 40, 41, 100, 101, 102, 103
 pond skaters 89
 ponies 273
 poppies 40
 populations 14, 86, 117, 237, 247, 276–277
 porcupines 232, 233
 pores 50
 porpoises 288–289
 Portuguese men o'war 52

possums 218–219, 221
 opossums 218, 219
 potoroos 218
 pottos 235
 pouches
 for carrying young 132, 193, 218, 219, 220
 for food storage 187, 197, 242
 prairie dogs 230
 prawns 78
 praying mantises 90–91
 prides 259
 primates 234–235, 236–237, 240–241, 242–243
 proboscis monkeys 242–243
 protoctists 18
 psammmodromus 145
 ptarmigans 163
 puffballs 25
 puffbirds 180
 puffer fish 112
 puffins 204
 pumas 261
 pupas 96 *see also* larvae
 pythons 152, 153

Q

quail-doves 164
 quails 163
 quolls 221

R

rabbits 228–229
 raccoons 265
 ragworms 57
 rails 200
 ratfish 106
 rats 232–233
 rattlesnakes 151
 rays 106–107
 recycling 22
 red-backed shrikes 214–215
 red-eyed tree frogs 134–135
 red lionfish 104–105
 reef lobsters 78
 reindeer 283
 reproduction 12, 14, 16, 31
 see also birth, eggs, mating
 rheas 161
 rhinos 270–271
 roadrunners 171
 robins 211, 212
 rodents 230–233
 rollers 179
 roses 40
 roundworms 56
 royal ferns 35
 rufous horneros 209
 ruffs 203
 Rüppell's vultures 158–159

S

sac fungi 26–27, 28–29
 saki monkeys 240
 salamanders 136–137
 salmon 116–117
 salmonella 15
 saltwater fish 112–117
 sandpipers 203
 sapsuckers 181
 sawfish 107
 sawflies 102
 sawsharks 107
 scales 94, 112, 139, 142, 156, 223
 scallops 59

scavengers 79, 87, 147, 221, 251
 birds 165, 182, 185, 186, 205, 207
 schools 118–119, 288
 scorpions 72, 73
 screamers 189
 scutes 139
 sea anemones 53, 114
 sea cucumbers 66, 67
 sea lettuces 21
 sea lions 256–257
 sea mice 57
 sea pens 52, 53
 sea potatoes 67
 sea slugs 60–61
 sea spiders 74–75
 sea urchins 66, 67
 sea whips 53
 seabream 114
 seadragons 113
 seahorses 113
 seakraits 151
 seals 256–257
 seaweeds 20–21
 secretary birds 183
 seeds 38, 40, 47



dispersal (spreading) 31, 41, 43, 45, 46, 165
 pollen 31, 38
 pollinators 39, 40, 41, 100, 101, 102, 103
see also spores
 self-defence *see* defences
 senses 13, 48, 81, 104
 hearing 172, 216, 229, 272
 see also smell, sight
 sequoia trees 36–37
 seriemas 201
 setts 265
 shags 197
 sharks 106–109, 110–111
 sheep 279
 shelducks 188
 shells 49
 cases 52, 80
 invertebrates 48, 58–61, 62, 65, 76
 mammals 222
 reptiles 140, 142, 143
 single-celled life 16, 17
 shire horses 273
 shoals (schools) 118–119, 288
 shoebills 196
 shrews 224–225
 shrikes 210, 214–215
 shrimps 78, 79
 siamangs 236
 sifakas 234
 sight
 amphibians 137
 birds 203
 fish 109, 124
 mammals 234, 244, 270, 289
 see also eyes
 silk moths 95
 silk producers 70, 72–73, 95
 silky anteaters 223
 simians (primates) 234–235, 236–237, 240–241, 242–243
 single celled life 14–15, 16–17
 plankton 17, 18–19

siphonophores 52
 size 19, 29, 111, 135, 248 *see also* height, length, weight
 skates 106–107
 skeletons 51, 52–53, 106, 112
 bones 137, 158, 216, 244, 286
 see also exoskeleton
 skimmers 82–83
 skin 49, 69, 115, 126, 131, 139, 192
 mammals 216, 219, 236, 244
 skinks 144, 145, 146
 skunks 264
 skylarks 213
 sleep 177, 221, 223, 246, 278, 280
 hibernation 153, 230, 246
 sliders 140, 141
 sloths 223
 slow worms 146
 slug moth caterpillars 98–99
 slugs 60–61
 smell
 as defence 69, 85, 96, 153, 264, 267
 for reproduction 25, 31, 279
 senses 137, 148, 226, 244, 252, 271
 snails 58–59, 61
 snakes 139, 150–153, 154–155, 183, 266
 snapper 114–115
 snapping turtles 141
 snowy owls 173
 soles 117
 solenodons 225
 sound waves 246, 288, 289
 sounds *see* calls
 sparrows 210, 213
 speed
 birds 160, 171, 176, 183, 203
 fish 113
 insects 97
 mammals 219, 223, 232, 243, 250–251, 256, 260, 289



reptiles 149
 sperm whales 291
 spider monkeys 240, 241
 spiders 48–49, 70–72, 74–75
 spines 39, 40, 67, 105, 107, 116, 224
 sponges 50–51
 spoonbills 194–195
 spores
 fungal 22, 23, 24, 25, 26, 28, 29
 plant 32, 33, 34
 springboks 278
 spruce trees 37
 squid 64–65
 squirrel monkeys 240
 squirrels 230
 staphylococcus 14–15
 starfish 66, 67
 stargazer lilies 30–31
 starlings 212
 stems 23, 30
 stick insects 84–85
 stilts 202–203
 stingrays 106, 107
 stings 49, 52, 53, 73, 102, 103, 116
 stinkhorns 25
 stoats 265
 stomachs 121, 150, 276
 stonefish 113
 storks 194–195
 streptococcus 15
 sugar gliders 218, 219
 Sumatran orang-utans 237, 238–239
 sun bears 253
 sunbirds 208
 swallows 212
 swan mussels 61

swans 188, 189
 swarms 55, 78, 86
 swifts 177
 T
 tadpoles 127, 128, 129, 131, 132
 tails 104, 107, 109, 145, 230, 240
 talons 174
 see also claws, pincers
 tamanduas 223
 tamarins 241
 tapeworms 56
 tapirs 270–271
 tarantulas 48, 49, 70, 71
 tarsiers 235
 Tasmanian devils 221
 teeth 106, 110, 115, 157
 mammals 217, 230, 232, 281, 291
 see also fangs, mouth
 tegus 147
 tench 122
 tentacles 52, 53, 55, 65, 114, 225
 terns 204–205
 terrapins 140
 territory 94, 241, 263, 274
 Thai boxer praying mantises 90–91
 thistles 40
 thoraxes 81
 thorn bugs 88
 threatened species
 amphibians 125
 birds 169, 206
 mammals 232, 239, 241, 270, 271, 285

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

U

uakaris 240
 ural owls 172
 urchins 65

V

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

W

waders 202–205
 wagtails 212
 wallabies 218
 walnut trees 45
 walrus 256
 wapitis (elks) 283
 warblers 209, 212
 warm-blooded animals 115, 137, 152, 159, 216
 warrens 228
 warthogs 282–283
 wasps 102, 103

water intake 28, 39, 33, 51, 126, 227, 284
 water monitors 144
 waxwings 212
 weasels 265
 weather systems 119
 weeds 35, 40
 see also seaweed
 weeverfish 116
 weevils 93
 weights 25, 37, 62, 149, 151
 birds 175, 177, 201, 207
 large mammals 227, 237, 255, 273, 281, 283, 287, 289, 291, 293
 small mammals 218–219, 240–241, 269
 wentletraps 58
 weta 87
 whale sharks 110–111
 whales 288, 290–291, 292–293
 whelks 59
 whiskers 116, 218
 whydahs 210
 wigeons 188
 wild turkeys 162
 wildebeest 277
 wings
 birds 161, 171, 174, 190, 196, 206
 insects 80, 86–87, 88–89, 92, 94, 100
 mammals 244
 wingspan 95, 97, 169, 175, 184, 187, 195, 199, 207, 215, 245

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

Y

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

Z

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



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Ruiz (ca). 51 **Alaska Fisheries Science Center, NOAA Fisheries Service:** (ftr). **Corbis:** Minden Pictures / Norbert Wu (tl); Visuals Unlimited / David Wrobel (c). **Getty Images:** Age Fotostock / Marevision (tr); Fotosearch Value (cr). 52 **FLPA:** Panda Photo (c). **Getty Images:** Fotosearch (br); Axel Rosenberg (cr); Nature / UIG (fcrb). **naturepl.com:** Solvin Zankl (cl). 53 **Dorling Kindersley:** Natural History Museum, London (cra, tl). **imagequestmarine.com:** (tc). 54 **Ardea:** Steve Hopkin (c). **Corbis:** Minden Pictures / Fred Bavendam (cl); Visuals Unlimited / Dr. Robert Calentine (cb). **naturepl.com:** Sinclair Stammers (bl). **Photoshot:** ANT (tc). **Science Photo Library:** James H. Robinson (cla). 54-55 **Corbis:** Kerrick James. **FLPA:** D P Wilson (c). 55 **Alamy Images:** blackwink (cl). **FLPA:** Nigel Cattlin (cla). **Science Photo Library:** Dr Morley Read (ca, tc). 59 **Getty Images:** Age Fotostock / Marevision (c). 60 **Getty Images:** Age Fotostock / Mary Jonilonis (br). **Science Photo Library:** Alexander Semenov (crb). 61 **FLPA:** Minden Pictures / Kevin Schafer (tc); Walter Rohdich (tr). 62-63 **Corbis:** Science Faction / Norbert Wu. 64 **Corbis:** Visuals Unlimited (clb). **Dorling Kindersley:** Weymouth Sealife Centre (cb). **naturepl.com:** Sue Daly (c). **Science Photo Library:** Dante Fenolio (tr). 65 **Alamy Images:** Mike Veitch (clb). **Getty Images:** Photographer's Choice / Steven Hunt (tr); WaterFrame / Reinhard Dirscherl (ca). **Richard Ling:** (cl). **naturepl.com:** David Shale (tc). 66 **Corbis:** Minden Pictures / Fred Bavendam (bl). **Getty Images:** Botanica / James Baigrie (cl). 67 **Corbis:** Brandon D. Cole (tl); Minden Pictures / Fred Bavendam (tr). **Getty Images:** Oxford Scientific / Karen Gowell-Holmes (cra); Workbook Stock / Frederic Pacorel (cr). 68 **FLPA:** David Hosking (clb). **Getty Images:** Flickr Open / Alan Cressler (crb); Visuals Unlimited, Inc. / Gerry Bishop (cl); Peter Arnold / James Gerholdt (bl). **naturepl.com:** Kim Taylor (tr). 69 **Alamy Images:** Leslie Garland Picture Library / Doug McCutcheon (ca). **Ardea:** Steve Hopkin (cla). **Corbis:** Minden Pictures / Thomas Marent (crb). **Dreamstime.com:** Milosluz (b). **Getty Images:** Flickr Open / Shailesh Makwana (cb). 70 **Dreamstime.com:** Scott Harms (tr). **FLPA:** Olivier Digoit (cl). **Getty Images:** James H. Robinson (cra). 71 **Corbis:** Steve Parish Publishing / Patrick Honan (clb). **Dorling Kindersley:** Geoff Brightling / Chris Reynolds and the BBC Team - modelmakers (bc). **FLPA:** Minden Pictures / Pete Oxford (cr). **Science Photo Library:** Simon D. Pollard (br). 72 **Corbis:** Science Faction / Stefan Sollfors (ca). **FLPA:** Photo Researchers (tc). **Getty Images:** Kallista Images (clb); Visuals Unlimited, Inc. / Robert Pickett (br). 73 **Corbis:** Minden Pictures / Albert Leal (bl). 74-75 **Oceanwideimages.com:** 76 **Corbis:** Foto Natura / Minden Pictures / Stephen Belcher (bl); Minden Pictures / Fred Bavendam (cl). **Getty Images:** Visuals Unlimited, Inc. / Fabio Pupin (cb). **imagequestmarine.com:** (crb). 77 **Corbis:** Ocean (c). **Getty Images:** Age Fotostock / Marevision (tc); (tr). 78 **Corbis:** Gary Bell (cl); Photocuisine / J. Garcia (tl); Design Pics / Dave Fleetham (bl). **Getty Images:** Visuals Unlimited / Gerald & Buff Corsi (bc). 79 **Dreamstime.com:** Olga Demchishina (cla). **FLPA:** Gerard Lacz (bc). **imagequestmarine.com:** (crb, tl). 83 **Fotolia:** Roque141 (tr). 84-85 **Dorling Kindersley:** Thomas Marent. 86-87 **FLPA:** Ingrid Visser (tc). 86 **FLPA:** Dave Pressland (c). **Getty Images:** AWL Images / William Gray (cla). **naturepl.com:** MYN / John Tiddy (bl); Ann & Steve Toon (br). 87 **Corbis:** Ocean (b); Damon Wilder (cra). **Dorling Kindersley:** Natural History Museum, London (cra). 88 **Corbis:** Minden Pictures / Ingo Arndt (cl); Visuals Unlimited / Alex Wild (br). **Dorling Kindersley:** Natural History Museum, London (bl). 90-91 **Getty Images:** Adegsm. 92 **Dorling Kindersley:** Natural History Museum, London (cl, br); Jerry Young (ca). 93 **Dorling Kindersley:** Natural History Museum, London (cr). 94 **Dorling Kindersley:** Andrew Mackay (fcrb); Natural History Museum, London (ftr, tc, tl, fl, ca, cl, c, cr, fcr, clb, cb, crb, fbl, bl, bc, br). 95 **Dorling Kindersley:** Natural History Museum, London (tl, tc, tr, fcl, cla, ca, cra, fcr, cl, c, crb, cr, clb, fbl, bc, br, fbr). 96 **Dorling Kindersley:** Natural History Museum, London (tl, tc, cl, ca, cra, cl, c, cr, fcr, clb, cb, crb, fbl, bl, br, fbr). 97 **Dorling Kindersley:** Natural

History Museum, London (tl, tc, cla, cr, cl, fclb, clb, crb, fcrb, cb, fbl, bl, br, fbr). 98-99 **Dorling Kindersley:** Thomas Marent. 99 **Dorling Kindersley:** Booth Museum of Natural History, Brighton (br). 100 **Alamy Images:** Premaphotos (fbr). **Dorling Kindersley:** Natural History Museum, London (bc); Jerry Young (tl). **Getty Images:** First Light / Grambo Grambo (cl). 101 **Corbis:** Minden Pictures / Stephen Dalton (bl). **Dorling Kindersley:** Natural History Museum, London (cl, br). **The Natural History Museum, London:** (tr). 102 **Dreamstime.com:** Dbmz (bc); Ryszard Laskowski (c); Meoita (cr). 103 **Dreamstime.com:** Amskad (tr). 106 **Corbis:** Minden Pictures / Pete Oxford (bl). **FLPA:** Norbert Wu (clb). **Getty Images:** Visuals Unlimited, Inc. / Andy Murch (cl). **Photoshot:** (ca, cl). 106-107 **Ardea:** Kenneth W Fink (tl). 107 **Alamy Images:** Stephen Frink Collection (ca). **Corbis:** Visuals Unlimited / Patrice Ceisel (crb). **Getty Images:** Dr Peter M Forster (b). 108 **Alamy Images:** Roberto Nistri (cr). **Getty Images:** Visuals Unlimited, Inc. / Andy Murch (tl, cl). 108-109 **Corbis:** Science Faction / Norbert Wu (bc). **Dorling Kindersley:** Jeremy Hunt - modelmaker (ca). 109 **Corbis:** Dave Fleetham / Design Pics (tl). **Getty Images:** De Agostini Picture Library (cb). 110-111 **Corbis:** National Geographic Society / Colin Parker. 112 **Dorling Kindersley:** Weymouth Sea Life Centre (bc). **Dreamstime.com:** Isselee (tr). 112-113 **Dreamstime.com:** Asther Lau Choon Siew (c). 113 **Alamy Images:** cbimages (cra). **Dorling Kindersley:** Weymouth Sea Life Centre (cb, c). **Dreamstime.com:** Peter Leahy (bl). **Getty Images:** Marevision (crb). **imagequestmarine.com:** (bc). 114-115 **Alamy Images:** Emilio Ezeza (bc). 115 **Dreamstime.com:** Lunamarina (br, cra). 116 **Dreamstime.com:** Andylid (bl); Serg. dibrova (tc). 117 **Corbis:** Dpa / Hinrich Baesemann (cr). **Dreamstime.com:** Yordan Rusev (crb). 118-119 **FLPA:** Imagebroker / Norbert Probst. 120-121 **Alamy Images:** Diarmuid Toman (c). 120 **Jón Baldur Hlíðberg (www.fauna.is):** (crb). **Corbis:** Visuals Unlimited / David Wrobel (cla). **naturepl.com:** David Shale (br); Doc White (bl). 121 **Alamy Images:** Roberto Nistri (cb). **FLPA:** Norbert Wu (c). **Getty Images:** Dan Kitwood (ca). **naturepl.com:** David Shale (cla, cra). 122 **Alamy Images:** Blackwink (bl). **Dorling Kindersley:** Jerry Young (c, fbl). **Getty Images:** DEA / A. Calegari (cb). 122-123 **Alamy Images:** Stocktrek Images / Michael Wood (bc). **Corbis:** Minden Pictures / Norbert Wu (tl). 123 **Alamy Images:** Blackwink (cra). **Dorling Kindersley:** Natural History Museum, London (tc); Linda Pitkin (tr). **Fotolia:** poco_bw (c). 124 **Dreamstime.com:** Stephan Pietzko (clb). **FLPA:** (cr). **Getty Images:** Ken Lucas (cl). 124-125 **FLPA:** OceanPhoto (bc). **Science Photo Library:** Tom Mchugh (c). 128 **Photoshot:** James Carmichael Jr (ca, bl). **Science Photo Library:** Dr. Morley Read (cla). 130 **Getty Images:** Photodisc / Life On White (cl); Purestock (clb). 131 **Corbis:** All Canada Photos / Jared Hobbs (crb). 132 **Corbis:** Minden Pictures / Piotr Naskrecki (tc). **Dreamstime.com:** Mgujippers (cr). **FLPA:** Imagebroker / Winfried Schäfer (clb); Photo Researchers (cra). **naturepl.com:** Michael D. Kern (bc). 133 **Corbis:** Minden Pictures / Stephen Dalton (c); Reuters / Jose Luis Saavedra (cl). **FLPA:** Minden Pictures / Michael & Patricia Fogden (tr); Minden Pictures / Piotr Naskrecki (ca). 134-135 **Getty Images:** Gail Shumway. 136 **FLPA:** Photo Researchers (tr). **naturepl.com:** Nature Production (bl). **Science Photo Library:** Dante Fenolio (cb). 137 **Alamy Images:** Ladi Kirm (tr); Vibe Images / Jack Goldfarb (cr). **Corbis:** Minden Pictures / Pete Oxford (tl). **Dreamstime.com:** Jason P Ross (br). **Getty Images:** Visuals Unlimited, Inc. / Michael Redmer (crb). **naturepl.com:** Barry Mansell (cra). **Science Photo Library:** E.R. Degginger (bc). 140-141 **Dreamstime.com:** Lloyd Luecke (tc). 140 **Corbis:** Minden Pictures / SA Team / Foto Natura (bl); David A. Northcott (crb). **Dorling Kindersley:** Jerry Young (br). **Dreamstime.com:** Amwu (tc). 141 **Corbis:** Visuals Unlimited / Michael Redmer (cb). **Dreamstime.com:** Peter Leahy (crb). **Getty Images:** Visuals Unlimited, Inc. / Michael Redmer (ca). 142 **Dreamstime.com:** Checco (crb). 143 **Corbis:** Imagemore Co., Ltd (cb). **Dorling Kindersley:** Jerry Young (cr, cl, br). **Dreamstime.com:** Amwu (cra). 145 **Alamy Images:** Searagen (br). **Dorling Kindersley:** Jerry Young (crb). 146 **Getty Images:** Mint Images / Frans Lanting (c). **Photoshot:** A.N.T. Photo Library (tc); Ken Griffiths (ca). 148-149 **Getty Images:** Cordier Sylvain. 150 **Alamy Images:** Michal Cerny (crb). **Corbis:** Auscape / Minden Pictures / Jean-Paul Ferrero (cr); David Northcott (cla). **Dorling Kindersley:** Diego Reggiani (cra). 151 **FLPA:** Minden Pictures / Mitsuhiro Imamori (clb); Minden Pictures / Michael & Patricia Fogden (crb). **Getty Images:** Joel Sartore (tl). 154-155 **Getty Images:** Mark Kostich. 156 **Alamy Images:** Jan Csernoch (cb). **Dorling Kindersley:**

Jerry Young (ca). **Dreamstime.com**: Nico Smit (bl). **Getty Images**: Minden Pictures / Mike Pary (cl). 156-157 **Photoshot**: Andrea & Antonella Ferrari (bc). 157 **Alamy Images**: Prisma Bildagentur AG/ Dani Carlo (cla). **Corbis**: Minden Pictures / Pete Oxford (clb); Minden Pictures / Luciano Candisani (crb). **Dreamstime.com**: Lukas Blazek (c). **Getty Images**: Age Fotostock / Morales (br). 160 **Alamy Images**: Holger Ehlers (br). **Corbis**: Eurasia Press / Steven Vidler (cr). **FLPA**: Minden Pictures / Tui De Roy (cra, bl). 161 **Alamy Images**: Images of Africa Photobank / David Keith Jones (c). **Dreamstime.com**: Tomas Pavelka (tr). **Getty Images**: Nigel Pavitt (tl). 162 **Corbis**: (ca); Kevin Schafer (cra). 163 **Dorling Kindersley**: Mike Lane (cr); Ian Montgomery (bc); Markus Varesvuo (clb); Jari Peltomaki (cl); Judd Patterson (cb); Brian E. Small (ca). **FLPA**: John Hawkins. 164 **Dorling Kindersley**: Tom Grey (tl); Brian E. Small (ftr). 165 **Alamy Images**: Genevieve Vallee (cla). **Corbis**: Martin Harvey (ca). **Dorling Kindersley**: Bob Steele (cra). **FLPA**: Martin B Withers (cb). **Science Photo Library**: Michael Mccoy (tl). 168-169 **Corbis**: Minden Pictures / Pete Oxford. 169 **Alamy Images**: paul abbitt rml (clb). 170 **Alamy Images**: Regis Martin (cla). **Dorling Kindersley**: Brian E. Small (bc). **FLPA**: John Watkins (tl); Ignacio Yufera (clb). **Getty Images**: Nigel Pavitt (crb). 171 **Alamy Images**: Peter Fakler (tc). **Dorling Kindersley**: Brian E. Small (c). **Getty Images**: Jared Hobbs (br); J & C Sohns (tl). 172 **Dorling Kindersley**: Brian E. Small (cra, ca). 173 **Dorling Kindersley**: E. J. Peiker (crb); Bob Steele (cla, cl); Brian E. Small (fbr). **FLPA**: Ignacio Yufera (bl). 174-175 **Corbis**: All Canada Photos / Glenn Bartley. 176 **Dorling Kindersley**: Mike Danzenbaker (br); Robert Royse (fcr); Garth McElroy (fcl); Bob Steele (cb); Brian E. Small (fca, cl); Brian E Small (fcrb). **Getty Images**: Visuals Unlimited, Inc. / Glenn Bartley (clb). 177 **Alamy Images**: George Reszeter (cl). **Corbis**: Kevin Schafer (br). **Dorling Kindersley**: Mike Danzenbaker (c). **Getty Images**: Jay B. Adlersberg (cla). 178 **Corbis**: Winfried Wisniewski (cr). **FLPA**: Rolf Nussbaumer (tr). **Getty Images**: Matti Suopajärvi (cla). 179 **Corbis**: Minden Pictures / Foto Natura / Grzegorz Lesniewski (tl). **Dorling Kindersley**: Alan Murphy (crb). **FLPA**: Mark Sisson (tr). 180 **Fotolia**: Eduardo Rivero (cr). **Getty Images**: Kevin Schafer (cl). 181 **Dorling Kindersley**: Brian E. Small (crb). **Fotolia**: Impala (clb). **Getty Images**: CR Courson (tr). 184 **Dorling Kindersley**: The National Birds of Prey Centre, Gloucestershire (cl). 185 **Dorling Kindersley**: Chris Gomersall Photography (bl); The National Birds of Prey Centre, Gloucestershire (ca, cr). 186 **Dorling Kindersley**: The National Birds of Prey Centre, Gloucestershire (tl, cra, bc); Pert S. Weber (c). 186-187 **Corbis**: Minden Pictures / Gerry Ellis. 188 **Dorling Kindersley**: E. J. Peiker (cl); South of England Rare Breeds Centre, Ashford, Kent (tr); Markus Varesvuo (tl); Brian E. Small (tl, cra). 189 **Corbis**: All Canada Photos / Glenn Bartley (tc, tl). **Dorling Kindersley**: Garth McElroy (cra); Steve Young (ca). 190 **Corbis**: Nick Rains (c). **Dreamstime.com**: Lukas Blazek (cr); Inaras (fcr); Nico Smit (bc); Olga Khoroshunova (f). **Getty Images**: Photographer's Choice RF / Frank Krahmer (cl). 191 **Corbis**: Galen Rowell (bc). **Dreamstime.com**: Gentoomultimedia (crb); Pu Sulan (tl). **FLPA**: Minden Pictures / Tui De Roy (br). **Getty Images**: Darrell Gulin (tr); Nigel Pavitt (tc). **Photoshot**: John Shaw (cr). 192-193 **Getty Images**: Mint Images / Frans Lanting. 194 **Corbis**: Joe McDonald (tr); Robert Harding World Imagery / Peter Barritt (cr). **Dorling Kindersley**: Chris Gomersall Photography (bc); Roger Tidman (br); David Cottridge (bl). 195 **Dorling Kindersley**: Brian E. Small (tc); Roger Tidman (bl). **Getty Images**: Josh Manning - JourneymanGallery.com - Travel Photographer (bc). 196 **Dorling Kindersley**: Brian E. Small (bl). **FLPA**: Minden Pictures / Tui De Roy (bc); Tui De Roy (tr). **Fotolia**: Imagevixen (cra); Petergyure (br). 197 **Dorling Kindersley**: Judd Patterson (cb); Brian E. Small (crb, cl). **Dreamstime.com**: Worakit Sirijinda (br). **FLPA**: John Holmes (tr). **Fotolia**: CPJ Photography (cr); Impala (fcrb). **Getty Images**: Mint Images / Frans Lanting (ca). 198-199 **Corbis**: Theo Allofs (c). 200 **Corbis**: Eric and David Hosking (fca); Minden Pictures / Foto Natura / Jasper Doest (c). **Dorling Kindersley**: Mike Lane (cra); Brian E. Small (tr, fcla); Bob Steele (tc). **Dreamstime.com**: Mirceax (bc). 201 **Corbis**: Frank Lukasseck (cr). **Dorling Kindersley**: Melvin Grey (bl). **naturepl.com**: Jose B. Ruiz (tr). 202 **Alamy Images**: Craig Ingram (cra). **Dorling Kindersley**: Robert Royse (ca); Bob Steele (crb). **Getty Images**: Glenn Bartley (tr). 203 **Alamy Images**: Keith J Smith (bc). **Dorling Kindersley**: Chris Gomersall Photography (fcl); Kevin T. Karlson (tl); Garth McElroy (cra); George McCarthy (cb). **FLPA**: Steve Young (bl). **Getty Images**: Dieter Schaefer (br). 204 **Dorling Kindersley**: Mike Danzenbaker (tr); Hanne and Jens Erikson (fcl); Melvin Grey (tl); Brian E. Small (ftr); E. J. Peiker (fcl); Mike Lane (c); Bob Steele (fcr, clb); Tomi Muukonen; Robert Royse (bl). **Dreamstime.com**: David Steele (bc). **FLPA**: IMAGEBROKER / INGO SCHULZ (br). 204-205 **FLPA**: Yossi Eshbol (ca). 205 **Dorling Kindersley**: E. J. Peiker (bc); Brian E. Small (crb); Bob

Steele (cr). **Dreamstime.com**: Edurivero (tr). **FLPA**: Mike Lane (tl); James Lowen. 206-207 **Corbis**: Naturbild / Lars-Olof Johansson. 208 **Dorling Kindersley**: Brian E. Small (cra, fcr). **Dreamstime.com**: Foxyjoshi (tr); Susan Robinson (bc). **FLPA**: Imagebroker / Rolf Nussbaumer (clb). 209 **Corbis**: Frans Lemmens (ca). **Dorling Kindersley**: Robert Royse (cla); Brian E. Small (br, fbr). **FLPA**: David Hosking (cb); (cr). 210 **Dorling Kindersley**: Alan Murphy (ca); Jari Peltomaki (tc); Brian E. Small (ftr). **Dreamstime.com**: Roscco (tl). **FLPA**: Hugh Lansdown (fca). **Getty Images**: Nacivet (fcrb); Roberta Olénick (crb). 211 **Dorling Kindersley**: Brian E. Small (ca). **Getty Images**: Vishdesh photography (cra). **Photoshot**: Marie Read (tl). 212 **Alamy Images**: Greg C Grace (fbl). **Dorling Kindersley**: Garth McElroy (cb); Brian E. Small (tr, fcrb). **FLPA**: David Tipling (tc). 213 **Corbis**: Joe McDonald (cra). **Dorling Kindersley**: Chris Gomersall Photography (fclb); Brian E. Small (clb, bc). **FLPA**: Imagebroker / Rolf Nussbaumer (cr). 214-215 **Photoshot**: Dave Watts (c). 218 **Corbis**: Steve Parish Publishing (c). **Dreamstime.com**: Brian Lasenby (tr). **FLPA**: Jurgen & Christine Sohns (crb); Martin B Withers (cr, cb). 219 **Dorling Kindersley**: Ian Montgomery (crb). **Dreamstime.com**: Eastmanphoto (c). **FLPA**: Photo Researchers (cb); Eric Woods (tr). 220 **Corbis**: EPA / Julian Smith (tl); Minden Pictures / Auscape / Glen Threlfo (cra). **Dreamstime.com**: Marco Tomasini (b). **FLPA**: Martin B Withers (c). 221 **Alamy Images**: Gerry Pearce (tl). **Corbis**: Steve Kaufman (br). **FLPA**: Gerry Ellis (bl); Martin B Withers (c, cl). 222 **Dorling Kindersley**: Jerry Young (cl). **Dreamstime.com**: Eastmanphoto (c). **FLPA**: Imagebroker / Nico Stengert (cr). **Fotolia**: Eric Isselee (b). **Getty Images**: Tom Brakefield (crb). **naturepl.com**: Luiz Claudio Marigo (clb). 223 **Dorling Kindersley**: Greg and Yvonne Dean (tr). **Dreamstime.com**: Isselee (clb). **FLPA**: ImageBroker (cl); Minden Pictures / Kevin Schafer (tc); Frans Lanting (crb). **Getty Images**: Nigel Dennis (c). **Photoshot**: Gerald Cubitt (br); Jany Sauvanet (cb). 224 **Dorling Kindersley**: Rollin Verlinde (cb); Jerry Young (bl). **Dreamstime.com**: Martinsevick (c); Naasrautenbach (crb). **FLPA**: David Hosking (bc); Konrad Wothe (tr); Minden Pictures / ZSSD (cl); S & D & K Maslowski (br). 224-225 **Photoshot**: Photo Researchers (c). 225 **Dorling Kindersley**: Rollin Verlinde (clb, bl, br). **Dreamstime.com**: Melinda Fawver (bc). **FLPA**: Biosphoto / Daniel Heuclin / B (tl); Biosphoto / Gregory Guida (tr); Panda Photo (c); S & D & K Maslowski (crb); Chris & Tilde Stuart (cb). **naturepl.com**: Nature Production (cra). 226-227 **steveblum.com**. 228 **Dreamstime.com**: Samfoto (br). **naturepl.com**: Barry Mansell (c). 229 **Corbis**: Minden Pictures / Donald M. Jones (cra). **Dreamstime.com**: Rafael Angel Irusta Machin (tc); Peterwey (c); Derrick Neill (br). **FLPA**: Martin B Withers (tl). **Getty Images**: Purestock (bc). **Science Photo Library**: C.K. Lorenz (crb). 230 **Corbis**: Joe McDonald (c); Minden Pictures / Ch'ien Lee (tr). **Dorling Kindersley**: Rollin Verlinde (crb). **Dreamstime.com**: Isselee (cl, fcr). 231 **Dorling Kindersley**: Josef Hlasek (clb). **Dreamstime.com**: Docbomby (tr); Sergey Uryadnikov (bl). **FLPA**: Frank W Lane (cb); Minden Pictures / Michael & Patricia Fogden (cra); S & D & K Maslowski (cla). **Fotolia**: Mkguijpers (tr). **Getty Images**: David Campbell (ca); Peter Schoen (br). 232 **Corbis**: Ocean (fbr). **Dreamstime.com**: Erllre (bc); Isselee (cr). **Getty Images**: Steve Allen (fbl). 233 **Dreamstime.com**: Jarous (tl). **FLPA**: ImageBroker (cra). 234 **FLPA**: Bernd Rohrschneider (cla). **naturepl.com**: Pete Oxford (ca). 235 **Dorling Kindersley**: Thomas Marent (fcr). **Dreamstime.com**: Davthy (cb). **FLPA**: ImageBroker (bl); Minden Pictures / Chien Lee (tr); R & M Van Nostrand (c); Minden Pictures / Pete Oxford (crb); Minden Pictures / Konrad Wothe (clb); Chien Lee (ca). **Getty Images**: Mint Images (cr). **naturepl.com**: Jabruson (cl). 236 **Dorling Kindersley**: Courtesy of Twycross Zoo, Atherstone, Leicestershire (bc); Ian Montgomery (tr); Jerry Young (fcr). **Dreamstime.com**: Eric Gevaert (bl). **FLPA**: Minden Pictures / Thomas Marent (clb); Jurgen & Christine Sohns (fcl). **naturepl.com**: Eric Baccaga (cr); Bernard Castelein (cra). 237 **Dorling Kindersley**: Courtesy of Twycross Zoo, Atherstone, Leicestershire (bl). **FLPA**: Minden Pictures / Thomas Marent (tc). **Getty Images**: Tom Brakefield (cl). 238-239 **Dorling Kindersley**: Thomas Marent. 240 **Alamy Images**: Amazon-Images (cb). **Corbis**: Minden Pictures / Thomas Marent (clb). **Dorling Kindersley**: Jerry Young (fcrb, bc). **Dreamstime.com**: Laurent Renault (fcr); Wojphoto (crb). **FLPA**: Jurgen & Christine Sohns (cra). 241 **Dorling Kindersley**: Exmoor Zoo, Devon (c); Jerry Young (crb). **FLPA**: Frans Lanting (t). **Fotolia**: Eric Isselee (br). 242-243 **Dreamstime.com**: Benjamin Schalkwijk (c). 242 **Corbis**: Minden Pictures / Thomas Marent (bl); Visuals Unlimited / Thomas Marent, (tr). **Dorling Kindersley**: Jerry Young (cl, br). **naturepl.com**: Suzi Eszterhas (bc). 243 **Alamy Images**: The Africa Image Library (cb). **Getty Images**: Comstock (ca). 244 **Dorling Kindersley**: Jerry Young (cr, cb, bc). **Science Photo Library**: Merlin Tuttle (clb). 245 **Dorling Kindersley**: Greg and Yvonne Dean (cl); Natural History Museum, London (cr). 246-247 **Dorling Kindersley**:

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