

My First Library of Knowledge

Mini-Beasts



Orpheus

First published in 2006 by Orpheus Books Ltd.,
6 Church Green, Witney, Oxfordshire, OX28 4AW

Copyright © 2006 Orpheus Books Ltd.

Created and produced by Rachel Coombs,
Nicholas Harris and Sarah Hartley,
Orpheus Books Ltd.

Text Rachel Coombs and Nicholas Harris

Consultant Richard Walker

Illustrated by Fiammetta Dogi, Betti Ferrero,
Sauro Giampaio, Ray Grinaway,
Inklink Firenze, David Wright

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

ISBN 1 901323 XX X

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

Printed and bound in Singapore



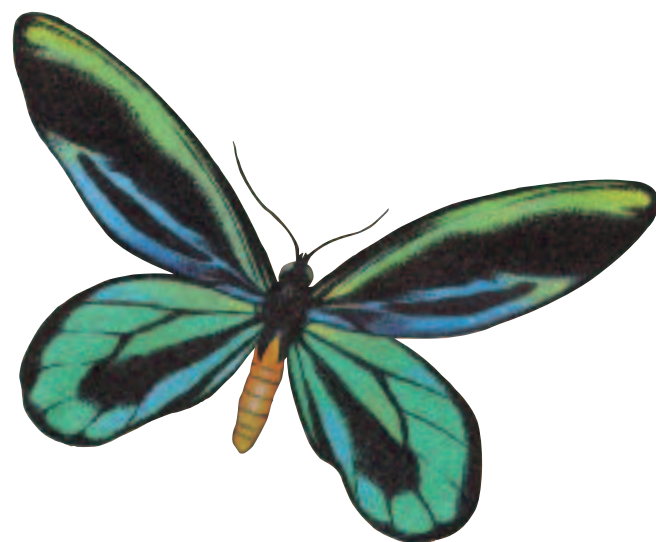
CONTENTS

4 THE WORLD OF MINI-BEASTS

6 WHAT IS AN INSECT?

8 CAMOUFLAGE AND MARKINGS

10 BEETLES



12 ANTS, BEES AND WASPS

14 HOW HONEYBEES LIVE

16 INSIDE AN ANTS' NEST

18 TERMITES



20 BUTTERFLIES AND MOTHS

22 THE LIFE OF A BUTTERFLY

24 FLIES AND MOSQUITOES

26 INSECT GROUPS

28 SPIDERS AND SCORPIONS

30 HOW A SPIDER SPINS ITS WEB

32 INDEX

INTRODUCTION

BESIDES mammals, birds, reptiles and amphibians, there are other kinds of animals that live on land. They are mostly very small. Some live in the soil, while others can fly. Still others live in our homes, and some even live on us! These are the amazing creatures we call mini-beasts—insects, spiders, worms and many others.



THE WORLD OF MINI-BEASTS

THERE ARE mini-beasts all around us. In just a small area of ground, you may, on a summer's day, come across bees and butterflies flitting from flower to flower.

Beetles, centipedes and spiders scuttle around on the ground, while the soil is full of ants, worms and other small creatures.



MICRO-BEASTS

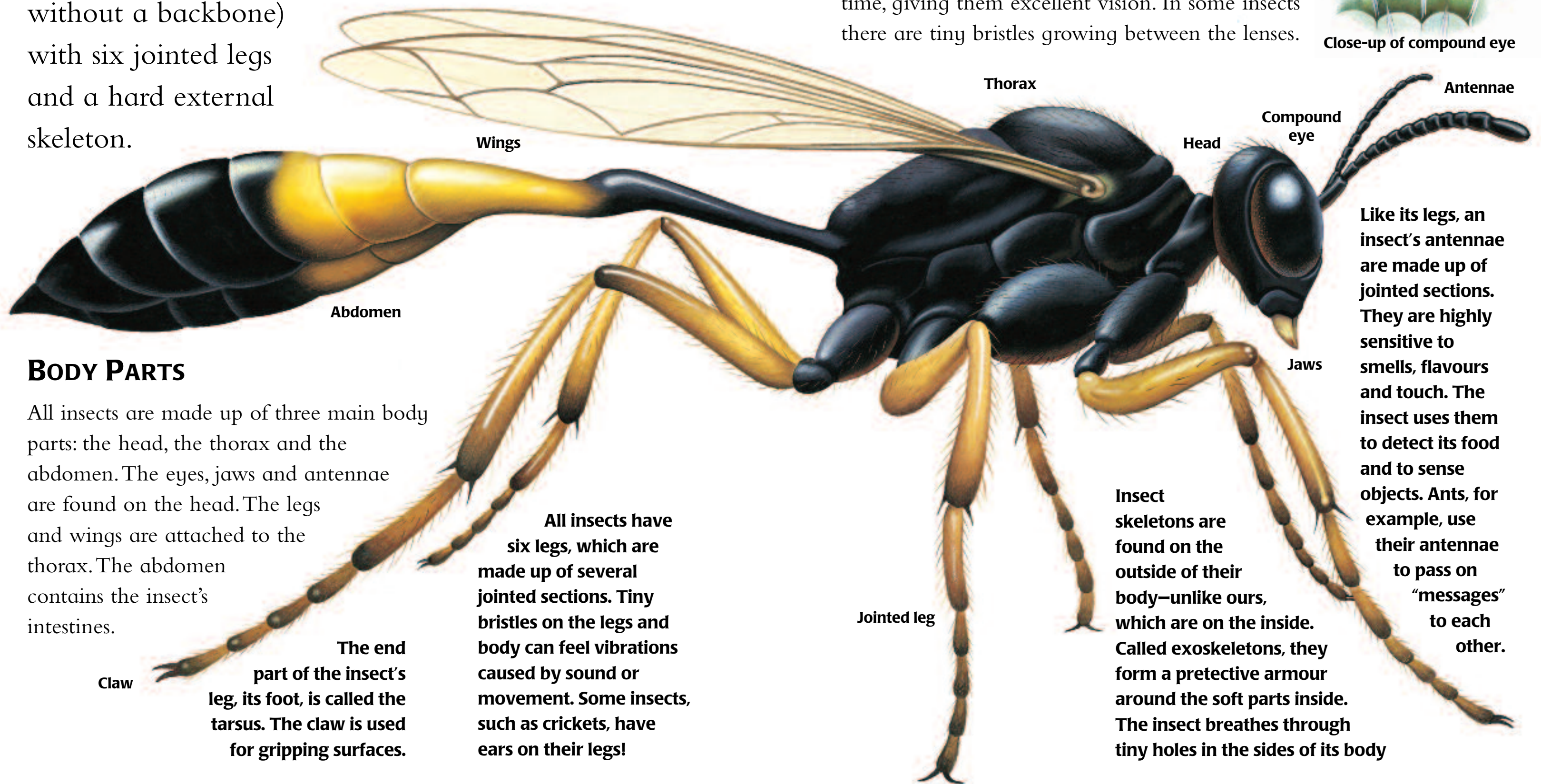
The top part of the soil may be teeming with millions of mini-beasts. Most are far too tiny for us to see without a microscope. Micro-beasts like soil mites and springtails (*right*) all play their part in turning rotting animal and plant matter into nutrients that make the soil more fertile for plants.

Earthworms burrow through the earth. Their tunnels allow air to get to plant roots. Worms also mix up the soil, bringing rotting matter down from the surface. This makes the soil better for growing plants. Slugs and snails often hide in damp dark places in order to stay moist.

WHAT IS AN INSECT?

AN INSECT is an invertebrate (an animal without a backbone) with six jointed legs and a hard external skeleton.

Although it is only 2 mm long, this parasitic wasp has all the features of a typical insect.



BODY PARTS

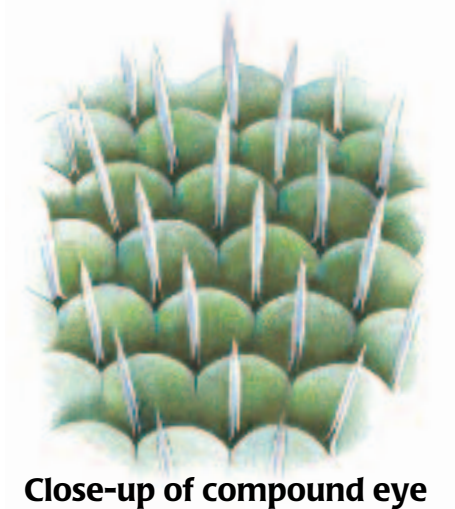
All insects are made up of three main body parts: the head, the thorax and the abdomen. The eyes, jaws and antennae are found on the head. The legs and wings are attached to the thorax. The abdomen contains the insect's intestines.

The end part of the insect's leg, its foot, is called the tarsus. The claw is used for gripping surfaces.

All insects have six legs, which are made up of several jointed sections. Tiny bristles on the legs and body can feel vibrations caused by sound or movement. Some insects, such as crickets, have ears on their legs!

COMPOUND EYES

Most insects have compound eyes. They are made up from hundreds of lenses. These allow the insect to see ahead, below and behind all at the same time, giving them excellent vision. In some insects there are tiny bristles growing between the lenses.



Close-up of compound eye

Like its legs, an insect's antennae are made up of jointed sections. They are highly sensitive to smells, flavours and touch. The insect uses them to detect its food and to sense objects. Ants, for example, use their antennae to pass on "messages" to each other.

Insect skeletons are found on the outside of their body—unlike ours, which are on the inside. Called exoskeletons, they form a protective armour around the soft parts inside. The insect breathes through tiny holes in the sides of its body

CAMOUFLAGE AND MARKINGS

INSECTS use camouflage and markings to hide themselves from prey. Stick insects, for example, take on the same colour and shape as the plants they live amongst. They even sway in the breeze along with the plant.



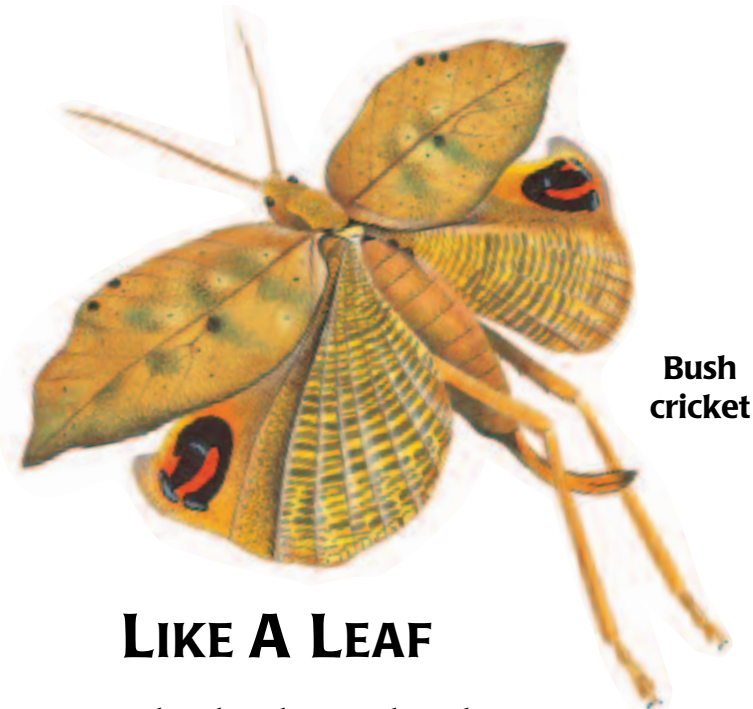
Stick insect

DEADLY FLOWER

This flower mantis, found in Africa and the Far East, blends in among pink orchids. It waits very still for an insect to come to collect nectar before launching its attack.



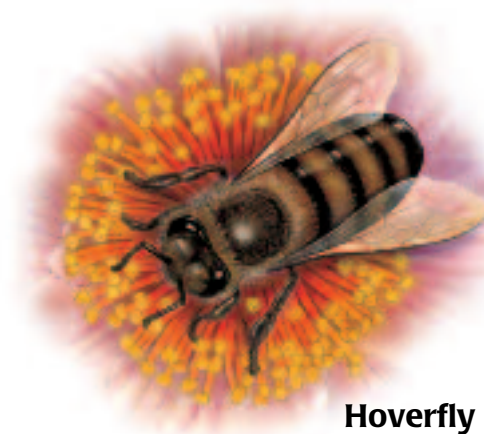
Flower mantis



Bush cricket

LIKE A LEAF

The bush cricket lives in trees. When still, it looks like a dead leaf, so other creatures do not notice it. When disturbed, it leaps to safety, flashing its fake eyes.



Hoverfly

This hoverfly's markings make it look like a bee. This scares off hungry birds.

BUTTERFLY EYES

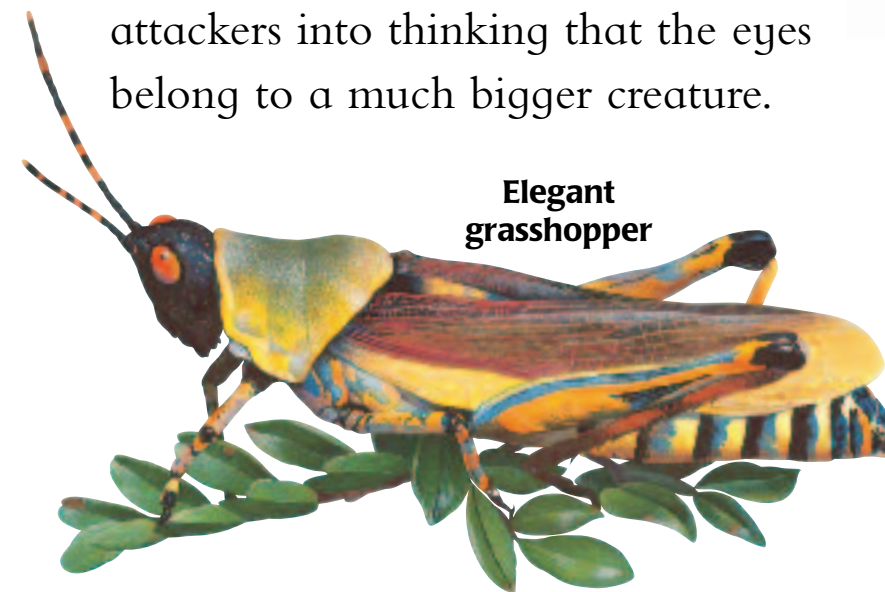
Many butterflies, like this purple emperor butterfly, have markings on their wings that look like eyes. These are usually hidden and only revealed when their wings open. They fool attackers into thinking that the eyes belong to a much bigger creature.



Purple emperor butterfly

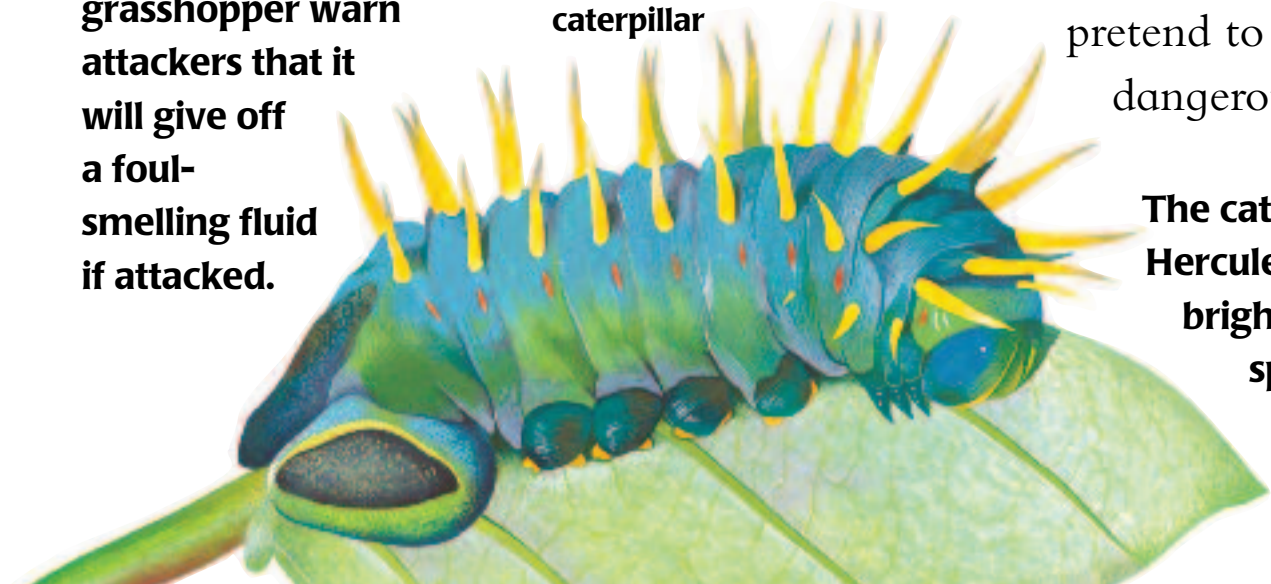
COLOUR

Some insects make no attempt to blend into the background. Instead they have bright colours. These mean: danger! Reds, yellows and blacks warn predators that they sting or are poisonous. Some harmless insects use these colours to pretend to be dangerous.



Elegant grasshopper

The colours of this grasshopper warn attackers that it will give off a foul-smelling fluid if attacked.



Hercules moth caterpillar

The caterpillar of the Hercules moth has brightly coloured spikes to warn off predators.

BEETLES

BEETLES make up the largest group of insects. There is a huge variety in colours and shapes. All beetles have wings. When they are not in flight, the wings are folded away under hard wing-cases for protection.

Harlequin longhorn

The harlequin longhorn has very long front legs. These help it to move around tree trunks.



Rhinoceros beetle

10
Cockchafer

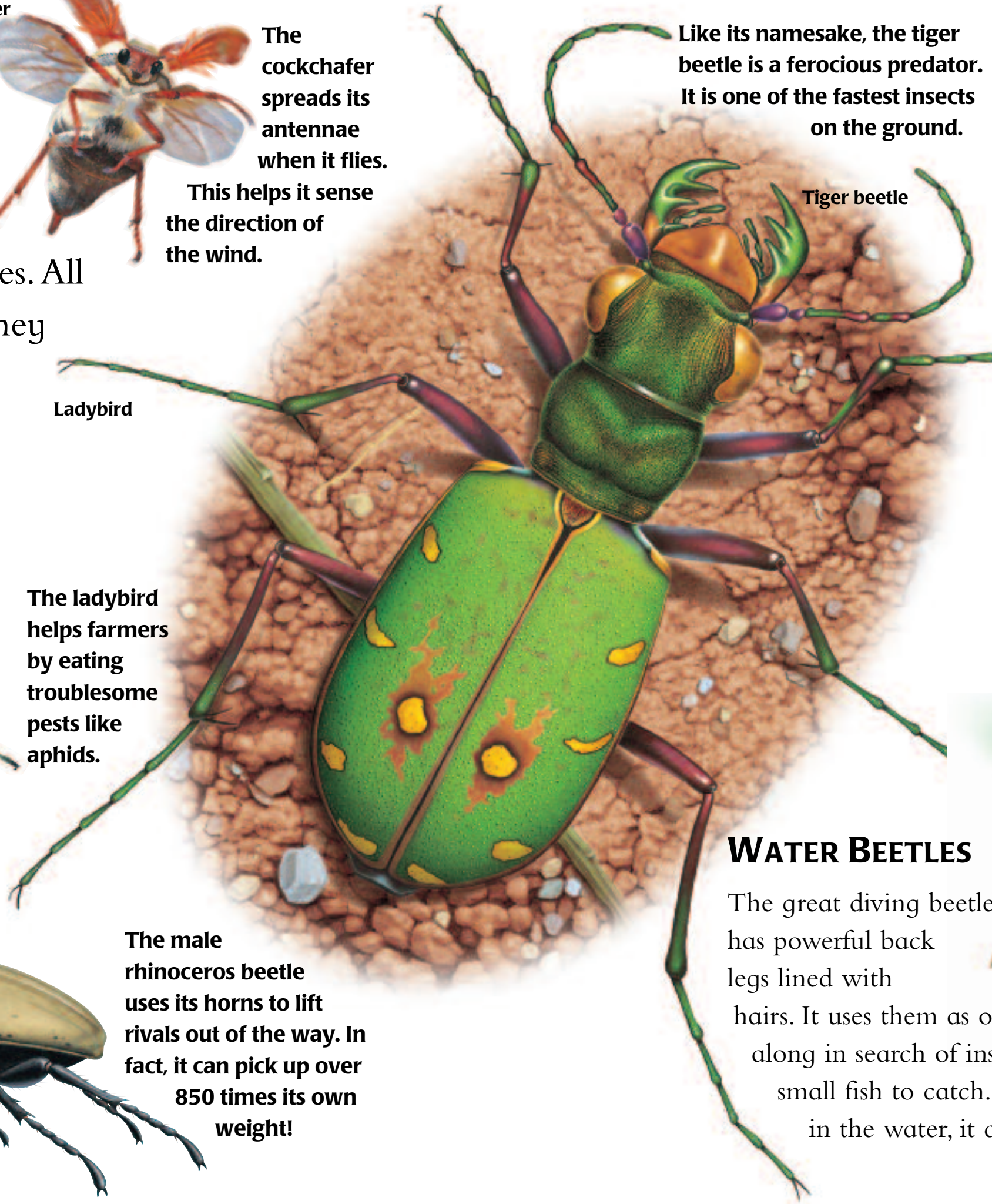


The cockchafer spreads its antennae when it flies.

This helps it sense the direction of the wind.

Ladybird

The ladybird helps farmers by eating troublesome pests like aphids.

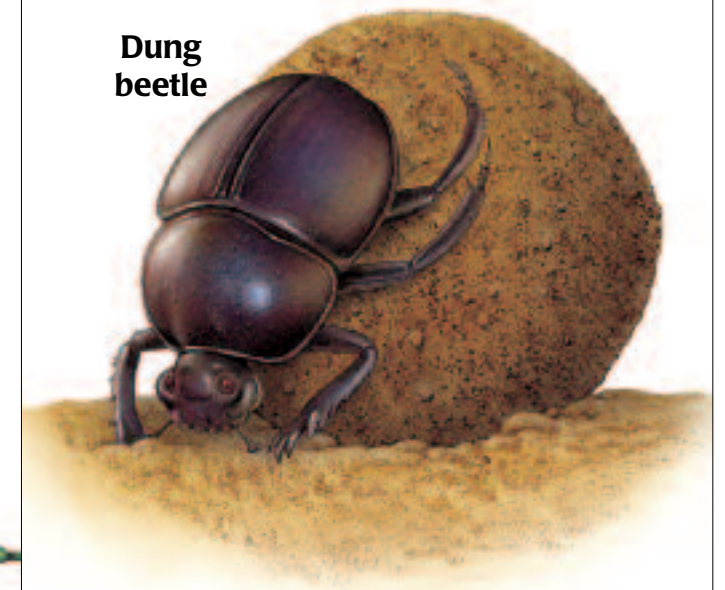


Tiger beetle

Like its namesake, the tiger beetle is a ferocious predator. It is one of the fastest insects on the ground.

The male rhinoceros beetle uses its horns to lift rivals out of the way. In fact, it can pick up over 850 times its own weight!

Dung beetle



DUNG BEETLES

Dung beetles live in grasslands. The adult beetles use their toothed legs to mould the dung into balls. Then they roll the ball to their under-ground burrows. They lay their eggs in animal dung. Their larvae feed on it when they hatch out.

Great diving beetle



WATER BEETLES

The great diving beetle has powerful back legs lined with hairs. It uses them as oars as it swims along in search of insects, tadpoles and even small fish to catch. Although it spends most of its time in the water, it can also fly well.

ANTS, BEES AND WASPS

ANTS, bees and wasps are related. They all have narrow “waists” between their thorax and abdomen. Some kinds live closely together, building nests, gathering food and raising their young in large “colonies”. Bees and some kinds of wasp protect themselves with their sting.



Tarantula
hawk wasp

This wasp attacks tarantula spiders. It lays an egg on its prey. The egg hatches out and feeds on the spider.



European
wasp

There are more than 50,000 kinds of wasp. Those with black and yellow stripes and a painful sting live in colonies. Their papery nests are made from chewed-up wood fibres.

Ants will fight termites (see pages 16-17) or any other intruder that threatens to attack their nest. They are equipped with powerful jaws. They can also squirt acid at the enemy.



Ant



How HONEYBEES LIVE

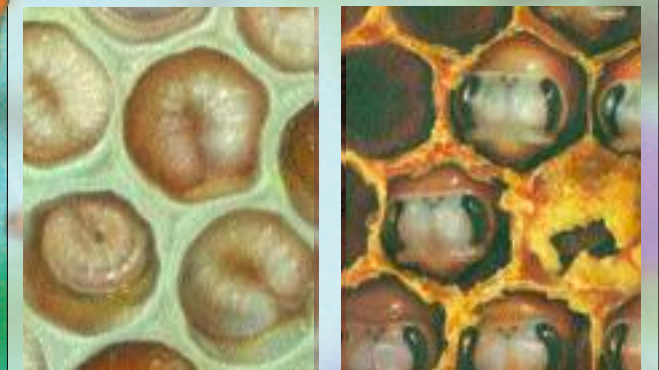
HONEYBEES live in huge colonies of thousands of bees. The queen is the only bee that lays eggs. One of the male bees, called drones, will mate with the queen. The other female bees are called workers. They build the nest, clean it and protect it from attackers. They gather nectar and pollen from flowers and bring it back to the nest. They “chew” nectar until it turns into sticky honey and store it in the nest as food.



The queen bee lays her eggs inside small hexagonal cells made from wax (*left*), called the honeycomb. The workers use other cells to store the honey they have made.

INSIDE THE NEST

Inside their wax cells, the eggs soon hatch into larvae (*below left*). They are looked after by the workers and fed with honey and pollen.



After nine days the workers cap the cells with wax. Inside, the larvae turn to pupae (*above right*). Eventually, they emerge as adult bees (*right*).



The queen eventually leaves the colony. She takes some workers with her. Most swarm around her while others go in search of a new nest site.

INSIDE AN ANTS' NEST

AN ANTS' nest is a maze of tunnels and chambers under the ground. Here, the queen ant lays her eggs. The first eggs hatch into worker ants. Workers are females that cannot mate. They keep the nest clean and find food. Later on, winged males and females hatch out. They fly out of the nest to mate. The females become queens.

AN ANT'S LIFE

An ant begins life as a grub, or a larva. It hatches out of an egg laid by the queen. It does nothing but eat, and shed its skin as it grows. When it is large enough, it spins a silk coat around itself. This hardens into a cocoon. Inside, the larva, now known as a pupa, changes into an adult ant.



TERMITES

TERMITES live in large colonies. Each nest has a single king and queen.

They served by blind workers and soldiers, who feed and protect the colony.

Termites live in hot climates. They eat wood and other dead plant material.



SOLDIER TERMITES

Soldier termites are reared to protect the colony. They are bigger than workers and equipped with powerful biting jaws. Some kinds can squirt poison at their attackers. Soldiers rely on workers to feed them.

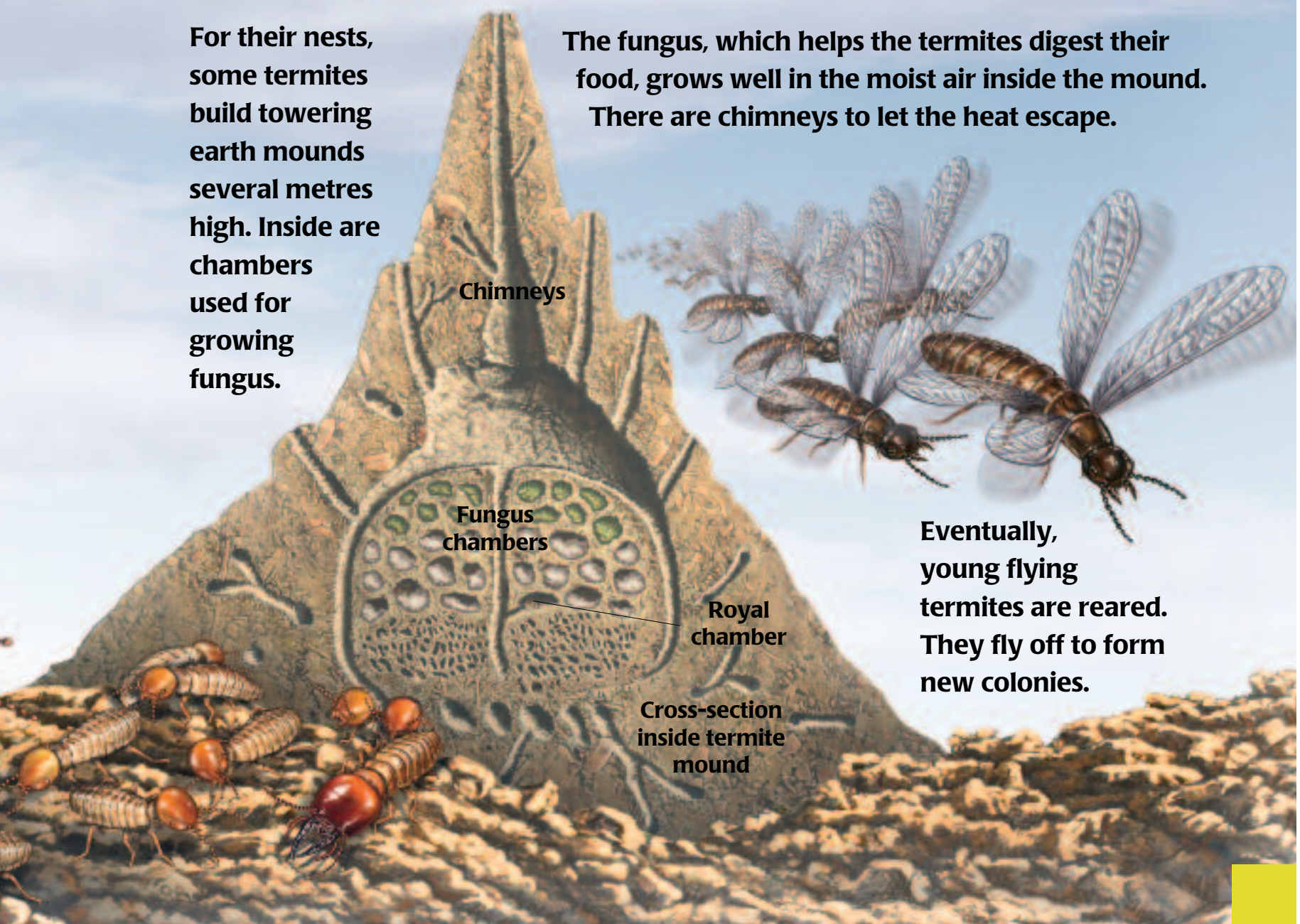
THE ROYAL CHAMBER

The king termite is larger than the workers, but he is dwarfed by the queen. She has a massive swollen abdomen up to 14 cm long. In the royal chamber inside the nest, she produces 30,000 eggs a day. As she lays them, the workers carry them away to other chambers to be hatched out.



For their nests, some termites build towering earth mounds several metres high. Inside are chambers used for growing fungus.

The fungus, which helps the termites digest their food, grows well in the moist air inside the mound. There are chimneys to let the heat escape.

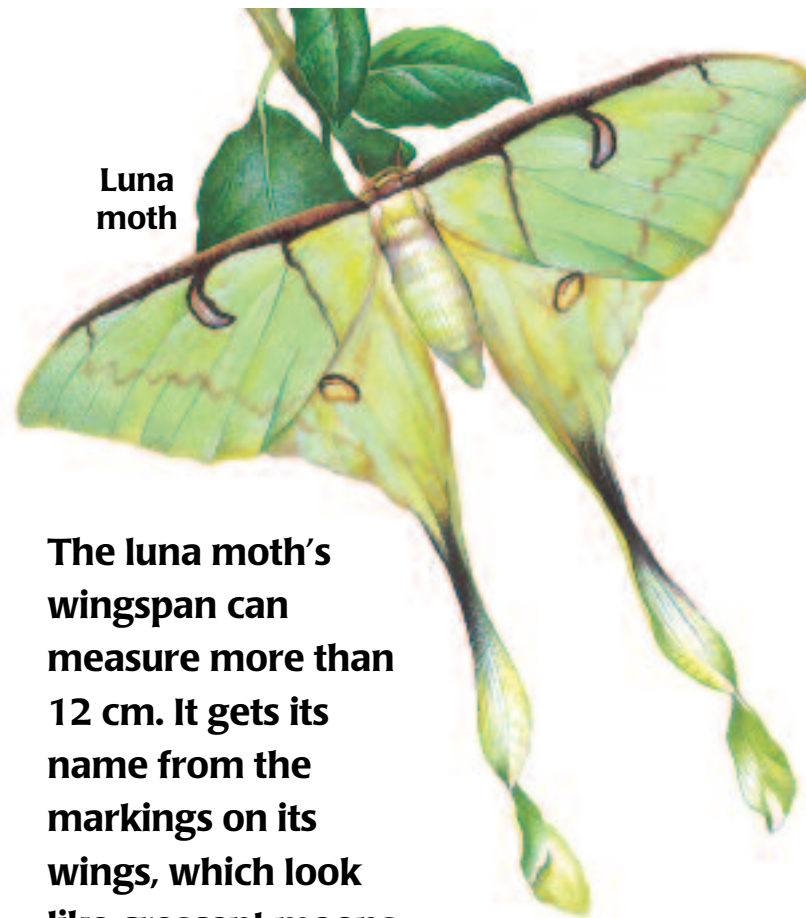


Eventually, young flying termites are reared. They fly off to form new colonies.

BUTTERFLIES AND MOTHS

BUTTERFLIES fly during the daytime. They usually have antennae shaped like thin clubs. Most moths are night-flyers. Their antennae are usually feathery in shape.

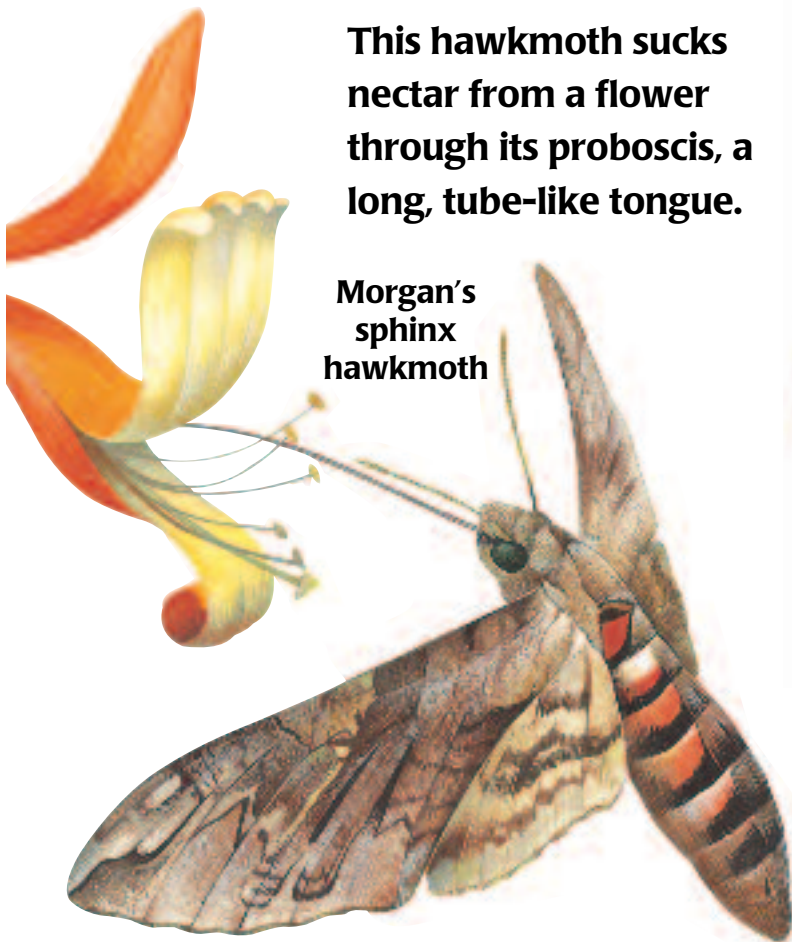
Luna moth



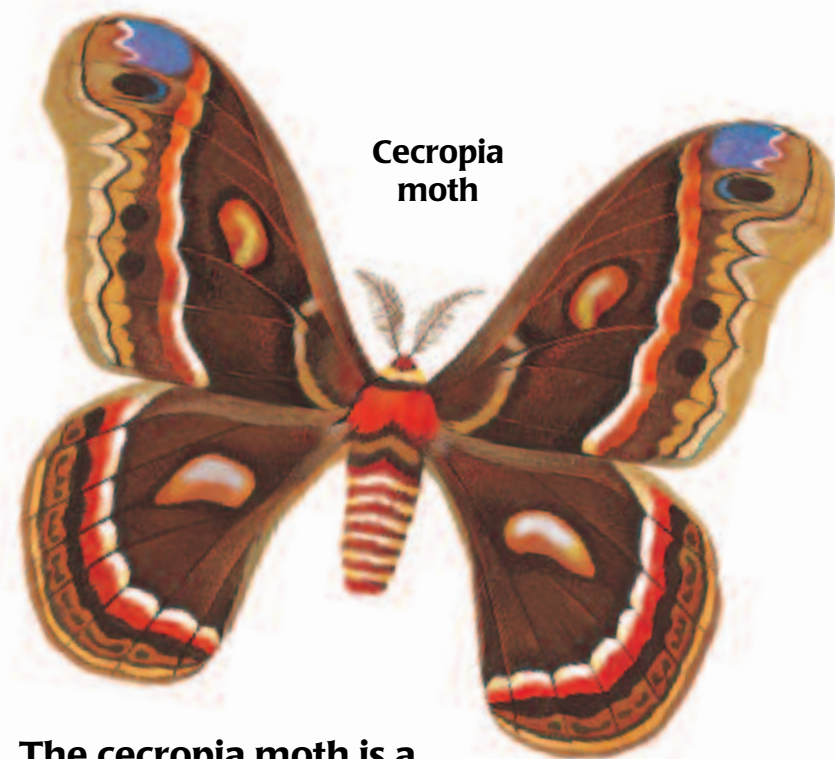
The luna moth's wingspan can measure more than 12 cm. It gets its name from the markings on its wings, which look like crescent moons.

This hawkmoth sucks nectar from a flower through its proboscis, a long, tube-like tongue.

Morgan's sphinx hawkmoth



Cecropia moth

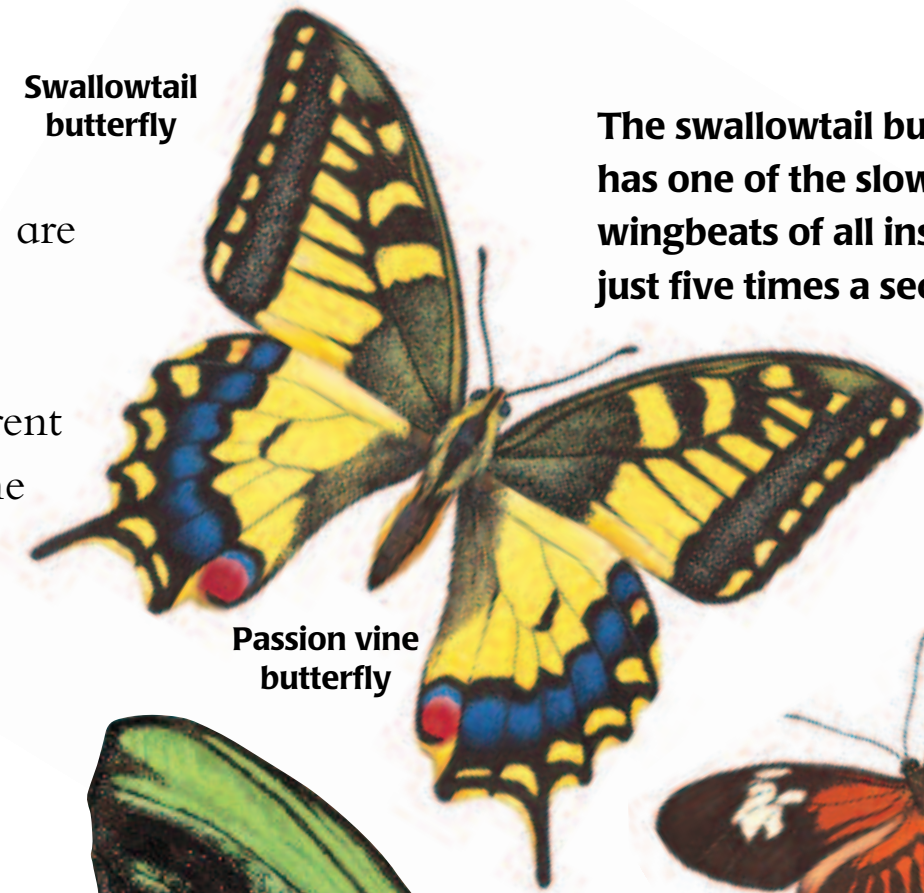


The cecropia moth is a kind of silkworm. Its feathery antennae give it a good sense of smell. Like many moths, the caterpillars (called "silkworms") produce silk to make their cocoons. They are bred in special farms to produce silk for cloth.

WINGS

A butterfly's wings are covered in tiny, overlapping scales (*below*). Their different colours produce the familiar wing patterns.

Swallowtail butterfly



The swallowtail butterfly has one of the slowest wingbeats of all insects: just five times a second.

Passion vine butterfly

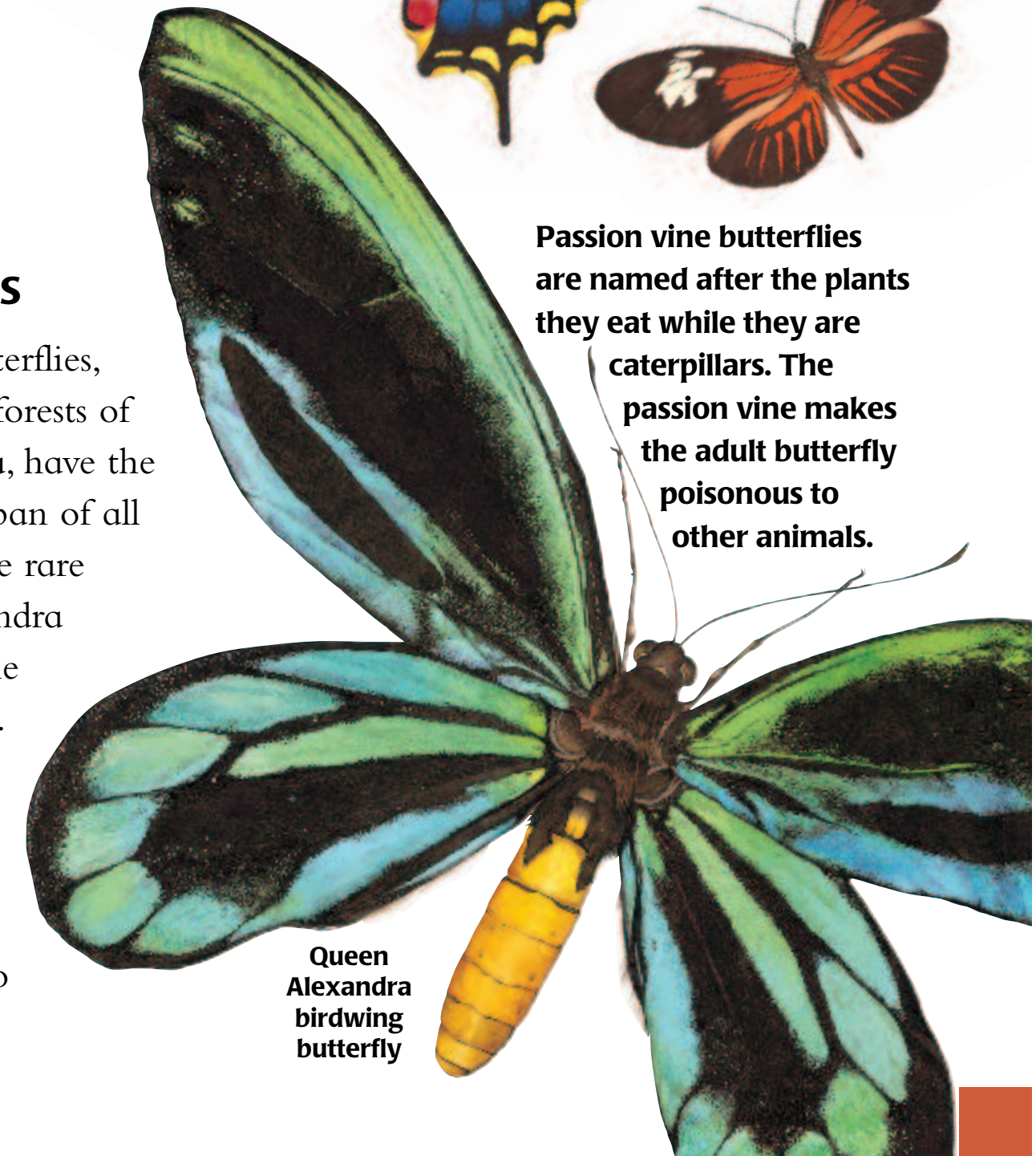


BIRDWINGS

Birdwing butterflies, from the rainforests of southeast Asia, have the largest wingspan of all butterflies. The rare Queen Alexandra birdwing is the record-holder. Although the males are smaller, the females can measure up to 28 cm across.

Passion vine butterflies are named after the plants they eat while they are caterpillars. The passion vine makes the adult butterfly poisonous to other animals.

Queen Alexandra birdwing butterfly



THE LIFE OF A BUTTERFLY

THE monarch butterfly is one of the most amazing insects in the world. Every year, millions of monarchs fly south thousands of kilometres across America to spend winter in Mexican forests.



The monarch caterpillar feeds on milkweed.



The caterpillar sheds its skin.

CATERPILLAR TO CHRYSALIS

Like all butterflies, the female monarch lays her eggs, then flies away, never to

return. A caterpillar hatches out. It feeds on the milkweed plant only, devouring its leaves, flowers and stem. As it grows, it sheds its skin four times. After a few weeks, it weaves a cocoon of silk around its body. It is now a chrysalis. Inside, its body starts to change.



The chrysalis in its cocoon.

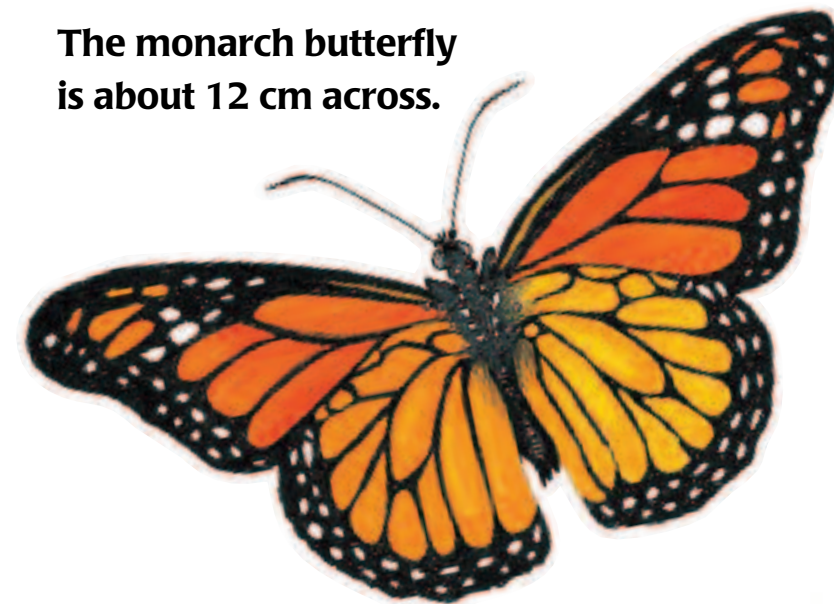
AN ADULT EMERGES

After a few weeks, the adult monarch butterfly climbs out of its silk cocoon. Most kinds of butterflies live quite close to the area where they were born. The female finds a mate, lays her eggs, and more caterpillars are born. But for monarchs, when winter comes, they set out on a journey that takes them south across the United States to the mountains of Mexico.



The adult monarch emerges from its cocoon.

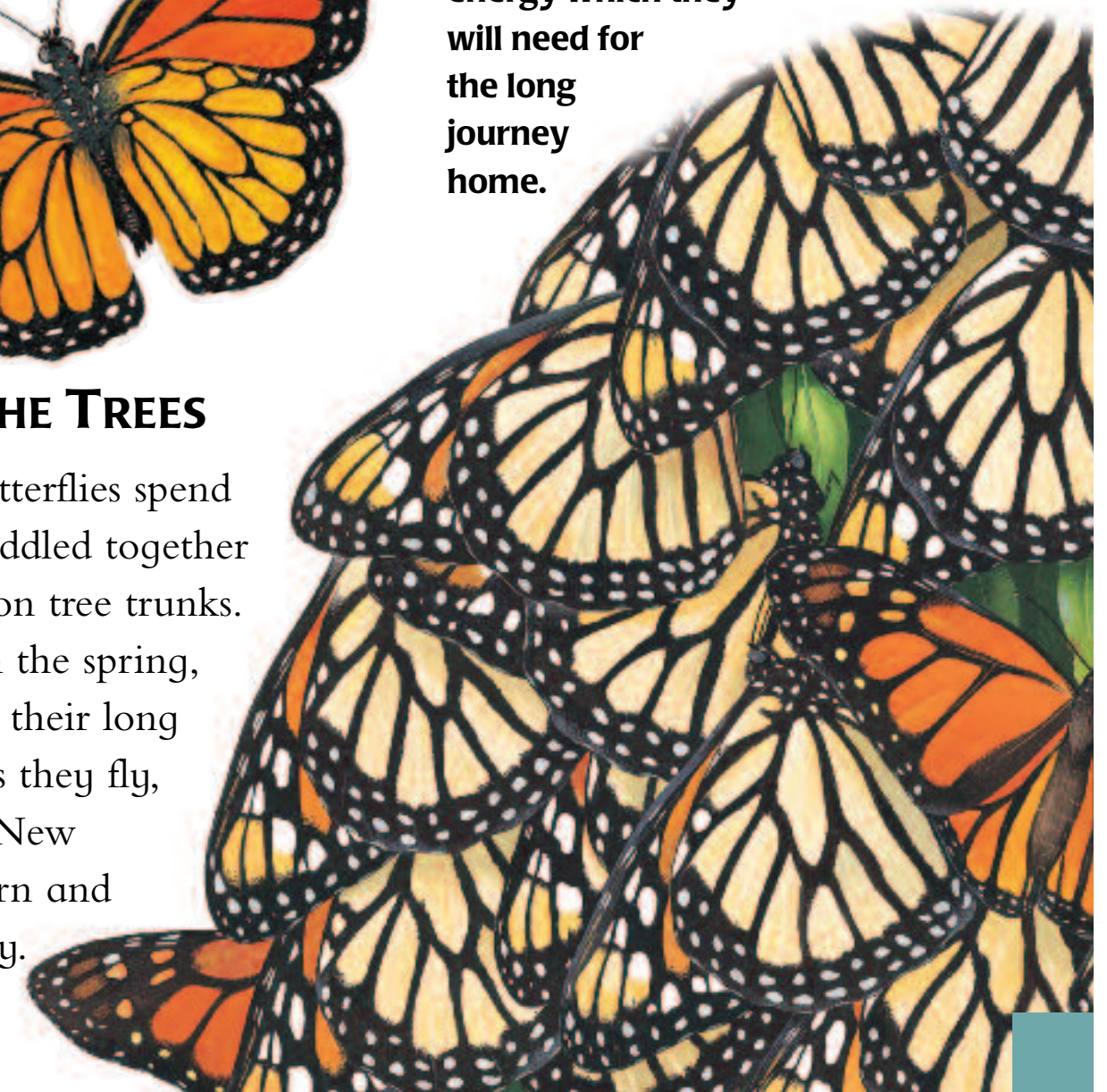
The monarch butterfly is about 12 cm across.



The monarchs rest on tree trunks for most of the winter. They are saving energy which they will need for the long journey home.

ASLEEP ON THE TREES

The monarch butterflies spend winter resting huddled together in their millions on tree trunks. They wake up in the spring, when they begin their long journey home. As they fly, the adults mate. New butterflies are born and continue the story.



FLIES AND MOSQUITOES

FLIES have only one pair of wings, unlike all other insects which have two. Instead of biting jaws, they have mouthparts that suck up food. We often see flies as a nuisance because they spread diseases. But they are essential to the process of decomposing dead animals and plants, and waste. Many kinds also spread pollen or are food for other animals.



Tsetse fly

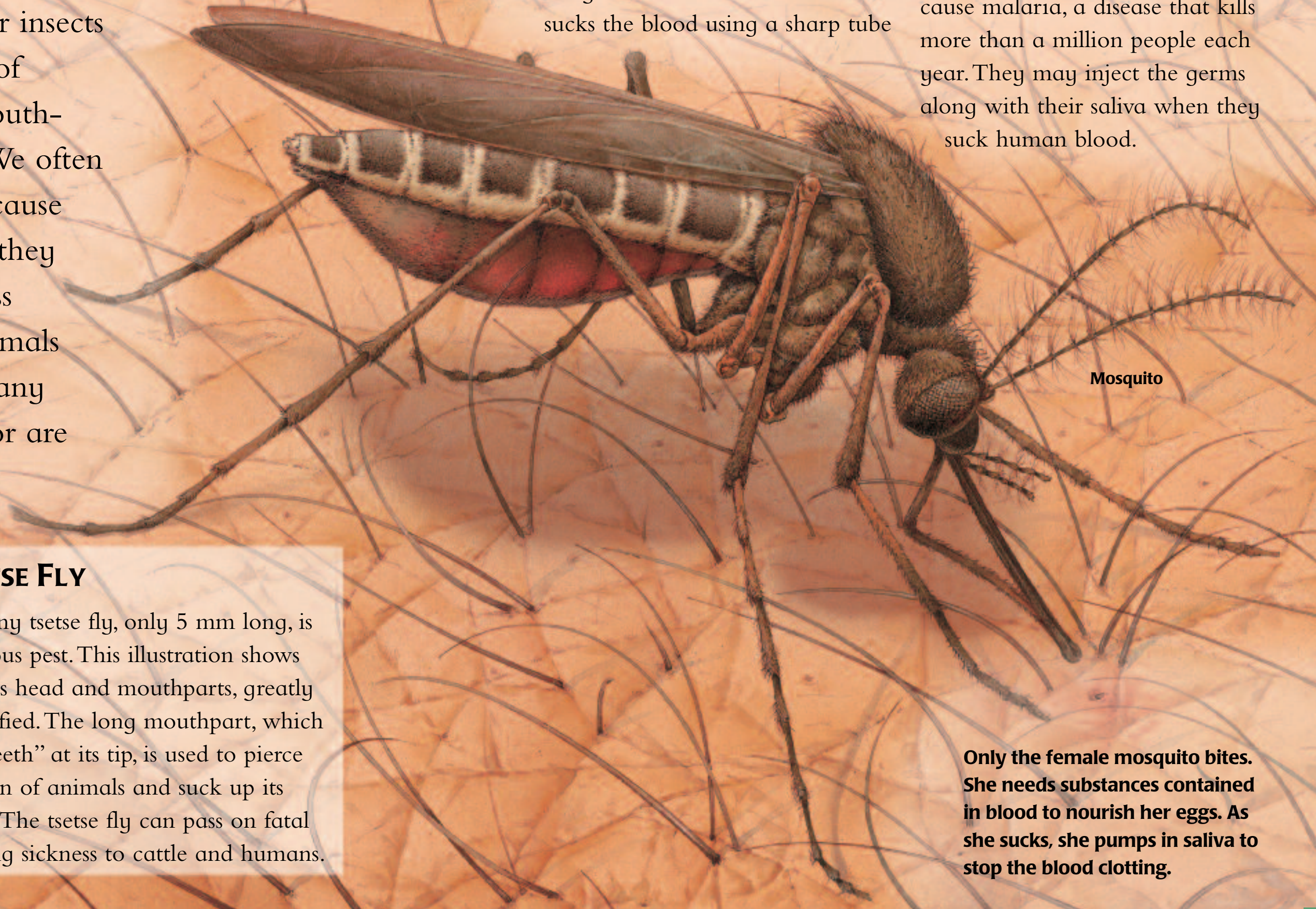
TSETSE FLY

The tiny tsetse fly, only 5 mm long, is a serious pest. This illustration shows only its head and mouthparts, greatly magnified. The long mouthpart, which has “teeth” at its tip, is used to pierce the skin of animals and suck up its blood. The tsetse fly can pass on fatal sleeping sickness to cattle and humans.

A DEADLY INSECT

The mosquito can be extremely dangerous to humans. The female sucks the blood using a sharp tube

called a proboscis to pierce the skin. In some parts of the world, mosquitoes carry the germs that cause malaria, a disease that kills more than a million people each year. They may inject the germs along with their saliva when they suck human blood.



Mosquito

Only the female mosquito bites. She needs substances contained in blood to nourish her eggs. As she sucks, she pumps in saliva to stop the blood clotting.

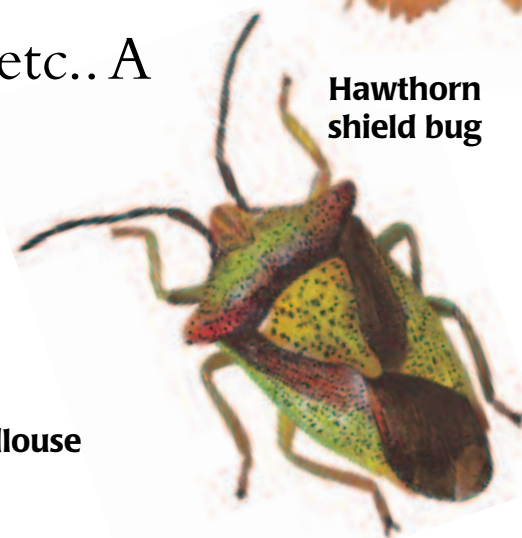
TYPES OF INSECT

THERE are probably more than 10 million types of insect. They are divided into a number of major groups: ants, flies, bugs, cockroaches etc.. A few different types are illustrated on this page.



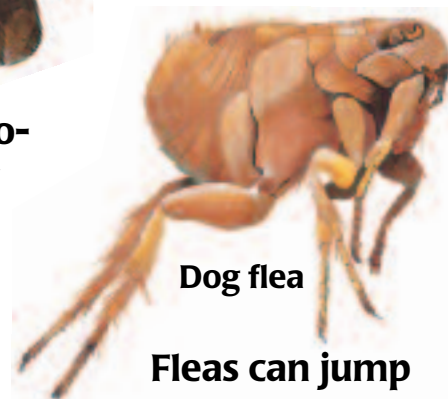
Hissing cockroach

The hissing cockroach protects itself by puffing up with air to look bigger. When the air is forced out, it sounds like hissing.



Hawthorn shield bug

Shield bugs are so-called because of their distinctive shape. If attacked, they squirt out a foul-smelling liquid.



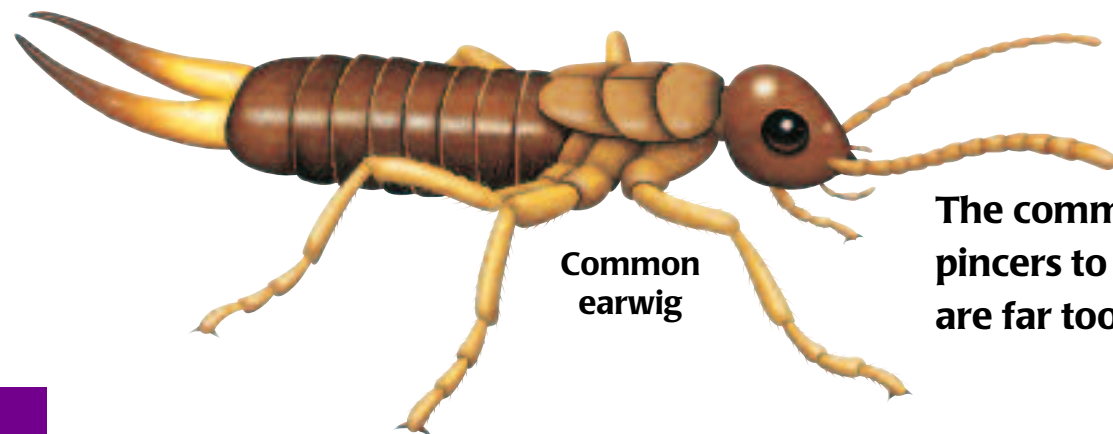
Dog flea

Fleas can jump over 500 times their own length. They feed on the blood of larger animals such as rats.



Headlouse

The headlouse feeds on human blood. Its huge claws grasp tightly to strands of our hair.



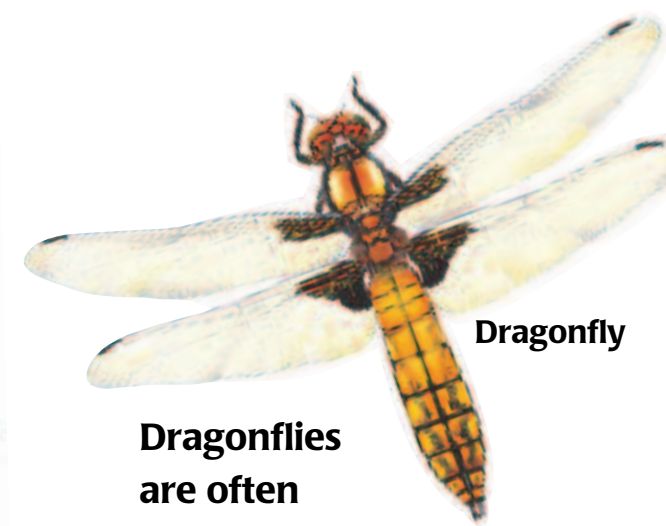
Common earwig

The common earwig uses its pincers to capture prey. They are far too small to hurt humans.

PRAYING MANTIS

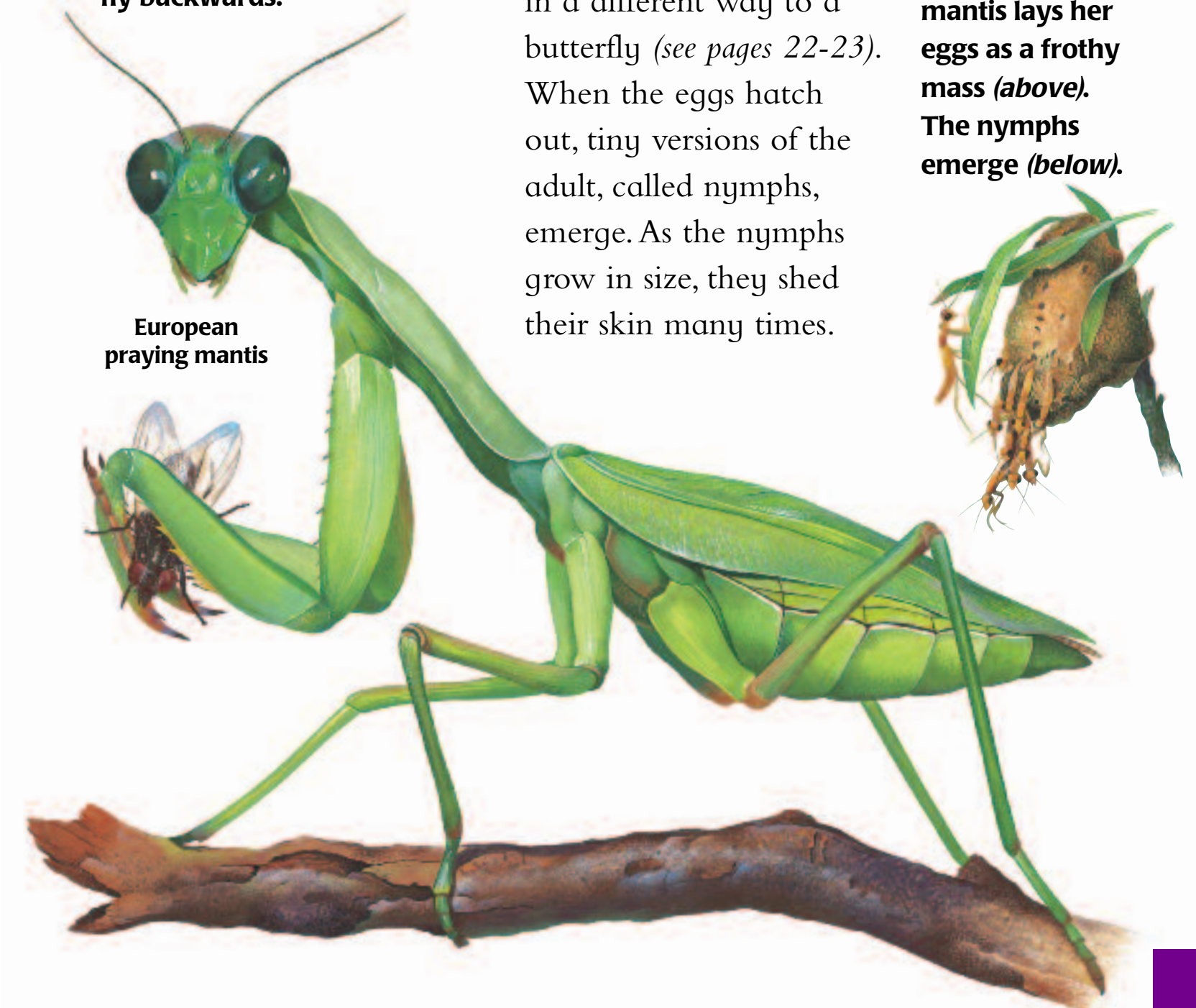
The praying mantis is a terrifying predator. It sits with its front legs up, as if praying, waiting to feed. When it spies its victim, it flicks out its spiny front legs to trap it.

The mantis reproduces in a different way to a butterfly (see pages 22-23). When the eggs hatch out, tiny versions of the adult, called nymphs, emerge. As the nymphs grow in size, they shed their skin many times.



Dragonfly

Dragonflies are often found around ponds. They feed on other flying insects. They can fly at great speed, hover, and even fly backwards.



European praying mantis



The female mantis lays her eggs as a frothy mass (above). The nymphs emerge (below).



SPIDERS AND SCORPIONS

SPIDERS, scorpions and mites are not insects but arachnids. They have eight legs and two grasping “limbs” called pedipalps. Spiders have two body parts and many pairs of eyes. All spiders can produce silk, but only some kinds use it for making webs.

jumping spiders capture their prey by leaping at it with fangs ready to strike.



Jumping spider

Bird-eating spiders live in the rainforests of South America. Their leg span may be as wide as a dinner plate! Despite their name, they feed mainly on other insects. They will also eat small lizards.



Many spiders produce poison to paralyse their prey. Most are completely harmless to humans, but the bite of some species, such as the black widow, can be fatal.

Bird-eating spider

Many kinds of mite are less than 1 mm long. Dust mites feed on skin flakes.



Millipede

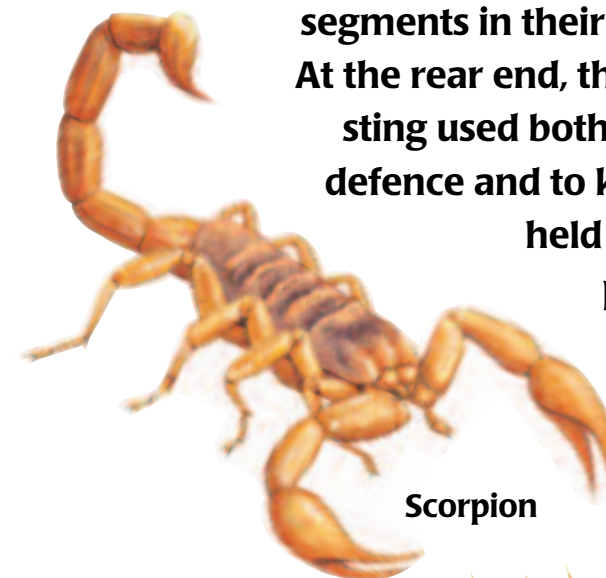
MILLIPEDES

Millipedes and centipedes are types of arthropod, a name meaning “many legs”. Millipedes eat mainly plants and move very slowly. Their tube-like bodies and short legs allow them to squeeze into tiny spaces.



Dust mite

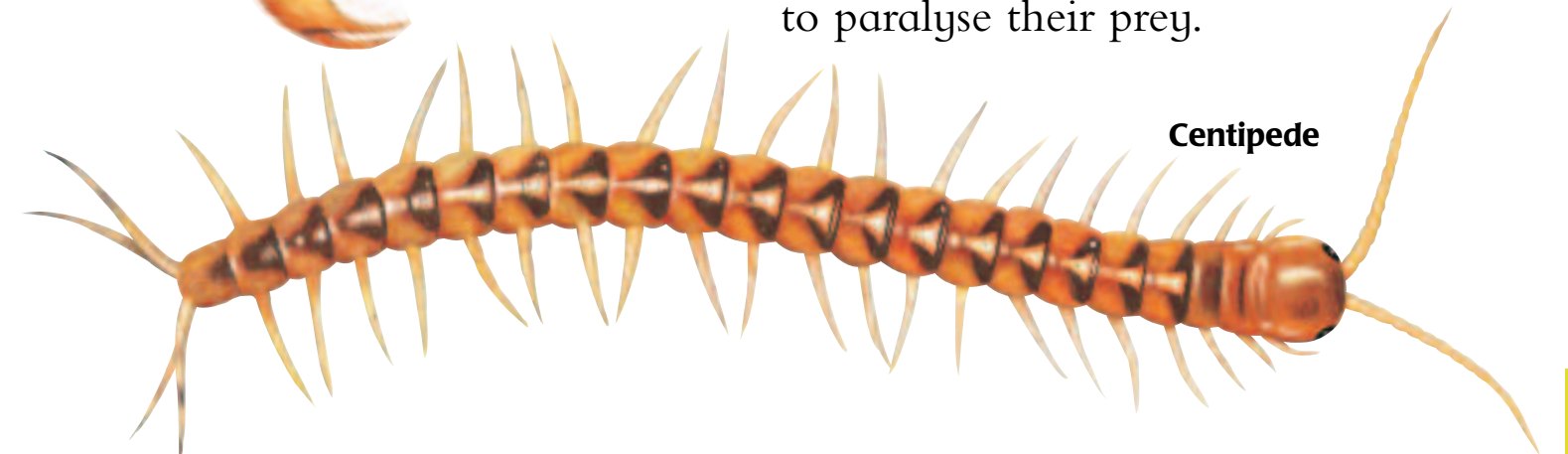
Scorpions have many segments in their bodies. At the rear end, there is a sting used both in self-defence and to kill prey held in their pincers.



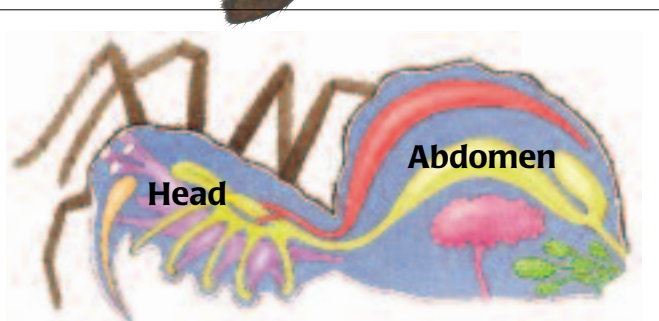
Scorpion

CENTIPEDES

Centipedes prey on other creatures. They can run quickly, their bodies waving from side to side as they scuttle along on their long legs. They use the venom glands on their heads to paralyse their prey.



Centipede



INSIDE A SPIDER

This is a cross-section inside a spider's body. The head contains the brain (purple) and stomach (yellow). The other digestive organs (also yellow) heart (red) silk glands (green), ovary (pink) are in its abdomen.

HOW A SPIDER SPINS ITS WEB

MANY spiders catch their prey by spinning webs. These can be of a great variety of shapes, including delicate spirals, irregular cobwebs or thick funnels.

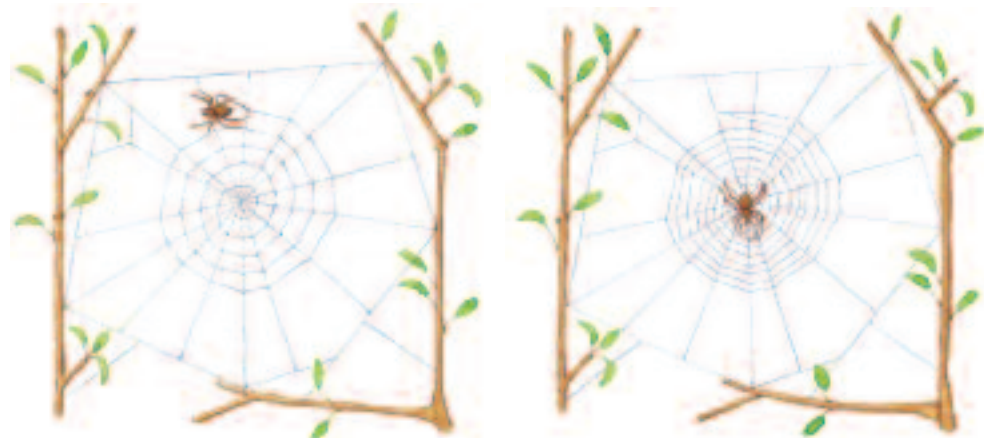
Once an insect is caught in the web, the spider can tell exactly where it is by feeling the vibrations using the hairs on their legs. It then hurries to claim its victim.



First, the spider joins two branches with a line of silk.

A vertical line anchors the web at the bottom.

Radiating lines are linked together at the central hub.



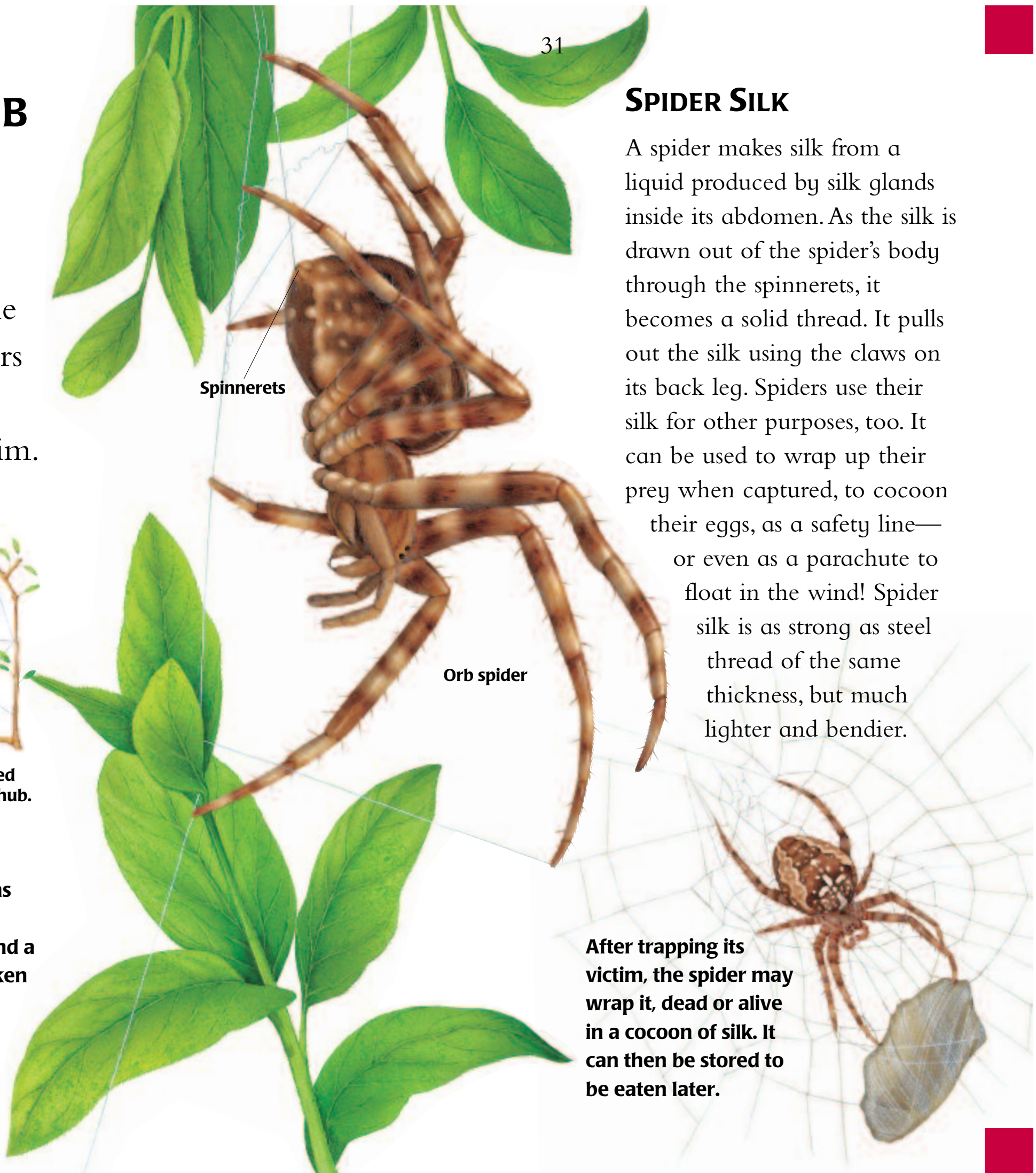
Finally, the spider lays down the sticky spiral strands.

The spider waits for its first victim in the dry centre.

The orb spider, often found in gardens, spins webs like these. They usually only last around a day before being broken by wind or rain. It can take as little as an hour for the spider to make a new one.

SPIDER SILK

A spider makes silk from a liquid produced by silk glands inside its abdomen. As the silk is drawn out of the spider's body through the spinnerets, it becomes a solid thread. It pulls out the silk using the claws on its back leg. Spiders use their silk for other purposes, too. It can be used to wrap up their prey when captured, to cocoon their eggs, as a safety line—or even as a parachute to float in the wind! Spider silk is as strong as steel thread of the same thickness, but much lighter and bendier.



After trapping its victim, the spider may wrap it, dead or alive in a cocoon of silk. It can then be stored to be eaten later.

INDEX

A

abdomen 6, 12, 19, 28, 31
antennae 6-7, 10, 20
ants 4-5, 12-13, 16-17, 26
 nests of 5, 12-13, 16-17
 worker 16
aphids 10
arachnids 28

B

bees 4-5, 8, 12, 14-15
 nests of 12, 14-15
 swarm of 15
 worker 14-15
beetles 4-5, 10-11
bird-eating spiders 28-29
birdwing butterflies 21
black widow spider 29
bugs 26
bush cricket 8
butterflies 4-5, 9, 20-21, 22-23
 life cycle of 22-23, 27

C

camouflage 8-9
caterpillars 5, 20-21, 22-23
cecropia moth 20
centipedes 4-5, 29
chrysalis 22
cockchafer 10
cockroaches 26
cocoon 17, 20, 22-23, 31
colonies 12, 14-15, 18-19
compound eyes 7

D

dog flea 26
dragonflies 4, 27

drones 14
dung beetle 11
dust mite 29
E
earthworms 4-5
earwigs 26
elegant grasshopper 9
exoskeletons 7
eye markings 8-9

FG

fleas 26
flies 5, 24-25, 26
flower mantis 8
grasshoppers 9
great diving beetle 4, 11

H

harlequin longhorn beetle 10
hawkmoth 20
hawthorn shield bug 26
headlouse 26
hercules moth caterpillar 9
hissing cockroach 26
honey 14-15
honeybees 14-15
hoverfly 9

IJK

insects 4-27
 and humans 24-25, 26
 body parts of 6-7, 24
 colours of 8-9, 10, 21
 disease-spreading 24-25
 eggs of 11, 12, 14-15, 16-17, 19, 22-23, 27
 flight in 10-11, 16, 19, 20, 22-23, 27
 groups of 10, 26-27
 markings of 8-9, 20
 pollen-spreading 24

predators 8-9, 11, 27
 senses of 7, 10
invertebrates 6
jumping spiders 28
king termite 18-19

L

ladybird 10
larvae 11, 15, 16-17
luna moth 20

M

malaria 25
mayfly 4
microscopic creatures 4
milkweed 22
millipedes 5, 29
mites 28-29
monarch butterfly 22-23
Morgan's sphinx hawkmoth 20
mosquitoes 24-25
moths 5, 20-21
myriapods 29

NO

nectar 8, 14, 20
nutrients 4
nymphs 27
orb spider 30-31

P

parasitic wasp 6
passion vine butterfly 21
pedipalps 28
pests 10
poison 18, 21, 29
pollen 14-15, 24
pondskater 4
praying mantis 27
proboscis 20, 25
pupae 15, 17
purple emperor butterfly 9

QR

Queen Alexandra birdwing butterfly 21
queen ant 16-17
queen bee 14-15
queen termite 18-19
rhinoceros beetle 10

S

scorpions 28-29
shield bugs 26
silk 17, 20, 28, 30-31
silkmoth 20
slugs 5
snails 5
soil 4-5
soil mites 4
soldier termites 18
spiders 4-5, 28-31
 and humans 29
 body parts of 28
 webs of 28, 30-31
spinnerets 31
springtails 4
stick insects 8
stings 12, 29
swallowtail butterfly 21

T

tarantula hawk wasp 12
tarantula spiders 12
tarsus 6
termites 13, 18-19
 nests of 18-19
 worker 18-19
thorax 6-7, 12
tiger beetle 11
tsetse fly 24

W

wasps 6, 12
 nests of 12
water boatman 4
water stick insect 4
wax 14-15
woodlice 5