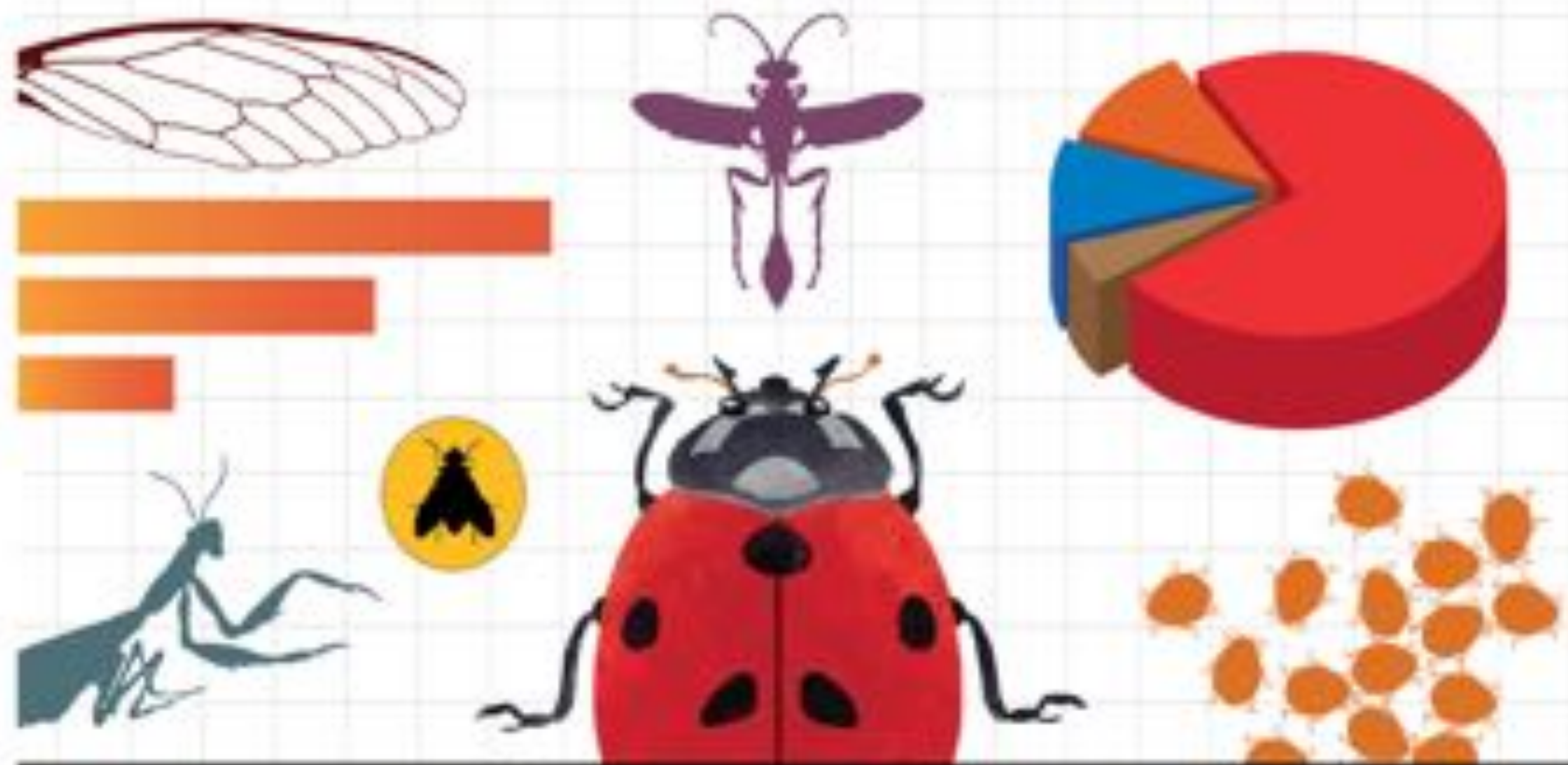
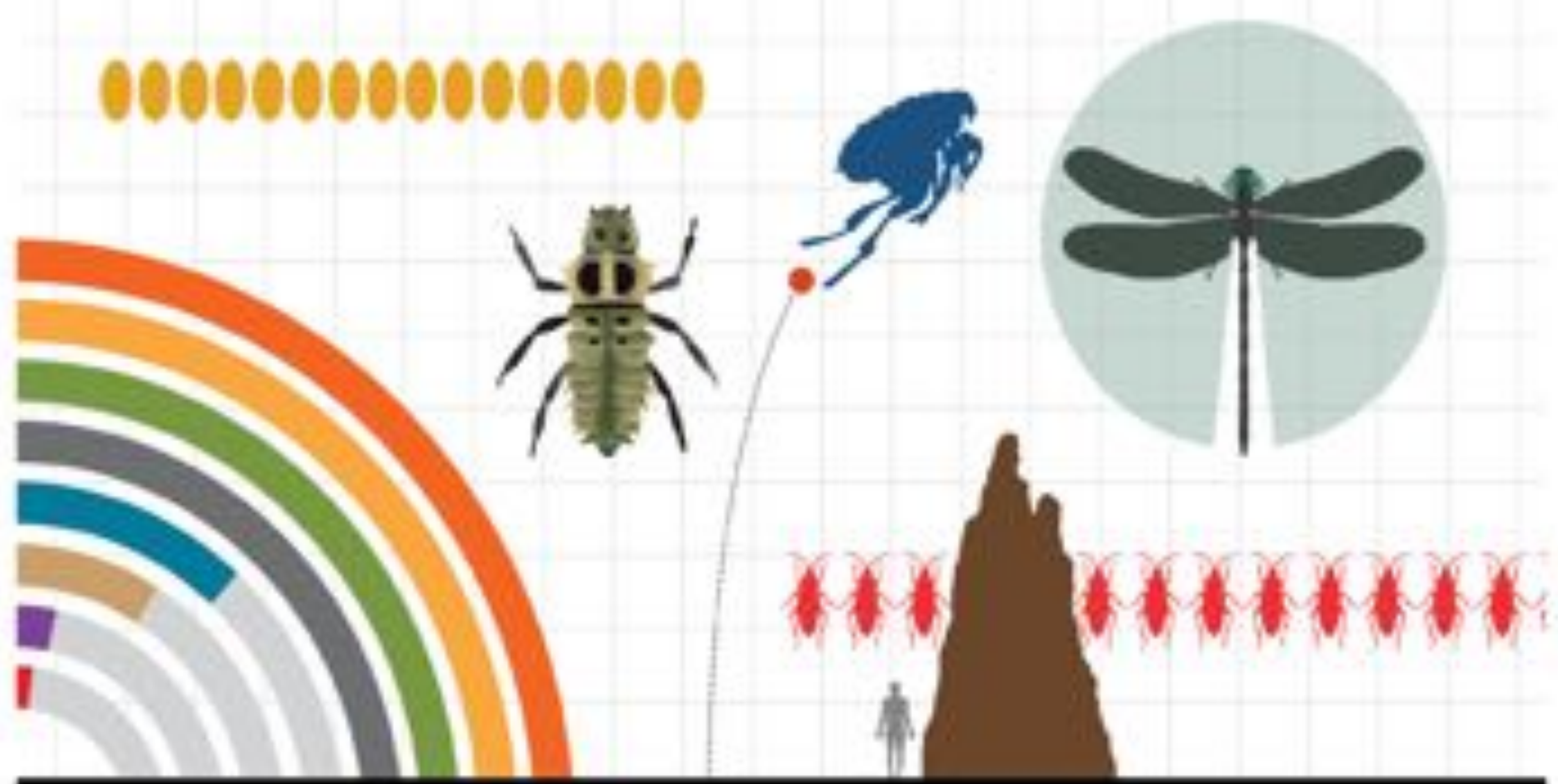


A BOOK OF INFOGRAPHICS



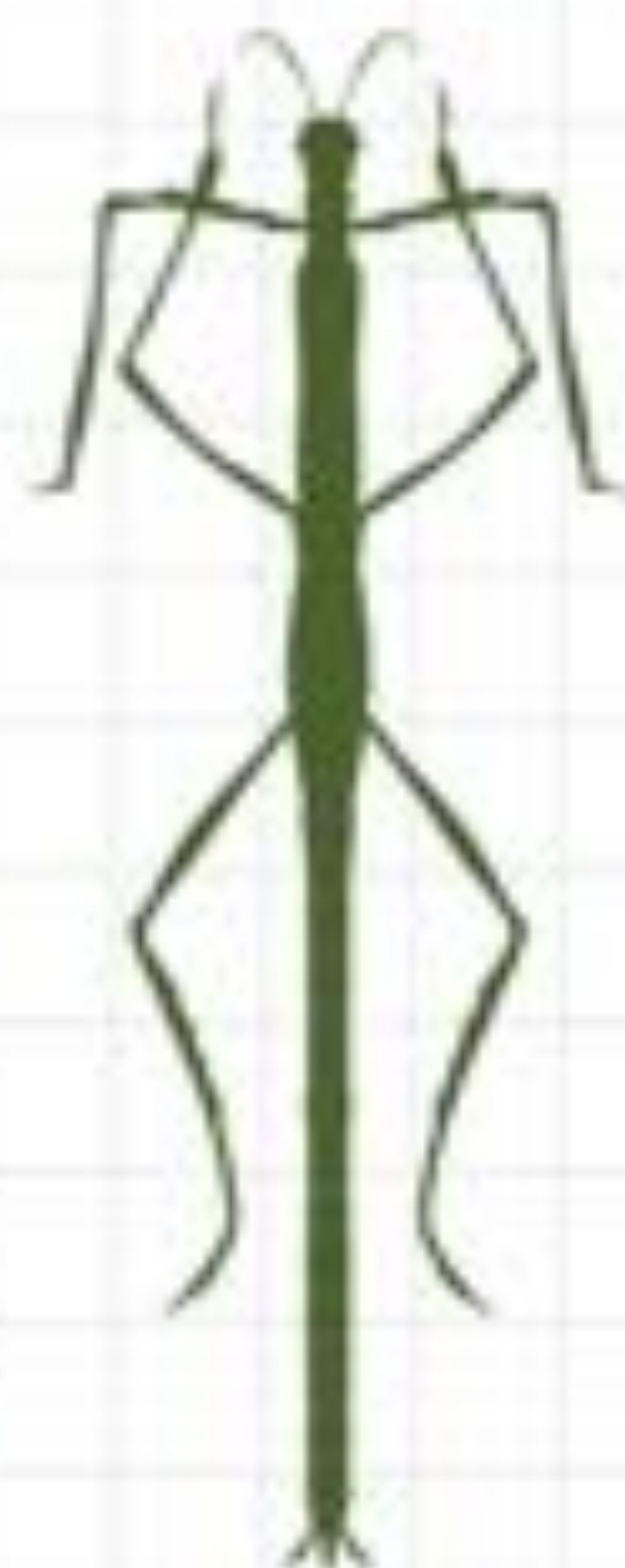
INSECTS

BY THE NUMBERS



STEVE JENKINS

A BOOK OF INFOGRAPHICS



INSECTS

BY THE NUMBERS



STEVE JENKINS

HOUGHTON MIFFLIN HARCOURT • BOSTON • NEW YORK

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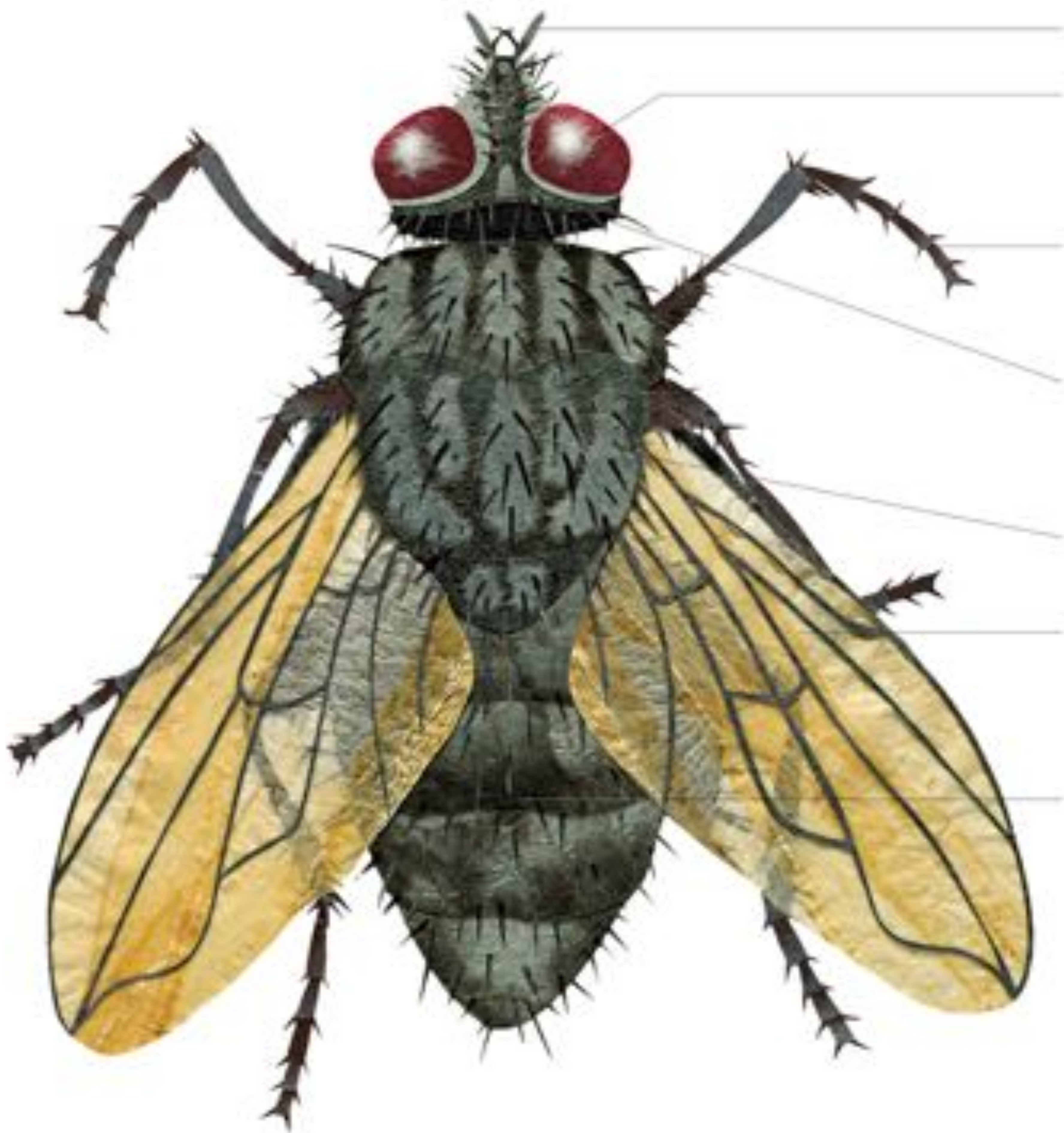
Insects are, by far, the most common kind of animal on Earth. They have been here for hundreds of millions of years, and they'll probably be here long after we are gone. Insects come in an amazing range of colors, shapes, sizes, and abilities. Most are harmless to humans, but a few can be deadly. In fact, the most dangerous animal on Earth is an insect.

The [infographics](#) in this book—maps, graphs, and diagrams—help us explore the fascinating world of these six-legged creatures.



* Words in blue can be found in the glossary on page 38.

What is an insect?



Actual size of a housefly

Insect parts

Insects have two antennae . . .



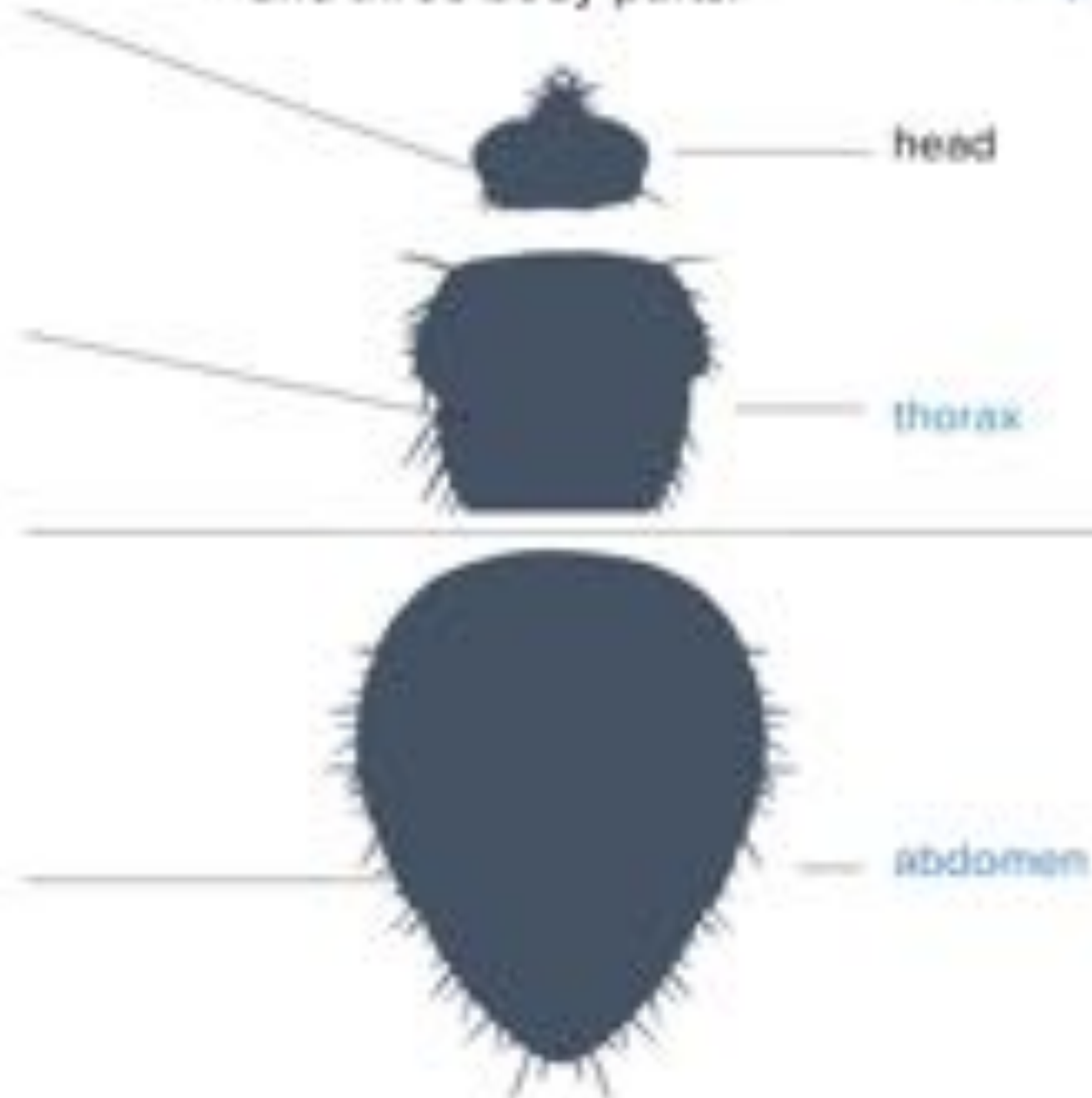
two compound eyes, each with many tiny lenses . . .



six legs . . .



and three body parts.



Most insects have wings.

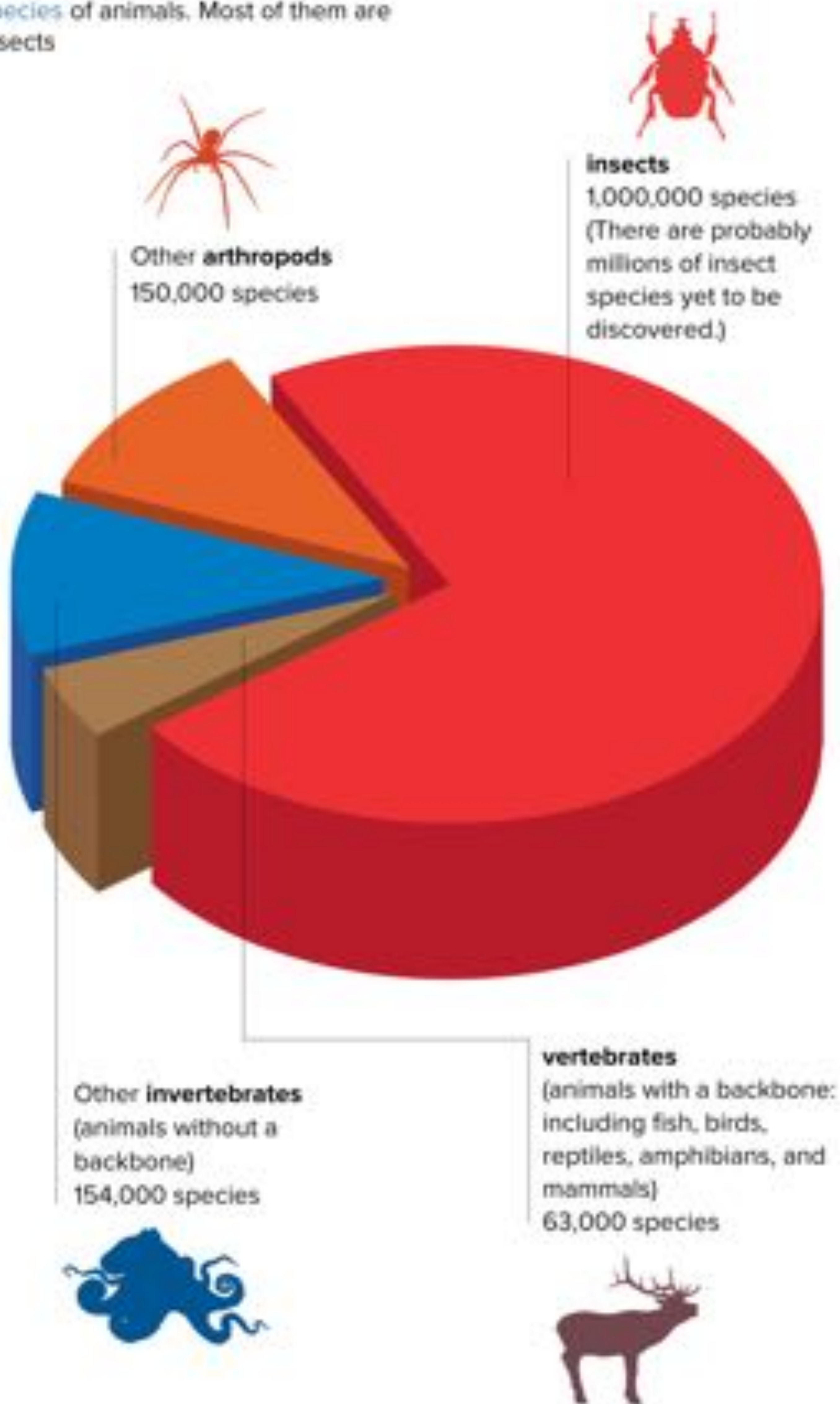
Insects are members of a large group of animals called arthropods.
(These animals are all arthropods.)

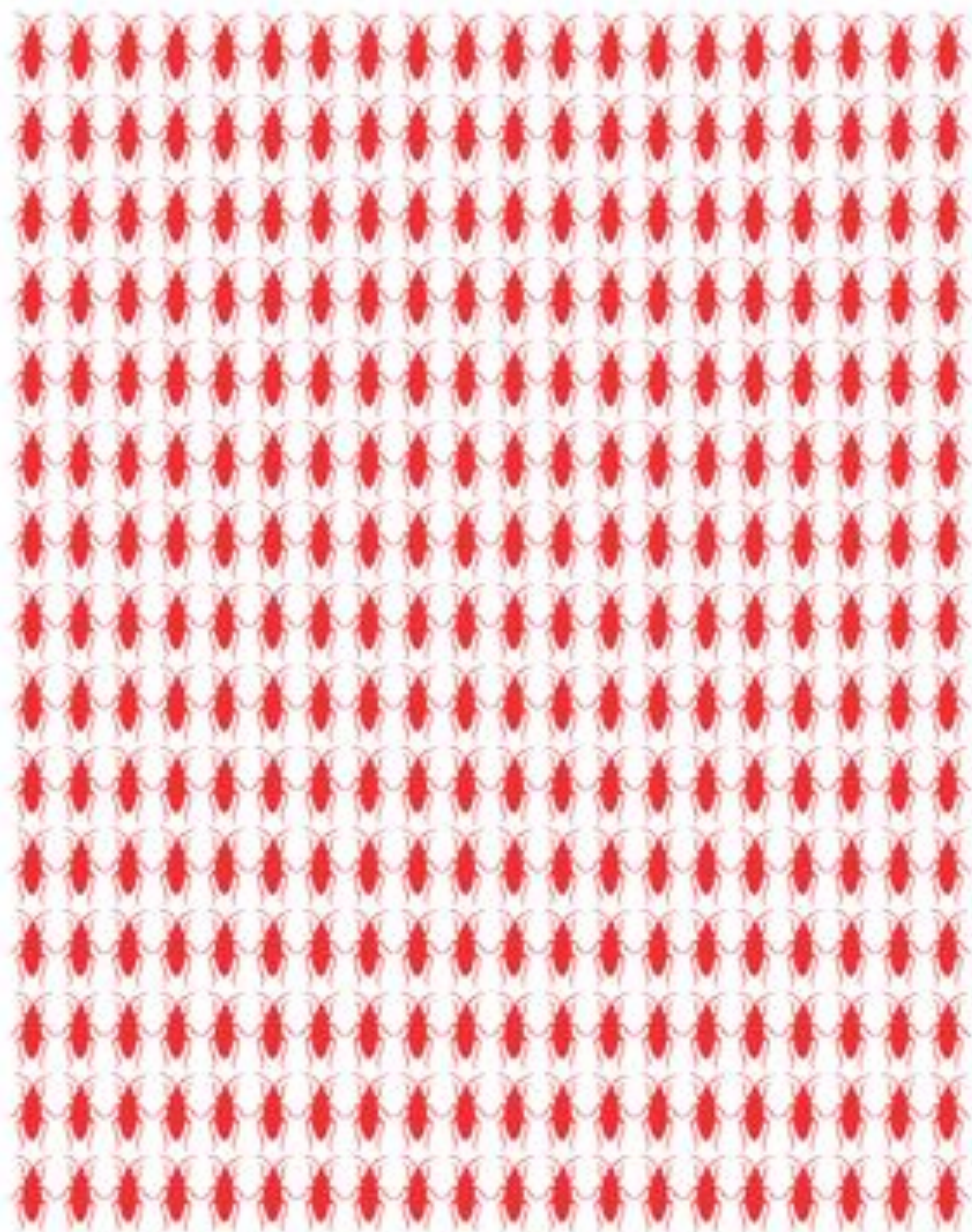


Arthropods have a hard outer covering instead of bones. They have bodies that are divided into segments. And they have lots of legs.

How many insects?

There are almost 1,400,000 named species of animals. Most of them are insects





= one pound (454 grams)
of insects



= one pound (454 grams)
of humans

For every pound (454
grams) of human on
Earth, there are an
estimated 300 pounds
(136 kilograms) of
insects.



Insects large and small

These insects are shown at actual size.



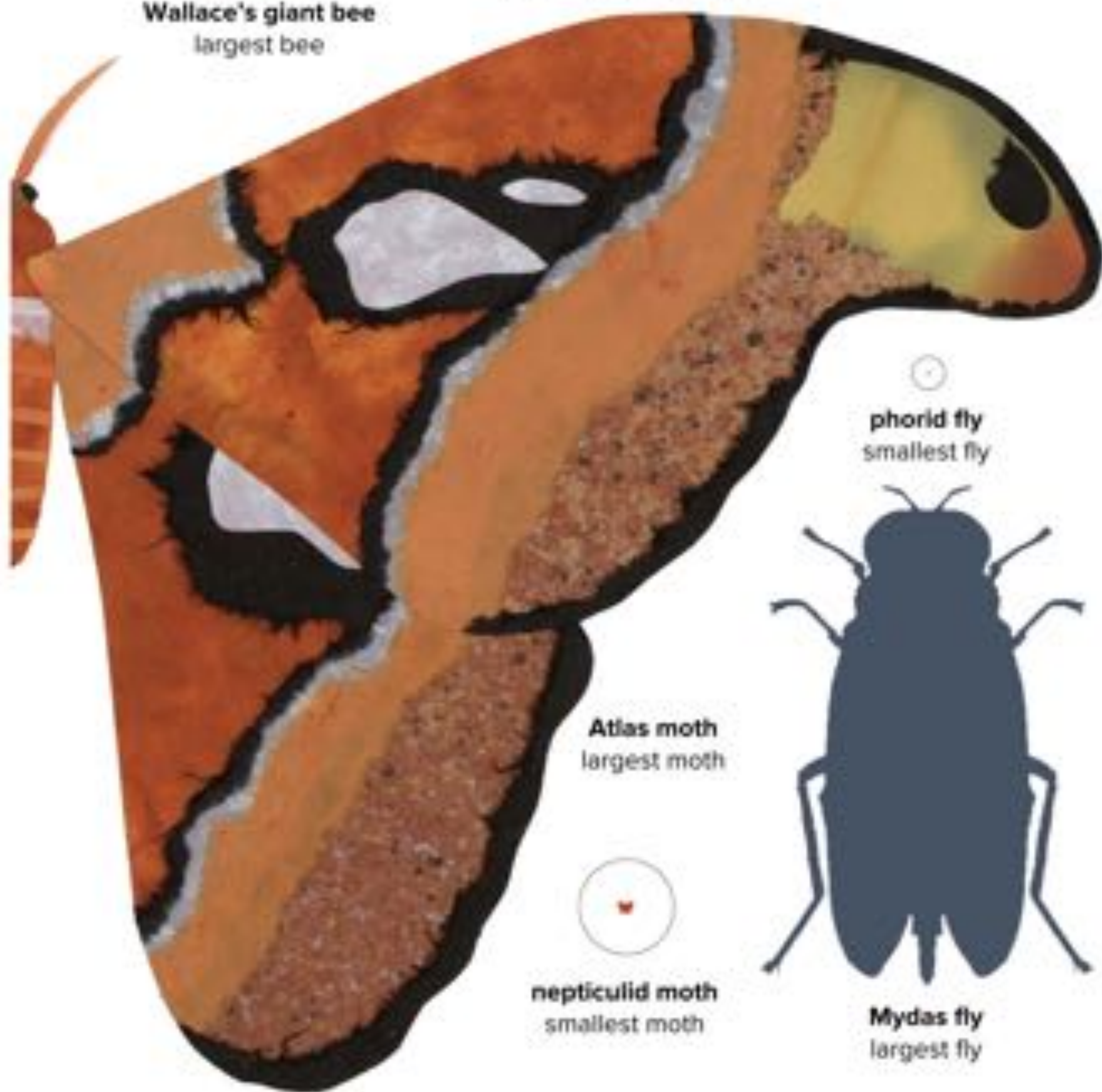
Wallace's giant bee
largest bee

④
Perdita minima
smallest bee



Japanese giant hornet
largest wasp

fairyfly wasp
smallest wasp
(and smallest insect)



Atlas moth
largest moth

⑤
nepticulid moth
smallest moth

⑥
phorid fly
smallest fly



Mydas fly
largest fly



giant weta
relative of the cricket

ant-loving cricket
smallest cricket



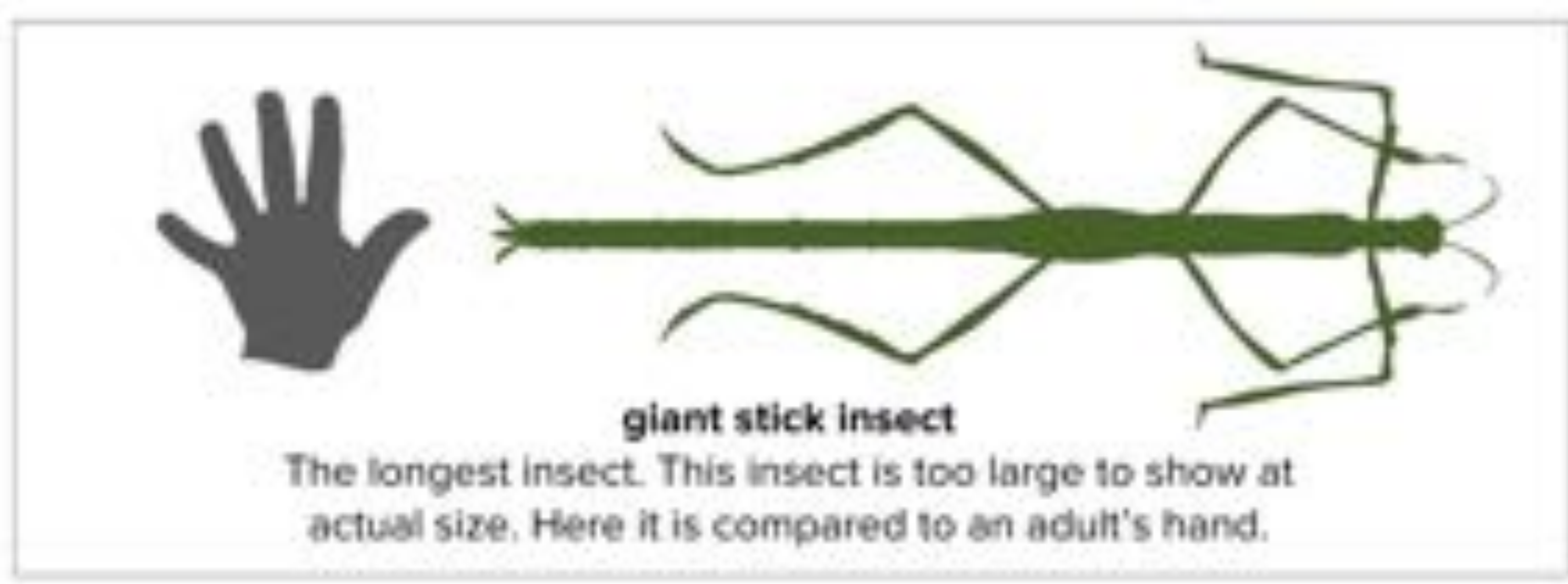
giant Amazonian ant
largest ant



thief ant
smallest ant



Cristina's timema
smallest walking stick insect



giant stick insect

The longest insect. This insect is too large to show at actual size. Here it is compared to an adult's hand.

Meet the beetles



There are more beetles than any other kind of insect. In fact, almost one out of every four animals on Earth is a beetle.



A tiger beetle, one of more than 350,000 beetle species



A life-size tiger beetle

Beetles come in many different shapes and sizes. These beetles are shown life-size.

○ featherwing beetle

smallest beetle

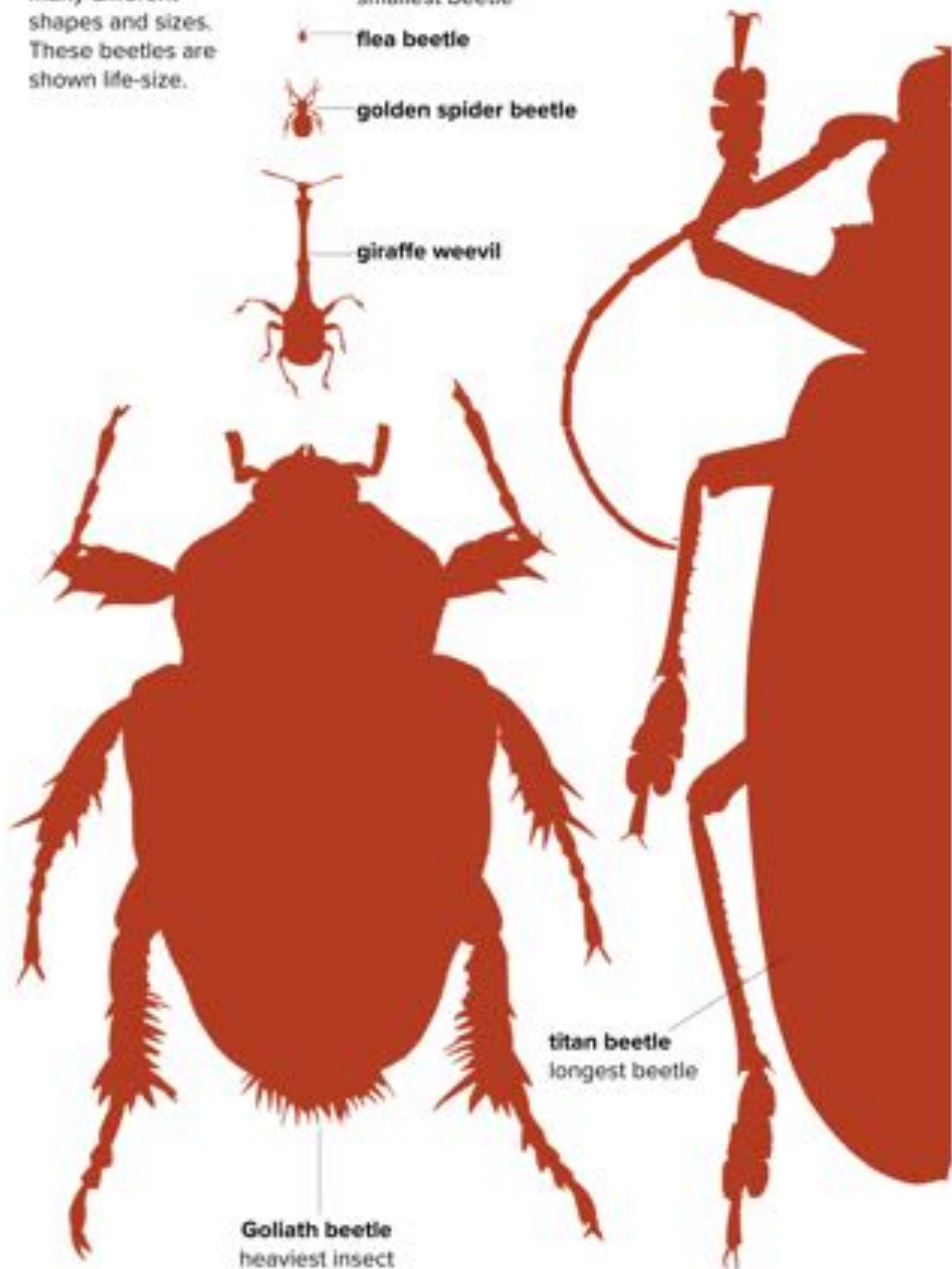
● flea beetle

● golden spider beetle

● giraffe weevil

● titan beetle
longest beetle

● Goliath beetle
heaviest insect



Insect flight

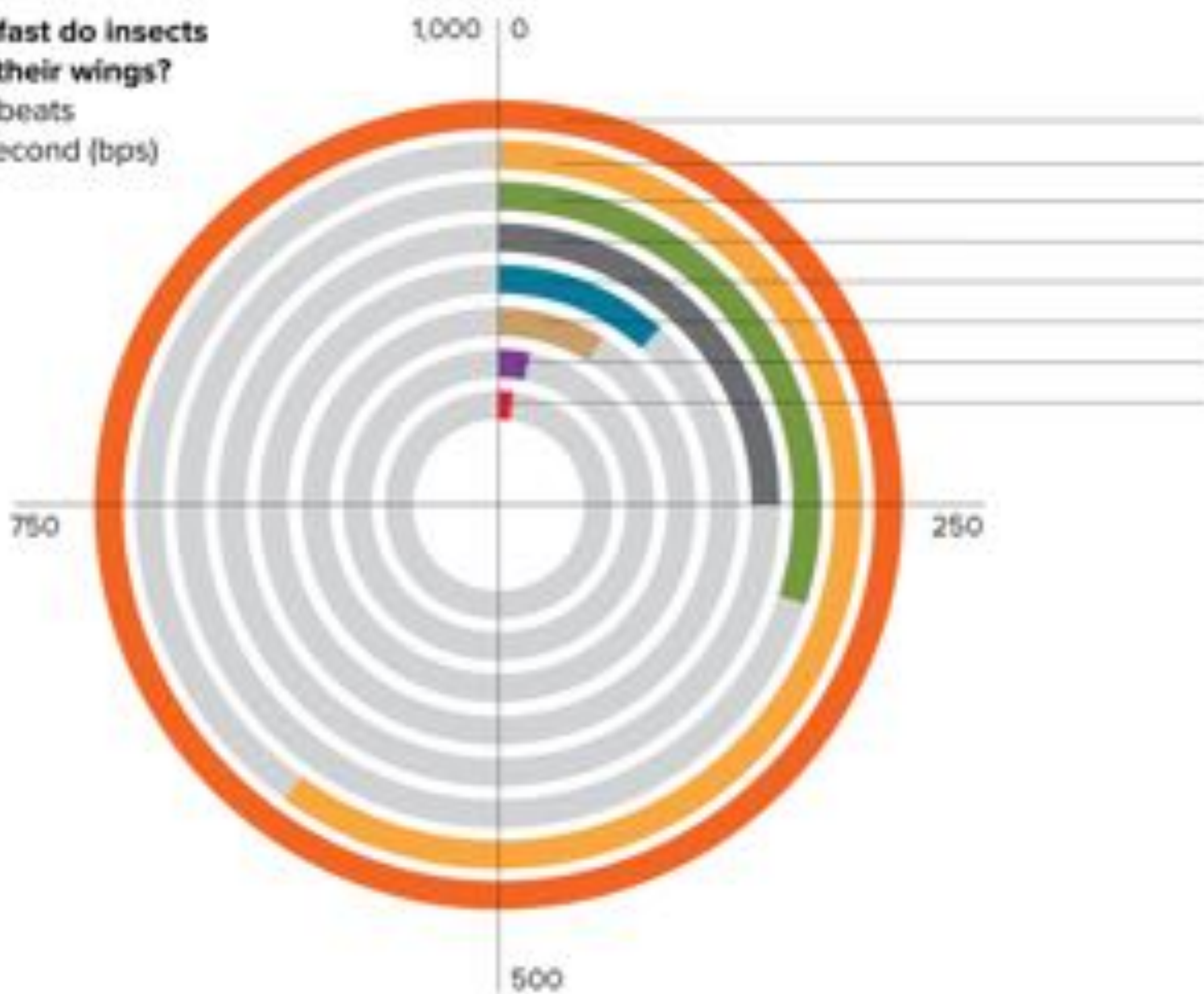


Insects were the first flying animals. This giant dragonfly lived about 300 million years ago.

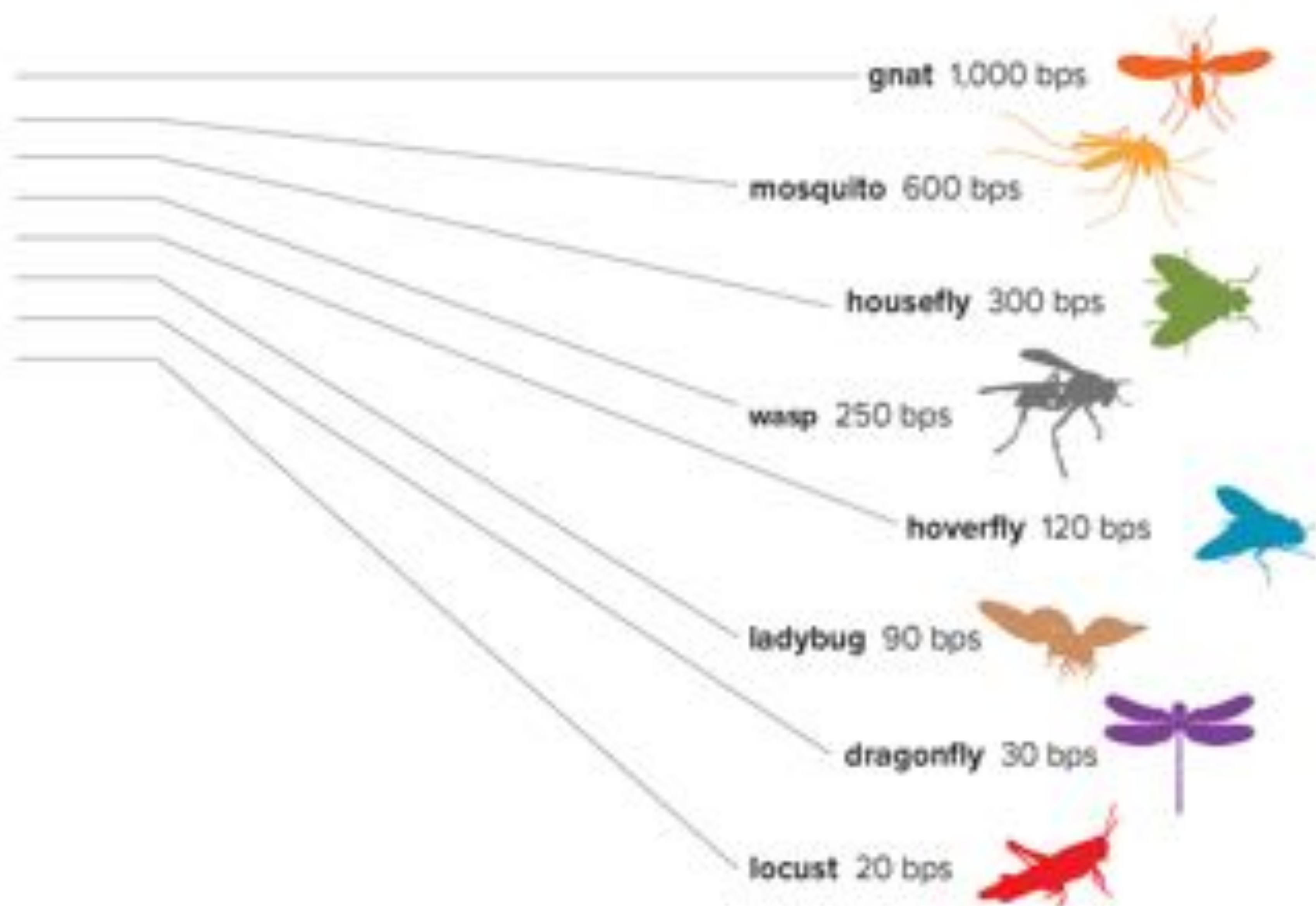
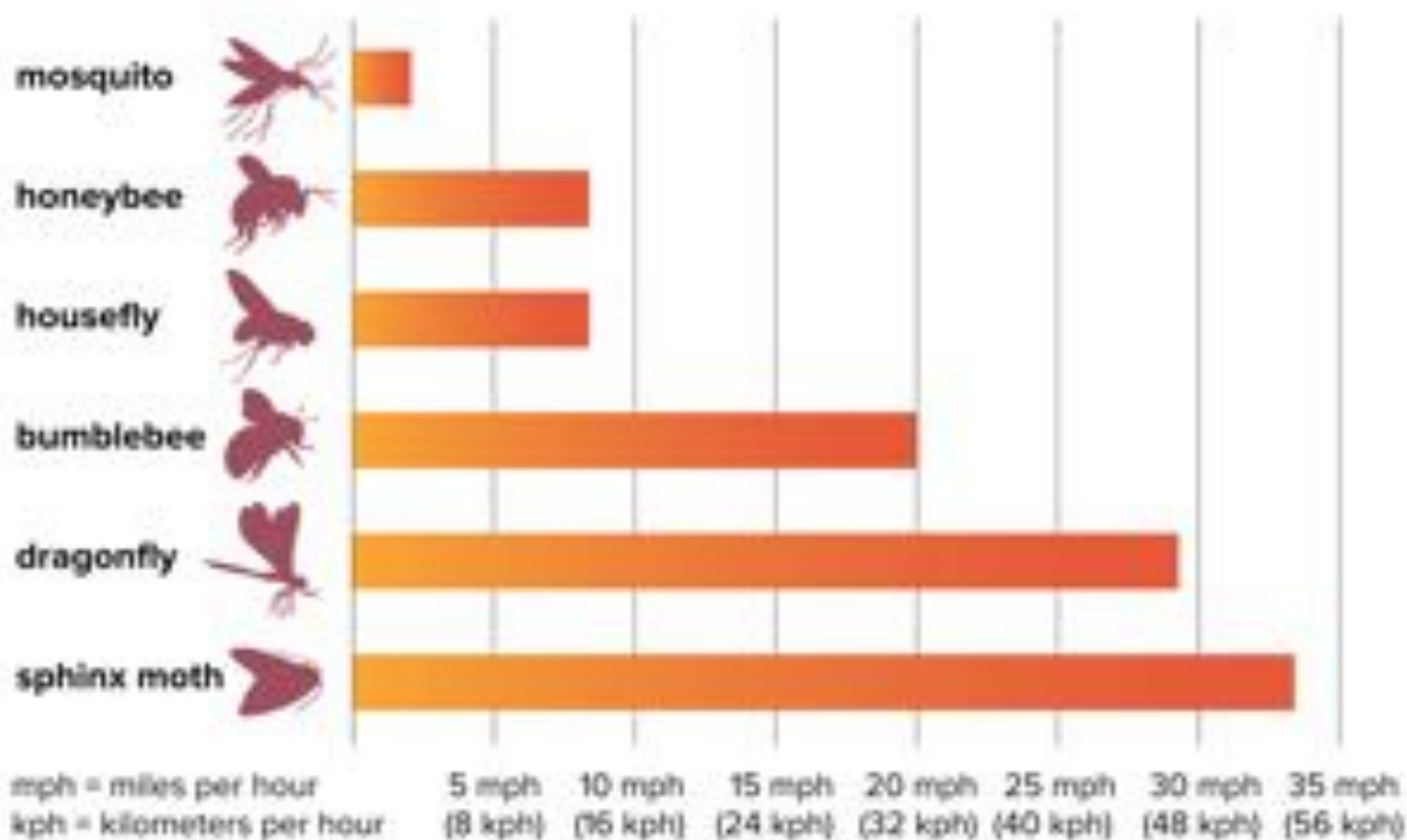


An ancient dragonfly compared to a human

How fast do insects beat their wings?
wing beats per second (bps)

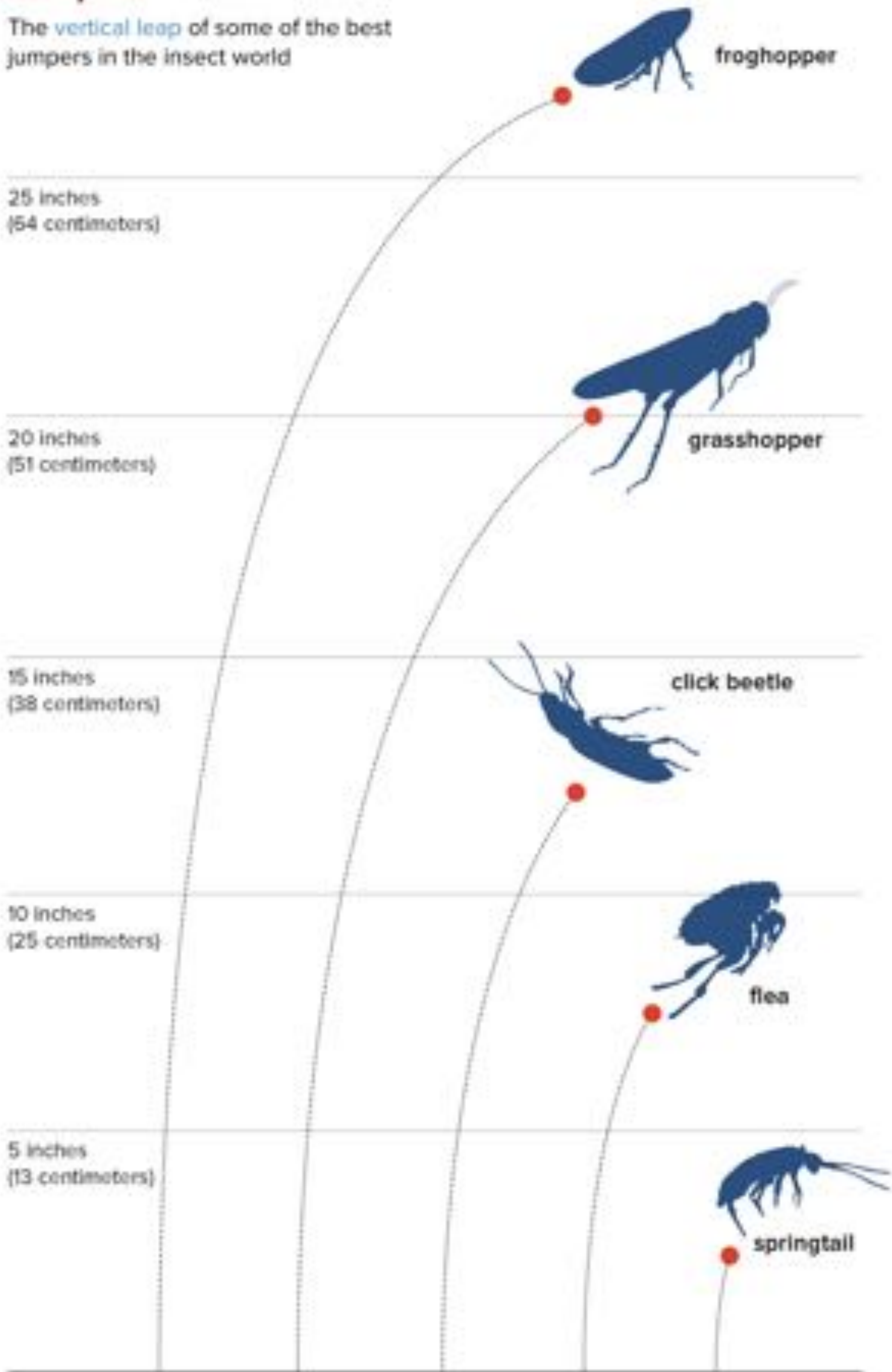


How fast do insects fly?

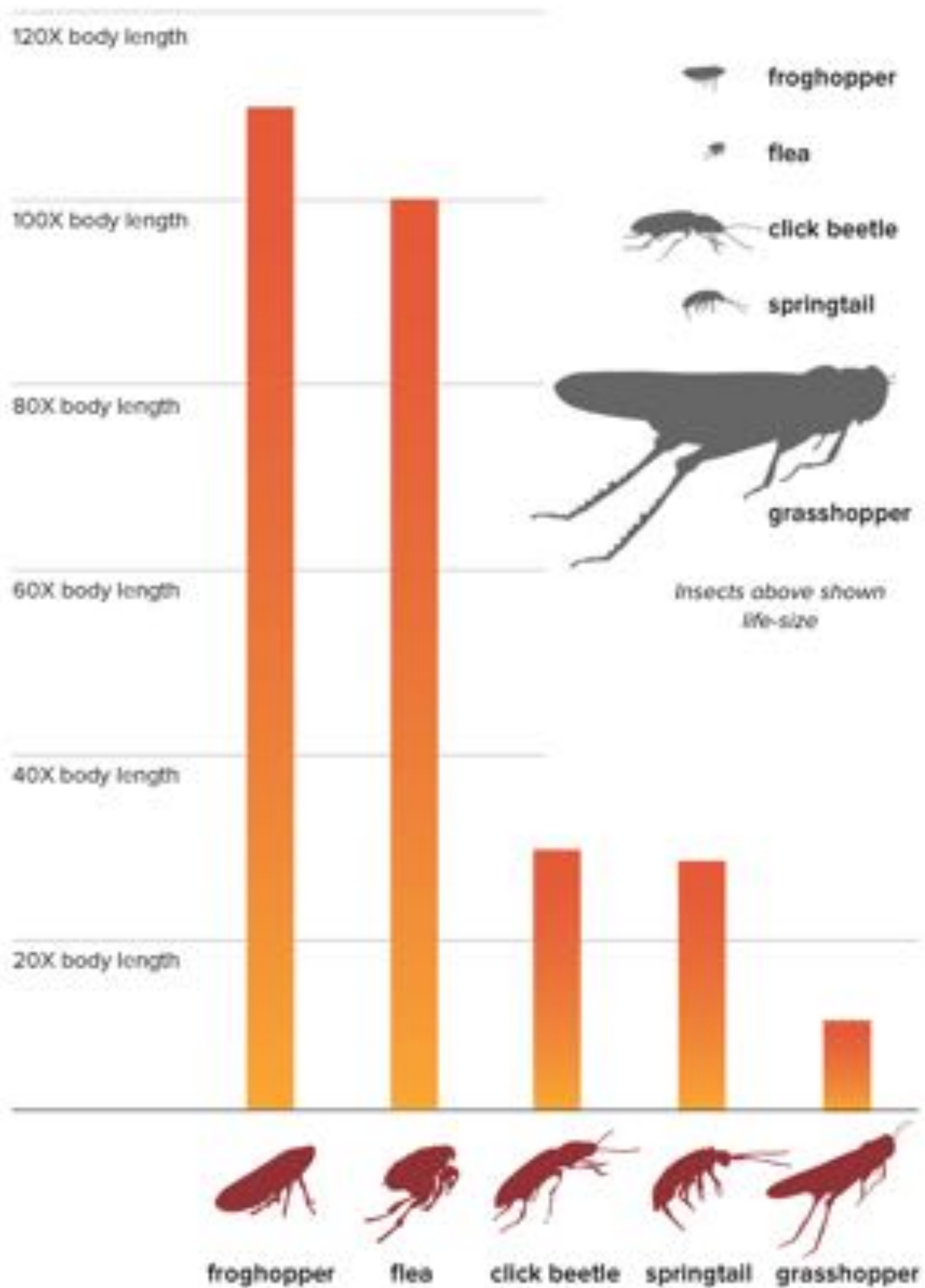


Jumpers

The vertical leap of some of the best jumpers in the insect world



The height of an insect's jump compared to its body length



Ouch!

Many insects defend themselves with a venomous sting. A scientist named Justin Schmidt created the **Schmidt Sting Pain Index**. It uses a scale of 1 to 4 to rate the pain of insect stings.

Sting Pain Index: 1

Slight pain, lasts only a few minutes.



sweat bee



Sting Pain Index: 2

Hot, searing pain. Lasts for up to ten minutes.



honeybee



Other insects with Level 1 stings



twig ant



western paper wasp

Other insects with Level 2 stings



trap-jaw ant



yellow jacket

These insects are shown life-size.

In his work as an entomologist—a scientist who studies insects—Justin Schmidt was stung by more than 100 different kinds of bees, wasps, and ants.

Sting Pain Index: 3

Severe pain. Lasts for up to thirty minutes



velvet ant

(This insect is actually a wasp.)



actual size

Sting Pain Index: 4

Intense, blinding pain. Almost unendurable. Pain may be brief or last for up to twenty-four hours.



tarantula hawk

(shown actual size)

Another insect with a Level 3 sting



giant bull ant

Special mention



bullet ant

This ant gets a 4+ on the Sting Pain Index. The sting of this ant is said to feel like getting shot.

Deadly insects

The size of each circle represents the estimated number of humans killed by insects each year.



fire ant
30 deaths



**Japanese
giant
hornet**
40 deaths



bee
100 deaths



Cause of death



venom or
allergic
reaction



deadly disease
carried by insect



mosquito
1,000,000 deaths

The insect life cycle

Most insects go through several life stages. This process is called metamorphosis.

The life cycle of the ladybird beetle, or ladybug



A female ladybug lays about 50 eggs at a time.



Ladybugs **hibernate** during the winter. They often cluster together in groups that include thousands of beetles.



Ladybug eggs take five to seven days to hatch.



The adult stage of the ladybug. These beetles can live for a year or more.



The larva of a Hercules beetle, one of the largest insects



A larva hatches from the egg. After about three weeks, it will become . . .



Many insect larvae, including the ladybug's, go through several stages as they grow.

. . . a pupa. In about two weeks, it will become an adult beetle.

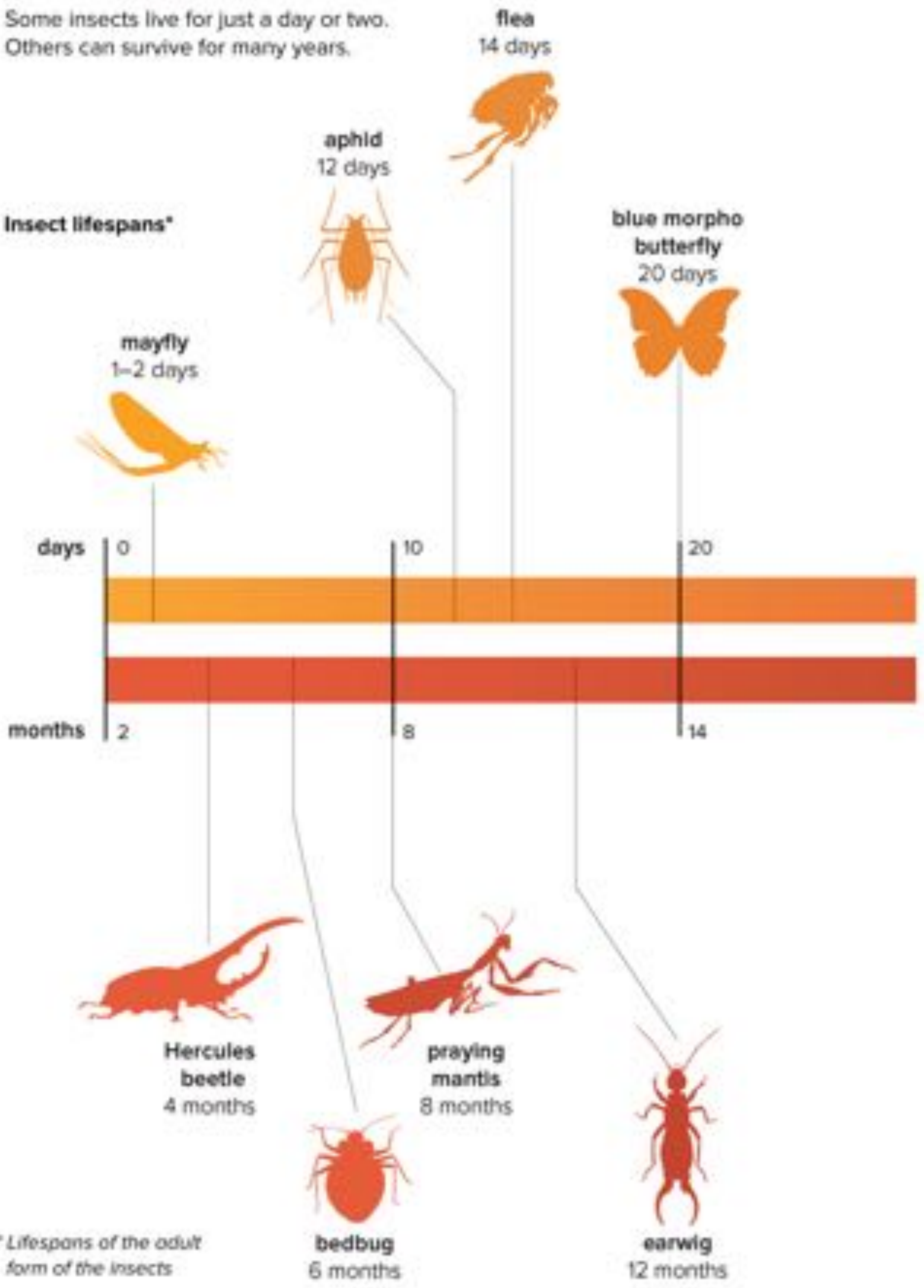


A butterfly pupa is called a chrysalis.

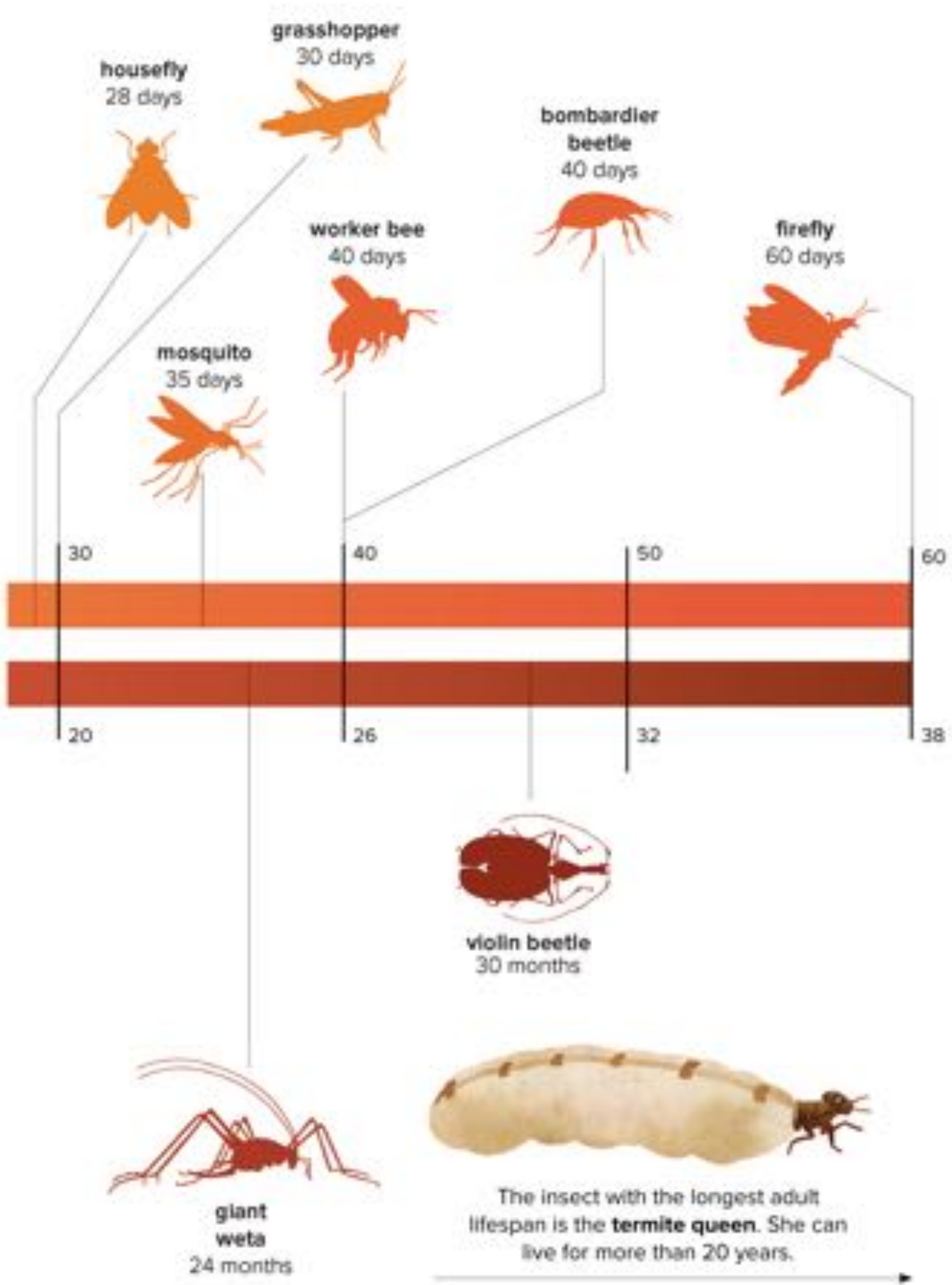
Insect lifespans

Some insects live for just a day or two. Others can survive for many years.

Insect lifespans*



* Lifespans of the adult form of the insects



violin beetle
30 months

giant weta
24 months

The insect with the longest adult lifespan is the **termite queen**. She can live for more than 20 years.

Insect vision

Insect eyes are made up of many individual lenses. They are called compound eyes.



The **dragonfly** can almost see in a complete circle.

The compound eyes of the **walking stick insect** are enormous.



A flower as we see it (top) and as a **bee** might see it (bottom)

Some insects, such as the **rove beetle**, have extra eyes. They are simple and probably serve to detect light.



Glowing insects

A few insects are bioluminescent—they produce their own light.



The **railroad worm** is a beetle larva. It glows to warn predators that it is poisonous.



The **glowworm** is the larva of a fungus gnat. It lives in caves in New Zealand, where it dangles sticky glowing threads to capture flies.



On warm summer evenings, the **firefly** flashes on and off to attract a mate.

This **click beetle** glows to attract the flying insects it eats.



Fireflies are also called **lightning bugs**.



Noisy insects

To attract a mate, these insects make surprisingly loud sounds.

These insects are shown life-size.



The shape of the mole cricket's burrow makes its call louder.



mole cricket
The mole cricket rubs its wings against its legs to make a sound.



water boatman
The loudest animal on Earth for its size



cicada
The loudest insect humans can hear



katydid
The sound it makes is too high-pitched for human ears to hear.

120 decibels

110 decibels

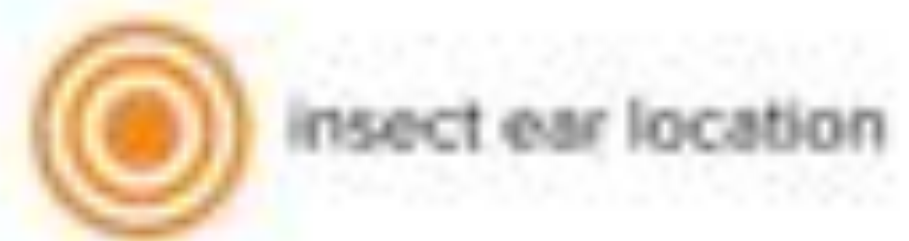
100 decibels

90 decibels



Insect ears

Most insects are deaf. The ones that can hear have ears on different parts of their body.



scarab beetle



tiger beetle



cricket



hawk moth



praying mantis



water boatman



mosquito



locust

These insects are not shown at actual size.

Insect builders

Many insects that live in colonies construct impressive nests.



paper wasps

Their nest is made of chewed-up wood pulp—a kind of paper.



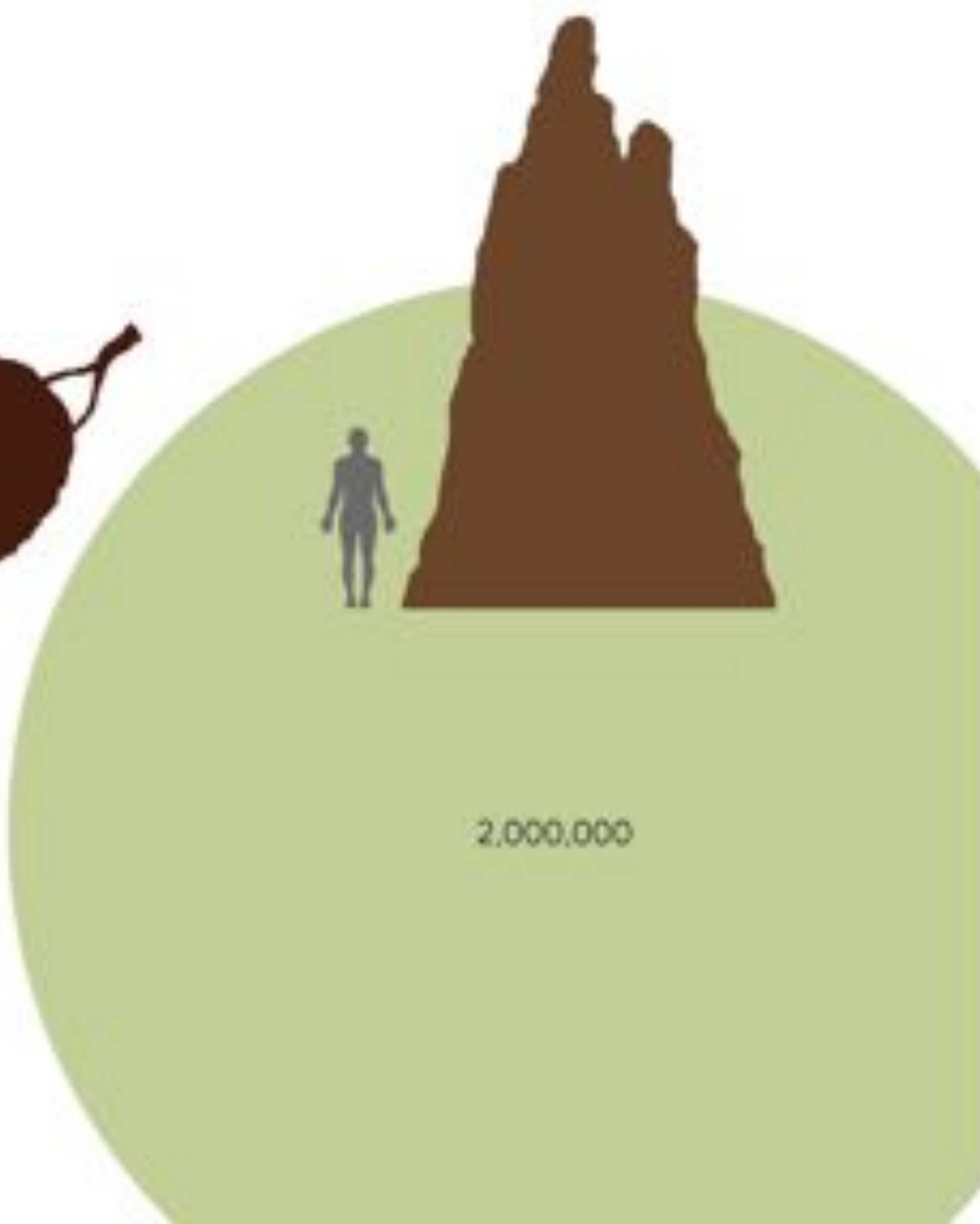
mound-building termites

They build towering nests made of mud and saliva.



How many insects live in a nest?

800



2,000,000



fire ant

A pile of earth is formed as the ants dig out underground tunnels and chambers.



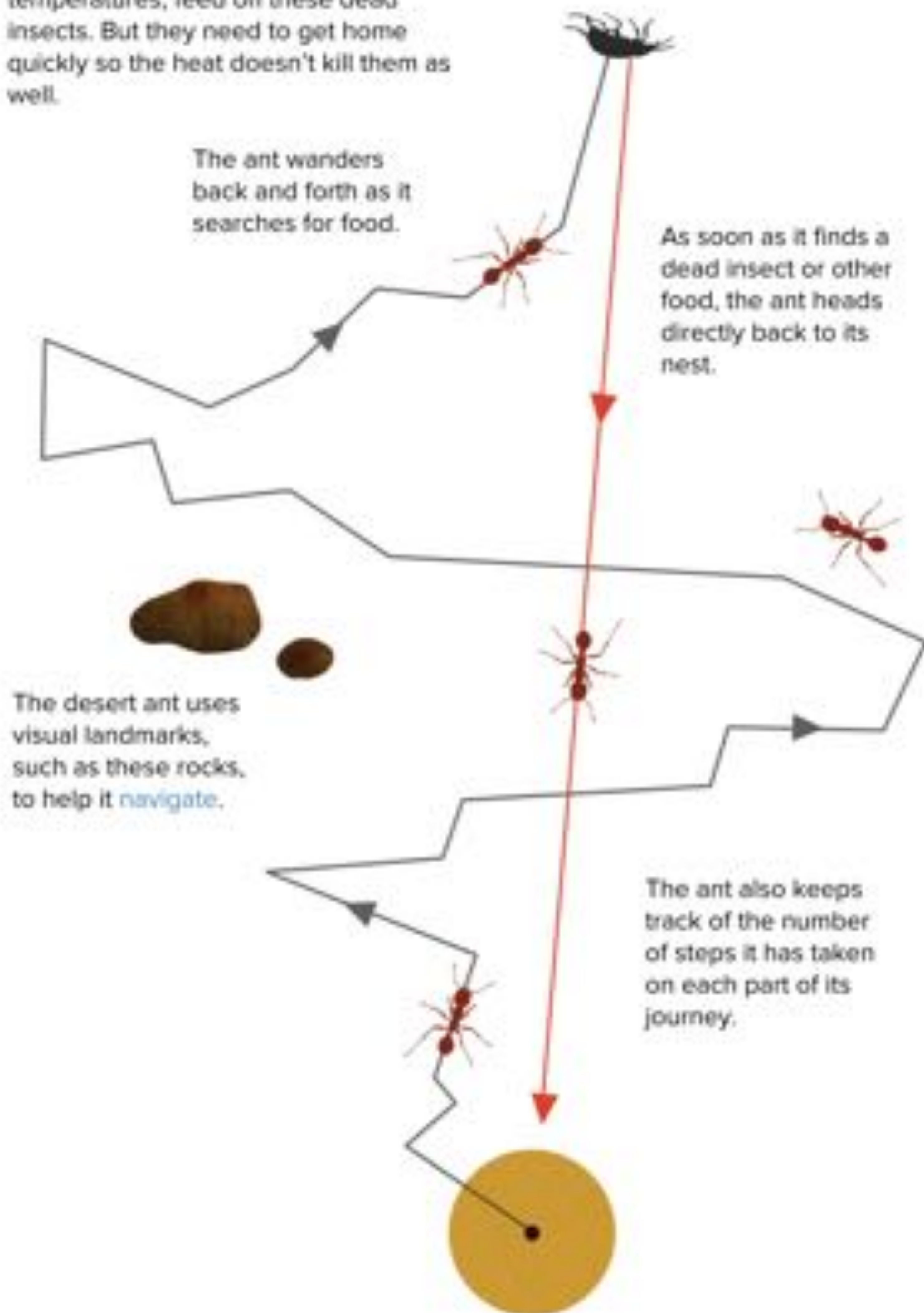
Africanized bees

These dangerous insects are also known as "killer bees." Their nests, or **hives**, can be attached to trees, rocks, or buildings.



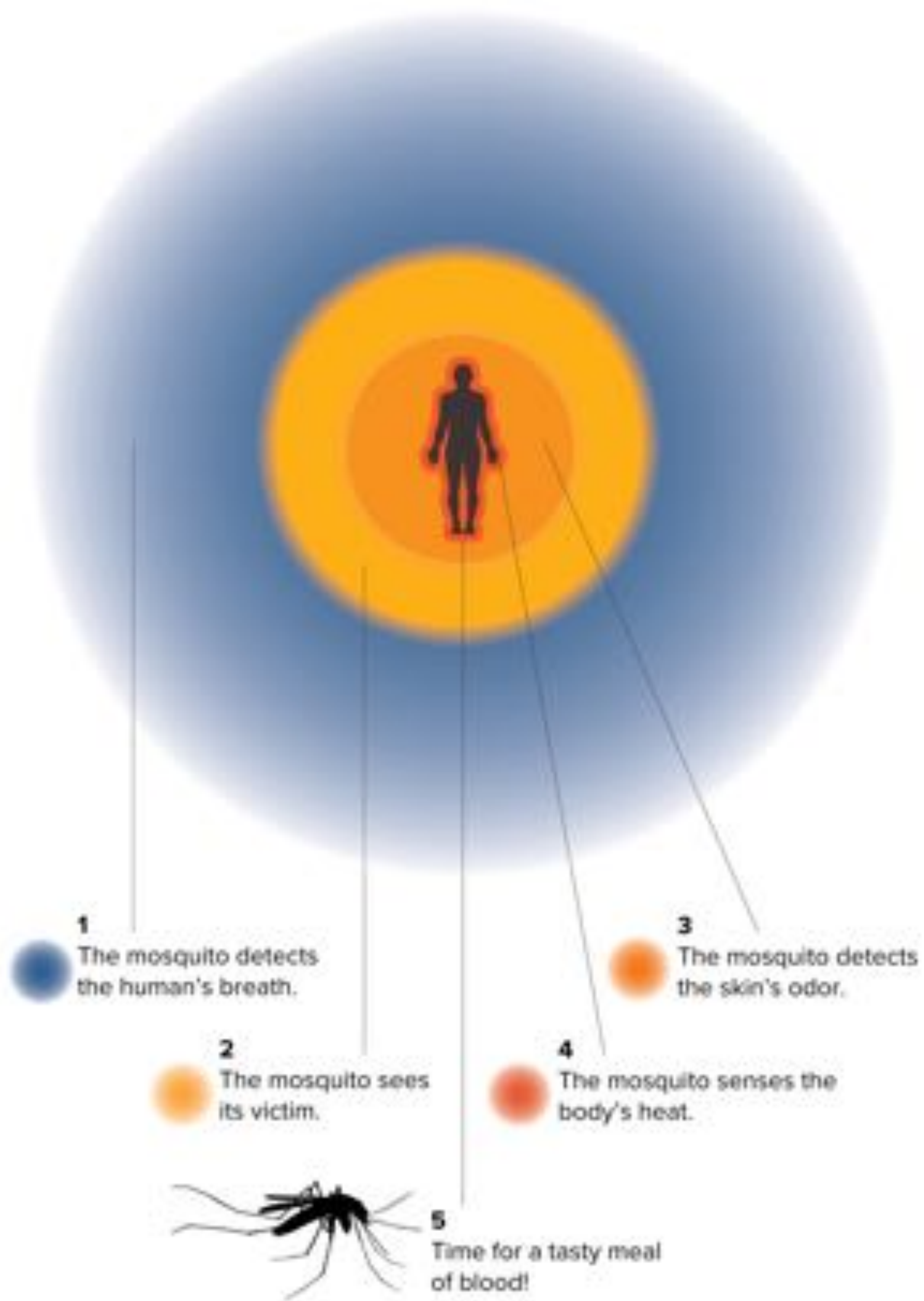
Finding home

Desert ants live where the ground gets hot enough to kill many insects. The ants, which can survive high temperatures, feed on these dead insects. But they need to get home quickly so the heat doesn't kill them as well.



Mosquito senses

A mosquito has several ways of finding a human to bite. Each method works at a different distance.



Insect migration

Some insects travel thousands of miles to find food, water, or a warm climate.


monarch butterfly _____


locust _____

painted lady butterfly _____

globe skimmer dragonfly _____




 The **monarch butterfly** flies south to Mexico in the winter and heads north in the spring. A single butterfly can't make the whole trip in its lifetime. It can take four generations of monarchs to complete the journey.

 **Locusts** migrate to find food, moving with the wind. In 1988, a swarm of locusts crossed the Atlantic Ocean.



 The **painte lady butterfly** stays warm during the winter in Africa. Its **descendants** return to northern Europe in the spring. It can take six generations of butterflies to make the round trip.

 The record for longest insect migration is held by the **globe skimmer dragonfly**. It makes a round trip from Africa to India and back, following seasonal rains.

Insect extremes



life-size

Highest insect

A colony of **bumblebees** was found at an elevation of 18,400 feet (5,608 meters) on Mount Everest.



Deepest insect

A tiny **midge**—a kind of fly—was discovered in a cave in Europe. It was living 3,215 feet (980 meters) below the surface.



life-size



The most eggs

A **termite queen** can lay 30,000 eggs a day for 20 years. She'll lay more than two hundred million eggs in her lifetime.

termite queen
and adult's
hand



Largest and smallest eggs

The largest insect egg is that of the **carpenter bee**. A **parasitic fly** lays the smallest egg. It's too tiny to see with the naked eye.



carpenter bee
and egg



The parasitic fly egg
is too small to see.

Fastest insect on land The **Australian tiger beetle** can run at more than 5½ miles per hour (9 kilometers per hour).



fastest human

27 mph (43½ kph)

6 body lengths/second



cheetah

70 mph (112½ kph)

16 body lengths/second



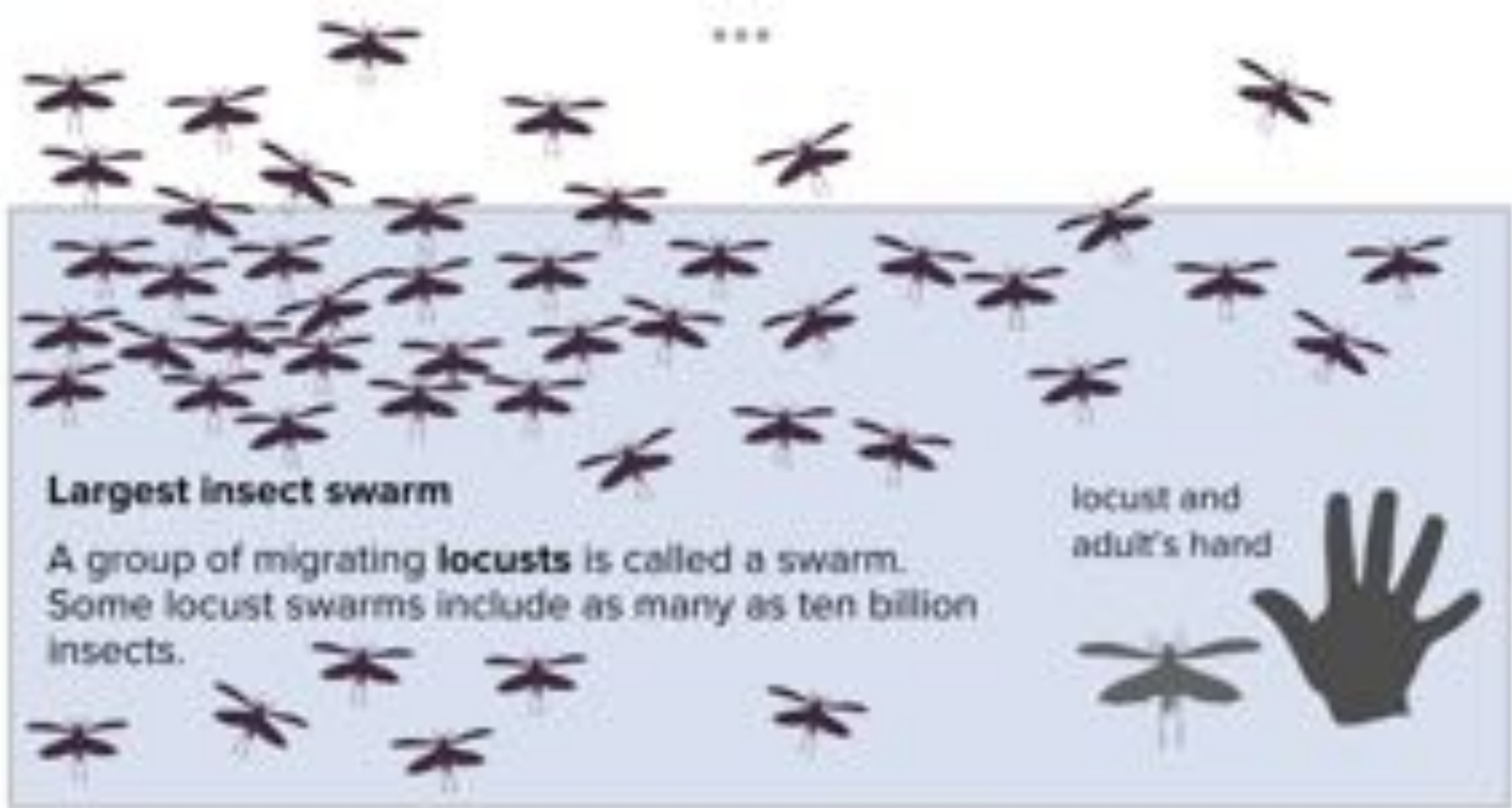
tiger beetle

5½ mph (9 kph)

120 body lengths/second



life-size Australian tiger beetle



life-size

Deadliest venom

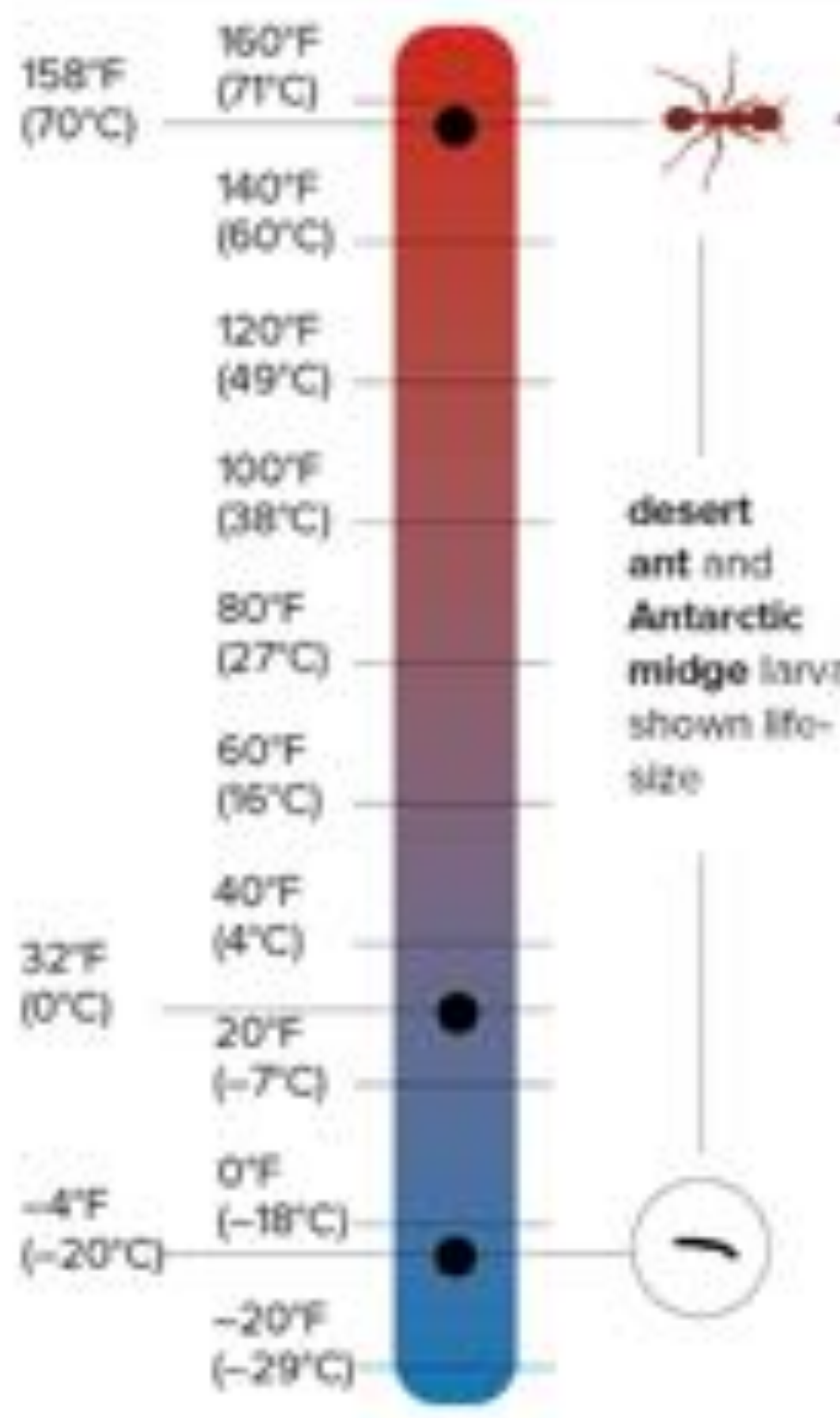
A **harvester ant** has the most **potent** venom in the insect world. Eight hundred stings from these ants could kill an adult human.



life-size

Longest life cycle

Before emerging as an adult, a **woodboring beetle** larva may spend more than 25 years inside a piece of wood.



Temperature extremes

The **desert ant** can survive temperatures of 158°F (70°C). The larva of the **Antarctic midge** lives on the snow at temperatures as low as -4°F (-20°C).



life-size

Strongest insect

The **horned dung beetle** can pull more than 1,100 times its own weight. This is like a human pulling two loaded tractor-trailers.



Glossary

abdomen

The third body segment of an insect. It contains the heart and digestive organs.

allergic reaction

The body's reaction to foreign substances. Sometimes the body's immune system overreacts, which can be harmful.

antennae

A pair of sense organs on or near the head of an insect. They are usually long, thin projections and are sometimes called "feelers."

chrysalis

The hard-shelled pupa of a butterfly—the stage of metamorphosis between caterpillar and adult.

compound eyes

Eyes found in insects and other arthropods. They contain many individual segments, each of which forms part of an image.

decibel

A unit used to describe the intensity of sound. A 10 decibel increase equals a sound that is ten times more intense.

descendant

An organism that is related to ancestors that lived in the past.

generation

All the individuals born at about the same time. Grandparents,

parents, and children represent three different generations.

hibernate

To spend the winter asleep or in a resting state.

hive

The home or nest of some kinds of insects that live in colonies, including bees and wasps.

infographics

Facts and information presented visually as diagrams, charts, and graphs rather than just text.

larva

An immature form of an insect. Typically, larvae hatch from eggs. Caterpillars are the larvae of butterflies and moths.

metamorphosis

In insects, the process of changing form in a series of distinct stages as time passes.

navigate

To intentionally travel from one place to another using memory, landmarks, smells, or astronomical guides such as the Sun, Moon, and stars.

potent

Strong, powerful.

pupa

One of the stages of metamorphosis in many insects. Larvae become pupae, which will finally turn into adults.



round trip

A journey and a return to where the trip began.

saliva

A fluid created in the mouths of animals. Sometimes called "spit."

species

A group of living things that look alike, behave

in a similar way, and are able to produce offspring.

thorax

The second body segment of an insect. It lies between the head and the abdomen. An insect's legs and wings are attached to its thorax.

venomous

The ability of an insect or other animal to inject venom with teeth, spines, or stingers.

vertical leap

The height of a jump measured from the ground to its highest point.

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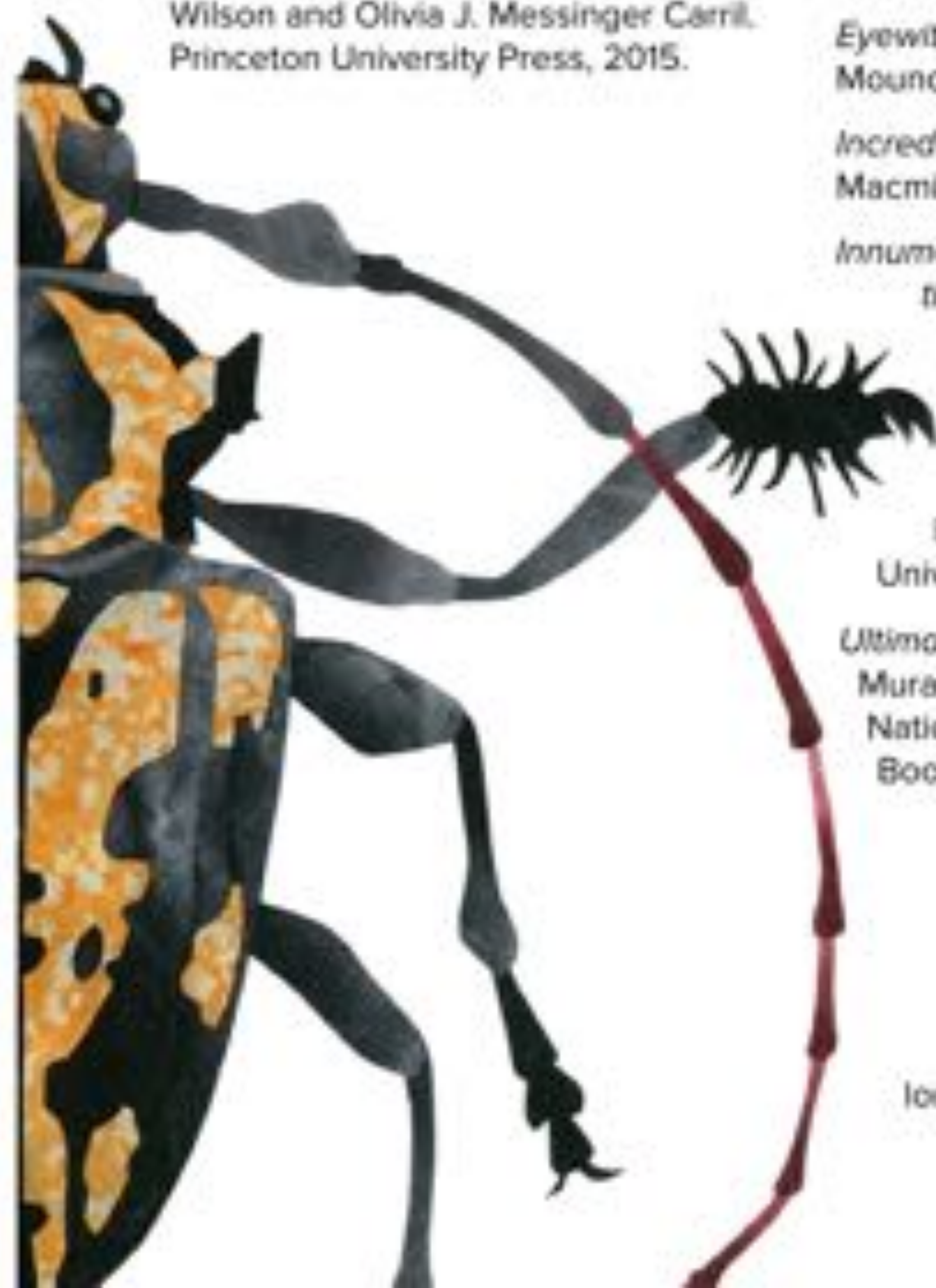
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longhorn beetle

For Zoe

LEXILE: 760
F&P: P

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