

LEVELED BOOK • Y

Goliath Beetles: Giant Insects



Written by Cheryl Reifsnyder, PhD

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Focus Question

What characteristics enable the Goliath beetle to survive in the wild?



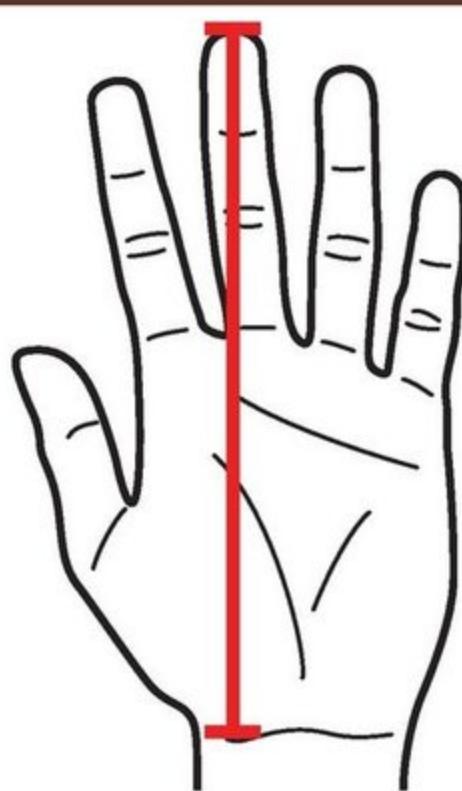
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The World's Biggest Beetle

There are about a million **species** of known insects in the world, and nearly half of them are beetles. Goliath beetles may belong to the most common insect category on the planet, but don't let that fool you—these beetles are anything but common. Goliaths are swift-moving and **solitary** insects. We are still learning a lot about them because they can be challenging to find and study. We do know that Goliath beetles are more than two thousand times as large as their ladybug cousins and are even bigger when they are younger. Developing Goliaths (larvae) weigh nearly twice as much as adults, so it's no wonder these beetles are the heavyweight champs of the insect world and all-around amazing insects.

How Big Is It?



Human hand
length: 7.44 inches
(18.89 cm)
width: 3.3 inches (8.4 cm)



Goliath beetle
length: 4.33 inches
(10.99 cm)
weight: 1.7 ounces (48.2 g)



Goliath beetle larva
length: 5 inches
(12.7 cm)
weight: 3.5 ounces (99.2 g)



Rhinoceros beetle



Hercules beetle



Goliath beetle

Beetles come in all shapes and sizes, but Goliath beetles are the heavyweight champs!

Fossils from three hundred million years ago show evidence of mammoth centipedes and dragonflies with gigantic, hawk-sized wingspans. Earth's atmosphere contains less oxygen now than it did millions of years ago, and insects and other animals with less advanced **circulatory systems** can't deliver oxygen throughout their bodies efficiently. Goliath bodies, therefore, simply can't grow as large as they did in prehistoric times when there was more oxygen in Earth's atmosphere.

A few present-day beetles out measure the Goliath beetle. The Hercules beetle can grow to 7 inches (18 cm) long, including 4 inches (10 cm) of horn. The rhinoceros beetle is 6 inches (15.24 cm) long, with most of its length also attributed to the enormous horns growing on its head. In comparison, the Goliath beetle is about 4 inches (10 cm) long, but other beetles can't compete with the Goliath's hefty body weight—a whopping 1.7 ounces (48.2 g)!

What Kind of Beetle?

The name *Goliath beetle* encompasses six separate, related types of beetles, but telling them apart can be challenging. Even within a single Goliath beetle species, no two beetles' markings are identical. In fact, individual beetles can look so different from one another that early **naturalists** mistakenly named over two dozen varieties, thinking each was a separate species. They actually discovered that these "unique specimens" were different examples of the six types of Goliath beetles.

Six Types of Goliath Beetles

Goliathus regius
(go-LY-uh-thus REJ-ee-us)



Goliathus goliatus
(go-LY-uh-thus go-LY-uh-tuhs)



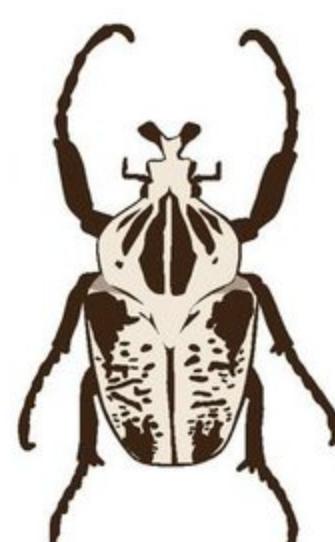
Goliathus cacicus
(go-LY-uh-thus KA-sih-kus)



Goliathus orientalis
(go-LY-uh-thus or-ee-en-TAH-lis)



Goliathus "atlas"
(go-LY-uh-thus AT-luhs)



Goliathus albosignatus
(go-LY-uh-thus al-bo-SIG-nuh-tuhs)



Early British naturalists named Goliath beetles “zebra beetles” because of the striking black-and-white stripes and other markings on the beetles’ bodies. Scientists suspect that the bold patterns might actually make it difficult for enemies—and researchers—to spot Goliath beetles in the wild. The markings break up the outline of a beetle’s body, making it harder to detect against a leafy background.

All beetles share certain physical characteristics, including two pairs of wings. The hind wings, or flying wings, are dark in color; they look leathery but are actually thin and membranous. The hind wings are surprisingly powerful and can support a beetle’s full body weight in flight. Beetles’ front wings, called *elytra*, are smaller, harder, and stronger than the flying wings and form protective “armor” that completely covers the folded hind wings when not in use. In many beetles, the elytra help protect the body as well.

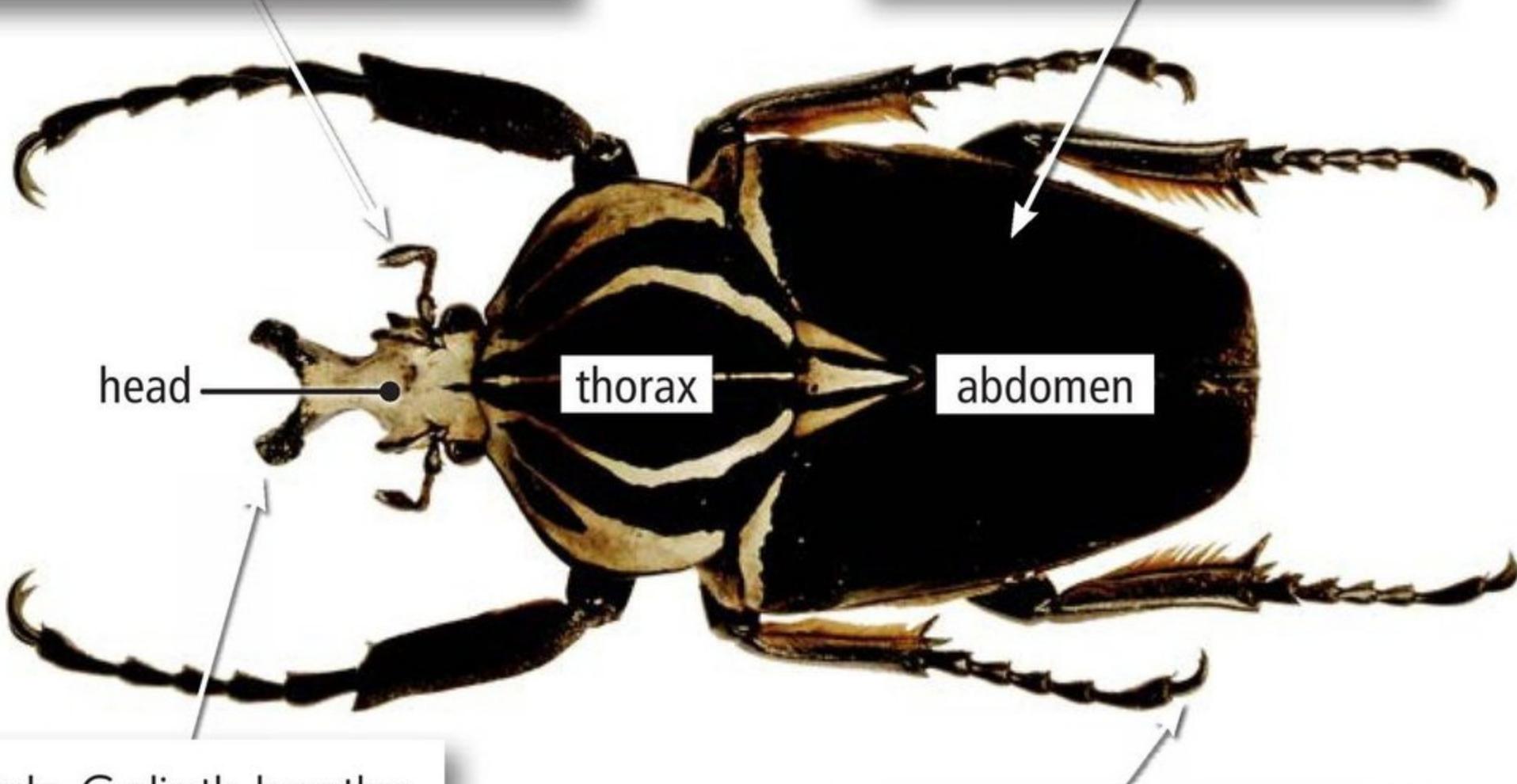
Some insect species have mouths that have adapted for different ways of eating and drinking. Goliath beetles do drink sap; however, their mouths are more suited for chewing rather than sipping nectar (like a butterfly) or piercing skin (like a mosquito).

Many smaller beetle species can be found on flowers, where they feed on pollen or petals. Goliath beetles weigh too much to be supported by flowers, though, so scientists think these supersized insects probably don't feed on them. Instead, with the help of sharp claws (called *tarsi*), they climb trees to feed on tree sap and rotting fruit.

What Makes a Goliath Beetle an Insect?

Antennae can unfold to improve the beetle's ability to sense its environment.

Hardened wings protect the delicate flying wings.



Male Goliath beetles have Y-shaped horns used for battle.

Sharp claws give Goliath beetles a strong grip for climbing.

All insects have

- wings
- legs with joints
(most have six legs)
- three main body parts:
head, thorax, and abdomen
- an outside skeleton

wowser!

Beetle Cold Case

X-rays recently proved that holes in the remains of a beetle in a London museum display were actually gunshot wounds. On the basis of the locations of the entry and exit wounds, the scientist reported that the beetle was shot while flying upside down!



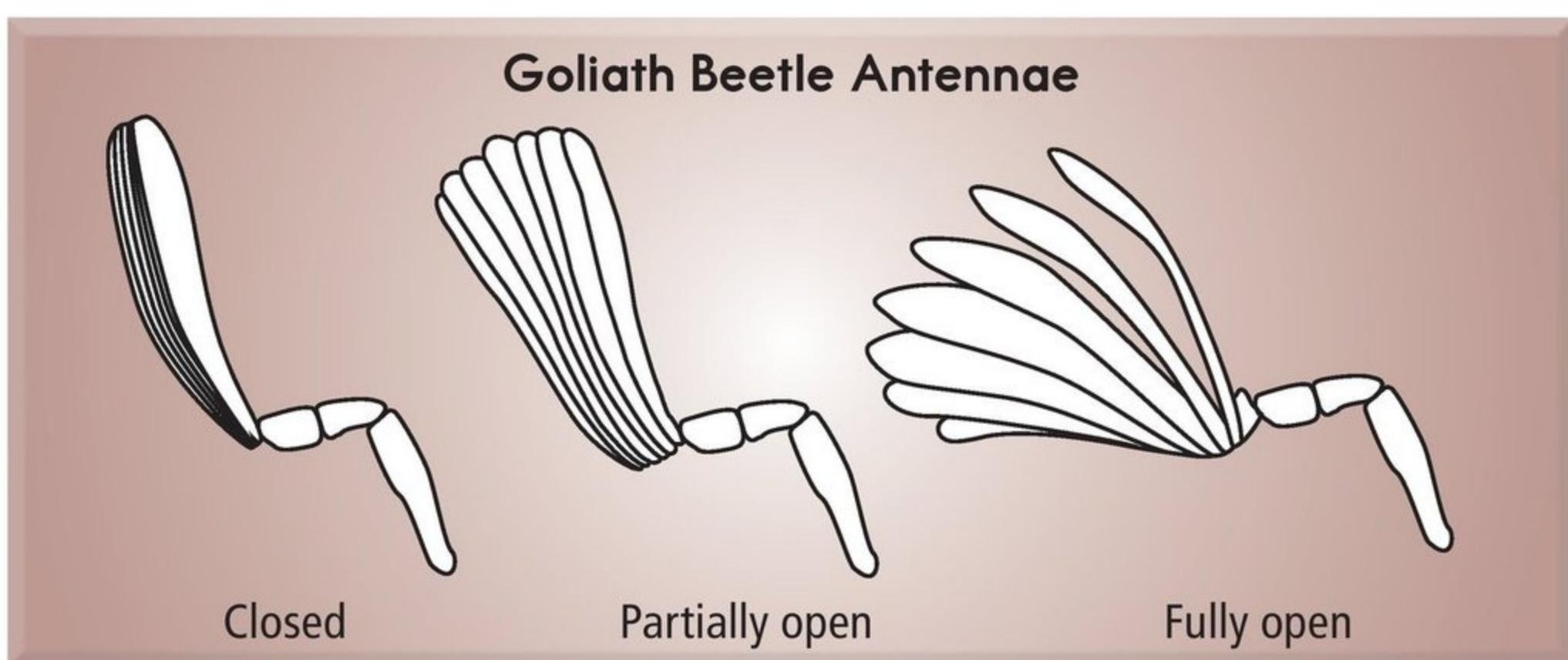
The Scarab Family

There are more than one hundred different families of beetles. In scientific terms, an animal family is a group that shares similar characteristics. Scientists think members of beetle family groups are descended from a common ancestor that lived hundreds of millions of years ago. Goliath beetles belong to the **scarab** beetle family, a group that also includes rhinoceros beetles and dung beetles.

You might think that giant beetles would be slow and clumsy, but that's hardly the case. In fact, Goliath beetles are such acrobatic flyers that early insect collectors had to shoot them out of the sky to get a look at them! Even today, **entomologists** have trouble getting near enough to Goliath beetles in the wild to observe their behavior. "They are very difficult to observe in nature," says insect specialist Dr. Brett Ratcliffe.

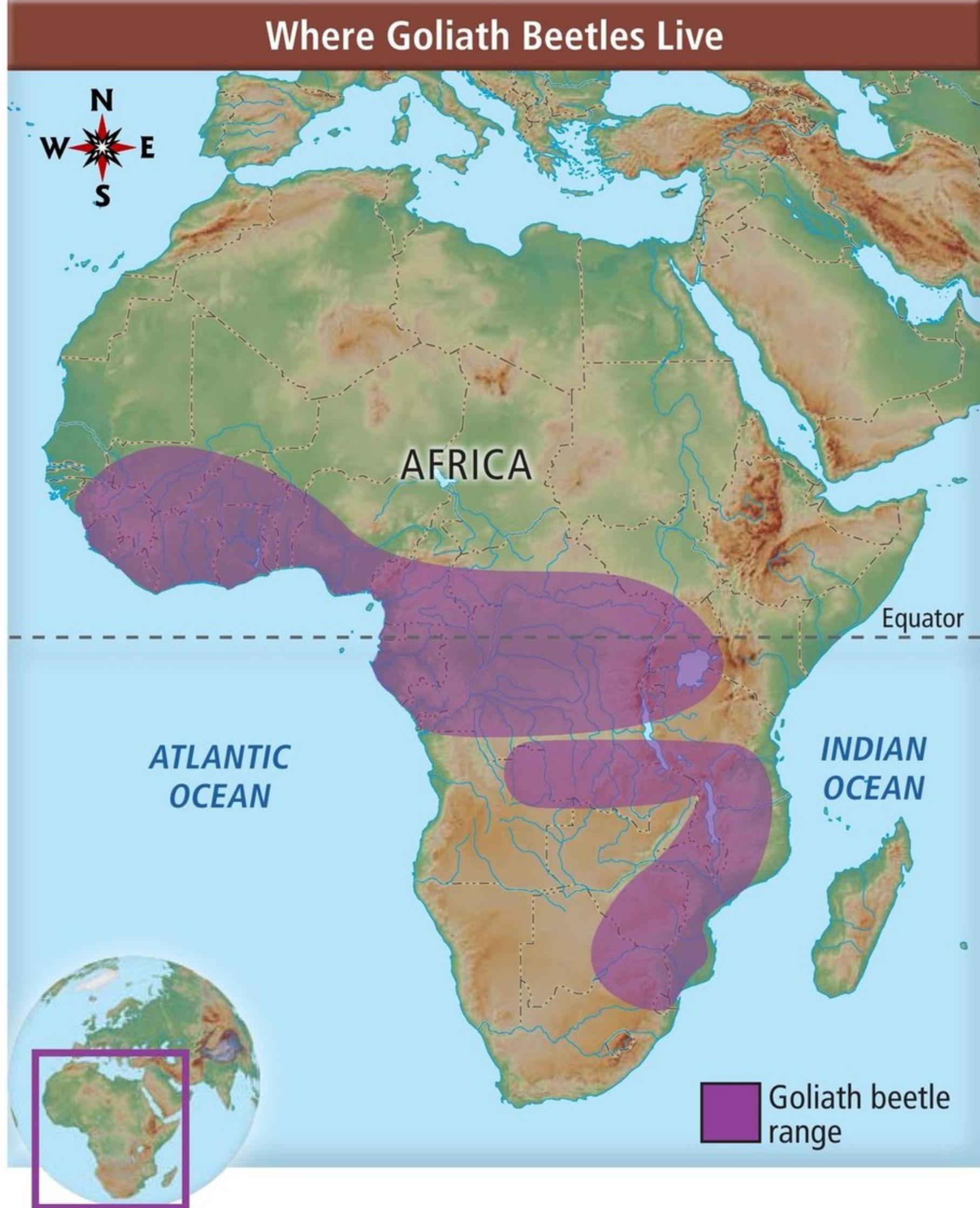
Goliath beetles may owe their speed to their specially **modified** elytra. Unlike some other types of beetles, Goliaths can unfold their flying wings without moving their wing covers out of the way first, which scientists think helps them take flight more quickly.

All beetles use their antennae to detect odors, chemicals, and other sensory information in their environment. However, Goliath and other scarab beetles' antennae have a shape all their own—one that experts think boosts their sensitivity. Separate, overlapping segments at the ends of their antennae can open like a fan. The enlarged antennae's surface area increases the beetles' ability to detect food and feeding sites, pick up smells, and even find a mate. This is similar to how you can feel something with your whole hand better than you can with your fingertip.



Scarab beetles are the only beetles whose antennae open up to increase their ability to sense things around them.

Where Goliath Beetles Live



An African Home

Goliath beetles live in tropical African rainforests and savannas, which are warm year-round with a dry season that lasts several months of every year. Goliath beetles are primarily seen during the wet season, when heavy rainfall creates warm, humid conditions perfect for plant growth.

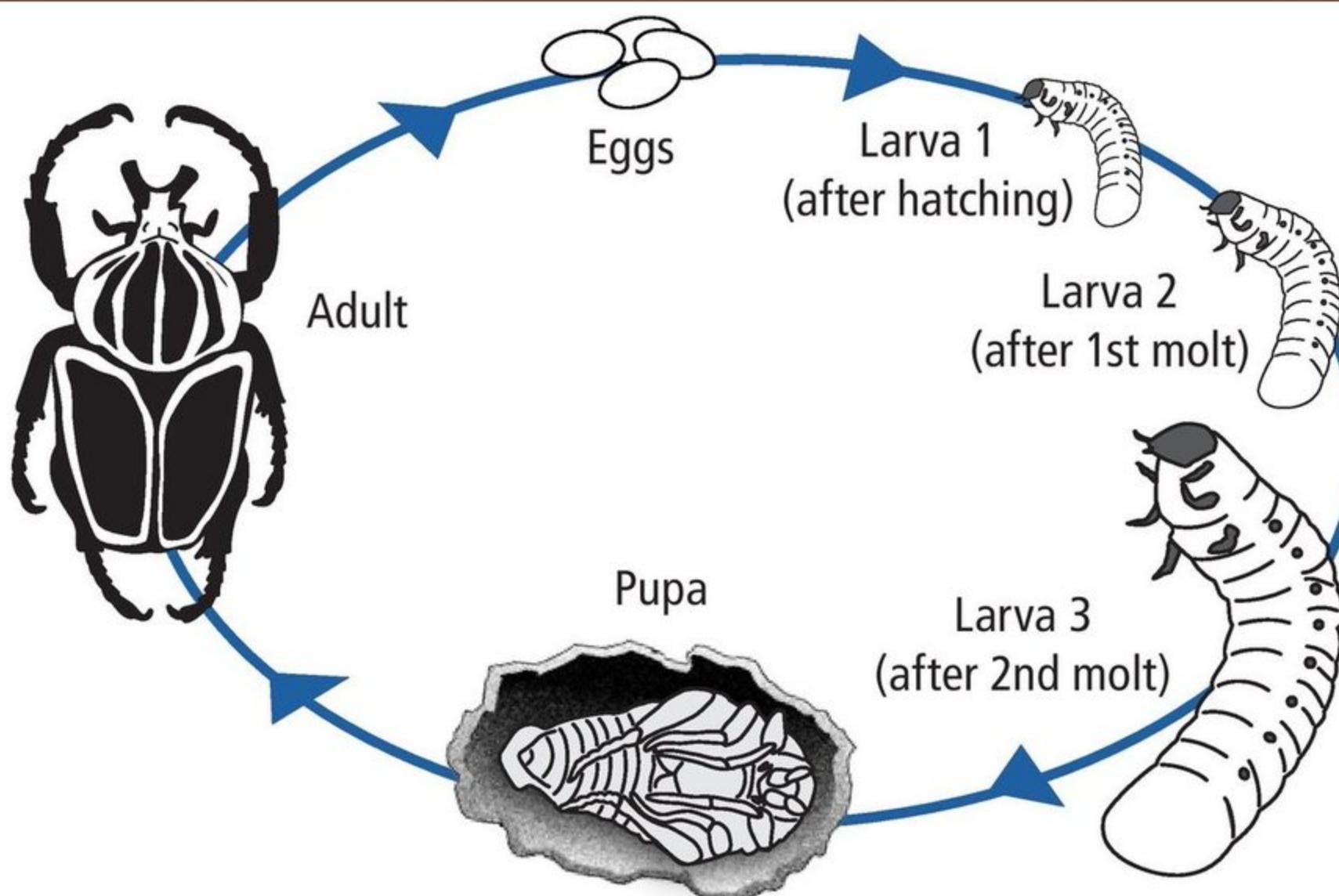
That's excellent news for Goliath beetles since trees at this time of year produce abundant fruit and sap for them to eat. There are also ample leaves where Goliath beetles can take cover from predators that might enjoy a crunchy beetle snack.

It's not known which types of animals consider Goliath beetles prey, but some experts think that monkeys and large birds might eat Goliaths if they can catch them. These speedy flyers do such a good job of hiding in treetops that no one knows for sure.

Socially, Goliath beetles occasionally gather on tree trunks and branches where food is plentiful. Normally, unless they are looking for a mate, Goliaths seem to prefer spending most of their time on their own. "They are not social insects," says Dr. Ratcliffe.

Male Goliath beetles fiercely defend their feeding sites against intruders. The heads of all male Goliaths are equipped with Y-shaped horns, which they use to push away other males. Their reason for battling is about more than just food. Entomologists suspect that staking a claim to the best feeding sites gives males a better chance of attracting females.

Goliath Beetle Life Cycle



During the pupal stage, the larva sheds its outer skin. Wings and legs form.

The Cycle of Life

The wet and dry seasons define the life cycle of the Goliath beetle. These seasons occur during different months, depending on the exact location. Like other beetles, Goliaths go through a complete **metamorphosis**, including egg, larval, pupal, and adult stages.

Goliath beetles devote most of their adult lives to mating. Afterward, when a female Goliath beetle is ready to lay eggs, she uses her wedge-shaped head to dig a burrow deep into the rainforest soil. She lays her eggs—often more than one hundred—underground and dies shortly afterward. Her job is done. The Goliath young remain underground for the next several months.

Goliath beetle eggs hatch after about two weeks, when the young larvae, sometimes called *grubs*, emerge. Eyeless and wingless, they spend all their time eating and growing. No one knows exactly what Goliath larvae eat in the wild, but they most likely feed on rotting plant matter found in the soil. In **captivity**, however, the larvae also eat smaller beetle larvae and adult insects.

Goliath larvae grow quickly, reaching full size in about four months, near the end of the wet season. The larger species can grow up to 5 inches (12.7 cm) in length—nearly as long as a dollar bill—and weigh a whopping 3.5 ounces (100 g).

When the wet season ends, the larvae burrow deeper underground until they reach sandy soil. There, they use the soil to build thin-walled “cells,” similar to butterfly cocoons, in which they enter the pupal stage. Metamorphosis occurs inside these cells over the next several months during the dry season. Wings and legs form and fold into place. The outside of a pupa’s body hardens into a protective shell.

The new adult hibernates inside the earthen cell until the following wet season starts. When moisture seeps deep enough into the soil to reach the hibernating beetle, it awakens, emerges from the soil, and begins the cycle again.

Fleet and Fascinating

The speedy Goliath beetle is an **elusive** giant—hard to spot and even harder to catch. However, its bold stripes and immense size make it a favorite with insect enthusiasts. Some fans even keep Goliath beetles as pets. That's fortunate for scientists, who owe much of their knowledge of Goliath beetles to the study of captive insects.

Big as a songbird, striped like a zebra, and agile as an aerial acrobat, the Goliath beetle is one amazing insect!



Goliaths can be almost as large as a human hand (top). Beetles fly quickly and can be hard to catch (bottom).



Glossary

captivity (<i>n.</i>)	the state of being confined or without freedom (p. 14)
circulatory systems (<i>n.</i>)	the body systems that move blood or another fluid throughout the body (p. 5)
elusive (<i>adj.</i>)	difficult to capture or find (p. 15)
entomologists (<i>n.</i>)	scientists who study insects (p. 9)
larval (<i>adj.</i>)	having the immature form of an animal that goes through major body changes before it looks like an adult of its kind (p. 13)
metamorphosis (<i>n.</i>)	an animal's change from one shape to a totally different shape (p. 13)
modified (<i>adj.</i>)	of or relating to something that has changed (p. 10)
naturalists (<i>n.</i>)	people who study nature and natural history, especially plants and animals (p. 6)
pupal (<i>adj.</i>)	of or relating to an immature insect in the stage between larva and adult (p. 13)
scarab (<i>n.</i>)	a type of large beetle with a hard shell that is often black (p. 9)
solitary (<i>adj.</i>)	tending to live or spend time alone (p. 4)
species (<i>n.</i>)	a group of living things that are physically similar and can reproduce (p. 4)

Words to Know

captivity
circulatory systems
elusive
entomologists
larval
metamorphosis

modified
naturalists
pupal
scarab
solitary
species

Front cover: A Goliath beetle uses its claws to scale a tree in a rainforest in Africa.

Title page: A Goliath near the roots of a fig tree in Guinea, West Africa

Page 3: Male Goliath beetles have Y-shaped horns used for fighting.

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