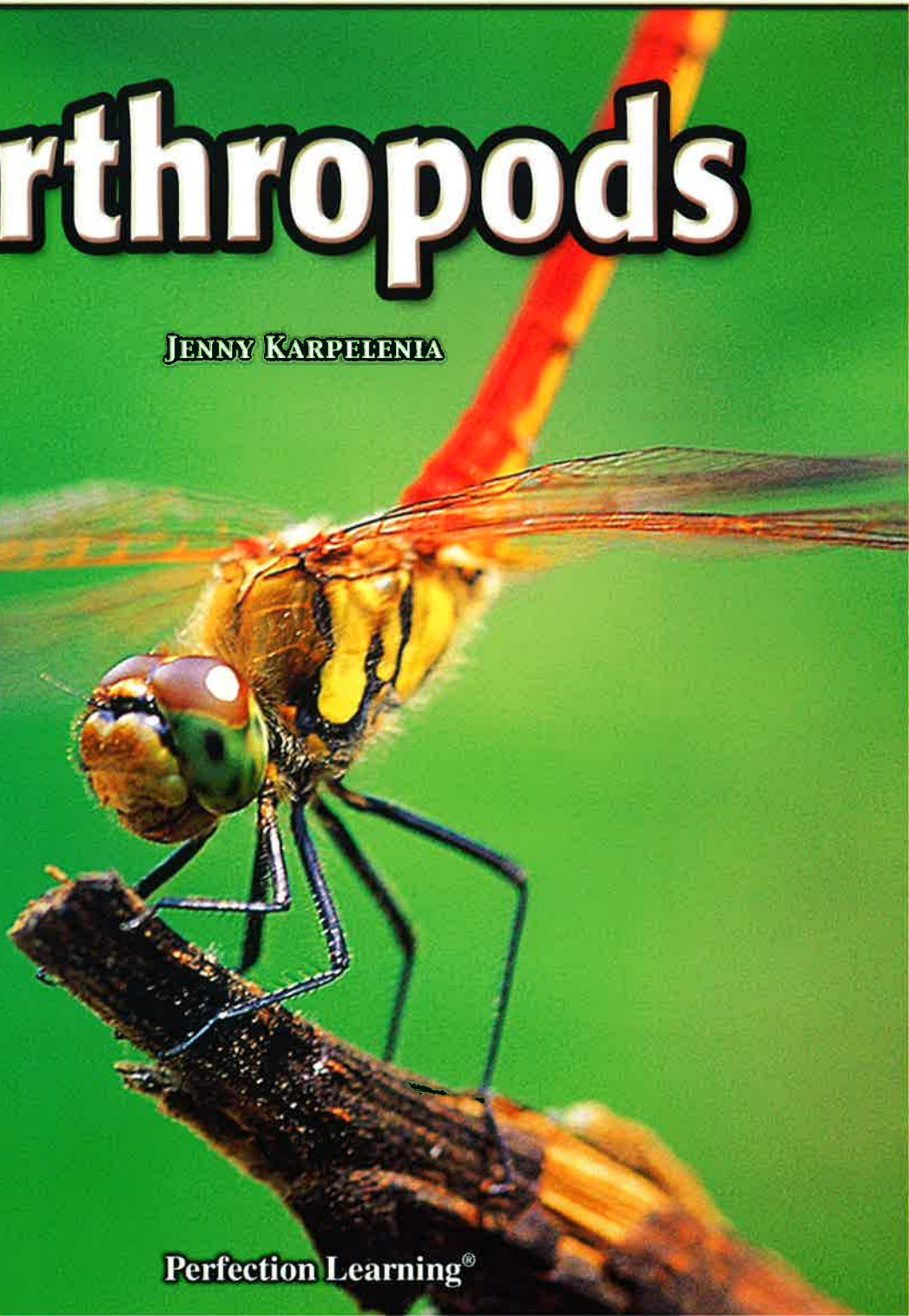


# Arthropods

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## DIVERSE POPULATIONS

# Arthropods

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abdomen

colony

eyespot

metamorphosis

pincer

telson

zooplankton

antenna

compound eye

gamete

molting

sessile

terrestrial

cephalothorax

detritivore

host

nauplius

spiracle

thorax

chelicera

exoskeleton

mandible

parasite

swimmeret

trachea

### Overview

At least three-fourths of the animal species on Earth are arthropods. Arthropods are invertebrates with exoskeletons. Their bodies are segmented and have jointed legs. Many arthropods also have other appendages such as antennae, pincers, mouthparts, and wings. The body systems of arthropods are well developed, and many of these animals undergo metamorphosis throughout their life cycle. Arthropods are classified into four main groups—crustaceans, chelicerates, myriapods, and hexapods (insects).

Crustaceans have three body regions, but often the head and thorax are fused into a cephalothorax. Crustaceans have two pairs of antennae, two compound eyes, and several mouthparts for chewing food. The majority of crustaceans live in water, but a few make their home on land. Crabs, lobsters, shrimp, crayfish, copepods, krill, barnacles, and isopods are crustaceans.

Chelicerates get their name from their mouthparts called *chelicerae*. Chelicerae are used to grasp and tear up food. In some species, chelicerae inject venom into prey, liquefying it so they can suck it up. Chelicerates have four pairs of walking legs and a set of leglike appendages called *pedipalps* used for grasping food. Arachnids and horseshoe crabs are chelicerates. The arachnids include spiders, harvestmen, scorpions, ticks, and mites.

Myriapods are characterized by a large number of legs attached to a long trunk with many segments. Centipedes and millipedes are the two largest groups of myriapods.

Hexapods are arthropods with six feet, otherwise known as insects. Insects have three distinct body regions. The head holds antennae, eyes, and mouthparts. The legs and any wings are attached to the thorax. An insect's abdomen houses the digestive and reproductive organs. Most insects undergo complete or incomplete metamorphosis. Many insects are solitary, while others live in colonies. Insects, along with all other arthropods, inhabit every continent on Earth.

For teachers' inspection ONLY

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# A Real View of Arthropods

**H**ave you ever thought of being a contestant on a reality TV show? To do so, would you be willing to eat live beetles, crickets, or sand crabs? How about sticking your head in a box of tarantulas or standing still while bees are allowed to swarm all over you? Could you lie in a coffin full of hissing cockroaches? If this sounds like it's for you, then perhaps you'd also like to learn more about the real lives of these creatures.



## The Real Rulers of the World

Beetles, crickets, crabs, tarantulas, bees, and cockroaches are all arthropods. These animals rule the animal world in numbers. At least three-fourths of the animal species on Earth are arthropods. More than one million species of arthropods have been identified so far, and there may be millions more that haven't been discovered yet.

Arthropods make their homes just about everywhere on the planet. There are species of arthropods living on all continents and in all climates. They can be found in the air, on the ground, and in the water.

### Tracing the Path of Science

Arthropods evolved more than 500 million years ago during the Cambrian Period. Two common arthropods of the period were the trilobites and eurypterids.

Trilobites were ocean animals with flat, oval bodies divided into three (*tri*) lobes. Some trilobites could roll up in a ball to protect themselves from enemies. These sea creatures were once so plentiful that the Cambrian Period is known as the "Age of Trilobites." Trilobites became extinct about 250 million years ago during the Permian Period.

Eurypterids were called *sea scorpions* because they resembled land scorpions. These aquatic animals could grow up to 10 feet long, making them the largest arthropods of all time. They, too, disappeared during the Permian Period.



Trilobite fossil



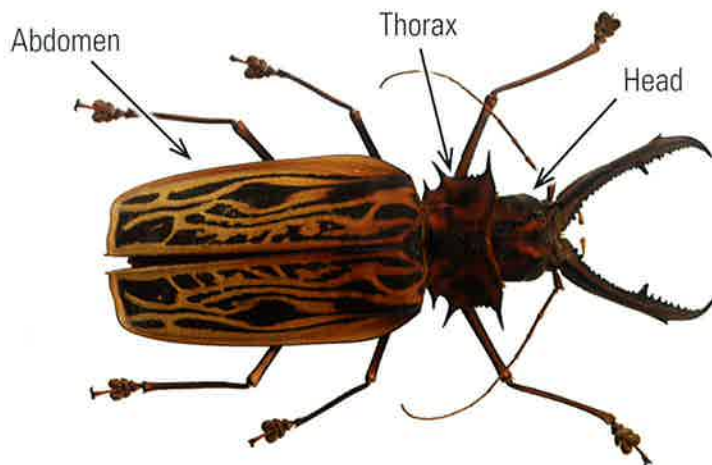
Eurypterid fossil

## Getting Real About Arthropods

Arthropods share several basic body characteristics. Arthropods are invertebrates, or animals without a backbone. Their bodies have bilateral symmetry. If you drew a vertical line down the middle of their bodies, the right and left sides would look very similar.

Arthropods have skeletons on the outside of their bodies. These **exoskeletons** are made of a hard material called *chitin*. Exoskeletons are tough for protection yet flexible at joints for easier motion. They also retain moisture for those arthropods that live on land. Exoskeletons don't grow with the animal inside, so they must be shed and regrown when they get too small. **Molting** is a dangerous time for arthropods since it leaves them unprotected until the new exoskeleton hardens.

Arthropods have segmented bodies that are grouped into regions such as the head, **thorax**, and **abdomen**. They also have a number of jointed legs. In fact, the word *arthropod* means "jointed foot." Many arthropods also have other appendages such as **antennas**, **pincers**, mouthparts, and wings. These extensions are used for movement, defense, eating, and sensing the environment.



Cicada





Cicada molting

The body systems of arthropods are well developed. Arthropods have open circulatory systems, which means that a heart pumps blood into open spaces in the body, bathing tissues directly. Most arthropods have respiratory organs, such as gills or **tracheas**, that take in oxygen from water or air. Some spiders and scorpions have book lungs, a stack of tissues that exchange oxygen and carbon dioxide in the body. Arthropods have a digestive system with an opening at one end for food to enter and an opening at the opposite end for wastes to exit. Many arthropods have specialized organs, such as **compound eyes** and antennae, that take in sensory information.

The majority of arthropods have distinct male and female sexes with different reproductive organs.

Sexual reproduction occurs through the exchange of male and female sex cells, or **gametes**. Most female arthropods lay eggs, which they may or may not take care of until they hatch. Some species of arthropods undergo **metamorphosis** in which they go through several

immature phases before reaching adulthood. Other baby arthropods look like miniature versions of their parents.



One-year-old lobster

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## Four Really Big Groups

Scientists have classified the arthropods into four main groups. The crustaceans include crabs, lobsters, barnacles, and wood lice. Spiders, scorpions, ticks, mites, and horseshoe crabs are members of the chelicerates (kuh LIS er ayts) group. Centipedes and millipedes make up most of the myriapods (MIR ee uh pahds). The hexapods, or insects, are the largest and most varied group of arthropods. Each of these arthropod groups will be discussed in detail in the following chapters.



Garden spider



Barnacles



Butterflies are members of the insect group.



# Calling All Crustaceans

Crustaceans are a large group of arthropods that includes lobsters, crabs, krill, barnacles, and wood lice. Crustaceans have three body regions (head, thorax, and abdomen), but in many crustaceans, the head and thorax are fused into one unit called a **cephalothorax**. Their heads hold two pairs of antennae, two compound eyes, and several mouthparts for chewing food. Most crustaceans breathe through gills located where their legs meet their bodies. A few crustaceans simply absorb oxygen through their moist skin.

