

Science understanding, Science inquiry

Verbal/Linguistic



Arthropods make up over 75% of known animal species. Arthropods have a segmented body covered by an exoskeleton, and jointed limbs that let them move. Groups within the arthropods include insects, arachnids, crustaceans, millipedes and centipedes.

Insects

Insects are the largest group of arthropods. Their body is divided into three parts—head, thorax and abdomen. They have a pair of antennae and a pair of compound eyes. Extending from the thorax are three pairs of legs for walking, jumping or digging. All types of insects have some individuals with wings at some stage in their life cycle. Worker ants do not have wings. Young grasshoppers do not have wings, but adults do.

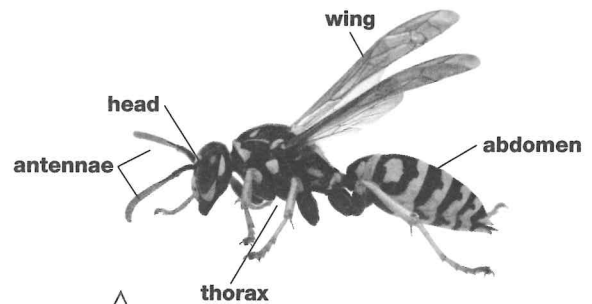


Figure 6.6.1

Wasps, dragonflies, mosquitoes, ants, butterflies and moths are insects.

Arachnids

Arachnids have two body parts. The head and thorax are fused to form a cephalothorax. Arachnids have four pairs of walking legs but do not have antennae. Spiders have fangs to capture their prey. Poison injected from the fangs paralyses or kills the prey. Many arachnids make webs to catch prey. The silk is produced by spinnerets at their tail.

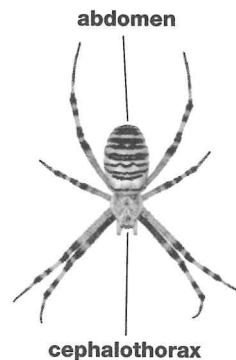


Figure 6.6.2

Scorpions, spiders and ticks are arachnids.

prey (n) an animal that is hunted and eaten by another animal

Crustaceans

Most crustaceans live in water. They have a cephalothorax. Crustaceans have two pairs of antennae and usually five pairs of legs. Sometimes the front legs are pincers, which are used to catch and hold prey. The pincers are also used for protection.

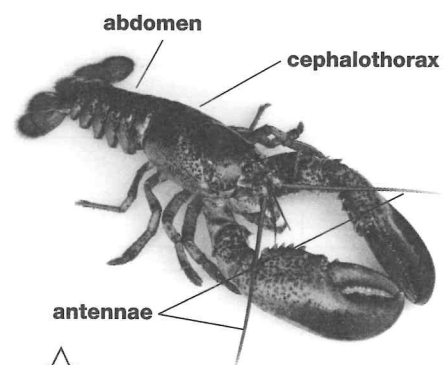


Figure 6.6.3

Lobsters, wood lice, prawns and crabs are crustaceans.

Centipedes and millipedes

Centipedes and millipedes have legs on most of their segments. Centipedes have one pair of legs on each segment and are very fast moving. Millipedes have two pairs of legs on each segment. Although they have more legs, they are slow-moving animals.

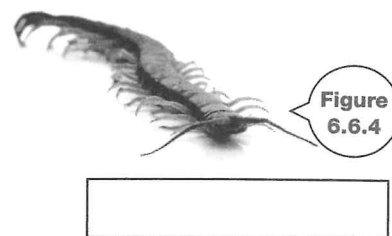


Figure 6.6.4



Exoskeleton

Having an exoskeleton has advantages and disadvantages. The exoskeleton provides protection. The wax on the exoskeleton makes it waterproof and also stops the organism from drying out. The exoskeleton lets arthropods live on land.

To allow movement, the exoskeleton has joints in the legs, antennae and between the segments of the body. At the joints the exoskeleton is thinner and more flexible.

Just like you, arthropods move by using muscles that act in pairs. Your muscles are attached to the outside of your skeleton. Arthropod muscles are attached on the firm ridges or bars inside the exoskeleton as shown in Figure 6.6.6. You can see the damselfly shedding its skeleton in Figure 6.6.7.



Figure 6.6.5

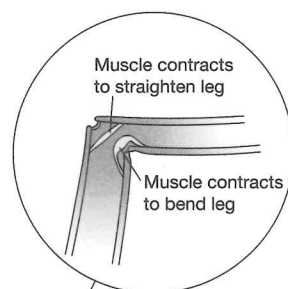
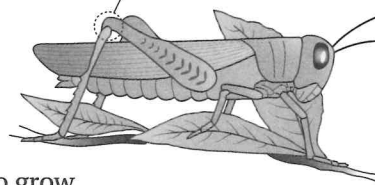


Figure 6.6.6



Arthropods shed their exoskeleton when they need to grow. This is called moulting. Material to make a new exoskeleton is produced before the old exoskeleton splits, releasing the arthropod. While the new exoskeleton is still soft, the arthropod puffs itself up, making its body as big as possible. This stretches the new exoskeleton before it hardens. Without an exoskeleton, the arthropod is vulnerable to attack by predators so it stays hidden.



Figure 6.6.7

A damselfly comes out of its old exoskeleton. Its wings are folded up on its back.

- 1 **Identify** the centipede and millipede by placing labels in the boxes shown in Figures 6.6.4 and 6.6.5.

- 2 **Identify** and label the body parts of the butterfly.

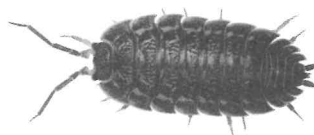


- 3 **Identify** and label the body parts of the scorpion.



predator (n)
an animal that hunts and eats another animal

- 4 **Identify** and label the body parts of the wood louse.



- 5 **Identify** characteristics common to all arthropods.

- 6 **Compare** insects and arachnids. How are they similar?

- 7 **Contrast** centipedes and millipedes. How are they different?

- 8 **Explain** what arthropods would not be able to do if they did not moult.

- 9 **Explain** why moulting is dangerous for arthropods.

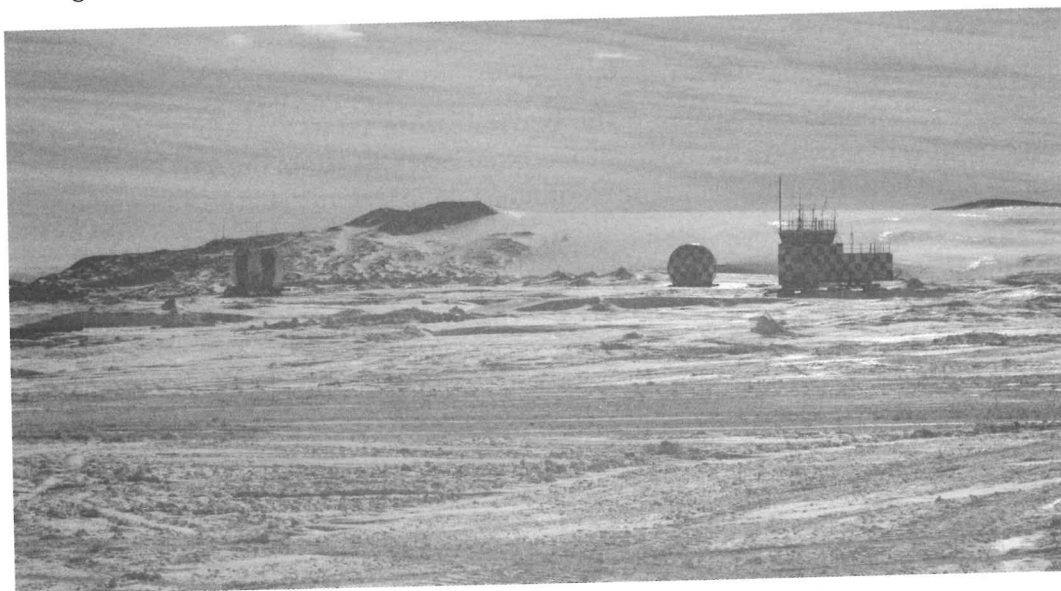
- 10 **Explain** how arthropods make sure that there is some room for growth in their new skeleton.

- 11 **Compare** the way your arm (or leg) bends with the way arthropods bend their legs.

Science as a human endeavour

Verbal/Linguistic Visual/Spatial

Photographs of Antarctica show a land that appears to be untouched by human impact. However, in the 100 years that people have been travelling to Antarctica, they have left their mark. Some evidence of this is visible in the photo below. Past human activities that have harmed the ecosystems of the Antarctic and the Southern Ocean include fishing and hunting.



The Antarctic appears to be untouched, but there is evidence that human activity has caused changes to its ecosystems.

Hunting whales and seals

People began hunting for whales and seals in Antarctica in the nineteenth century. Within a few decades, the populations of these animals decreased significantly. Some seal species, such as the Antarctic fur seal shown here, were endangered.

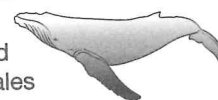
Eventually, seal hunting was stopped. Some of the islands off Antarctica became world heritage areas where the seals were protected. Since then, the seal populations have recovered and are no longer endangered.

Whaling was a very important industry in the Southern Ocean in the early 1900s. The number of whales reduced quickly. Falling profits put many whaling companies out of business, and commercial whaling stopped in 1986. Whale populations appear to be recovering. Because whales live for a long time and have few young, it will take many years for their numbers to increase significantly.



The Antarctic fur seal is the smallest of the seals. It was hunted almost to extinction for its very thick, soft fur.

whaling (n) the hunting, killing and processing of whales



profits (n) money made by a business after costs have been paid

commercial (adj) related to commerce (business)

Fishing

There is still a lot of fishing in Antarctica. As part of an international treaty to protect Antarctica, there are regulations that aim to manage the fishing industry and stop over-fishing. A decrease in the numbers of one species affects the predators (hunters) and prey (hunted) of that species, and changes the food web. The regulations protect the fish and all the other organisms in their food web. This helps to protect the environment.

regulation (n) control

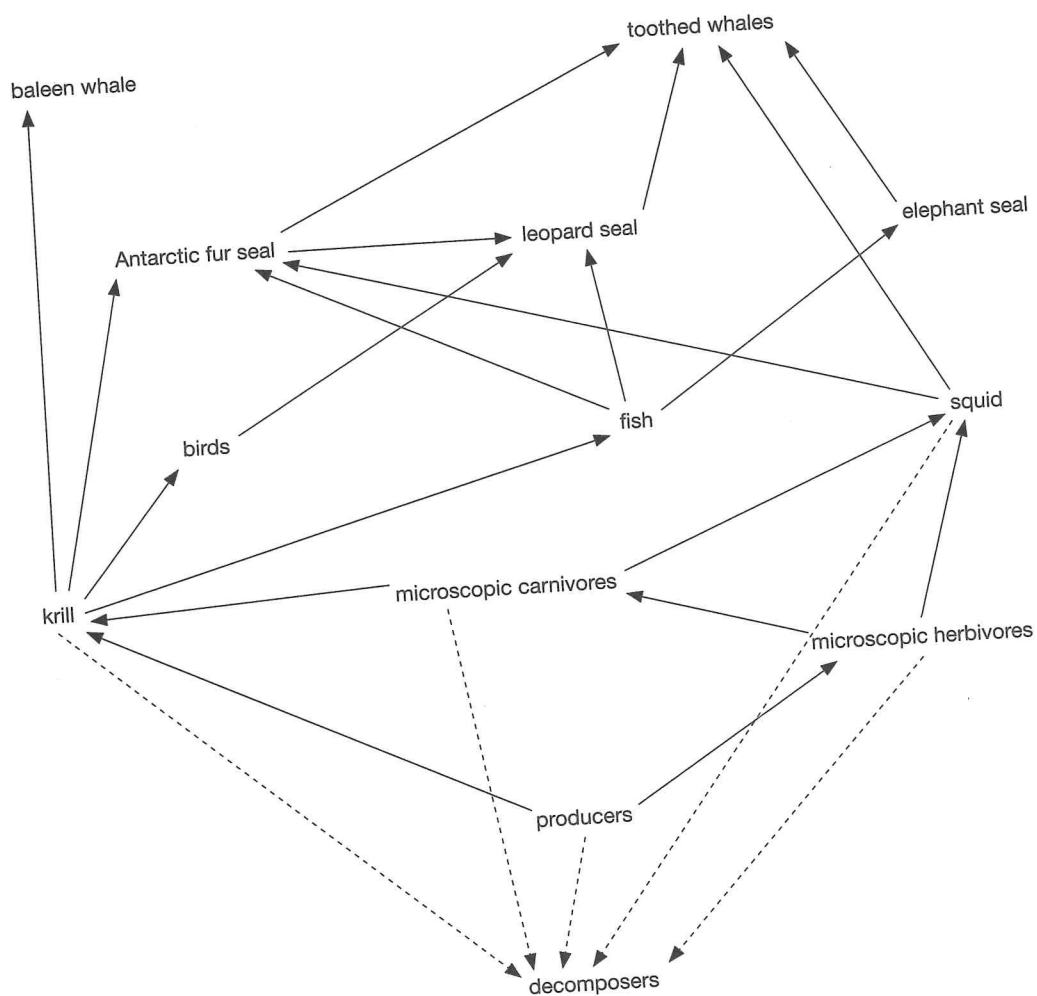
industry (n) people or companies that work in the same kind of business

Research

The Australian Government, through the Australian Antarctic Division (AAD), aims to protect the Antarctic environment. The AAD employs scientists who investigate the effects of changes in the environment.

Krill are small shrimp-like creatures. The food web below shows that krill are food for a large number of species in the Antarctic food web. Scientists from the AAD are studying krill to learn how they are affected by biotic and abiotic factors in the environment.

Scientists from AAD are also studying seal populations, many of the fish species and the seabirds that feed on the fish.



A food web from the Southern Ocean

- 1 Study the top photo on page 69 carefully. Using the photo and the information on pages 69 and 70, **identify** evidence of human activity in Antarctica.

- 2 **Explain** why it was important that seal hunting was stopped.

- 3 **State** what has happened to protect the seal population.

- 4 **Explain** why it will take a long time for whale populations to increase.

- 5 **Explain** what Australian scientists are doing to protect the ecosystems of Antarctica.

- 6 Using the food web, **identify** the organisms that would be directly affected if the amount of krill decreased.

- 7 **Identify** any organisms in the food web that would *not* be affected if the amount of krill decreased.

- 8 **Explain** in your own words why krill are an important part of the Antarctic food web.

Science understanding

 Verbal/Linguistic  Visual/Spatial

Recall the key terms of classification by matching these with their definitions. Use a ruler to draw a line from the dot near the key term to the dot near the correct definition.

Each line you draw should pass through one letter. The letters you cross should spell out a word. The word should provide you with the answer to the question.

When you put things into groups what are you practising? _____

Species	•	L	C	•	A skeleton inside the body	
Endoskeleton	•	L	D	•	Animals with a nerve cord running down their backs and an endoskeleton	
Taxonomy	•	F	A	•	A class that includes all the animals that have a body covering of hair and feed their babies on milk produced by the mother	
Mammal	•	S	S	•	The last level of classification of living things	
Dichotomous key	•	A	A	•	The science of grouping and naming things	
Exoskeleton	•	I	N	D	•	One of five kingdoms of living things. Multicellular or unicellular organisms with eukaryotic cells. A protein-rich cell wall is the outer layer
Fungi	•	C	I	•	A skeleton on the outside of the body	
Chordates	•	L	C	•	One of five kingdoms of living things. Multicellular organisms. Cells with a distinct nucleus. A cellulose cell wall is the outer layer	
Plants	•	C	A	A	•	One of five kingdoms of living things. Multicellular organisms. Cells with a distinct nucleus. With a membrane as the outer layer
Protists	•	T	•	•	One of five kingdoms of living things. Single-celled organisms with a distinct nucleus	
Animals	•	A	•	•	Key with two choices at each stage	
Monerans	•	C	I	•	Animal with an exoskeleton and jointed limbs	
Arthropod	•	N	O	•	Describes animal with a body temperature that varies with the temperature of their surroundings	
Ectothermic	•	N	L	•	One of five kingdoms of living things. Single-celled organisms with a distinct nucleus	