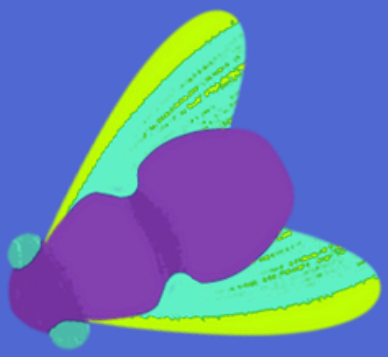
Invertebrates



About this unit

Essential question:

What is an invertebrate?

Key vocabulary:

invertebrate	exoskeleton	crustaceans	insects
no backbone	arachnids		

Learning intentions:

By the end of this unit students should:

- Understand that the kingdom of animals can be subdivided into two groups: vertebrates and invertebrates.
- Understand that there are many different types of invertebrates, grouped according to specific similarities, including insects, arachnids and crustaceans.
- Understand that invertebrates do not have a backbone or internal skeleton.
- Consider how invertebrates may protect themselves without an internal skeleton.

Key teaching points:

- Invertebrates have no internal skeleton or backbone. The function of an internal skeleton is achieved by a range of other means. Some invertebrates, such as insects and crustaceans, have a hard exoskeleton, while others, like jellyfish, are supported by water.
- Invertebrates are sub-divided into smaller groups according to specific similarities. These groups include, but are not limited to, insects, which have three body parts, six legs and two antennae; arachnids, which usually have four pairs of legs and no antennae or wings; and crustaceans, which have two body parts and two pairs of antennae.

What you need to know:

Vertebrates and invertebrates

The animal kingdom can be further divided into vertebrates and invertebrates. Animals that have a backbone are known as vertebrates; those that don't have a backbone are invertebrates. Vertebrate animals can be subdivided into five groups: mammals, birds, fish, amphibians and reptiles. Over 95% of the animal kingdom is invertebrate. This classification is further subdivided into over 30 groupings, which includes: insects, molluscs, arachnids and crustaceans. The importance of invertebrates is often underestimated. Many habitats rely on them as an important part of food chains and they play a crucial role in the decomposition of organic matter in soil. They also act as pollinators, without which many species of plant would be unable to reproduce.

Exoskeleton and endoskeleton

Invertebrates that lack an internal skeleton (endoskeleton) use other means for support and movement. Many have a hydrostatic skeleton, which contains water that can be moved onto different sections of the body by contracting muscles. An earthworm moves using a hydrostatic skeleton. Other invertebrates utilise muscles attached to an exoskeleton. Exoskeletons also provide protection for internal organs.

Before watching

Activate prior knowledge: Insect game

Resources:

- *Insect* game

Arrange the students in groups of two to six. Give each group a die and an *Insect* game (page 12), and each student in the group a sheet of paper and a pencil/pen.

Clarify the rules of the game. (Each player rolls the die in turn. A six must be thrown in order to start the game, and the player begins by drawing the thorax of the insect. Body parts can then be added in the correct place after each roll of the die. Eyes and antennae can only be added after the head has been drawn. If the die is thrown and a body part is not needed, the die is passed to the next player. The first person to complete their insect has to shout "Insect!". The winner scores 40 points and all other players score points to the value of the insect body parts they have drawn. Play as many games as the time permits. The winner is the player with the highest total score.)

Explain to the students that this is a fast-moving game, and so the quicker the die is thrown and passed on, the more rounds they can play. Give the students 10 minutes to play.

Draw the activity to a close and ask the students to name some insects. Ants, bees, beetles, butterflies, moths, aphids, dragonflies, crickets and grasshoppers, for example. Draw the students' attention to the game and the insects' body parts. Explain to the students that all insects have these three body parts (head, thorax and abdomen), six jointed legs, which are attached to the thorax, and a pair of antennae.

Give each group a few minutes to name and discuss any further knowledge they have about insects. Insects have an exoskeleton, compound eyes and often have wings. Most insects hatch from eggs and undergo some form of metamorphosis. Insects can carry disease and destroy crops. Many insects carry out pollination. Insects represent over half of all known species.

After watching

Here are activities to take your students' learning further.

Activity 1: Classifying invertebrates

Resources:

- *Animal* images
- *Invertebrate* cards
- *Invertebrates* video
- *Invertebrate Warriors* video

Play the video *Invertebrates*.

Ask:

- What is the key difference between vertebrates and invertebrates?

Vertebrates have an internal skeleton and backbone, and invertebrates do not.

Organise the students into pairs and give each pair the *Animal* images (pages 13-14) (already cut up). Ask the students to sort the images into vertebrates and invertebrates.

Give the pairs some time to discuss and arrange the images. Ask them to look at other pairs' work to compare their groupings. Discuss where there are any differences.

Optional extra
Give each student a sheet of paper and pencils/pens. Ask them to produce a poster that shows a range of vertebrates and invertebrates.

Tell the students that there is enormous diversity and variety within the invertebrate group. More than a million species of insects alone have been identified.

Ask the pairs to discuss the features of all insects. Insects have three body parts (head, thorax and abdomen), six legs, two antennae and two compound eyes.

Ask the pairs to look at the *Invertebrate* cards (pages 15-16) and group the images according to shared features. The pairs can decide what these groups are, but they must be able to justify their decisions. Give the pairs some time to discuss and arrange the images according to the names and descriptions. Ask them to look at other pairs' work to compare their groupings.

Explain to the students that scientists don't always agree on the classifications given to animals and can sometimes change their minds. There are some animals that are quite different from the others in the same group.

Groupings: insects (ant, butterfly, grasshopper and bee); crustaceans (crab, lobster and woodlouse); arachnids (spider and scorpion); molluscs (octopus, oyster and snail); echinoderms (starfish and sea urchin); annelids (worm); cnidaria (jellyfish).

Play the video *Invertebrate Warriors*.

Ask the pairs to look at the images again and discuss the answers to the following:

- Which of these animals do not have an exoskeleton?

Jellyfish, worm and octopus.

- How do animals manage without an internal skeleton or exoskeleton?

Some animals use water to support their bodies. They may also have developed methods of deterring predators, such as stings or the ability to squirt ink. Some hide underground or in natural shelters, or adopt the shells of other animals.

Support:

Students could be given the *Statement visuals* (pages 9-11) to refer to, to support their understanding of any new terms discussed.

Extension:

Students could watch the video *Tracking tarantulas* and then research other invertebrates that shed their old exoskeletons and grow new ones.

Activity 2: Mini safari

Send the students on a mini safari to find invertebrates in the school grounds. How many different species of invertebrates can they find? Invertebrates may be carefully collected using small containers with air holes. Encourage the students to make close observational drawings of the invertebrates, using hand lenses or digital microscopes where possible, or by taking photographs of the invertebrates in their habitats. Include ponds and other pools of water, such as inside old buckets, in the search.

Ensure that the students are aware of the need to care for these living creatures, and that they understand the importance of returning each to its point of discovery after drawing/recording.

Support:

Students could be provided with named images of the invertebrates they may encounter to help identify what they find.

Extension:

Students could keep count of how many of each invertebrate they encounter and then record the data in a graph.

Activity 3: Build a bug hotel

Ask the students to design and build a bug hotel – an area of shelter designed to encourage a range of insects into the environment. This means providing many small crevices of different shapes and sizes in which the insects can take shelter from predators and bad weather. They are generally made from recycled or natural materials. This allows them to blend into the surroundings in the school grounds. The simplest bug hotel could be made using short bamboo sticks packed between bricks.

Wooden logs, old pallets, bricks and slabs provide a sturdy frame for a hotel. Pack these with lots of natural materials and create hollows for larger creatures using plastic plant pots, sticks, dead leaves and stones.

Support:

Provide images of example bug hotels for students to refer to, to support them in completing their design.

Extension:

Students could research the needs of insects and then write about how their bug hotel will provide the insects with what they need to survive.

Activity 4: Invertebrate habitats

Ask the students to work in groups to make a photo album or short video that gives a series of clues about a particular invertebrate's habitat.

Ask the groups to present this to the class, and have then rest of the students work out which invertebrate might live there.

Support:

Students could be shown a completed example to spark ideas and support their participation in this activity.

Extension:

Students could research the habitats of echinoderms (includes starfish, sea urchins), annelids (includes worms, leeches), cnidaria (includes jellyfish) or myriapods (includes centipedes and millipedes) and present their work to the class.

Conclusion

Ask students to respond to the following review questions:

- What is an invertebrate?
- Can you remember the names of any invertebrate groups?
- Can you name some species of invertebrates?

Optional extension question:

- Why do crabs have to climb out of their exoskeletons?

Their bodies grow bigger but their shells stay the same size. They have to shed the small shells and grow new, larger ones.

Ask if students still have any questions about the content presented in the video. Discuss and answer these questions as a class.

Classroom visuals

Statement visuals

Use these visuals to support students' understanding of key concepts during lessons.

Activity sheets

Activate prior knowledge: Insect game

Insect game

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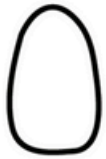
6	
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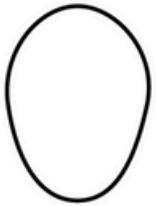
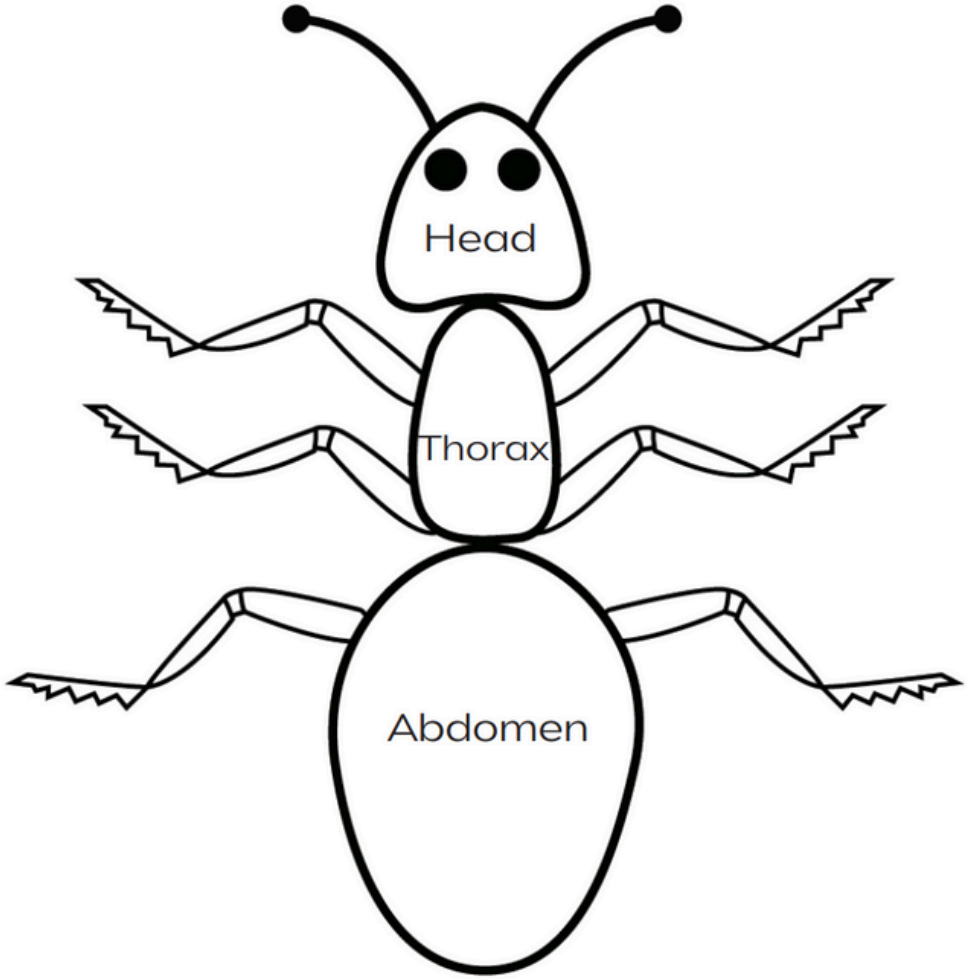
1	



Activity 1: Classifying invertebrates

Animal images

















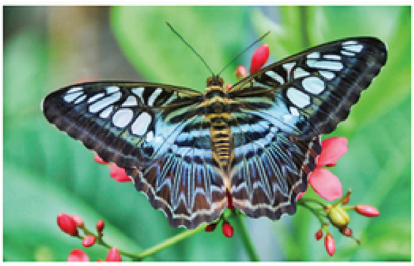











Activity 1: Classifying invertebrates

Invertebrate cards

Insects	• 3 body parts: head, thorax and abdomen • 3 pairs of jointed legs attached to thorax • 1 pair of antennae • 2 compound eyes • Exoskeleton for protection
Crustaceans	• 2 body parts: fused head/thorax and abdomen • Hard exoskeleton, often as a shell • 2 pairs of antennae • 3 pairs feeding mouthparts • Often have many pairs of legs
Arachnids	• 2 body parts: fused head/thorax and abdomen • 8 jointed legs • No antennae or wings • Sensory hairs cover the body • Exoskeleton for protection • No muscles – they use fluid inside legs to move
Molluscs	• Very diverse in structure • May have a large muscular “foot” or tentacles • Have organs with more than one function • Some have a shell
Annelids	• Segmented bodies • Each segment has the same set of organs • Soft-bodied • No legs, but ripples passing through body aid movemen
Cnidaria	• Simple aquatic organisms • Usually found in marine environments • Contain non-living jelly between living skin cells

Myriapods	• Number of legs varies from fewer than 10 to over 750 • 1 pair of antennae • Segmented body • Exoskeleton
Echinoderms	• Marine animals • Radial symmetry (usually 5 sided) • Able to re-grow tissue, organs and limbs