

Unit 4 Ecosystems

Topic 4.1 The Sonoran Desert ecosystem

- 1 The Sonoran Desert, which is very dry, and the temperature never goes below 0 °C
- 2 It has wide-spreading, shallow roots to absorb water when it rains. It has no leaves to reduce water loss by evaporation. It has spines to stop animals eating it.
- 3 It is too cold. They die if the temperature falls below 0 °C, because their cells are killed if they freeze.
- 4 If all the Gila woodpeckers and gilded flickers died out, there would be no holes made in the saguaro cacti, so other animals that use these holes would not be able to use them. This could mean that the population of birds such as elf owls might decrease.
- 5 The cacti are probably unable to compete with other plants that are specifically adapted to survive in wetter places. For example, other plants are likely to be able to grow faster than saguaro cacti, and produce a lot of leaves. They would overshadow the cacti, reducing the light falling onto them, so that they would not be able to photosynthesise.

If all the saguaro cacti died out, all the birds that use them for nesting (Gila woodpeckers, gilded flickers, elf owls, Harris hawks) would not be able to breed, so their populations would decrease. Bats would not have a source of pollen and nectar from the cacti, so, unless they could switch to feeding on other plants, their population might also decrease. Animals that eat the cactus fruits could also die out.

Topic 4.2 Different ecosystems

Exercise 4.2A A tropical rainforest ecosystem

Tropical rainforests grow where the temperature is always high and there is plenty of rainfall. Many different species of plant grow in the rainforest.

The rainforest provides **habitats** and food for many different species of animal.

On the forest floor, fungi break down dead leaves and waste from the animals. These fungi are **decomposers**.

The fungi release **nutrients** from the dead leaves and waste, which help the plants to grow.

All of the plants, animals and fungi interact with one another. They also interact with the non-living parts of their **environment**.

This network of interactions makes up the tropical rainforest **ecosystem**.

Exercise 4.2B Hydrothermal vents

- 1 There is no light, so they cannot photosynthesise.
- 2 For example: bacteria → zooplankton → sea anemones → crabs
- 3 bacteria
- 4 From chemicals dissolved in the hot water that comes out of the vent.
- 5 For example: inside a tube worm; in the hot water around the vent; on the sea floor.

Exercise 4.2C Mangroves and fish

- 1 habitat – the place where an organism lives
ecosystem – a network of interactions between living and non-living things
predator – an animal that kills and eats other animals
- 2 yellowtail
- 3 The masses for all species are lower where there are no mangroves. The biggest difference is for yellowtail, where the mass is less than half of that where there are mangroves on the shore.
- 4 When no mangroves are present, there is no habitat for the baby fish to develop safely from predators, so fewer baby fish grow to become adults, and there are fewer adult fish on the coral reef.

Topic 4.3 Intruders in an ecosystem

Exercise 4.3A Beavers in South America

- 1 streams and rivers in North America
- 2 They make dams, which cause deep pools to form. They cut down trees.
- 3 The bears would almost certainly harm other native species (including humans) as well as killing beavers.

not contain cane toad to the other half. (This is the independent variable.)

They should then give each quoll the chance to eat a cane toad, and record whether or not the quoll tries to eat it. (This is the dependent variable.)

If the hypothesis is correct, the results should show that the quolls that have eaten cane toad sausages try to eat fewer cane toads, than the quolls that have only eaten sausages that do not contain cane toad.

Exercise 4.3B Water hyacinth

- 1 herbivore: an animal that eats (only) plants
invasive species: a species that has been introduced into an ecosystem where it is not native, and that has spread widely and in large numbers
aquatic: living in water
- 2 Water hyacinths are native to South America, and there are several herbivores in the ecosystems there that eat water hyacinth and keep its numbers under control.
- 3 The water hyacinths stop oxygen getting into the water, so native plants and fish are killed. They make it difficult for fishermen to make a living, because the boats cannot move easily through the water hyacinth and the nets cannot catch fish.

Exercise 4.3C Cane toads in Australia

- 1 There will be other species in their native country that keep cane toad numbers under control – for example, predators that can eat them without being poisoned. In Australia, no species can eat them safely.
- 2 The researchers should obtain a large number of quolls, and keep them all in the same conditions. They should feed cane toad sausages to half of them, and sausages that do

Topic 4.4 Bioaccumulation

Exercise 4.4A Microplastics

- 1 tiny pieces of plastic less than 5 mm long
- 2 Some come from large pieces of plastic that break up into small pieces. Others are manufactured as microplastics, used in products such as face creams and toothpaste.
- 3 Some sink to the bottom because they are denser than water. Some go into the bodies of animals and may be carried to the bottom when the animal dies.
- 4 **a** 54
b $156 - 54 = 102$
- 5 As they feed, they take in microplastics that are floating in the water. There may also be some microplastics in the bodies of the zooplankton that they eat.
- 6 Bioaccumulation is the build-up of substances in an organism's body over its lifetime, because the substance does not break down in its body.
- 7 Seals eat many fish in their lifetimes, and all of the microplastics in the fish that they eat gradually build up in their bodies.

Exercise 4.4B Bias

- 1 The company wants to make money by selling its product, so it might try to make the risk posed by using the spray seem less important than it really is.
- 2 Yes. Once again, the company that sells the predators wants to make money, so it might play down the risk (represent it as lower than it really is) to other species posed by using the predators.
- 3 No damage is done to organisms that live in the area.
- 4 This could reduce the populations of other insects and, in some cases, could make them become extinct. Some of these could be useful: they could be pollinators, for example. This could, in turn, affect the populations of plants that rely on pollinators.
- 5 The chemicals in the spray build up in each organism that is exposed to it. The further up the food chain an animal is, the more of the chemicals it will take in over its lifetime, as it eats many animals that contain the chemicals.
- 6 No, they cannot be absolutely sure, but they can certainly trust this information more than the information from the companies.
- 7 Checking for bias is difficult, but it could involve looking at the results of any tests that have been done, so that they can see for themselves whether the results match the statements made by the agriculture department.