Name _____ Class _____ Date _____

CHAPTER 4 | Population Changes

SECTION 3

Natural Selection in Action

BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- Why do populations change?
- How are new species formed?
- Why do some species become extinct?

TN Tennessee Science Standards

GLE 0807.5.3
GLE 0807.5.4

Why Do Populations Change?

Natural selection explains how a change in the environment can change a population. Natural selection happens when members of a population have a variety of traits. Factors in the environment determine which traits are favorable and which are unfavorable.

Members of a species have different traits because their genes are different. The *genetic variation* of a population is a measure of the genetic differences between members of the population.

The members of a population with high genetic variation have many different alleles. Remember that an *allele* is a version of a gene. Because there are many different alleles in the population, there will be a large variety of traits in the population. If the environment changes, some of the individuals may have traits that will help them to survive in the new environment. ☑

The members of a population with low genetic variation do not have very many different alleles. Therefore, they have many of the same traits. If the environment changes, it is less likely that some individuals will have traits that help them survive. Therefore, populations with low genetic variation are not as able to become adapted to changes in their environment.

Cheetahs are an endangered species. Their populations have low genetic variation. Therefore, they are less likely to be able to survive a change in their environment.

STUDY TIP

Summarize As you read, underline the important ideas in each paragraph. When you finish reading, write a short summary of the section using the ideas that you underlined.

READING CHECK

1. Explain Why do individuals in a population with high genetic variation have a large variety of traits?

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TN TENNESSEE STANDARDS CHECK

GLE 0807.5.4 Explain why variations within a population enhance the changes for group survival.

2. Identify What determines whether a trait is favorable or unfavorable?

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ENVIRONMENTAL FACTORS

The greater the number of traits in a population, the more likely that some individuals will survive and reproduce. Which traits are favorable and which are unfavorable? The answer depends on environmental factors. *Environmental factors* are the conditions in an environment that affect the organisms that live there.

Different environments have different environmental factors. These factors include nonliving things, such as climate. For example, organisms that live in a desert need to be able to survive without much water. Organisms that live in the ocean need to be able to survive in salty water. Environmental factors can also be living things, such as the types of food and predators in an area.

Different traits are useful in different environments. Imagine two rabbits living in a forest. The forest floor is covered with dark-colored material. A dark-colored rabbit can blend in with this material. It can easily hide from its predators. A white rabbit cannot blend as well with the forest floor. It is less able to hide from its predators. Therefore, it will probably not survive as well as the dark-colored rabbit.

Now, imagine the same two rabbits living in a snowy area. In this environment, the white rabbit can blend in with the snow. The dark-colored rabbit cannot. Therefore, in this environment, the white rabbit is more likely to survive than the dark-colored rabbit.

Critical Thinking

3. Make Predictions What are two traits that may help an animal survive in a cold environment?

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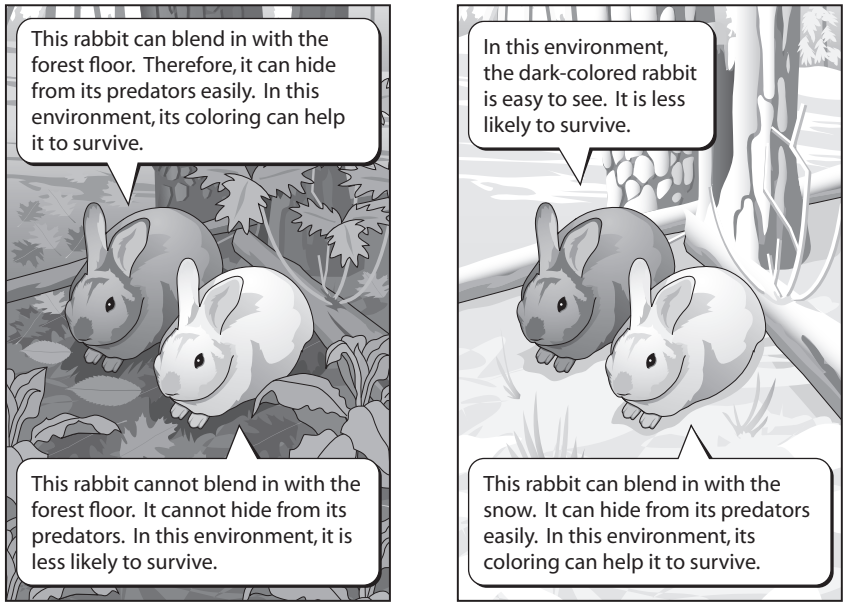

How Do New Species Form?

The formation of a new species as a result of changes in traits in a population over time is called **speciation**. Three events often lead to speciation: separation, adaptation, and reproductive isolation. ☑

READING CHECK

4. Define Write the definition of speciation in your own words.

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SEPARATION

Speciation may happen when a group of individuals becomes separated from the rest of a population. The process of separation can happen in many ways. A newly formed canyon, mountain range, or lake can divide a population. Movements of Earth's tectonic plates can also split populations and cause new species to develop.

TAKE A LOOK

5. Explain How can a lake cause a population to become separated?

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Many natural features can cause populations to become separated. Canyons, mountains, and lakes are some examples of these features.

ADAPTATION

After two groups have been separated, each group continues to be affected by natural selection. Different environmental factors may affect each population. Therefore, different traits can be favored in each population. Over many generations, different traits may spread through each population. ☑

READING CHECK

6. Explain Why may separated populations develop different traits?

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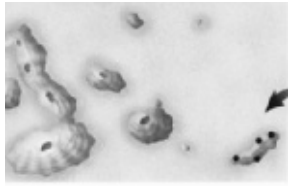
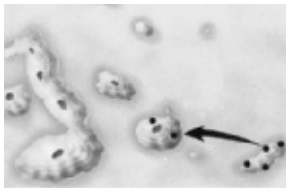
REPRODUCTIVE ISOLATION

Natural selection can cause two separated populations to become very different from each other. With time, the members of the two populations may be unable to mate successfully. The two populations may then be considered different species. The figures on the next page show how species of Galápagos finches may have arisen through separation, adaptation, and reproductive isolation.

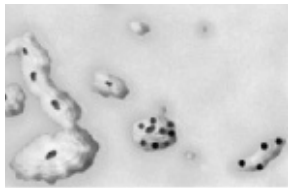
1 Separation Some finches left the South American mainland and reached one of the Galápagos Islands.



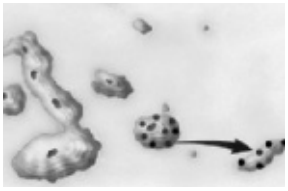
2 Adaptation The finches on the island reproduced. Over time, they adapted to the environment on the island.



3 Separation Some finches flew to a second island.



4 Adaptation These finches reproduced on the second island. Over time, they adapted to the second island's environment.



5 Reproductive Isolation After many generations, the finches on the second island were unable to successfully mate with the finches on the first island. The populations of finches on the two islands had become different species.

6 Speciation This process may have happened many times as finches flew to the different islands in the Galápagos.

TAKE A LOOK

7. Identify Where did all of the finches on the Galápagos Islands originally come from?

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What Causes Species to Become Extinct?

Organisms have traits that help them survive in their environment. What happens if the environment changes? Sometimes organisms can survive and reproduce after the environment changes. Sometimes the species cannot adapt fast enough to survive in the new environment.

If a species does not have the adaptations needed to survive, it may become extinct. A species is extinct when all the individuals of the species have died out completely. Species may become extinct for many reasons. ☑

READING CHECK

8. Describe What does it mean for a species to become extinct?

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INCREASED COMPETITION

Organisms need resources such as food, water, shelter, space, and sunlight. Different species compete for these resources. If the amount of resources decreases or the number of organisms increases, there is more competition for the remaining resources. If the members of a species cannot gather the resources they need, the species may become extinct.

NEW PREDATORS

Sometimes, a new species of predator enters an area. The new predator may hunt members of other species that live in the area. The prey species may not have adaptations to avoid the new predator. If the predator kills too many members of the prey species, the prey can become extinct.

A new species may travel to an area from nearby or humans may bring it in. For example, humans brought the European red fox to Australia. The foxes prey on many animals, such as numbats. Numbats do not have adaptations to escape foxes. Their numbers are decreasing. They may become extinct because of the foxes.

TN TENNESSEE STANDARDS CHECK

GLE 0807.5.3 Analyze how structural, behavioral, and physiological adaptations within a population enable it to survive in a given environment.

9. Identify Give three things that can cause a species to become extinct.

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LOSS OF HABITAT

Most species get the food, water, and shelter they need from the habitat in which they live. However, habitats can be destroyed by human activities. Natural disasters, such as floods, storms, and fires, can also destroy habitats.

When a population loses its habitat, it may move to a new area. The population may not have adaptations that allow it to live in other environments. When this happens, species may become extinct.

TAKE A LOOK

10. Explain How can a loss of habitat cause a species to go extinct?

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HOW DO SPECIES AVOID EXTINCTION?

Species often adapt to avoid extinction. For example, many people use chemicals that kill insects, called insecticides. Sometimes, and insect populations is no longer affected by an insecticide. This occurs because a few insects in the population are resistant to the chemical. These insects survive insecticide treatment and pass the resistance trait to their offspring.

The figure below shows how an insect population becomes resistant to an insecticide. More than 500 kinds of insects are resistant to some insecticides. Insect populations become resistant quickly because the insects produce many offspring and have a short generation time. **Generation time** is the average time between one generation and the next.

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Section 3 Review

GLE 0807.5.3, GLE 0807.5.4 TN

SECTION VOCABULARY

generation time the period between birth of one generation and the birth of the next generation	**speciation** the formation of new species as a result of change over time

1. **Define** What is genetic variation?

2. **Describe** What kinds of environmental factors may affect organisms that live on a rocky beach? Give three examples.

3. **List** What are three events that can lead to speciation?

4. **Identify** Give three examples of things that can cause groups of individuals to become separated.

5. **Explain** How can the introduction of a new predator cause a species to go extinct?

6. **Identify Relationships** How is genetic variation related to a species' chances of becoming extinct? Explain your answer.