

CHAPTER 10 The Evolution of Living Things

SECTION 3 **Natural Selection in Action**



California Science Standards

7.3.a, 7.3.e, 7.4.f

**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?

**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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**Why Do Populations Change?**

The theory of evolution by 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.

**SECTION 3** Natural Selection in Action *continued*

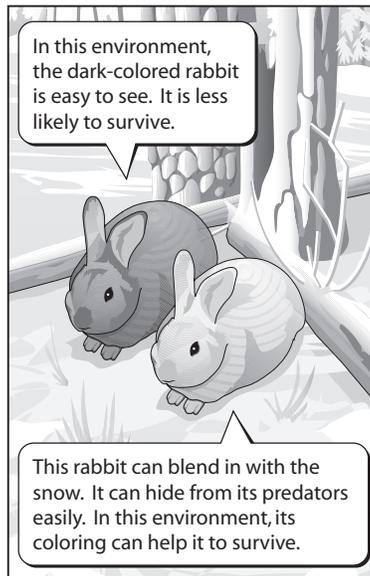
**ENVIRONMENTAL FACTORS**

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.



**CALIFORNIA STANDARDS CHECK**

**7.3.a** Students know both genetic variation and environmental factors are causes of evolution and diversity of organisms.

**Word Help: variation**  
a difference in the usual form or function

**Word Help: environment**  
the surrounding natural conditions that affect an organism

**Word Help: factor**  
a condition or event that brings about or contributes to a result

**Word Help: diversity**  
variety

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

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*Critical Thinking*

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

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**SECTION 3** Natural Selection in Action *continued*

**How Do New Species Form?**

The formation of a new species as a result of evolution 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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**TAKE A LOOK**

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

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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 evolve.



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 evolved through separation, adaptation, and reproductive isolation.

**SECTION 3** Natural Selection in Action *continued*



**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. ✓

**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.

**READING CHECK**

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

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**SECTION 3** Natural Selection in Action *continued*

**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.

**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.

 <p><b>CALIFORNIA STANDARDS CHECK</b></p>
<p><b>7.3.e</b> Students know that extinction of a species <u>occurs</u> when the <u>environment</u> changes and the adaptive characteristics of a species are <u>insufficient</u> for its <u>survival</u>.</p> <p><b>Word Help: occur</b> to happen</p> <p><b>Word Help: environment</b> the surrounding natural conditions that affect an organism</p> <p><b>Word Help: insufficient</b> not enough</p> <p><b>Word Help: survive</b> to continue to live or exist</p> <p><b>9. Identify</b> Give three things that can cause a species to become extinct.</p> <p>_____</p> <p>_____</p> <p>_____</p>

**TAKE A LOOK**

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

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# Section 3 Review

7.3.a, 7.3.e, 7.4.f 

## SECTION VOCABULARY

<b>extinct</b> describes a species that has died out completely	<b>speciation</b> the formation of new species as a result of evolution
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1. **Define** What is genetic variation?

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

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

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

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

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

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