

CHAPTER 7 The Evolution of Living Things

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 do new species form?

National Science Education Standards

LS 2a, 2e, 3d, 4d, 5b

Why Do Populations Change?

The theory of evolution by natural selection explains how changes in the environment can cause populations to change. Organisms that are well-adapted to their environment survive to reproduce. Organisms that are less well-adapted do not.

Some environmental changes are caused by people. Others happen naturally. No matter how they happen, though, environmental changes can cause populations to change.

ADAPTATION TO HUNTING

Hunting is one of the factors that can affect the survival of animals. In Africa, people hunt male elephants for their tusks, which are made of ivory. Because of natural genetic variations, some male elephants do not grow tusks. People do not hunt these tuskless elephants, so tuskless elephants tend to live longer than elephants with tusks. Therefore, tuskless elephants are more likely to reproduce and pass the tuskless trait to their offspring. ✓

Over time, the tuskless trait has become more common. For example, in 1930, about 99% of male elephants in one area had tusks. Today, only about 85% of male elephants in that area have tusks.



People hunt elephants for the ivory in their tusks.

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 are tuskless elephants more likely to reproduce in Africa?

SECTION 3 Natural Selection in Action *continued*

INSECTICIDE RESISTANCE

Many people use chemicals to control insect pests. These chemicals, called *insecticides*, kill insects. Sometimes, an insecticide that used to work well no longer affects an insect population. The insect population has evolved a resistance to the insecticide. This happens by natural selection, as shown in the figure below. ✓

READING CHECK

2. Define What is an insecticide?

1 When it is first used, the insecticide kills most of the insects. However, a few insects have genes that make them resistant to the insecticide. These insects survive.



2 The insects that are resistant to the insecticide pass on their genes to their offspring. Over time, almost all of the insects in the population have the insecticide-resistance gene.



3 When the same insecticide is used on the insects, only a few of the insects are killed. This is because most of the insects are resistant to the insecticide.



TAKE A LOOK

3. Infer What would happen to the population of insects if none were resistant to the insecticide?

Critical Thinking

4. Apply Concepts The females of a certain species of mammal prefer to mate with less-colorful males. What will probably happen to the proportion of colorful males in the population with time?

Insect populations can evolve quickly. This happens for two reasons: insects have many offspring and they have a short generation time. **Generation time** is the average time between one generation and the next. In general, the longer the generation time for a population, the slower the population can evolve.

COMPETITION FOR MATES

Organisms that reproduce sexually have to compete with one another for mates. For example, many female birds prefer to mate with colorful males. This means that colorful males have more offspring than less-colorful males. In most organisms, color is a genetic trait that is passed on to offspring. Therefore, colorful male birds are likely to produce colorful offspring. Over time, the proportion of colorful birds in the population will increase.

SECTION 3 Natural Selection in Action *continued*

How Does Natural Selection Make New Species?

The formation of a new species as a result of evolution is called **speciation**. Three events often lead to speciation: separation, adaptation, and division. ✓

SEPARATION

Speciation may begin when a part of a population becomes separated from the rest. This can happen in many ways. For example, a newly formed canyon, mountain range, or lake can separate the members of a population.

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. ✓

DIVISION

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 figure below shows how species of Galápagos finches may have evolved through separation, adaptation, and division.



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.



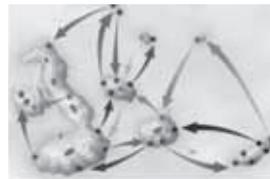
3 Separation Some finches flew to a second island.



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



5 Division 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.

✓ **READING CHECK**

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

✓ **READING CHECK**

6. Explain Why may separated populations develop different traits?

TAKE A LOOK

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

Section 3 Review

NSES LS 2a, 2e, 3d, 4d, 5b

SECTION VOCABULARY

<p>generation time the period between the birth of one generation and the birth of the next generation</p>	<p>speciation the formation of new species as a result of evolution</p>
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1. **List** What are three events that can lead to speciation?

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

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

4. **Explain** Why can insects adapt to pesticides quickly? Give two reasons.

5. **Apply Concepts** Which of the organisms described below can probably evolve more quickly in response to environmental changes? Explain your answer.

Organism	Generation time	Average number of offspring per generation
A	6 years	50
B	2 years	100
C	10 years	5
