Lesson 1: Stickleback, Stickleback, Where Are Your Spines

Introduction

In this unit, you will have a chance to think about populations of organisms and how their characteristics change over time. You will ask questions that scientists have wondered about for a long time. Scientists have made observations andfound that different populations have characteristics that have changed. Here are some examples of questions that scientists have asked:

- Why have some antibiotics that once killed many kinds of bacteria stopped being as effective at killing these bacteria?
- Deer mice populations living in Nebraska generally have dark-colored fur. When some populations migrated to the light-colored sand hills of Nebraska, why did their fur change from dark brown to light brown?
- The peppered moth, living in the forests outside of London, England, used to be a light color with black spots. When the air in London became filled with soot because of the Industrial Revolution, the white trees became darker, and the moths became darker. What caused this change?

To help you learn more about these questions, the unit will focus on the question below.

Unit Central Question

What is the process that leads to changes in population of organisms over time?

Process and Procedure

1. Write your best ideas about the unit central question in the space below. Leave space to revise your ideas as you learn more in later lessons.

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2. To begin to explore ideas about how populations change over time, you will consider populations of small fish called stickleback. They represent a natural phenomenon that will help you understand what might happen to any population. A natural phenomenon is an observable event or process in nature that makes you ask questions like, what happened? Or why did that happen?

   Preview the provided card set with your group. You will be sequencing the cards using information in the video.

   Watch the video about stickleback populations. You can watch the videoclip more than once, if needed. As you are watching, ask yourself the question, “What is happening to the stickleback fish?” and “What might be causing it to happen?”

3. To help you understand what happened to the stickleback fish, group the story cards provided by your teachers into three-time segments:

   a. during the ice age

   b. at the end of the ice age

   c. after the ice age to today

4. Now, using the sticky notes provided, make a label for each of the three-time segments. Then under each heading label, arrange the cards in a way that tells the story of what happened to the stickleback of Loberg Lake.

   Be prepared to share your visual representation of your sequence story cards with the class.

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Lesson Focus Question

5. Write the focus question for the lesson in the box below. Then, write your best ideas about the question under the box. Be sure to leave space to revise your answer as you learn more.

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Two Views about Change in Populations

6. You just explored what happened to the stickleback fish populations in freshwater lakes and saw that they look different from the ocean stickleback populations. For many years, scientists have wondered about what causes populations to change over time. Two scientists offered explanations to answer this question. To learn more about their ideas, read the information in *Two Views about Change in Populations*, found on the next page. Be sure to annotate using the literacy strategy explained by your teacher.

   Review your annotations and re-read, if necessary, to compare the two scientists' thinking about the sticklebacks. Use the literacy strategy explained by your teacher to identify what similarities the two scientists share. Next identify what the differences were in their thinking. Record these in the space below.

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7. Draw a "cause and effect organizer" in the space below as your teacher demonstrates. Both Scientist 1 and 2 would agree on the effect on stickleback. Discuss, decide, and record in your organizer the common effect on stickleback.

   Now focus on the boxes describing proposed causes for the changes in the stickleback population. In the Scientist 1 box, you'll record Scientist 1's ideas about the cause and in the Scientist 2 box, you'll record Scientist 2's ideas about the cause. In later lessons, you'll analyze additional data and information to determine which scientist's ideas are better supported by evidence.

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Two Views about Change in Population

Scientist 1	Scientist 2
Ideas about Populations and Individuals In a population, all the individuals have similar traits. There are differences in how a trait appears in different individuals. An example of this idea might be that all bears have claws, but they have different sized claws. Individuals can change the way a trait appears if they need it to be different. Once their needs are different or the environment changes, it leads to changes in behavior and traits. Those changes mean that the individual uses traits more or less, which then leads to the trait changing in that individual. The new version of the trait is then passed down to their offspring in the next generation. An example would be that bears use their claws to help them catch and eat prey. The bears with the longer claws are better able to catch prey and have more to eat. The bears with the shorter claws may not be able to catch prey as effectively and do not eat as often or as much. Bears with shorter claws would need to have longer claws to catch prey. As the bear uses the claws more, the claws will grow longer and stronger. Then, if the bear reproduced, the longer, stronger claws are passed down to its offspring. Because individuals can change their traits as they need to, in this case the bears change their claws and pass the longer claw trait to their offspring. The population will have mostly bears with long claws in the next generation.	*Ideas about Populations and Individuals* In a population, all the individuals have similar traits. There are differences in how a trait appears in different individuals. An example of this idea might be that all bears have claws, but they have different sized claws. Individuals do not change the version of traits that they have. However,the different versions mean that some individuals are better suited for the environment where they live. Those individuals are better able to survive. They are also more likely to reproduce. Because they reproduce, the version of the traits that the individuals had are passed down to their offspring in the next generation. An example of this idea would be that in a population of bears, some bears have longer, stronger claws and others have shorter, weaker claws. The bears with the longer claws are better able to catch prey and have more to eat. The bears with the shorter claws may not be able to catch prey as effectively and do not eat as often or as much. This makes them less likely to survive long enough to reproduce. The well-fed bears with longer claws can survive long enough to possibly reproduce. This means the longer, stronger claw version of the trait is passed down to the bears' offspring. Some of the bears with the shorter claws do survive, however. This means that in the next generation, there are more bears with longer claws and fewer with shorter claws. This trend continues in each generation of new bears. After many generations, most of the bears in the population have stronger, longer claws.

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Summarize and Synthesize Ideas

8. You have just considered two scientists' ideas about how populations change. Now take a few minutes to compare their ideas to yours. To do this, reread your initial response to the lesson focus question. Determine if your initial ideas were more like those of Scientist 1 or Scientist 2. Use a colored pen or pencil to put a "1" near your phrases or sentences that are more like Scientist 1's ideas and use a different color to put a "2" near your phrases or sentences that are more like Scientist 2's ideas.

   Now, compare your initial thinking to the ideas that you saw in the activities you completed. If your thinking has changed, add to or revise your initial response in a different color.

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