## Lesson 10. How Does the Story of the Juramayas Relate to All Our Other Stories?

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| The *"Big Idea"* | We can use the natural selection explanation we have learned in the course of this unit to make sense of (a) a plant or animal's specialized traits, (b) the emergence of new species, and (c) how all living things are connected. |
| Investigation Question | How does the story of the juramayas relate to all our other stories? |
| Summary | The lesson has three parts:<br>Part 1. Students hear the story *How the Harpies Evolved into Juramayas* and notice how it is the same as or different from *How the Piloses Evolved into Miroungas.*<br>Part 2. Students wrap up the unit. They revisit the long ago and nowadays scenarios from L1 and their initial ideas about a possible mechanism for change over time. They decide if their ideas have changed and revise their explanations as needed.<br>Part 3. Small groups use their knowledge of natural selection and their imagination to construct a scenario and create a poster that tells what could happen to their "nowadays" population over many generations following a dramatic shift in the environment. |
| Materials | For the class<br>● Copy of the *How the Harpies Evolved into Juramayas* storybook<br>● Slide deck for this lesson<br>For each small group<br>● Paper, pencils, markers, scissors, glue sticks, tape, etc. to create future scenario storyboards<br>For each student<br>● Notebook page 20 to revise their L1 explanation of change over time<br>● Notebook page 21 to record brainstormed ideas about a future scenario |

**Lesson Description and Rationale**

In the last class, students explored a set of fossils and wrestled with ideas about what fossil evidence can tell us about how plants and animals have changed over long periods of time.

Today they extend their understanding of what fossils can tell us about evolutionary history by engaging with a storybook, *How the Harpies Evolved into Juramayas*. This storybook explains how scientists used fossil evidence to reconstruct the evolutionary history of two real species that lived many thousands of years ago. Based on the fossil evidence they figured out that one

of the species ("juramayas" - actually *Juramaia sinensis*) was descended from the other more ancient species ("harpies" - actually *Procynosuchus delaharpeae*) through the process of speciation by natural selection. After they listen to the story, students have time to ask questions for clarification.

To wrap up the unit, students then return to Lesson 1 and tie together the big ideas from lessons 2-9 by creating their own "What Happened Next" scenario that starts with the nowadays panel from their assigned animal from Lesson 1. They imagine that this population is confronted with either (1) the arrival of an aggressive predator, (2) a dramatic change in climate, e.g., shift from cool and rainy to hot and dry, or, (3) a tectonic event that isolates part of the population, e.g., a volcano, tidal wave, earthquake that creates a chasm or rift that separates individuals in the population. They imagine what trait variant might be beneficial given the population's new circumstances and imagine how this will affect survival, reproduction, and distribution of trait variants in future generations. Students create a storyboard using drawings and words or captions to describe steps or stages in the changes that will occur over future generations.

The class shares their "What Happened Next" scenarios.

By the end of this lesson, students will be able to create their own storyboard that explains how a change in the environment led to changes in a population of animals over time–either the emergence of new traits or the emergence of a new species.

*Note: This lesson will take two class periods and should be broken after the reflection activity at the end of Part A.*

**Learning Targets in this Lesson**

- Fossil evidence supports a claim that two different species had the same ancestor many generations ago.
- A natural selection story explains how a population of animals changes over many generations in response to a major change in the environment.

| **Sequence of Experiences** | | |
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| **Part A.** | | |
| **1. Introduction** | All class | 5 Minutes |
| **2. Read Aloud *How the Harpies Evolved into Juramayas* Storybook** | All class | 15 Minutes |
| **3. Make Meaning of Juramayas Storybook** | All class | 10 Minutes |
| **4. Reflection: Have My Ideas Changed?** | Small group | 15 Minutes |

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| **Part B.** | | |
| **5. Create a "What Happened Next?" Storyboard or Poster** | Small group | 30 Minutes |
| **6. Scenario Walk-About and Wrap Up** | All class | 15 Minutes |

**Preparation**

- Watch the pointing guide to become familiar with how to read the storybook *How the Harpies Evolved into Juramayas:* https://youtu.be/JXC7oMIVCe0
- Make sure you have copies of the new, more detailed illustrations of animals from Lesson 1 to distribute to each small group.
- Post the list of the members of each small group from Lesson 1 – these same students will work together again.
- Gather materials for the *What Happened Next* posters.

**The Lesson-Part A**

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**1. Introduction** (5 min)

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Explain that today's lesson is the last one in the unit and that it has several parts.

*In **Part A**, we will read a new storybook that tells about the discovery of two different fossil species. We will learn how scientists used the fossil evidence to explain how they think a new species evolved.*

*We will return to Lesson 1 and the long ago and nowadays animals we looked at. We will revisit our ideas about how change happens and see if our ideas have changed.*

*Finally, in **Part B**, we will imagine what might happen to the "nowadays" animals in the future.*

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**2. Read Aloud *How the Harpies Evolved into Juramayas* Storybook** (15 Min)

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Gather students so that illustrations are clearly visible.
Read the *How the Harpies Evolved into Juramayas* book from start to finish.

Ask students to turn and talk. Is there anything about this story that is not clear? Have students pose questions to the class and encourage peers to respond.

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**3. Make Sense of the Juramayas Story** (10 Min)

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*Do you think the harpy/juramaya scenario is the same as the piloses/miroungas story?*

Similarities

- The population (piloses or harpies) is confronted with environmental challenges (group of piloses swept away and isolated, food in water; harpies stranded on land and threatened by predators)
- Some individuals have a combination of beneficial trait variants (Piloses: shorter trunks, wider feet, shorter tails; Harpies: bigger claws, longer legs, skinnier tails)
- Individuals with beneficial trait variants live longer, get more food, have more babies, and their relative numbers increase and begin to dominate the population
- Individuals in one population become different enough from the individuals in the other population that they are a new species (piloses/miroungas; harpies/juramayas)

Next, ask students

- *How do you think the stories are different?*
  The goal is to highlight the idea that the mechanism or explanation is the same for adaptation and speciation.

Differences

The environmental challenges were different:

- Miroungas: the two populations were *separated by a flood and the group that was separated was threatened by a lack of easily accessible food.*

- Harpies: the two populations were *separated by a volcano and the group that was separated was threatened by predators.*

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**4. Reflection: Have My Ideas Changed?** (15 Min)

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*In Lesson 1, you looked at 4 populations of animals whose traits have changed over a long time. You wrote your ideas about how this happened in your notebooks. You have now seen that the same mechanism can explain every case you have studied since then. In Lesson*

*6, you had a chance to revisit your ideas from Lesson 1. Now you will have another chance to look back at what you wrote in Lesson 1 and in Lesson 6.*

*Have your ideas about how change happened changed since Lesson 1? Have they changed since Lesson 6?*

Have students turn to page 20 in their notebooks and reread their initial ideas about how animal populations' characteristics or traits change over long periods of time. Ask them to find the space provided and write down ways in which these ideas have changed (if any).

If time permits, have students tell their classmates some ways their ideas have changed since Lesson 1.

*NOTE: You will need to break this lesson into two parts. THIS IS A GOOD STOPPING POINT.*

**The Lesson–Part B**

**5. Create a "What Happened Next?" Storyboard or Poster** (30 Min)

Ask students to gather in their Lesson 1 small groups and distribute the new images of Lesson 1 populations.

*Note: You may want to post a list of Lesson 1 small group members for reference.*

Ask students to look at the Nowadays drawings of "their" animals in the Lesson 1 panels and the directions for this activity found on P. 21 in their notebooks.

Review the "What Happened Next?" storyboard instructions.

Distribute the storyboard materials, 4 sheets of paper to create 4 storyboard panels and other materials to work with (e.g., pencils, markers, glue sticks, clear tape).

Panel 1 is a new Nowadays drawing of "their" Lesson 1 animals and a place to indicate which environmental challenge the group chooses for their story.

*Note: The new Nowadays drawing of the Lesson 1 animals include more details to depict the trait variants in each population. They are designed to give students the possibility of focusing on more than one trait in their poster if they choose.*

Encourage students to combine their imagination and their understanding of the steps in natural selection that they learned about in the cases of radishes, piloses, anoles, piloses/miroungas, and harpies/juramayas.

Encourage them to be creative and have fun!

Tell them they will have about 30 minutes for this activity.

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**6. Scenario Walk-About and Wrap Up** (15 min)

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Post/display the storyboard posters.
Give students about 10 minutes to circulate so they can take a good look at each poster.

*Note: Students do not need to explain their posters to their peers; all can circulate. You may need to call time to prompt students to move to the next poster.*

Gather the class so the group can see the posters while they talk to each other and ask open-ended but targeted questions about the content of this group of posters.

> *What jumped out as you looked at all the posters?*
>
> *Can you point to a feature of a poster [refer to a specific poster] that helped you understand this change-over-time story?*

If possible, keep the posters on display for a time to remind students of all that they learned in this unit and to motivate their continued thinking about the process of natural selection.