Science Learning Packet
Grade 8:
Natural Selection, Lesson 4

science learning activities for SPS students during the COVID-19 school closure.

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Due to the COVID-19 closure, teachers were asked to provide packets of home activities. This is not intended to take the place of regular classroom instruction but will help supplement student learning and provide opportunities for student learning while they are absent from school. Assignments are not required or graded. Because of the unprecedented nature of this health crisis and the District's swift closure, some home activities may not be accessible.

If you have difficulty accessing the material or have any questions, please contact your student's teacher.

Name _____

Class Period _____

Teacher _____

Lesson 2.1: Reproduction and Traits

You have seen how much the distribution of traits can change in a population, and you know that adaptive traits become more common—but how does this happen? In this lesson, you will be using the *Natural Selection* Simulation, doing a hands-on activity, and reading an article to understand where individuals get their traits and how this affects the trait distribution across the entire population over many generations.

Unit Question

- Why do populations change over time?

Chapter 2 Question

- How did the trait for increased poison level become more common in the newt population?

Vocabulary

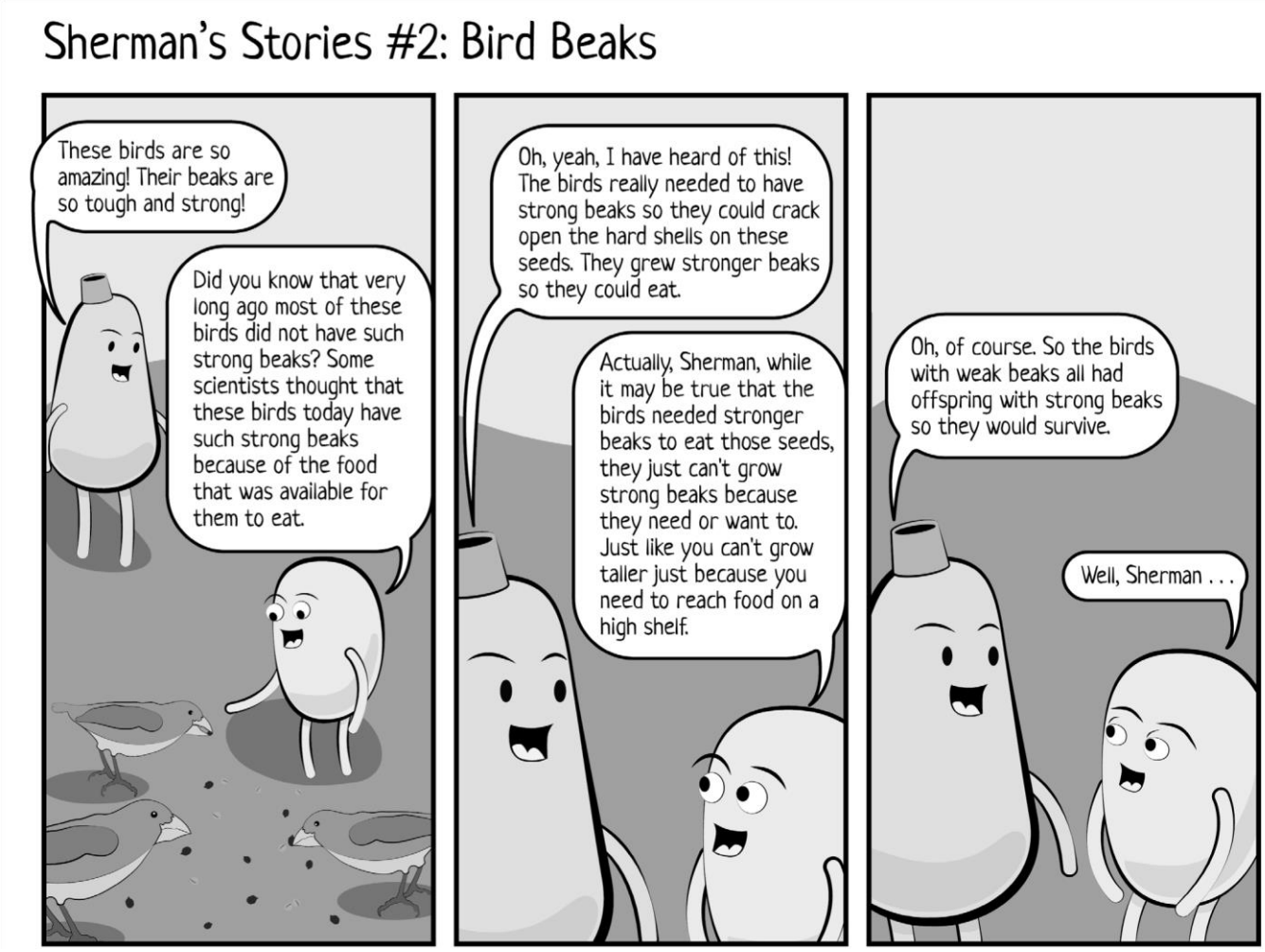
• Adaptive Trait • Cause • Claim • Distribution • Effect • Refute	• Environment • Evidence • Gene • Generation • Natural Selection • Trait	• Non-Adaptive Trait • Population • Prediction • Protein Molecule • Variation

Materials Needed

•Pencil & Paper

Warm-Up

Read the story and then answer the questions below and on the next page.



1. In this environment, which trait is adaptive for the birds?

_____

_____

_____

_____

_____

_____

2. Did the birds choose to have the adaptive trait? (check one)

   ☐ yes ☐ no

3. Sherman suggests that reproduction always creates individuals with adaptive traits. Does this seem correct? Why or why not?

_____

_____

_____

_____

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_____

Reproduction in the Sim

In the simulation, we are going to follow ostrilopes with non- adaptive and adaptive traits. The environment color is 7 and the environment contains carnithons that will be eating the Ostrilopes. Ostrilopes with a color-trait level of 7 are adaptive because their color helps them to survive as they can blend into the environment, whereas ostrilopes with a color-trait level *other* than 7 have a color trait that is non-adaptive because they will stand out more in the environment.

Do you think <u>all</u> ostrilopes who reproduce will create offspring with the adaptive yellow-color trait? Why or why not?

_____

_____

_____

_____

_____

Let's Gather Evidence from the simulation to see if this claim is supported or refuted.

Name: _____ Date: _____

Gathering Evidence of Reproduction in the Sim

Data on Ostrilope Reproduction

If you have Amplify at home log on the and navigate to the Natural Selection Simulation, click on the 'Reproductive Claims' Mode and follow an Ostrilope with a non-adaptive color as it mates and reproduces and then follow an Ostrilope with an adaptive color as it mates and then record your data in the tables below.

Ostrilopes with <u>non-adaptive</u> traits:

	Parent color-trait level	**Parent color-trait level**	**Offspring color-trait level**
Trial 1	Teal (color level 3)	Teal (color level 3)	Teal (color level 3)
Trial 2	Green (color level 4)	Blue (color level 1)	Blue (color level 1)

Ostrilopes with <u>adaptive</u> traits:

	Parent color-trait level	**Parent color-trait level**	**Offspring color-trait level**
Trial 1	Mustard yellow (color level 7)	Mustard yellow (color level 7)	Mustard yellow (color level 7)
Trial 2	Mustard yellow (color level 7)	Green (color level 5)	Mustard yellow (color level 7)

Think about if the data you collected in the Sim supports or refutes the claim that 'reproduction <u>always</u> creates individuals with adaptive traits'. You collected data about four offspring.

How many of the offspring that you observed had the adaptive trait of Yellow Color 7? (check one)

- ☐ none (0)
- ☐ some (1–3)
- ☐ all (4)

Making Sense of the Data

Does the data you collected support or refute the following claim? <u>How</u> does your data support or refute it?

Claim: Reproduction always creates individuals with adaptive traits.

_____

_____

_____

_____

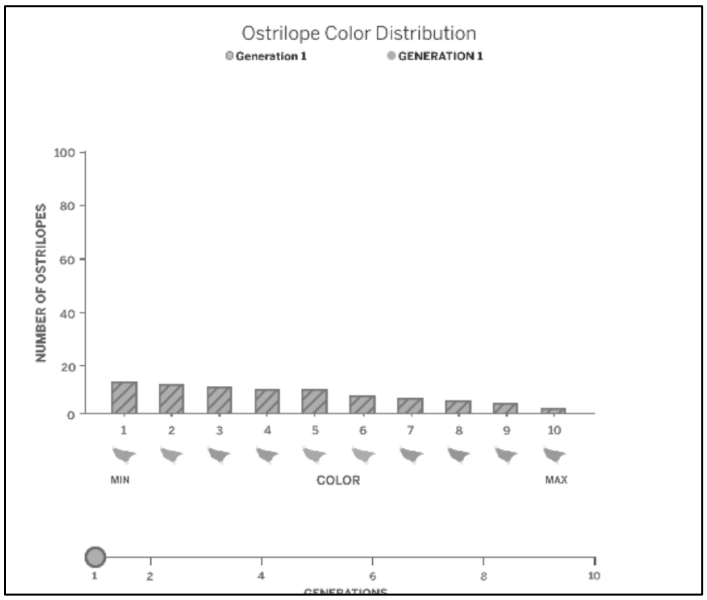
_____

Name: _____ Date: _____

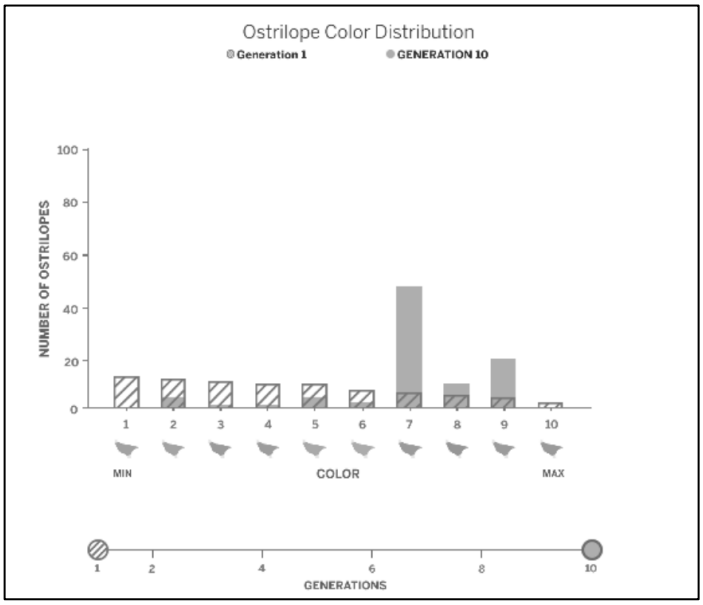
Traits in a Population

Now that we have seen the outcomes of reproduction on an individual level, let's look at the population overall and see what patterns we notice.

Histogram 1
Ostrilope Color Distribution at Generation 0



Histogram 2
Ostrilope Color Distribution at Generation 10



Making Sense of the Data

1. *What <u>differences</u> do you notice between Histogram 1 and Histogram 2? (I notice….)*

_____

_____

_____

2. *Does the data you collected support or refute the following claim? <u>How</u> does your data support or refute it?*

Claim: Reproduction always creates individuals with adaptive traits.

_____

_____

_____

_____

_____

Name: _____ Date: _____

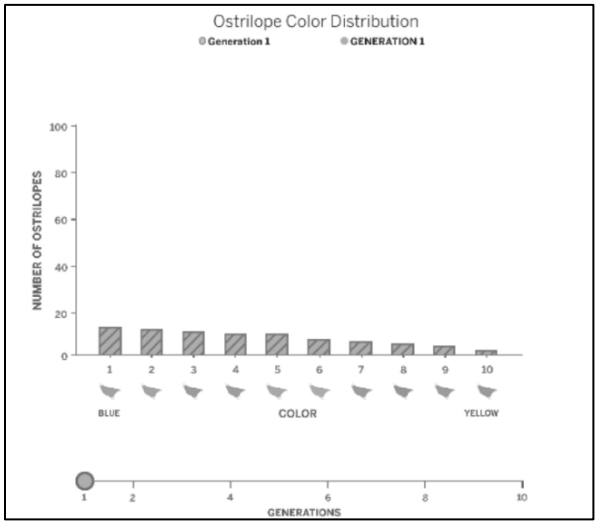
Traits Over Generations

We used the Sim to gather evidence to refute the claim that reproduction always produces offspring with adaptive traits. We saw that this claim wasn't true because in a population, the traits of offspring are generally similar to the traits of their parents.

But, reproduction does play a key role in how the distribution of traits in a population changes over time. Additionally, having the *opportunity* to reproduce in the first place is a contributing factor to the distribution of traits in a population over time. In these graphs from the SIM, think about how trait distribution in populations change with each round of offspring in a new generation without a predator and with a predator.

Figure 1: Ostrilope Color Distribution Over Time in a Population without Carnithons

Histogram 1
Ostrilope Color Distribution at Generation 0



Histogram 2
Ostrilope Color Distribution at Generation 10

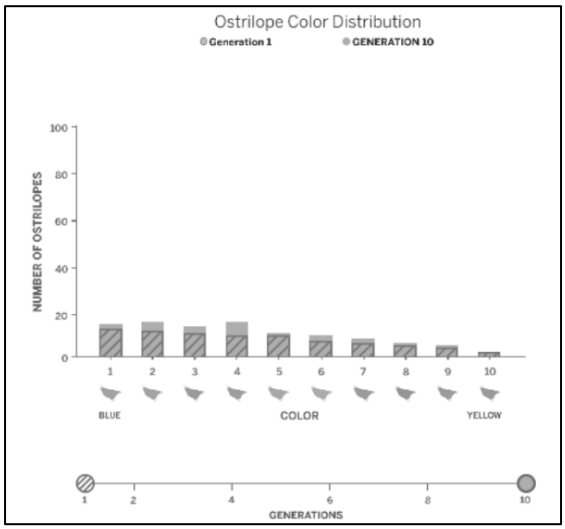
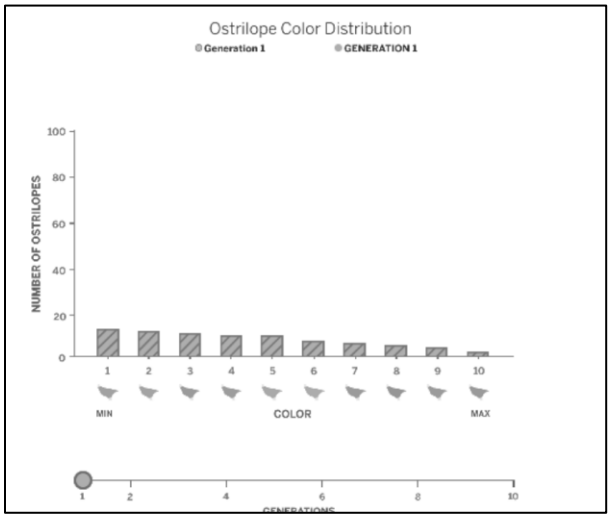
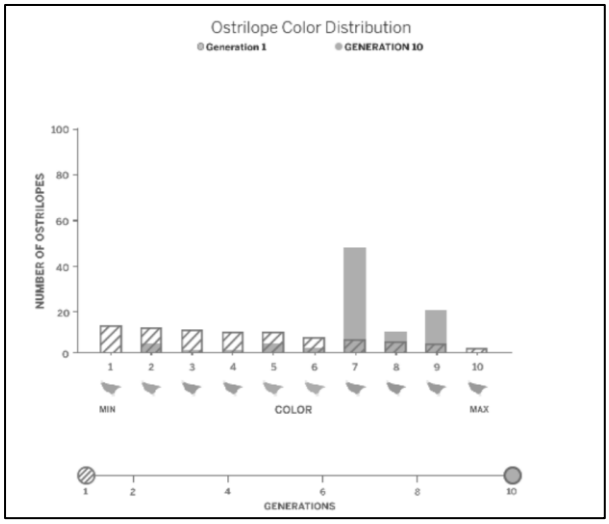


Figure 2: Ostrilope Color Distribution Over Time in a Population with Carnithons

Histogram 1
Ostrilope Color Distribution at Generation 0



Histogram 2
Ostrilope Color Distribution at Generation 10



Name: _____ Date: _____

Traits Over Generations (continued)

Making Sense of the Data

1. *What do you notice about trait <u>variation</u> in the population between the environment without carnithons compared the environment with carnithons?*

_____

_____

_____

2. *<u>How</u> do you think this change in trait variation happened in the environment with the carnithons?*

_____

_____

_____

_____

_____

On the next pages, you will read a short article to get more evidence.

This reading will help us answer the following Investigation Question:

How do individuals in a population get their traits?

Name: _____ Date: _____

Reading: Glowing Jellies

Active Reading Guidelines

- ☐ Think carefully about what you read. Pay attention to your own understanding.
- ☐ As you read, annotate the text to make a record of your thinking.
- ☐ Use a highlighter to highlight unknown words and in context definitions.
- ☐ Write in the margins to identify questions, impactful ideas, and paragraph summaries.
- ☐ Examine all visual representations carefully. Consider how they go together with the text.
- ☐ After you read, discuss what you have read with others to help you better understand the text.

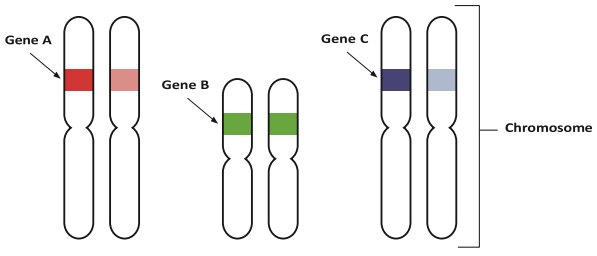
Imagine splashing in a calm ocean cove at night. As you splash, you notice green flashes in the water: glowing jellies! These are called crystal jellies. They can't sting humans, so you can swim and watch them glow green as you bump into them.

A protein molecule called Green Fluorescent Protein (GFP) causes some jellies to glow in the dark!

Where does this trait of being able to glow come from? In 1992, some scientists decided to find out. They examined the cells of crystal jellies and discovered that the glow comes from a protein. They gave the protein the name Green Fluorescent Protein, or GFP for short. To find out how these jellies make GFP, scientists investigated the jellies' genes. A gene is instructions for an organism's cells to make a particular protein. Scientists were able to find the gene that gave the jellies' cells instructions to make the GFP protein.

If a jelly has the GFP gene, its cells can make green fluorescent protein. If its cells make green fluorescent protein, the jelly can glow. The gene leads to the protein, which leads to the trait.

How does a jelly get the gene for glowing? When a pair of adult jellies reproduce, each one passes down genes to the offspring. Genes are found on chromosomes and chromosomes come in pairs. An organism has two copies of any given gene because there is one copy on each chromosome in a pair. However, the two copies of any particular gene can be the same version or different versions. These different versions of a gene are called alleles. When jellies reproduce sexually, each parent passes down one of each of their chromosomes (with all their genes on it) to the offspring. If at least one of the adult jellies has the version of the gene that is instructions for GFP, then that gene could be passed down to the offspring. Offspring with that gene will have cells that produce GFP, so they will glow, also.



This diagram shows three pairs of chromosomes. Chromosomes have many genes, but in this diagram only shows one for each chromosome. There are two copies of each gene, one on each chromosome of the pair. When an organism reproduces sexually, it gives the offspring one of each of its chromosomes and therefore one copy of each gene.

Scientists think that jellies glow as a defense against predators. The bright glow might startle or confuse predators, or it might attract bigger predators that could scare away or eat the jelly's attacker! Glowing is an adaptive trait for jellies because it helps them survive in their environment.

Name: _____ Date: _____

Reflection

How do individuals in a population get their traits?

Use what you learned in this lesson to answer the Investigation Question.

1. Where do the genes that determine an individual's traits come from? (check one)

   ☐ An individual can be born with any genes, since genes are random.

   ☐ Individuals grow genes specific to their environment.

   ☐ Parents pass their genes down to their offspring.

   ☐ Parents choose which genes their offspring have when each individual is born.

2. How do genes determine an individual's traits? (check one)

   ☐ Genes directly cause traits.

   ☐ Genes are random and don't lead to traits.

   ☐ Genes give organisms the ability to change their traits.

   ☐ Genes are instructions for making protein molecules and protein molecules determine traits.

3. How can an individual be born with an adaptive trait? (check one)

   ☐ The individual can choose to change to the adaptive trait when they want to.

   ☐ The parents had genes for the adaptive trait, which they passed down to the individual.

   ☐ The individual can choose to have the adaptive trait at birth.

   ☐ The parents can choose for the offspring to have genes for the adaptive trait.