Lesson 7.4 Natural Selection II

Name

Date

Period

Key Terms		
Selection pressure	extinction	Adaptation

Engage

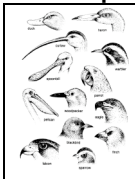
The English Pepper moth *Biston betularia* naturally has a variation in its pigmentation. Its color can vary from a fairly light variety to a very dark variety. In pre-industrial England, the lighter colored variety was seen in greater numbers than the darker variety. The light bark color coupled with predation by birds formed a selection pressure that favored the lighter moths over the darker variety.

With industrialization, pollutants such as soot coated the trees causing them darken. This new habitat color coupled with predation by birds formed a new selection pressure exerted on the pepper moth populations. As a result, birds found and consumed the lighter moths more effectively. The population of pepper moths then shifted so that the darker variety was shown in greater numbers.

1. Now that new pollution standards for factories have reduced the amount of soot released into the atmosphere in England, what do you predict will happen to the populations of pepper moths in England? Support your answer.

2. Why is variation in a population important?

Explore I



In this activity you will simulate a single species called Forkbirds. Forkbirds feed by using their beaks to scoop up food or spear it. All current fork birds in this population have a 2-pointed fork beak. During each generation each bird gathers "wild loops" using its fork beak and immediately puts them in their stomach cups before gathering more food. Competition for wildloops can be fierce in the forkbird population. The goal of all forkbeaks is to eat enough to survive and reproduce. This will allow them to pass on their genes to the next generation. Occasionally, a Forkbird offspring will express a mutated phenotype that makes it different from its parents. This new phenotype can than be selected for or against by the current environmental conditions and the level of competition in their environment.

Procedure

a. Work in groups of 4 students.
b. During each round of this simulation, all students will hunt wild loops (cheerios) by using their beaks (forks) to scoop or spear as many wild loops as possible and place them in their stomach cups (plastic cup)
c. In the first round (generation 1) you will start hunting wild loops using only a 2-pointed forkbeak (fork with only 2 tines) to collect the wild loops and place them in your stomach cup (plastic cup).
d. You will collect wild loops for 90 seconds. At the end of 90 seconds, all forkbeaks stop hunting.
e. After collecting wild loops for 90 seconds all forkbeaks should count the number of wildloops in their stomach cup. The two forkbeaks with the most wildloops in each group survive and reproduce, the two with the fewest wildloops die.
    i. The forkbeak who captured the most wild loops in your group will determine the new beak type of the person who captured the least wild loops in your group.
    ii. The fork beak who captured the second most wild loops in your group will determine the new beak type of the person who captured the second fewest wild loops in your group.
    iii. Surviving forkbeaks will roll the die to determine what their new offspring will look like. Use the table below to determine what your offspring will look like.

# on Die	Number of Points On Beak
1	1 Pointed Beak
2	2 Pointed Beak
4	4 Pointed Beak
3, 5, 6	Same Beak as Parent

f. Before starting the next round of feeding record the number of individuals representing each forkbeak phenotype that will be alive at the start of the next generation in the table labeled "Group Data." You will be sharing this data with the class so make sure you and your group members are accurately recording this information.
g. After recording the number of forkbeaks of each type for the next round, return your wildloops to the feeding bin and wait for your teacher to reset the timer and tell your group to begin.
h. When instructed to, begin capturing wild loops and placing them in your stomach cup using the correct type of beak as determined by the previous round of feeding.
i. We will repeat this process for 10 rounds of feeding that are each 90 seconds long.

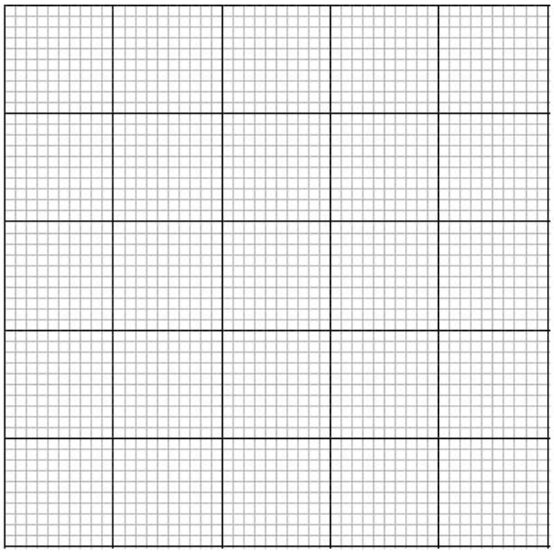
Group Data			
Generation	**Number of 1 Pointed Fork Beaks**	**Number of 2 Pointed Fork Beaks**	**Number of 4 Pointed Fork Beaks**
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

We will now gather the results from all groups to see how the entire population of forkbeaks in the class has changed. Make sure all members of your group have complete sets of data for all 10 generations. Appoint one group member as the reporter, they will be sharing your groups data for each generation for the class to record in the table below.

Whole Class Data			
Generation	**Number of 1 Pointed Fork Beaks**	**Number of 2 Pointed Fork Beaks**	**Number of 4 Pointed Fork Beaks**
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Explain I

3. Graph the class data in the space provided. Label the x-axis "generation #" and create and appropriate scale. Label the y-axis "number of fork beaks" and create and appropriate scale. Plot the data for each type of fork beak on the graph. Use a different color for each of the lines representing the one pointed, two pointed and four pointed forkbeak phenotypes.



KEY

# of points	color
one	
two	
three	
four	

4. The combination of various beak types and competition with other members of the same species forms a ***selection pressure***. The selection pressure reduces some of the population that lack necessary adaptations for survival. In some cases, a selection pressure can completely eliminate a species or a variety of a species. Which varieties were eliminated or significantly reduced in the class forkbeak population?

5. Explain why some forkbeaks were more likely to survive and reproduce than other forkbeaks in the class?

6. What happens to the variety of beak types over time as competition for wild loops occurs within the habitat?

7. After 1000 generations what type of beaks do you think would be most common? Explain your answer.

Explain II: Watch the video clip Dressing for Desire (4:05) and answer the questions below.

8. Why are ornamental feathers on peacocks not advantageous to their survival?

9. Why did Darwin believe the ornamental peacocks were advantageous to their survival?

10. Why do peahens prefer males with bright showy feathers?

11. What is the term for natural selection for courtship purposes?

12. What is one theory for the reason that humans have developed artistic skills?

Explain III: Read the Survival of the Sneakiest article and answer the following questions:

13. What does the term “survival of the fittest” mean?

14. Is calling good or bad for a cricket’s fitness? Explain your answer.

15. Give 2 examples of selection pressure in this story.

16. How does natural selection favor calling?

17. How does selection favor not calling?