Lesson Self-Check

CAN YOU EXPLAIN IT?

FIGURE 18: There are three types of male ruffs, and all can occur in a single population.

a An independent male

b A satellite male

c A female. Faeder males greatly resemble females.

Recall that there are three types of males in the ruff population. The dominant "independent" males are territorial and fight other independent males to attract females. The smaller "satellite" males do not fight. Satellites freely move between independents' territories and are able to mate with some females. The "faeder" males look like female ruffs. They generally mate with females sneakily while the other males are distracted or fighting.

Explain Refer to the notes in your Evidence Notebook to explain how three very different types of males evolved in a single population.

Scientists think that the independent males expend a lot of energy and incur the risk of being injured in a fight when establishing a territory to attract females. The independents (84 percent of the population) attract females by showing dominance.

Types that pay fewer of these costs also have evolved within the population. The satellites (14 percent of the population) mate with the females in the independent males' territories. Though independent ruffs may mate with more females, they are at risk of being injured in territorial fights and are more susceptible to predators because of their elaborate plumage and larger size. The faeders (1 percent of the population) are able to reproduce by sneaking into an independent male's territory and quickly mating with a female.

Interestingly, scientists have discovered that the behavior and physical traits that differentiate the three types are controlled at a single genetic location, a "supergene." Studies indicate that the faeders are a result of a chromosome inversion that occurred 3.8 million years ago. The satellite type was a result of a chromosomal rearrangement between the original sequence and the inverted sequence that happened about 0.5 million years ago. The differences in traits and behavior among these types allow them all to be successful and persist in the population.

CHECKPOINTS

Check Your Understanding

Use the following information to answer Questions 1-4.

In a population of 900 pea plants, 530 are homozygous purple, 250 are heterozygous purple, and 120 are homozygous white. Purple color (*P*) is dominant and white color (*p*) is recessive.

1. Determine the genotypic frequency in the population for *PP*, *Pp*, and *pp* individuals.

2. What is the total number of alleles in this gene pool?

3. What is the allele frequency of *P*? Express the frequency as a decimal rounded to the nearest hundredth.

4. What is the allele frequency of *p*? Express the frequency as a decimal rounded to the nearest hundredth.

Use the information in the table below to answer Question 5.

Color Variation	Frequency in Original Population (%)	Frequency in New Population (%)
Gray	15	45
Gray and white	60	20
White	25	35

5. The frequencies of a color trait among rabbits living in a mountainous area have changed over time. What type of selection most likely occurred?

a. directional
b. disruptive
c. stabilizing
d. sexual

6. Scientists observed a population of monkeys on an island. The monkeys were observed to have different finger lengths. Some monkeys had long fingers, some had short fingers, but the majority of them had finger lengths that were closer to the short finger length. Explain how this trait in the population of monkeys would evolve over time if tree branches on the island grew thicker. Would this be an example of stabilizing, directional, or disruptive selection?

7. Widowbirds are members of a bird species found in the southeastern part of Africa. The females have dull brown feathers and the males have black feathers, including tail feathers that measure an average of 41 centimeters long. Studies have shown that females prefer and choose to mate with males that have longer tails. Which outcome can be expected to occur in this scenario?

a. Over time, there will be more males with 41 centimeters tails.
b. Over time, there will be more males with tails longer than 41 centimeters.
c. Over time, there will be more males with tails shorter than 41 centimeters.
d. Over time, there will be more males with no tails.

8. Model how the bottleneck effect can lead to evolution by putting the following events in order.

a. Many of the individuals die in the population.
b. Population increases with less variation.
c. A random event acts on a population.
d. Surviving individuals reproduce.

9. Determine if the scenarios will likely result in an increase or a decrease in genetic variation over time. Copy and then complete the table below in your notebook by writing "increase" or "decrease" in the second column.

Scenarios	Genetic Variation within Individual Population
Mosquitos become resistant to pesticides.	
Arabian horses mate with wild horses.	
A population becomes lactose intolerant through mutation.	
A smaller body is selected for in cheetahs.	

10. The Florida panther is a type of mountain lion. About a hundred years ago, Florida panthers scattered and mated with other subspecies of mountain lions in nearby populations.

a. Explain how the gene flow in this population would be affected by the introduction of the Florida panthers.

b. Would genetic variation increase or decrease in the mountain lion population?

11. Give an example of the way sexual selection can cause extreme phenotypes in a population.

Use the information in the table below to answer Question 12.

Trait	Frequency of Trait (%)	
Color Variation	Predicted Frequencies Using the Hardy-Weinberg Equation	Observed Frequencies after Three Generations
Large flowers	75	44
Medium flowers	10	22
Small flowers	15	34

12. Study the table to compare predicted and actual frequencies of flower size in a flower population. What conclusion is best supported by the data in the table?

a. The population is evolving.

b. The population's gene pool remained the same.

c. The population is in equilibrium.

d. The population selected for an intermediate trait.

13. Why must allele frequencies in a gene pool always add up to 100 percent?

14. Explain how the process of genetic drift occurs completely by chance.

15. What are the differences and similarities between natural selection and sexual selection?

MAKE YOUR OWN STUDY GUIDE

In your Evidence Notebook, design a study guide that supports the main ideas from this lesson:

Changing allele frequencies can be an indication of the evolution of a population.

Selective pressures, such as competition and predation, can shift the distribution of traits in a population.

Small populations are more susceptible to genetic drift because large populations are able to lessen the impact of random events.

Remember to include the following information in your study guide:

- Use examples that model main ideas.
- Record explanations for the phenomena you investigated.
- Use evidence to support your explanations. Your support can include drawings, data, graphs, laboratory conclusions, and other evidence recorded throughout the lesson.

Consider how the evolution of populations relates to the assumption that natural laws operate today as they did in the past and will continue to do so in the future.