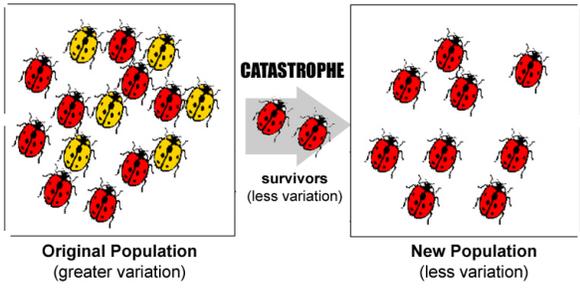
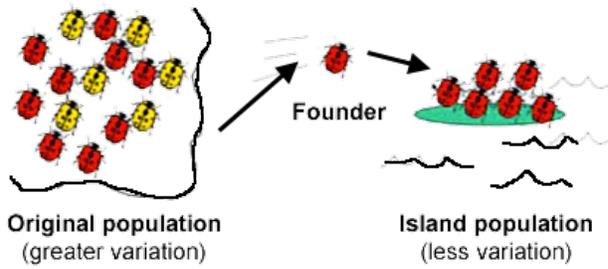


GENETIC DRIFT

Introduction:

- According to Darwin's theory of natural selection, there must be **variation** among individuals in the same species. For example, different individual porcupines may have different quill lengths.
- According to natural selection, these variations make some individuals **more adapted** to their particular environment. The more adapted individuals survive and reproduce more, and their adaptations (through their genes) become more common in the population over time.
- However, natural selection is **not the only source of evolutionary change**.

Genetic Drift	
<ul style="list-style-type: none"> • In small populations, individuals that carry a particular trait may leave more offspring than other individuals, just by chance. The environment is not "selecting" the more adapted individuals. • Genetic drift is a change in the genes of a population by random chance, making a particular allele more or less common in the population. • There are several ways that genetic drift can occur: 	
Genetic Bottleneck	The Founder Effect
<ul style="list-style-type: none"> • Sometimes, a disaster, such as a disease, can kill many individuals in a population. • Just by chance, the smaller, leftover population's gene pool can be different from the original population's. • The bottleneck effect is a change in gene frequency following a dramatic reduction of a population's size. • The bottleneck effect usually results in a population with reduced genetic diversity. 	<ul style="list-style-type: none"> • Genetic drift can also occur when only a few individuals colonize a brand new habitat. • These founding individuals may carry alleles that differ than those from the main population that they came from. • The new gene pool therefore starts out with different frequencies and grows in size. • When a small group of founding individuals colonize a new location, reduced genetic diversity usually occurs.
	
<p>e.g. Northern elephant seals have much reduced genetic variation due to hunting in the 19th century, which left their population to as few as 20 total individuals. Their population has rebounded to 30,000, but the genes still are not as diverse as their southern elephant seal cousins, who were never hunted in the same way.</p>	<p>e.g. The Amish, a group of highly traditional Christians that tend to live in isolated communities, have a higher frequency of polydactyly (extra fingers and toes) because the trait was brought over by one of its founders from Europe and then spread through the growing population due to intermarriage within the communities.</p>

Review:

Read each description and choose the correct pattern of genetic change it describes.

1. When Christopher Columbus came to the Americas, he randomly chose 3 chickens from Spain to bring along. These 3 chickens were the only chickens to breed in the Americas for hundreds of years.

a. natural selection	b. genetic bottleneck	c. founder effect
----------------------	-----------------------	-------------------

2. **Organisms better adapted to their environment tend to survive and produce more offspring. Their genetic profile becomes more common in the population over time.**

a. natural selection	b. genetic bottleneck	c. founder effect
----------------------	-----------------------	-------------------

3. In 2013, Typhoon Haiyan is estimated to have killed over 500 water buffalo in the Philippines. Water buffalo are used in the Philippines to plow crops. Many of the water buffalo that perished were concentrated near farms. These animals are more muscular than buffalo allowed to roam free.

a. natural selection	b. genetic bottleneck	c. founder effect
----------------------	-----------------------	-------------------

4. The Afrikaner population of Dutch settlers in South Africa is descended from a few colonists. Today, the Afrikaner population has an unusually high frequency of the gene for Huntington's disease.

a. natural selection	b. genetic bottleneck	c. founder effect
----------------------	-----------------------	-------------------

5. **The reduced genetic diversity that results when a population is descended from a small number of colonizing ancestor that interbreed.**

a. natural selection	b. genetic bottleneck	c. founder effect
----------------------	-----------------------	-------------------

6. Camouflage allows many species to blend in to their environment. Those individuals with the best camouflage are not eaten by predators as often as those with poorer camouflage.

a. natural selection	b. genetic bottleneck	c. founder effect
----------------------	-----------------------	-------------------

7. **A catastrophe kills many individuals in a population, leaving a small number of individuals to interbreed. These individuals may have different genes than the original population.**

a. natural selection	b. genetic bottleneck	c. founder effect
----------------------	-----------------------	-------------------

8. More severe illnesses exist among certain Jewish groups. Ashkenazi Jews, for example, have a particularly high chance of suffering from Tay-Sachs disease, a fatal condition in young children.

a. natural selection	b. genetic bottleneck	c. founder effect
----------------------	-----------------------	-------------------

9. During a hike a man accidentally steps on a population of rare beetles that were in the path, leaving just four from the original twenty.

a. natural selection	b. genetic bottleneck	c. founder effect
----------------------	-----------------------	-------------------

10. Antibiotic resistance occurs when certain bacteria with a mutation that allows them to survive exposure to antibiotic chemicals live on and reproduce. Quickly, a fully resistant generation develops.

a. natural selection	b. genetic bottleneck	c. founder effect
----------------------	-----------------------	-------------------

Review (KEY):

Read each description and choose the correct pattern of genetic change it describes.

1. When Christopher Columbus came to the Americas, he randomly chose 3 chickens from Spain to bring along. These 3 chickens were the only chickens to breed in the Americas for hundreds of years.

a. natural selection b. genetic bottleneck c. founder effect

2. **Organisms better adapted to their environment tend to survive and produce more offspring. Their genetic profile becomes more common in the population over time.**

a. natural selection b. genetic bottleneck c. founder effect

3. In 2013, Typhoon Haiyan is estimated to have killed over 500 water buffalo in the Philippines. Water buffalo are used in the Philippines to plow crops. Many of the water buffalo that perished were concentrated near farms. These animals are more muscular than buffalo allowed to roam free.

a. natural selection b. genetic bottleneck c. founder effect

4. The Afrikaner population of Dutch settlers in South Africa is descended from a few colonists. Today, the Afrikaner population has an unusually high frequency of the gene for Huntington's disease.

a. natural selection b. genetic bottleneck c. founder effect

5. **The reduced genetic diversity that results when a population is descended from a small number of colonizing ancestor that interbreed.**

a. natural selection b. genetic bottleneck c. founder effect

6. Camouflage allows many species to blend in to their environment. Those individuals with the best camouflage are not eaten by predators as often as those with poorer camouflage.

a. natural selection b. genetic bottleneck c. founder effect

7. **A catastrophe kills many individuals in a population, leaving a small number of individuals to interbreed. These individuals may have different genes than the original population.**

a. natural selection b. genetic bottleneck c. founder effect

8. More severe illnesses exist among certain Jewish groups. Ashkenazi Jews, for example, have a particularly high chance of suffering from Tay-Sachs disease, a fatal condition in young children.

a. natural selection b. genetic bottleneck c. founder effect

9. During a hike a man accidentally steps on a population of rare beetles that were in the path, leaving just four from the original twenty.

a. natural selection b. genetic bottleneck c. founder effect

10. Antibiotic resistance occurs when certain bacteria with a mutation that allows them to survive exposure to antibiotic chemicals live on and reproduce. Quickly, a fully resistant generation develops.

a. natural selection b. genetic bottleneck c. founder effect