

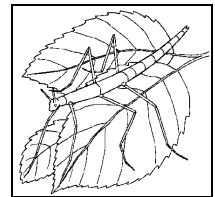
NATURAL SELECTION

Natural selection explains how species evolve, or change, over time. Natural selection is based on several key principles:

- Overproduction- Populations tend to produce more offspring than can possibly survive.
- Inherited variation- Each individual has its own traits.
- Competition- Because resources are limited, there is a struggle for survival.
- Selection- The individuals that win the struggle for survival will be able to reproduce.

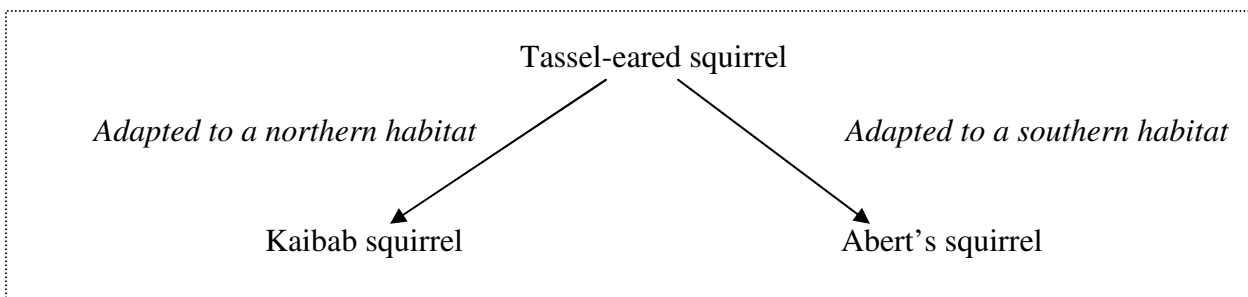
In summary, when organisms with favorable variations (helpful traits) for a particular environment survive and reproduce, they pass the favorable variations (helpful traits) to their offspring. Organisms with less-favorable variations (not helpful traits) are less likely to survive, and therefore less likely to mate. If they do not mate, they will not pass on their traits, and over time we will see fewer and fewer individuals with that trait.

Traits that help an organism survive and reproduce are also known as **adaptations**. Adaptations include body structures, chemical processes, and behaviors that increase survival. For example, if a mutation arises that allows an organism to blend in with their surroundings, they are less likely to be spotted by a predator. If an organism blends in and is not eaten (like the insect shown here), it is more likely to survive and reproduce; thus the camouflage trait will be passed on.



Another example of natural selection is pesticide resistance. Pesticides are chemical designed to kill insect pests. If an insect has mutation that allows them to break down the chemical, the chemical will not kill it. If the insect lives, it can reproduce, and it will pass on the ability to survive even when exposed to pesticides.

If two groups of a species are separated, they may become quite different as they each adapt to their own environments. **Speciation** is the formation of new species. This occurs if the two groups become so different that they can no longer interbreed (mate with each other). For example, the squirrel population shown below was split into different areas, and is now two different species.

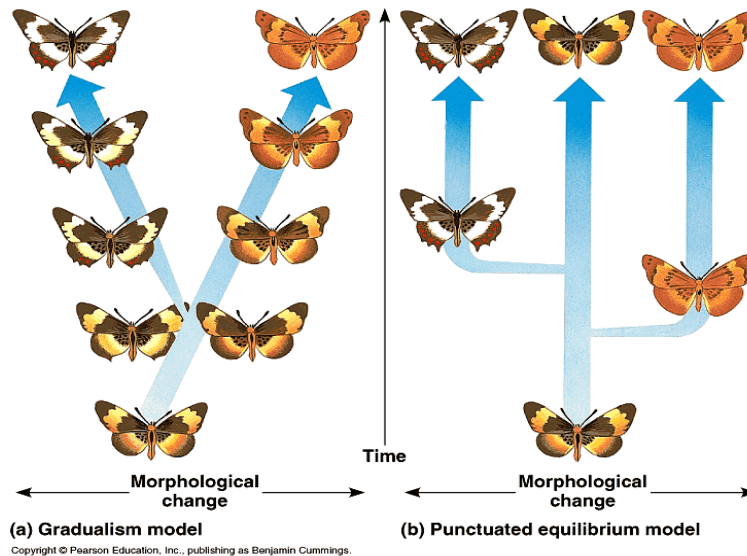


To survive a changing environment, each *species* must adapt to those changes.

Extinction is the disappearance of a species that occurs when the last member of a species dies.

The fossil record shows different possible patterns of evolution.

- **Gradualism** shows that some species change slowly over very long periods of time.
- **Punctuated equilibrium** involves spurts of change. There may be long periods in which a species remains unchanged, interrupted by change that occurs relatively rapidly. (Keep in mind that “sudden” change in evolution can refer to a period that only lasts for a few million years.)

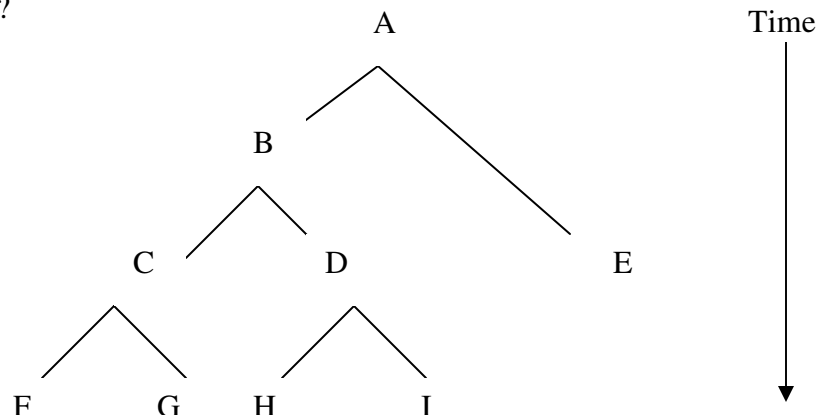


PRACTICE

1. How does camouflage aid in the evolutionary process?
 - A. Camouflage enables an organism to copy the appearance of another species
 - B. This adaptation helps an organism mutate
 - C. Organisms that are well camouflaged are more likely to escape predators and survive to reproduce
 - D. The ability to camouflage is lost during embryonic development
2. Industrialization in England in the early 1900s produced black soot that covered many tree trunks and branches. At the same time, the number of light colored moths in this part of the country decreased over time. Why?
 - A. The soot killed only light colored moths
 - B. The light-colored moths became extinct
 - C. The light colored mothers showed up against the dark tree bark and could be easily seen by birds that fed on them
 - D. The light-colored moths became isolated from other moths and speciation occurred
3. Over time, natural selection caused a change in the moth populations mentioned above. Which of the following most likely occurred as the result of natural selection?
 - A. All of the moths became light-colored
 - B. The dark moths increased in number until most of this species in the area were dark
 - C. The birds stopped eating moths and found a new food source
 - D. The moths were unable to reproduce and became extinct

4. Periods of drought (absence of rain) broke up the forest into smaller patches of trees. Groups of tree frogs become separated, and changes built up over time. If the tree frogs meet now, they will not be able to reproduce. This is an example of _____, or formation of new species.
5. _____ is the disappearance of a species that occurs when the last member of a species dies.
6. Bryozoans are coral-like sea animals. These organisms first appeared in the fossil record about 140 million years ago and remained relatively unchanged for 40 million years. Then they experienced a great diversification. Which process does this illustrate?
- gradualism
 - extinction
 - fossil formation
 - punctuated equilibrium
7. Assume that the environment on one of the Galapagos Islands changes. How might this environmental change affect the finches living there?
- These finches may start to overproduce.
 - These finches may no longer exhibit inherited variations.
 - These finches may lose their adaptations.
 - These finches may lack the adaptations needed to survive.
8. A Chinook salmon fish in Alaska can produce between 2000 to 17000 eggs in a single spawning. Which principle of natural selection does this observation support?
- Overproduction
 - Inherited variation
 - Struggle to survive
 - Differential reproduction
9. Which of the following provides the “raw materials” for the genetic variations that play an important role in natural selection?
- mitosis
 - homeostasis
 - cell differentiation
 - mutations

10. The diagram below shows relationships of selected species over time. According to this information, which of these species is expected to have the most differences from the ancestral species (A)?



- Species B
- Species D
- Species E
- Species G