Natural Selection

An Evolutionary Force

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What Is Natural Selection?

"Survival of the Fittest" → Or when certain traits make an individual more likely to survive, reproduce, and pass on their genes

IT DOES....

- take place over generations
- change allele frequencies over time
- adapts organisms to their environment

An allele is one of the forms a gene can take

Different alleles for eye color produce blue and brown eyes

IT DOES NOT....

- work towards an optimum
- always create visible change
- always change established traits (actually mostly does not)

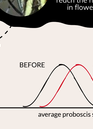
A trait is a distinct version that's passed from parent to child

Like eye color or height

When Does it Occur?

There are 3 conditions for natural selection:

1. There is variation among individuals in a population



2. The variation is heritable (can be passed on to offspring)

3. Variation in the trait is associated with variation in fitness (reproductive success)

Types of Natural Selection

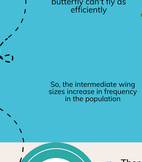
We will look at four main types of natural selection...

Directional Selection · Disruptive Selection · Stabilizing Selection · Sexual Selection

And examine how each could operate in a model population of butterflies

Directional Selection

Leads to increase in the frequency of a favored allele over time



Butterflies have a long tongue called a proboscis

They use it to reach the nectar in flowers

There are two types of flowers our butterflies feed on: a small shallow plant and a large deep one

A bad frost kills off most of the small shallow plants

The mean proboscis size increases as the deep plant remains the main food source

Butterflies with a longer proboscis are better able to feed on the deep plants and survive better

Disruptive Selection

This type of natural selection favors traits at the extremes

Our butterflies range in color from green to brown, with most being an intermediate color

The intermediate color helps them blend with the tree trunks as well the leaves

In the forest where the butterfly population lives, a large logging mill was built

And loggers began cutting down all the surrounding trees

The intermediate butterflies don't blend in with the field or the building, are seen by predators, and don't survive

The green and the brown butterflies survive and become more common

Stabilizing Selection

Maintains different forms of alleles in a population

Wing size in our butterflies is under stabilizing selection

Too small, and the butterfly can't fly as efficiently

Too big, and the butterfly is more easily seen by predators

So, the intermediate wing sizes increase in frequency in the population

FUN FACT

There is a special dynamic kind of stabilizing selection called...

Frequency-Dependent Selection

Positive	Negative
When the more common a variation in an allele is, the higher the fitness	When the higher the variant is in fitness, the less common it is
Decreases genetic variation	Increases genetic variation

REAL WORLD EXAMPLE: MIMICRY

Eastern Coral Snake
Poisonous

Scarlet Kingsnake
Mimics the color of the poisonous snake

Predators learn to avoid both species because of the similar color

Kingsnakes become more common, selection relaxes, and color becomes more variable

The mimicked color is thus *more fit* as the population becomes *more numerous*

Sexual Selection

Two Main Subtypes

Intersexual

Members of one sex choose members of the other to mate with

Typically the female chooses the male

Responsible for extravagant features like the colors of peacock feathers

Intrasexual

Competition between members of the same sex for mates

Typically between males

Responsible for defensive features on males like antlers or horns

In our butterflies, females prefer males with a white spot on their wings

Males with spots mate more, have more offspring, and are more likely to pass on their spots

Increasing the frequency of spots in males!

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