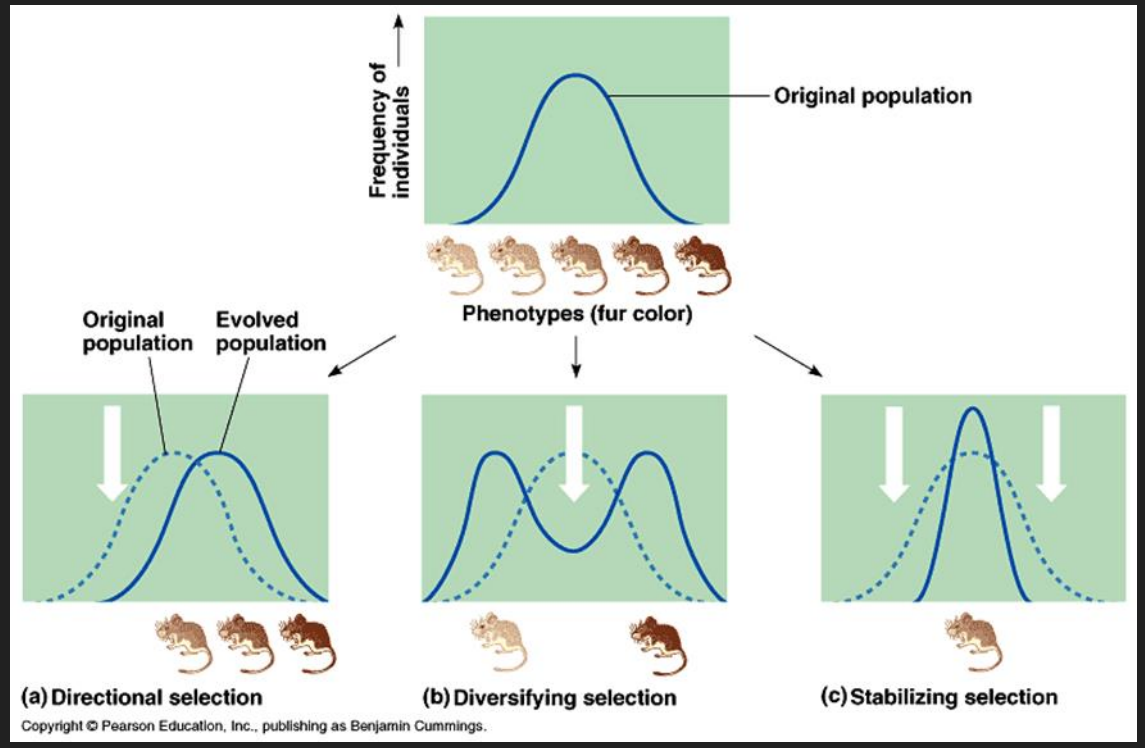
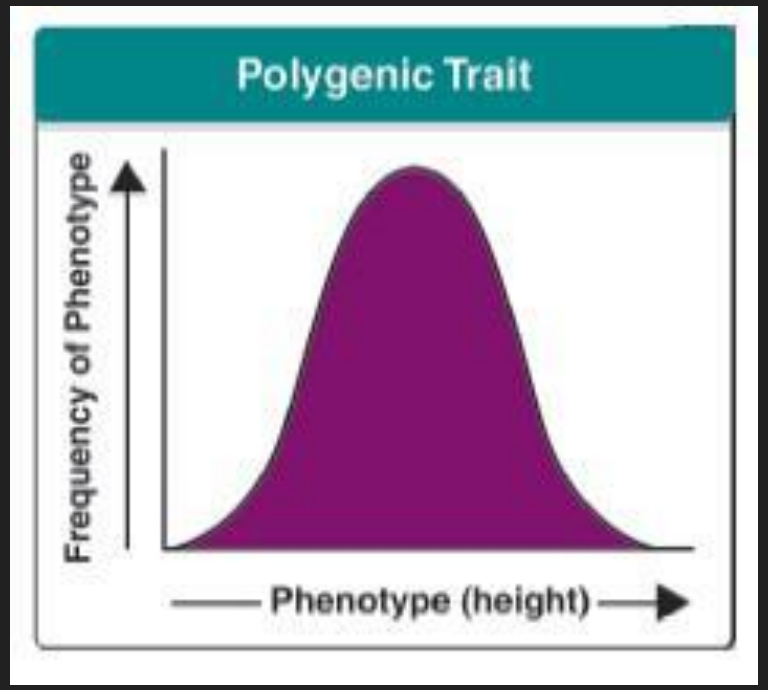
Selection on multi gene traits (Polygenic)

- Effects of Natural Selection are more complex
- Multiple alleles (from multiple genes) provides a range of phenotypes
- Natural Selection affects the distributions of phenotypes in three ways
  - Directional Selection
  - Stabilizing Selection
  - Disruptive Selection



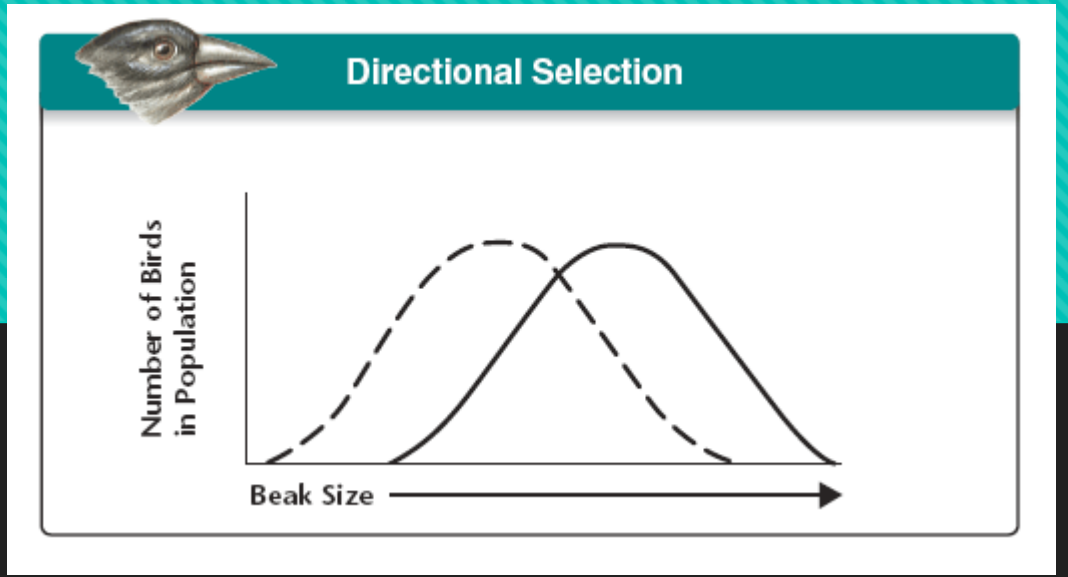
Original Population

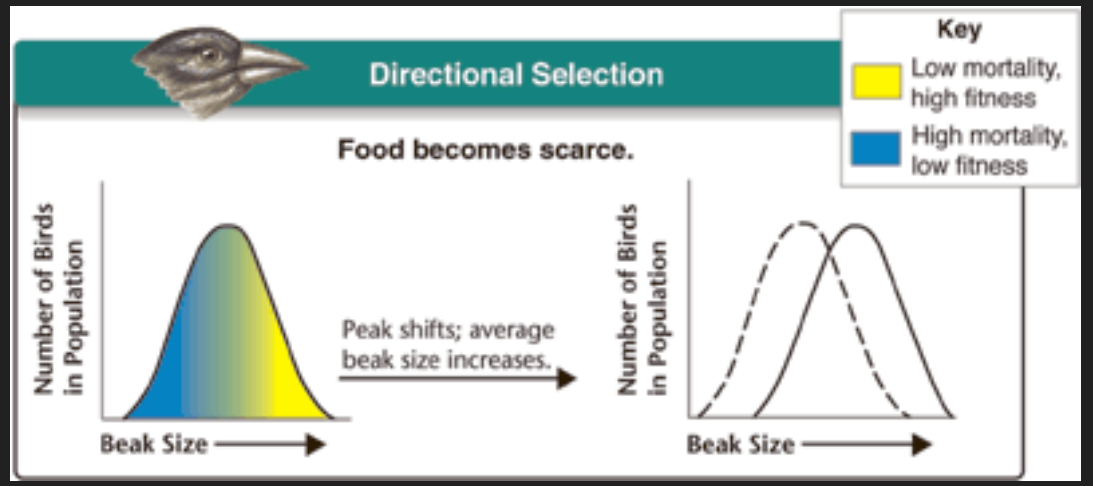
- Normal population distribution based on random breeding and has few individuals at the extremes with many average individuals



Directional Selection

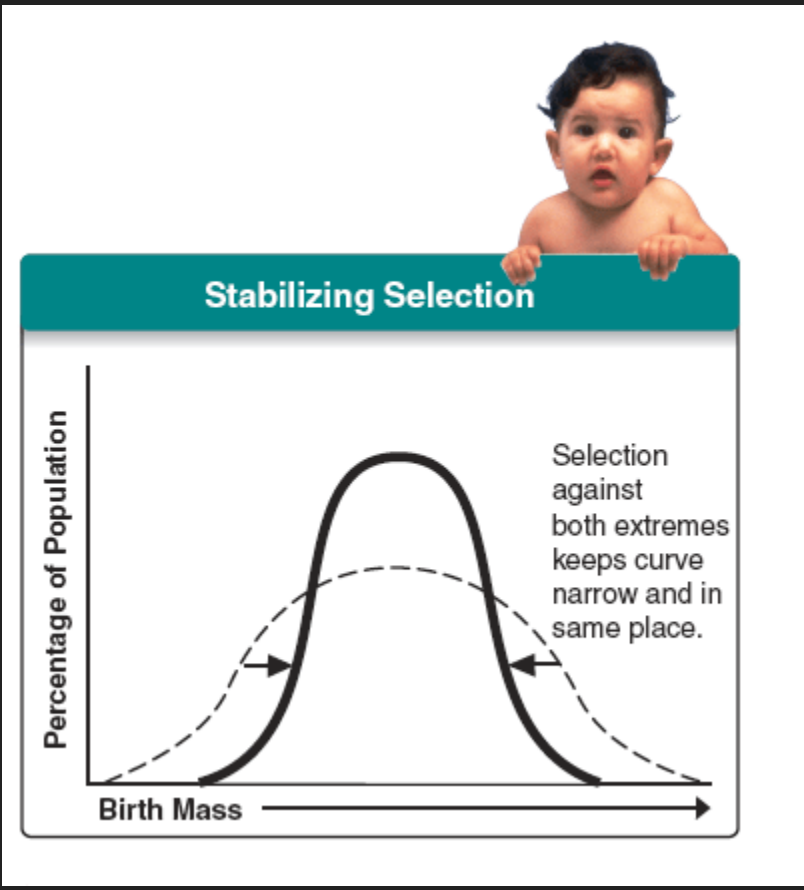
- Individuals at one end of the curve have a higher fitness than individuals in the middle or other side
- The range of phenotypes shifts as some individuals fail to survive and reproduce and others succeed.
- Can occur due environmental constraints
  - Resource availability





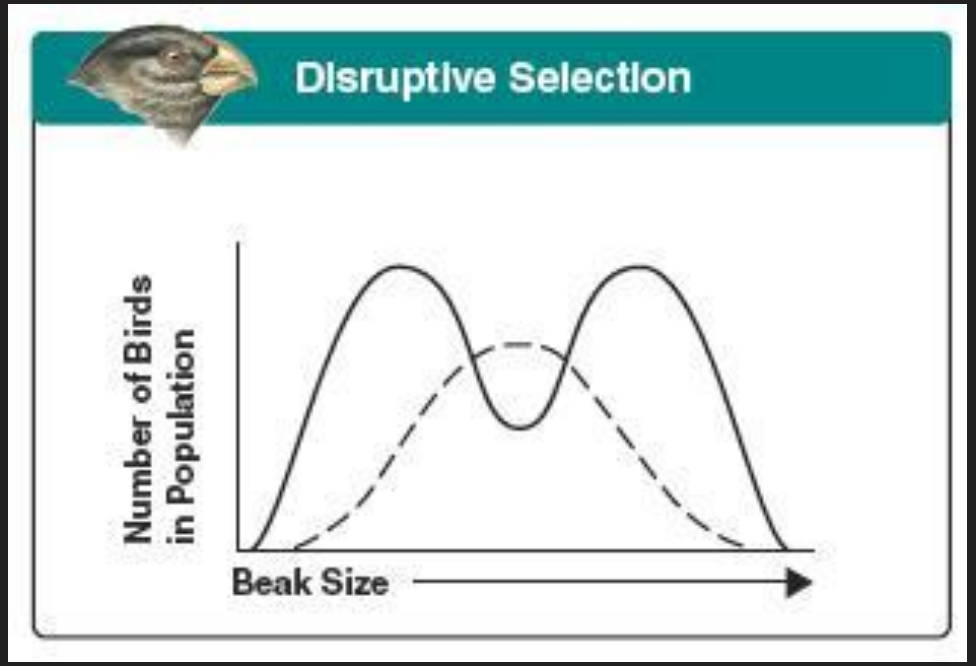
Stabilizing Selection

- Occurs when individuals near the center of the curve have higher fitness than the individuals at either end
- Narrows overall graph
- Selection acts upon the extremes
- Stabilizes the population



Disruptive Selection

- When individuals at the upper and lower ends of the curve have higher fitness
- Selection acts against the middle group
  - If it acts long enough it can cause the curve to split in two
    - I.e. creating two distinct phenotypes
    - Speciation can occur
      - New species arise from old ones



Sexual Selection

- Some mates are more desirable than others
  - More alluring song
  - Nicer feathers
  - Good dancer
- Disturbs random breeding
- Results in Directional Selection
- May result in extreme characteristics

Lets Try It!

- Evolution in Action
  - Butterfly Evolution Mini Lab

Peppered Moths: Natural Selection in Action!

- During the day moths stay on the bark of oak tress
- Earth 19th century bark was light brown speckled with green
- Most of the moths were light brown
- There were a few dark coloured moths but the light brown moths were most common

Industrial Revolution

- Pollution from burning coal stained England's tree trunks dark brown
- Biologists started to notice dark coloured moths were more common
- Predators were birds
  - What was happening?

Predation

- Harder for birds to spot the dark coloured moths on the newly coal covered tree trunks
- Camouflage works to the advantage of the moth

The Moth Population Was Changing

- As the tree trunks darkened, the rarer, darker moths were better able to survive
- The darker moths had greater fitness
- During the Industrial revolution more of the darker moths survived and reproduced, passing on genes for dark colour to their offspring
- The moth population evolved darker colouration