Speciation

Biology

Objectives

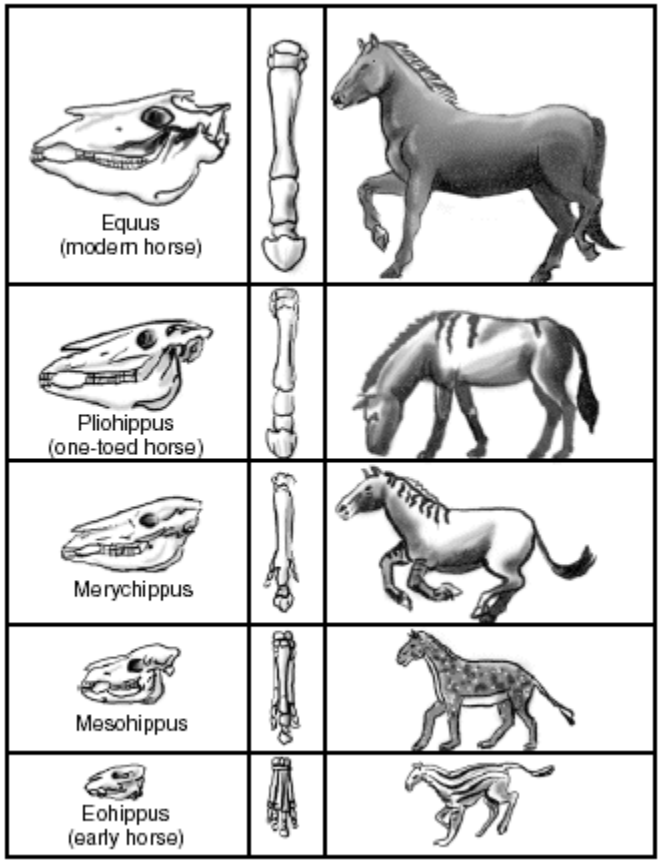
- Students will understand what a biological species is
- Students will know the definition of speciation
- Students will be able to explain different ways that speciation can occur and give examples
- Students will understand how evolution through natural selection can lead to speciation

What is a Species?

- A group of organisms that can and do reproduce
- Ambiguity is not unusual (hybrids, subspecies, arguments)
- We will mostly consider species that are inarguably different

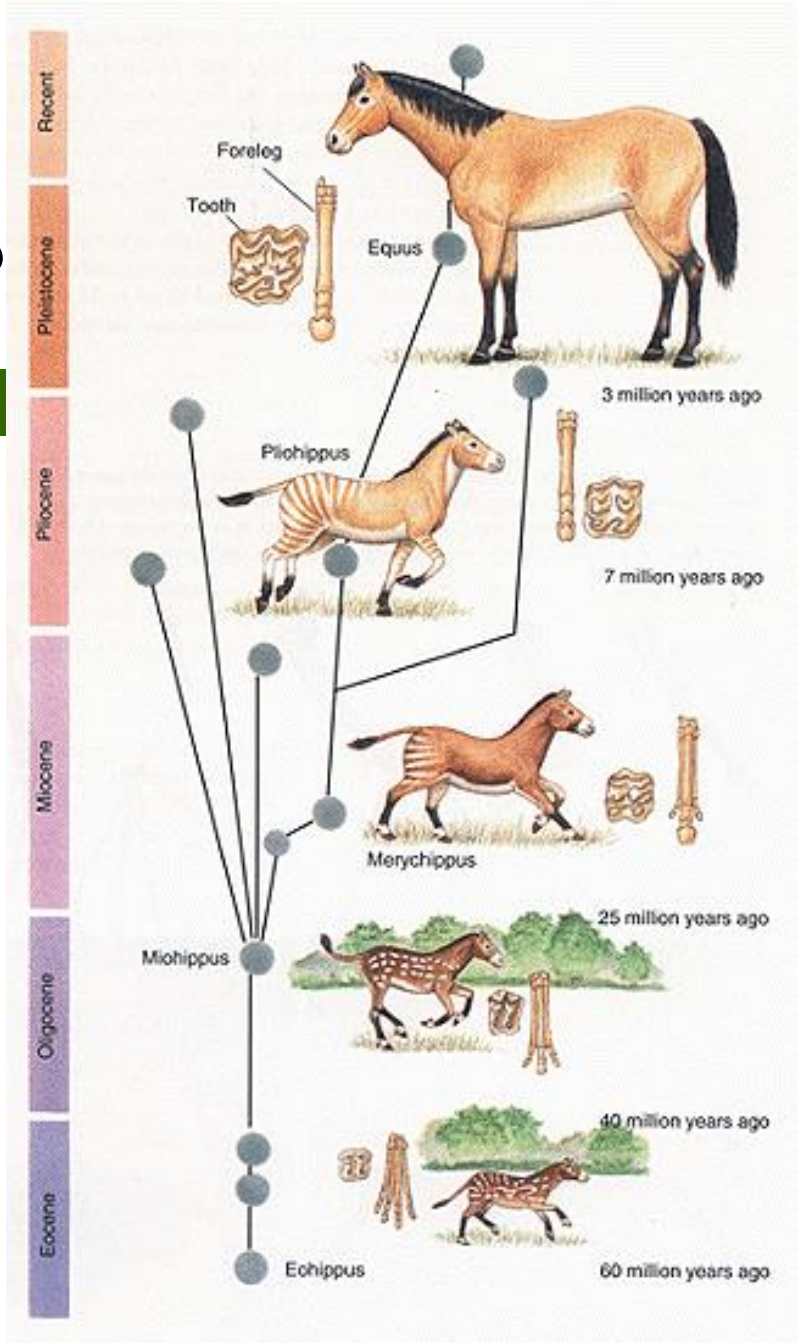
The Fossil Record

- We can see evidence of different species in the fossil record ~ APPEAR AT DIFFERENT TIMES
- We can't necessarily tell if two groups of similar organisms could interbreed …
- But it is clear when new forms of organisms appear



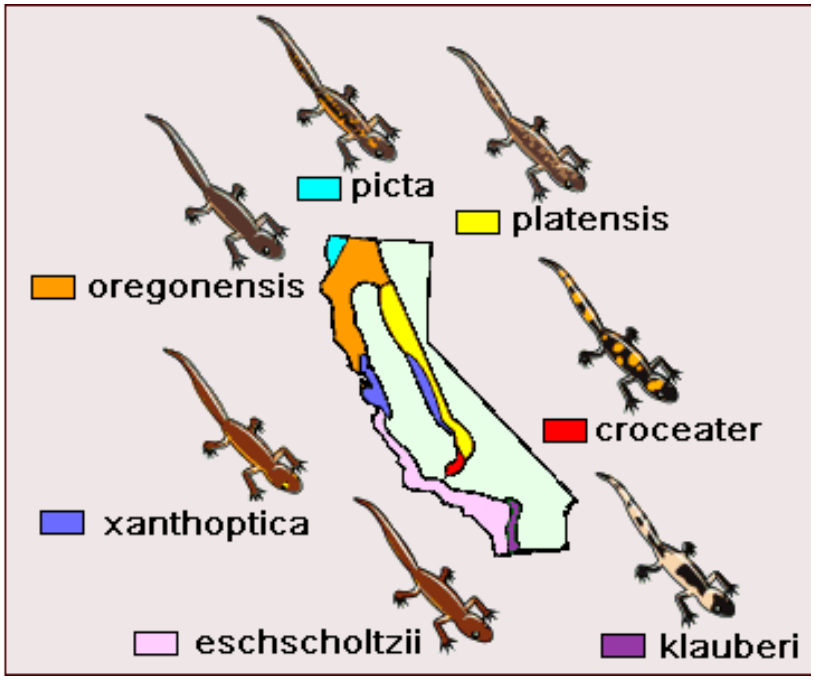
What is Speciation?

- Speciation is a process – but it often seems to appear instantaneous in the fossil record
- It occurs when a new species emerges (generally only seen in fossils)



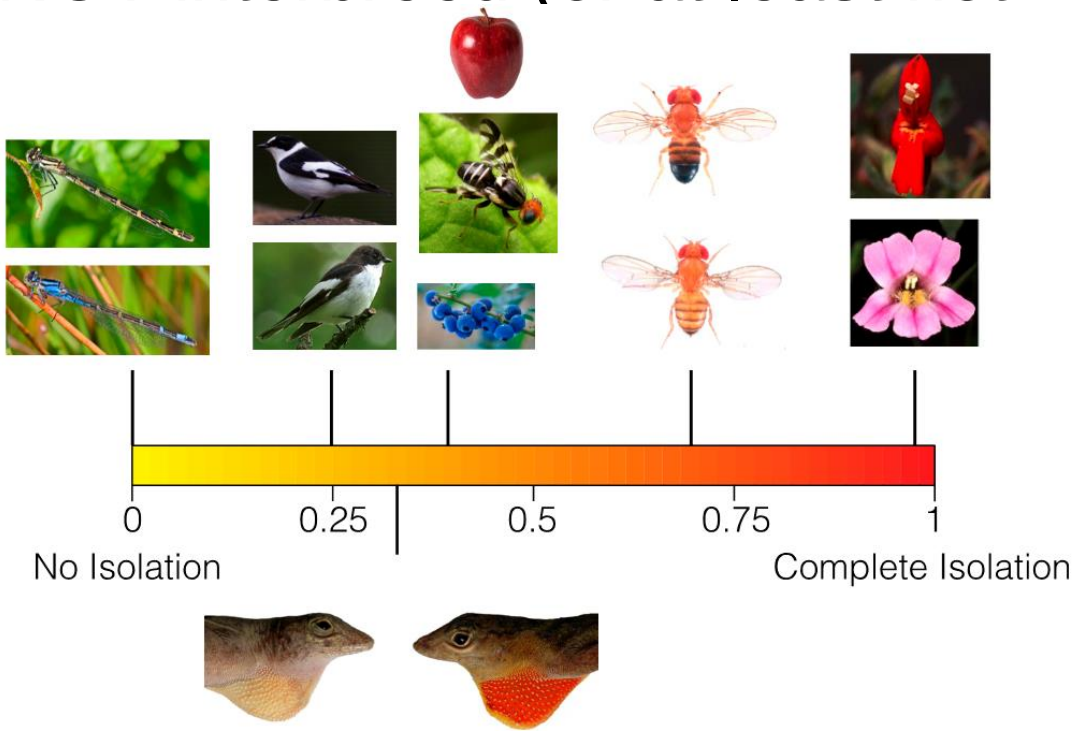
How Does Speciation Occur?

1. Geographic isolation: a barrier (or a large distance) between populations of the same organism



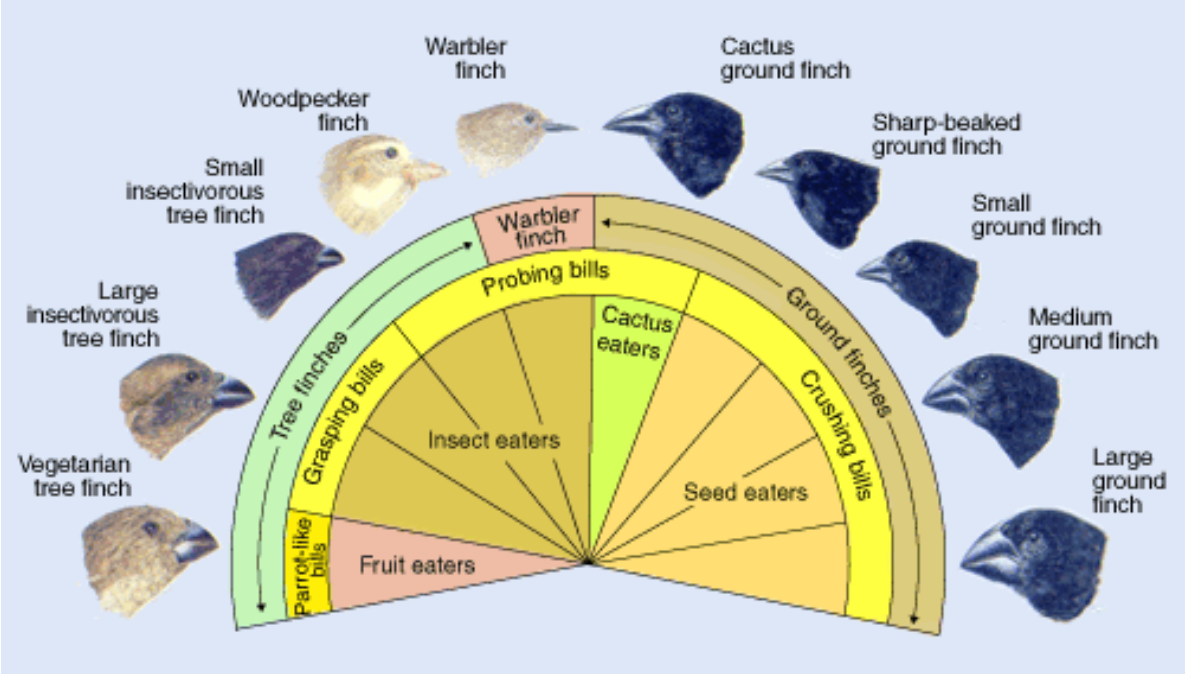
How Does Speciation Occur?

2. Reproductive Isolation: Separated populations do NOT interbreed (or at least not often).



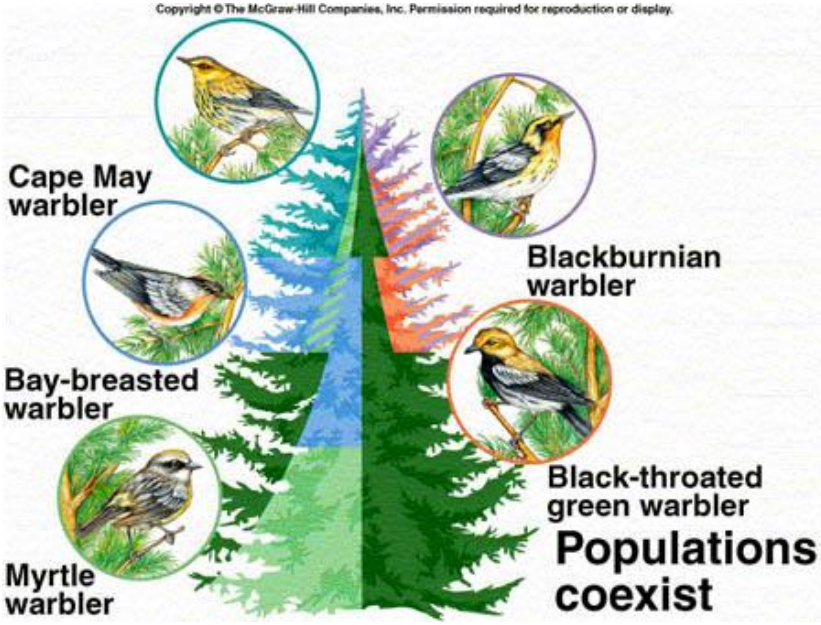
How Does Speciation Occur?

3. Different environments, habitats, or niches* (can develop over time or be pre-existing)



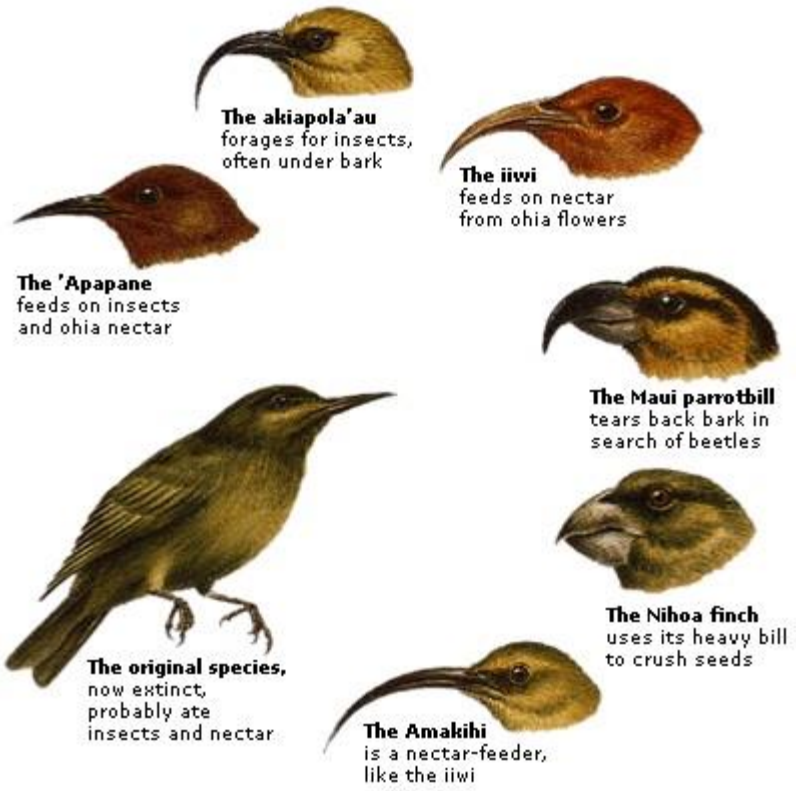
*Sidebar – What is a Niche?

- The survival strategy an organism uses within a particular environment or habitat
- Summarizes everything – food choices, reproductive strategy, protection, etc.



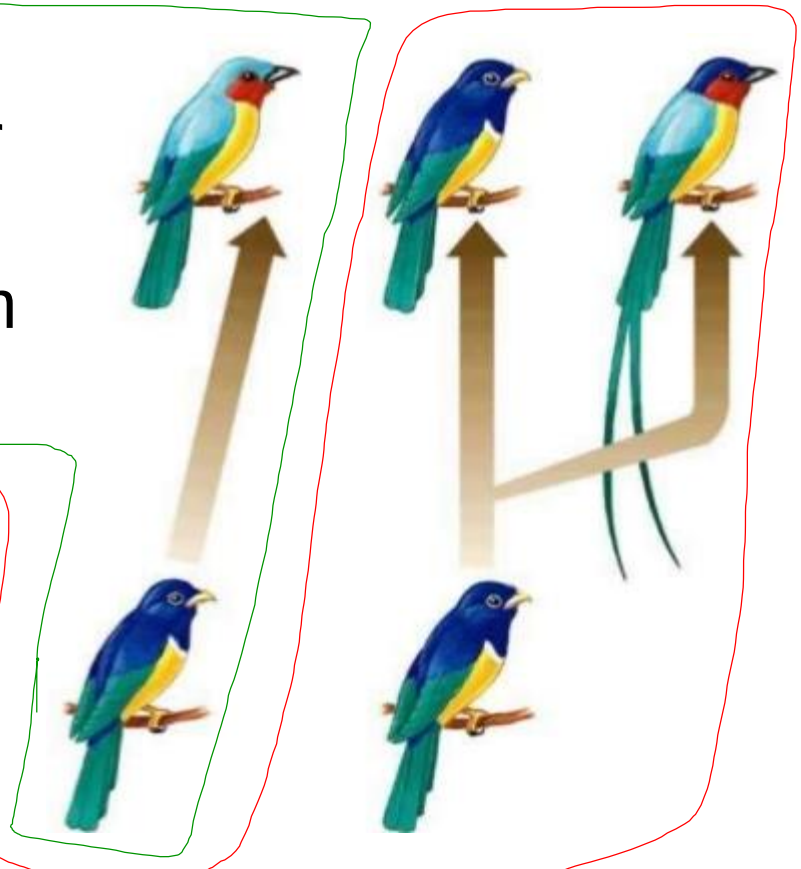
How Does Speciation Occur?

4. Natural selection operates on each population separately - in different places, or for different niches, higher fitness can look very different!



What Does Speciation Look Like?

- In a given habitat, a population can evolve over time so that descendants are a different species from their ancestors
- If there is still an existing population of the ancestral species somewhere else, the ancestor may evolve differently (or not at all)



What to Think About:

- If one species evolves into a new species, how can the old one still be there?
- What needs to happen in order for dramatic changes to occur along a lineage?
- Have we ever seen speciation occur?

More Questions:

- What are the odds that evolution could lead to speciation?
- If mutations are random (not purposeful) and likely destructive, how can new species possibly ever evolve?
- Why don’t we see “transitional fossils” that clearly show the process of speciation?