Speciation

- Modes of Evolution

What is Speciation?

- Creation of a new, separately breeding, genetically similar group of organism.
- Come from a pre-existing species of organism.

How does speciation occur?

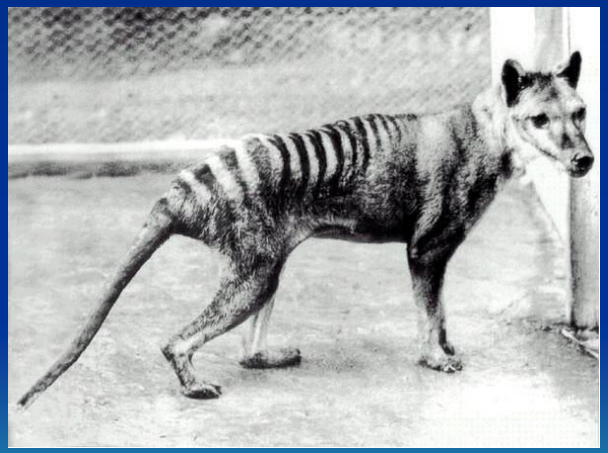
- Organisms each have their own NICHE and must either compete with others, or find a new niche.
- This includes competition for food, environment, living space…etc.
- NO two organisms can easily occupy the same niche for extended period of time.

Why not share niches?

- Competition for resources and living space often lead to extinction of species, unless the less adapted species can find a new niche.
- It is this competition that scientists believe drives evolution of species.
- New niches can allow new species to flourish.

Examples of extinct species

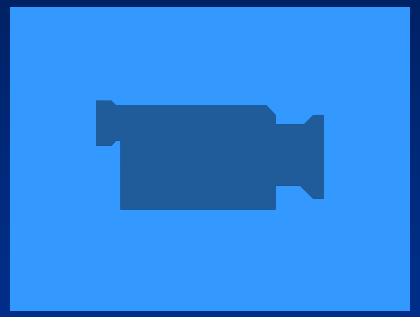
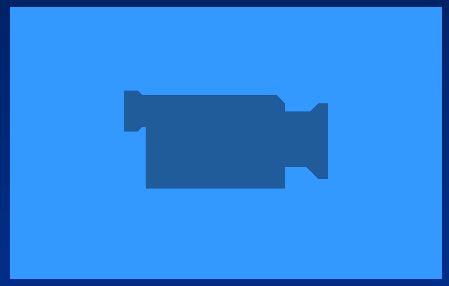
- These are all examples of species that went extinct due to competition for niches.



Thylacine – “Tasmanian Tiger”

Ivory-Billed Woodpecker

Dodo Bird

Process of Speciation

- Functional species must have a separate gene pool for reproduction.
- Organisms that share a common gene pool are NOT different species.

Ex) Muskie + Pike = Tiger Muskie (Not new species = hybrid) artificial selection



Process of Speciation

- Most scientists know that the most influential factor for the development is reproductive isolation.
- New species more rapidly and successfully develop when populations are isolated and the isolated species creates a new gene pool.

Causes of reproductive isolation

Known as **Isolating mechanisms**

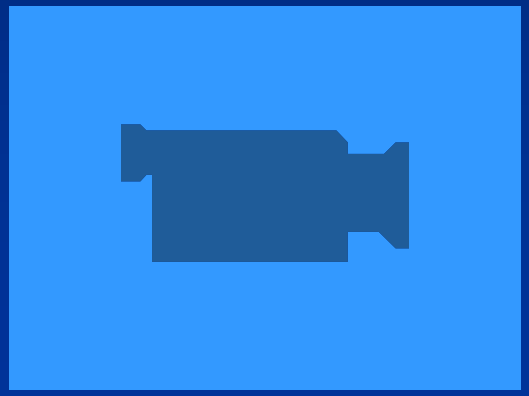
- Geographic isolation, like a species trapped on an island (Galapagos), divided by bodies of water or mountains.

Behavioral Isolation changes/differences in behavior and courtship methods

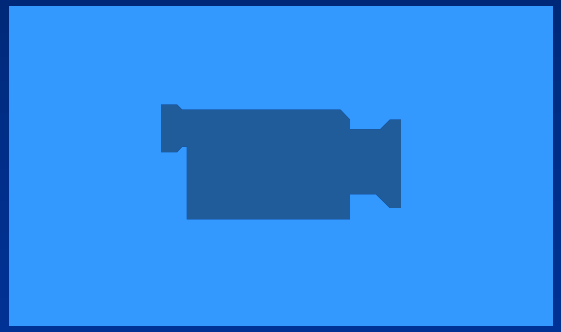
Temporal Isolation – Mating at different times of the year

Ex) Different frog species

Shake it Up Alligator!!!



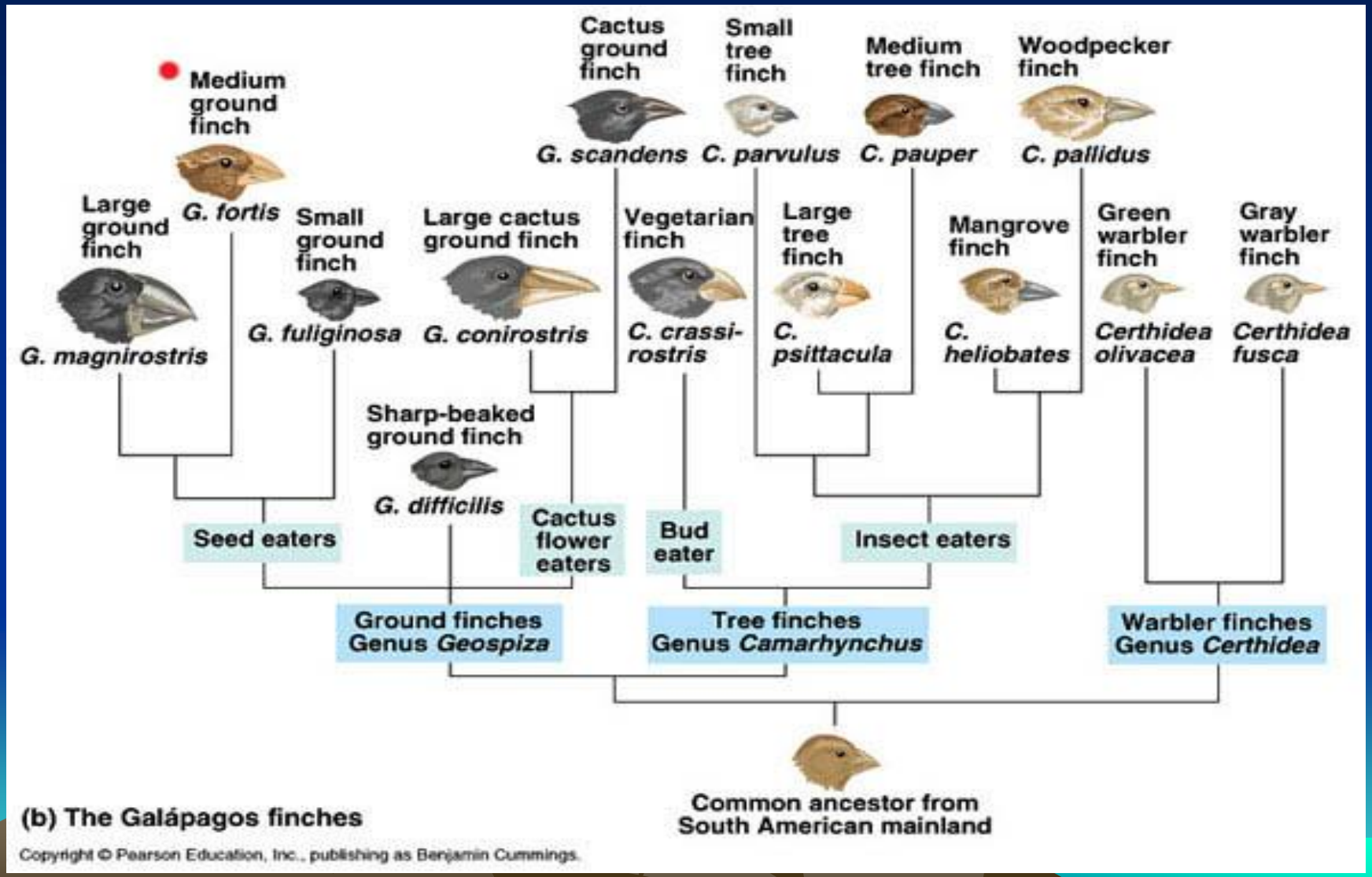
Break it down, bird!



Darwin's Finches

- Darwin counted 14 different functional reproductively isolated species of finch birds on the Galapagos Islands.
- Each filled a different niche on the island and each only reproduced with its own species.
- Different food sources, beak shapes, feather patterns, mating rituals, and sizes.

Darwin's Finches



Darwin's Finches

- Darwin theorized that all of the 14 species of finch must have originated from a single ancestor (common decent) and underwent speciation to allow for more organisms to thrive.
- He theorized 5 steps that lead the single origin species to 14 new species.

Darwin's 5 Steps to Speciation

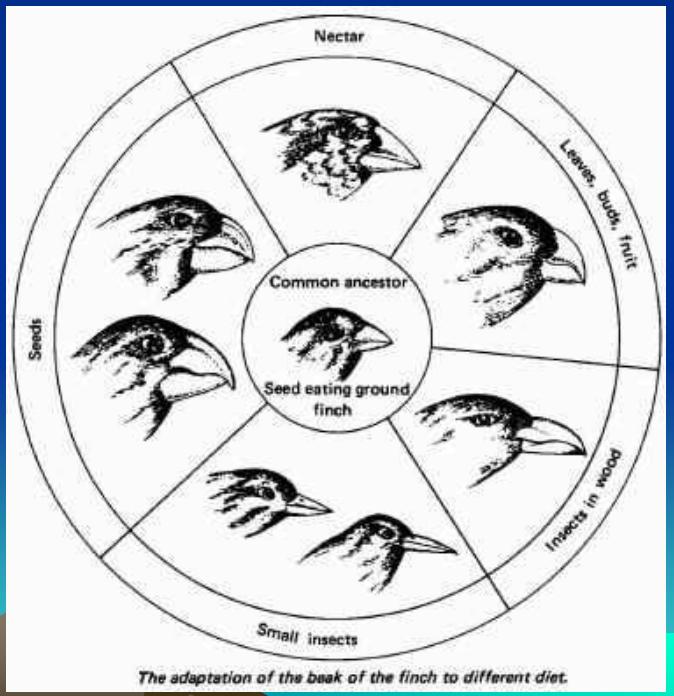
- Step 1: Founding Fathers and Mothers
  - Geographic isolation lead finches to Galapagos islands. Began to thrive
- Step 2: Separation of Population
  - Further isolation of species as the population spread out to new islands and remained. Still same species, but geographically isolated.

Darwin's 5 Steps to Speciation

- Step 3: Changes in Gene Pool.
  - Each island's finches became adapted to their island environment – acquiring new beaks to help aid them in survival.
  - Caused by natural selection
- Step 4: Reproductive Isolation
  - Newly acquired gene pools keep different species from breeding. New species can share space, but have different niches.

Darwin's 5 Steps to Speciation

- Step 5: Sharing the same island
  - Species are face with 3 choices: Coexistence, Extinction, or further evolution.

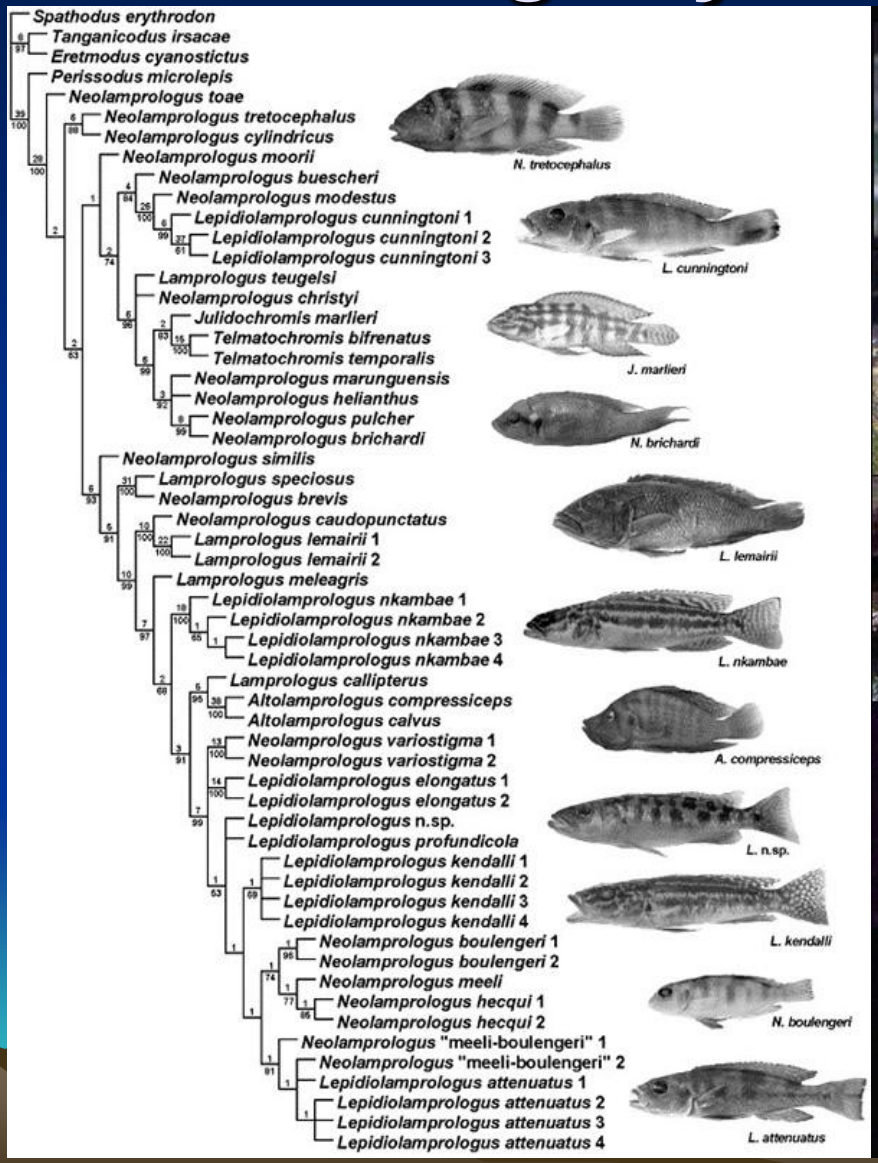


The adaptation of the beak of the finch to different diet.

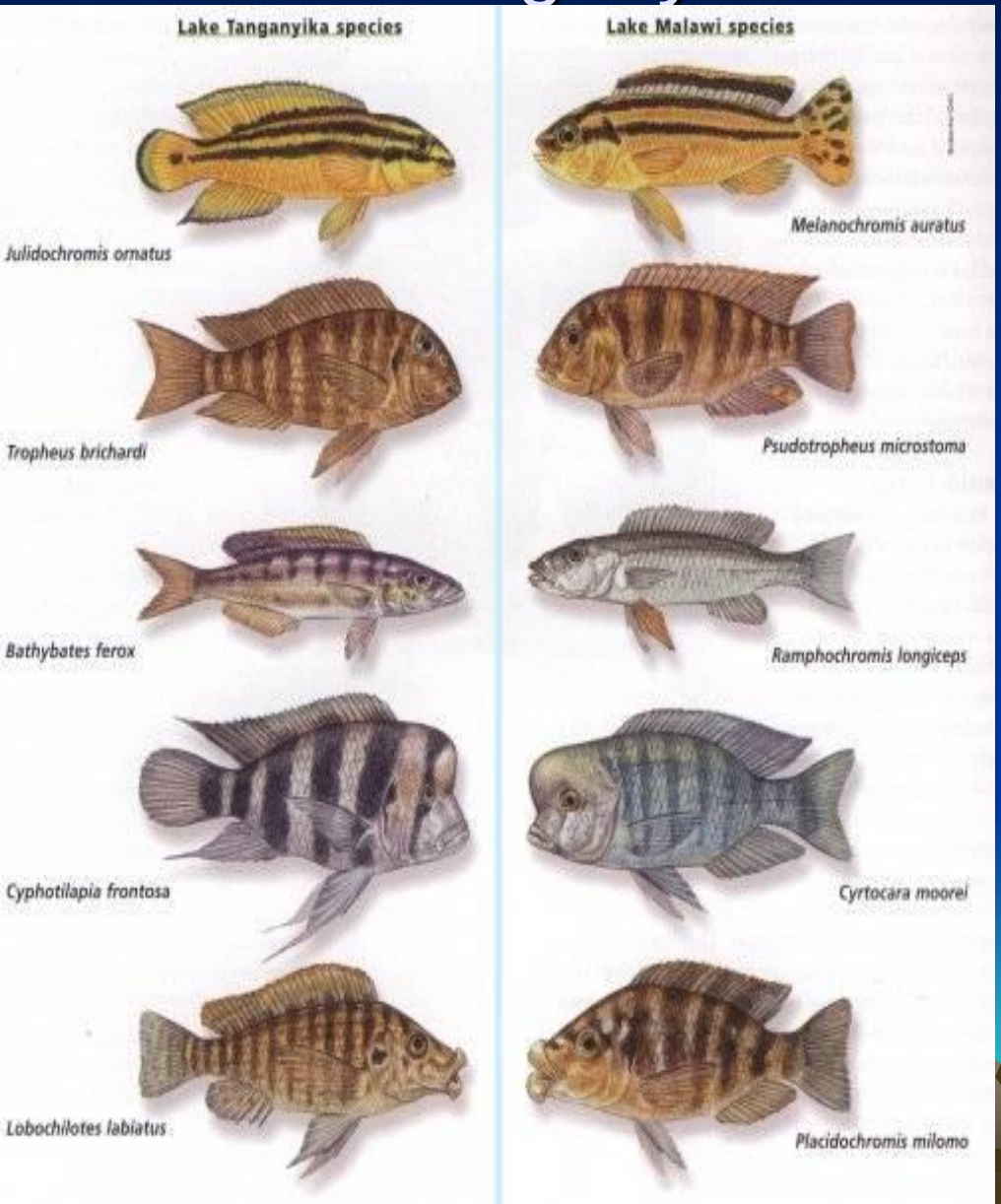
Another Example : African Cichlids

- There are currently at least 250 African cichlid fish in Lake Tanganyika.
- Although they share the same environment, they are reproductively isolated.

Lake Tanganyika cichlids



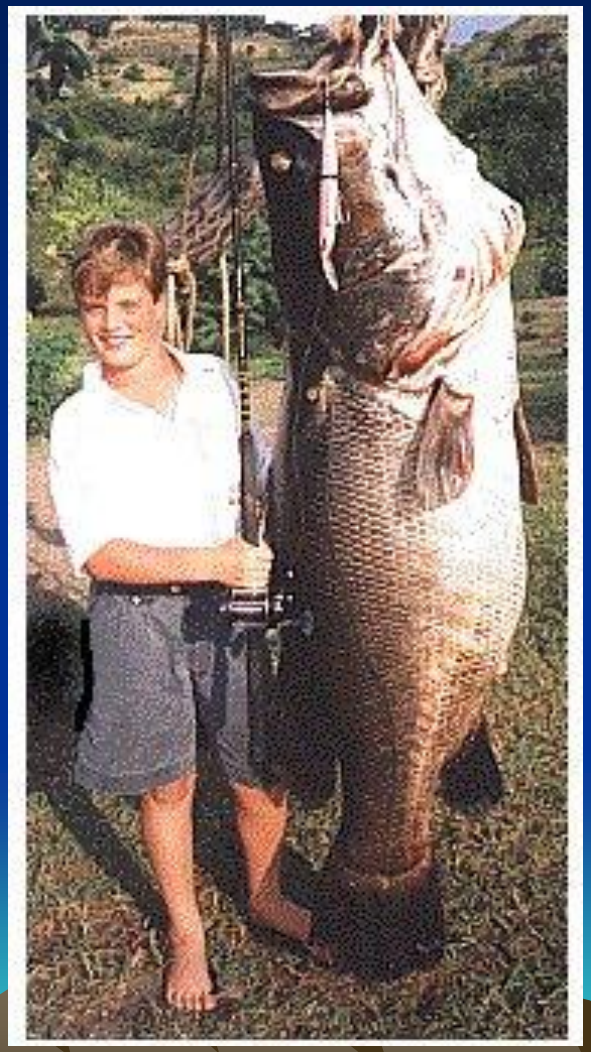
Lake Tanganyika cichlids vs. Lake Malawi



- http://www.youtube.com/watch?v=N2xgq402glo - devious fish
- http://www.youtube.com/watch?v=Kw0pxLuxkVo&feature=relmfu - King of the Castle

- From the “Mutant Planet” Series on Science Channel

Cichlid's Demise!



Invasive Specie – The Nile Perch!

Wrap-up of Speciation

- Through the work of Darwin and other scientists, we have a better understanding of how evolution could lead to the vast array of organisms sustained in our world.
- Natural selection and isolation are key for Darwin's theory to be correct!

Resources

- http://images.google.com/images/
- Biology - Miller and Levine
- http://en.wikipedia.org/wiki/Lake_Tanganyika
- http://www.naturalworlds.org/thylacine/films/motion_film_footage.htm
- http://www.dpiw.tas.gov.au/inter.nsf/WebPages/BHAN-53777B?open