

Speciation: How Species Form

SPECIATION

- ▶ **Microevolution: changes in allele frequencies and phenotypic traits** within populations and species; can result in new species.
- ▶ **Speciation: The evolutionary formation of new species.**
- ▶ **Species:** members of groups or **populations** that **interbreed** or have the ability to interbreed with each other under **natural** conditions.
 - ▶ reproductively isolated from other groups
 - ▶ evolve independently

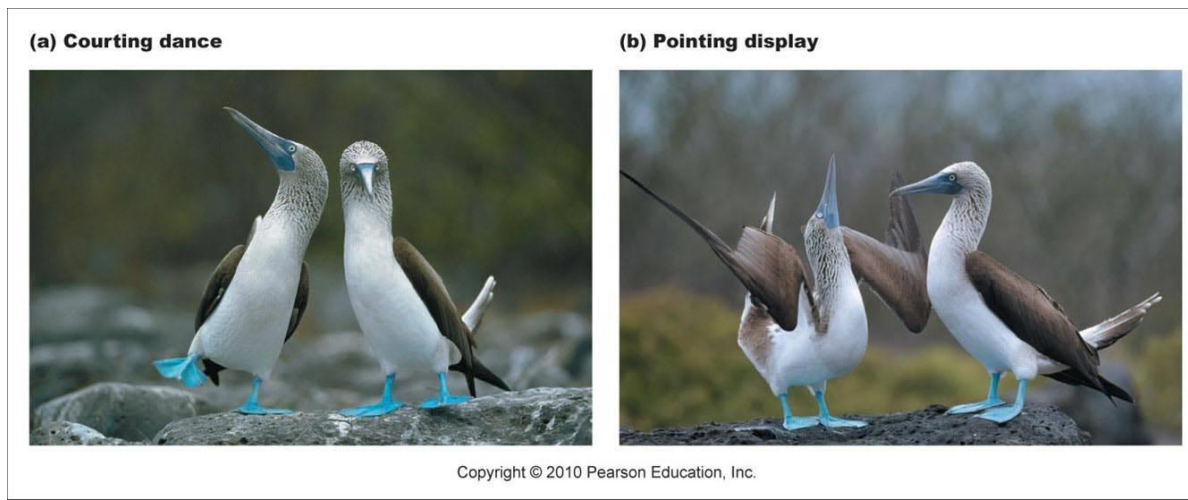
Reproductive Isolation

- ▶ Whether or not different species interbreed successfully in the wild can be **difficult to examine**.
- ▶ **Differentiating** species is mainly done by **physical appearance/morphology**, however, subspecies (or races) are morphologically distinct subpopulations that **can** interbreed.
- ▶ Where morphology is not possible, **behaviour** or **reproductive isolating mechanisms** are used.
- ▶ A reproductive isolating mechanism is any **behavioural, structural or biochemical trait that prevents individuals of different species from reproducing successfully** together.

Means of Reproductive Isolation:

PREZYGOTIC (prevention of interspecies mating or fertilization)

- Prevention of **mating**:
 - **Ecological isolation:** different habitat, niches,
 - **Temporal isolation:** different reproductive cycles (timing of day, seasons)
 - **Behavioural isolation:** different signals



Means of Reproductive Isolation:

- Prevention of fertilization:
 - **Mechanical isolation:** structural differences in reproductive organs (arthropod, flowers)
 - **Gametic isolation:** molecular recognition of sperm and egg (water animals)

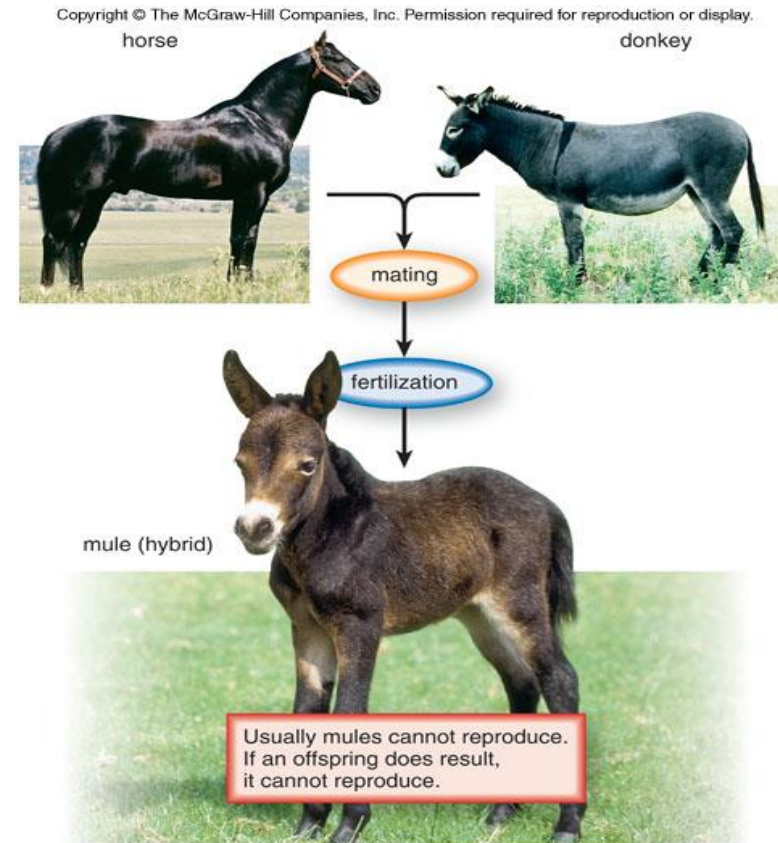


Different penis structures of damselflies



Means of Reproductive Isolation:

- **POSTZYGOTIC** (prevent maturation and reproduction in offspring from interspecies reproduction)
 - **Zygotic Mortality:** different species can mate but no embryos develop to maturity,
 - **Hybrid Inviability:** baby hybrids aren't viable, don't live long
 - **Hybrid Infertility:** baby hybrid viable but not fertile.

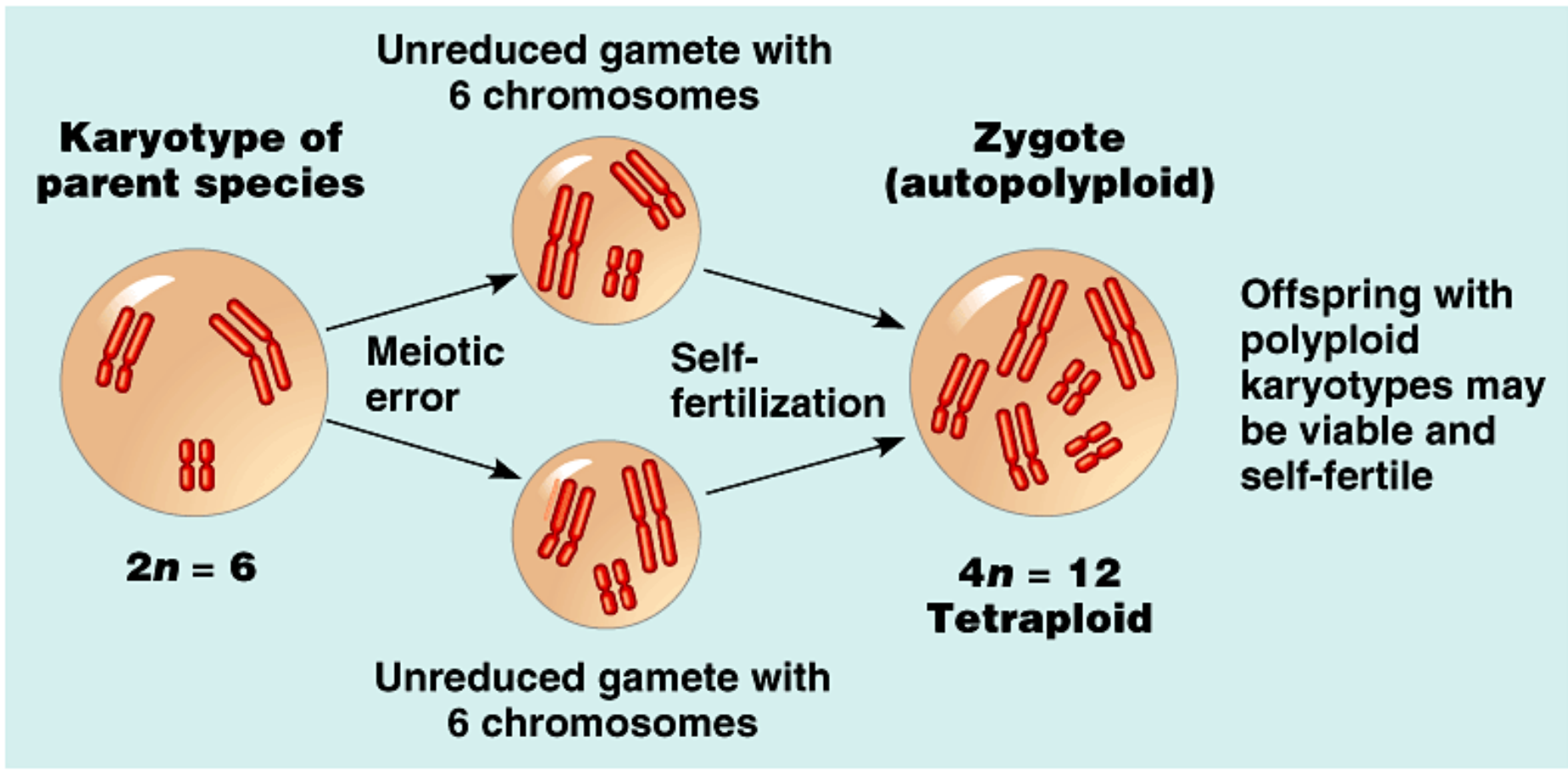


Reproductive isolation and Speciation

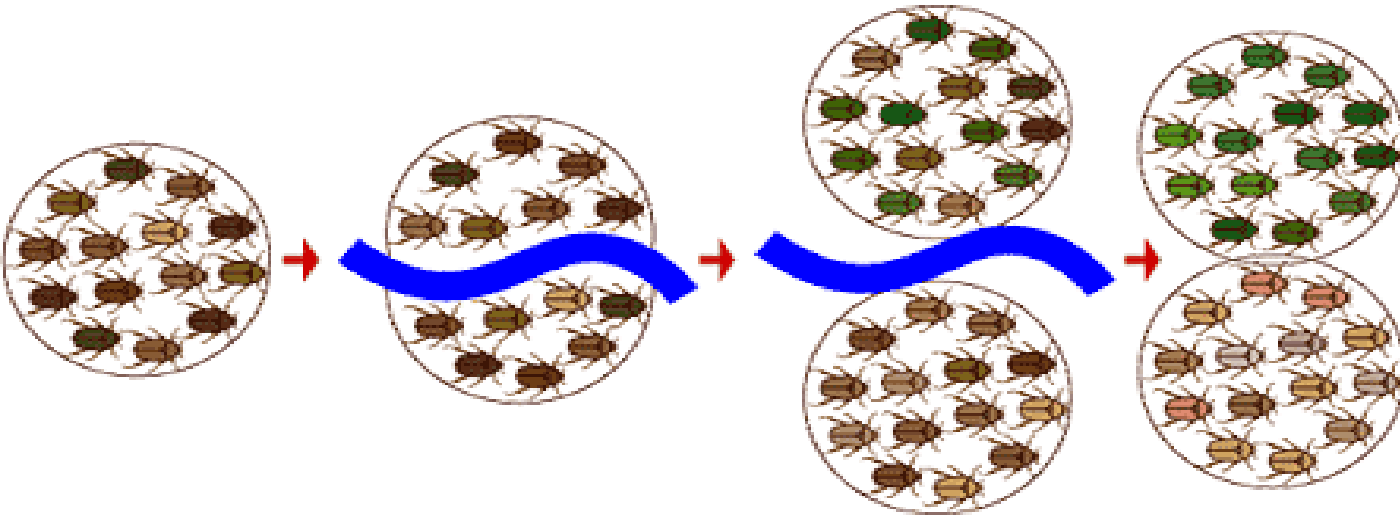
- ▶ Reproductive isolation may **lead to** speciation.
- ▶ The gene pool is **isolated**, any mutation and selection that occurs is **no longer shared**;
- ▶ any **significant evolutionary changes** that occur in either population (new or old) will result in the **formation of separate species**.

Modes of Speciation

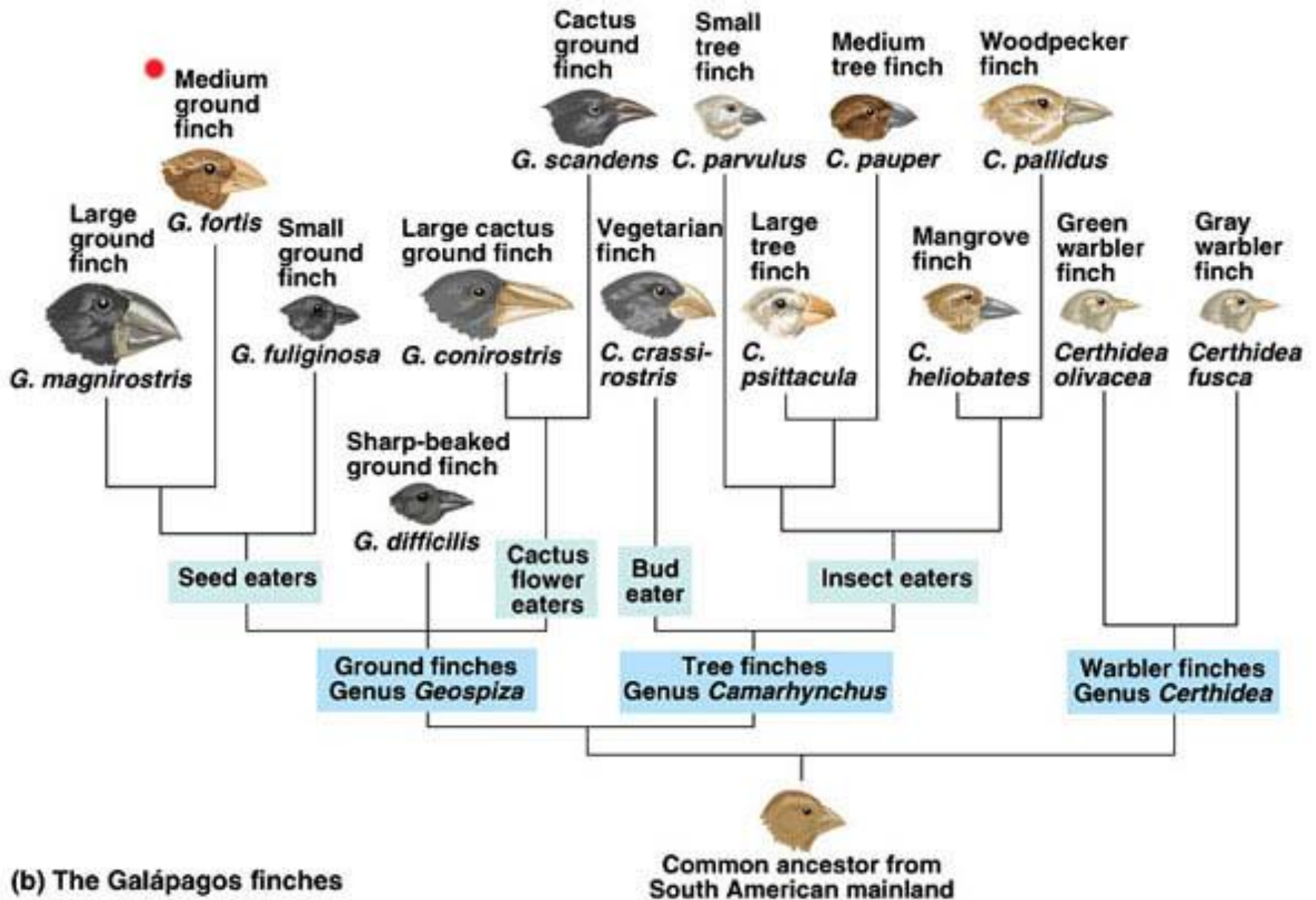
- **Sympatric Speciation:** evolution of populations within the **same geographic area** into separate species. (ex. grey tree frogs)
- Chromosomal changes (plants) and non-random mating (animals) alter gene flow
- More common in plants
- Polyploidy (3 or more sets of chromosomes) can lead to speciation



Modes of Speciation



- **Allopatric Speciation:** evolution of populations into separate species **as a result of geographic isolation.** Ex. water, canyon, mountain range, human construction (dams, highways, canals)



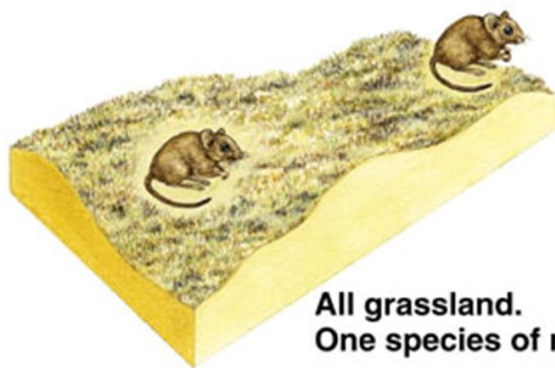
(b) The Galápagos finches



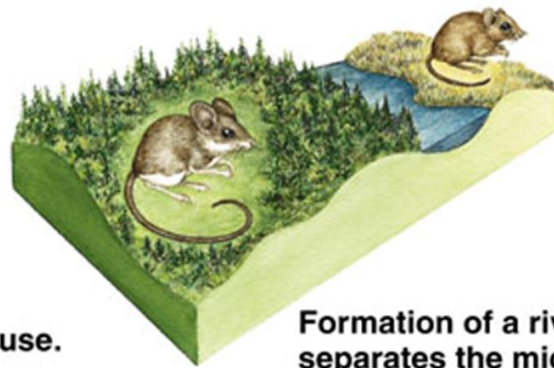
Northern Spotted Owl
(*Strix occidentalis caurina*)



Mexican Spotted Owl
(*Strix occidentalis lucida*)



All grassland.
One species of mouse.



Formation of a river
separates the mice.
Later, differences in
habitat cause the two
species to diverge.

