ORIGIN OF SPECIES

Objectives

1. Contrast microevolution and macroevolution.
2. Define the morphological, biological and phylogenetic species concepts and state the difficulties of each.
3. Describe the types of prezygotic and postzygotic reproductive barriers.
4. Describe at least three methods of speciation.

Outline

A. Microevolution v. Macroevolution
B. Species
    1. Reproductive isolation
    2. Prezygotic Barriers
    3. Postzygotic Barriers
    4. Speciation
    5. Hybrid Zones
    6. Rate of Speciation

A. Microevolution v. Macroevolution

- Microevolution

- Macroevolution

B. Species

- Morphological Definition

(a) Similarity between different species

    - Problems

        - Appear same but cannot interbreed

        - Don't appear same but do interbreed

- Biological Definition

(b) Diversity within a species

  - Problems
    - Organisms with no sexual cycle
      - e.g., bacteria, fungi , some plants
    - Hydrids between species
      - Usually poorly adapted
      - Usually less fertile
      - e.g., some plants, some insects

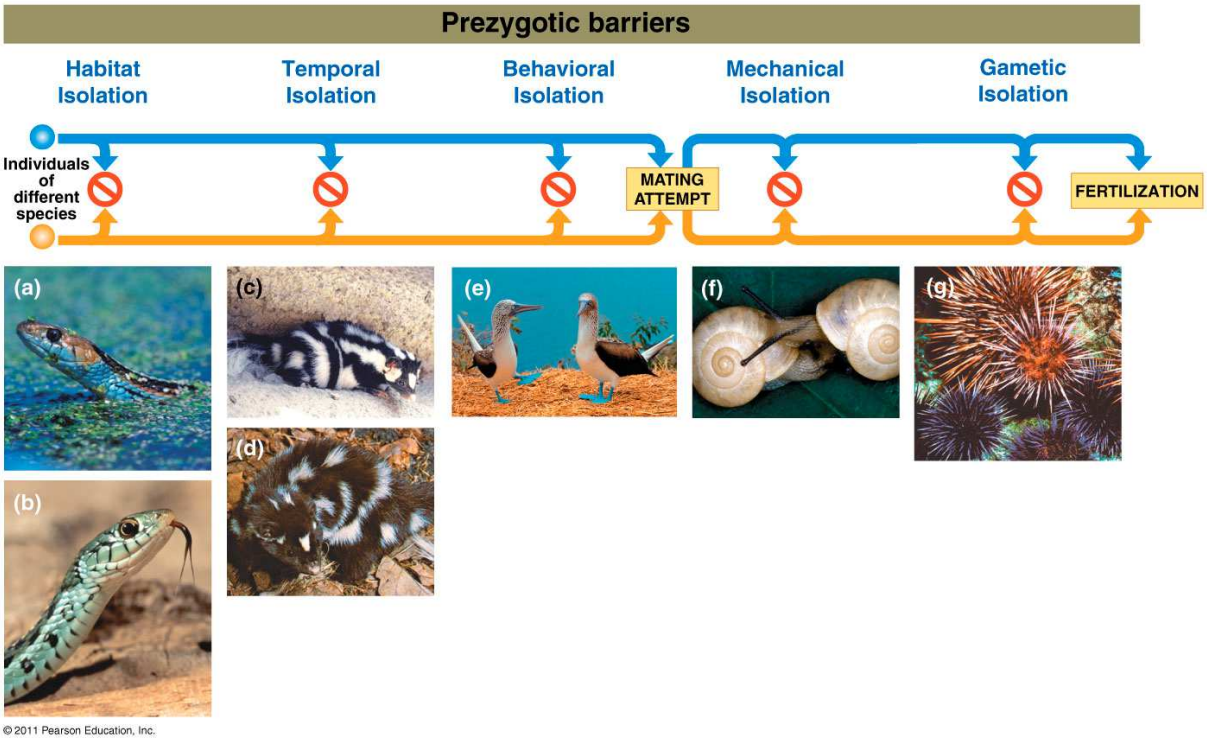
Phylogenetic Species Concept

  - Problems
    - Showing descent

1. Reproductive isolation

- Precursor for speciation
    - Limit creation of hybrids
- Caused by selection, genetic drift

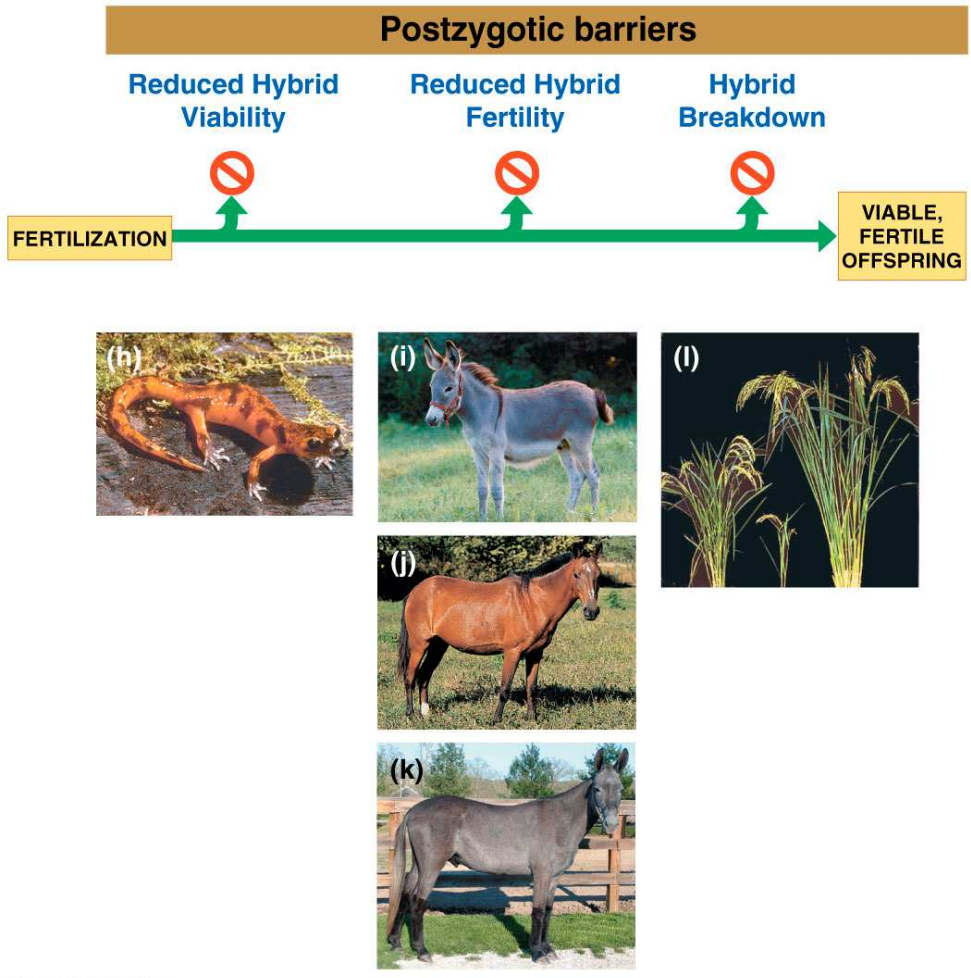
2. Prezygotic Barriers



- Habitat Isolation
    - different feeding/mating locations
- Temporal Isolation
    - different mating seasons

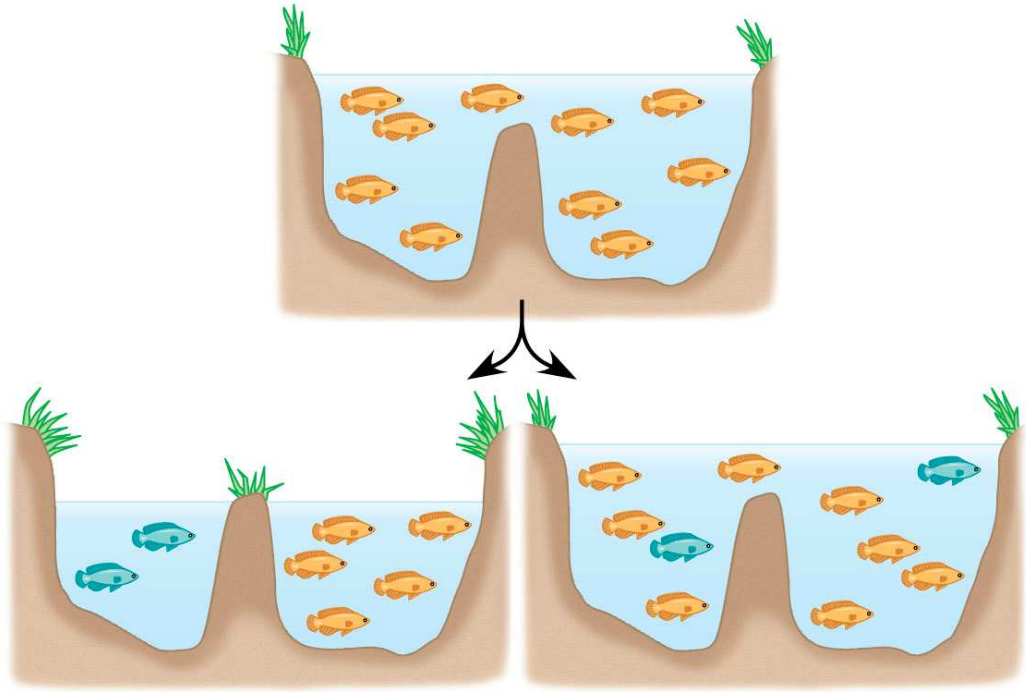
- Behavioral Isolation
    - mating rituals
- Mechanical Isolation
    - incompatible mating apparatuses
- Gametic Isolation

3. Postzygotic Barriers



- Reduced Hybrid Viability
- Reduced Hybrid Fertility
    - e.g., mules
- Hybrid Breakdown

4. Speciation



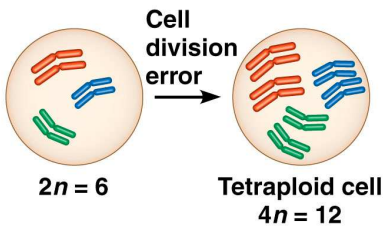
(a) Allopatric speciation. A population forms a new species while geographically isolated from its parent population.

(b) Sympatric speciation. A subset of a population forms a new species without geographic separation.

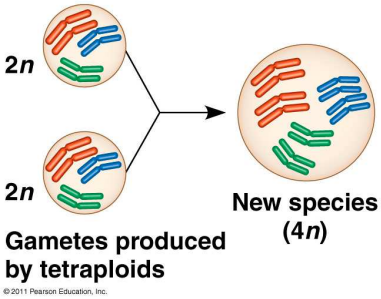
- Allopatric Speciation
    - Due to geographic isolation
        - Migration to new locations
            - e.g., Birds-of-Paradise
        - Physical event splits population
            - e.g, ground squirrels

- Sympatric Speciation
    - Within same geographic location
        - e.g., apple maggots

- Polyploidy
    - > 2 sets of chromosomes

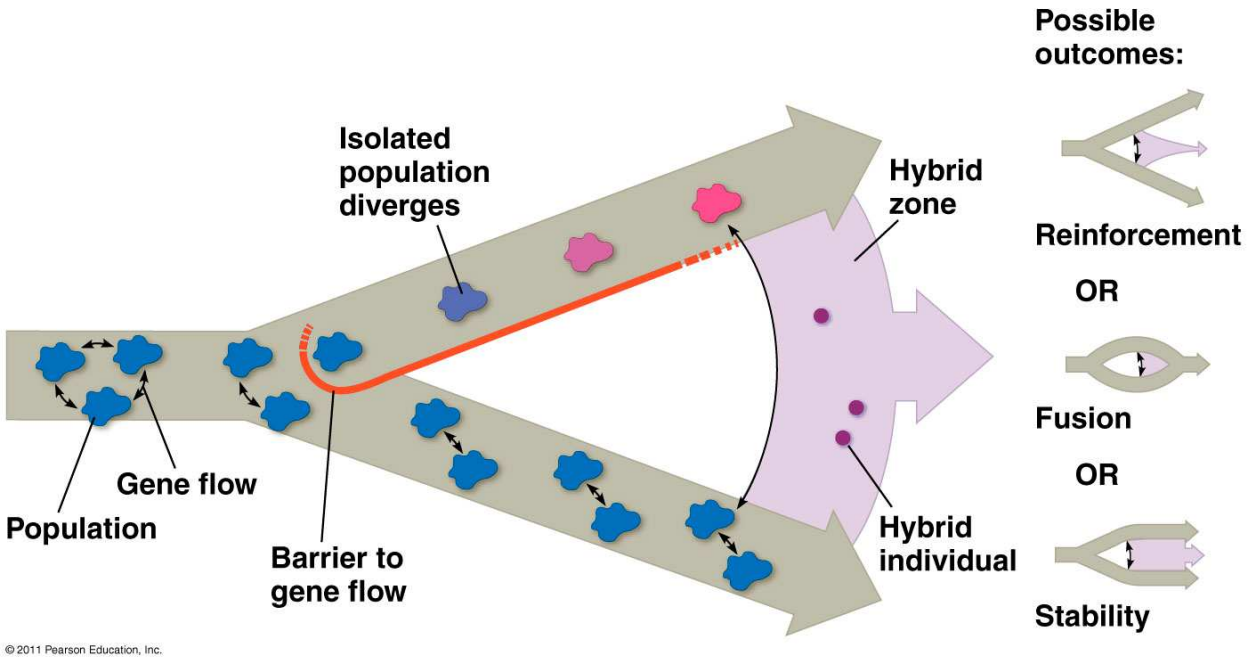


    - Caused by chromosome doubling
        - Makes an infertile hybrid fertile



5. Hydrid Zones

- Often less fit than either parent
    - May move genes between species
- Reinforcement
- Fusion
- Stability



6. Rate of Speciation

- Gradualism
    - Modifications accumulate slowly
- Punctuated Equilibrium
    - Modifications occur in spurts
    - Long periods of stasis between