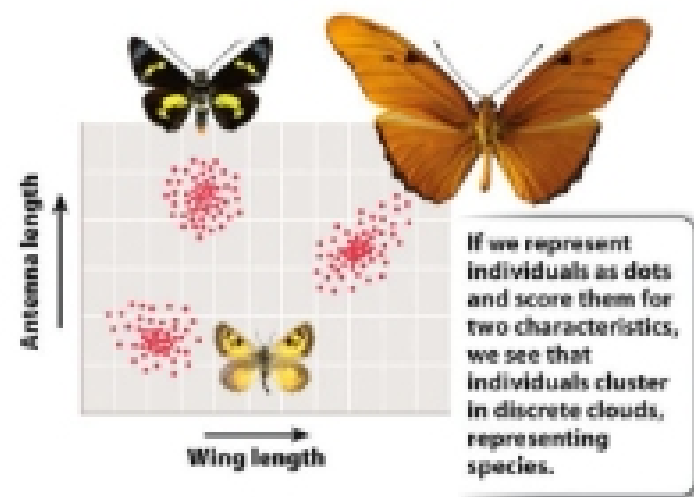
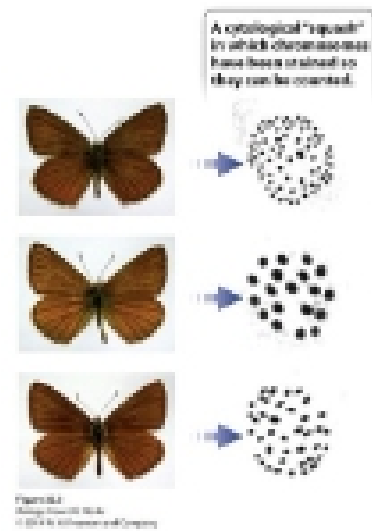


- I. Species and Speciation
 - A. **Speciation** is the process that produces new species.
 - B. Gene flow can lead to speciation.
- II. Species
 - A. **Species** is a group of organisms that can evolve or change.
 - B. A fundamental biological unit
 - C. Defined by the ability (or inability) of two individuals to exchange genetic material by producing fertile offspring
 - D. Become extinct
 - E. Give rise to new species
 - 1. Living on Earth today are only about 1-2% of the species that exist in the world (scientists predict).

- III. Species Plot
 - A.



- IV. Biological Species Concept (BSC)
 - A. Alfred Russel Wallace (1865)
 - 1. First proposed it.
 - B. Ernst Mayr
 - 1. Refined it.
 - C. Is there enough genetic similarities in those species to produce successful offspring?
 - 1. To test this, scientists must actually mate species.
 - D. Groups of actually or potentially interbreeding populations that are reproductively isolated from other such groups.
- V. Morphospecies Concept (
 - A. Stated simply, the **morphospecies** concept holds that members of the same species usually look alike, which is why natural history guidebooks are useful.
 - B. States that members of the same species usually look alike.
 - C. More practical.
 - D. Not perfect.
 - E. Not always real accurate.
 - F. Limitations in appearance.
 - G. Good start but then BSC is needed.
 - H.



VI. Ring Species

- A. An unusual but interesting geographic pattern shown by ring species highlights another shortcoming of the BSC.
- B. Limitation in BSC.
- C. May not be part of the same species, but can be genetically similar. (gene flow)
- D. **Hybridization**, or interbreeding

VII. Limitations of the BSC

- A. Difficult to apply in real world
 - 1. Have mating event, and watch and see what happens to offspring.
- B. Cannot be applied to asexual or extinct organisms
 - 1. Cando mating event between fossils.
- C. Does not account for genetic exchange in ring species
- D. Does not account for **hybridization** (successful reproduction between two different species) in plants
 - 1. Interbreeding between different species (seen often in plants)
 - 2. The species maintain distinct appearances indicating that natural selection works against the hybrid offspring

VIII. Improving the BSC

- A. Ecological species concept (ESC)
 - 1. A species can sometimes be characterized by its *ecological niche*
 - a. **Ecological Niche**: a complete description of the role the species plays in its environment—its habitat requirements, its nutritional and water needs, and the like.
 - i. Impossible for two species to coexist in the same location if their niches are too similar.
 - ii. Can be separated this way by where they live/ what they eat.
- B. Evolutionary species concept (EvSC)
 - 1. Members of a species all share a common ancestry and a common fate (with each other)
 - a. Evolutionary history=more information.
- C. These two concepts broaden and generalize the BSC

IX. Reproductive Isolation

- A. Pre-zygotic (isolating factors act before the fertilization of an egg)
 - 1. Behavioral (dance)
 - 2. Physical
 - 3. Time (temporal)
 - 4. Space (ecological)

5. Among animals, species are often **behaviorally isolated**, meaning that individuals only mate with other individuals based on specific courtship rituals, songs, and other kinds of behaviors.

B. Post-zygotic (factors come into play after fertilization)

1. Genetic incompatibility

a. Different numbers of chromosomes, zygote does not develop, offspring are sterile

X. Speciation: the evolutionary process of genetic divergence

A. Speciation occurs when two populations that are genetically diverging become reproductively isolated from each other.

B.

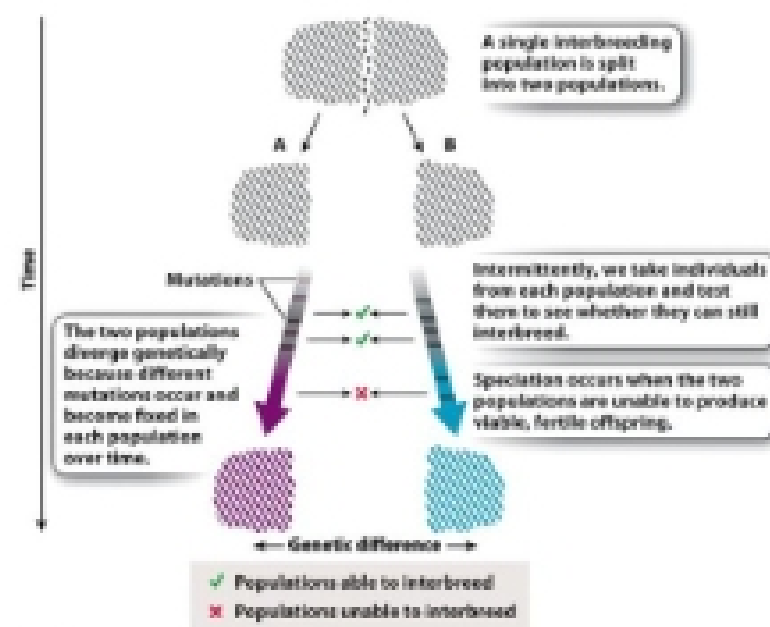


Figure 24.4
Biology: The Unity and Diversity of Life, Seventh Edition, © 2004 Sinauer Associates, Inc. and W. H. Freeman & Co.

XI. Allopatric Speciation

A. The process usually begins with the creation of **allopatric** (literally, “different place”) populations, populations that are geographically separated from each other.

B. Geographic model of speciation

C. Physical separation between two populations

D. Subspecies may form

1. Exposed to different environments (mutations)

2. Adding a further designation after its species name

E. Two basic mechanisms

1. Dispersal

a. Some individuals colonize a distant place, such as an island, far from the main source population.

b. Organisms move.

2. Vicariance

a. A geographic barrier arises within a single population, separating it into two or more isolated populations.

b. Formation of a physical variant.

XII. Dispersal-Derived Speciation: **Peripatric Speciation**

A. Dispersal is important in a specific kind of allopatric speciation

B. Members of the parent species (mainland population) become separated by physical barriers.

1. Living on different parts of a land mass.

2. Migrating to an island and forming a new population there.