Evolution 6

Classification

Cactus

Figure 9-20a Biology: Science for Life, 2/e

Euphorbia cereiformis

Figure 9-20b Biology: Science for Life, 2/e

Classification

- If two organisms share some characteristics, are they closely related?
  - Sometimes
    - If traits are shared via common descent, then traits are homologous
    - If traits are NOT shared via common descent, then traits are convergent
    - Convergent evolution

Classification

Evolution

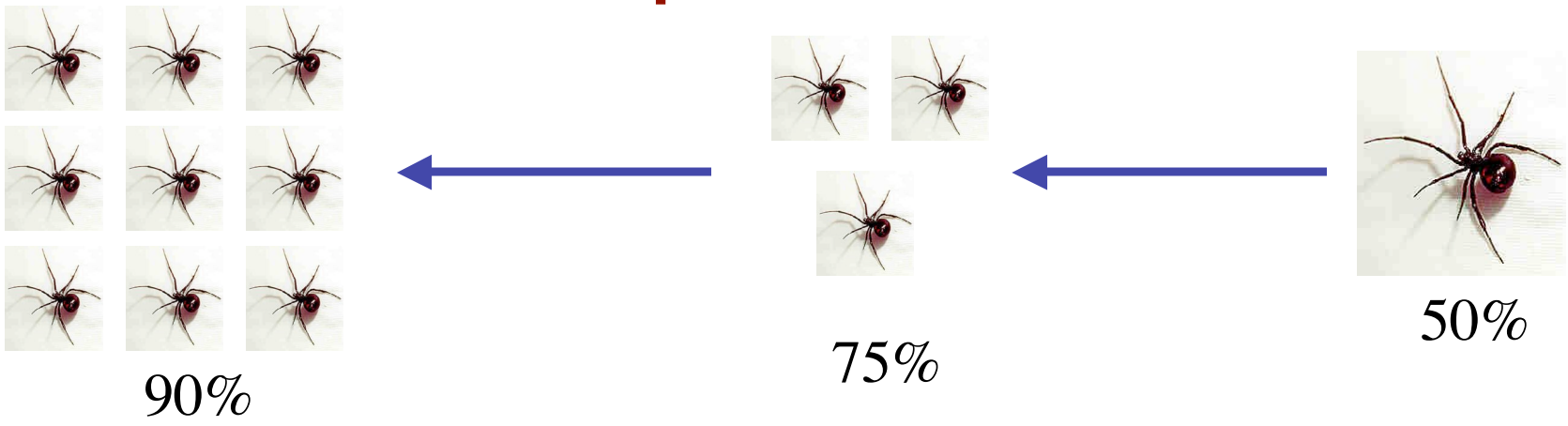
- Selection acts on individuals
  - Some individuals get higher fitness than others.
  - Those individuals pass more copies of their alleles onto the next generation
- The population characteristics change over time

- Is selection the only process that can change allele/trait frequencies?

Evolution

- What processes can change allele frequencies in a population?
  - 1. Natural selection
    - Can act very quickly as a result of fitness differences

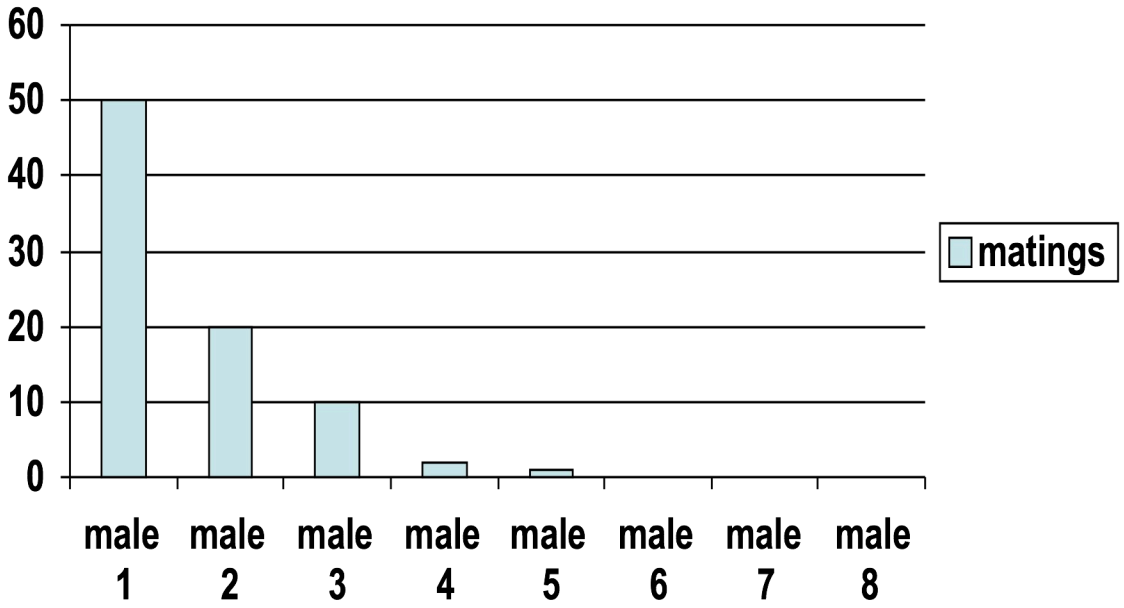
Selection and Red-backed spiders



Evolution

- What processes can change allele frequencies in a population?
  - 2. Assortative mating
    - Mate choice can affect traits in a population.
    - Traits evolve as a result of mate choice or competition for access to mates. These traits may actually reduce rates of survival, but are maintained because they increase mating success
      - **Sexual selection**

Assortative mating



- Several males get nearly all the matings

Evolution

- What processes can change allele frequencies in a population?
  - 3. Mutation
    - Any change in genetic sequences
    - For any particular trait in sexually reproducing organisms, the rate of mutation is generally low

Evolution

- What processes can change allele frequencies in a population?
  - 4. Gene flow
    - As individuals move from one population to another, they take alleles/traits with them

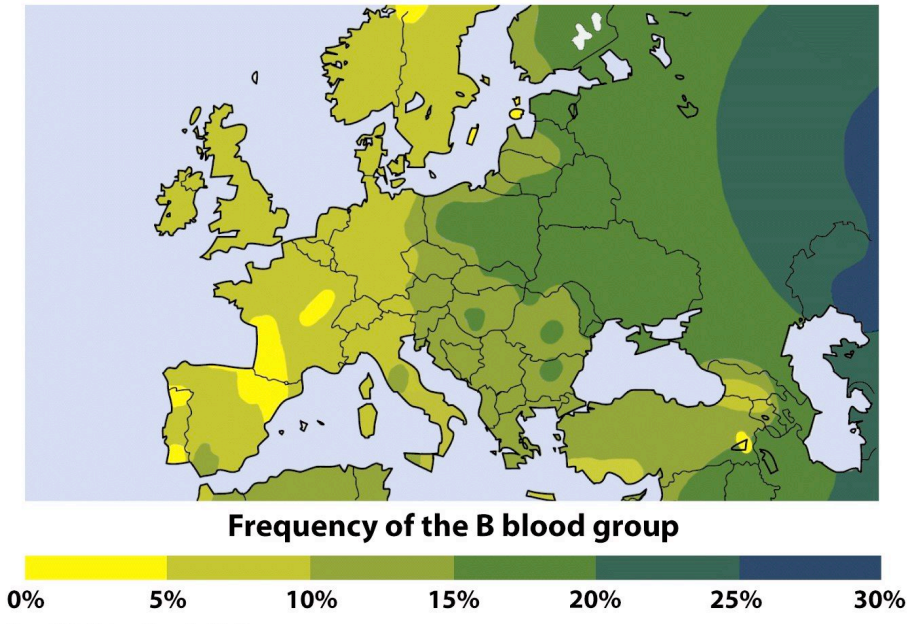


Figure 11-19 Biology: Science for Life, 2/e

Evolution

- Gene flow
  - Populations are not generally completely isolated from each other

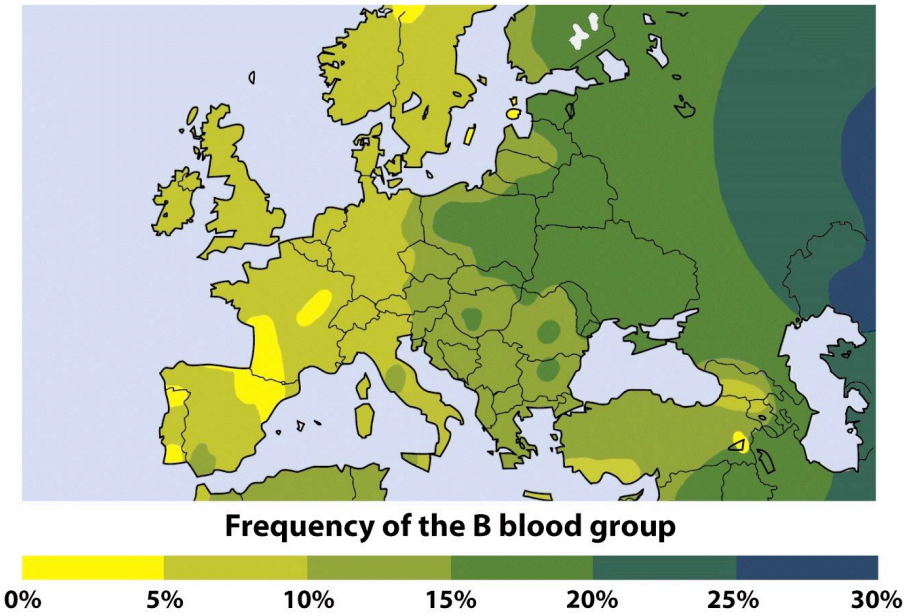


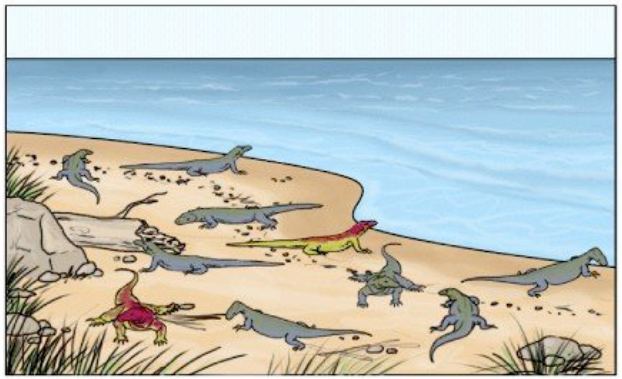
Figure 11-19 Biology: Science for Life, 2/e

Evolution

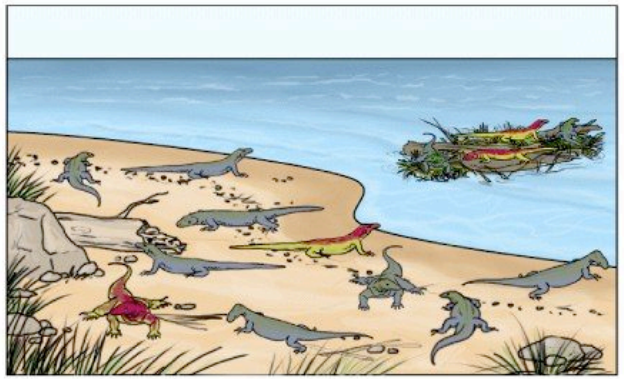
- What processes can change allele frequencies in a population?
  - 5. Genetic drift
    - Any random change in allele or trait frequencies in a population
    - More likely to affect small populations
      - 1. Founder effects
      - 2. Population bottlenecks
      - 3. Chance differences in reproduction

Genetic drift

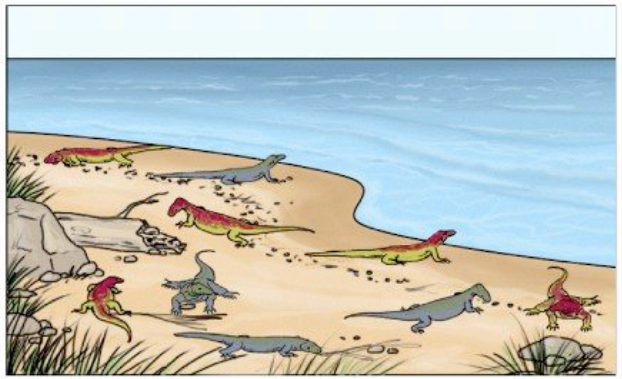
Founder effect: A small sample of a large population establishes a new population.



Frequency of red allele is low in original population.



Several of the travelers happen to carry the red allele.

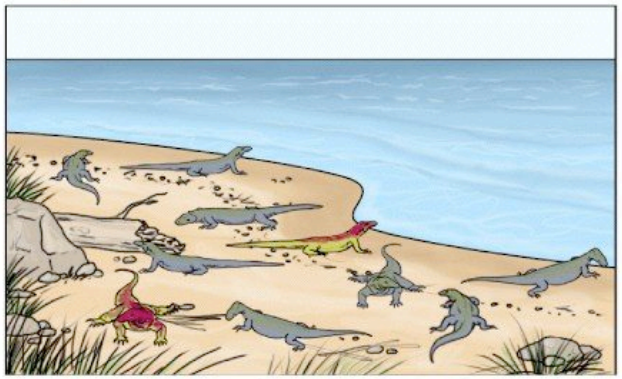


Frequency of red allele much higher in new population.

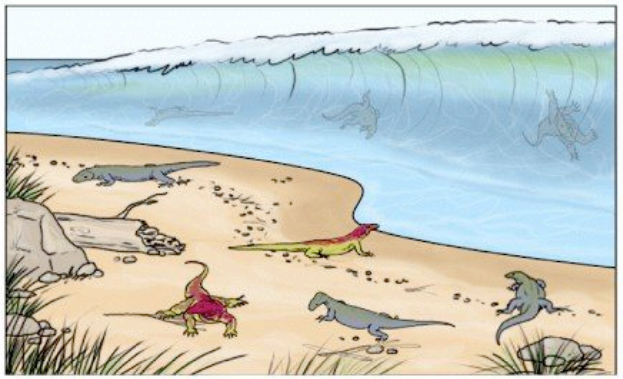
Figure 11-25a Biology: Science for Life, 2/e

Genetic drift

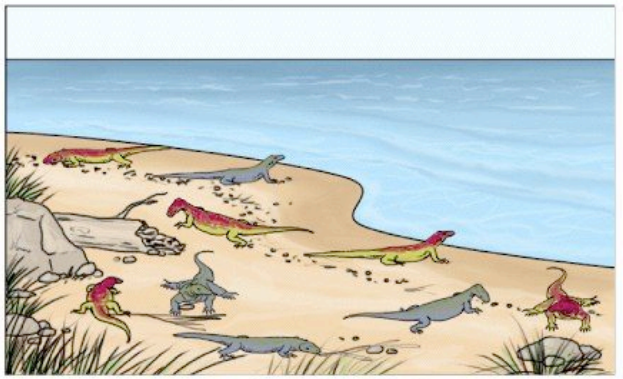
Population bottleneck: A dramatic but short-lived reduction in population size.



Frequency of red allele is low in original population.



Many survivors of tidal wave happen to carry red allele.

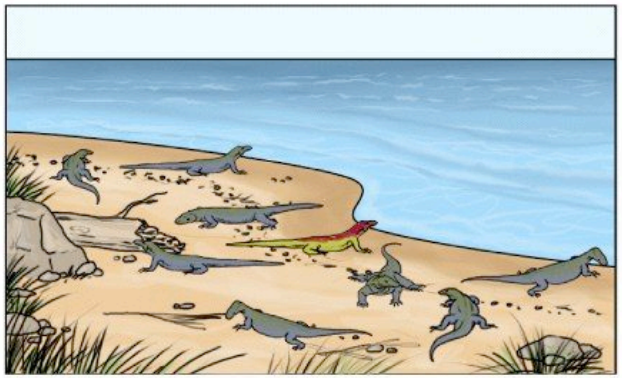


Frequency of red allele much higher in new population.

Figure 11-25b Biology: Science for Life, 2/e

Genetic drift

Chance events in small populations: The carrier of a rare allele does not reproduce.



Frequency of red allele is low in original population.

The only lizard with red allele happens to fall victim to an eagle and dies.

Red allele is lost.

Figure 11-25c Biology: Science for Life, 2/e