

Ch23: Evolution of Populations

- Population = a group of individuals in the same species that live in the _____ and _____
- Gene pool = _____ in the members of a population
 - A _____ gene pool is important for the survival of a species in a changing environment
 - _____ organisms have 2 alleles for a gene
 - Homozygous dominant (AA), Heterozygous (Aa), and Homozygous recessive (aa)

Phenotypic Variation

- Environments change and act as _____ on populations
– As environments become stable or fluctuating, this affects evolutionary _____. Different genetic variations can be selected in each generation
- Phenotypic variations are not directed by the environment but occur through _____ in DNA and through new gene combinations

Phenotypic Variation

- Some phenotypic variations significantly increase or decrease _____ of the organism and the population
- Humans can impact variation in other species

Hardy-Weinberg Theorem

- *Serves as a model for the genetic structure of a*

population
(equilibrium)
- 5 conditions for equilibrium:
 - 1.
 - 2.
 - 3.
 - 4.
 - 5.

Hardy-Weinberg Equation

- $p =$
- $q =$
- For allele frequencies:
- For genotypic frequencies:

Causes of Evolution / Changes in Allele Frequencies

1) Natural Selection:

- Results in alleles being passed to the next generation in proportions different from their relative frequencies in the present generation
- Fitness: *contribution an individual makes to the gene pool of the next generation*

Survival of the “Fit Enough”

- Selection can only operate on the available genetic variation – _____
- Constraints due to history - genes predetermine body formation and development
 - You can only work with what you have at the time
- Adaptations are often _____ – as a body part gets bigger or faster it might bring some problems with it
- Chance, natural selection, and the environment interact

Causes of Evolution

2) Genetic drift:

_____ ,
nonselective changes in the gene pool

– _____ population →
_____ the chance for
genetic drift

– Allele frequencies can change at

– Can lead to _____ of genetic
variation within a population

– Can cause harmful alleles to become fixed

—

of genetic variation within a given
population can

the
differences between populations of
the same species

Examples of Genetic Drift

- The Bottleneck Effect:

- _____ change in the environment causes drastic

- _____ in the population (natural disaster)

- Surviving population is

- _____ genetically representative of the

Examples of Genetic Drift

- Founder Effect:

- _____ of a small group and establishment of a new population whose gene pool is

of the source population

- Ex: moving to an island

Causes of Evolution

3) Gene Flow:

– Genetic exchange due to the

_____ of
fertile individuals or gametes between
populations

– Tends of _____ the
genetic differences between populations
resulting in

_____ populations

Sources of Variation

- **Mutations – change in DNA**

- _____ of
new genes and new alleles

- Can be positive, negative, or neutral
based on the environmental context

Sources of Variation

- ---

of alleles – how most of the variation occurs in a population

 - **Crossing over** – during _____
 - **Independent assortment** – random alignment of chromosomes in meiosis
 - **Fertilization** – random sperm and egg unite

Sources of Variation

- Geographical variation: differences in genetic structure between populations
 - _____ = graded change in a character along a geographic axis
 - Ex: fur color in a species of rabbits from north to south

Preservation of Genetic Variation

- Balanced polymorphism = presence of phenotypically distinct forms of a trait in a single population
 - One morph is better adapted for one area, while the other does better in a different area
 - Ex) shells of mollusks – different banding patterns

Preservation of Genetic Variation

- Outbreeding – mating of organisms that are _____
- Frequency-Dependent Selection – maintains variety by increasing the frequency of the _____ common allele
 - Due to _____ relationships

Preservation of Genetic Variation

- Diploidy – _____ condition that shelters a _____ gene pool of alleles
- _____ – hybrid state is selected for because of its increased reproductive success
 - Sickle cell anemia and malaria protection
- Evolutionary Neutral Traits – _____ selective value
 - Ex) fingerprints, blood type