Module 16: Evolution of Populations (Microevolution)

Keys to Success & Study Guide

Learning Objectives

By the end of this module, you should be able to:

1. **Calculate** allele and genotype frequencies using the Hardy-Weinberg equations.
2. **Differentiate** between the effects of genetic drift, gene flow, and natural selection on allele frequencies.
3. **Identify** patterns of selection (stabilizing, directional, disruptive) from phenotypic data.
4. **Explain** how heterozygote advantage maintains deleterious alleles in a population.

Key Terminology Checklist

Define these terms in your own words to ensure mastery.

- [ ] **Gene Pool**: All alleles in a population.
- [ ] **Microevolution**: Changes in allele frequencies within a population over generations.
- [ ] **Sexual Dimorphism**: Phenotypic differences between males and females of a species.
- [ ] **Gene Flow**: Movement of alleles between populations via migration.
- [ ] **Bottleneck Effect**: A sharp reduction in genetic diversity following a population crash.

Concept Check

1. Hardy-Weinberg Equilibrium

- **Question**: What are the five conditions for Hardy-Weinberg equilibrium?
- **Key Answer**: (1) No mutation, (2) No gene flow, (3) No natural selection, (4) Random mating, (5) Infinite population size. These conditions are rarely met; evolution is inevitable.

2. Hardy-Weinberg Equations

- **Question**: What are the two equations?
- **Key Answer**:
  - $p + q = 1$ (allele frequencies)
  - $p^2 + 2pq + q^2 = 1$ (genotype frequencies)
  - Start with q^2 (frequency of homozygous recessive) because this phenotype is identifiable.

3. Genetic Drift

- **Question**: What is genetic drift?
- **Key Answer**: Random changes in allele frequencies due to chance events. Drift has a stronger effect on small populations due to sampling error.