

Evolutionary Genetics Review

POPULATION of ANNUAL ORGANISMS

Account Generations at Time $t = 0, 1, 2, \dots$

DIPLOIDS, SEXUAL REPRODUCTION

DIALLELIC LOCUS: ALLELES A, a

GENE FREQUENCIES IN GAMETE POOL TIME t :

$$\text{Freq}(A) = p_t \quad \text{Freq}(a) = 1 - p_t = q_t$$

ZYGOTE FORMATION: NEW GENERATION

Gamete Pool Time $(t + 1)$:

$$\text{Freq}(A) = p_{t+1} \quad \text{Freq}(a) = 1 - p_{t+1} = q_{t+1}$$

Population Evolve?

***EVOLUTION*: CHANGE IN GENE FREQUENCIES THROUGH TIME**

p_t = Frequency A, time t

$\Delta p_t = p_{t+1} - p_t$ Forward Difference

$\Delta p = 0$ *OR* $\Delta p \neq 0$

$\Delta p = 0 \Rightarrow p_{t+1} = p_t$ No Change (Equilibrium)

$\Delta p \neq 0 \Rightarrow p_{t+1} \neq p_t$ Population Evolves

HARDY – WEINBERG: NO EVOLUTION

ASSUME:

- 1. NO MUTATION**
- 2. NO IMMIGRATION/EMIGRATION (NO GENE FLOW)**
- 3. INFINITE POPULATION SIZE (NO DRIFT)**
- 4. RANDOM MATING**
- 5. NO SELECTION (GENOTYPES EQUALLY FIT)**

POPULATION EVOLVES

ANY ASSUMPTION FAILS TO HOLD

ONE ASSUMPTION: NATURAL SELECTION

1. Evolution: Level of Individual

2. Heritable Phenotypic (Genotypic)

Variation Among Individuals

3. Individual Fitness

Survival, Lifetime Fecundity

4. Greater Fitness - Greater Lifetime

Reproductive Success

5. Quantify: Selection Coefficient (s)

6. Individuals Selected;

Population Adapts