Population genetics - III

Gene swamping – in absence of selection, most newly created alleles (rare!) will be lost from the population

Two possible outcomes (in closed population):
Get fixed, or get lost!

Chance of getting fixed: 1/2N
...why?

A molecular clock...

How many mutations get fixed per generation?

- Mutation rate per locus per generation = μ

- # of copies of the gene available to mutate = 2N

- # of mutations in the locus (in population) per generation =

- # of mutations that will be fixed in the population =

Migration

Movement of individuals between populations

How does it affect allele frequency?

If initial frequency of allele **A** in existing population= **p_0**

and in immigrant population = **p_g**

and **m** = coefficient of migration (fraction of population that is immigrant):

After 1 generation of immigration,

$$p_1 = (1-m)p_0 + mp_g$$

$$= p_0 + m(p_g - p_0)$$

Change in frequency of **A** = $p_1 - p_0$ =

How much migration is needed to counter genetic drift?

◆ Drift: $1/N$

◆ Need: $m \geq 1/N$

◆ or, need $mN \geq 1$

◆ How many is that?

Selection

- **Fitness:** relative probability of survival and reproductive success due to a genetically inherited phenotype

- **What is selected,** the genotype or the phenotype?

- Selection may be –
  - directional

◇ stabilizing

◇ disruptive