

EEB245: Evolutionary Biology

Spring 2008

Problem Set 5

EXTRA PRACTICE PROBLEMS:

MIGRATION: Calculating allele frequency after migration

This question is similar to that in Problem Set 4 but we have added a question asking you to calculate allele frequency after migration. (see Migration notes posted online for formula)

Populations of prong-gill mayflies (*Leptophlebia cupida*) occupy slow-moving and marshy habitats scattered along the Fenton River in Connecticut. An entomologist studying these populations found that the frequency of the *tricky* allele was 0.91 at Clear Meadows site, and only 0.23 in Tall Hill (TH), a site three-quarters of a mile down river. The sites are separated by a large overgrown field of brush and weeds, and normally these two populations do not mix. The large field is subsequently mowed down to better manage local bird populations that regularly signal for mates in the field (and thus need open space). Now movement of individuals between the two populations is facilitated. The entomologist then goes out and collects 324 individuals from Clear Meadows, 67 of which are identified to be from Tall Hill in the last generation.

a)What would the frequency of the *tricky* allele be in Clear Meadows after one generation of migration? (Hint: see box 6.1 on page 199)

GENETICS OF NATURAL SELECTION: Allele and Genotype Frequency

Changes Under Natural Selection

(see Genetics of Natural Selection notes posted online for formulas)

A scientist observed:

GENOTYPE →	AA	Aa	aa
# of eggs	33	100	45
Viability	0.3	0.7	0.4

# of adults	10	70	18
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a) Calculate the number of adults that were observed. (See table above)

b) Using the data in the table calculate the genotype frequency of AA (before and after selection) and the allele frequency of A (before and after selection).

Egg-to-adult survival rates in a laboratory population of *Drosophila melanogaster* is as follows: 90%, 70%, and 60% for genotypes A_1A_1 , A_1A_2 , and A_2A_2 , respectively. The fecundity values for each genotype are 50, 55, and 70 eggs, respectively.

(a) Complete the table below:

Genotype	A_1A_1	A_1A_2	A_2A_2
# eggs			
w_x			
# adults			

(b) Calculated allele and genotype frequencies before and after selection

(c) After the selection event from egg-to-adult, the adults are bred randomly. Assuming Hardy-Weinberg equilibrium into the next generation, what are the allele and genotype frequencies of eggs in the next generation?