Population Genetics Problems

Ethology and Behavioral Ecology

Differences in three behavioral strategies are influenced genetically by variation at a single locus where it is known that there are <u>two alleles</u>, <u>A1 and A3</u>. There is <u>no</u> <u>dominance between these alleles</u>. Here are some data on the study population:

	# of individuals in parental generation showing the phenotype
Phenotype A1	70
Heterozygote	20
Phenotype	
Phenotype A3	10

1. Find the <u>allele frequencies</u> for this generation.

2. Assume that this population was derived from a parental population with the same <u>allele</u> frequencies. If the heritability of this trait is 1.0, is the present population <u>at Hardy-Weinberg equilibrium</u>? (Don't be hasty in answering; you must do a calculation to answer this question).

3. Suppose that a couple of generations later you measure the fitness of each phenotype (based on the number of children produced). This is what you get:

	# of individuals in	mean # of offspring
	parental generation	to phenotype
	showing the	1 11
	phenotype	
Phenotype A1	70	1.9
Heterozygote	20	2.2
Phenotype		
Phenotype A3	10	1.9

(a) What is the relative fitness of each phenotype?

(b) Comments? -- what does this tell you about the relationship between allele frequencies, phenotype frequencies and selection? What does a calculation of fitness for each of the two alleles at this locus suggest?

Note: this is an example of what is termed a balanced polymorphism.

(c) Calculate the allele and phenotypic frequencies in the next generation.

(d) Based on your answer to #2; has selection been consistent (constant in a certain direction) over the generations?