BIOL 354 FOUNDATIONS IN EVOLUTION AND SYSTEMATICS Ouiz 2 18 January 2006

Answer all questions completely but succinctly. Complete sentences are not necessary.

Family	Midparent speed (m/s)	Midoffspring speed (m/s)		Running speed in sled dogs
1	12.7	10.8	16.0	
2	7.6	8.0	14.0 -	
3	14.4	8.0	12.0	
4	4.3	9.7	(s/u	\$
5	11.3	6.6	<u>ອ</u> 10.0	•
6	12.5	6.2	0.8 bri	
7	8.9	12.5		
8	8.2	7.4	Vide	
9	6.3	3.4	4 .0 -	• v = 0.0453v + 8.3165
10	12.7	6.7	2.0 -	y = 0.0433X + 0.3103
11	13.9	7.9	0.0	
12	7.3	13.6	0.0	0 5.0 10.0 15.0 20.0
13	5.9	7.4		Midparent (m/s)
14	12.8	12.1		
15	12.5	11.3		
average	10.1	8.8		

Imagine that a dog breeder asked you for advice. The breeder keeps Alaskan huskies, which she races in sledding events. She would like to breed huskies that run faster. The table above gives data on the running speeds (m/s) of 15 families of dogs in the breeder's kennel. The graph above is a scatterplot of those data, with a linear regression line fitted. The equation for that line is shown in the lower right of the graph. The slope is not statistically significantly different from zero.

1. Calculate the selection differential if the breeder selects the five fastest pairs of parents. (2pt) Average of selected (fastest) parents - average of all potential parents = selection differential 13.3 - 10.1 = 3.2 m/s = 5

2. Using this selection differential and your estimate of heritability, predict the average running speed of the dogs in the next generation. (1pt)

The heritability is not significantly different from zero, so there will be no response to selection, ergo the average running speed should not change (*i.e.*, = 10.1 m/s). If you put any faith in the h^2 estimate of 0.045 (= slope of the parent-offspring regression line) you could calculate the response to selection (R) as the product of the selection differential (S) and the heritability (h^2) ; R= $h^2 \times S$ = 0.045 x 3.2 = 0.14 m/s. Add the 0.14 m/s to the average speed of the parental generation (10.1 m/s) to get the predicted speed for the next generation (10.24 m/s).

3. Thoroughbred horses experience intense artificial selection for running speed. Only the fastest 6% of stallions are allowed to breed in each generation. Average speed of thoroughbreds over measured distances has increased steadily for more than 100 years. What does this suggest about the heritability of running speed in thoroughbreds? (1pt)

Absolutely nothing, because the horses' environment (e.g, nutrition, training, drugs) has changed over the past 100 years. Controlled experiments are required to demonstrate heritability.