

NOTES AND COMMENTS

NICHE WIDTH AND GENETIC VARIATION IN *DROSOPHILA*
REEXAMINED

Work concerning the relationship between niche width and genetic variation has been reviewed by Steiner (1977). He quite rightly points to the generally contradictory results and the methodological problems of past efforts. However, Steiner's analysis of Hawaiian species of *Drosophila* does not provide the "strong evidence" for a positive relationship between niche width and genetic variability that he suggests.

First, Steiner found a "significant" positive regression using genic heterozygosity as the independent variable and number of plant species (NPS) used for oviposition as the independent measure of niche width. These data, presented in his table 1 and figure 1 for 18 *Drosophila* species, are more completely analyzed here. Since there are multiple values of the dependent variable for values of the independent variable, the null hypothesis of differences among group means (NPS) is tested first (Sokal and Rohlf 1969, p. 428). The analysis of variance results are shown in table 1. The F value is not significant and the null hypothesis is accepted. This conclusion would normally complete the analysis, since it indicates no relationship between the variables. However, if the analysis is continued by partitioning the among groups sum of squares (SS) into the SS due to linear regression and the SS due to deviations from regression, it becomes clear where Steiner made an important error. The mean square (MS) for deviations from regression is nonsignificant, leaving only the final test of the linear regression MS. This test may be made against either the deviation MS or by pooling it with the within groups MS. The former is the correct choice in this case (Sokal and Rohlf 1969, p. 433) and the F value is again nonsignificant. Steiner considered only the test of linear regression MS over the pooled deviation MS and within groups MS, which is significant ($P = .04$). This result is due to the slight increase in group means with increasing number of plant species.

Second, even if the relationship between genic heterozygosity and niche width was significant, data presented in the second part of Steiner's study would lead one to question the validity of the result. Average genetic variability for eight populations of *D. setosimentum* at different altitudes are given in Steiner's table 2. I do not question his finding that genetic variability increases with altitude. The interesting point is that the range of genetic variability is 0.053–0.219 for this

TABLE 1
ANALYSIS OF VARIANCE RESULTS FOR THE EFFECT OF NUMBER OF
PLANT SPECIES UTILIZED ON GENETIC HETEROZYGOSITY IN
EIGHTEEN *DROSOPHILA* SPECIES

Source of Variation	df	SS*	MS†	F
Among groups (NPS‡)	4	.01700	.00425	2.17 NS
Linear regression	1	.01009	.01009	4.38 NS
Deviations from regression	3	.00691	.00230	1.18 NS
Within groups (NPS)	13	.02542	.00196	...
Total	17	.04244		

*Sum of squares.

†Mean square.

‡No. of plant species.

species. The range for the 18 species of *Drosophila* (which includes a population of *D. setosimentum*) is 0.010–0.194. Unfortunately the measures of genetic heterozygosity are based upon electrophoretic data in the first study and chromosomal and electrophoretic data in the second one. It is important that the two types of data need not give the same result (Honeycutt et al., in press). However, within-species variation appears to be almost as great as between-species variation. This suggests that, depending upon where and how the data are collected and analyzed, any relationship between genetic variability and niche width might be found.

LITERATURE CITED

- Honeycutt, R. L., I. F. Greenbaum, and R. J. Baker. In press. Evolution of vampire bats: incongruence of character states from biochemical, chromosomal and morphological studies. *Evolution*.
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JAMES G. HALLETT*

DEPARTMENT OF BIOLOGICAL SCIENCES
TEXAS TECH UNIVERSITY
LUBBOCK, TEXAS 79409

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* Present address: Department of Environmental Sciences, University of Virginia, Charlottesville, Virginia 22903.