

nant function DF, the weights = the discriminant coefficients DC, and the population mean of DF is the $\bar{DF} \times DC$ for each character). The relationship of tested population pairs depends on an evaluation of the DF separating the population pair. Population pairs that are most similar have similar DF values. The accuracy of the expression of relationship depends on the degree to which the populations are separated by DF. In addition, the multiple character difference between *Gopherus* species was also estimated using Mahalonobis' D^2 statistic, which is a general extension of distance comparisons for single characters. For this study the discriminant coefficients and the D^2 statistic for each pair of the selected populations of *Gopherus polyphemus*, *G. berlandieri*, *G. agassizi*, and *G. flavomarginatus* were computed using the 17 selected adult shell characters (Table 15). We see that *polyphemus* differs by 2.4 and 13.6 standard deviations from *flavomarginatus* and *berlandieri*, respectively, whereas *agassizi* and *berlandieri* differ by only 3.1 standard deviations. These tests serve to emphasize the separation of *Gopherus* into two major groups.

TABLE 15.—GENERALIZED D^2 DISTANCE (AND STANDARD DEVIATIONS) BETWEEN EXTANT POPULATIONS OF *Gopherus*.

	<i>agassizi</i>		
<i>polyphemus</i>	64.8 (08.3)	<i>polyphemus</i>	
<i>flavomarginatus</i>	55.8 (12.6)	8.1 (02.4)	<i>flavomarginatus</i>
<i>berlandieri</i>	21.3 (03.1)	82.3 (13.6)	92.7 (18.9)

The analysis of relationship was checked by tentatively assigning each specimen to one of the populations by use of the functions, and then checking each assignment *a posteriori* against the actual identification. With the proper choice of characters, most of the specimens can be correctly identified, though there is considerable overlap in species DF values. The results of these analyses are plotted in Figure 28. Although the results are less clear, *G. polyphemus* and *G. flavomarginatus* are closer to one another in both coordinates, whereas *berlandieri* is clearly different. *Gopherus agassizi* overlaps the characters of the remaining three species in both coordinates.

QUALITATIVE SPECIES-CORRELATED SHELL CHARACTERS.—To date most efforts to measure differences between the shells of *Gopherus* populations or to identify fossil specimens have used few specific measurements of any kind. They have relied mainly on size and general proportions. However, the overlap is so great that many individuals, particularly fos-