

the pattern of ossification. This pattern is coincidentally identical to the more primitive, pre-testudinine pattern because only two major types are possible. Fenestral ossification is usually bilaterally correlated, so that if one center of ossification fills the fenestra on one side, the same center tends to do so on the other side as well. In some specimens the right and left sides do not develop identically (Fig. 24).

**QUANTITATIVE SHELL VARIABLES.**—The purpose of this portion of the study was to determine those combinations of characters that would best separate the adult specimens of the four species of *Gopherus*, and to establish how widely they are separated. The sample analyzed consisted of 183 adult *Gopherus*, including an approximately equal number of males and females of each species. From each of the shells available for study 49 measurements were obtained, 25 on the plastron (Fig. 25) and 24 on the carapace (Fig. 26). To simplify computation and comparison, these two parts of the shell were analyzed independently. Other variables considered early in the study were sex and population (= species). Accumulated data are provided in Table 11.

Relative variability of the characters investigated was first established by analysis of the coefficients of variation ( $=\overline{CV}$ ) exhibited by the measurements. These are summarized as follows:

#### PLASTRON

- 1) Different parts of the plastron are differentially variable (Range  $\overline{CV} = 11.13$  to  $57.54$ ;  $\overline{CV} = 21.31$ ).
- 2) In different species the same characters do not vary in the same direction, or to the same degree.
- 3) Variation of scute length along median line ( $\overline{CV} = 22.68$ ) does not differ significantly from variation in bone length along median line ( $\overline{CV} = 23.80$ ) (Fig. 27).
- 4) Plastral variation in males is not significantly different from that of females (males  $\overline{CV} = 21.19$ , females  $\overline{CV} = 22.45$ ) (Table 12). Within the species *polyphemus*, females are significantly more variable than males (males  $\overline{CV} = 18.52$ , females  $\overline{CV} = 26.80$ ), but sexual variation is not significantly different in the three remaining species (*agassizi* males  $\overline{CV} = 22.60$ , females  $\overline{CV} = 22.70$ ; *flavomarginatus* males  $\overline{CV} = 23.15$ , females  $\overline{CV} = 24.05$ ; *berlandieri* males  $\overline{CV} = 21.81$ , females  $\overline{CV} = 18.79$ ).
- 5) None of the species differ significantly from one another in total plastral variability ( $\overline{CV}$  for all plastral measurements in *polyphemus* =  $22.76$ , *flavomarginatus* =  $25.06$ , *agassizi* =  $23.79$ , *berlandieri* =  $26.26$ ) (Table 12).

#### CARAPACE

- 1) Different parts of the carapace are differentially variable (Range  $\overline{CV} = 2.00$ – $162.94$ ,  $\overline{CV} = 29.80$ ).
- 2) Variation in different parts of the carapace are species-dependent.
- 3) Variation of carapace scutes ( $\overline{CV} = 38.36$ ) is not significantly different from variation of carapace bones ( $\overline{CV} = 30.87$ ) (Table 12).
- 4) Males ( $\overline{CV} = 29.01$ ) are significantly less variable than females ( $\overline{CV} = 36.63$ ) when all species are combined. There is no significant difference in the mean variance of males ( $\overline{CV} = 29.80$ ) and females ( $\overline{CV} = 32.27$ ) in *berlandieri*. How-