

FIG. 6. The values for individual queen component scores ( $cv_1$  and  $cv_2$ ) plotted against each other: *M.sabuleti* (circles), *M.scabrinodis* (squares) and *M.hirsuta* (triangles). The centroids are marked by a star, and the 99% confidence circles are shown.

for any of the species; in Fig. 6 although *M.hirsuta* queens do not overlap there is a slight overlap of the 99% confidence circles for *M.scabrinodis* and *M.sabuleti*. However, it is possible to calculate that of the 99% of individuals that are expected to fall in each circle only 0.3% of these are expected to fall within the region of overlap. Conversely, if the distance between any two centroids is halved ( $d$ ) and this is taken as the value that will be used to discriminate between

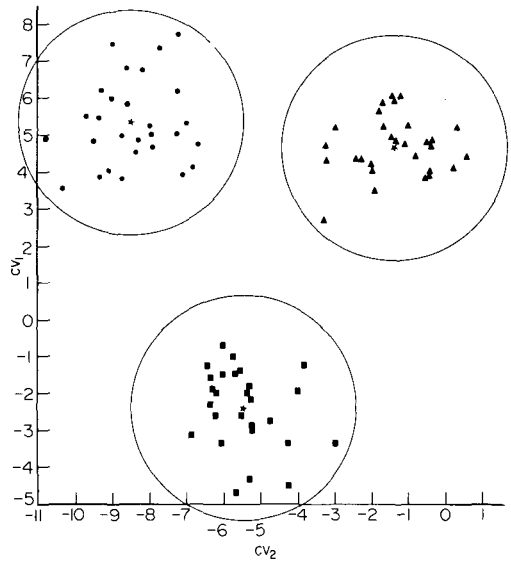


FIG. 7. The values for individual male component scores ( $cv_1$  and  $cv_2$ ) plotted against each other: *M.sabuleti* (circles), *M.scabrinodis* (squares) and *M.hirsuta* (triangles). The centroids are marked by a star, and the 99% confidence circles are shown.

unknown new individuals then the confidence of a separation based on this value will be that for a  $\chi^2 = d^2$ . Thus in the present case it would be possible to draw a key based on the canonical variate values as shown at the foot of this page.

Compare this for the separation of *M.scabrinodis* from *M.sabuleti* based on the ratio of two measurements, headwidth and frons width (section 2 and Fig. 5). There, up to 40% of each of the species could not be assigned to either group with any degree of confidence. Even using graphical interpolation up to 10% can be misclassified, compare this to the very high levels of confidence of correct classification using the canonical variates.

Having shown that the three species can be separated with a high degree of confidence by canonical variates it is usual to attempt

Queens	1.	$cv_1$ value < 22.2	.....	<i>M.hirsuta</i>	(confidence > 99.9%)
		$cv_1$ value > 22.2	.....	2	
	2.	$cv_2$ value > -22.8	.....	<i>M.scabrinodis</i>	(confidence 99.0%)
		$cv_2$ value < -22.8	.....	<i>M.sabuleti</i>	
Males	1.	$cv_1$ value < 1.5	.....	<i>M.scabrinodis</i>	(confidence > 99.9%)
		$cv_1$ value > 1.5	.....	2	
	2.	$cv_2$ value > -4.9	.....	<i>M.hirsuta</i>	(confidence > 99.9%)
		$cv_2$ value < -4.9	.....	<i>M.sabuleti</i>	