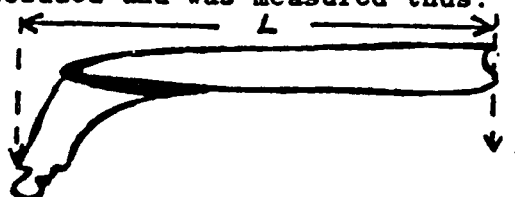


## METHODS

Eleven measurements were made on queens and workers, and 10 on males: headwidth, headlength, minimum frons width, scape length, thorax width, epinotal spine length (females only), petiole width, post-petiole width, post-petiole height, and the number of hairs on the petiole; all were measured as indicated by Elmes (1978). The length of a head bristle was not measured for this study, but the length of the female scape was included and was measured thus:

Scape length:  $L$



All measurements were recorded to the nearest 100th of a mm.

Canonical variate analysis was carried out on the groups of samples. For a detailed explanation of the method see Blackith & Reyment (1971), and for its application to *Myrmica* ants see Elmes (1978). In simple terms, this method attempts to maximise the between-/within-group variance ratio; in other words, it looks for a linear combination of the original morphometrics that emphasise differences which exist between the distinct groups while condensing the differences between the individuals within those groups. If there is no discrimination between 2 groups, they cannot be separated by this method. For convenience, the canonical variate (Cv) scores are standardised to have unit average within-group variance and an overall mean of zero.

The method assumes that the original measurements are normal and that the within-group variances are homogenous, so theoretically the within-group canonical variate scores should all have the same spread and the confidence limits can be calculated as the square root of  $\chi^2$  with the degree of freedom equal to the number of canonical variates that are considered together. In practice, the data never conform exactly to the assumptions, so we consider it best to show confidence limits that are calculated from the actual scores. When 2 canonical variates are considered together, as is usual in this study, the confidence limits are ellipses whose major axis lies along the correlation between the 2 scores. If the assumptions about the data were perfectly true, these would be equal-sized circles!

As a starting point, we have taken the comparison of the queens of *Myrmica scabrinodis*, *Myrmica sabuleti* Meinert and *Myrmica hirsuta* Elmes (Elmes 1978). Here the analysis is repeated with scape included instead of bristle length (Fig. 1). In the case of 3 groups, only 2 canonical variates are obtained: Cv1 accounting for 83% of the between-/within-group variation and Cv2 the remaining 17%.

We can illustrate the discriminating power of the method by including in the analysis 2 more groups from each of the 3 species. These were:

*M. scabrinodis*, 10 queens from Bindon Hill, Dorset, GB, and 10 queens from Yenne, France (the same site as the unknown queens).

*M. sabuleti*, 10 queens from Oland, Sweden, and 10 queens from miscellaneous sites in France.