

## Appendix 4 to:

# *Measures of Genetic Diversity*

## Geometric distance

### Quantitative variables

Geometric distance, also known as the taxonomic distance (Sokal, 1961), is measured by Euclidian distances, following the formula below:

$$d_{ij} = [\sum_k (X_{ik} - X_{jk})^2]^{1/2}$$

Where,

$X_{ik}$  = the value of the  $k^{\text{th}}$  variable of individual  $i$

See Appendix 5 for an example of calculation.

### Mixed variables

If there are mixed variables, they should be transformed or standardized first by following the formula:

$$X_{ij\text{stand}} = \frac{X_{ij} - \bar{X}_i}{s_i}$$

Where,

$X_{ij}$  = the  $i^{\text{th}}$  character value in individual  $j$

$\bar{X}_i$  = the average for the  $i^{\text{th}}$  character

$s_i$  = the standard deviation for character  $i^{\text{th}}$

### P number of variables

If there are  $P$  numbers of variables, distance must be weighted to become independent of the number of variables, as follows:

$$d_{ij}^2 = \frac{\sum_k \left[ \frac{(X_{ik} - X_{jk})}{\sigma_k} \right]^2}{P}$$

### Reference

Sokal, R. 1961. Distance as a measure of taxonomic similarity. Syst. Zool. 10(2):40-51.