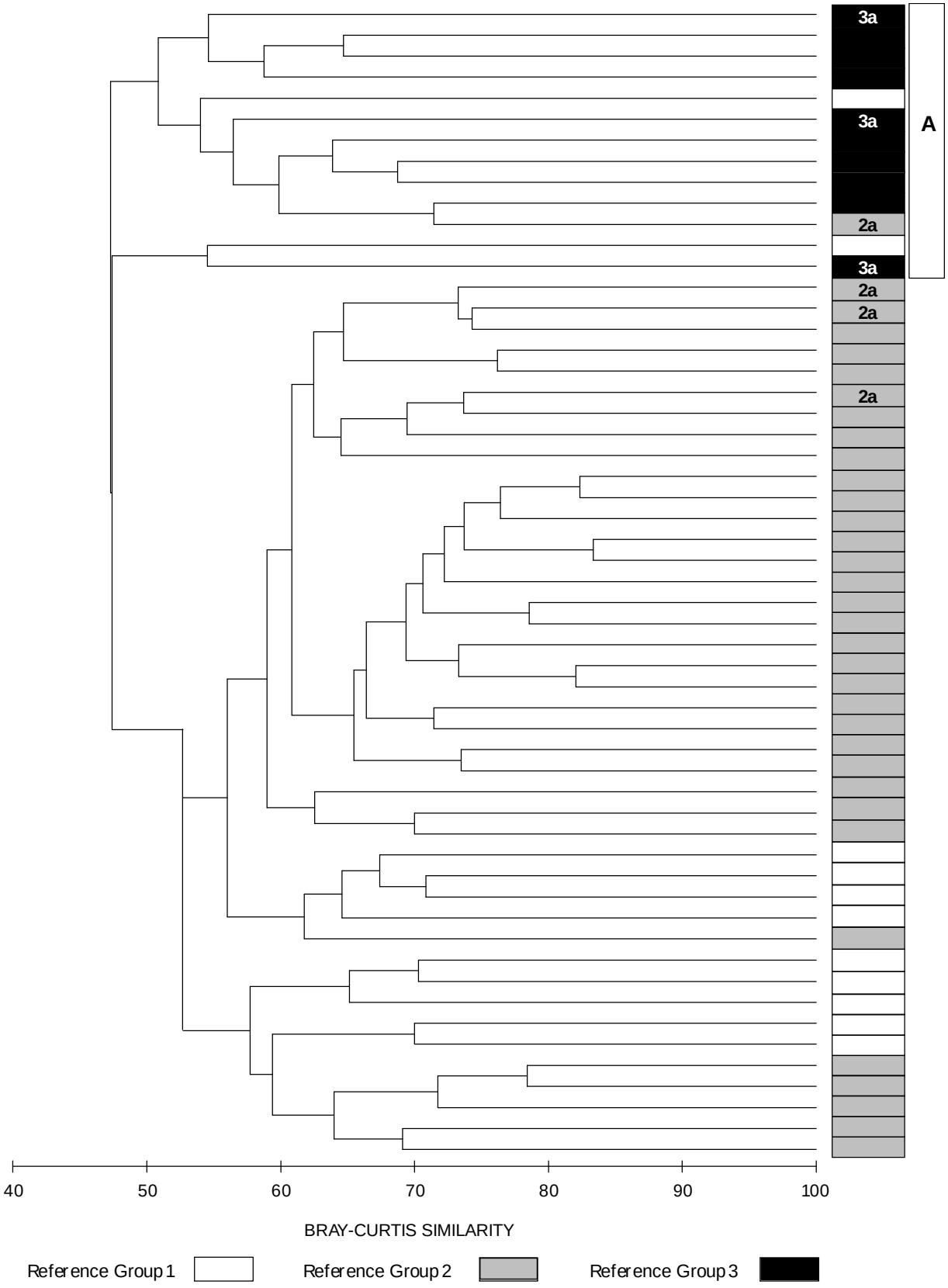

Figure 4.21 **Dendrogram showing the classification of 57 reference sites in Mpumalanga based on taxa recorded in autumn (May). Sites are shaded on the basis of the composite Reference Group classification (Figure 4.5). Sites in sub-groups 2a and 3a are indicated.**

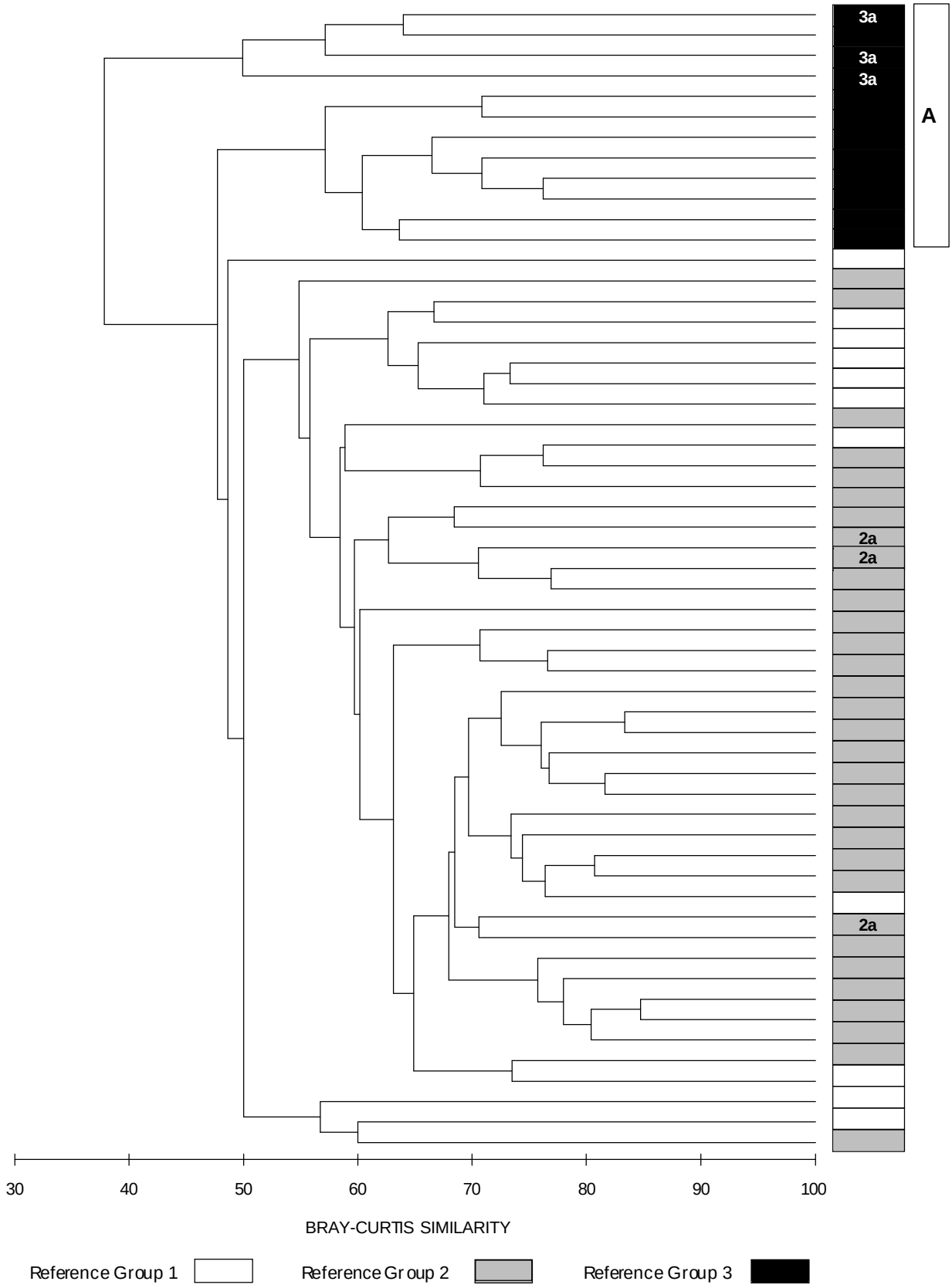

Figure 4.22 Dendrogram showing the classification of 57 reference sites in Mpumalanga based on taxa recorded in winter (July). Sites are shaded on the basis of the composite Reference Group classification (Figure 4.5). Sites in sub-groups 2a and 3a are indicated.

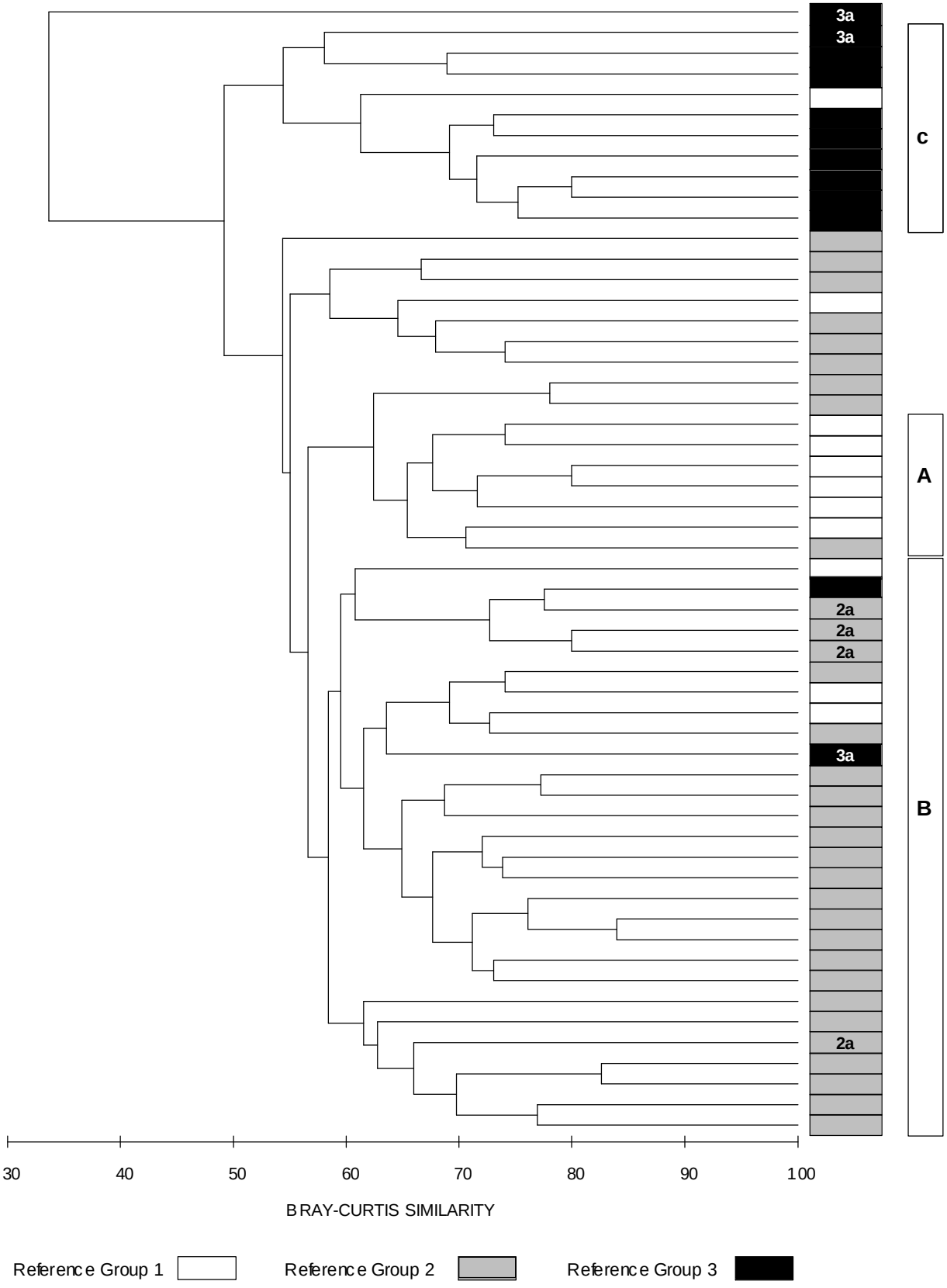

Figure 4.23 **Dendrogram showing the classification of 57 reference sites in Mpumalanga based on taxa recorded in spring (September). Sites are shaded on the basis of the composite Reference Group classification (Figure 4.5). Sites in sub-groups 2a and 3a are indicated.**

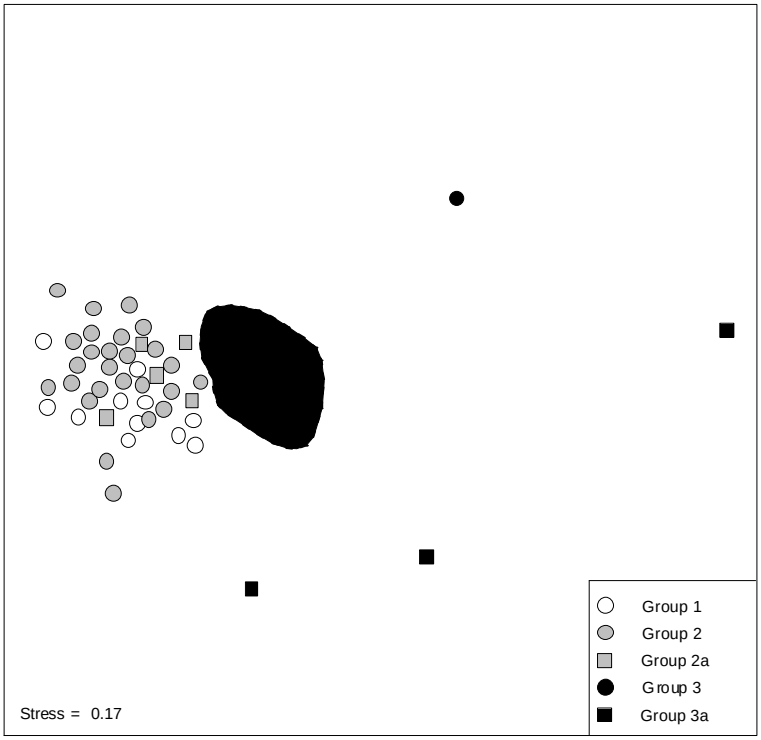

Figure 4.24 **Ordination of 57 reference sites in Mpumalanga based on taxa recorded in the autumn (May). Sites are shaded on the basis of the composite Reference Group classification and groups have been outlined manually on the basis of the cluster analysis.**

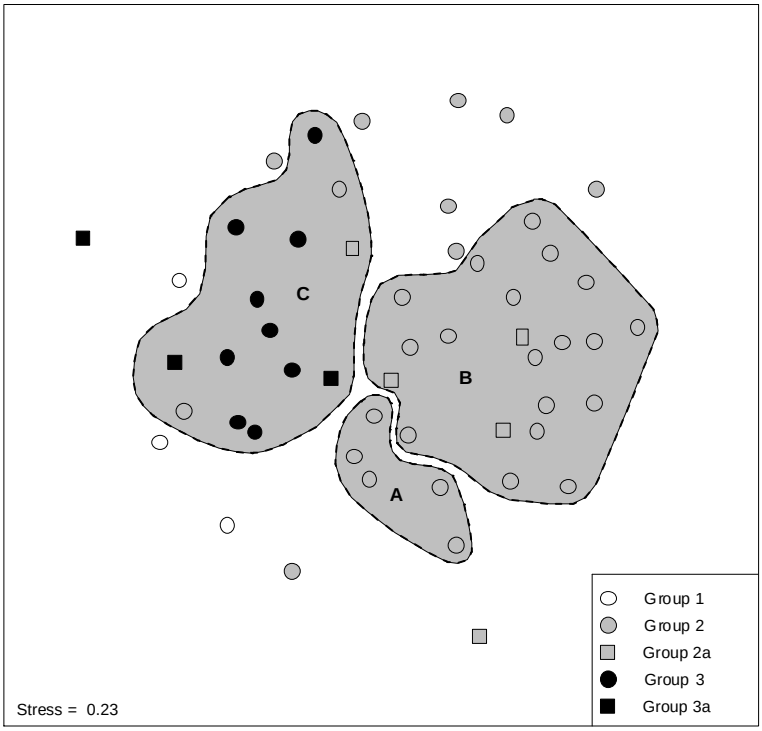

Figure 4.25 **Ordination of 57 reference sites in Mpumalanga based on taxa recorded in winter (July). Sites are shaded on the basis of the composite Reference Group classification and groups have been outlined manually on the basis of the cluster analysis.**

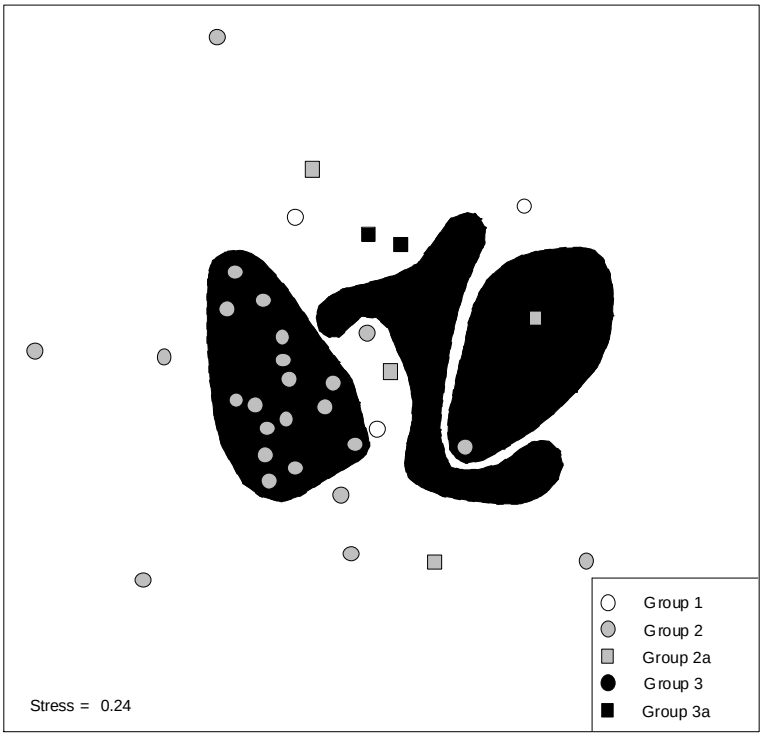

Figure 4.26 Ordination of 54 reference sites based on taxa recorded in spring (September). Sites are shaded on the basis of the composite Reference Group classification and groups have been outlined manually on the basis of the cluster analysis.

Autumn - May:

- Sites from Reference Groups 1 and 2 and most of sub-group 2a were grouped together at 50% similarity and were relatively intermingled, although there was some differentiation between Reference Groups 1 and 2 (Figures 4.21 and 4.24).
- Reference Group 3 and sub-group 3a sites grouped together at 45% similarity (indicated as A on the dendrogram and ordination plots). Two Reference Group 1 sites and one sub-group 2a site also formed part of this aggregate. Interestingly, both the Reference Group 1 sites had a high proportion of bedrock present, 40-60%, a feature common to many Reference Group 3 and sub-group 3a sites.

Winter - July:

- Sites from Reference Groups 1 and 2 and sub-group 2a were mixed together at around 50% similarity (Figures 4.22 and 4.25), although five of the 11 Reference Group 1 sites clustered together at 60% similarity.
- Eight of the nine Reference Group 3 sites clustered together at 55% similarity. The sub-group 3a sites together with one Reference Group 3 sites clustered together at approximately 50% similarity. The ordinations grouped both these Reference Group 3 and sub-group 3a sites together (indicated as A in Figures 4.22 and 4.25.

Spring - September:

- Sites from Reference Groups 1 and 2 and sub-group 2a were mixed together at around 55% similarity, although on the basis of dominance, three groups were apparent. The first group (indicated

as A on Figures 4.23) was dominated by Reference Group 1 sites and the second (indicated as B) by Reference Group 2 sites. This grouping was less clear on the ordination (Figure 4.26).

- Eight of the nine Reference Group 3 sites and one sub-group 3a site clustered together at 50% similarity (indicated as C in Figures 4.23 and 4.26).

Generally, classification of sites based on faunal data collected in a single season was less clear and there was less differentiation into groups of sites. Given the natural variability in invertebrate biota in river ecosystems, it may be advisable to base site classifications on more than one season's data and in this way derive a multiple-season classification of sites. Subsequent comparisons between monitoring sites and the reference condition may then be done for individual seasons.

4.4.4.2 The frequency of occurrence of each SASS taxon amongst seasons

The frequency of occurrence of each SASS taxon amongst the three sampling seasons (autumn, winter and spring) was calculated using data from the final reference sites (n = 57) on a per sampling basis. This resulted in 171 observations on which to base the frequency data which have been plotted as stacked bar graphs (Figures 4.27 and 4.28). Any taxon present at < 5% of any one season was excluded. Most taxa were recorded with relatively similar frequency across all of the sampling seasons. Taxa present with a relative frequency of >50% within a single season were as follows:

- No taxon was more frequently recorded in autumn.
- Taxa more frequently occurring in winter included:
  - Trichoptera: Psychomyiidae,
  - Hemiptera: Nepidae, and
  - Odonata: zygopterans (immature juveniles)
- Taxa more frequently occurring in spring included:
  - Diptera: Culidiae, Muscidae,
  - Hemiptera: Belastomatidae,
  - Odonata: Calopterygidae,
  - Lepidoptera: Pyraustidae,
  - Hydrachnellae,
  - Porifera, and
  - Mollusca: Planorbidae and Sphaeriidae.

Seasonal differences in the relative frequency of occurrence of taxa amongst seasons were less pronounced than differences related to biotope groups. Many of the taxa were recorded in all three seasons, although several invertebrate taxa were more frequently recorded in spring. The implications of this in terms of monitoring, is that if a monitoring site is assessed in autumn only, it needs to be compared to the reference condition for autumn, if available, or to the general reference condition, taking into account those taxa which are reported to occur more frequently in spring. The absence of one of these "spring" taxa, may be a seasonal phenomenon, as opposed to one related to water quality impairment or reduced river health.