1.8 One-way example (Ekofisk oil-field macrofauna)

Our first real example comes from a study by Gray, Clarke, Warwick *et al.* (1990) , who studied changes in community structure of soft-sediment benthic macrofauna in relation to oil-drilling activity at the Ekofisk oil platform in the North Sea. These data consist of $p = 174$ species sampled by bottom grabs at each of $N = 39$ stations. The stations were placed roughly along five transects radiating out from the centre of the oil platform. Stations have been grouped with labels according to their distance from the oil platform as A (> 3.5 km), B (1 km – 3.5 km), C (250 m – 1 km) and D (< 250 m). The data are located in the file ekma.pri in the 'Ekofisk' folder of the 'Examples v6' directory. Open the file by selecting **File>Open** from within PRIMER and using the browser. Next, select **Edit>Factors** to view the factor labels associated with each sample. See chapter 2 of Clarke & Gorley (2006) for detailed information concerning creating, importing and editing factors to identify sample groups within PRIMER. Of interest here is to test the null hypothesis of no differences among the communities inhabiting the benthic habitats in these four different groups.

First, we may wish to visualise the relationships among the samples in terms of a relevant resemblance measure, using ordination. A well-known robust procedure for doing this is non-metric multidimensional scaling[14] (MDS, Shepard (1962) , Kruskal (1964) , Kruskal & Wish (1978) , Minchin (1987)). Produce a resemblance matrix among the samples by selecting **Analyse > Pre-treatment > Transform (overall)** > Transformation: fourth-root, followed by **Analyse > Resemblance** > (Analyse between$\bullet$Samples) & (Measure$\bullet$Bray-Curtis similarity). Next, produce an MDS plot by selecting **Analyse > MDS** and click 'OK' with all of the default options. Once the 2-dimensional graph is in view, show the samples according to their factor labels by selecting **Graph > Data labels & symbols** > (Labels > $\checkmark$Plot > $\checkmark$By factor Dist) and by removing the $\checkmark$ from the (Symbols > Plot) box (Fig. 1.7). The resulting ordination plot suggests that the communities are fairly distinct in the different distance groups, and also that they tend to occur along a gradient, from those lying closest to the platform (group D) to those lying furthest away (group A).

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[14] Here and throughout, we shall use the acronym MDS to denote non-metric (as opposed to metric) multi-dimensional scaling. More details about the method of MDS and its implementation in PRIMER can be found in chapter 5 of Clarke & Warwick (2001) and chapter 7 of Clarke & Gorley (2006) .

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