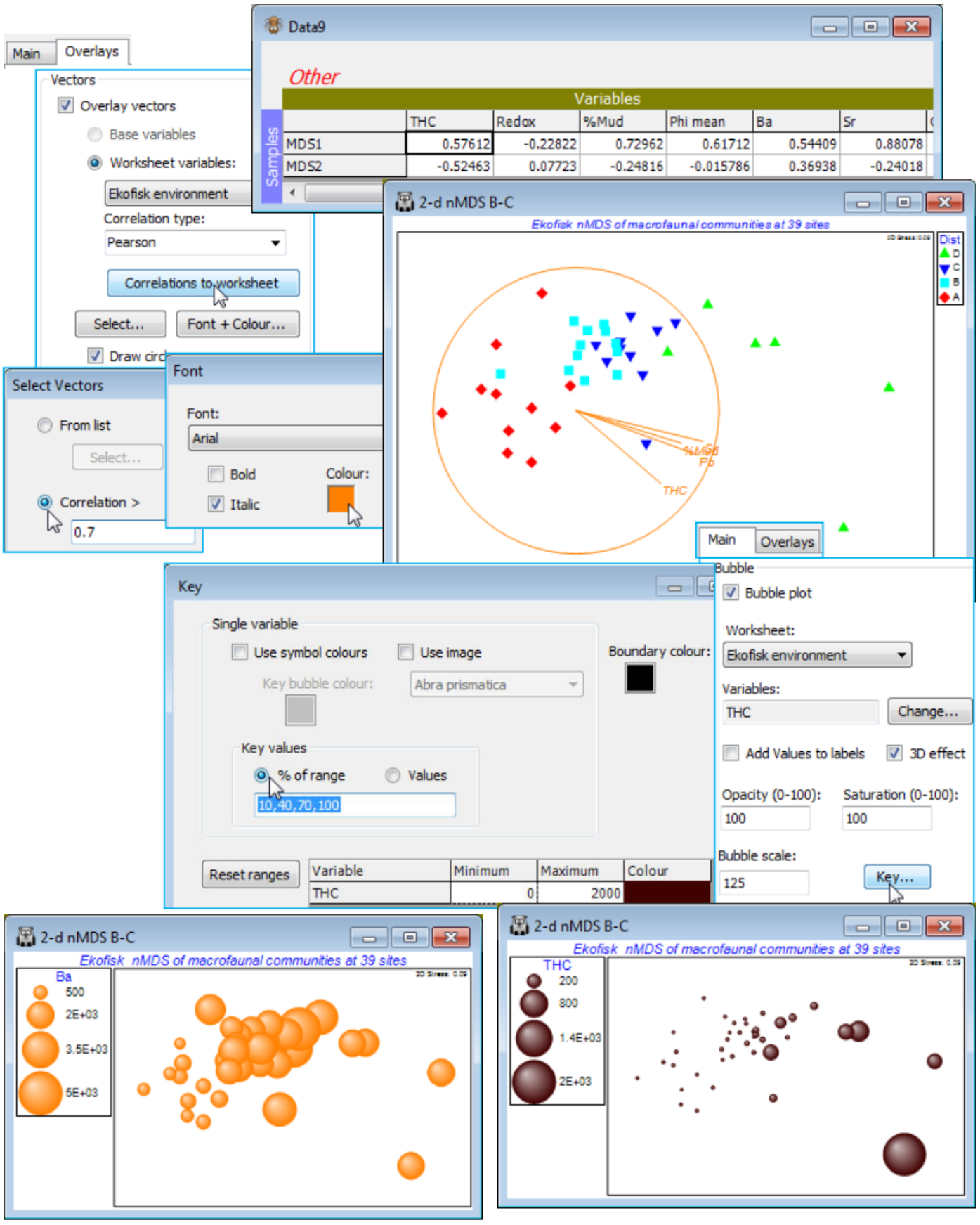
Environment bubble & vector plots

An important use for a bubble plot is in displaying the behaviour of a further measured variable, which has not been used in the multivariate analysis, across the sample positions on an ordination, e.g. in superimposing environmental or contaminant variables one at a time, on a community MDS. Also, in this case, vector plots have a more useful role because there is a better chance of linearity, or at least monotonicity, of the relationships between abiotic gradients and community gradients – also the rescaling of abiotic values implicit in a correlation coefficient is appropriate here, because environmental variables will usually be on different measurement scales.

As an example, **File>Open** the Ekofisk environment sheet into the current workspace (if it is not already there from the transformation examples of Section 4). On the biotic 2-d nMDS B-C plot, under **Special>Overlays**, retain (✓Overlay vectors) but change to (•Worksheet variables: Ekofisk environment) & **Select**>(•Correlation > 0.7) to display only those abiotic variables with a high (multiple) correlation coefficient with the biotic ordination positions. The vector plot below shows these to be *THC*, *%Mud*, *Sr* and *Pb*. Those multiple correlations can be calculated by clicking the **Correlations to worksheet** button on the (✓Overlay vectors) dialog, which produces a worksheet of Pearson correlations of each abiotic variable with the ordination co-ordinates (MDS1, MDS2). These are the values obtained by projecting each vector onto the (*x*, *y*) ordination axes, which is how the vectors are constructed in this case. The length of the vector (the multiple correlation) is simply obtained by Pythagoras, e.g. for *THC*, $\sqrt{0.576^2 + (-0.525)^2} = 0.78$. [For the technically minded, that this is equivalent to the multiple correlation coefficient from multiple linear regression of *THC* on the (MDS1, MDS2) co-ordinates follows from the fact that the MDS solution is rotated to PC's, making the MDS axes uncorrelated]. In addition, simple bubble plots (e.g. of *THC* and *Ba*) can be drawn as before, using **Main**>(✓Bubble plot>Worksheet: Ekofisk environment).



The vector plot, though not as unsatisfactory as when superimposing species, can again be seen to miss an important relationship here by comparison with the bubble plots. The pattern of *Ba* is not a linear one and thus does not give a very strong correlation, but it is distinctive and instructive, since barite is a component of the drilling muds dispersing into the marine environment. The bubble plot shows that *Ba* values are consistently higher around the oilfield but drop to background levels at about 3-4km – another example of a threshold change not optimally captured by

correlation. Note that plots here used untransformed abiotic variables, which is visually informative, but there is a good case for instead using the selectively transformed sheet (Data3) deemed appropriate for these variables in Section 4; e.g. this would reduce the dominant effect of the large outlier in *THC*.

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