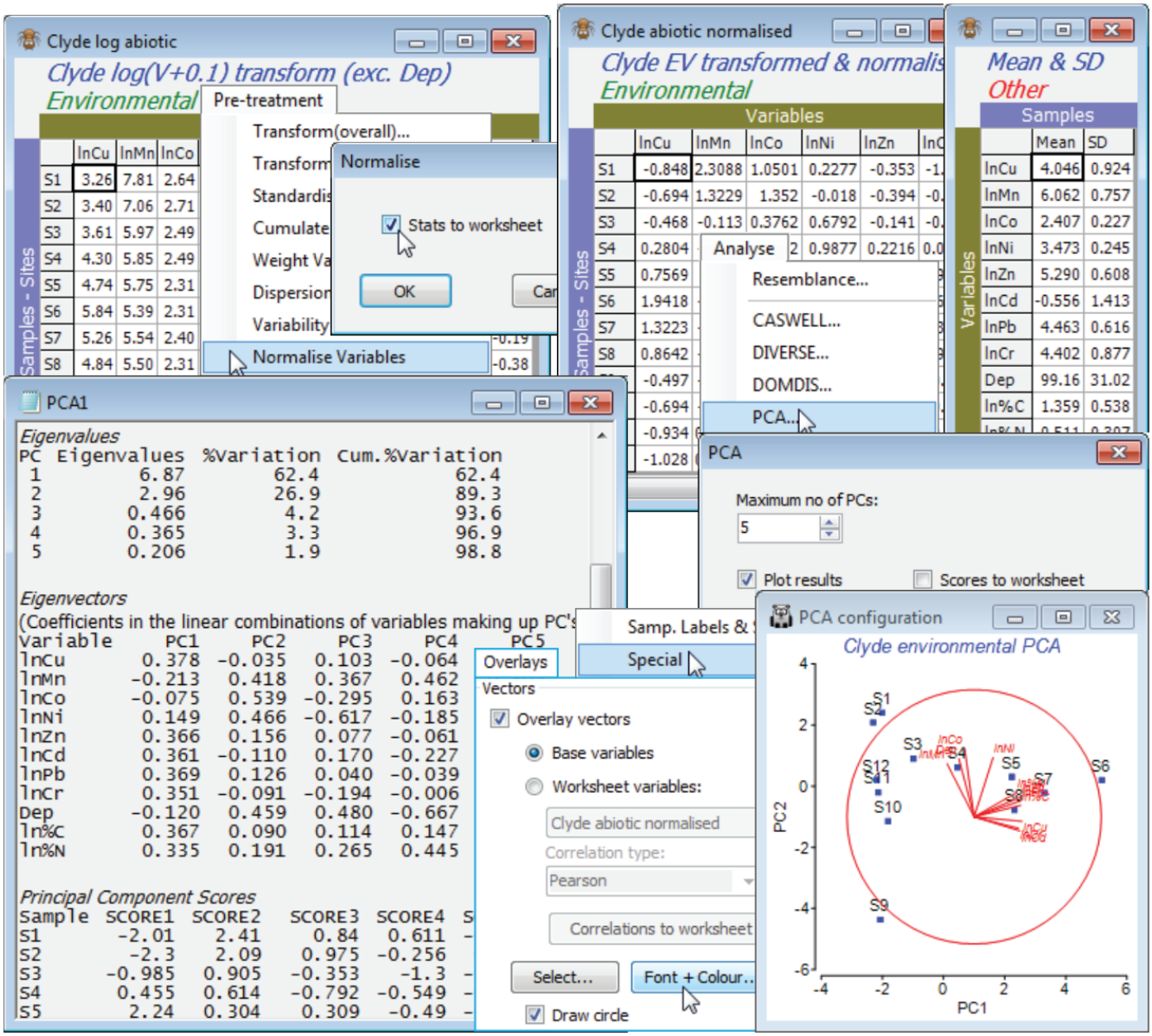
Principal Components Analysis

PCA is an ordination method in which samples, regarded as points in the high-dimensional variable space (11-d here) are projected onto a best-fitting plane, or other low-dimensional solution – the user can specify how many principal components (new axes) are required, and the routine offers 2 d and 3-d plots of any combination of these PC's. The purpose of the new axes is to capture as much of the variability in the original space as possible, and the extent to which the first few PC's allow an accurate representation of the true relationship between the samples in the original high-d space is summarised by the *% variance explained* (a percentage from *eigenvalues*). The PC's are simply a rotation of the original axes and thus a linear combination of the input variables (the coefficients are termed *eigenvectors*); PRIMER allows for superimposition of these vectors on the 2-d PCA plot. The co-ordinates of the samples on the PC axes are called the *principal component scores*, and these are output to the results, along with the %variance explained by each axis and the linear coefficients defining each PC. Chapter 4 of CiMC has a little more detail.

For the Clyde log abiotic data sheet used above, which resulted from a log(0.1+x) transform of all the environmental variables except water depth (*Dep*), take **Pre-treatment>Normalise Variables**, sending the mean and standard deviation for each of these (transformed) variables to a worksheet, and renaming the resulting data matrix Clyde abiotic normalised. On this sheet, run **Analyse>PCA**, choosing the (default) option of displaying only the first 5 PC axes, and resulting in two outputs: a detailed results window with three sections (*Eigenvalues*, *Eigenvectors* and *Scores*), and a PCA ordination with a superimposed vector plot (blue lines, text and circle). The vector overlay can be turned off (or changed in colour) for improved clarity, by unchecking **Graph>Special>Overlays**>(Vectors✓Overlay vectors), using **Font + Colour** to change colour from the default blue, or the circle (indicating a maximal vector) removed by unchecking the (✓Draw circle) box.



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