6.4 Example: Indonesian reef-corals

Warwick, Clarke & Suharsono (1990) examined data from 10 replicate transects across a single coral-reef site in S. Tikus Island, Thousand Islands, Indonesia, for each of the six years 1981, 1983, 1984, 1985, 1987 and 1988. The community data are in the form of % cover of a transect by each of the 75 coral species identified, and the analysis used Bray-Curtis similarities on untransformed data to obtain the MDS of Fig. 6.5. There appears to be a strong change in community pattern between 1981 and 1983 (putatively linked to the 1982/3 El Niño) and this is confirmed by a 1-way ANOSIM test for these two years alone: R = 0.43 (p< 0.1%). Note that, though not really designed for this situation, the test is perfectly valid in the face of greater variability in 1983 than 1981; in fact it is mainly a change in variability rather than location in the MDS plot that distinguishes the 1981 and 1983 groups (a point returned to in Chapter 15).¶ This is in contrast with the standard univariate ANOVA (or multivariate MANOVA) test, which will have no power to detect a variability change; indeed it is invalid without an assumption of approximately equal variances (or variance-covariance matrices) across the groups.

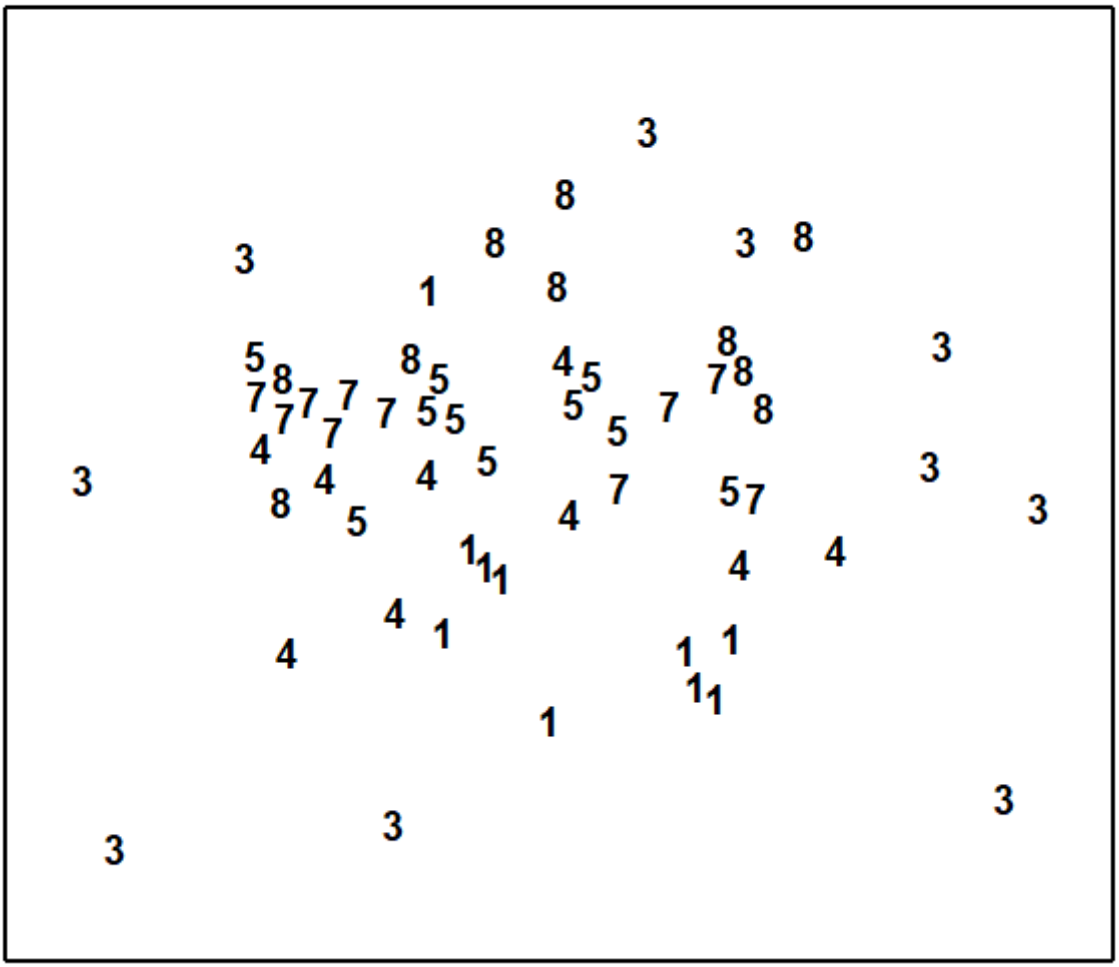


Fig. 6.5. Indonesian reef corals, S. Tikus Island {I}. MDS of % species cover from 10 replicate transects in each of 6 years: 1 = 1981, 3 = 1983 etc (stress = 0.19).

The basic 1-way ANOSIM test can also be extended to cater for more complex sample designs. Firstly we consider the basic types of 2-factor designs (and later move on to look at 3-factor combinations).

¶ *Of course it could equally be argued that, as with any portmanteau test, this is a drawback rather than an advantage of ANOSIM. The price for being able to detect changes of different types is arguably a loss of specificity in interpretation, in cases where it is important to ascribe differences solely to a shift in the 'mean' community rather than variation changes. The key point here is that ANOSIM tests the hypothesis of no difference among groups in any way, either (multivariate) location or dispersion. It has more power to detect a location shift than a dispersion difference because of its construction, but a sufficiently large change in either between groups can lead to significance – this is very different than the PERMANOVA test which is constructed to be a test only of location, and assumes constant dispersion. An issue for the latter is how sensitive it is to this assumption, and recent simulation work, Anderson & Walsh (2013) , suggests it is not.*

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