

# Bootstrap regions for Tikus coral reef study

The above study was not an example given in Chapter 18 of CiMC and was therefore discussed in detail, but bootstrap average regions are given and interpreted for three other data sets there, and we shall end just by showing a region plot from one of those, for the 6 years (1981, 83, 84, 85, 87 and 88) of coral assemblage data from 10 replicate transects per year at Tikus Island, Indonesia.

The workspace **Tikus ws** was saved in Section 5, where it was used to illustrate the zero-adjusted Bray-Curtis similarity coefficient (see also the analyses for this data in Chapter 16, CiMC). If not available, open file **Tikus coral cover** from C:\Examples v7\Tikus corals, square root transform it and **Analyse>Resemblance>**(Measure•Bray-Curtis similarity)&(✓Add dummy variable>Value:1), calling it **B-C adj**. An *m*MDS of the replicate-level data (60 points) has high stress of 0.29 but does seem to show a major change between 81 and 83 (spanning a major coral bleaching event) and a (partial) reversion – the *n*MDS has a similar pattern but also a high stress (of 0.21). On **B-C adj**, run **Analyse>Bootstrap Averages>**(Factor: **Year**) & (Number bootstraps per group: 75) & (•Auto m> Rho: 0.99) & (✓MDS plot•Metric) & (✓Group average) & (✓Bootstrap region•95%) but uncheck the (✓Bootstrap averages) box. The bootstrap averages will still be calculated of course, and used to structure the 2-d *m*MDS space for the display of regions (and the computation time will be non-negligible for an MDS of 450 bootstrap average points!) but there may occasionally be merit in showing just the smoothed regions, with group averages joined, as in Fig. 18.2c of CiMC. It is wise though to run again with the bootstraps displayed, to check the shape of the envelopes against the clusters –1987 shows some non-convexity, also suggested by the position of the group average in relation to the smoothed region. To join the group averages in year order, take **Graph>Special>Overlays>**(✓Overlay trajectory)>(Trajectory numeric factor: **Year**). Testing by ANOSIM (or by PERMANOVA) does show significant differences between all pairs of years, which permits a clear interpretation of the temporal pattern, in this *means plot* with bootstrap-derived regions.



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