

Analysis of Multivariate Data from Ecology and Environmental Science, using PRIMER v6

Virginia Institute of Marine Science, Gloucester Point VA, USA, June 6-10, 2011

Course

- This five-day workshop will cover the statistical analysis of assemblage data (species-by-samples matrices of abundance, area cover, etc.) and/or multi-variable environmental data that arise in a wide range of applications in environmental science and ecology, from environmental impact assessments, through fundamental community ecology studies and monitoring of wide-scale biodiversity change, to biomarker studies and purely physical or chemical analyses
- Based on the PRIMER package (Plymouth Routines In Multivariate Ecological Research), a worldwide standard software tool used in more than 6,000 SCI-listed papers for analysis of aquatic assemblages and, increasingly, terrestrial, paleontological, microbial and genetic data, also for model output, in ecotoxicology, epidemiology, sociology, etc.
- The workshop covers definitions of similarity, clustering (CLUSTER), ordination by non-metric multi-dimensional scaling (MDS) and principal components analysis (PCA), hypothesis testing on similarity matrices (ANOSIM) and other permutation tests (RELATE), linking biotic patterns to environmental variables (BEST), identifying species responsible for the observed community pattern (SIMPER, BEST), comparison of ordinations (2STAGE, eg 2nd stage MDS), dominance curves and (bio)diversity indices, including measures based on taxonomic relatedness of species (TAXDTEST). All other features of PRIMER v6 are also covered: choice between over 50 (dis)similarity measures, including dispersion-weighted and relatedness-based coefficients, new 'exploratory' permutation tests for structure in *a priori* unstructured samples (SIMPROF) and optimal biota-environment relationships (the latter also examined by a non-parametric form of multivariate regression tree, LINKTREE). Also covered are tests for dominance curves (DOMDIS), SIMPER analyses for 2-way layouts and abiotic variables, missing-data algorithms for environmental data, merging of non-matching species lists, etc.
- Also briefly demonstrated (though not in detail, since they require another 5-day course!) will be the 'add-on' PERMANOVA+ routines to PRIMER6, which add 'semi-parametric' multivariate analyses, e.g., the extension of permutation tests to complex designs (PERMANOVA), regression (DISTLM) and dispersion tests (PERMDISP).
- The workshop will be given by Dr P J Somerfield (Plymouth Marine Lab, UK). Paul Somerfield is a senior researcher in community ecology and quantitative methods at the PML, spearheading the laboratory's biodiversity research. He has been responsible for some of the methodology in the current version of PRIMER and has much experience of using the package creatively in a wide range of applications (well outside the biodiversity area)
- 'Hands-on' lab sessions will use real literature case studies, analysed with PRIMER. Participants are also encouraged to bring some of their own data to the course. The emphasis throughout is on practical application and interpretation, the theoretical aspects (e.g. the multivariate statistical methods which are the core of the course) being carefully selected to be those that are simple to describe and understand. **No prior statistical knowledge is assumed**
- The workshop will be held in the Virginia Institute of Marine Science, College of William & Mary, Greate Rd, Gloucester Point, VA 23062. Information on nearby hotels, parking for workshop participants etc can be sought from the local organiser, April Cook, acook@vims.edu, but note that it is a participant's responsibility to arrange and pay for their own accommodation-this is not included within the course fee.
- The course will take place in a computer laboratory, with enough PCs available with the software already installed for participants to share (at most in pairs). Sharing PCs can actually be beneficial for the lab sessions (it leads to livelier interactions!), in which participants analyse literature data in a structured way. However, participants are welcome to bring their own laptops, and may find this more convenient for the sessions in which they analyse some of their own data with Paul Somerfield's help. (If a laptop is not brought to the workshop, then bring some of your own data on a USB stick to try out on the lab machines). Laptops will require a registered PRIMER6 licence already installed, or purchased (at discount) for delivery and installation at the start of the workshop (we will not install PRIMER temporarily on any laptop). A CD/DVD drive and administrator access is required for installation. PRIMER6 is a Windows-only product (no native Mac version, though it runs well under Parallels, for example). Permitted Windows versions are 2000, XP (needs 256Mb RAM), Vista and 7 (needs 1Gb RAM), and both 32 and 64-bit machines (also needs Internet Explorer 5 or later).

Workshop costs

- **Course fee: \$900 (\$600 for full-time students)** for a full five days. The fee includes the course book but not the cost of PRIMER software, accommodation or meals.

- **Software licence** for PRIMER6. The PRIMER v6 software will be used throughout and, to register, participants are expected to either already have purchased a single-user licence for this version or purchase/upgrade, in connection with the course* (otherwise what is the point in learning how to use the software?). The below are single-user licence fees for participants (at 20% discount on list price - they subsume any further discounts for bulk purchase). The usual additional carriage charges will also be waived if software is picked up at the start of the workshop.

New **academic**, single-user licence (i.e. universities and colleges only): **\$400**

New **public** sector, single-user licence (state/federal labs, museums, 'not-for-profits' etc): **\$600**

New **private** sector, single-user licence (fully commercial activity): **\$800**

Licensed v5 users can upgrade** to v6 at 50% of the above prices

PERMANOVA+ can additionally be ordered*** at standard list prices (\$250/\$375/\$500) for delivery at the workshop

A courier charge (e.g. **\$35** for PRIMER) will be added if software is required to be sent in advance of the workshop

* An exception can only be made for a student who will, in future, always use their supervisor's PC (and their supervisor has a registered v6 licence), or they will be using a machine covered by a v6 teaching licence at their university

** If upgrading, please first check with Cathy or Marg (at admin@primer-e.com) that you hold a valid v5 licence

*** PERMANOVA+ add-on licence is not mandatory for this course - it will only be briefly demonstrated, not used in the lab sessions

Contact and Registration

- **Contact the local organiser, April Cook** of the VIMS Fisheries Science Department, e-mail: acook@vims.edu, phone: (804) 684-7522, fax: (804) 684-7327. She will e-mail you a detailed schedule for the workshop and a registration form.

- However, **registration** for the course is **solely through PRIMER-E** in Plymouth, UK. The completed registration form must be accompanied by payment or an institutional purchase order, for both the course and software fees (if the latter are needed), e.g. by mailing a US dollar check or by mailing/faxing credit card details (Visa or Mastercard only). Cards will be debited on receipt of registration form, or later if requested, but no later than the **payment deadline of 29 April 2011**. Please make sure your card issuer will not block payment of the requisite amount to a UK-registered company, PRIMER-E Ltd, listed as a software vendor. If there are institutional rules which prevent payment from purchase orders being made in advance of the workshop, please discuss this with Cathy or Marg at PRIMER-E (admin@primer-e.com)

- The workshop can cater for up to 25 participants: **places will be allocated in order of receipt of registration**, with payment or purchase order. Completed registration forms can be faxed to 44 1752 837721 (note that this requires an international prefix, 011 from most US locations, before the UK country code of 44), posted to: PRIMER-E Ltd, 3 Meadow View, Luton, Ivybridge, Devon PL21 9RH, UK, or e-mailed to admin@primer-e.com. Receipted invoices, confirming payment, will be issued. Proforma invoices (formal quotes) can also be e-mailed, if requested. Registrations after the payment deadline will be accepted, space permitting, also in order of payment. Clearly, credit card numbers or cheques will not be processed unless a participant has been allocated a definite place.