

PRIMER 7 and PERMANOVA+ workshops

Multivariate Analysis for Ecology & Other Sciences

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| PRESENTER: | Dr Marti J. Anderson (<i>PRIMER-e and Massey University</i>) | | |
| DATES: | Week 1: PRIMER 7 | 19 - 23 February 2024 | |
| | Week 2: PERMANOVA+ | 26 February - 1 March 2024 | |
| VENUE: | The Marine Biological Association of the United Kingdom (MBA) The Resource Centre, The Laboratory, Citadel Hill, Plymouth, PL1 2PB, U.K. | | |

OVERVIEW

PRIMER-e is pleased to announce a **two-week in-person workshop** to be held at The Marine Biological Association (MBA) in Plymouth, United Kingdom. This workshop consists of two parts. *Week 1* will cover the non-parametric methods in PRIMER 7. *Week 2* will cover the semi-parametric methods in the PERMANOVA+ add-on package for PRIMER. The workshop will run 5 days per week, Monday to Friday, 09:00 to 17:45 each day. Participants may register for **week 1 only**, **week 2 only**, or **both weeks**. Each week mixes lectures and computer lab sessions on example data and includes practical sessions in which participants can discuss and analyse their own data in consultation with the lecturer. **Participants are expected to bring their own laptop**. Software may be purchased at a discounted price (see below), or a **free** fully functional (but time-limited) licence of the software can be made available to registered participants for trial use during the workshop. Note that PRIMER is a Windows-only product, so Macs need to run in Windows emulation.

WEEK 1 - PRIMER 7

Week 1 will provide an extensive overview of statistical methods in non-parametric analysis of multivariate data implemented in the software **PRIMER 7**. The core basic multivariate routines in PRIMER 7 will be fully discussed, including: pre-treatment of data; definitions of similarity; clustering methods; ordination by principal components (**PCA**), non-metric multi-dimensional scaling (**MDS**); permutation tests on similarity matrices for structured (**ANOSIM**, **RELATE**) and unstructured (**SIMPROF**) cases; emphasis on species analyses; linking community to abiotic data (**BEST**); biodiversity indices, including **taxonomic distinctness**; and graphical tools for effective presentation of results. Non-parametric statistics and permutation tests make the methods intuitively simple to understand, so **no prior background in statistics is required**.

This workshop will cater both to those who are **new to PRIMER** and to those who are “**old hands**” but would like a refresher. Novel additional tools and methods in PRIMER 7 that will also be covered in week 1 include: **shade plots** with flexible ordering & clustering of axes; **coherence plots** to show groups of species that display coherent response patterns among samples; **divisive clustering**; **metric or threshold metric MDS**; **bootstrap averages** to show variation among averages in metric MDS space; **2-way versions** of BEST and RELATE; a variety of **plot types** (bar, box, means, line, histogram, scatter, surface, shade) in 2-d or 3-d; **animations** of ordinations captured to video files; multi-variable **segmented bubble plots** in 2-d and 3-d; **ANOSIM** extended for **ordered factors** and **3-factor** designs and much more...

WEEK 2 - PERMANOVA+

PERMANOVA+ is an add-on package for PRIMER 7. Its core routine, **PERMANOVA+** allows robust analysis of multivariate data in response to complex sampling/experimental designs on the basis of a resemblance measure of choice, with rigorous inferences obtained using permutation methods. The broader suite of methods in PERMANOVA+ enable formal models, tests, and predictions to be achieved for multivariate ecological (and other) systems that are over-parameterised (i.e., have too many variables) and/or that demonstrate substantial non-normality. Familiarity with the core methods in PRIMER and/or some prior knowledge of basic multivariate methods is desirable. However, week 2 (like week 1) will emphasise conceptual understanding, software implementation and interpretation of the methods for scientists and practitioners, so no prior specific background in statistics is assumed. Participants will explore the following core topics:

- partitioning and estimation of components of variation in complex experimental designs, including interactions, covariates, contrasts, fixed or random factors, crossed or nested models, unbalanced designs, environmental impact designs, randomised blocks or repeated measures (**PERMANOVA**);
- tests for homogeneity of multivariate dispersions and analyses of beta diversity (**PERMDISP**);
- unconstrained ordination (**PCO**, **nonmetric MDS** and **metric MDS**), particularly with the aim of visualising the most important factors structuring multivariate data in multi-way designs;
- dissimilarity-based multivariate multiple regression and model selection (**DISTLM**), including constrained ordination (distance-based redundancy analysis **dbRDA**), especially to relate biotic data to environmental (or other explanatory) variables;
- canonical analysis of principal coordinates (**CAP**), including leave-one-out allocation success for discriminant analysis, canonical correlation analyses and the predictive placement of new points into existing canonical model spaces.

VENUE

All sessions will be held in the Resource Centre at [The Marine Biological Association of the United Kingdom, The Laboratory, Citadel Hill, Plymouth, PL1 2PB, UK](#). For local information, including directions to the venue, please click [HERE](#) or for further information please contact the venue directly on +44 (0)1752 426493 or email: info@mba.ac.uk.

WORKSHOP FEES

The workshop fee **includes** all course materials, coffee/tea and snacks during breaks, lunch, free Wi-Fi, and a temporary fully functional time-limited software licence key for the duration of the workshop, **but not** accommodation, or the separate (discounted) cost of purchasing time-unlimited software. The workshop fee also **includes MBA membership for one year**. (Current MBA members are offered a discount of **GBP £45 (GBP £25 for students)** off the workshop registration fee).

The **prices to register** for this **in-person workshop** are:

| | For <u>either</u> Week 1 or Week 2 | For <u>both</u> Weeks 1 and 2 |
|---|---|---|
| EARLY BIRD On or before 1 November 2023 | GBP £ 700 (£ 480 for full-time students) | GBP £ 1,330 (£ 910 for full-time students) |
| AFTER 1 November 2023 | GBP £ 760 (£ 530 for full-time students) | GBP £ 1,440 (£ 1,000 for full-time students) |

All prices are in Great British Pounds (£GBP). Please note that our [Global Equitability Pricing \(GEP\)](#) percentage discounts **do not apply to registration for in-person workshops** such as this one.

DISCOUNTED SOFTWARE PRICES FOR WORKSHOP PARTICIPANTS

For these in-person workshops, we are pleased to offer all workshop participants a **special discounted base price** to purchase time-unlimited PRIMER software in **£ GBP**. Workshop participants may also be eligible for a [Global Equitability Pricing \(GEP\)](#) discount on all our software products. Any GEP discount will be applied **on top of** the **special discounted base price** shown below. For example, the special workshop prices (including GEP) to purchase a **single end-user licence** of **PRIMER 7 with PERMANOVA+ software** across different sectors for residents of various countries are shown below:

| Country of Residence | GEP discount (%) | Commercial licence (£GBP) | Public licence (£GBP) | Academic licence (£GBP) | Student licence (£GBP) |
|--------------------------------------|------------------|---------------------------|-----------------------|-------------------------|------------------------|
| UK | 16.03% | £ 1,058.02 | £ 789.32 | £ 529.01 | £ 264.51 |
| France | 26.18% | £ 930.13 | £ 693.91 | £ 465.07 | £ 232.53 |
| Croatia | 54.40% | £ 574.56 | £ 428.64 | £ 287.28 | £ 143.64 |
| Germany | 23.31% | £ 966.29 | £ 720.89 | £ 483.15 | £ 241.57 |
| Discounted base price (£GBP): | 0.00% | £ 1,260 | £ 940.00 | £ 630.00 | £ 315.00 |

All prices above are given in Great British Pounds (£GBP). Note that **your price** may well differ from those listed above. **All** discounts for which you are eligible (including, for example, discounts for upgrades from PRIMER 6) will be applied on invoice. If you would like a quotation from us for workshop registration + software prior to registering, please get in touch with us directly at: primer@primer-e.com.

REGISTRATION

To register, please fill out the registration form available on the [PRIMER-e website](#) and return it directly to primer@primer-e.com to secure your place. The deadline for registration and payment is **Thursday 1st February 2024**. Late registrants will only be accepted if space permits. Please get in touch with us directly if you have any questions primer@primer-e.com, and especially if you would like:

- to **obtain a quote** for your registration (with or without software), including all discounts for which you are eligible;

- to register ***more than one individual*** from your organisation and pay on a single invoice (please include separate registration forms for each individual participant); or
- to purchase ***more than one software licence*** at discounted prices on a single invoice.

ABOUT THE PRESENTER

Dr Marti J. Anderson is the Director of PRIMER-e (Quest Research Limited), a Fellow of the Royal Society of New Zealand and an Honorary Research Associate at the New Zealand Institute for Advanced Study (NZIAS) at Massey University in Auckland. Her core research is in community ecology, biodiversity, multivariate analysis, experimental design and resampling methods, with a special focus on developing novel statistical methods for ecology. She has developed all of the statistical methods in PERMANOVA+ and especially enjoys engaging in the dynamic interactions with students, academics and professionals that have become a trademark of the PRIMER/PERMANOVA+ international workshops, shedding new light on multivariate data.