PRIMER/PERMANOVA Essentials

A Course in Multivariate Analysis for Ecology & Other Sciences

PRESENTER:	Dr Adam Smith
DATES:	**May 19th - 23rd, 2025**
HOSTED BY:	California State University, Long Beach, California, USA
VENUE (in person):	Hall of Science (HSCI), 1250 Bellflower Blvd., Long Beach, CA 90840, USA
or ONLINE:	USA Pacific Daylight Time (UTC -7 hours)

OVERVIEW

PRIMER-e is pleased to announce a **hybrid course** (offered *in person* and *online*) in *Multivariate Analysis for Ecology & Other Sciences* to be held over one week at California State University, Long Beach, California, USA. This 5-day course will cover *the essentials* – a suite of core non-parametric methods implemented in PRIMER software, as well as several key semi-parametric methods encapsulated in PERMANOVA+. Sessions will run daily, Monday to Friday, from **8:30 am to 5:30 pm** on each day. Online participants will join the course live *via* Google Meet (in the USA Pacific Daylight Time (PDT) time zone, UTC -7 hours). Each day will include a mixture of lectures and computer lab sessions, in which participants can practice implementing the new methods learned on example datasets. Participants will also have the opportunity to discuss and analyse their own data in consultation with the presenter. Participants who register to attend in person **are expected to bring their own laptop to the venue**. Software may be purchased at a discounted price (see below), or a *free* fully functional (but time-limited) licence of the software will be made available to registered participants for trial use during the course. Note that PRIMER is a Windows-only product, so Macs need to run in Windows emulation. This course will cater both to those who are new to PRIMER and to those who are familiar with PRIMER methods but would like a refresher. This course is designed for scientists and research practitioners; it will emphasise the achievement of a conceptual understanding of multivariate methods, with demonstrations of how to implement the software and interpret results, so no prior background in statistics is required.

OUTLINE of TOPICS

The topics covered in this course shall include:

- Properties of multivariate data (summary statistics, shade plots, histograms, draftsman plots, etc.);
- Pre-treatment options (transformations, normalization, standardization, & dispersion weighting);
- Measures of resemblance: distance, similarity and dissimilarity (Euclidean, Bray-Curtis, Jaccard, etc.);
- Cluster analysis (**CLUSTER**), including tests for significant structure within clusters (**SIMPROF**) to permit non-arbitrary classifications of samples or variables (species);
- Ordination *via* projection: principal components analysis (**PCA**) and principal coordinate analysis (**PCO**);
- Ordination to preserve inter-sample relationships *via* non-metric, metric or threshold metric multi-dimensional scaling (**MDS**, **mMDS**, **tmMDS**);

- Relating biotic to abiotic data, including tests of association between resemblance matrices (**RELATE**), and finding optimal subsets of environmental (or other) variables that generate a 'best' match to patterns among samples based on species variables (**BEST - BIOENV**);
- Non-parametric permutation test for differences among *a priori* groups of samples (analysis of similarities (**ANOSIM**), and ordination of **bootstrap averages**;
- Finding important variables (**SIMPER** and **BEST – BVSTEP**);
- Diversity measures (**DIVERSE**); Taxonomic distinctness; Taxonomic resemblance
- Partitioning variation; tests for centroid differences among groups (**PERMANOVA**), including one-way and two-way cases, tests of interactions, constructing *a priori* contrasts and pairwise tests.
- Multivariate variation (spread), tests for homogeneity of multivariate dispersions and comparisons of beta diversity (**PERMDISP**);
- Complex multi-factor experimental designs, identifying **fixed and random factors** that are **nested or crossed** with one another (**PERMANOVA**);
- Fitting multivariate response data (e.g., species) to continuous predictor variables (e.g., environmental), including model selection (**DISTLM**) and visualising fitted variation using dissimilarity-based redundancy analysis (**dbRDA**);
- Graphical tools for effective presentation of results, including **matrix displays** and a variety of plot types, **animations** of ordinations captured to video files, centroid plots, bubble plots and multi-variable **segmented bubble plots**.

VENUE

All sessions will be held live online and in person at California State University Long Beach (CSULB), Hall of Science (HSCI), 1250 Bellflower Blvd, Long Beach, CA 90840, USA. Online participants will join the course *via* Google Meet. For further local information or if you have questions regarding logistics at the venue, please contact the local host: Dr Christine Whitcraft Christine.Whitcraft@csulb.edu. For information regarding registration or any other course-related matters, contact the PRIMER-e admin team directly (tel: +64-9-869-2230, email: primer@primer-e.com).

COURSE FEES

The course fee **includes** all course materials, coffee/tea and snacks during breaks, free Wi-Fi, and a temporary licence key to use PRIMER software (fully functional, for the duration of the course), *but not* accommodation, meals, or the separate cost to purchase time-unlimited software (offered at discounted prices for workshop participants, see below).

The **prices to register** are:

Registration fees (in $USD)	In person	Online only
EARLY BIRD On or before March 31st, 2025	USD $1,050 ($750 for full-time students)	USD $930 ($610 for full-time students)
AFTER March 31st, 2025	USD $1,200 ($860 for full-time students)	USD $930 ($610 for full-time students)

All prices are in US dollars ($USD). GST will be applied for New Zealand residents. Participants residing outside of the USA registering to attend this course ***online only*** may be eligible for a ***[Global Equitability Pricing](GEP)*** discount on their registration fees, in accordance with their country of residence. Please note that the GEP *does not apply* to ***in-person*** registrations.

DISCOUNTED SOFTWARE PRICES FOR COURSE PARTICIPANTS

We are pleased to offer <u>all</u> course participants (attending online or in person) a **special discounted price** of ***10% off*** our standard base prices to purchase time-unlimited PRIMER software in $USD. Course participants not residing in the USA may also be eligible for a ***[Global Equitability Pricing](GEP)*** discount on all our software products, in accordance with their country of residence. **All** discounts for which you are eligible (including, for example, discounts for upgrades, etc.) will be applied on invoice. If you would like to receive a quotation from us for course 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 **Friday, May 9th, 2025**. Late registrants will only be accepted if space permits. Unfortunately, we cannot permit attendance at the course unless payment for registration has been ***received in full*** by PRIMER-e prior to the commencement of the course. 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

Adam Smith has worked with PRIMER-e since 2017 as a Workshop Presenter and Statistical Consultant. Adam obtained his PhD in Statistics from Massey University (MU) in Auckland, New Zealand, where he lectured statistics for 15 years. He is Director of [Sea Through Science Ltd.](#), providing statistical consulting and marine ecological research services. Adam has extensive experience across a wide range of disciplines, including quantitative ecology, data mining, and biostatistics. He specializes in applying modern statistical methods to biology and ecology and is a key consultant to industry and government for fisheries and marine reserve assessments. As an educator, Adam is known for his enthusiastic and engaging teaching style and his passion for using statistical concepts to learn about our world. As a consultant, with over 20 years of scientific experience with hundreds of datasets, Adam can quickly grasp his clients' analytical needs and identify the appropriate statistical methods to meet them.