

Multivariate Analysis of Ecological Data, using R

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Date & Time:	24 - 26 April 2018
Location:	AWI Building E; room 4025
Language:	English
POLMAR credit points:	3
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Course content: Ecological data needed for assessment and hypothesis testing are typically multidimensional. Multivariate analysis allows researchers to effectively summarize and model the response of multiple ecological variables. The course will focus on the theory and practice of multivariate analysis of ecological data, using R as a platform for computation and graphical presentation. The course will cover the main ordination and classification methods used in ecology, and provide the means to produce, interpret and communicate graphical results (e.g. dendrograms and ordinations) as well as tabular results. The methods covered during the course include hierarchical and nonhierarchical clustering, multidimensional scaling (MDS), principal component analysis (PCA), correspondence analysis (CA), and constrained ordination methods such as canonical correspondence analysis (CCA). Permutation testing of multivariate models is also introduced as a distribution-free way of testing hypotheses in multivariate modelling. Also included is an introduction to modern and more flexible methods of regression and classification such as generalized additive models (GAM) and classification and regression trees (CART).

Target group: The course is primarily, but not exclusively, directed at advanced undergraduate and graduate students in ecology, marine biology, the geosciences and oceanography. For the most part and where possible, the level of instruction will take into consideration the spread of disciplinary backgrounds of course participants. For additional guidance please see the recommended reading or contact the instructor.

The language of instruction and discussion in class will be English.

Prerequisites: The participants are expected to have a basic background in descriptive and inferential statistics, and some experience with statistical software. Experience with the R package is a prerequisite. We strongly recommend that participants sign up for the R-Course with Prof. Stephan Frickenhaus, held on April 5 & 6, 2018.

Participants would also benefit from participation in the visualisation course, held by Prof. Michael Greenacre on April 23 (please register separately for that course), although this is not a prerequisite.

More information: The textbook '*Multivariate Analysis of Ecological Data*' (Greenacre & Primicerio, 2014) provides the main background literature for the course. Participants are invited to inspect the opening chapters of the book before the beginning of the course (all the PDFs of this book can be freely downloaded from www.multivariatestatistics.org, as well as Michael Greenacre's book '*Biplots in Practice*' (2010), which is also relevant for this course.

Course participants are kindly asked to bring a laptop (with wireless network card) to access data and to be able to complete the R sessions during the afternoon PC labs.

Course program:

Day 1:

- Introduction to multivariate data.
- The concept of distance for measuring multivariate difference.
- Distances and dissimilarities for different types of data.
- Hierarchical and non-hierarchical cluster analysis.
- Afternoon practical session using R.

Day 2:

- Multidimensional scaling.
- The biplot as a fundamental ordination tool.
- Regression biplots.
- Principal component analysis biplots.
- Correspondence analysis biplots.
- Afternoon practical session using R

Day 3:

- Redundancy analysis and canonical correspondence analysis.
- Permutation tests of multivariate relationships.
- Generalized linear models.
- Generalized additive models.
- Classification and regression trees.
- Afternoon practical session using R

Our courses are generally free of charge for all participants. However, they do have a price and can cost POLMAR as much as 150 € per day per student. Please take this into account when cancelling your place at the last minute.
