Helmholtz Graduate School for Polar and Marine Research

Course announcement: POLMAR Expert Type

Multivariate Analysis of Ecological Data, using R

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Date & Time:	Oct 5 – 7, 2015
Location:	AWI Building E; room 4025
Language:	English
POLMAR credit points:	3
Registration:	info.polmar@awi.de

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 clustering, multidimensional scaling (MDS), principal component analysis (PCA), correspondence analysis (CA), constrained ordination methods such as canonical correspondence analysis (CCA) and permutation testing of multivariate models. 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.

Pre-requisites: The participants are expected to have a basic background in descriptive and inferential statistics, and some experience with statistical software. Some experience with the R package is recommended, but we will nevertheless start the computing sessions "from scratch".

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:

- Constrained ordinations.
- Redundancy analysis and canonical correspondence analysis.
- 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 as much as 150 € per day per student. Please take this into account when cancelling your place on the last minute.