Univariate and multivariate analysis

Synopsis

This short course introduces students to biostatistics as applied to ecotoxicological studies. The basic principles and methods used in biostatistics are covered. This includes the technical qualifications necessary for exploring, analyzing and interpreting data from both controlled experiments, in particular standardized ecotoxicity tests, and field monitoring. Beyond conventional tests such as ANOVA and its variants, an overview of other less conventional approaches (e.g. GAM, Random Forest, t-sne, MDS) will be provided to broaden students' statistical toolbox and ensure they make proper use of their data.

Aims

Investigating ecotoxicological data.

Objectives

At the end of this Unit, you should understand:

1)Basics of experimental and sampling design.

2)Main statistical approaches to monitor toxicants and estimate their effects on organisms.

3)Assumptions and interpretation of statistical methods.

Key Skills Acquired

At the end of this Unit, you should be able to:

1)Choose the most appropriate statistical method to answer a specific question.

2)Use R software to analyse data.

3)Interpret statistical results.

Syllabus

Topics covered include:

- Basic use of R software.
- Basic and advanced statistical approaches.
- Uni- and multivariate statistics.
- OECD guidance on the statistical analysis of ecotoxicity tests: no/lowest observed effect concentrations (NOEC/LOEC), dose-response, effective concentrations (ECx).

Learning & Teaching

- Lectures: 22h
- Laboratory work: 23h
- Work in autonomy: 10 to 20h

Teaching Staff: M. Vignon (Coord.), C. Recapet & B. Liquet

Semester: 1

Timetable slot: To be advised

ECTS:5

Level: Optional

Bibliography

- N. Gotelli. 2004. A primer of ecological statistics, Sinauer Associates, Sunderland, Massachusetts.
- C. Dytham. 2003. Choosing and using statistics: a biologist's guide, Blackwell, Malden (MA).
- J. Faraway. 2006. Extending the linear model with R: generalized linear, mixed effects and nonparametric regression models. Chapman & Hall/CRC, cop.
- B.S. Everitt. 2010. A handbook of statistical analyses using R. Chapman & Hall/CRC, cop.
- L. Fahrmeir. 2001. Multivariate statistical modelling based on generalized linear models. Springer, New York, Berlin, Paris

Assessment

- Laboratory work and report (100%)

Course Evaluation

By completion of University Unit Evaluation Questionnaire by students, annual assessment by Unit Coordinator.