Profile Working Group Computational Ecology (COPE),
Institute for Environmental Research, RWTH Aachen University:

The working group "Computational Ecology" develops mathematical and statistical algorithms and methods for multivariate modeling, causal analysis and pattern recognition in ecology and ecotoxicology. Integration of empirical observations and theoretical models allows for the generation and testing of multifactorial hypotheses. A system-oriented approach is used to elucidate structures, processes and dynamics in complex interaction networks of populations, communities, and environmental factors. Important research applications are related to the link of biodiversity, stability, information and complexity in ecosystems, the relevance of self-organization processes in communities and its importance for sustainable provision of ecosystem services, as well as the question of how external disturbances affect structure and dynamics of non-linear ecological networks. The working group is lead by Dr. Richard Ottermanns.

General topics of research activities:

- Research into ecosystem structure (investigation and interpretation of community assemblages in aquatic and terrestrial ecosystems)
- Cause and effect analysis (investigations in species-species and physico-species interactions)
- Retrospective modelling (monitoring) and predictive modelling (forecasting) of community dynamics
- Bioindicator development (research into spatio-temporal patterns, synecology and bioindicator potential of species)
- Bioassessment and monitoring (development of assessment tools and concepts in restoration ecology and ecotoxicology)

Exemplary fields of application:

- Regeneration of species composition in secondary rain forests
- Consequences for arthropod communities of land-use change on alpine pastures
- Response of age-structured populations to external stressors
- Suitability of benthic macroinvertebrate organisms as indicators in freshwater systems
- Evaluation of restoration actions and prognosis for macro-invertebrate communities in restored palsa bogs
- Relevance of test-species for the assessment of ecotoxicological effects in complex ecosystems and their species communities
- Relationship of molecular mechanisms and toxic effects of sediment-bound pollutants in lakes and rivers
- Reference conditions and toxic thresholds for limnic sediment contact tests

Methods used include:

- Explorative Data Analysis (e.g. diversity indices, PCA)
- Exploratory statistical models (Multivariate statistics: e.g. Correspondence Analysis, Multidimensional Scaling, Cluster analysis, PRC)
- Confirmatory statistical models (Structural equation models)
- Probabilistic models (Bayesian belief networks)
- Machine learning and artificial intelligence (Neural Networks)
- Non-linear time series analysis (Attractor reconstruction)
- Data mining (Knowledge discovery in databases)
- Synecological methods (classical table work)

Contact:

Dr.rer.nat. Dipl.-Ing. Richard Ottermanns
Computational Ecology (COPE)
Institute for Environmental Research (Biology V)
Chair of Environmental Biology and Chemodynamics (UBC)
RWTH Aachen University
Worringerweg 1
D-52074 Aachen
Germany

Room:	42C 251
Tel:	+49-241-8026688
Fax:	+49-241-8022182
Mail:	ottermanns(at)bio5.rwth-aachen.de
Web:	http://www.bio5.rwth-aachen.de/ro
Business card:	download