

Preface to Methods in Ecological Research

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Curiosity is a good quality to have as a researcher. As ecologists, we are fascinated by patterns revealed by nature and often ask questions such as, are these patterns real, how general are they, and why are we observing these patterns? If we are to satisfy our curiosity about patterns and the mechanisms behind them, we need good scientific practice to make sure our explanations are well founded. Effort that has gone into a whole season, or more, of field or lab work may be wasted if not enough time was spent designing the study beforehand or analysing and reporting the data afterwards. This special issue is dedicated to showing how good scientific practice can be developed.

The aim of this volume is actually best summarised in the first paragraph of the final paper, by Jeff Harvey: “*The ability to formulate hypotheses [David Ford], to independently conduct experiments [Dana Campbell et al., Tony Underwood], and to generate empirical data are important pre-requisites for a successful scientific career. Moreover, it is equally vital to be able to correctly analyze the data [Esa Läärä, Bob O’Hara] and to write up the results for publication in peer-reviewed journals [Jeff Harvey]*”.

In the first paper of this issue, David Ford discusses how to clarify the issues a study is investigating, concentrating on the development of an exact scientific question and a data statement that will precisely answer this. Tony Underwood follows this up by discussing the logic and requirements of field experiments. In particular, he emphasises the importance of the design of experiments in answering the data statement, and discusses the nature of replication and controlling for artefacts. In contrast, Dana Campbell and colleagues look at laboratory experiments, which can isolate and control specific variables, and evaluate the advantages and disadvantages of different laboratory experiments in behavioural ecology. Throughout this paper they emphasise the importance of linking lab experiments with experiments conducted in the field.

Papers four and five are devoted to statistical issues. Bob O’Hara introduces generalized linear mixed models, a framework in which most ecological data can be analysed. He discusses the workings of these models and how they should be interpreted. Esa Läärä critically evaluates the use of null hypothesis significance testing and argues for alternative approaches to statistical evaluation of ecological data, such as basic point and interval estimation of effect sizes, likelihood-based and information theoretic methods and the Bayesian inferential paradigm. Finally, Jeff Harvey discusses the practical issue of how to prepare an article for submission to a peer-reviewed journal, explaining one strategy for making it as painless as possible.

We hope that this volume will be of value to those at the onset of their scientific careers, and perhaps even experienced readers of ecology and evolutionary biology, when they start planning and implementing a new study. If it helps researchers translate their curiosity into good scientific practice, we will have succeeded.