A Review of Protocols in Peat Palaeoenvironmental Studies

FOREWORD

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Palaeoenvironmental studies in peatlands often require a series of proxy analyses with specific protocols. Although most of the existing protocols are of high quality, there are significant differences in the laboratory procedures available for some proxies. This variability of approach may lead the researcher - and especially the newcomer - to experience difficulties in selecting appropriate protocols, to re-test unsatisfactory methodologies, and to experience problems in comparing results between different studies.

For these reasons, participants at the international research workshop *Peatland Archives of Holocene Climate Variability* held in May 2009 (Vihula, Estonia) agreed that an integrated protocol guide for palaeoenvironmental studies in peat would be of considerable benefit to the discipline. Moreover, they resolved to gather together the leading specialists in each field of peat palaeoenvironmental studies in order to produce such a guide. The ultimate purpose of the guide is to encourage researchers to adopt common standards; not because they are the best ones, but because there is a need to facilitate better data integration and inter-comparison, which can only be achieved if the acquisition methods are comparable.

This protocol guide summarises the main proxies used in peat palaeoenvironmental studies and the methodologies used to obtain them. It starts with an article on peat coring and sub-sampling, which is the first step towards high-quality data acquisition. Then, separate articles review a wide range of proxies and/or proxy groups including (listed alphabetically):

- charcoal particles;
- deposition chronologies using ^{210}Pb and ^{14}C;
- inorganic geochemistry;
- peat humification, bulk density, LOI, TC, TOC, TIC;
- plant macrofossils;
- pollen and non-pollen palynomorphs;
- spheroidal carbonaceous particles;
- stable isotopes and biomarkers;
- tephrostratigraphy; and
- testate amoebae.

In each case, a step-by-step procedure is given to optimise data acquisition.

Such a guide is, in our view, important for several reasons. It will be the first integrated methodological guide for acquiring appropriate material for each proxy study, which is a major step towards gathering high-quality observations and results. Moreover, it will provide any newcomer to the field with a comprehensive overview of the uses and limits, as well as a step-by-step procedure, for each proxy. It will also give the experienced researcher an opportunity to critically assess his methods, as well as the ones proposed here. Finally, this guide will be a useful "cook-book" for undergraduate, postgraduate and PhD students who wish to investigate palaeoenvironmental changes using the peat archive.

We wish to express here our gratitude to all contributors and referees for the effort that has been put into assembling and peer reviewing this protocol guide.

Submitted 26 April 2010; Editor: Olivia Bragg

This Special Volume of *Mires and Peat* developed from discussions at the workshop *Peatland Archives of Holocene Climate Variability* which was sponsored by the National Science Foundation (USA), the Past Global Changes (PAGES) International Project Office, the International Union for Quaternary Research, the Quaternary Research Association (UK) and the University of Tartu (Estonia). For their persistent work in overseeing the preparation of manuscripts, *Mires and Peat* wishes to thank the Guest Editors, namely:
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