

**SYSTEMATIC STUDIES IN *SCHOENUS* L.
(SCHOENEAE, CYPERACEAE)**

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Prologue

Format

The main layout of the thesis follows the Style Guide of the University of New England <http://www.une.edu.au/research-services/forms/thesis-submission-instructions.php>. The bibliographic style was formatted using Endnote X4 software. Formatting of the papers which constitute the major part of the thesis follows the editorial style of the relevant journal. For other chapters, the format follows that of *Australian Systematic Botany*. Figures and tables are located throughout the text, which is left hand justified, and one and a half line spacing is used throughout the thesis.

Project statement

This study is part of a broader project on the systematics of *Schoenus* L. addressing the phylogeny and species relationships in the genus.

Status of nomenclature

Following Articles 29 and 30 (especially 30.5) of the International Code of Botanical Nomenclature (<http://ibot.sav.sk/icbn/main.htm>), names presented in chapters of this thesis are not to be regarded as validly published.

Thesis layout

The main body of the thesis is made up of a series of related chapters/papers. My % contribution is given at the end of each paper. The introduction (**Chapter 1**) sets up the links between the papers and the conclusions (**Chapter 6**) tie the research project together.

Chapter 2 (Paper 1):

Paul M. Musili, Adele K. Gibbs, Karen L. Wilson & Jeremy J. Bruhl. *Schoenus* (Cyperaceae) is not monophyletic based on ITS nrDNA sequence data. To be submitted to *Molecular Phylogenetics and Evolution*.

Chapter 3 (paper 2):

Paul M. Musili, Karen L. Wilson, Adele K. Gibbs & Jeremy J. Bruhl. Setting and testing species limits in *Schoenus* (Cyperaceae, Schoeneae) using phenetic analysis of morphological data. To be submitted to *Australian Systematic Botany*.

Chapter 4 (paper 3):

Paul M. Musili, Karen L. Wilson & Jeremy J. Bruhl. Taxonomic value of culm anatomy in *Schoenus* (Cyperaceae, Schoeneae). To be submitted to *Systematic Botany*.

Chapter 5 (paper 4):

Paul M. Musili, Karen L. Wilson & Jeremy J. Bruhl. A slender, new species distinguished from *Schoenus melanostachys* R.Br. Ready for submission to *Phytokeys*.

References

References are presented for each chapter rather than in a final cumulative bibliography. This is made necessary by the differing bibliographical styles required by the publishing journals.

Abstract

Infra- and suprageneric classification of *Schoenus* is uncertain. Like other Cyperaceae, *Schoenus* L. and allied genera have reduced vegetative and reproductive structures which have resulted in uncertain homologies and hence differences in opinion about its phylogenetic relationships. This study addresses the issues of phylogeny, species limits and usefulness of anatomical data in the genus.

Phylogenetic analysis of 195 ingroup samples made up of 123 samples covering 74 species of *Schoenus* and 72 samples across 56 species from 11 genera in tribe Schoeneae was conducted on a molecular sequence dataset from ITS nrDNA using maximum parsimony and Bayesian inference. Results indicated that *Schoenus* is non-monophyletic, which corroborates small-scale previous molecular studies. *Schoenus* subgen. *Schoenus* had strongly supported lineages whereas *S.* subgen. *Pseudomesomelaena*, including *S. grandiflorus*, are embedded within other genera in Schoeneae and therefore not in core *Schoenus*. The ITS data did not fully resolve relationships of *Schoenus* at species level, but revealed numerous well supported terminal groupings and taxa allowing for further fine-scale study of the complexes to resolve limits and application of names.

A phenetic analysis for 174 OTUs representing 65 taxa based on 77 qualitative and quantitative characters in *Schoenus* addressed the question of species limits in the genus. Intense sampling and use of many morphological characters confirmed limits for 38 of 46 named species, and led to reinstatement of four species to various ranks as earlier proposed, elevation of two subspecies, and proposal of four new species. Five sections of *Schoenus sensu* Kükenthal (1938, 1940) as modified by Wilson (2003) were largely recovered, reflecting the morphological basis for those classifications.

Taxonomic value of culm anatomy has been investigated using phenetic analysis. The results show culm anatomical features have taxonomic value in *Schoenus* at and below species level and help to clarify patterns of variation at infra and interspecific level and to resolve species complexes. Phylogenetic analysis, however, indicated that the dataset had no power to resolve higher level relationships within *Schoenus*.

A new species has been distinguished from *S. melanostachys* using morphology and integrating evidence from culm anatomy and scanning electron microscopy.

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