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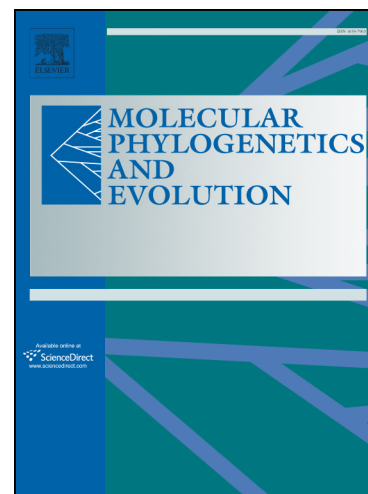
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Running title:—Zhang & Zhang, Phylogeny and classification of *Pteris*

Phylogeny and systematics of the braken fern genus *Pteris* (Pteridaceae) based on molecular (plastid and nuclear) and morphological evidence

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Abstract:

The braken fern genus *Pteris* belongs to Pteridaceae subfamily Pteridoideae. It is one of the largest fern genera and has been estimated to contain 200–250 species distributed on all continents except Antarctica. Previous studies were either based on plastid data only or based on both plastid and nuclear data but the sampling was small. In addition, an infrageneric classification of *Pteris* based on morphological and molecular evidence has not been available yet. In the present study, based on molecular data of eight plastid markers and one nuclear marker (*gapCp*) of 256 accessions representing ca. 178 species of *Pteris*, we reconstruct a global phylogeny of *Pteris*. The 15 major clades identified earlier are recovered here and we further identified a new major clade. Our nuclear phylogeny recovered 11 of these 16 major clades, seven of which are strongly supported. The inclusion of *Schizostege* in *Pteris* is confirmed for the first time. Based on the newly reconstructed phylogeny and evidence from morphology, distribution and/or ecology, we classify *Pteris* into three subgenera: *P.* subg. *Pteris*, *P.* subg. *Campteria*, and *P.* subg. *Platyzoma*. The former two are further divided into three and 12 sections, respectively.

Keywords Fern phylogeny; nuclear *gapCp*; plastid; *Pteris*; *Schizostege*; systematics

Introduction

The fern genus *Pteris* L. was published by Linnaeus in 1753. The genus contains ca. 200 (Tryon and Tryon, 1982) to 250 species (Tryon et al., 1990), making it one of the largest fern genera. Species of the genus adapt to the habitats varied from open slopes to dense forests and from acidic soils to basic soils developed from limestone rock, which has contributed to the global distribution of the genus. Some species of the genus have long been used as ornamental plants (e.g., cultivars of *P. cretica* L.), are arsenic hyperaccumulators (e.g., *P. vittata* L.) (Watanabe et al., 2014), and also as foods (e.g., *P. wallichiana* J.Agardh).

The taxonomic delimitation and the infrageneric classification of *Pteris* had not been clear in the long history of its study. In the 19th century, species recognized nowadays in

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