



Taxonomic changes in *C₄* *Cyperus* (Cypereae, Cyperoideae, Cyperaceae): combining the sedge genera *Ascolepis*, *Kyllinga* and *Pycreus* into *Cyperus s.l.*

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Abstract

The sedge genera *Alinula*, *Ascolepis*, *Kyllinga*, *Lipocarpha*, *Pycreus*, *Queenslandiella*, *Remirea*, *Sphaerocyperus* and *Volkiella* (Cyperaceae) were recognised at generic level because they possess specialised inflorescence and/or flower characters. However, recent molecular phylogenetic analyses show that these genera are all nested in a paraphyletic *Cyperus s.s.* and therefore should be viewed as part of a broadly circumscribed genus *Cyperus*. For all species of *Alinula* and for the single species of *Queenslandiella*, *Remirea* and *Sphaerocyperus*, *Cyperus* names were already published by other authors. For the species of *Lipocarpha* and *Volkiella*, *Cyperus* names and a new sectional classification are published in a separate paper including a detailed molecular phylogenetic hypothesis for these taxa. Based on a study of herbarium specimens and literature, in this paper, twenty species of *Ascolepis*, seventeen species of *Kyllinga*, and six species of *Pycreus*, which do not yet have a validly published and legitimate name in *Cyperus*, are formally included into *Cyperus* as new combinations or new names. Notes on the synonymy of an African *Pycreus* species are also included.

Introduction

The tribe Cypereae is the second most species rich tribe of the Cyperaceae family. Its largest genus *Cyperus* (Linnaeus 1753: 44) forms the most diverse sedge genus in the tropics. It also represents one of the most ecologically important angiosperm genera in tropical wetlands. As a result of recent molecular phylogenetic studies (e.g. Muasya *et al.* 2002, 2009a, Simpson *et al.* 2007, Larridon *et al.* 2011a, 2013, Bauters *et al.* 2014), the need became clear to create a new classification of this tribe reflecting its natural relationships, and to re-evaluate the morphological characters used for generic delimitation in this tribe (Muasya *et al.* 2009b; Vrijdaghs *et al.* 2011, Reynders *et al.* 2012, Larridon *et al.* 2011b, 2013, Bauters *et al.* 2014).

Following recent molecular phylogenetic analyses (e.g. Simpson *et al.* 2007, Muasya *et al.* 2009a, Larridon *et al.* 2011a, 2013), *Cyperus s.l.* or the *Cyperus* clade is a monophyletic clade including a paraphyletic genus *Cyperus s.s.* encompassing at least 12 segregate genera (following the classification of Goetghebeur 1998 and Govaerts *et al.* 2007). Besides the paraphyletic nature of *Cyperus s.s.*, there are several other arguments for a new classification of the taxa in the *Cyperus* clade, and more specifically to reduce the segregate genera into an expanded genus *Cyperus*. These arguments include: (1) the multiple origins of most of the characters used to circumscribe the segregate genera, such as, switches from spiral to distichous glume arrangement and the other way around, deciduous spikelets, pistil dimerisation and condensation of the inflorescence; (2) the fact that when using the current classification, taxa are often nested in other taxa of the same rank, for example, the genus *Volkiella* (Merxmüller & Czech 1953: 318) is nested in the genus *Lipocarpha* (Brown 1818: 459), which is nested in the group *Cyperus* species using the *C₄* photosynthetic pathway formerly known as the genus *Mariscus* (Vahl 1805: 372), and the monophyletic clade of *Cyperus* species using *C₄* photosynthesis is in turn nested into the group of *Cyperus s.l.* species using *C₃* photosynthesis; (3) the presence of many species with intermediate morphologies;

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