



Molecular phylogenetic data on reticulate evolution in the genus *Barbilophozia* Löske (Anastrophyllaceae, Marchantiophyta) and evidence of non-concerted evolution of rDNA in *Barbilophozia rubescens* allopolyploid

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Abstract

Phylogeny of the genus *Barbilophozia* inferred from ITS1-2 nrDNA, *trnL*-F and *trnG*-intron cpDNA provides different evolutionary scenarios within the genus. ITS1-2 tree placed *B. barbata* and *B. lycopodioides* in sister position, whereas from both cpDNA loci morphologically quite distinctive *B. barbata* is separated from *B. hatcheri* and *B. lycopodioides*. The significant differences in nucleotide sequences suggest that *B. lycopodioides* and *B. hatcheri* are clearly separated species. The poorly known species—*B. rubescens*—has originated through hybridization of *B. barbata* and *B. hatcheri*. The occurrence of both two parental types of ITS in hybrid accessions indicate a non-completeness of concerted evolution in these cases. The highest haplotype diversity is found for ITS1-2 that could be caused by recombination, whereas *trnL*-F and *trnG* are characterized only by several haplotypes. The haplotypes distribution is weakly supported from geographical evidence.

Key words: liverworts, Jungermanniales, speciation, hybridization, systematics, molecular evolution, biogeography, ITS1-2, *trnL*-F, *trnG*-intron

Introduction

Barbilophozia is a widely distributed and morphologically relatively easily distinguishable group of jungermannioid liverworts. For a long time *Barbilophozia* was assigned to the subfamily Lophozioideae of Jungermanniaceae (Grolle 1983, Schuster 1984, Crandall-Stotler 2000) or to the family Lophozioaceae (Schuster 1969, Schljakov 1980). However, based on earlier molecular data *Barbilophozia* was placed in enlarged family Scapaniaceae Mig. (Heinrichs *et al.* 2005, Crandall-Stotler *et al.* 2009), but later was transferred into the newly described family Anastrophyllaceae L. Söderstr., De Roo et Hedd. (Söderström *et al.* 2010).

Barbilophozia was treated as a distinct genus or as a subgenus of the genus *Lophozia* (Dumort.) Dumort. s. l. (Schuster 1969, Damsholt 2002). In a broad sense *Barbilophozia* apart from *Barbilophozia* s. str. includes species of *Orthocaulis* H. Buch (Grolle & Long 2000, Paton 1999, Schumacker & Váňa 2005). In a narrow sense the genus *Barbilophozia* consists only of species from the subgenus *Barbilophozia* sensu Müller (1906–1911) and Schuster (1969). The broad generic concept in *Lophozia* is not supported by *trnL*-F analyses: *Barbilophozia* was shown as a separate genus phylogenetically distinct from *Orthocaulis* (Yatsentyuk *et al.* 2004). The latter taxon appears to be polyphyletic (De Roo *et al.* 2007, Vilnet *et al.* 2009) and several new oligotypic genera have been described (Konstantinova & Vilnet 2009, Söderström *et al.* 2010). Phylogenetically, *Barbilophozia* is closely related to *Lophozia sudetica* (Nees ex Hübener) Grolle (1971: 262)