

## Molecular phylogenetics and ordinal relationships based on analyses of a large-scale data set of 600 *rbcL* sequences of mosses<sup>1,2</sup>

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A phylogenetic study was carried out to investigate the ordinal relationships within mosses based on analysis of a large-scale data set including 601 sequences of mosses of the chloroplast ribulose 1,5-bisphosphate carboxylase/oxygenase large subunit (*rbcL*) gene. Results of the present study suggested that: (1) Sphagnales is the most basal lineage within mosses; (2) Andreaobryales is sister to the remaining mosses and the orders Andreaeales, Tetraphidales and Polytrichales, and the family Oedipodiaceae configure a basal clade within mosses, sister to a large clade with all exemplars of the Bryopsida; (3) within Bryopsida, the Buxbaumiaceae (Buxbaumiales), is the most basal lineage and the Diphyssiaceae is sister to the large clade of arthrodontous mosses; (4) within the arthrodontous mosses, the Timmiaceae and Gigaspermaceae together form the most basal lineage, and the clade with the orders Funariales and Encalyptales is sister to the haplolepidous and diplolepidous mosses; (5) the Dicranidae includes exemplars of Grimmiiales, Archidiales, Dicranales, and Pottiales; (6) the Bryidae includes the Bartramiaceae as basal lineage followed by Hedwigiales as sister to the remaining diplolepidous mosses; and (7) a clade that includes Rhizogoniales, Splachnales, and Orthotrichales is sister to the large group of Bryales, Hookeriales, and Hypnales. Character state optimization suggests that diplolepidous-opposite peristome structure maybe ancestral to both Bryidae and Dicranidae.

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### Introduction

Mosses are the second largest group of land

plants containing ca 13,000 recognized species (Crosby et al. 1999), of which more than 95% belong to the Bryopsida. Some 112 families are classified under 27 orders in the Bryopsida (Goffinet & Buck 2004). The most important character in moss classification is the formation and ornamentation of peristome (e.g., arthrodontous and nematodontous, haplolepidous and diplolepidous), although in the Hypnales peristome modifications in many lineages have misled taxonomists (Buck et al. 2000; Tsubota et al. 2002b). During the past decade, many sequences

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<sup>2</sup> This work was a part of a talk presented by Tsubota et al. in the symposium held at the Missouri Botanical Garden in 2003 organized by Goffinet and Magill, where the focus was on the relationships between the Grimmiiales and Seligeriales, separately published in Tsubota et al. (2003).