Molecular phylogeny of tribe Schismatoglottideae (Araceae) based on two plastid markers and recognition of a new tribe, Philonotieae, from the neotropics

Sin Yeng Wong,1,3 Peter C. Boyce,2 Ahmad Sofiman bin Othman3 & Leaw Chui Pin4

1 Department of Plant Science and Environmental Ecology, Faculty of Resource Science and Technology, Universiti Malaysia Sarawak, 94300 Samarahan, Sarawak, Malaysia
2 Forest Herbarium (BKF), The Office of Forest and Plant Conservation Research, National Park, Wildlife and Plant Conservation Department, 61 Phahonyothin Road, Chatuchak, Bangkok, 10900 Thailand
3 School of Biological Sciences, Universiti Sains Malaysia, 11800 Penang, Malaysia
4 Institute of Biodiversity and Environmental Conservation, Universiti Malaysia Sarawak, 94300 Samarahan, Sarawak, Malaysia

Author for correspondence: Wong Sin Yeng, sywong@frst.unimas.my

Abstract Tribe Schismatoglottideae comprises one large genus, Schismatoglottis, and six small ‘satellite’ genera. A combined molecular phylogenetic analysis of matK, the 3’ portion of the trnK intron, and trnL-F sequence data was carried out on 77 taxa representing all genera in the tribe, all informal groups in Schismatoglottis, together with sister tribe Cryptocoryneae, and outgroups from Araceae. Analyses of combined datasets with parsimony, maximum likelihood, and Bayesian methods revealed tribe Schismatoglottideae to be a polyphyletic assemblage. Neotropical Schismatoglottis is shown to be sister to the palaeotropical Schismatoglottideae + Cryptocoryneae. Schismatoglottis acuminatissima is a sister clade to the rest of the Schismatoglottideae. Palaeotropical Schismatoglottis is unsupported as a monophyletic genus. A new neotropical tribe of Araceae, Philonotieae S.Y. Wong & P.C. Boyce, sister to Cryptocoryneae + palaeotropical Schismatoglottideae, is proposed.

Keywords Araceae; molecular systematics; Philonotieae; Schismatoglottideae; taxonomy

INTRODUCTION

The Araceae are predominantly tropical in distribution, with 90% of 110 genera, and 95% of ca. 4000 species restricted to the everwet or perhumid tropics. Tribe Schismatoglottideae (Aroidae) with ca. 150 species is almost 95% endemic to Borneo. The tribe consists of mainly mesophytes, rheophytes, lithophytes and chasmophytes. The largest genus in the tribe, Schismatoglottis Zoll. & Moritzi, extends from Myanmar (Burma) to Vanuatu and from southern subtropical China to New Guinea, with an additional three species in the Myanmar (Burma) to Vanuatu and from southern subtropical China to New Guinea.

Prior molecular phylogenetic studies focused on family-wide analyses of Araceae and only included two or three taxa from Schismatoglottideae. Barabé & al. (2004) indicated that Schismatoglottideae are not monophyletic but form a monophyletic clade with Cryptocoryne balansae Gagnep. Cabrera & al. (2008) maintained Schismatoglottideae and Cryptocoryneae as monophyletic. However, the neotropical Schismatoglottis was not included in the analysis. The objectives of the current research are to produce an established and testable phylogeny for the tribe Schismatoglottideae using two plastid markers (trnL-F, matK) and to resolve the internal topology of Schismatoglottis and the currently recognized satellite genera.

MATERIALS AND METHODS

Sampling. — 71 samples were newly sequenced (65 taxa from Schismatoglottideae, 3 from Cryptocoryneae, 3 from other Araceae) and analyzed together with 6 samples obtained from GenBank (Appendix). The samples represent each taxonomic group (sensu Hay & Yuzammi, 2000) of Schismatoglottis: Calyptrata Group (4 taxa), Multiflora Group (28 samples representing 16 taxa), Tecturata Group (4 samples representing 3 taxa), Asperata Group (6 taxa), Corneri Group (2 samples of 1 taxon), and Rupestris Group (1 taxon) and one neotropical group (Schismatoglottis americana). The satellite genera sampled follow the generic taxonomy of Bogner & Hay (2000): Aridarum sect. Aridarum (3 taxa), and A. sect. Caulescentia (5 samples representing 3 taxa), Bakoa (1 taxon), Bucephalandra (one species sampled from two localities), Phymatarum (one taxon, sampled from two localities), Piptospatha Elongata Group (4 taxa), and Grabowskii Group (2 samples representing 1 taxon), and Schottarum (1 taxon). Six taxa from the tribe Cryptocoryneae were sampled: Cryptocoryne balansae Gagnep.,...