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Colocasia lihengiae (Araceae: Colocasieae), a new species from Yunnan, China

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Abstract. A new species of *Colocasia* Schott, *C. lihengiae* C. L. Long et K. M. Liu, sp. nov., is described and illustrated. The species is restricted to the rainforest of Xishuangbanna in southern Yunnan, China. Diagnostic morphological characters that distinguish the new species from the related species, *C. fallax* Schott, are discussed. Chromosome numbers (2*n*=28) were observed in plants of *C. lihengiae* cultivated at the Kunming Botanical Garden.

Keywords: Araceae; China; *Colocasia lihengiae*; New species; Taxonomy; Xishuangbanna; Yunnan.

Introduction

Yunnan, a province in southwest China with an area of 394,000 km^2, is notable for its rich plant diversity. Over 15,000 vascular plants have been recorded from Yunnan. Since the 1830s more than 2,100 new species of vascular plants have been described from Yunnan and collected by botanists such as J. Anderson, J. M. Delavay, Prince Henri d'Orleans, A. Henry, E. H. Wilson, G. Forrest, E. E. Maire, F. Kingdon-Ward, H. Handel-Mazzetti, K. A. H. Smith, J. F. Rock, T. T. Yü, R. C. Ching, C. W. Wang, C. Wang, K. M. Feng and other Chinese botanists (Bao et al., 1998). Today, Yunnan is still one of the most interesting places for botanical exploration.

Colocasia (Araceae) is a tropical Asian genus. Until 1997, only about nine species had been described (Engler and Krause, 1920; Li, 1979; Sivadasan, 1982; Plucknett, 1983; Shaw, 1984; Sreekumari and Mathew, 1991a, b; Li and Wei, 1993; Hay, 1996; Mayo et al., 1997). In 1999, an additional species, *Colocasia gaoligongensis*, was described by Li and Long from a small area in western Yunnan, close to northern Myanmar (Burma).

In June 1998, we collected an aroid in a dense rainforest in valleys of southern Yunnan. This perennial herb with long stolons and large leaf blades, and with inflorescences lacking an appendix, was difficult to determine as belonging to *Remusatia*, *Colocasia* or *Alocasia*. Living plants and herbarium specimens were collected and brought to the Kunming Botanical Garden for cultivation. Further study of the morphology, especially of the ovules, revealed the plant to be a new species of *Colocasia*.

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Materials and Methods

Three living plants were brought to Kunming. Before planting them in the greenhouse of the Kunming Botanical Garden at the Kunming Institute of Botany, most of the leaves were removed to reduce stress. The largest plant was grown in open ground; the other two were grown in pots.

Herbarium specimens were prepared from both field and greenhouse plants. They were deposited in the Herbarium of Kunming Institute of Botany (KUN). Both female and male flowers were observed under a microscope.

Root tips were collected for chromosome observations. The growing root tips were pretreated with 0.002 M 8-hydroxiquinoline for 2 h at room temperature (20 ± 2°C) and for an additional 2 h in a refrigerator (8 ± 2°C). They were subsequently fixed in ethanol-acetic acid (3:1) and kept in a refrigerator until observed. The fixed root tips were rinsed in water and hydrolyzed in a 1N hydrochloric acid at 60°C for 5 min. After washing in distilled water and removing the excess, the samples were submerged in Feulgen stain for 30 min, transferred into aceto-carmin and 45% acetic acid for 10 min, and squashed in 45% acetic acid. The chromosomes were then examined under a microscope (Nguyen, 1998).

Additional specimens similar to the new species were examined and recorded. In total, 16 herbarium specimens (ca. 80 individuals) of *Colocasia* were studied. These specimens are deposited in A/GH, CAS, HAST, HITBC, KUN, MO, NY, and PE.

Description

Colocasia lihengiae C. L. Long et K. M. Liu, sp. nov.—TYPE: **CHINA.** Yunnan Prov.: Mengla, Mengxing River

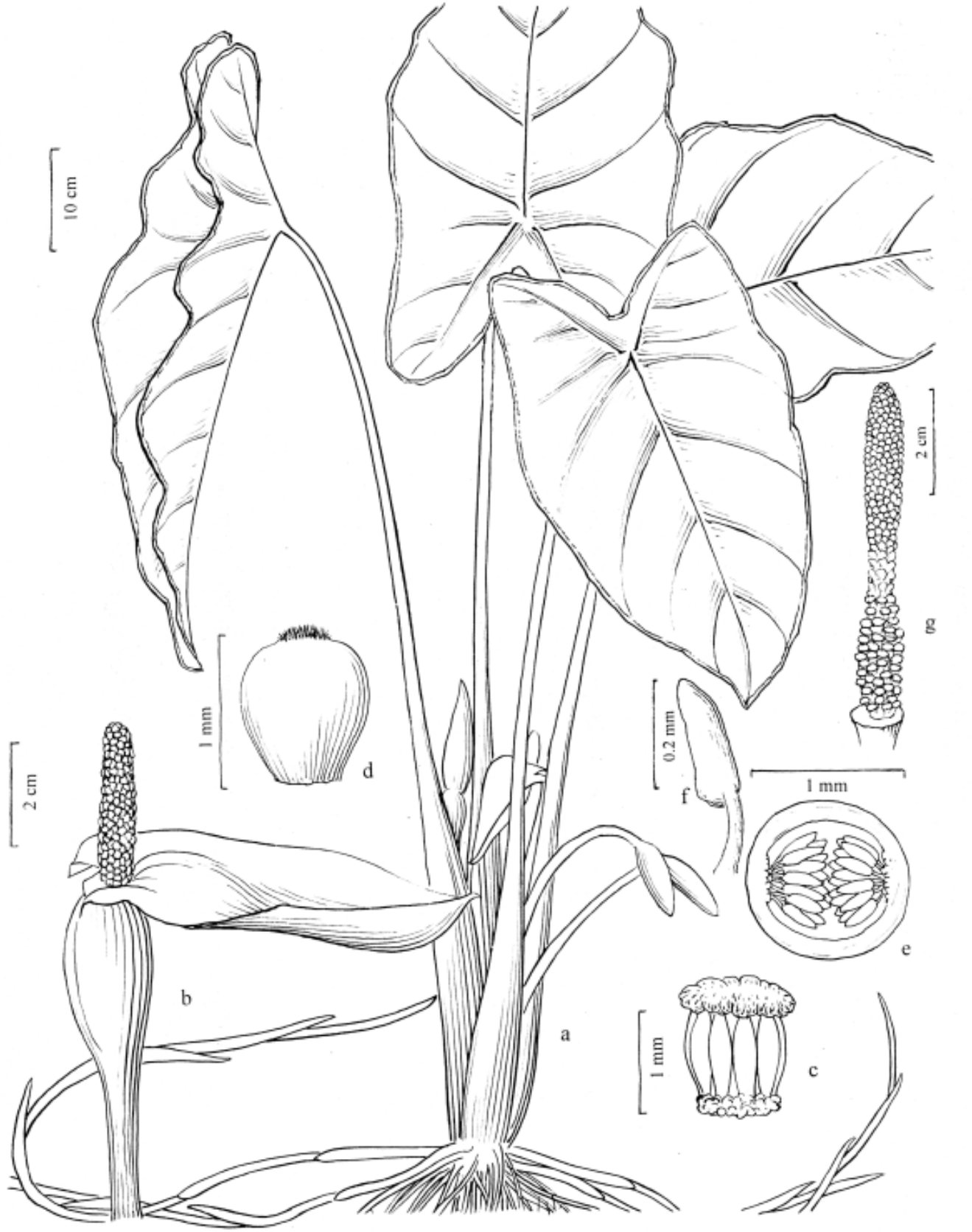

Figure 1. Illustration of *Colocasia lihengiae* C. L. Long et K. M. Liu, sp. nov. (drawn by Yitao Liu). a, flowering plant; b, inflorescence; c, synandrium; d, female flower; e, transverse section of ovary; f, enlargement of an ovule; g, spadix.

watershed, in a valley with dense rainforest, 20 Jun 1998, *Long Chun-lin & Li Meilan 9806* (holotype: KUN); Paratype: 18 Jul 1998, *Long Chun-lin & Li Meilan 9824* (KUN), cultivated in Kunming Botanical Garden.

Figure 1

Colocasia fallax Schott similis, sed appendice absenti differt.

Terrestrial perennial herbs with stolons (stoloniferous runners) and an erect rhizome. Rhizome 4-8 cm long, 2-3 cm in diam.; stolons (stoloniferous runners) 6-12, trailing horizontally, non-branching, thin, pale green or pale purple, 70-80 cm long, 0.5 cm in diam., with dark green cataphylls; internodes cylindric, 15-25 cm long, without tubercles. Leaves 4-6; petiole cylindric, light green, reddish-purple, 80-120 cm long; blade peltate, sagittate-cordate, membranaceous, 30-40 cm long, 18-25 cm wide, upper surface glossy green, lower surface pale green; primary lateral veins 6 pairs, pale green; marginal vein inconspicuous. Inflorescences (4-) 5 (-6); peduncle cylindrical, pale green, 40-50 cm long, much shorter than petiole. Spathe constricted in the middle, lower convolute part (tube) yellowish green, 4-5 cm long, 2 cm in diam., nearly cylindrical; lamina oblong-lanceolate, golden yellow, 11-13 cm long, 4 cm wide, patent to reflexed. Spadix fragrant, female zone golden yellow, cylindrical, 2-2.5 cm long, 0.7 cm in diam., half as short as spadix; male zone cylindrical, yellow, 3.5 cm long, 0.6-0.8 cm in diam.; neutral flower zone between female and male zones, cylindrical, 1 cm long, 0.4-0.5 cm in diam.; appendix absent; female flower obovoid, carpels 3 or 4, ovary unilocular, placentae 2, parietal, ovules spindle shaped, nearly erect, numerous, stigma sessile, discoid; synandria 8-10-androus, ca. 0.1 cm long, yellow. Fruits not seen. Chromosome number: $2n = 28$.

This species is gratefully dedicated to our advisor, Prof. Li Heng, who has contributed much to the study of Araceae in China. Her wide knowledge of Araceae and other monocots and her contribution to Chinese botany are of great importance for a better understanding of aroids and of the flora of Yunnan.

Phenology

In the wild, flowering occurs between June and August; fruiting occurs between July and October. In the botanical garden, flowering occurs between July and October; fruiting occurs between August and late October. Pollinators were seen both in the field and in cultivated plants. These insects are small flies, probably members of the genus *Colocasiomyia* (H. Wang, *pers. com*.).

Distribution and Habitat

Colocasia lihengiae grows in clusters of 1-4 individuals in small populations at edges of and in forests in limestone areas at 600 m. Other aroids in the same habitats include *Alocasia odora* Koch, *A. navicularis* (C. Koch) C. Koch, *A. longiloba* Miq., *Colocasia gigantea* (Bl.) Hook. f., *C. esculenta* (L.) Schott, *Pothos scandens* L., *Remusatia vivipara* (Roxb.) Schott, and *Rhaphidophora decursiva* (Roxb.) Schott.

Discussion

Colocasia lihengiae is an attractive evergreen perennial herb with handsome foliage and fragrant inflorescences.

After a thorough search through the literature (Hook. f., 1893; Li, 1979; Li and Wei, 1993; Yoshino, 1994; Mayo et al., 1997; Nguyen, 1998; Li and Long, 1998, 1999), the closest species to our material appears to be *Colocasia fallax* Schott. But *Colocasia lihengiae* is clearly different from *C. fallax*. The most obvious difference is the absence of an appendix in spadix of *C. lihengiae*. The differences and similarities between these two species are shown in Table 1.

Table 1. Comparison of *Colocasia lihengiae* and *C. fallax*.

Characters	*Colocasia lihengiae*	*Colocasia fallax*
Growth habit	In small clusters	Massive
Rhizome	Erect, 4-8 cm long, 2-3 cm diam.	Horizontal, 4-5 cm long, 0.8-1.5 cm diam.
Tubercles	None	Small, 1-1.5 cm diam.
Stolon	6-12, each 70-80 cm long	None
Petiole	80-120 cm long	30-50 cm long
Blade	Sagittate-cordate, 30-40 cm long and 18-25 cm wide	Ovate-cordate, 8-15 cm long and 5-12 cm wide
Primary lateral vein	6 pairs	3-5 pairs
Peduncle	40-50 cm long	7-15 cm long
Spathe tube	Ovate-oblong, 4-5 cm long, 2 cm diam.	Oblong, 2.3 cm long, 1.2 cm diam.
Spathe lamina	Oblong-lanceolate, 11-13 cm long, 4 cm wide, reflexed	Oblong, 4-6.5 cm long, 2 cm wide, reflexed
Male zone	1.3-1.8 cm long, 0.4 cm diam.	3.5 cm long, 0.6-0.8 cm diam.
Female zone	2-2.5 cm long, 0.7 cm diam.	1.5 cm long, 0.5 cm diam.
Sterile zone	1 cm long, 0.4-0.5 cm diam.	1 cm long, 0.1-0.2 cm diam.
Appendix	None	Fusiform, 3 cm long, 0.2-0.3 cm diam.
Male flower	Synandria 8-10-androus	Synandria 6-8-androus
Female flower	Ovary ovoid, placentae 2	Ovary ovoid, placentae 2
Habitat	Valleys near or in rainforest, alt. 600 m	Valleys in forests or scrubs, alt. 850-1,400 m
Distribution	Endemic to Xishuangbanna, China	China (S Yunnan), N Bangladesh, NE India, Thailand

The new species is also similar to some species of *Alocasia* (e.g. *Alocasia odora* and *A. longiloba*). It differs from these by its long stoloniferous runners, many ovules per ovary, and lack of an appendix in spadix. It is notable that the present new species possesses characteristics not only of *Colocasia* but also of *Alocasia* and *Remusatia*, which may be a result of natural hybridization.

Natural hybridization between *Colocasia* and *Alocasia* has been suggested and described. Yoshino (1994, 1995, 1998) succeeded in crossing *Colocasia esculenta* var. *aquatilis* and *Alocaisa brisbanensis*. Possible hybrids within *Colocasia* may occur in nature. Meiotic chromosome behavior in hybrids between *Colocasia esculenta* and *C. gigantea* have been reported (Okada and Hambali, 1989; Yoshino, *pers. com*., 1999). Based on the morphological characters of *Colocasia lihengiae*, determining its phylogenetic position is difficult. Molecular approaches and artificial hybridizations may reveal phylogenetic relationships between it and other taxa of *Colocasia*, *Alocasia* and *Remusatia*.

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中國雲南產天南星科芋屬一新種：李氏香芋

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本文記述並描繪天南星科（Araceae）芋屬之新種，李氏香芋（*Colocasia lihengiae* C. L. Long & K. M. Liu），此種特產且局限分佈于雲南南部西雙版納之熱帶雨林中。本文討論了與本新種同屬近緣種假芋（*Colocasia fallax* Schott） 在形態上之區別，並報導了移栽於昆明植物園之李氏香芋的染色體數目（2*n*=28）。

關鍵詞：天南星科；李氏香芋（新種）；分類學；中國；雲南；西雙版納。