



Three new ginger species (*Zingiberaceae*) from Laos

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Key words

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Abstract Three new *Zingiberaceae* species from Laos, *Curcuma corniculata* and *C. flammea* (*Curcuma* subg. *Ecomata*), and *Zingiber jiewhoei* (*Zingiber* sect. *Zingiber*), are described and illustrated here.

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INTRODUCTION

Cambodia, Laos and Vietnam comprise one of the least known hotspots of the family *Zingiberaceae*, the latest comprehensive study being over a century old (Gagnepain 1908). Only *Amomum* L. has been studied in depth since then, resulting in the description of eleven new species (Lamxay & Newman 2012). There have been, by contrast, numerous recent descriptions of new species (e.g. Leong-Škorničková & Lý 2010, Lý et al. 2010, Nguyen & Leong-Škorničková 2012, Leong-Škorničková & Trần 2013, Leong-Škorničková et al. 2013, 2014, Leong-Škorničková & Luru 2014) and a new genus, *Newmania* (Leong-Škorničková et al. 2011), from the Indochinese floristic region (sensu Takhtajan 1986), suggesting that a large amount of ginger biodiversity is yet to be documented.

During our extensive explorations of the Indochinese region, the following three ginger species have been found to be new, and are described and illustrated below. The original descriptions and types of all the species in their respective genera/subgenera have been consulted, especially those from adjacent territories.

While two of these three species are currently known only from their type localities, we believe that detailed descriptions accompanied by colour plates will aid local botanists and students in identification and bring more reports of their distribution in the near future.

The descriptions were made from full-grown, flowering, living material. In line with good practice on collecting *Zingiberaceae*, the type collections include spirit material and the descriptions are accompanied by detailed photographic documentation. Conservation assessments follow the criteria outlined by IUCN version 3.1. (2012).

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TAXONOMIC TREATMENT

Curcuma corniculata Škorničk., sp. nov. — Fig. 1

Similar to *Curcuma glans* K.Larsen & Mood, but differs in the red corolla lobes (vs white or white with a reddish tinge), bright orange, diamond-shaped labellum with horn-like tips curving outwards (vs obovate white labellum with golden yellow median band and apex) and bright orange lateral staminodes with dark purple patch at the base (vs white lateral staminodes with purple base and golden yellow apex). — Type: *Jana Leong-Škorničková, Trần Hữu Đăng, Otakar Šída, Udone Souvannakhoummane & Kittisack Phouthavong JLS-1752* (holotype SING (incl. spirit); isotype E, HNL, P), Laos, Louangphrabang, Ban Long Lao Mai, 866 m asl, N19°45'16.6" E102°02'56.7", 20 June 2012.

Etymology. The specific epithet '*corniculata*' is derived from Latin and means small horns, in reference to the horn-like tips of the labellum.

Herb to 1 m tall. *Rhizome* ovoid, c. 1.5–3.5 by 0.8–1.5 cm, with thin branches (c. 3–6 mm diam), brown externally, light yellow internally, slightly aromatic; *root tubers* elliptic, 3–5.5 cm long, light brown externally, pure white internally with translucent white centre, distanced 5–15 cm from rhizome. *Leafy shoot* with 5–9 leaves when flowering; *pseudostem* to 35 cm long, green, composed of leaf sheaths; *leafless sheaths* perhaps two, decayed at anthesis; *leaf sheaths* green, puberulent; *ligule* 5–11 mm long, bilobed, hyaline, greenish white, translucent, puberulent; *petiole* 10–35 cm long (petiole of first leaf shortest, innermost leaves longer), canaliculate, green, shortly sparsely hairy; *lamina* broadly elliptic to elliptic-ovate, to 47 by 22 cm, prominently plicate, adaxially bright green, sparsely shortly hairy along main veins, abaxially lighter green, glabrous; midrib glabrous, green; base cordate; apex acute, c. 1–1.5 cm long, puberulent. *Inflorescence* lateral, many-flowered; *peduncle* 4–15 cm long, to 1 cm diam, cream-white, with up to 5 sheathing bracts (mostly decayed, 1–8 cm long); *spike* 7–11 cm long, c. 4–6 cm diam in the middle, without coma; *fertile bracts* 20–30 per inflorescence, bract 3–6 by 1.2–3.3 cm (larger at the base of the inflorescence), ovate to trullate, smaller and ovate at the apex, whitish at base to light green at apex with various degrees of red tinge throughout the bract (resulting in light red to deep red bracts, colour varying within population), both surfaces shortly pubescent, connate in the lower 1/2 to 1/4; enclosing cincinnus with 3 flowers at the base of the inflorescence, 1–2



Fig. 1 *Curcuma corniculata* Škorničk. a. Habit; b. inflorescence; c. seeds; d. ligules; e. rhizome; f. flower dissection, with detail of stamen from side and front view (all from type: JLS-1752). — Scale bars: c, f (inset) = 1 cm; e, f = 2 cm. — Photos by Jana Leong-Škorničková.

flowers at the top; *bracteoles* much reduced, one per flower, ovate, boat-shaped, c. 1–2.5 mm by c. 1 mm (outer ones larger, inner ones gradually smaller), hyaline, translucent white, glabrous. *Flowers* 6.5–8 cm, much exserted from the bracts; *calyx* to 21 mm long, 3-toothed, unilaterally split to c. 6–8 mm, translucent white or with slight red tinge at upper part, sparsely hairy or glabrous; *floral tube* c. 4–5.5 cm long, externally white at the base, with red tinge at the apex, densely puberulent, internally white, sparsely puberulent with dorsally placed groove holding the style; *dorsal corolla lobe* 22–27 by 7–9 mm, triangular ovate, concave, with sides rolled inwards, glabrous, red outside, light red to white inside, apex mucronate, mucro c. 2 mm, with a few short hairs; *lateral corolla lobes* 21–24 by 7–8 mm, triangular ovate with sides incurved, concave, glabrous, red outside, light red to white inside; *labellum* 23–25 by 16–20 mm, diamond-shaped, margins recurved, apex bifid with an incision up to 14 mm long and strongly recurved horn-like lobes, base of the labellum light orange with two orange lines in the centre and often with slight purple tinge laterally, middle and apex of the labellum light to deep orange at the margin, with deep orange band running through the centre (median band); *lateral staminodes* c. 22–24 by 8–10 mm, slightly rhomboid with sides flexing outwards, bright orange with 3–4 mm at base tinged dark purple (sometimes missing), sparse, short glandular hairs present on both surfaces. *Stamen* 18–20 mm; *filament* 8–9 mm long, white with purple tinge towards base, 2.5–3 mm broad at base, 1.5 mm broad at apex (the point of attachment to the connective), covered with dense, very short, glandular hairs; *anther* c. 13–15 mm long, spurred, connective light yellow to very light orange, densely covered with short glandular hairs; *anther spurs* c. 3 mm long, triangular with sharp tips, pointing outwards; *anther crest* thin, rounded, c. 1.5 mm long and c. 1 mm broad at base, orange; *anther thecae* 9–11 mm long, dehiscing along their whole length. *Epigynous glands* 2, c. 4–6 mm long, 0.3–0.5 mm diam, cream-white. *Style* thin, white, glabrous, held in groove in dorsal side of floral tube; *stigma* c. 1 mm long, 0.8 mm wide, white, ostiole ciliate, facing upwards. *Ovary* 2–3 by 2–2.5 mm, trilobular, densely puberulent, hairs c. 0.2 mm long. *Fruit* a globose trilobular capsule, c. 1 cm diam, white, puberulous; *seeds* irregularly obovoid, 4–7 mm long, light brown, shiny, enclosed in translucent white, lacinate aril. Description based on living and spirit material of JLS-1752.

Distribution — Endemic to Laos, currently known only from the type locality.

Habitat & Ecology — Growing in bamboo vegetation on limestone outcrops, at 800–900 m asl.

Phenology — Flowering in early rainy season, end May to July, flowers last a single day, open in the morning and closing in late afternoon. Fruiting June to July (August?).

Conservation status — Specimen records exist so far only from the type locality. Local people who were interviewed and shown images of this species, reported that it occurs in various areas adjacent to Louangphrabang. The number and size of the populations are, however, not yet exactly known. Most *Curcuma* species in subg. *Ecomata*, especially those allied to *C. bicolor* Mood & K.Larsen, where this species belongs, tend to be fairly restricted in their distribution. Accordingly, we estimate that the extent of occurrence is less than 20 000 km². The type population is not in a protected area and is used for cultivation of maize (*Zea mays* L.), groundnuts (*Arachis hypogaea* L.) and other crops, therefore continuing decline in area, extent and quality of habitat can be foreseen. Category Vulnerable VU B1ab(iii) is, with caution, proposed here. Further exploration of the region is needed as this species may be Endangered or Critically Endangered soon.

Notes — *Curcuma corniculata* belongs to the recently established subg. *Ecomata* (Záveská et al. 2012). The two most

closely related species in this subgenus are *C. glans* and *C. bicolor*. It may be fairly difficult to determine dried herbarium specimens but there is no confusion when living, flowering material is available (see Mood & Larsen 2001) or when there are appropriate notes or photographs accompanying specimens. Also, if a spirit specimen is present, confusion is not likely. Among these species, *C. corniculata* can be readily recognised by its bifid labellum, with the two strongly reflexed horn-like lobes.

Curcuma flammea Škorničk., sp. nov. — Fig. 2

Similar to *Curcuma bicolor* Mood & K.Larsen, but differs in inflorescence with longer peduncles to 13 cm long (vs almost sessile inflorescence with peduncle c. 1.5 cm long), bracts white, pink to dark red (vs light green bracts with more or less reddish tinge and prominent veins), bright orange labellum with various degree of red ornamentation (vs mostly yellow-orange labellum with reddish to purple margins). — Type: Jana Leong-Škorničková, Trần Hữu Đăng, Somsanith Bouamanivong, Khantheo Santhammavong, Udone Souvannakhoummane, Kittisack Phouthavong JLS-1777 (holotype SING (incl. spirit); isotype E, HNL, P), Laos, Vientiane Prov., Vang Vieng Dist., Ban Phou Din Deng, 467 m asl, N18°57'43.2" E102°26'09.9", 23 June 2012.

Etymology. The specific epithet is Latin for fiery or flaming. It is given on account of the bright orange-red colours of the flowers and bracts, which resemble flames on the forest floor when in full bloom.

Herb to 70 cm tall. *Rhizome* ovoid, c. 1–1.5 by 0.8–1.2 cm, with thin branches c. 3–6 mm diam, brown externally, light yellow internally, slightly aromatic with bitter smell; *root tubers* elliptic, c. 3.5 by 2 cm, light brown externally, pure white internally with translucent white centre, distanced 5–15 cm from rhizome. *Leafy shoot* to 90 cm long with 1–5 leaves when flowering; *pseudostem* to 30 cm long, composed of leaf sheaths; *leafless sheaths* decayed at anthesis; *leaf sheaths* white green or with pink tinge at base turning green towards the apex, densely puberulent; *ligule* 3–5 mm long, bilobed, lobes round, hyaline, greenish white, translucent, hairy; *petiole* 6–27 cm long (petiole of first leaf shortest, innermost leaves longer), canaliculate, green, densely puberulent; *lamina* elliptic, broadly elliptic to elliptic-ovate, to 36 by 17 cm, prominently plicate, adaxially bright green, shortly hairy along main veins, abaxially lighter green, shortly puberulent; midrib glabrous, green; base cordate; apex acute, c. 5–10 mm long. *Inflorescence* central (often breaking through the pseudostem) or rarely lateral (both can occur on the same plant), many-flowered; *peduncle* 3–13 cm long, to 7 mm diam, cream-white; *spike* 4–9 cm long, c. 3 cm diam in the middle, without coma; *fertile bracts* 7–24 per inflorescence, 3–6 by 1.2–3.3 cm (larger at the base of the inflorescence), ovate to trullate, smaller and ovate at the apex, whitish to light green at base with various degree of red tinge throughout the bract (resulting in very light pink, light red to deep red bracts; the colour of the bracts is consistent within a spike, but varies within a population), very sparsely puberulent outside, glabrous inside, connate in the lower 1/2 to 1/3; enclosing cincinni with 3 flowers at the base of the inflorescence, 1–2 flowers at the top; *bracteoles* strongly reduced, one per flower, ovate, boat-shaped, c. 1–2 by c. 1 mm (outer ones larger, inner ones gradually smaller or totally absent), hyaline, translucent white, glabrous. *Flowers* 6.5–7.5 cm, much exserted from the bracts; *calyx* to 22 mm long, 3-toothed, unilaterally split c. 8–10 mm, translucent white with more or less red tinge especially distally, sparsely puberulent; *floral tube* c. 4–5 cm long, externally white at the base, with rich red tinge at the apex, densely puberulent, internally white to very light orange, puberulent with dorsally placed groove holding the style; *dorsal corolla lobe* 22–25 by 9–11 mm, triangular ovate, concave, with sides rolled inwards, glabrous, red outside, light red inside, apex mucronate, mucro c. 2 mm; *lateral corolla lobes* 20–21 by 8–9 mm, triangular ovate with sides rolled inwards, concave, glabrous, red on outside,



Fig. 2 *Curcuma flammea* Škorničková. a, b. Habit; c, d. inflorescences; e. ligules; f–h. flower (side view, front view, top view); i. detail of stamen (side, back and front view); j. flower dissection (all from type: JLS-1777). — Scale bars: i = 1 cm; j = 2 cm. — Photos by Jana Leong-Škorničková.

light red on inside; *labellum* 21–25 mm long, 7–9 mm broad at basal 1/3, then diamond-shaped in distal 2/3, c. 16–21 mm at widest point, apex bifid with an incision to 8 mm long, base of the labellum light orange with dark red lines, middle and apical part of the labellum orange at apex and margin, with dark red tinge towards the lower part, with deep orange band marked with dark red line on the outside running through the centre (median band); *lateral staminodes* 20–22 by 10–13 mm, rhomboid, bright red in basal half, orange at apex, glabrous outside, with short glandular hairs present on the middle part facing the centre of the flower. *Stamen* 16–17 mm long; *filament* 7–8 mm long, orange with red tinge, 4 mm broad at base, 2 mm broad at apex (the point of attachment to the connective), covered with glandular hairs; *anther* c. 14 mm long, spurred, connective light orange, densely covered with short glandular hairs; *anther spurs* 3–4 mm long, narrowly triangular with sharp tips pointing outwards; *anther crest* thick, rounded, c. 1.5 mm long and c. 2 mm broad at base, orange; *anther thecae* 9–10 mm, dehiscing along their entire length. *Epigynous glands* 2, c. 5–6 mm long, c. 0.6 mm diam, light yellow at base, darker at apex. *Style* thin, white, glabrous, placed in a groove in dorsal side of floral tube; *stigma* c. 1.5 mm long, 1.5 mm wide, white, ostiole ciliate, facing upwards. *Ovary* 2–3 by 2–2.5 mm, trilobular, densely hairy, hairs c. 0.2 mm long. *Fruits* not seen. Description based on living and spirit material of Leong-Škorničková *et al.* JLS-1777.

Distribution — Currently known only from the type locality.

Habitat & Ecology — Growing on steep limestone slopes covered with primary dipterocarp forest at 400–500 m asl.

Phenology — Flowering in the early rainy season, end May to July, flowers last a single day, open in the morning and closing in late afternoon. Fruiting June to July (August?).

Conservation status — Specimen records exist so far only from the type locality. Most *Curcuma* species in subg. *Ecomata*, especially from the alliance of *C. bicolor*, where this species belongs, tend to be fairly restricted in distribution. Accordingly, we estimate that the extent of occurrence is less than 20 000 km². While the habitat of this species is unsuitable for fast agricultural exploitation, the fact that Vang Vieng is a popular tourist destination and the type population is not in a protected area, continuing decline in area, extent and quality of habitat can be foreseen. Category Vulnerable VU B1ab(iii) is therefore proposed here. Further exploration of the area around Vang Vieng is needed to understand the situation better and amend the conservation status.

Notes — *Curcuma flammea* also belongs to subg. *Ecomata*. Morphologically, the most similar species are *C. bicolor* and *C. rhomba* Mood & K. Larsen. Preliminary molecular analyses of subg. *Ecomata* (Žáveská *et al.* unpubl.) suggest that *C. flammea* is closer to *C. bicolor* than to *C. rhomba*.

Zingiber jiewhoei Škorničk. *sp. nov.* — Fig. 3

Similar to *Zingiber peninsulare* Theilade, but differs in cream-white labellum and cream-white staminodes with dense, bright, purple-violet blotches (vs labellum and staminodes dark purple with white spots). — Type: Jana Leong-Škorničková, Trần Hữu Đăng, Somsanith Bouamanivong, Khantheo Santhammavong, Udome Souvannakhoummane, Kittisack Phouthavong JLS-1807 (holotype SING (incl. spirit); isotype E, HNL), Laos, Vientiane Prov., Vang Vieng Dist., Kaeng Nyui waterfall, 370 m asl, N18°57'21.5" E102°29'45.5", 25 June 2012.

Etymology. We name this beautiful species in honour of Mr. Tan Jiew Hoe, President of the Singapore Gardening Society, for his continuous contributions towards ginger research at Singapore Botanic Gardens and generous support of plant taxonomy in Laos.

Rhizomatous, clump-forming herb. *Rhizome* 1–3 cm diam, branched, 1–3 cm between leafy shoots arising from the same rhizome, externally pinkish (young rhizomes) to light brown (older

rhizomes), internally purple, smelling strongly of lemongrass, scales broadly triangular, soon decaying. *Leafy shoot* to 2.5 m long, arching, with up to 42 leaves, base swollen to 3 cm diam, pink-red, basal 1/2 to 1/3 of pseudostem leafless, sheathed by numerous (c. 13) leafless sheaths; *leafless sheaths* dark green with faint, dark red-brown tinge towards base; *leaf sheaths* green, glabrous at base, pubescent towards the ligule; *ligule* to 9 mm long, shallowly bilobed, green, pubescent when young, glabrescent in old pseudostems; *petiole* reduced to a pulvinus (to 5 mm long); *lamina* to 30 × 8 cm (gradually smaller towards apex of leafy shoot), narrowly ovate (lanceolate), gradually tapering to attenuate apex, base rounded, adaxially glossy green, glabrous, abaxially lighter green and sparsely villose. *Inflorescence* radical, on erect peduncle to 16 cm long sheathed by 4–8 sterile bracts; *spike* 9–18 by 4–5 cm, fusiform, with up to 50 bracts; *bracts* obovate, to 4.7 by 2.7 cm (smaller towards apex of inflorescence), apex broadly acute, externally bright red, whitish towards base, internally whitish except red margins, glabrous and glossy both sides, enclosing a single flower; *bracteole* to 4 cm long, 15 mm broad at widest point, narrowly ovate, translucent white with apex tinged red, glabrous throughout. *Flowers* 7–9 cm long; *calyx* c. 21 mm long, translucent white, glabrous, with three inconspicuous, reddish teeth at apex, with unilateral incision c. 10 mm; *floral tube* c. 42 mm long, white towards base, cream-yellow towards apex, externally glabrous, internally shortly puberulous at apex; *dorsal corolla lobe* narrowly ovate-triangular, to 40 mm long, c. 11 mm broad at widest point, semi-translucent light yellow, glabrous throughout, apex mucronate, mucro < 1 mm; *lateral corolla lobes* narrowly ovate-triangular, to 35 mm long, 5–6 mm broad at widest point, semi-translucent light yellow, glabrous throughout, apex acute; *labellum* c. 30 mm long, c. 16 mm wide (c. 28 mm including the staminodes), ovate, cream-white; *lateral staminodes* 16–20 mm long, c. 7 mm broad, more or less elliptic, connate to the labellum by basal 2/3, cream-white with dense bright purple-violet blotches. *Stamen* 25 mm long; *filament* reduced to < 1 mm; *anther* c. 25 mm long (crest not straightened), c. 4 mm broad, connective tissue cream-white with pink tinge, glabrous; *anther crest* c. 20 mm long (straightened), wrapped around stigma, white, glabrous; *anther thecae* c. 14 mm long, dehiscing along their entire length. *Epigynous glands* 2, c. 5 mm long, c. 0.75 mm diam, ochraceous. *Style* white, glabrous; *stigma* 2–3 mm long, slightly thicker than style, white, ostiole facing downwards (towards the labellum), ciliate. *Ovary* 4.5 by 3 mm, white, glabrous, trilobular with central placentation. *Fruit* (young fruit, perhaps immature) ovoid or slightly trigonal capsule, 2.3 by 1.1 cm, white, glabrous; seeds c. 8 by 3 mm, dark maroon, enclosed in translucent white, irregularly lacinate aril. Description based on living and spirit material of Leong-Škorničková *et al.* JLS-1807.

Distribution — Currently known only from the type locality.

Habitat & Ecology — Growing near streams in lowland deciduous forest.

Phenology — Flowering in the early rainy season, June to July, flowers open in the afternoon, around 3 pm and close the next morning. Fruiting occurs at the end of June to August.

Conservation status — Specimen records exist so far only from the type locality. Accordingly, we conclude that the extent of occurrence is less than 20 000 km². The type locality is a popular tourist destination and the type population is not in a protected area, continuing decline in area, extent and quality of habitat can be foreseen. Category Vulnerable VU B1a,b(iii) is therefore proposed here. Further exploration of the area around Vang Vieng is needed to understand the situation better and to amend the conservation status.

Notes — By its fusiform inflorescences and bright red bracts, *Z. jiewhoei* resembles *Z. peninsulare* and *Z. newmanii* Theilade



Fig. 3 *Zingiber jiewhoei* Škorničk. a, b. Habit; c. detail of pulvinus and ligule; d. internal colour of rhizome; e. inflorescence; f. flower (side view); g. flower (front view); h. seeds; i. young fruit in bract; j. stamen (front and side view); k. fertile bract and flower with bracteole (side view); l. dissected flower (all from type: JLS-1807). — Scale bars: h, j = 1 cm; k, l = 2 cm. — Photos by Jana Leong-Škorničková.

but it can be readily recognised by its cream-white labellum and cream-white staminodes with dense bright purple-violet blotches (vs labellum and staminodes with dense dark-maroon blotches).

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