

***Curcuma lindstromii* (Zingiberaceae: Zingiberoideae), a new species from southeastern Thailand**

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ABSTRACT. *Curcuma lindstromii* Škorničk. & Soonthornk. (Zingiberaceae: Zingiberoideae), a new species from Thailand, is described. It is compared to the morphologically closest species from *Curcuma* subg. *Ecomatae*, *Curcuma rhomba* Mood & K.Larsen. A detailed description, a colour plate and information on its distribution, ecology, phenology and uses are provided. A provisional IUCN conservation assessment of Vulnerable is proposed for this species. A lectotype is designated for the name *Curcuma stenochila* Gagnep.

Keywords. *Curcuma rhomba*, *Curcuma stenochila*, *Curcuma* subgenus *Ecomatae*, gingers, lectotypification, Vulnerable, Zingibereae

Introduction

Curcuma L. (Zingiberaceae: Zingibereae) is one of the largest ginger genera, being widely distributed in South and Southeast Asia, and South China, with a few species extending to northern Australia and the South Pacific (Záveská et al., 2012). The exact number of *Curcuma* species has been estimated to exceed 120 species (Leong-Škorničková et al., 2015) although, since then, close to 30 new species have been described and the total number of species will likely exceed 150 in the near future. The genus is economically important, particularly due to turmeric (*Curcuma longa* L.), but very many other species are used as spices, condiments, vegetables and as medicinal plants, while several species are also a prominent part of the tropical horticultural industry. Further information on the genus and its subclassification can be found in Leong-Škorničková et al. (2015, 2020, 2021) and is therefore not repeated here.

With over 65 species from all three subgenera, the genus is particularly species-rich in Thailand (Leong-Škorničková et al., 2021). More than 20 have been described from Thailand in the last 10 years (e.g., Boonma & Saensouk, 2019; Chen et al., 2015; Leong-Škorničková et al., 2017, 2020, 2021; Maknoi et al., 2011, 2019; Rakarcha et al., 2022; Soonthornkalump et al., 2020, 2021, 2022; Saensouk et al., 2021).

We have known about the existence of the species here described as *Curcuma lindstromii* for over a decade from various photographic materials. During a recent trip by some of the authors to Nong Nooch Tropical Botanical Garden in Pattaya, located in Chonburi province in Thailand, we found the species to be present and in full flower in their ex situ living collection, together with provenance records, enabling us to collect high-quality type material and prepare a detailed description and a photographic plate from living flowering material from multiple plants. The species has also been growing in the third author's private collection; spirit material of this accession has also helped to further refine the description.

The style of description follows the recent works of Leong-Škorničková et al. (2015, 2017, 2020, 2021). The general plant terminology follows Beentje (2016). All extant herbarium material of *Curcuma* was examined at AAU, BK, BKF, BM, CMU, E, K, L, P, PSU, QBG and SING. The preliminary conservation assessments are based on the guidelines of the IUCN Standards and Petitions Committee (2022). The exact GPS coordinates are not given here for conservation purposes.

New species

Curcuma lindstromii Škorničk. & Soonthornk., **sp. nov.** (subgenus *Ecomatae*)

Similar to *Curcuma rhomba* Mood & K. Larsen in general habit, flower colour and shape, but differs by the prominently clawed labellum with dark maroon tips (vs labellum without a basal claw and without differently coloured tips in *C. rhomba*), staminodes with dark maroon tip (vs tip of the same colour as the rest of the staminode), anther with 3–4 mm long narrowly conical spurs, producing mucilage (vs c. 1 mm short broadly conical spurs with blunt apices, not producing mucilage). – TYPE: Ex culta, Nong Nooch Tropical Botanical Garden (acc. no. NN 9329), 31 August 2022, *Leong-Škorničková & Lim JLS-3833* (holotype BKF (including flowers in spirit as part of a single specimen); isotypes E, QBG, SING (SING including flowers in spirit as part of a single specimen); originally collected in Thailand, Sa Kaeo Province, Aranyaprathet District, 29 August 1999, *A. Lindstrom s.n.*). (Fig. 1, 2)

Rhizomatous herb to 0.6 m tall. **Rhizome** branched, main rhizome ovoid, 1–2.5 × 0.8–2 cm, branches 1–3 cm long, up to 1 cm diam., cream-white to ochraceous externally, cream-white internally, slightly aromatic; *root tubers* not seen. **Leafy shoot** with 2–5 leaves when flowering; *pseudostem* to 10 cm long, composed of leaf sheaths; *bladeless sheaths* c. 4, cream-white at base, with rich dark red to maroon tinge distally, fully decayed at anthesis; *leaf sheaths* cream-white basally, gradually green with reddish tinge distally, glabrous; *ligule* 3–5 mm long, bilobed, lobes acute, hyaline, greenish white, puberulent; *petiole* 5–25 cm long (petiole of first leaf shortest, innermost leaves longer), canaliculate, green, glabrous; *lamina* broadly elliptic to elliptic-ovate, 18–32 × 6–14 cm, plicate, adaxially bright to mid green, abaxially lighter green, glabrous on both sides, midrib green, glabrous on both sides, base cordate to rounded, apex acute. **Inflorescence** central, many-flowered; *peduncle* to 6 mm diam., embedded within

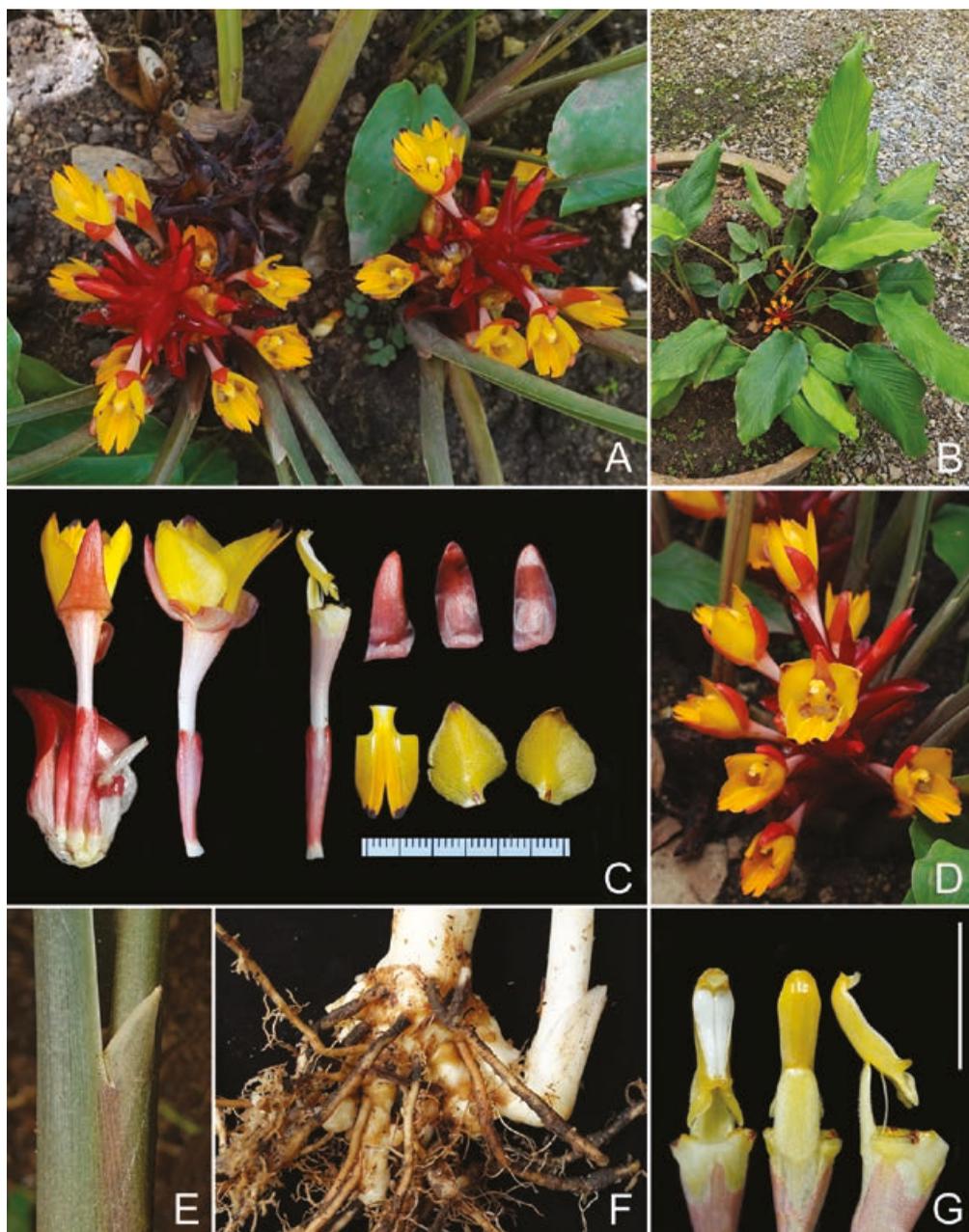


Fig. 1. *Curcuma lindstromii* Škorničk. & Soonthornk. cultivated at Nong Nooch Tropical Botanical Garden. **A.** Inflorescences (top view). **B.** Habit. **C.** Flower in bract, flower removed from bract and dissected flower (from left: floral tube with ovary, calyx and stamen attached, upper row dorsal and lateral corolla lobes, lower row labellum and two lateral staminodes). **D.** Inflorescence with detail of flower in front view. **E.** Details of ligule. **F.** Rhizome. **G.** Stamen still attached to floral tube from front, back and side view. Scale bar: 1 cm. All from the type collection, *Leong-Škorničková & Lim JLS-3833*. (Photos: J. Leong-Škorničková)



Fig. 2. Comparison of flower in side view, stamen, lateral staminode and labellum of *Curcuma rhomba* Mood & K.Larsen (left flower and parts in upper row; from Leong-Škorničková & Lim JLS-3838) and *Curcuma lindstromii* Škorničk. & Soonthornk. (right flower and parts in lower row; from Leong-Škorničková & Lim JLS-3833). (Photo: J. Leong-Škorničková)

pseudostem; *thyse* 8–10 cm long, 5–6 cm diam in the middle, without coma; *fertile bracts* 20–40 per inflorescence, 2–3 × 1–2 cm (larger at the base of the inflorescence), ovate to trullate, gradually smaller and more ovate towards the apex, bright to dark crimson, both surfaces glabrous, connate in the lower 1/4 to 1/3, enclosing cincinnus with 3 flowers at the base of the inflorescence, 1 or 2 flower(s) at the top; *bracteoles* much reduced, 1 per flower, ovate, boat-shaped, 1–5 × 1–2 mm (outer ones larger, inner ones gradually smaller), hyaline, translucent white or with slight pink tinge, glabrous. **Flowers** 5.5–6 cm long, much exserted from the bracts; *calyx* to 20 mm long, 3-toothed, unilaterally split to c. 5 mm, pink-red, glabrous; *floral tube* 31–34 mm long, externally white at the base, with pink-red tinge at the apex, mostly glabrous, but with a row of hairs ventrally, internally white, glabrous in basal 2/3, pubescent distally at the point of widening, with dorsally placed groove holding the style; *dorsal corolla lobe* 17–20 × 7–8 mm, oblong-ovate, concave, with sides rolled inwards, glabrous, red outside, light red to pale yellow-orange inside, apex mucronate, mucro c. 2 mm, glabrous; *lateral corolla lobes* 16–18 × 5–7 mm, elliptic, concave, glabrous, red outside, light red to pale yellow-orange inside; *labellum* 15–20 × 13–15 mm, spatulate with basal claw, basal claw 4–5 × 3–4 mm, lamina bluntly obtriangular, margins recurved, apex bifid with an incision up to 8 mm long, median thicker than the rest of the lamina, bright

orange with two dark maroon (nearly black) tips, with central groove, sides of the lamina orange, glabrous and shiny on both sides; *lateral staminodes* 11–12 × 12–13 mm, unequally bluntly rhomboid to trullate, bright orange with small maroon patch/tinge at base (line-shaped, in the centre) and tip (roundish), glabrous and somewhat shiny on both surfaces. **Stamen** c. 13 mm long; *filament* c. 5 mm long, yellow, c. 3 mm broad at base, c. 2 mm broad at apex (the point of attachment to the connective), covered with short glandular hairs; *anther* 11–12 mm long, spurred, connective warm yellow to orange, densely covered with short glandular hairs; *anther spurs* c. 3 mm long, triangular with sharp tips, pointing outwards (producing mucilage); *anther crest* thin, rounded, c. 1.5 mm long and 2–2.5 mm broad at base, warm yellow to orange (slightly darker than the rest of the connective tissue); *anther thecae* 7–8 mm long, dehiscent along their whole length; *pollen* white, sticky. **Epigynous glands** 2, c. 7 mm long, 0.5–0.75 mm diam, apex blunt, cream-white to pale yellow. **Style** thin, white, glabrous, held in groove in dorsal side of floral tube; *stigma* c. 1.5 mm long, c. 1.2 mm wide, pale yellow, ostiole ciliate, facing upwards. **Ovary** c. 3 × 2.5 mm, trilobular, cream with reddish tinge distally, glabrous. **Fruit** (immature) a subglobular capsule, c. 11 × 9 mm, cream-white to pale yellow with reddish tinge distally, glabrous; mature seeds not seen.

Distribution. Only known from Sa Kaeo and Chanthaburi provinces, Southeast Thailand.

Habitat and phenology. Growing in semi-shade, in shallow mulch in limestone crevices on steep limestone cliffs in dry deciduous forests at 100–300 m above sea level. The species flowers from mid-July till September, with fruiting extending well into November.

Eponymy. We name this species after our colleague Anders J. Lindstrom, an excellent botanist who has dedicated his life to cycad taxonomy and conservation, and to building ex situ living collections for various plant groups, including gingers, at Nong Nooch Tropical Botanical Garden. The description of this species is based on his collections made more than 20 years ago and sustained in the research living collections of Nong Nooch Tropical Botanical Garden.

Vernacular name and uses. As the vernacular name Wan Pet Ma (ว่านเพชรมา) is used for *Curcuma stenochila* Gagnep. as well as for this species, we propose Krachiao Lindstrom (กระเจียวลินด์สตรอม) [= Lindstrom's Curcuma] for this species. No uses have been reported but the species has a good potential as an ornamental plant.

Provisional IUCN conservation assessment. During our extensive revision of all *Curcuma* material in numerous herbaria (as listed in the introduction), we have not found any herbarium collections that could be confidently assigned to this species. The species is therefore known only from two collections made at two locations 8 km apart. One of the locations has about 1000 mature individuals based on a recent

estimate; the number of individuals at the second location is not well known. Neither of the locations is in a legally protected area. The main threats to this species are excessive collection from the habitat for horticultural purposes and trade, as well as conversion of unprotected areas into agricultural lands. We therefore propose to treat this species as Vulnerable (VU D2).

Additional specimens examined. THAILAND: Ex culta (by Sira Niwesrat), 4 Sep 2022, *Leong-Škorničková & Lim JLS-3969* (SING, flowers preserved in spirit only), originally sourced from a local market in Sa Kaeo Province, Khlong Hat District, Aug 2022.

Notes. Among orange-flowered species with a well-defined identity in *Curcuma* subg. *Ecomatae*, *C. lindstromii* is morphologically most similar to *C. rhomba*, a species to which it is compared in the diagnosis.

The name *Curcuma stenochila* is currently being applied loosely in Thailand to at least two orange-flowered species, one of which is here described as *C. lindstromii*. Photographs of *Curcuma lindstromii* previously appeared in Wannakrairoj (1996: 104–105) under the common name Wan Pet Ma (ว่านเพชรม้า) which is associated with the name *Curcuma stenochila* in Thailand. The identity of *Curcuma stenochila* Gagnep., a species described based on material from Cambodia near Kampot, remains elusive after a failed attempt by the first author to re-collect it at the type locality. It is, however, easy to ascertain from the original material and the protologue, that *Curcuma lindstromii* is sufficiently distinct based on the following characters: inflorescence (both measured from dried material) 8–10 × 4–5 cm (vs c. 5 × 3 cm), staminodes rhomboid, 12 × 12 mm, i.e., as long as wide (vs staminodes lanceolate, c. 16 × 5 mm, i.e. length-width ratio 3:1), staminodes and labellum with dark tips (vs plain orange-yellow), and ovary glabrous (vs pubescent). The pressed flowers are very well preserved on the type, and the black tips, at least on the labellum, where they are more prominent, would certainly be visible.

Typification of *Curcuma stenochila*

Curcuma stenochila Gagnep., Bull. Soc. Bot. France 52: 543 (1905). – TYPE: Cambodia, R. monts Kamchay, près Kampot, 400–500 m, 12 July 1904, *Geoffray 409* (lectotype P [P032710], designated here; isolectotype P [P032712]).

Notes. *Curcuma stenochila* was described by the Paris-based botanist François Gagnepain based on material collected by Geoffray in Cambodia (Gagnepain, 1905). The collection information in the protologue reads: ‘R. monts Kamchay, près Kampot, c. a 400–500 m d’altitude, 12 julliet 1904, N° 479 [Geoffray]’. Two sheets with information that perfectly matches the collection information in the protologue, except the collection number, are extant at P [P032710, P032712]. Both specimens are numbered N° 409 in Geoffray’s hand (P032710 marked as 409 bis) and we consider that the number given in the protologue, differing only by a single digit, is a

typographical error. Both sheets are also annotated by Gagnepain's hand as *Curcuma stenochila*. Although the sheets are annotated in red ink as HOLOTYPE/ISOTYPE, both of these sheets are syntypes. We designate the sheet [P032710] as the lectotype, because it is accompanied by a drawing of a flower dissection; the sheet [P032712] shall be regarded as an isolectotype. Larsen (1996) published a preliminary checklist of the Zingiberaceae of Thailand which included the names and brief information on the types. For the entry under *Curcuma stenochila* he only stated 'Type: (Holotype P)' without a collector or collection number. It does not, therefore, qualify as an unintentional first-step lectotypification.

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