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Curcuma lithophila and *C. rufostriata* (Zingiberaceae), two new species from Thailand, and additional notes on *C. papilionacea*

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ABSTRACT

Curcuma lithophila and *C. rufostriata*, two new species from *Curcuma* subgen. *Hitcheniopsis*, are described and illustrated. They are compared with their morphologically closest species, *Curcuma rhabdota*, *C. papilionacea* and *C. sparganiifolia*. Notes on distribution, ecology, etymology, uses and IUCN provisional assessments are provided. Further notes on the distribution of the recently described *C. papilionacea* and an improved IUCN conservation assessment are reported from additional collections.

KEYWORDS: *Curcuma rhabdota*, *Curcuma sparganiifolia*, *Curcuma* subgen. *Hitcheniopsis*.

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INTRODUCTION

Curcuma L. (Zingiberaceae: Zingibereae) consists of more than 120 species (Leong-Škorničková *et al.*, 2020) widely distributed in South and South-East Asia and South China, with a few species extending to northern Australia and the South Pacific (Záveská *et al.*, 2012). The most recent phylogeny of the genus established subgenus *Ecomatae* Škorničk. & Šída f. (Záveská *et al.*, 2012), in addition to the two traditionally recognized subgenera *Curcuma* L. and *Hitcheniopsis* (Baker) K.Schum. (Schumann, 1904). Our previous publications provide a more detailed introduction to the genus (Leong-Škorničková *et al.*, 2015, 2020, 2021) and list many species recently described in Thailand (Soonthornkalump *et al.*, 2020; Leong-Škorničková *et al.*, 2020, 2021) and the information is therefore not repeated here.

In continuation of our work on *Curcuma* in Thailand, we describe here two new species in subgenus *Hitcheniopsis*: *Curcuma lithophila* and *C. rufostriata*. We also provide additional notes on the distribution of the recently described *C. papilionacea* Soonthornk., Ongsakul & Škorničk. (Soonthornkalump *et al.*, 2020), and an improved IUCN conservation assessment taken from additional collections we have located at AAU, BK, BKF and E.

The descriptions are based mainly on living flowering material from several plants and specimens from the type collections. The style of description follows our recent work (Soonthornkalump *et al.*, 2020; Leong-Škorničková *et al.*, 2020, 2021), and general plant terminology follows Beentje (2016). The preliminary conservation assessments follow the most recent version of the guidelines of the IUCN Standards and Petitions Subcommittee (2019).

DESCRIPTIONS

Curcuma lithophila Škorničk. & Soonthornk., **sp. nov.** (subgen. *Hitcheniopsis*)

Similar to *Curcuma rhabdota* Sirirugsa & M.F.Newman in overall habit, colour of the flowers, and spurless anther but differs in the lack of coma bracts, bracts without prominent red-brown striation, and lateral staminodes broadly obovate and broader than the labellum (versus prominent coma bracts,

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bracts with prominent striation and lateral staminodes elliptic and much narrower than the labellum in *C. rhabdota*). Type: Thailand. Kanchanaburi Province, Sai Yok District, Lum Sum Subdistrict, alt. 214 m, 19 Aug. 2020, *Puangpairote TP-1150* (holotype **BKF!**; isotypes **E!**, **PSU!**, **QBG!**, **SING!**). Figs. 1 & 2.

Rhizomatous perennial herb to 65(–80) cm tall. *Rhizome* 3–4.5 × 1–1.5 cm, ovoid, occasionally with lateral branches 1–1.7 cm long, 0.8–1.2 cm in diam., light brown to brown externally, covered with rusty-coloured and decayed scales, very pale pinkish cream internally, aromatic, bitter in taste; root tubers ovate to fusiform, 2–3.5 × 0.8–1.5 cm, light brown externally, white internally. *Leafy shoot* with 4–6 leaves at anthesis; pseudostem 16–30 cm long, composed of leaf sheaths which soon disengage; leafless sheaths plain green (paler towards base), often decayed at anthesis, puberulent, apex mucronate, mucro ca 0.15 mm with stipitate hair ca 0.15 mm, mostly decayed at anthesis; leaf sheaths plain light to mid green, margin hyaline, puberulent; ligule to 1.5 mm long, obliquely bilobed with an incision 3–4 mm long, semi-translucent greenish white, turning papery with age, glabrous; petiole to 15–35(–45) cm long, canaliculate, plain green, adaxially glabrous, abaxially puberulent; lamina 18–30 × 3.5–6 cm, elliptic to narrowly elliptic, adaxially dark green, glabrous, abaxially somewhat paler, puberulent, midrib green, adaxially glabrous, abaxially puberulent, base cuneate to obtuse, sometimes slightly oblique, apex acute, margin ca 0.1 mm wide, hyaline, semi-translucent white, glabrous. *Inflorescence* central; peduncle exceeding pseudostem by 25–42 cm, plain green, glabrous; thyrse 4.5–7 cm long, 3–4 cm in diameter in the middle, composed of 7–12 fertile bracts (no coma); fertile bracts 2–2.5 × 0.8–1.4 cm, broadly ovate to elliptic-ovate, connate in the lower ⅓ to ¼; apex acute to obtuse, reflexed, light pink to pink with green or reddish brown apex, sometimes extending down the centre to the base, glabrous on both sides; cincinni with up to 6(–7) flowers at basal bracts, gradually decreasing upwards to 1–2 flowers, flower(s) in uppermost bracts often underdeveloped or aborted and covered with developed bracteoles; bracteoles one per flower, to 8–10 × 5–7 mm (outer ones larger, inner ones gradually smaller), elliptic to triangular, boat shaped, hyaline, semi-translucent white with reddish tinge at apex, almost glabrous (few stipitate hairs at keel apex). *Flowers* 2.2–2.5 cm long, exserted from bracts, with faint rose-like scent; calyx 7.5–8 mm long, tridentate, with unilateral incision 4.5–5 mm, semi-translucent white, puberulent; floral tube 9–12 mm long, narrowly cylindrical at base for 7–9 mm above ovary, narrowly funnel-shaped distally, externally white, glabrous, internally white and glabrous at base, with yellow and red patches and ring of dense hair distally (near throat); groove holding the style positioned dorsally from base to constricted area; dorsal corolla lobe 9–10 × 5–7 mm, broadly elliptic to elliptic ovate, concave, hooded, white, glabrous, apex mucronate, mucro ca 0.1 mm long, glabrous; lateral corolla lobes 8–10 × 3–4 mm, narrowly elliptic to oblong, apex obtuse, strongly reflexing soon after anthesis, semi-translucent white, glabrous, margin hyaline; labellum 11–13 × 6–7 mm, obovate, bilobed (with an incision ca 2 mm long), light purple to purple, basally with two bright to dark red thick bands (one on each side), distally pale to bright purple, median band only slightly darker than remainder of labellum, basally formed by two keels (rising to 1.5 mm in thickness), flattening towards apex, glabrous; lateral staminodes 10–13 × 4–4.5 mm, elliptic to oblong with obtuse to rounded apex, pointing forward, pale to bright purple, basally darker and with bright to dark red patches, glabrous on both sides; stamen ca 8.5 mm long; filament 3 × 4.5–5 mm, ca 3 mm broad at base, less than ca 1.5 mm at point of attachment, cream white to pale purple, occasionally with sparse reddish tinge, glabrous; anther spurless, 4–4.5 mm long, ovoid to slightly pyriform, connective white to cream, sometimes with sparse reddish tinge, dorsally almost glabrous, sides with stipitate glandular hair ca 0.1 mm long, anther crest 1 × 1.2 mm rounded, with a very few glandular hairs at margin; anther thecae 4–4.5 mm long, dehiscing along their entire length, pollen white; epigynous glands absent; style white, glabrous; stigma capitate, funnel-shaped ca 0.8 mm long, ca 0.4 mm wide, white; ostiole with irregularly serrulate margin, facing forwards; ovary ca 2 × 1.7 mm, ovoid to sub-globular, trilocular, cream, glabrous, placentation axile. *Fruit* 11–13 mm diameter (almost ripe), a globular to subglobular, irregularly dehiscing capsule, greenish to cream with rich reddish tinge apically, glabrous, containing ca 40 seeds (most well-developed, some aborted); seeds irregularly obovoid, 4–5 mm long, light brown (almost ripe), shiny, enclosed in semi-translucent white, laciniate aril.

Figure 1. *Curcuma lithophila* Škorničk. & Soonthornk., A–B. Typical habitat in Kanchanaburi Province, Ta Sao Subdistrict; C–D. Plant habit; E. Infructescence with almost ripe fruits; F. Infructescence with one capsule dehisced; G. Old inflorescence in side view. Photographed by: S. Niwesrat.

Figure 2. *Curcuma lithophila* Škorničk. & Soonthornk. A. Typical habitat in Kanchanaburi Province, Wang Po Subdistrict; B. Plant habit; C. Detail of inflorescence in side view; D. Entire plant (scale 15 cm), E–F. Inflorescence with flower in front view (note the colour and shape variability); G. Almost ripe fruits and seeds. H. Flower dissection, from left: bracteole, calyx, floral tube (longitudinally dissected), ovary, lateral staminodes with dorsal lobe in between (upper part), lateral lobes with labellum in between (lower part) and stamen in the centre (inset detail of stamen from front, side and back view). Scale bars: D. = 10 cm; G. = 5 mm; H. = 10 mm. Photographed by: A–C, E, F from type locality by T. Puangpairaote; D, G, H by S. Soonthornkalump.

Thailand.— SOUTH-WESTERN: Kanchanaburi [Sai Yok District, Lum Sum Subdistrict, 214 m, 19 Aug. 2020, *Puangpairote TP-1150* (**BKF**, **SING**, **QBG**, **PSU**); ibid., 14 Aug. 1967, *Kasem 566* (**BK**); ibid., Ta Salao (Ta Sao) Subdistrict, ca 50 m, 10 July 1930, *Kerr 19483* (**BK**, **BM**, **C**, **L**, **K**); ibid., plant brought and cultivated in Bangkok, 28 Sept. 1930, *Kerr 19483A* (**K**); ibid., ca 50 m, 10 July 1930, *Marcan 2491* (**BM**, **K**, **L**); Sai Yok District, 31 July 1928, *Put 1793* (**BK**, **BM**, **C**, **K**, **L**); ibid., 10 Aug. 2000, *Triboun 1841* (**BK**, 2 sheets); ibid., Wang Krachae Subdistrict, 14 Sept. 2020, *Soonthornkalump Sutt-220* (**BKF**, **SING**); Sai Yok District, 175 m, 13 Sept. 2005, *Amnajruangrit 144* (**QBG**)].

Note.— the following specimen most likely represents this species: cultivated in Bangkok, exact origin doubtful [on K specimen given as 'brought from Chiangmai(?), which is unlikely, partly because we have found no Chiang Mai specimens similar to this species], Oct. 1934, *Collins ov* [*5*] (**BM**, **E**, **K**, **P**).

Distribution.— Endemic to Kanchanaburi Province, Thailand.

Ecology.— This species grows in soil pockets on rocky hills, in mixed semi-deciduous forests, bamboo forests and scrub forests, at elevation 50–230 m. Flowering starts in the rainy season and lasts from July–October; the first fruits can be observed in early August. The plants enter dormancy in December. The flowers open in the morning and last one day.

Etymology.— Greek, *litho-*, stone and *-philus*, loving; referring to the rocky habitat preferred by this species.

Proposed IUCN conservation status.— *Curcuma lithophila* is endemic to Thailand and is currently known to occur in five areas of Kanchanaburi Province (Ta Sao, Lum Sum, Wang Krachae, Khao Noi, Wang Dong). Of these, the first three are supported by herbarium records, while the last two are supported by photographic evidence. According to this evidence, the EOO is calculated as ca 387 km^2 and AOO as 20 km^2. The species sets seeds, and the size of the five populations we have seen in the wild ranged from 40–320 adult individuals. The species is under threat of harvesting from the wild as an ornamental species. Although at least one population is under legal protection in Salak Phra Wildlife Sanctuary, the remaining populations have no legal protection, and some are likely to be affected by development and agriculture. We therefore propose to treat this species as Vulnerable VU B2(a,biii,v), D1, D2.

Notes.— The oldest specimens of this species were collected more than 90 years ago by Thai collector Put Phraisurin (*Put-1793*) who reported the name of this species as Krachiao hin (กระเจียวหิน). Krachiao hin means Stone Curcuma and refers to the habitat of this species which grows in deep soil pockets among rocks. In horticulture, the species is known under the Thai name Mani kan (มณีกาญจน์) [Mani kan = Jewel of Kanchanaburi](Wannakrairoj, 1996: 96–98). *Curcuma lithophila* has several favourable character traits which are used in breeding of hybrids for the cut-flower industry, but no other uses have been reported.

As outlined in the diagnosis, *Curcuma rhabdota* is morphologically the closest species in overall habit and flower colour. *Curcuma lithophila* is also similar to *Curcuma rufostriata* described below, but differs by its broader leaves, bracts with no prominent striation and most importantly by a spurless anther (as compared to narrowly elliptic leaves, bracts with prominent striation and L-shaped anther). In herbaria, however, most specimens of *C. lithophila* have been misidentified as *Curcuma sparganiifolia*. In living material, there is little chance of confusion between the two species, as the flowers of *C. sparganiifolia* are predominantly white with a yellow median band and minute reddish spots on the labellum, while those of *Curcuma lithophila* have purple and red labellum and lateral staminodes. Additionally, the leaves in *C. sparganiifolia* tend to be narrower, and inflorescence bracts less connate and without the reddish-brown striation. These two species are also geographically well separated with *C. lithophila* occurring only in Kanchanaburi province in south-western Thailand, while *C. sparganiifolia* occurs in the north-east and south-east of Thailand (approx. 500–700 km from the type locality of *C. lithophila*), Cambodia and Vietnam.

Curcuma rufostriata Škorničk. & Soonthornk., **sp. nov.** (subgen. *Hitcheniopsis*)

Similar to *Curcuma rhabdota* Sirirugsa & M.F.Newman in fertile bracts with reddish brown striation and pink spots on each side of the apex, and overall shape and colour of the flowers, but differs in the lack of coma bracts, L-shaped anther

with prominent anther spurs and coriaceous laminae without prominent plication (versus prominent coma bracts, spurless anthers and non-coriaceous plicate laminae in *C. rhabdota*). Type: Thailand. Prachinburi Province, Mueang District, Noen Hom Subdistrict, alt. 126 m, 11 June 2020, *Soonthornkalump Sutt-216* (holotype **BKF!**; isotypes **BK!**, **E!**, **K!**, **P!**, **PSU!**, **QBG!**, **SING!**). Figs. 3 & 4.

Rhizomatous perennial herb to 45(–60) cm tall. *Rhizome* 1.5–2 × 1–2 cm, globose to ovoid, occasionally with lateral branches to 1–2.5 cm long, 0.3–0.5 cm in diameter, light brown to brown externally, covered with rusty-coloured and decayed scales, cream internally, aromatic, spicy-sweet, weakly acerbic in aftertaste; root tubers ovate to fusiform, 1.5–3.5 × 1–2 cm, light brown externally, cream internally. *Leafy shoot* with 2–4 leaves at anthesis; pseudostem 10–22 cm long, composed of 2–3 leafless sheaths and leaf sheaths which soon disengage; leafless sheaths 2 or 3, green with pinkish red tinge at base and margins when young, often decayed at anthesis, puberulent, apex mucronate, mucro ca 0.5 mm, stipitate hair at mucro ca 0.1 mm long, leaf sheaths plain green or with reddish tinge basally, puberulent, margin hyaline; ligule to 1–2.5 mm long, 4–5 mm wide, truncate, sometimes bilobed with an incision 1–2 mm long, semi-translucent greenish or with reddish tinge, turning papery with age, sparsely ciliate at upper margin (hair ca 0.05 mm long); petiole to 10–32 cm long, canaliculate, plain green or with reddish tinge at margins and base, adaxially glabrous (groove), abaxially puberulent; lamina 15–30 × 2.2–3.6 (–4.5) cm, narrowly elliptic to elliptic, adaxially dark green, abaxially somewhat paler, puberulous on both sides, midrib green often with narrow red patch along midrib almost entire length of lamina which may show through to the underside, adaxially glabrous, abaxially puberulous, base equal or slightly oblique, cuneate to attenuate, apex acuminate, margin ca 0.1 mm wide, hyaline, semi-translucent white or reddish, glabrous. *Inflorescence* central; peduncle basally obscured within pseudostem, and exceeding it by 15–45 cm, 2–3 mm in diameter, plain green, glabrous; thyrse 4.5–7 × 2–4 cm, composed of 9–15 fertile bracts; fertile bracts 1.5–2 × 1.9–2.5 cm (basal larger, uppermost smaller), broadly ovate to elliptic-ovate, connate in lower ½ to ¼, apex broadly obtuse to rounded, reflexed, striate, brownish red with light green, almost always with two pale to bright pink patches at upper part (one on each side, patches usually larger in upper bracts), puberulous on both sides; cincinni with up to 5 flowers at basal bracts, gradually decreasing upwards to 1–2 flowers, flowers in uppermost bracts often underdeveloped or aborted and covered with developed bracteoles; bracteoles one per flower, to 9–12 × 3.5–5 mm (outer ones larger, inner ones gradually smaller), ovate, boat shaped, hyaline, semi-translucent white with sparse red tinge, almost glabrous, with sparse stipitate hairs at tip. *Flowers* 1.5–2.5 cm long, slightly exserted from bracts; calyx 6–6.5 mm long, tridentate, with unilateral incision 3–4 mm, semi-translucent white sometimes with sparse red tinge, puberulent; floral tube 7–11 mm long, narrowly cylindrical at base becoming narrowly funnel-shaped distally, externally white, glabrous, internally white, sometimes with few sparse red spots, glabrous basally, puberulent with ring of dense hair distally (near throat), groove holding style positioned dorsally from base to constricted area; dorsal corolla lobe 7–7.5 × 4–5.5 mm, broadly elliptic to obovate, strongly concave, hooded, cream to pale purple, usually darker distally, glabrous, apex mucronate, mucro to 1 mm long, glabrous; lateral corolla lobes 7–9 × 2.5–3 mm, ovate to elliptic, apex obtuse, strongly reflexing soon after anthesis, semi-translucent cream at base, pale purple distally, glabrous, margin hyaline; labellum 10–11 × 6–7.5 mm, obovate, obscurely trilobed, midlobe small and with an incision ca 2 mm long, pale to bright purple with bright red bands at sides basally, median band triangular and white at base, narrowing to yellow line distally and extending to the incision, prominently raised at centre of labellum, glabrous throughout, but sparsely hairy at base; lateral staminodes 8–11 × 6–8 mm, obovate to elliptic, oblique, adnate to labellum in basal ¼, light purple to bright purple with red band basally (side adjacent to labellum), glabrous on both sides; stamen 8–9 mm long; filament 2–2.5 × 2–3 mm, 2.5–3 mm broad at base, less than 1.5 mm at point of attachment, white, glabrous; anther spurred, 7–8 mm long, L-shaped (angle 100°–110°), connective white to cream, sometimes very pale purple dorsally, covered with short glandular hairs (ca 0.1 mm long), apex crestless but prominently bilobed, anther spurs ca 3 mm long, 2 mm wide, somewhat dorso-ventrally compressed, slightly diverging from base but converging at apices creating narrow central opening between spurs, cream throughout with bright warm yellow apices

Figure 3. *Curcuma rufostriata* Škorničk. & Soonthornk. A. Typical habitat in Prachinburi Province; B–D. Plants in the habitat; E. Plant habit; F. Detail of rhizome (inset: ligules). Scale bars: E. = 15 cm; F. = 2 cm. Photographed by: A–D from A. Rodphitak; E, F from S. Soonthornkalump.

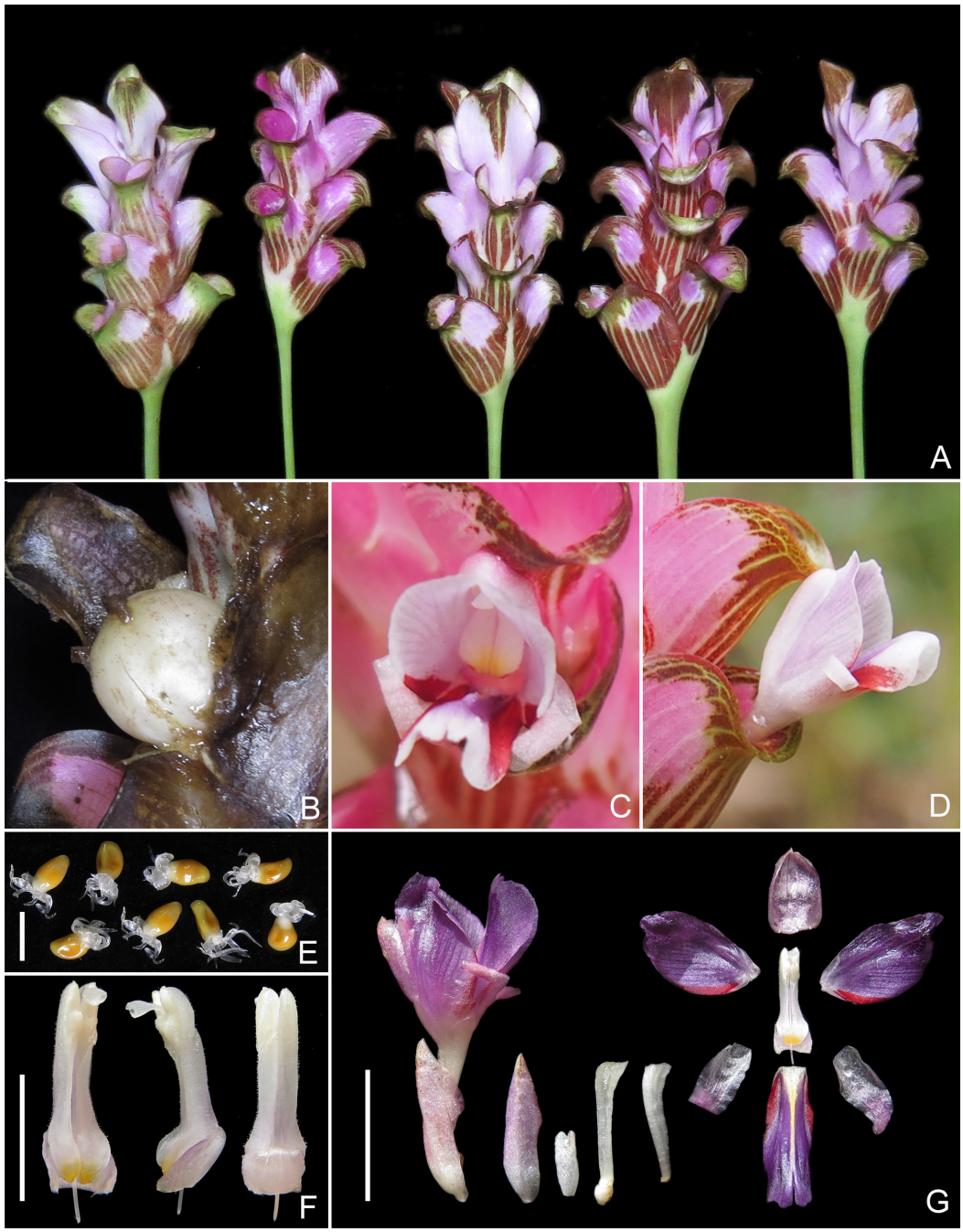

Figure 4. *Curcuma rufostriata* Škorničk. & Soonthornk. A. Examples of variability in inflorescence shape and colouration; B. Almost mature fruit; C. Flower (front view); D. Flower in bract (side view); E. Seeds; F. Stamens (front, side and back view); G. Flower in side view (bracteole attached), bracteole, calyx, ovary with floral tube (tube longitudinally opened into two halves) flower parts: stamen (central), lateral staminodes with dorsal corolla in between (upper half), lateral corolla lobes with labellum in between (lower half); Scale bars: E. = 3 mm; F. = 5 mm; G. = 10 mm. Photographed by: A, B, E–G from type by S. Soonthornkalump; C, D by A. Rodphitak.

(sometimes with small red spot), basally with glandular hair (ca 0.1 mm long); anther thecae 3–4 mm long, positioned in upper ⅓ of anther, dehiscing along their entire length, pollen cream; epigynous glands absent; style white, glabrous; stigma capitate, funnel-shaped ca 1 mm long, ca 0.8 mm wide, white; ostiole with irregularly puberulent to serrulate margin, facing forwards; ovary 2.5–3 × 3 mm, ovoid to globose, trilocular, cream, glabrous, placentation axile. *Fruit* 7–9 mm diameter (almost ripe), a globular, irregularly dehiscing capsule, cream or with rich reddish brown tinge, glabrous, dehiscing irregularly, containing 9–50 seeds (most well-developed, some aborted); seeds irregularly obovoid, 2.5–3 mm long, light brown (almost ripe), shiny enclosed in semi-translucent white, laciniate aril.

Thailand.— SOUTH-EASTERN: Prachinburi [Mueang District, Noen Hom Subdistrict, alt. 126 m, 11 June 2020, *Soonthornkalump Sutt-216* (**BKF**, **BK**, **E**, **K**, **P**, **PSU**, **QBG**, **SING**)].

Distribution.— Endemic to Prachinburi Province, Thailand.

Ecology.— This species grows in semi-deciduous, evergreen forests and scrub forests at 30–250 m elevation. Flowering starts in the rainy season and lasts from June–August, plants enter dormancy in early December. The flowers open in the morning and last one day.

Etymology.— Latin, *rufus*-, reddish brown and -*striatus*, striate; referring to the linear markings on the fertile bracts.

Proposed IUCN conservation status.— *Curcuma rufostriata* is endemic to Thailand. The type collection in Noen Hom Subdistrict, Muang District is the only one supported by herbarium specimen. We have seen and photographed another two populations of about 20 and 100 adult individuals in the same subdistrict in Khao E-to Buddha Forest Park. A large population (200–300 adult individuals) was also seen in Khao Yai National Park (Prachanthakam District, Pho Ngam Subdistrict). From these records, the EOO was calculated as ca 7.5 km^2 and AOO 8 km^2. The main threats to this species are collection from the wild for the horticultural trade, and conversion of habitat outside protected areas into agricultural land. As at least some populations are known to occur within protected areas, we propose to classify this species provisionally as Vulnerable VU(D2).

Notes.— The existence of this species has been known for over 20 years. Plants of *Curcuma rufostriata* are occasionally sold under the name Peacock Patumma (= Peacock Curcuma) or Chiang Mai Chocolate (Wannakrairoj, 1996: 93–95) although the latter name has also been applied to various ornamental species from subgen. *Hitcheniopsis* and formally registered for a cultivar of *Curcuma gracillima* (Royal Horticultural Society, 2020). The Thai common name is Bua lai prachin (บัวลายปราจีน) [Bua lai prachin = Striped lotus of Prachinburi]. It refers to the striped pattern of the bracts and the origin of the species in Prachinburi. No uses have been reported, except occasional sale as an ornamental plant and use as a parental line in horticulture breeding programmes.

This species sets seeds profusely, forming large populations with a considerable degree of variation in laminae (shape varies from elliptic to narrowly elliptic, and colour from plain green to green with prominent central red patch) and in colour of fertile bracts, which vary in striation density as well as the shade of pink.

This species is similar to *Curcuma rhabdota* (Fig 5A.) but as already mentioned in the diagnosis, there are significant differences, some of which (leaf shape and lack of coma bracts) are visible even in herbarium material. *Curcuma rufostriata* has an L-shaped spurred anther which is very rare in subgenus *Hitcheniopsis* and only known in *Curcuma papilionacea*, a species only recently described from Satun Province. In spite of the similarities in flower colour, anther shape and lack of coma, the two species cannot be confused as *Curcuma papilionacea* (Fig 5B.) has narrow inflorescences composed of a few green bracts with lighter green striation, and elliptic, plicate lamina compared to bracts with brownish red striation and pink spots, and narrowly elliptic, coriaceous leaves without prominent plication in *C. rufostriata*. The three species are also geographically well separated, *C. papilionacea* being known only from Satun Province in Peninsular Thailand, *C. rufostriata* only from Prachinburi Province in Central Thailand and *Curcuma rhabdota*, originally described from Laos, only recorded from Ubon Ratchathani in Eastern Thailand (Maknoi, 2006), and also known to occur in Cambodia.

Figure 5. A. *Curcuma rhabdota* Sirirugs. & M.F.Newman, showing habit, detail of stamen from front and side view, and inflorescence with flower in front view. B. *C. papilionacea* Soonthornk., Ongsakul & Škorničk. showing habit, detail of stamen from front and side view and, inflorescence with flower in front view. Photographed by: A by J. Leong-Škorničková, B by S. Soonthornkalump.

ADDITIONAL NOTES ON CURCUMA PAPILIONACEA

Curcuma papilionacea was described from Satun Province in Thailand. The type and all paratypes cited in the original publication were from three populations located close to each other in La-ngu District, Kamphaeng Subdistrict, and the species was provisionally assessed as Critically Endangered (CR B1ab(iii,v)+B2ab(iii,v) by Soonthornkalump *et al.* (2020). Three more specimens of this species, originally identified as *Curcuma rhabdota*, *Curcuma* aff. *parviflora* and *Curcuma* sp., have since been located at **AAU**, **BKF** (*Middleton et al. 4433* [SN 183883], *Middleton et al. 5485* [SN 194657]), **E** (*Middleton et al. 4433* [E00533029], *Middleton et al. 5485* [E00435260]) and **BK** (*Triboun 1881*). All three collections were made from Mu Ko Phetra National Park in La-ngu District, Satun Province. Although this significantly increases the Extent of Occurrence of this species (EOO = 3,301 km^2), and the number of locations has increased to five, the Area of Occupancy remains small (AOO = 12 km^2). Only two populations are under legal protection in a national park, while the three populations in Kamphaeng Subdistrict continue to face the threat of loss of habitat (clearing land for rubber plantations). We therefore propose to revise the status of this species to Endangered (EN B1ab(iii,v) & B2 ab (iii,v)) (IUCN Standards and Petitions Subcommittee 2019).

All specimens examined.— THAILAND, Satun Province, La-ngu District, Kamphaeng Subdistrict, 25 m a.s.l., 19 July 2017, *Ongsakul Ong-0984* (**BK**); ibid., growing in rubber tree plantation close to foothills of Khao Lek-Si (Kăo-Lâyk-Sèe), 6°54'9.14"N, 99°46'14.20"E, 27 m a.s.l., 25 June 2019, *Ongsakul et al. Ong-1002* (**PSU** (including spirit)); La Ngu District, Mu Ko Phetra National Park, trail from Park Headquarters, karst limestone hill beside sea, 6º50.0'N 99º45.2' E, 70 m, 10 Sept. 2008, *Middleton et al. 4433* (**AAU**, **BKF** [SN 183883], **E** [E00533029]); La Ngu District, Mu Ko Phetra National Park, dry evergreen forest on limestone bedrock, 6º 50'01"N 99º45'14" E, 80 m, 20 Sept. 2010, *Middleton et al. 5485* (**AAU**, **BKF** [SN 194657], **E** [E00435260], **PSU**); Koh Petra, 31 Aug. 2000 *Triboun 1881* (**BK**).

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