



Curcuma papilionacea (Zingiberaceae), an unusual new species from southern Thailand

SUTTHINUT SOONTHORNKALUMP^{1*}, ANNOP ONGSAKUL², AUMDAH DOLAJI³ & JANA LEONG-ŠKORNIČKOVÁ⁴

¹Department of Biology, Faculty of Science, Prince of Songkla University, Kho Hong, Hat Yai, Songkhla 90110, Thailand.

²Sulee nursery, 6 Chumporn Rd., Phuket, 83000 Thailand.

³15 Moo 5, Kamphaeng, La-ngu, Satun, 91110 Thailand.

⁴Singapore Botanic Gardens, National Parks Board, 1 Cluny Rd., 259569 Singapore.

*Authors for correspondence. E-mail: s_soonthornkalump@hotmail.com; jana_skornickova@nparks.gov.sg

Abstract

Curcuma papilionacea, an unusual new species of *Curcuma* subgenus *Hitcheniopsis* (Zingiberaceae) is described and illustrated here. It is known only from Satun province in southern Thailand, and is easily distinguishable among all species of subgenus *Hitcheniopsis* by its inflorescence of green bracts and pea-like flowers with a small labellum and very prominent lateral staminodes. It also has prominently developed anther spurs, a character not yet recorded in this subgenus. It is compared to the four morphologically closest species which are *Curcuma alismatifolia*, *C. harmandii*, *C. rhabdota* and *C. saraburiensis*. A preliminary IUCN conservation assessment of Critically Endangered (CR), and notes on its distribution and ecology are also provided.

Keywords: *Curcuma alismatifolia*, *C. harmandii*, *C. rhabdota*, *C. saraburiensis*, *C.* subgenus *Hitcheniopsis*, Satun province

Introduction

Curcuma L. (1753: 2) is one of the largest genera in Zingiberaceae, widely distributed in South and Southeast Asia, South China, and with a few species extending to Northern Australia and the South Pacific (Záveská *et al.* 2012). The exact number of *Curcuma* species is still unknown but, with many new descriptions published recently, it certainly exceeds the estimate of 120 given by Leong-Škorničková *et al.* (2007, 2015). The most recent phylogeny of the genus (Záveská *et al.* 2012) proposed recognition of three subgenera: the two traditionally recognized subgenera, subgenus *Curcuma* L. and *Hitcheniopsis* (Baker) K. Schum. (1904: 101), and an additional subgenus *Ecomatae* Škorničk. & Šída f. (Záveská *et al.* 2012: 758). Numerous new *Curcuma* species from mainland Southeast Asia have been described in recent years, five of them in subgenus *Hitcheniopsis* (*C. bella* Maknoi, K. Larsen & Siriruga (2011: 121), *C. leonidii* Škorničk. & Luru (2013: 37), *C. pygmaea* Škorničk. & Šída f. (2013: 639), *C. prasina* Škorničk. (2017: 245), and *C. saraburiensis* Boonma & Saensouk (2019: 245)). In addition, six species previously classified in *Stahlianthus*, and one in *Laosanthus* have also been transferred to this subgenus which now includes 20 species.

Thailand is one of the diversity hotspots of the Zingiberaceae and is also one of the richest areas of *Curcuma* (Larsen & Larsen, 2006) with all three subgenera well represented and more than 40 species reported (Maknoi, 2006, Siriruga *et al.*, 2007; Leong-Škorničková *et al.*, 2017).

The species we describe here as *C. papilionacea* was discovered in the southernmost part of the country in Satun province. It has an unusual flower morphology as it lacks epigynous glands (characteristics of subgenus *Hitcheniopsis* (Schuman, 1904: 101), but the anther is prominently L-shaped and spurred as in some species in subgenus *Ecomatae* (Škorničk. & Šída f., 2012: 747). However, considering that anther morphology is a more variable character than presence/absence of epigynous glands, due to pollinator pressure, and based on the overall look of the plant and the flower colour, we can quite confidently place this species in subgenus *Hitcheniopsis*. Similarities with the morphologically closest species, *C. rhabdota* Siriruga & M.F.Newman (2000: 196), *C. saraburiensis* Boonma & Saensouk (2019: 245)

C. alismatifolia Gagnep. (1903: 259) and *C. harmandii* Gagnep. (1907: 403) are discussed below. The description of *C. papilionacea* is based on living flowering material and specimens from the type collection. The style of description follows the recent works of Leong-Škorničková cited above. The general plant terminology follows Beentje (2016). The preliminary conservation assessment follows the guidelines of IUCN (2017).

Taxonomy

Curcuma papilionacea Soonthornk., Ongsakul & Škorničk. *sp. nov.*, subgen. *Hitcheniopsis*, Fig. 1, 2.

Curcuma papilionacea is unique in the genus by the following combination of characters: absence of epigynous glands, presence of L-shaped anthers, inflorescences composed of green bracts without coma, and flowers with a pea-like appearance.

Type:—THAILAND. Satun province, La-ngu Dist., Kamphaeng Subdistr., growing in rubber tree plantation close to the foothill of Khao Lek-Si (Kǎo-Lâyk-Sèe), 6°54'53"N, 99°46'15"E, 25 m, 25 June 2019, *Annop Ongsakul, Sutthinut Soonthornkalump & Aumdah Dolaji Ong-1001* (holotype BKF! (inclusive spirit), isotype QBG!, SING! (inclusive spirit)).

Rhizomatous herb, ca. 60–80 cm height. *Rhizome* ovoid, ca. 2.8–3.5 × 1.4–2.3 cm, occasionally with one or two lateral branches ca. 1.5–3 × 0.5 cm, yellowish-brown externally, covered with rust-coloured and decayed scales, white internally; root tubers, ovate to fusiform, 1–1.8 × 0.5–1.5 cm, light brown externally, white internally. *Leafy shoot* with 3–4 leaves at anthesis; *pseudostem* up to 40 cm height, composed of 2 leafless sheaths and 3–4 leaf-bearing sheaths, all plain green, glabrous; *ligule* up to 2.5 mm long, obscurely bilobed, hyaline, greenish-white, translucent, glabrous; *petiole* 39–43 cm long, canaliculate, green, glabrous; *lamina* elliptic, 27–33 × 11–13.5 cm, adaxially green, abaxially somewhat paler, glabrous on both sides, midrib green, margin entire, glabrous, base rounded, apex acuminate to narrowly acuminate. *Inflorescence* central, *peduncle* basally obscured within pseudostem, and exceeding it by 18–30 cm, glabrous; *thyse* ca. 9.5–11 × 1.5–2 cm, composed of 7–8 fertile bracts, coma bract absent; *bracts* ca. 2.5–2.7 × 2.3–2.4 cm, broadly irregularly obovate, green with pale green venation and mostly also with two greenish-white patches (one on each side of the bract), puberulent on both sides, connate in basal 2/3, apex obtuse, reflexed; *cincinni* with up to 6 flowers at the basal bracts, gradually decreasing distally; *bracteoles* narrowly triangular and curved, up to 9–10 mm long, up to 5–6 mm wide at base, white, glabrous. *Flowers* 2.9–3 cm long, slightly exerted from bracts; *calyx* 10–12 mm long, 3-toothed, with unilateral incision, 1–1.5 mm, semi-translucent, white, glabrous; *floral tube* 1.5–1.7 cm long, narrowly cylindrical at base, slightly widening distally, white, semi-translucent, externally glabrous, and internally glabrous with glandular hair near throat; *dorsal corolla lobe* ca. 10 × 5 mm, elliptical, with concave apex, white or pale purple with purple tinge at apex and margins, glabrous; *lateral corolla lobes* ca. 8–10 mm long, 3–4 mm wide at base, elliptic to slightly triangular with obtuse, concave apex, reflexing soon after anthesis, white or pale purple with purple tinge at apex and margins, glabrous; *labellum* ca. 13–15 × 7 mm, narrowly obovate, obscurely bifid with an incision ca. 1.5 mm long, white to pale purple with bright red bands at sides basally, gradually turning bright violet towards apex, median yellow, positioned at middle third of labellum and extending as band of fine white hairs towards apical incision, glabrous on both sides except distal part of median; *lateral staminodes* ca. 13–14 × 7–8 mm, unequally obovate to rhombic, adnate to labellum in basal 1/4, white or pale purple with red band basally on side adjacent to labellum, apex slightly reflexed, glabrous on both sides. *Stamen* 8–9 mm long; *filament* 3 mm long, 4 mm broad at base, less than 2 mm at point of attachment, white, glabrous; *anther* spurred, L-shaped (110°–120°), ca. 8–8.5 mm (measured across the L-shape), slightly divergent at middle and convergent at apices creating a narrow central opening, white with tips of spurs pale yellow, glabrous, anther crest absent, anther thecae ca. 3–3.5 mm long, dehiscing along entire length, pollen white. *Epigynous glands* absent. *Style* white, glabrous; *stigma* capitate, with two prominent lobes, ca. 0.75 mm wide, white; *ostiole* with irregularly serrulate margin, glabrous, facing forward. *Ovary* 3–4 × 2–2.5 mm, trilobular, placentation axile, white, glabrous. *Fruit* a globular trilobular capsule, 1–1.2 cm diameter (almost ripe), green, glabrous, dehiscing irregularly, containing 20–25 seeds (most well-developed, some aborted); *seeds* irregularly obovoid, 3–4 mm long, light brown (almost ripe), shiny, enclosed in translucent white, lacinate aril.

Distribution and ecology:—Known only from Satun province in southern Thailand. It grows in sandy clay loam at the edge of disturbed forest and rubber tree plantations. Some populations were found in humus pockets in limestone under semi-shade at 0–50 m a.s.l.

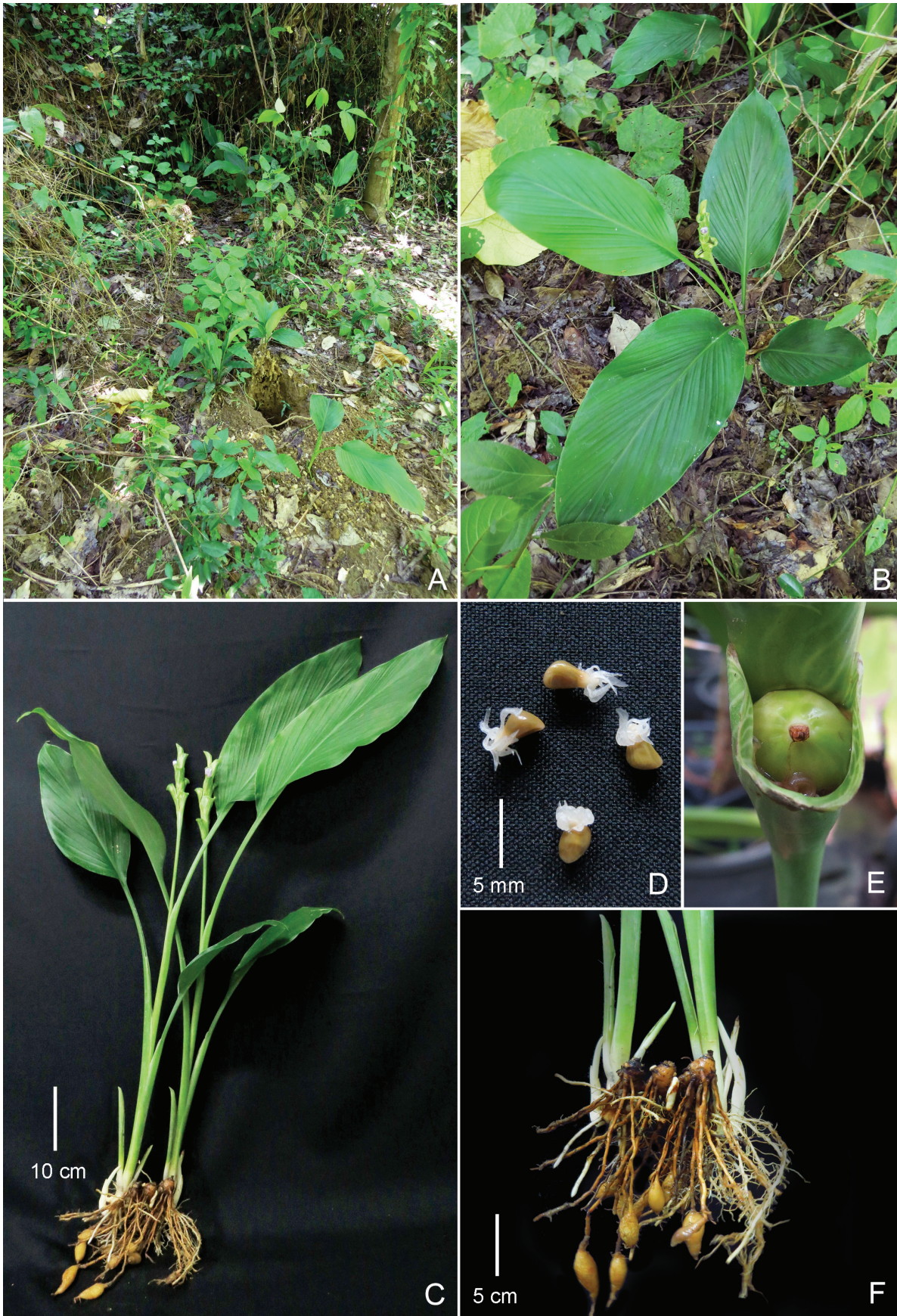


FIGURE 1. *Curcuma papilionacea* Soonthornk., Ongsakul & Škorničk.. A–B. Habitat. C. Plant. D. Seeds. E. Almost ripe fruit. F. Rhizome with root tubers. Photographed by S. Soonthornkalump.

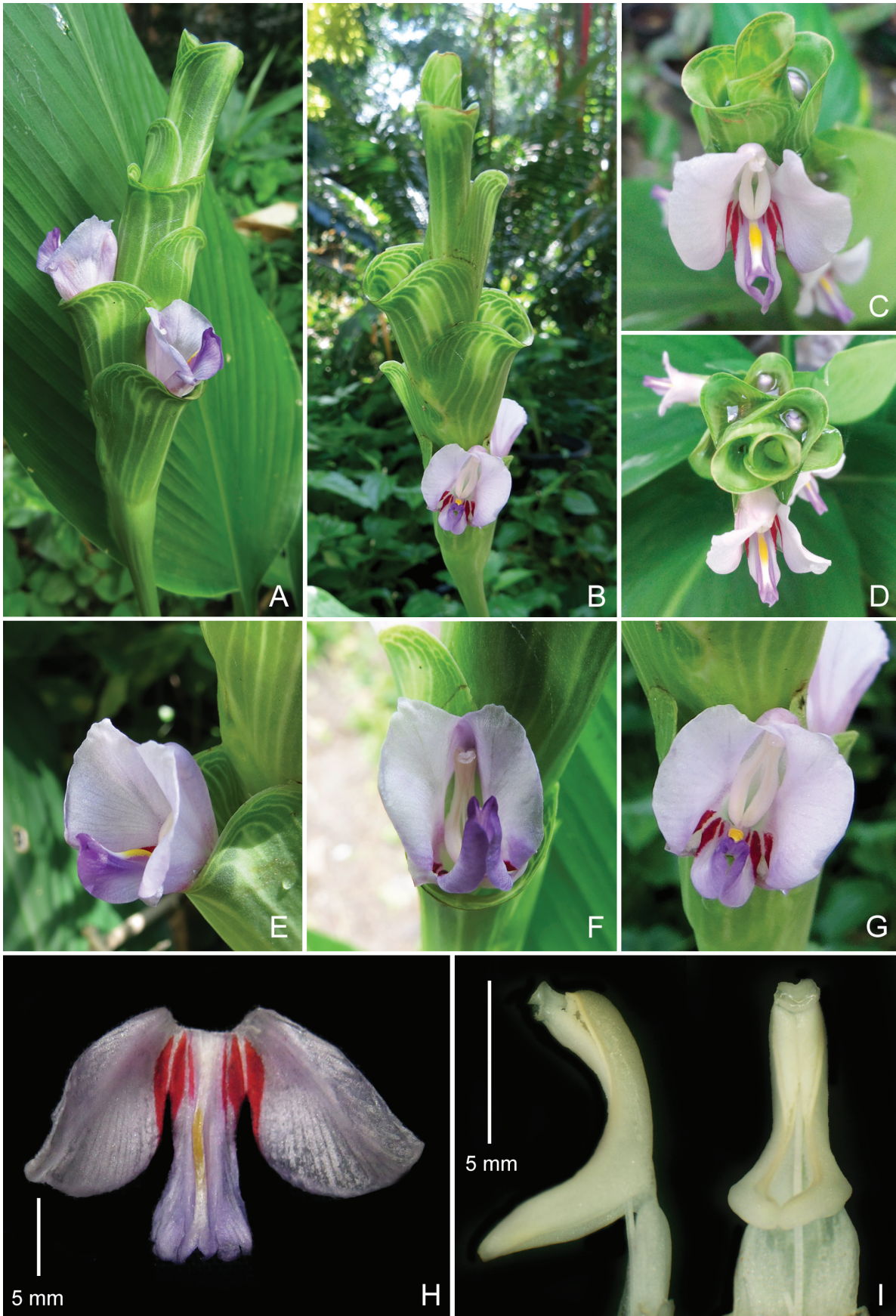


FIGURE 2. *Curcuma papilionacea* Soonthornk., Ongsakul & Škorničk. A–B. Inflorescence. C. Flower (semi-top view). D. Inflorescence (top view). E–G. Flower viewed from different angles. H. Labellum with lateral staminodes attached. I. Stamen in side and front view. Photographed by S. Soonthornkalump, A. Dolaji and A. Ongsakul.

Phenology:—Flowering starts in the early part of the rainy season and lasts from June–July. Fruiting occurs from mid-June and likely continues until early August. The plant goes dormant in January. The flower opens in the morning and lasts a single day. If exposed to strong sunlight and high temperature, the flowers will wilt earlier.

Preliminary IUCN assessment:—The species is currently known only from three populations with approximately 200, 100 and 5 adult individuals respectively, placing the taxon into the Endangered category using criterion D1. As the Extent of Occurrence (EOO) is only 0.262 km², and Area of Occupancy (AOO) is 8 km², and moreover, the area is used for rubber plantations and is not under any legal protection, it is evident that suitable habitat in the area is severely fragmented and continuing to decline in area, extent and quality. Furthermore, this species occasionally appears on sale at a local market as an ornamental. We therefore propose to treat it as Critically Endangered (CR B1a b(iii,v)+B2ab(iii,v)). *Ex situ* conservation is strongly recommended and several plants are being currently conserved at Sulee Nursery and further propagated through seeds as well as through *in vitro* approach. Supplying the horticulture market with *in vitro* propagated stock will hopefully ease the pressure to harvest this species from the wild.

Etymology:—The specific epithet is derived from Latin ‘*papilionaceus*’, which means butterfly-like. It refers to the pea-like appearance of the flower.

Vernacular names and uses:—No uses were reported, except occasional sale of the plant as an ornamental. As this species is likely to become more widespread in horticulture we propose Thai vernacular name Pathumma-Thin-Tai (Bpà-Tum-Maa-Tin-Dtâi; ปทุมมาถิ่นใต้) [Pathumma = the Thai common name for *Curcuma* species, Thin-Tai = native to the southern part of Thailand].

Additional specimens examined (paratypes):—THAILAND. Satun province, La-ngu Dist., Kamphaeng Subdistr., 25 m a.s.l., 19 July 2017, *Annop Ongsakul Ong-0984* (BK); ibidem, growing in rubber tree plantation close to the foothill 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, *Annop Ongsakul, Sutthinut Soonthornkalump & Aumdah Dolaji Ong-1002* (PSU (inclusive spirit)).

Note:—As mentioned in the diagnosis, this species is very easy to distinguish from all other species of *Curcuma* by its pea-like flower. By its flower colour, which combines violet, dark red, white and yellow, it resembles three species in subgen. *Hitcheniopsis*, namely *C. rhabdota*, *C. saraburiensis* and *C. alismatifolia* Gagnep. With the first two species, it also shares the prominently plicate leaf blades, but it is easily distinguished from both of them by its inflorescences with no coma. From *C. alismatifolia*, it can also be distinguished by the lack of coma bracts, and plicate leaves (compared to narrowly elliptic and rather smooth leaf blades in *C. alismatifolia*). It may also be considered somewhat similar to *Curcuma harmandii*, which has inflorescences composed of green bracts without coma, but these bracts are very different in shape with narrowly acute apices, and the flowers are greenish white overall, with a yellow median band on a labellum bordered by a pink tinge, and narrowly oblong lateral staminodes. In addition, *C. papilionacea* occurs only in southern Thailand, while the above four species are confined to Central, Eastern and Northeastern Thailand.

Acknowledgements

The authors thank the Department of Biology, Faculty of Science, Prince of Songkla University for the facilities support. The authors would also like to express their gratitude to Dr Charun Maknoi, Dr Thaya Jenjittikul, Dr Saroj Ruchisansakun and Dr Tidarat Puangpairote for their informative suggestion and Ms Kanokwan Buakeeree for field work support. We also thank Dr Piyakaset Suksathan for sharing photographs of *C. papilionacea* cultivated at Queen Sirikit Botanic Garden and Dr Mark Newman for constructive feedback and language improvements of this manuscript. The research of JL-Š is supported by the National Parks Board, Singapore.

References

- Beentje, H. (2016) *The Kew Plant Glossary, an illustrated dictionary of plant terms* (2nd ed.). Royal Botanic Gardens Kew: Kew Publishing.
- Boonma, T. & Saensouk, S. (2019) *Curcuma saraburiensis* (Zingiberaceae), a new species from Thailand. *Taiwania* 64 (3): 245–248. <https://doi.org/10.6165/tai.2019.64.245>
- Gagnepain, F. (1903 “1902”) Zingibéracées nouvelles de l’herbier du Muséum (1). *Bulletin de la Societe Botanique de France* 49: 247–269.

<https://doi.org/10.1080/00378941.1902.10830936>

- Gagnepain, F. (1907) Zingibéracées, Marantacées et Musacées nouvelles de l'herbier du Muséum. *Bulletin de la Société Botanique de France* 54: 403–413.
<https://doi.org/10.1080/00378941.1907.10831283>
- IUCN Standards and Petitions Subcommittee (2017) *Guidelines for Using the IUCN Red List Categories and Criteria*, ver. 13. Available from: <http://www.iucnredlist.org/documents/RedListGuidelines.pdf> (accessed 4 September 2017)
- Larsen, K. & Larsen, S.S. (2006) *Gingers of Thailand*. Queen Sirikit Botanic Garden, Chiang Mai, 184 pp.
- Leong-Škorničková, J., Šída, O., Jarolímová, V., Sabu, M., Fér, T., Trávníček, P. & Suda, J. (2007) Chromosome numbers and genome size variation in Indian species of *Curcuma* (Zingiberaceae). *Annals of Botany* 100: 505–526.
<https://doi.org/10.1093/aob/mcm144>
- Leong-Škorničková, J. & Luu, H.T. (2013) *Curcuma leonidii*, a new species from southern Vietnam. *Phytotaxa* 126 (1): 37–42.
<https://doi.org/10.11646/phytotaxa.126.1.4>
- Leong-Škorničková, J., Šída, O. & Trán, H.D. (2013) *Curcuma pygmaea* sp. nov. (Zingiberaceae) from Vietnam and notes on two related species *C. parviflora* and *C. thorelii*. *Nordic Journal of Botany* 31: 639–647.
<https://doi.org/10.1111/j.1756-1051.2012.01749.x>
- Leong-Škorničková, J., Šída, O., Závěská, E. & Marhold, K. (2015) History of infrageneric classification, typification of supraspecific names and outstanding transfers in *Curcuma* (Zingiberaceae). *Taxon* 64: 362–373.
<https://doi.org/10.12705/642.11>
- Leong-Škorničková, J., Middleton, D.J., Triboun, P. & Suddee, S. (2017) *Curcuma prasina* (Zingiberaceae), a new species from Thailand. *Edinburgh Journal of Botany* 74 (2): 245–250.
<https://doi.org/10.1017/S0960428617000117>
- Linnaeus, C. (1753) *Species plantarum*, ed. 1. Holmiae [Stockholm]: Impensis Laurentii Salvii.
<https://doi.org/10.5962/bhl.title.669>
- Maknoi, C. (2006) *Taxonomy and phylogeny of the genus Curcuma L. (Zingiberaceae) with particular reference to its occurrence in Thailand*. Dissertation, Prince of Songkla University, Songkhla, Thailand.
- Maknoi, C., Siriruga, P. & Larsen, K. (2011) *Curcuma bella* (Zingiberaceae), a new species from Thailand. *Thai Journal of Botany* 3: 121–124.
- Schumann, K. (1904) Zingiberaceae. In: Engler, A. (Ed.) *Das Pflanzenreich*, IV, vol. 46. Engelmann, Leipzig, pp. 1–458. [<https://www.biodiversitylibrary.org/page/16815036#page/7/mode/1up>]
- Siriruga, P. & Newman, M. (2000) A new species of *Curcuma* L. (Zingiberaceae) from S.E. Asia. *New Plantsman* 7 (4): 196–199.
- Siriruga, P., Larsen, K. & Maknoi, C. (2007) The genus *Curcuma* L. (Zingiberaceae): distribution and classification with reference to species diversity in Thailand. *Gardens' Bulletin Singapore* 59: 203–220.
- Závěská, E., Fér, T., Šída, O., Krak, K., Marhold, K. & Leong-Škorničková, J. (2012) Phylogeny of *Curcuma* (Zingiberaceae) based on plastid and nuclear sequences: proposal of the new subgenus *Ecomata*. *Taxon* 61: 747–763.
<https://doi.org/10.1002/tax.614004>