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Curcuma roseobracteata sp. nov. (Zingiberaceae), a new species from Thailand and distribution notes on the recently described *Curcuma suraponii* Boonma

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Abstract. *Saensouk P, Saensouk S, Maknoi C, Nguyen DD, Boonma T. 2024.* Curcuma roseobracteata *sp. nov. (Zingiberaceae), a new species from Thailand and distribution notes on the recently described* Curcuma suraponii *Boonma. Biodiversitas 25: 3368-3375.* *Curcuma roseobracteata* P. Saensouk, Saensouk, Maknoi & Boonma sp. nov., a newly identified species within the *Curcuma* subgenus *Curcuma* of the Zingiberaceae family, has been found in the northern and southwestern floristic regions of Thailand, distributed in Mae Hong Son, Tak, and Kanchanaburi Provinces. This new species shares similarities with *C. rubrobracteata* Škorničková, M. Sabu & Prasanthkumar, and *C. suraponii* Boonma, but differentiated by its lemon yellow rhizome; leaves base broadly cuneate to rounded, or cordate, abaxial surface with scattered hairs; thyrse oblong ovoid; fertile bracts obovate, rose pink with a pale green base; coma bracts inconspicuous, with 1-4 in number; bracteoles apex rounded with short mucronate; filament c. 3 × 6 mm; anther c. 8.5 × 3.5 mm; epigynous glands c. 4.5 mm long; ovary 2.5-3 × 2.5 mm. The new taxon is formally described here, detailing its morphological characteristics, vernacular name, ecology, phenology, and distribution, which includes updates on the presence of *C. suraponii*, previously recorded only in Tak Province, but now also observed in Mae Hong Son Province. The study includes an IUCN conservation assessment based on recent collections and presents a revised taxonomic key to differentiate the new species from its relatives.

Keywords: *Curcuma*, new species, taxonomy, Thailand, Zingiberaceae

Abbreviations: AAU: Aarhus University Herbarium, BK: Bangkok Herbarium, BM: Natural History Museum, London, BKF: The Forest Herbarium, CALI: Calicut University Herbarium, CMU: Chiang Mai University Herbarium, E: Royal Botanic Garden Edinburgh Herbarium, FOF: Faculty of Forestry Herbarium, K: Royal Botanic Gardens Kew Herbarium, KKU: Khon Kaen University Herbarium, L: National Herbarium Nederland, Leiden University Branch, MH: Madras Herbarium, MSU: Mahasarakham University Herbarium, P: Muséum National d'Histoire Naturelle, PSU: Prince of Songkla University Herbarium, QBG: Queen Sirikit Botanical Garden Herbarium, SING: Singapore Botanic Gardens Herbarium

INTRODUCTION

The genus *Curcuma* L., a diverse group within the family Zingiberaceae, encompasses a wide range of flowering plants prized for their ornamental beauty, culinary purposes, rituals, socio-religious practices, and medicinal properties (Sirirugsa et al. 2007). These plants play significant roles across their native habitats in tropical and subtropical regions, primarily in Asia (Larsen et al. 1999; Larsen and Larsen 2006; Sabu 2006; Leong-Škorničková and Newman 2015), with some species extending into the South Pacific and Australia (Hook 1867; Hemsley 1892; Valeton 1913; 1918). The genus comprises 167 accepted species according to the latest record on the Plant of the World Online database (POWO 2024). Thailand boasts the highest diversity, with 81 native species within all three subgenera, namely *Curcuma*, *Ecomata*, and *Hitcheniopsis* (Záveská et al. 2012; Leong-Škorničková et al. 2015), spread throughout the country. However, the global species total remains uncertain and could potentially be near 180 species due to the existence of unexplored suitable habitats.

The subgenus *Curcuma* is distinguished by its bell-shaped flowers, presence of epigynous glands, and calcarate anthers (Záveská et al. 2012). It has recently reported a new record for Thailand, such as *Curcuma cordata* Wall. and several novel species including *C. globulifera* Škorničk. & Soonthornk., *C. phrayawan* Boonma & Saensouk, *C. rangjued* Saensouk & Boonma, *C. sirirugsae* Saensouk & Rakarcha, *C. suraponii* Boonma, and *C. wanenlueanga* Saensouk, Thomudtha & Boonma (Leong-Škorničková et al. 2020; Saensouk et al. 2021a,b,c; Boonma 2023; Rakarcha et al. 2024). There are currently at least 25 identified and accepted species of *Curcuma*

subgenus *Curcuma* reported in Thailand. It is anticipated that the number of species in this subgenus will increase following our ongoing studies of this genus in Thailand.

Botanical surveys of Zingiberaceae diversity in Thailand have led to the discovery of an undescribed taxon within the subgenus *Curcuma*, found in the forests of Mae Hong Son, Tak, and Kanchanaburi Provinces. This undescribed species exhibits morphological similarities with *C. rubrobracteata* Škorničková, M. Sabu & Prasanthkumar (Leong-Škorničková et al. 2003) which *C. rubrobracteata* was previously recorded for Thailand since 2005 (Maknoi et al. 2005). Moreover, in the same subgenus *Curcuma*, the undescribed taxon is also similar to *C. suraponii* Boonma, a recently described species but displays distinct features that set it apart from its closest relatives within the genus. Additionally, new distribution areas for *C. suraponii* have been discovered, extending its previously documented range from Tak Province to the forest area of Mae Hong Son Province. Therefore, this study aimed to describe comprehensively this undescribed species as a new species to science, providing details on its morphological characteristics, vernacular name, ecological preferences, phenological patterns, distribution map, and conservation status. Moreover, updated distribution records for *C. suraponii* now include Mae Hong Son Province. Furthermore, a revised taxonomic key is presented to facilitate accurate identification of this new species and distinguish it from closely related taxa.

MATERIALS AND METHODS

Study area

Plant materials of the new species *Curcuma roseobracteata* were gathered between 2020 and 2023 from Mae Hong Son and Tak Provinces in Northern Thailand, as well as from Kanchanaburi Province in Southwestern Thailand. For *Curcuma suraponii*, samples were collected from Mae Hong Son Province, Northern Thailand, on June 15, 2024 (Figure 1).

Procedures

Morphological observation was conducted on living specimens taken from their natural habitats, using a stereoscopic microscope (Stemi 2000-C, ZEISS, Oberkochen, Germany). The specimens used in this study, including the holotype and additional samples were deposited at the Faculty of Forestry Herbarium (FOF) in Laos.

Some additional specimens were also placed in the Mahasarakham University Herbarium (MSU). Additionally, specimens of allied species were accessed both onsite and online from various herbarium collections, including: Aarhus University Herbarium (AAU), Bangkok Herbarium (BK), The Forest Herbarium (BKF), Calicut University Herbarium (CALI), Chiang Mai University Herbarium (CMU), Royal Botanic Garden Edinburgh Herbarium (E), Faculty of Forestry Herbarium (FOF), Royal Botanic Gardens Kew Herbarium (K), Khon Kaen University Herbarium (KKU), National Herbarium Nederland, Leiden University Branch (L), Madras Herbarium (MH), Mahasarakham University Herbarium (MSU), Muséum National d'Histoire Naturelle (P), Prince of Songkla University Herbarium (PSU), Queen Sirikit Botanical Garden Herbarium (QBG), and Singapore Botanic Gardens Herbarium (SING). The localities of the specimens were plotted on a map to illustrate their distribution alongside that of our new species (Figure 1).

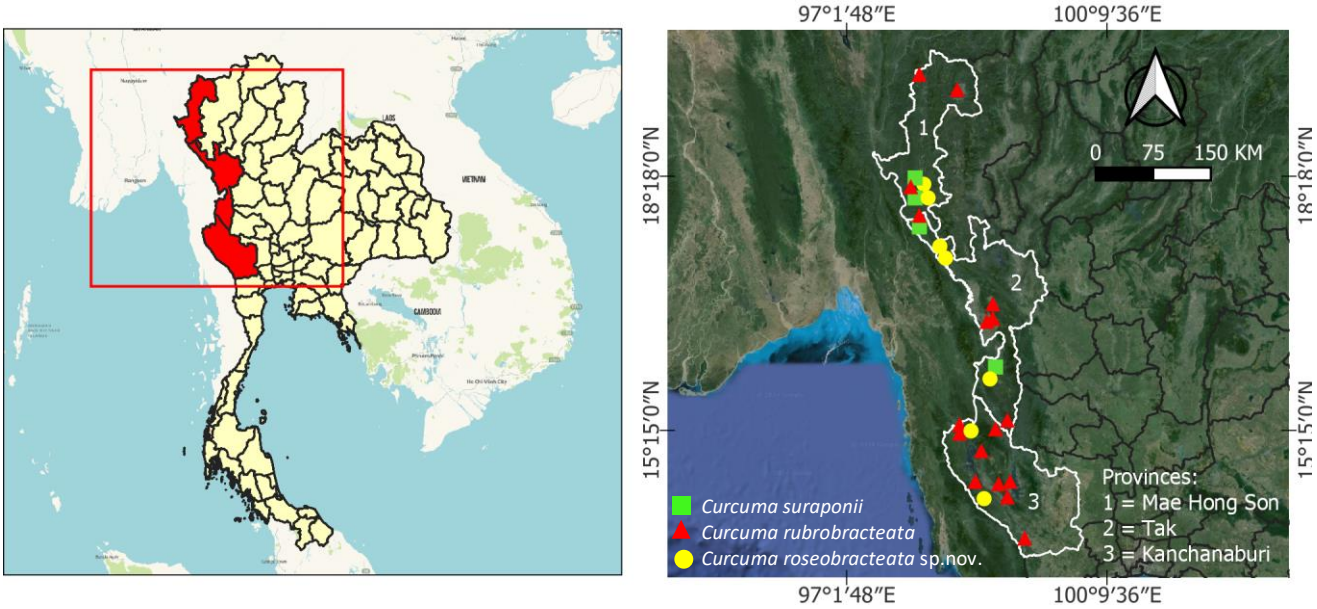

Figure 1. Distribution map of *Curcuma roseobracteata* P. Saensouk, Saensouk, Maknoi & Boonma sp. nov., *C. rubrobracteata* Škorničková, M. Sabu & Prasanthkumar, and *C. suraponii* Boonma

The distribution of *C. rubrobracteata* Škorničková, Sabu & Prasanth is illustrated in Figure 1. This species is native to Bangladesh, China, India, Myanmar, and Thailand, as supported by the following specimens collected and housed in various herbaria:

(i) Bangladesh: Chittagong, Rangamati District, Rampahar, Baluchhara, Longitude: 92°11'5"E, Latitude: 22°30'3"N, 6 September 1999, Newman M.F. & Rahman M.A. 984 (E).

(ii) China: Southern Yunnan, Menghai Xian (Chen and Xia 2010) (South China Botanical Garden, Chinese Academy of Sciences).

(iii) India: Mizoram, Lawngtlai District, on the way to Ngengpui Wildlife Sanctuary-Khomoi, 10 September 2002, Škorničková & Prasanthkumar 86241 (Holotype MH; isotype CALI, K, SING); Mizoram, Lawngtlai District, 10 September 2002, Škorničková & Prasanthkumar 86239 (CALI).

(iv) Myanmar: Shan state, Me Mue, Longitude: 98°25'E, Latitude: 22°N, Altitude: 400 m, 17 June 1922, Kerr A.F.G. 6145 (E); Sagaing Division, Katha District, Mohuyin Reserve, 9 July 1911, Lace J.H. 5324 (E); Mawlamyine, 7 August 2023, Boonma MM23801 (MSU).

(v) Thailand:

Northern floristic region:

Chiang Mai Province: Doi Chiang Dao, 12 July 1950, Garrett 1334 (K);: Mae Rim, 17 July 1968, Larsen et al. 2586 (AAU, BKF); Along the road Fang-Chiang Mai, 27 July 1968, Larsen et al. 2766 (AAU, BKF); Doi Nawong Hoy, Mae Rim Sa-Moeng road, 10 August 1989, Maxwell 89-1019 (CMU, E); Doi Chiang Dao, 25 June 1989, Maxwell 89-807 (CMU); Mok Fa Falls, along Mae How stream, 18 August 1990, Maxwell 90-890 (CMU); Ban Wieng Pa, Fang, 8 July 1991, Maxwell 91-619 (AAU, CMU, E, P); Wahng Hahng Falls, Doi Suthep-Pui, 10 September 1992, Palee 74 (CMU); 17 August 1998, Serm 103, QBG no. 11776 (QBG); Mae Sa Noi Waterfall, QBG, 18 July 2003, Maknoi 337 (AAU, BKF, PSU, QBG); Mae Mao reservoir, Fang, 22 July 2003, Maknoi *358* (AAU, BKF, PSU, QBG)

Lampang Province: Muang Ngao, 15 July 1931, Put 3998 (C, K, L); Hang Chat, Doi Khun Than National Park, 29 July 1994, Maxwell 94-821 (CMU); Jae Son National Park, Mueang Pan, 24 August 1995, Maxwell 95-576 (BKF, CMU); Jae Son National Park, Pha Ngaem (Nahn Kaht) cave, 25 August 1995, Maxwell 96-1137 (BKF, CMU); Jae Son National Park, Mueang Pan, 24 May 1996, Panatkool 53 (CMU); Jae Son National Park, Wang Nuea, 2 June 1996, Maxwell 96-781 (CMU); Jae Son National Park, Wang Nuea, 27 June1996, Maxwell 96-918 (CMU)

Mae Hong Son Province: Mae Sariang District, 17 July 1998, Kress 98-6213 (AAU); Ban Pang Pake, Pai, 24 July 2003, Maknoi 377 (AAU, BKF, PSU, QBG); Mueang District, Pha Daeng Cave, Tham Pla - Namtok Pha Suea NP., Altitude 581 m., 22 August 2013, M. Norsaengsri 10609 (QBG); Altitude 1400 m., 10 September 2014, W. Pongamornkul 4429 (QBG); Altitude 848 m., 19 July 2015, P. Phaosrichai 240 (QBG)

Phitsanulok Province: Thung Salaeng Luang National Park, 25 July 1966, Larsen et al. 878 (AAU, BKF, P)

Phayao Province: Altitude 1030 m., 14 August 2013, W. La-ongsri, P. Panyachan, P. Tatiya, S. Satatha 3043 (QBG); Altitude 1083 m., 24 June 2014, W. La-ongsri, P. Panyanchan, P. Tatiya 3430 (QBG); Altitude 1000 m., 26 August 2014, W. La-ongsri, K. Kertsawang, P. Panyanchan & P. Tatiya 3664 (QBG)

Tak Province: Thung Yai, 17 June 1922, Kerr 6145 (BK, BM, C, K); Mae Moei, Muan, 20 June 1922, Kerr 6145A (BK,BM, K); Mae Sot District, Mu Kee Haw (Karen) village, Pawo, 18 August 1994, Maxwell 94-893 (BKF, CMU); Khao Pha Wo, 23 July 1973, Murata et al. T16871 (AAU, BKF); Mae Sot, 14 July 1999, Ngamriabsakul 45 (BKF, E); Chedi Ko, Mae Sot, 11 July 1972, Smitinand & Seidenfaden 11621 (AAU, BKF, L).

Northeastern floristic region:

Loei Province: Dan Sai District, Altitude c. 775 m., 28 July 2023, Boonma 2371 (MSU).

Southwestern floristic region:

Kanchanaburi Province: Between Huai Ban Kao and Kriti, 2 July 1973, Geesink et al. 6071 (C); Ka Tha Lai, Wangka, 4 June 1946, Kostermans 798 (BKF, K, P); Thung Kang Yang, 2 July 1963, Larsen et al. 10431 (AAU); Thung Kang Yang, 2 July 1963, Larsen et al. 10441 (AAU); Thung Kang Yang, 6 July 1963, Larsen et al. 10538 (AAU); Srisawat, 26 June 1974, Larsen et al. 33800 (AAU, K, QBG); Thong Pha Phum to Sangkhla Buri, 11 Aug. 2003, Maknoi 453 (AAU, BKF, PSU, QBG); Thong Pha Phum, 6 July 1973, Maxwell 73-174 (AAU, BK); Huai Ban Kao, 13 July 1973, Maxwell 73-293 (AAU, BK); Thung Yai Naresuan, Sangkhla Buri, 17 June 1993, Maxwell 93-645 (CMU); Klu Nam Ron, 27 June 1934, Put 32 (K); Hin Dat, 29 June 1926, Put 39 (K); Ban Wang Kalang, Pan Paung River Valley, Ka Tha Lai, 4 June 1946, Kostermans A.J.G.H. 798 (K, P).

RESULTS AND DISCUSSION

A new species, *Curcuma roseobracteata* Saensouk, P. Saensouk, Maknoi & Boonma, belonging to the *Curcuma* subgenus *Curcuma* has been identified. This species is distributed in Mae Hong Son and Tak Provinces in Northern Thailand, as well as in Kanchanaburi Province in Southwestern Thailand, according to the floristic regions of Thailand (Figure 1). A morphological comparison is provided to differentiate this new species from related species (Table 1). Furthermore, an identification key is included to help distinguish this species and its close relatives.

Taxonomic treatment

Curcuma roseobracteata Saensouk, P. Saensouk, Maknoi & Boonma sp. nov. (Table 1, Figures 2 and 3)

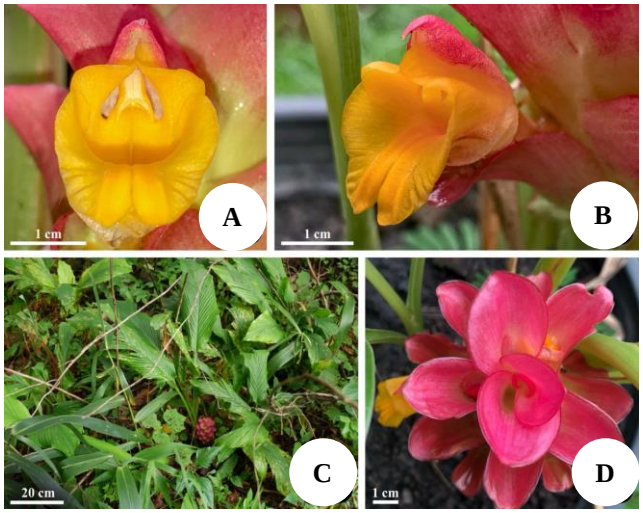

Figure 2. *Curcuma roseobracteata* P. Saensouk, Saensouk, Maknoi & Boonma sp. nov: A. Front view of flower, B. Semi side view of flower, C. Natural habitat, D. Top view of inflorescence. Photographs and designs by Thawatphong Boonma

Diagnosis

A new species is similar to *C. rubrobracteata* Škorničková, M. Sabu & Prasanthkumar, but differentiated by its lemon yellow rhizome (vs. *C. rubrobracteata* whitish yellow rhizome); pubescent sheaths (vs. glabrous); leaves base broadly cuneate to rounded, or cordate, abaxial surface with scattered hairs (vs. base attenuate, abaxial surface glabrous); peduncle 15-28 cm long, pale green (vs. 5-10 cm long, whitish); thyrse oblong ovoid (vs. subglobose); fertile bracts 25-46 bracts per thyrse, obovate, connate about 2-3 cm long, rose pink with a pale green base, pubescent on both surfaces (vs. 20-26 bracts per thyrse, suborbicular, connate only at the base, red with yellow or yellowish green base, glabrous, except hairy along the margin); coma bracts inconspicuous, with 1-4 in number (vs. absent); bracteoles apex rounded with short mucronate, pubescent (vs. apex acute, glabrous); floral tube 3.3-3.5 cm long, pubescent (vs. 3.7-4 cm long, glabrous); corolla lobes pubescent (vs. glabrous); staminodes 1.75-1.9 × 1.25-1.3 cm, apex rounded (vs. c. 1.0 × 1.1 cm, apex obtuse); filament c. 3 × 6 mm (vs. c. 5 × 4 mm); anther c. 8.5 × 3.5 mm (vs. c. 6 × 2.5 mm).

Type

Thailand, Tak Province, Tha Song Yang District, Altitude 650 m asl., Surapon & Boonma 23608, 8 June 2023 (holotype FOF!; isotype MSU!).

Description

Perennial herb. **Leafy shoot** 30-80 cm tall. **Rhizome** ovoid, internally lemon yellow, slightly aromatic with slender branches rhizome. **Roots** fibrous, bearing ellipsoid to ovoid tuberous structures, whitish internally. **Pseudostem** green or with reddish tinge; **bladeless sheath**, 2-4 in number, 5-32 cm in length, pubescent and displays a green coloration or with a reddish tinge and exhibits a mucronate apex with hairs. **Leaf sheaths** distichous, 8-39 cm in length, green or with a reddish tinge, and pubescent. **Ligule** membranous, 3-4 mm long, bilobed, each lobe rounded apex, pubescent. **Leaves** 4-7 in number; **petioles** sessile to 10-32 cm long (first leaf usually sessile or subsessile), green or with a reddish tinge; **laminae** elliptic to lanceolate, 15-52 × 7-17 cm, apex acuminate, base broadly cuneate to rounded, rarely cordate, margin entire with slightly undulate, whitish semi-translucent hyaline, adaxial surface green, midrib green, and prominently embossed veins with sparse hairs along the veins, the abaxial surface is paler green and with scattered hairs. **Inflorescence** terminal at the distal part of the pseudostem or protruding through the lateral slits measuring 10-18 cm above the ground; **peduncle** 15-28 cm in length, pale green. **Thyrse** oblong to ovoid, 9-15 × 7-9 cm. **Fertile bracts** 25-46 in number, broadly obovate, and 3-5 × 1.5-4 cm. The distal part of the lower bracts appears rounded, and the upper bract is more narrowly obtuse apex than the lower bracts, pubescent on both surfaces, rose pink with a pale green base, connate 2-3 cm long, 5-12 flowers per thyrse open at the same time. **Coma bracts** inconspicuous, with 1-4 coma bracts, obovate shape, apex narrowly obtuse, rose pink. **Bracteoles** obovate, 2-3 x 1-1.8 cm, keeled, hooded. Apex rounded with short mucronate, one per flower, yellowish white at the base and pinkish tinge at the distal part, pubescent. **Cincinnus** with 3-4 flowers. **Flower** 5.2-5.5 cm long, pubescent. **Calyx** tubular, apex trilobes, each lobe rounded, approximately 1 cm long, with an incision up to 4 mm long, pubescent. **Floral tube** slender and tubular, 3.3-3.5 cm in length, the distal part is larger in diameter than the basal part, pubescent, and yellow; **dorsal corolla lobe** triangular-ovate, 1.7-1.9 × 1.0-1.2 cm, apex mucronate 2.5-3 mm long, hooded, yellowish at the base with pinkish distal part and pubescent; **lateral corolla lobes** triangular-ovate, 1.6-1.8 × 1.0-1.2 cm, with obtuse apices, hooded, yellowish at the base with pinkish distal part and with sparse hairs. **Lateral staminodes** uniquely asymmetrical obovate, 1.75-1.9 × 1.25-1.3 cm, with rounded apices, yellow, and pubescent. **Labellum** broadly obovate, 1.86-2.0 × 1.7-1.8 cm, with an emarginate apex to become bilobed at the distal part, featuring a sinus up to 3-3.5 mm long, lobes yellow, with a slightly deeper yellow mediant band along the mid-lobe of the labellum, pubescent. **Stamen** 1; **filament** c. 3 mm long, c. 6 mm wide at the base, yellow, pubescent; **anther** c. 8.5 × 3.5 mm; **anther thecae** approximately 5 mm in length, with whitish pollen; **anther crest** inconspicuous, equal to the anther lobe, approximately 0.5 mm in length, with a rounded apex; **anther spurs** slightly flattened conical, measurement c. 3 mm long. **Epigynous glands** 2 in number, slender, c. 4.5 mm long, and yellowish, with blunt apices. **ovary** subglobose, 2.5-3 × 2.5 mm, pubescent; **style** slender, white; **stigma** ciliate, laterally opened, approximately 1 mm wide, yellowish, and shaped like an inverted cone. **Fruits and Seeds** not seen.

Additional specimens

Thailand, Northern floristic region: Tak Province: Tha Song Yang District, 27 July 2003, Maknoi 388 (AAU, BKF, PSU, QBG); Tha Song Yang District, 26 July 2004,

Maknoi 564 (AAU, BKF, PSU, QBG); Tha Song Yang District, Surapon 23609, 8 June 2023 (MSU); Mae Hong Son Province: Mae Sariang District, Boonma 19716, 16 July 2019 (MSU); Sob Moei District, Boonma 20809, 9 August 2020 (MSU); Southwestern floristic region: Kanchanaburi Province: Sangkhla Buri District, Boonma 18815, 15 August 2018 (MSU); Thong Pha Phum District, Boonma 20890, 9 August 2020 (MSU); Thong Pha Phum District, Boonma 23105, 5 October 2023 (MSU).

Vernacular name

"Ngu-Hao Chomphoo" is the Thai vernacular name, derived from two words: "Ngu-Hao," meaning cobra, and "Chomphoo," meaning pink. This name has been used for a long time in the market and is especially well-known to Thai ginger enthusiasts. It is adapted from the vernacular name of *C. rubrobracteata*, which is called "Wan Ngu-Hao." In contrast, the new species, *C. roseobracteata*, bears a resemblance to *C. rubrobracteata*, but is distinguished by its pink bracts, hence the name "Ngu-Hao Chomphoo" to represent this notable difference in bract color.

Etymology

The specific epithet "*roseobracteata*" is derived from the Latin words "roseus," meaning rose-colored, and "bracteatus," meaning furnished with bracts. This name denotes the distinguishing feature of the species, which possesses rose-colored bracts. This characteristic differentiates it from related species within the genus *Curcuma*. The epithet was selected to emphasize this notable and visually distinct trait.

Distribution

This newly discovered plant is currently endemic to Thailand. Our forthcoming surveys will seek to gather evidence and specimens to confirm its presence in Myanmar, where it is expected to occur.

Ecology

The *C. roseobracteata* thrives in soil composed of sandy loam and pebbles. It prefers habitats with high moisture levels and is found at elevations higher than 450 m asl., growing in semi-shaded areas. In Tak Province, it occurs in open to semi-shaded areas along small streams and watercourses, often in association with *Zingiber zitriodorum* Theilade & Mood. In Mae Hong Son Province, it grows alongside *Globba schomburgkii* Hook.f. and *C. suraponii* Boonma, which were observed in nearby areas. Additionally, in Kanchanaburi Province, *C. roseobracteata* is found in the same natural habitat as *Globba stenothyrsa* Baker and *Zingiber xishuangbannaense* S.Q.Tong. Notably, despite the presence of these related species, *C. rubrobracteata* was not found in mixed populations with *C. roseobracteata*; instead, *C. rubrobracteata* was observed in nearby areas at different altitudes.

Phenology

This species undergoes dormancy from late December to April. Following the first rains, it prepares for producing new shoots. Flowering typically occurs between late June and September, with most anthesis events taking place early in the morning.

Utilization

The *C. roseobracteata* is recognized in the market under the Thai vernacular name “Ngu-Hao Chomphoo”. Its vibrant rose-pink bracts and attractive appearance make it a popular choice for ornamental horticulture. The species is cultivated as a decorative potted plant and is valued for enhancing tropical garden displays.

Conservation status

The *C. roseobracteata* is classified as Vulnerable [VU B1B2ab(iv,v); C1a(i)] according to the IUCN red list categories and criteria version 16 (IUCN 2024). This assessment is based on the species' current Extent of Occurrence (EOO), which encompasses approximately 18,500 km², and its Area of Occupancy (AOO), which is confined to 7 locations totalling less than 800 km². This classification underscores the species' vulnerability to extinction, primarily due to habitat degradation exacerbated by global warming and potential threats from human activities. Since 2019, it has been observed that at least 100 mature plants are sold annually in markets and this trend of removing plants from their natural habitat has been increasing each year. If these practices persist without intervention, *C. roseobracteata* faces a high risk of extinction in the near future. Urgent conservation measures are essential to address these threats. These measures should focus on protecting the natural habitats of *C. roseobracteata*, mitigating threats and ensuring the species' long-term survival. Effective strategies should include designating non-protected areas where the species occurs as Other Effective Area-Based Conservation Measures (OECMs), actively engaging local communities, and educating the public on the importance of biodiversity and sustainable propagation methods to reduce the direct removal of plants from the forest. These actions are crucial for preserving the species and maintaining its ecological significance within its restricted range.

Additionally notes on *Curcuma suraponii* Boonma

The *C. suraponii* was recently described from Umphang District, Tak Province, Northern Thailand. The type specimens and paratypes cited in the original publication were collected from a single population in Umphang District. Initially, the species was assessed as Data Deficient (DD) by the author [Thailand, Tak Province, Umphang District, Altitude 600 m.a.s.l., 16 July 2021, Boonma 2201 (KKU, QBG)] (Boonma 2023). In current study, we discovered three additional populations: one in Tha Song Yang District in northern Tak Province [Tak Province, Tha Song Yang District, 9 October 2023, Surapon and Boonma 231 (MSU)], and two in Mae Sariang and Sob Moei Districts of Mae Hong Son Province, Northern Thailand [Mae Hong Son Province, Sob Moei District, 9 October 2023, Surapon and Boonma 232 (MSU); Mae Hong Son Province, Mae Sariang District, 9 October 2023, Surapon and Boonma 233 (FOF)]. This discovery expands the Extent of Occurrence (EOO) of *C.*

suraponii to approximately 6,000 km², with the number of known locations increasing to four. However, the Area of Occupancy (AOO) remains limited to approximately 5 km², and all populations are situated in non-protected areas, rendering them vulnerable to human activities.

After *C. suraponii* was published as a new species, over 200 mature plants were observed being sold in local and online markets by late 2023. This rising trend of plant removal from natural habitats significantly elevates the risk of extinction for this species if these practices persist without intervention. Urgent conservation measures are imperative to mitigate these threats. Strategies should focus on safeguarding natural habitats, promoting sustainable propagation methods before the species is sold to reduce their removal from natural habitats, and ensuring the long-term survival of *C. suraponii*. These measures should include designating protected areas such as OECMs, engaging local communities, and promoting public education on the importance of biodiversity. Consequently, we recommend revising the conservation status of *C. suraponii* to Endangered [EN B2ab(ii, iii) & C2a(i, ii)] (IUCN 2024).

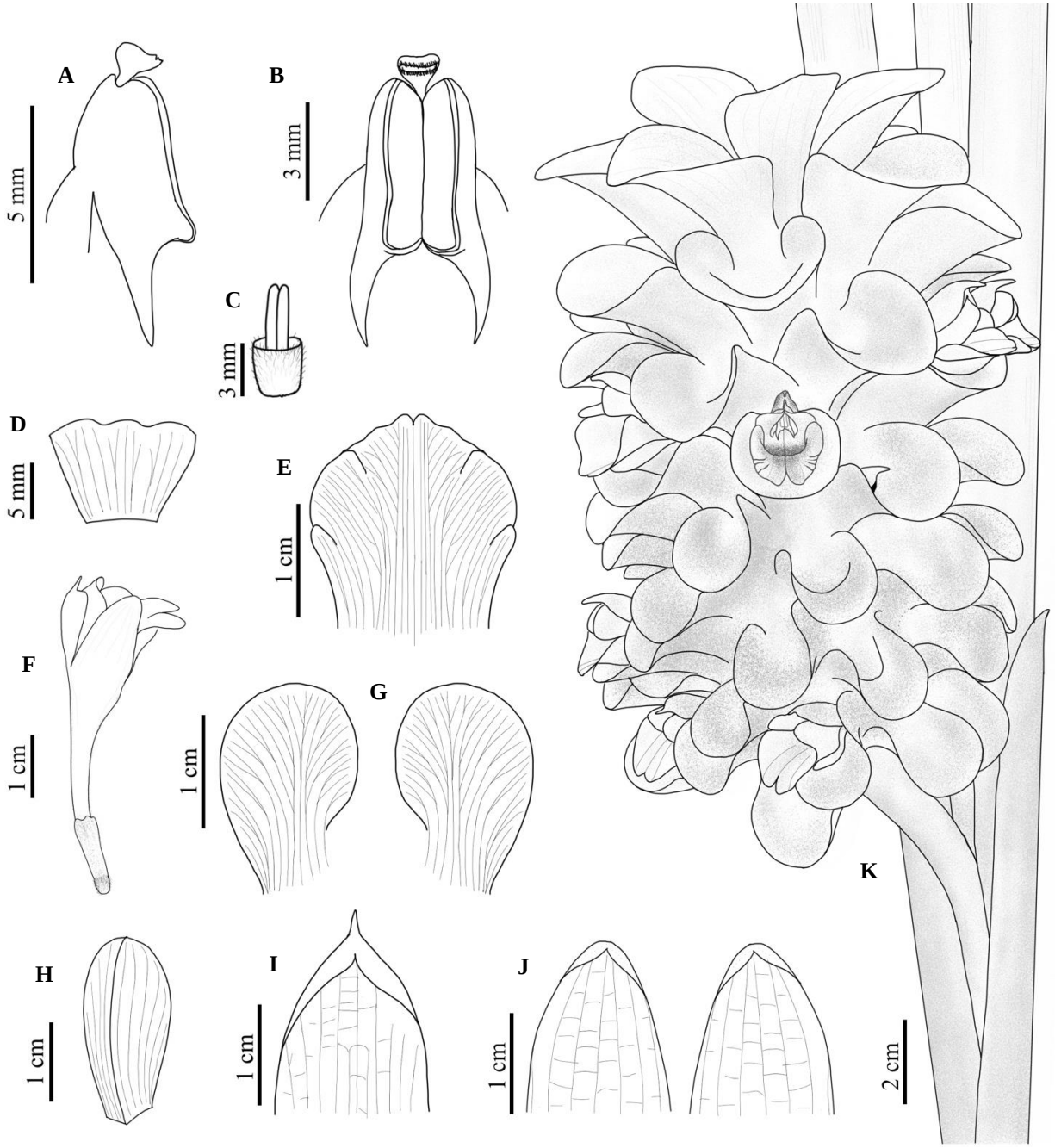

Figure 3. *Curcuma roseobracteata* P. Saensouk, Saensouk, Maknoi & Boonma sp. nov: A. Side view of anther, B. Front view of anther, C. Ovary and epigynous glands, D. Dissection of calyx, E. Labellum, F. Flower, G. Lateral staminodes, H. Bracteole, I. Dorsal corolla lobe, J. Lateral corolla lobes, K. Side view of inflorescence with flowers. Drawn by Thawatphong Boonma

Table 1. Diagnostic character of *Curcuma roseobracteata* P. Saensouk, Saensouk, Maknoi & Boonma sp. nov., and *C. rubrobracteata* (Leong-Škorničková et al. 2003), and *C. suraponii* (Boonma 2023)

Characters	*C. suraponii*	*C. rubrobracteata*	*C. roseobracteata* (present study)
Rhizome	Yellow, non-creeping	Whitish yellow, creeping	Lemon yellow, creeping
Pseudostem	Green	Green	Green or with a reddish tinge
Bladeless sheath	Pubescent	Glabrous	Pubescent
Ligule	5-6 mm long	1-2 mm long	3-4 mm long
Leaves	Base attenuate, abaxial surface glabrous	Base attenuate, abaxial surface glabrous	Base broadly cuneate to rounded, or cordate, abaxial surface with scattered hairs
Inflorescence	Terminal, protruding through lateral slits 15-20 cm above the ground	Terminal, protruding through lateral slits 3-10 cm above the ground	Terminal, at the distal part of the pseudostem or protruding through lateral slits 10-18 cm above the ground
Peduncle	20-25 cm long, greenish	5-10 cm long, whitish	15-28 cm long, pale green
Thyrse	Cylindrical, 15-25 × 9-10 cm	Subglobose, 10 × 7-9 cm	Oblong to ovoid, 9-15 × 7-9 cm
Fertile bracts	Broadly obovate, 28-35 per thyrse, 4.5-5 × 3.3-3.7 cm, connate about 2-3 cm long, ruby at distal part with pale green to the base, pubescent, cincinnus with 3-5 flowers	Suborbicular, 20-26 bracts per thyrse, c. 3.5 × 3.5 cm, connate only at the base, red with yellow or yellowish green base, glabrous, except hairy along the margin, cincinnus with 5-6 flowers	Obovate, 25-46 bracts per thyrse, 3-5 × 1.5-4 cm, connate about 2-3 cm long, rose pink with a pale green base, pubescent on both surfaces, cincinnus with 3-4 flowers
Coma bracts	Present, 5-9 in number, ruby at distal half and greenish white to the base	Absent	Inconspicuous, with 1-4 in number, rose pink
Flowering	Several flowers per thyrse open at the same time	Usually 1-3 flowers per thyrse open at the same time	5-12 flowers per thyrse open at the same time
Bracteole	3.0-3.8 cm long, apex acute, pubescent	2-3.5 × 1-3 cm, apex acute, glabrous	2-3 × 1-1.8 cm, apex rounded with short mucronate, pubescent
Flower	5.5-5.6 cm long	C. 6 cm long	5.2-5.5 cm long
Calyx	Apex trilobed, each lobe apex truncate, c. 1.0 cm long, incision up to 3 mm long, pubescent	Apex 3-toothed, each lobe acute, c. 1.2 cm long, incision c. 2 mm long, glabrous	Apex 3-lobes, each lobe rounded, c. 1 cm long, incision up to 4 mm long, pubescent
Floral tube	C. 4 cm long,	3.7-4 cm long, light orange, glabrous	3.3-3.5 cm long, yellow, pubescent
Corolla lobes	Sparsely hairy, dorsal: 1.6-1.7 ×1.0-1.1 cm, lateral : 1.6-1.7 ×1.0-1.1 cm	Glabrous, dorsal: 1.4 × 0.8 cm, lateral: 1.2 × 0.7 cm	Pubescent, dorsal: 1.7-1.9 × 1.0-1.2 cm, lateral: 1.6-1.8 × 1.0-1.2 cm
Staminodes	1.45-1.6 × 0.9-1.0 cm, apex rounded	C. 1.0 × 1.1 cm, apex obtuse	1.75-1.9 × 1.25-1.3 cm, apex rounded
Filament	4.5-5.0 mm long, c. 3.5 mm wide at the base	C. 5 mm long, c. 4 mm wide at the base	C. 3 mm long, c. 6 mm wide at the base
Anther	C. 7.2 × 2 mm	C. 6 × 2.5 mm	C. 8.5 × 3.5 mm
Epigynous glands	C. 4 mm long	C. 4 mm long	C. 4.5 mm long
Ovary	C. 4 × 3 mm	C. 2 × 2.5 mm	2.5-3 × 2.5 mm

Discussion

The *C. roseobracteata* P. Saensouk, Saensouk, Maknoi & Boonma sp. nov., belongs to the subgenus *Curcuma* (Záveská et al. 2012) due to its bell-shaped flowers, presence of epigynous glands, and calcarate anthers. While similar to *C. rubrobracteata* Škorničková, M. Sabu & Prasanthkumar, it exhibits several distinguishing features that collectively set the new species apart. Furthermore, despite the morphological similarities between *C. roseobracteata* and *C. suraponii* and their occurrence in nearby areas, several notable differences distinguish these two species. These distinguishing features and differences are presented in Table 1.

Although thriving in high-altitude, high-moisture zones and being found near similar species, *C. roseobracteata* is never observed growing in mixed populations with *C. rubrobracteata* or *C. suraponii*. These morphological differences not only reflect the distinct evolutionary adaptations of *C. roseobracteata,* but also provide insights into the speciation mechanisms and ecological adaptations within the genus *Curcuma*. The comparative analysis reveals that *C. roseobracteata* occupies a unique niche within the genus, contributing to the understanding of species diversity and evolutionary processes in *Curcuma*. The results of this study underscore the significance of morphological traits in the classification and differentiation of species within this complex and diverse genus. Identification key among the new species and its closely related species are as follows:

Identification key to *C. roseobracteata* and its closely related species

1a. Rhizome non-creeping; thyrse cylindrical, > 15 cm long…..……..……*C. suraponii*
1b. Rhizome creeping; thyrse oblong ovoid or subglobose, < 15 cm long……..……....2
2a. Fertile bracts connate about 2-3 cm long, rose pink with a pale green base, pubescent on both surfaces; leaf abaxial surface with scattered hairs……..……*C. roseobracteata*
2b. Fertile bracts connate only at the base, red with yellow or yellowish green base, glabrous except hairy along the margin; leaf abaxial surface glabrous……..……*C. rubrobracteata*

In conclusion, *C. roseobracteata* P. Saensouk, Saensouk, Maknoi & Boonma sp. nov., identified within the *Curcuma* subgenus *Curcuma*, represents a significant addition to the family Zingiberaceae, specifically within the floristic regions of Northern and Southwestern Thailand. The distinct morphological characteristics set *C. roseobracteata* apart from its close relatives, *C. rubrobracteata* and *C. suraponii*. The absence of mixed populations with these species despite similar ecological niches highlights the unique evolutionary adaptations of *C. roseobracteata*. This discovery not only enriches the understanding of species diversity within the genus *Curcuma* but also emphasizes the importance of detailed morphological analysis in plant taxonomy. The findings from this study contribute to a broader comprehension of speciation mechanisms and ecological adaptations, reinforcing the critical role of morphological traits in the classification and differentiation of species within this complex and diverse genus. The key to new species with its closely related species and the IUCN conservation assessment further underscore the importance of continued botanical exploration and conservation efforts in the region.

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