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TWO NEW SPECIES OF *KAEMPFERIA* (ZINGIBERACEAE) FROM THAILAND

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ABSTRACT

Two new species of *Kaempferia* section *Kaempferia*, *K. minuta* Jenjitt. & K. Larsen and *K. pardi* K. Larsen & Jenjitt. are described and illustrated.

Keywords: *Kaempferia minuta*, *Kaempferia pardi*, new taxa, taxonomy

INTRODUCTION

Kaempferia is one of the most gorgeous flowered genera in Zingiberaceae, established by Linnaeus (1753). It comprises about 40 accepted species, distributed around Indochina and throughout Southeast Asia (Sirirugsa, 1989, 1992). The center of *Kaempferia* diversity is Thailand and its neighboring regions, particularly in Lao PDR (Larsen & Larsen, 2006; Leong-Škorničková & Newman, 2015). There are currently 27 native species already formally described, while more undescribed taxa are being continuously discovered from Thailand (Nopporncharoenkul & Jenjittikul, 2017, 2018; Saensouk & Saensouk, 2018). Several species are treated as rare plants endemic to Thailand. For example, *K. grandifolia* Saensouk and Jenjitt. and *K. koratensis* Picheans. are only found in Northeastern and Eastern Thailand, respectively. *K. saraburiensis* Picheans. and *K. lopburiensis* Picheans. are so far known only from limestone habitats in Central Thailand, and *K. noctiflora* Nopporncharoenkul & Jenjitt. is only found in Northern Thailand (Saensouk & Jenjittikul, 2001; Picheansoonthon, 2010, 2011; Nopporncharoenkul & Jenjittikul, 2017). Since *K. scaposa* (Nimmo) Benth. & Hook.f., the only member belonging to *Kaempferia* section *Stachyanthesis* Benth., was transferred to genus *Curcuma* L. and named *C. scaposa* (Nimmo) Škorničk. & M. Sabu (Leong-Škorničková *et al.*, 2007), the genus *Kaempferia* is subdivided into two sections according to the inflorescence position: *Kaempferia* sect. *Kaempferia* and *K.* sect. *Protanthium* (Horan.) Benth. (Kiew, 1980; Leong-Škorničková *et al.*, 2015). *Kaempferia* sect. *Kaempferia* produces inflorescences between the innermost leaves and enclosed by the two innermost leaf sheaths, whereas inflorescences of *Kaempferia* sect. *Protanthium* typically occur separated from the pseudostem (Kiew, 1980).

In this paper, two new species, *K. minuta* Jenjitt. & K. Larsen, and *K. pardi* K. Larsen & Jenjitt., belonging to the sect. *Kaempferia,* are described. The name *Kaempferia minuta* and *K. pardi* were mentioned in the phylogenetic study of *Kaempferia* by Techaprasan *et*

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AL. (2010) for the first time, but they have not been validly published. They are obviously distinguishable from all other species known in Thailand and Lao PDR, and we do not hesitate to recognize them as taxonomically distinct on the specific level. The terminology used in this paper follows Kew's Plant Glossary (BEENTJE, 2016).

Kaempferia minuta Jenjitt. & K. Larsen, **sp. nov.**
(Figs. 1 and 3A–C)

Type: THAILAND. Eastern, Ubon Ratchathani Province, 29 May 2001, *Tiptabiankarn 6619* (holotype BKF; isotypes AAU, BK, QBG, Suan Luang Rama IX Herbarium).

Diagnosis.—Similar to *Kaempferia attapeuensis* Picheans. & Koonterm in its flower, but distinct in its orbicular to suborbicular laminae (vs. oblong-elliptic to ovate laminae in *K. attapeuensis*).

Description.—Perennial herb. *Rhizome* moniliferous, each subglobose, 0.5–1 cm long, 0.5–1 cm in diameter, pale brown; *roots* fibrous-fusiform with terminal tubers, 2.5–6 cm long, ca. 3–6 mm in diameter. *Leafy shoot* 2.5–6 cm tall; *bladeless sheaths* 2–3, 0.5–2 cm long, apex acute; *ligules* truncate, ca. 0.3 × 1 mm. *Leaves* 2, sessile; lamina orbicular to suborbicular, 4.5–7 × 4.5–7 cm, base rounded, apex rounded to short mucronate, lamina adaxially dull green usually with silver or pale green variegated pattern. *Inflorescence* terminal, 2–6-flowered, tightly enclosed by leaf sheaths; *bracts* triangular to linear, 7–11 × 3–10 mm; *bracteoles* narrowly triangular to linear, ca. 1.1 × 0.3 mm. *Calyx* bright green, 1.8–2.2 cm long, split on one side to ca. 7 mm, apex acute. *Corolla tube* white, 2.5–2.8 cm long; *dorsal corolla lobe* white, lanceolate, 13–16 × 4 mm long, apex acuminate to aristate (ca. 3 mm long), hooded; *lateral corolla lobes* oblong, 1.3–1.5 cm × 3 mm, apex rounded to acute. *Lateral staminodes* obovate, 1.6–1.8 × 1–1.2 cm, apex rounded, pink to light purple. *Labellum* broadly obovate, bilobed, 1–1.7 × 1.8–2 cm, sinus ca. 1.2 cm in depth, pink to purple with two deep purple spots in the center, each lobes obtriangular. *Filament* subsessile; *anther thecae* elliptic, 1.7–2 × 0.7–1 mm; *anther crest* suborbicular, 3 × 3 mm, usually curled back, apex shallowly bilobed to crenate, apex of each lobes acute. *Ovary* cylindrical, 3 mm long, 1.5 mm in diameter; *stylodial glands* 2, filiform, ca. 3.5 mm long. *Stigma* crateriform, 0.8 × 0.8 mm laterally compressed, stigma cup verrucate, margin long ciliate. *Fruits* white, ellipsoid, 1.5 cm long, 0.8 cm in diameter. *Seeds* few, oblong, ca. 5 mm long, pale brown, partly coated with fleshy white laciniate aril.

Distribution.—Thailand (Eastern: Ubon Ratchathani Province) and Laos

Ecology.—Open full sunlight on fine sand with limestone rocks in dry dipterocarp forest.

Phenology.—Flowering in May to July.

Other specimens examined.—THAILAND. Bangkok (cultivated, origin in Laos), 20 July 2008, *T. Tiptabiankarn 19095* (Suan Luang Rama IX Herbarium); Ubon Ratchathani Province, 2 October 2009, *T. Tiptabiankarn 16818* (Suan Luang Rama IX Herbarium), *T. Tiptabiankarn s.n.* (Suan Luang Rama IX Herbarium).

Vernacular name.—Proh noi (เปราะน้อย), Proh laolek (เปราะลาวเล็ก)

Etymology.—The specific epithet "*minuta*" refers to the tiny size.

Proposed IUCN conservation status.—*Kaempferia minuta* is found from at least 10 populations in Ubon Ratchathani Province and Lao PDR, with 50–500 plants in each population. We propose to treat this species provisionally as Vulnerable (VU C2ai) following the categories and criteria of IUCN (IUCN, 2012).

Note.—According to molecular phylogenetic study, this species is closely related to *K. angustifolia* (TECHAPRASAN *ET AL*., 2010), but it differs distinctly in leaf and floral shape.

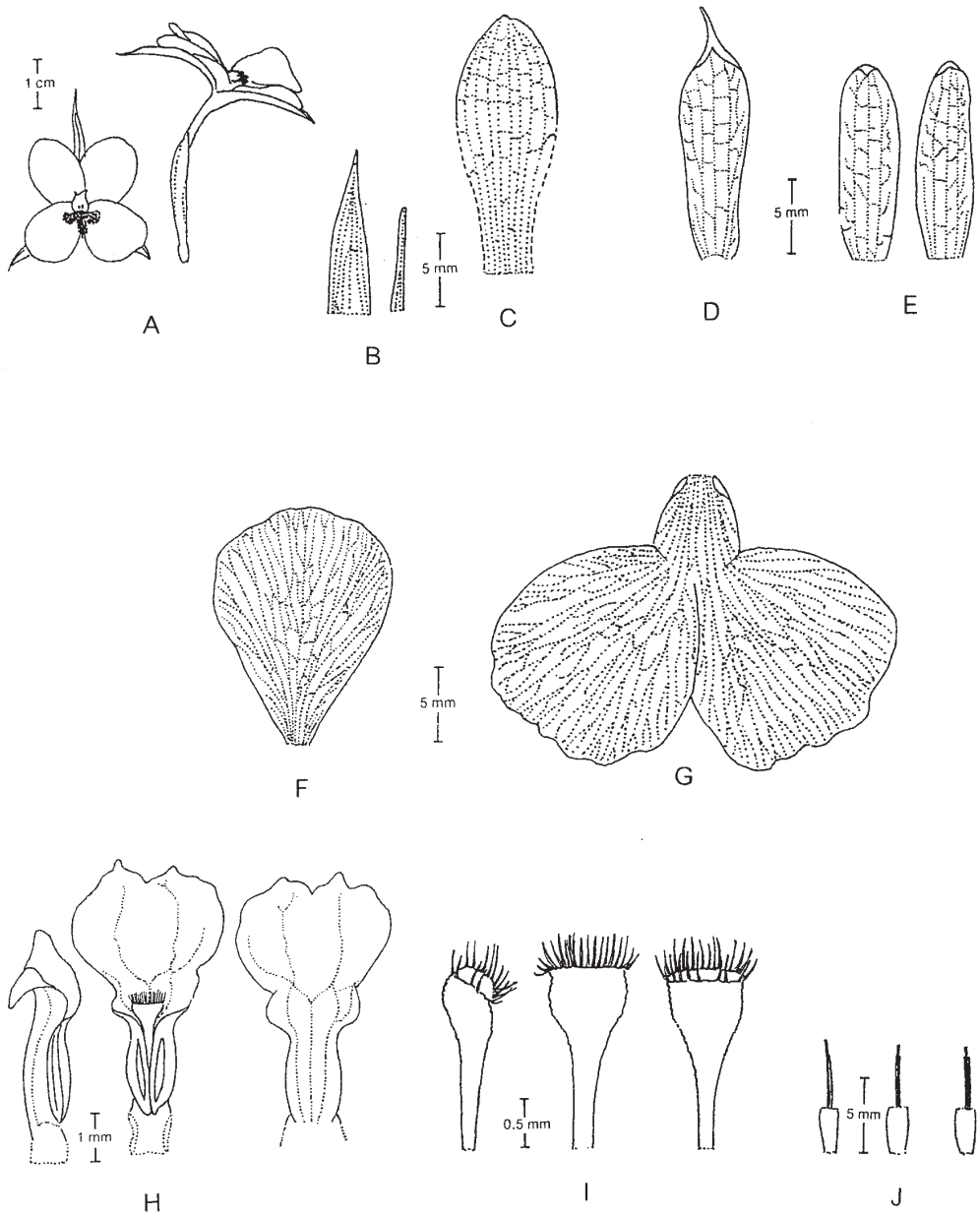

Figure 1. *Kaempferia minuta* Jenjitt. & K. Larsen: A, flower, front (left) and side (right) view; B, bracteole; outer (left) and inner (right); C, calyx; D, dorsal corolla lobe; E, lateral corolla lobes; F, lateral staminode; G, labellum; H, stamen and stigma, side (left), front (center) and back (right) view; I, stigma, side (left), front (center) and back (right) view; J, ovary and stylodial glands, side (left), front (center) and back (right) view. Drawn from *T. Tiptabiankarn* s.n. by Thaya Jenjittikul.

Kaempferia pardi K. Larsen & Jenjitt., **sp. nov.**
(Figs. 2 and 3 D–G)

Type: THAILAND. Northeastern, Phetchabun Province, 21 July 1999, *T. Tiptabiankarn 4402* (holotype BKF; isotypes AAU, BK, QBG, Suan Luang Rama IX Herbarium).

Diagnosis.—Similar to *Kaempferia koratensis* Picheans. in leaf shape, but differs in having larger laminae with numerous dark spots on upper surfaces (vs. dark green, sometimes with white variegated pattern in *K. koratensis*), a larger flower, white with two dull purple blotches at the sinus (vs. white with a pale yellow patch at the base of labellum in *K. koratensis*) and strikingly larger anther thecae.

Description.—Perennial herb. *Rhizome* ovoid to ellipsoid, 2–4 cm long, 1–1.8 cm in diameter, dark brown; *roots* fibrous-fusiform with terminal tubers, 10–15 cm long, 0.8–1.2 cm in diameter. *Leafy shoot* 4–10(–20) cm tall with 2 bladeless sheaths; *leaves* 2, appressed to the ground, suborbicular to obovate, 20–30 × 15–20 cm, base rounded to acute, apex rounded, adaxially dull green with dark blotches, abaxially pale green, soft and succulent; petiole up to 5 cm long. *Inflorescence* terminal, up to 20-flowered, enclosed between two innermost leaf sheaths, ovoid, ca. 6 cm long, 2 cm in diameter; *sterile bracts* 2–3, ovate; *fertile bracts* lanceolate to narrowly ovate, 5.8 × 2.8 cm; *bracteoles* white, keeled, 3.4 cm × 0.8–1 mm, membranous. *Calyx* tubular, 4.7–5 cm long, split on one side to ca. 2 cm, apex acute without lobes, with a pair of 2–3 mm long delicate teeth on back side of tip. *Corolla tube* 7.5–8 cm long; *dorsal corolla lobe* white, linear, 4.7 × 1 cm, apex aristate with hooded tip, arista ca. 5 mm long; *lateral corolla lobes* white, linear, 4–4.5 cm × 7–8 mm, apex acute, slightly hooded. *Lateral staminodes* white, rounded to obovate, 3.5–4 × 2.8–3.2 cm, apex rounded and undulate. *Labellum* obtriangular, bilobed, 4.5 × 5 cm, sinus ca. 2 cm in depth, white with a pale yellow band from the base to sinus and two purple blotches along midvein to sinus base, each lobes rounded, imbricate, apex of each lobe undulate. *Filament* 6 mm long, white, glabrous; *anther thecae* oblong, 7–9 × 2 mm, white; *anther crest* suborbicular with shallowly trilobed apex, 7 × 6 mm, slightly recurved, white. *Ovary* cylindrical, slightly angled, 7 mm long, 3 mm in diameter, white, glabrous; *stylodial glands* 2, filiform, 6–7 mm long. *Stigma* conical with ciliate margin, white. *Fruit* narrowly ovoid, white. *Seeds* brown partly coated with fleshy white laciniate aril, germinating in one week.

Distribution.—Endemic to Thailand. This species is currently only known in Phetchabun, Lopburi, Phitsanulok and Nakhon Sawan provinces.

Ecology.—Open full sunlight to partial shade in disturbed deciduous dipterocarp forest.

Phenology.—Leaves emerging in May, flowering in June to July and dormancy around September.

Other specimens examined.—THAILAND. Nakhon Sawan Province, 18 August, 2016, *N. Nopporncharoenkul 486* (cultivated) (Suan Luang Rama IX Herbarium); Phitsanulok Province, 15 June 2018, *T. Tiptabiankarn 24449* (Suan Luang Rama IX Herbarium); Lopburi Province, 23 August 2019, *T. Tiptabiankarn 25681* (Suan Luang Rama IX Herbarium).

Vernacular name.—Proh sua tam (เปราะเสือแต้ม)

Etymology.—The specific epithet "*pardi*" refers to leopard-like spotted pattern on its upper surface of leaves.

Proposed IUCN conservation status.—*Kaempferia pardi* is endemic to North and Northeast Thailand. Currently, only four populations have been found from four localities, in Phetchabun, Lopburi, Phitsanulok and Nakhon Sawan provinces. Each population contains a

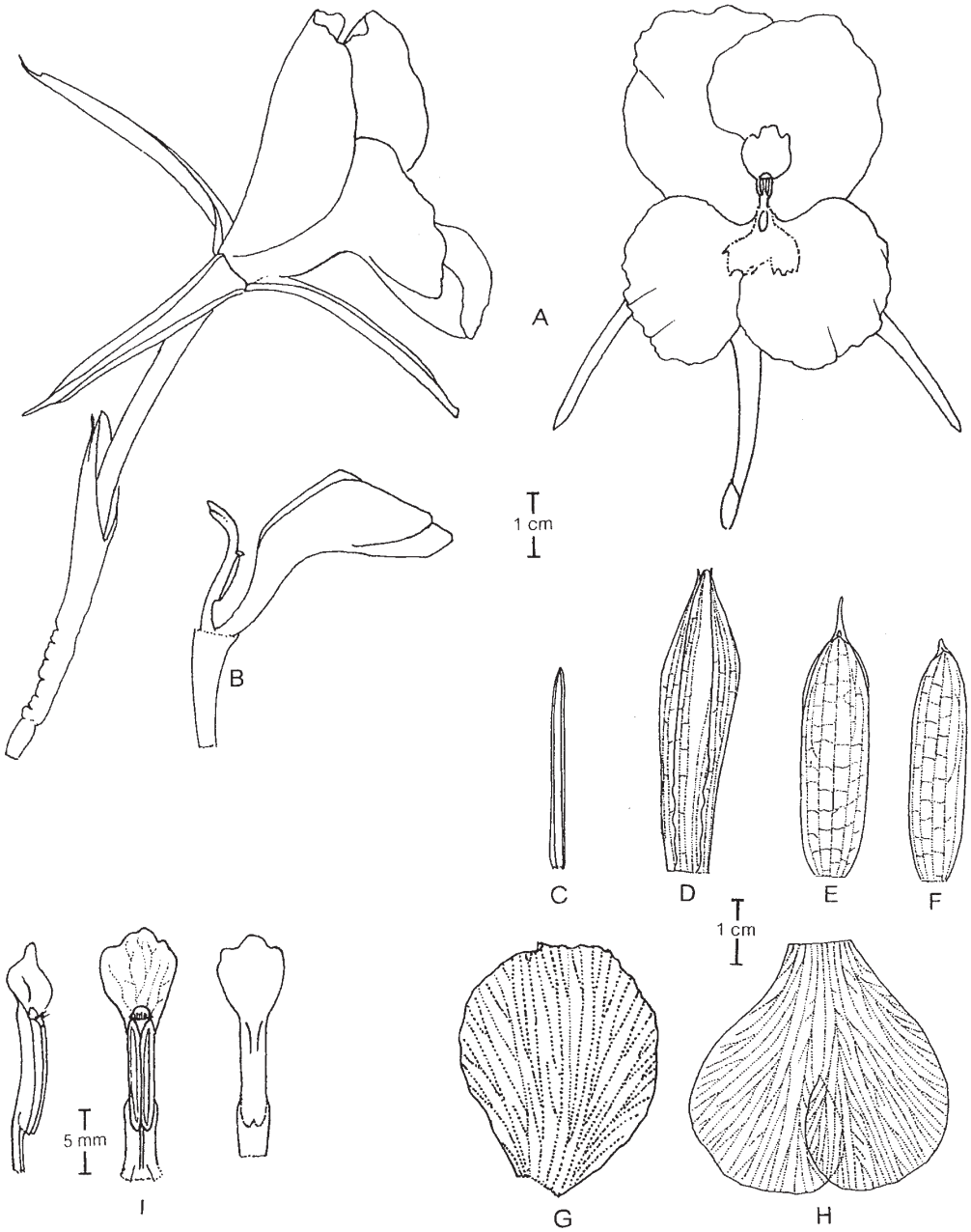

Figure 2. *Kaempferia pardi* K. Larsen & Jenjitt.: A, Flower, side (left) and front (right) view; B, Labellum and anther, corolla lobes and lateral staminods removed; C, Bracteole; D, Calyx; E, Dorsal corolla lobe; F, Lateral corolla lobe; G, Lateral staminode; H, Labellum; I, Anther, side (left), front (center), and back (right) view. Drawn from *T. Tiptabiankarn 4402* by Thaya Jenjittikul.

Figure 3. (A–C) *Kaempferia minuta* Jenjitt. & K. Larsen: A, Habit; B, Plant in side view; C, Flower. (D–G) *Kaempferia pardi* K. Larsen & Jenjitt.: D–F, Habit; G, Flower. Photographs by Nattapon Nopporncharoenkul.

few hundred mature individuals. We propose to treat this species provisionally as Vulnerable (VU D1 and D2) following the categories and criteria of IUCN (IUCN, 2012).

Note.— According to the molecular phylogenetic study, this species is closely related to some species in clade A (Techaprasarn *et al*., 2010), but it differs distinctly in having larger leaves with numerous dark spots on upper surface.

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