

## A new species and a new record of *Boesenbergia* (Zingiberaceae) for Thailand

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**ABSTRACT.** *Boesenbergia purpureorubra* Mood & L.M.Prince is described and illustrated. *Boesenbergia longipes* (King & Prain ex Ridl.) Schltr. is noted as a new record for Thailand based on *C. Maknoi T38* (PSU, QBG).

**Keywords.** *Boesenbergia*, Thailand, Zingiberaceae

### Introduction

The genus *Boesenbergia* Kuntze currently includes c. 82 species which are distributed from SW India eastward to the Philippine Islands and south to the Wallace Line. Although the majority of species are found within forests, some have adapted to unusual habitats to include limestone formations near the ocean [*Boesenbergia ochroleuca* (Ridl.) Schltr.] and sandstone mountain tops at over 1000 m [*B. alba* (K.Larsen & R.M.Sm.) Mood & L.M.Prince]. As a consequence, *Boesenbergia* species have evolved into a variety of vegetative forms to adapt to specific environments. They can be evergreen as are all the wild species in Borneo, or deciduous as are the majority in Thailand. Plants can range from c. 10 cm tall [*Boesenbergia parvula* (Wall. ex Baker) Kuntze] to over 130 cm (*B. maxwellii* Mood & L.M.Prince), form single clumps [*B. curtisii* (Baker) Schltr.] or develop into large, spreading populations of connected stems (*B. kingii* Mood & L.M.Prince). Florally, *Boesenbergia* has evolved to accommodate pollinators within each habitat, resulting in several different labellum forms, from flat to very saccate. These variations aside, most *Boesenbergia* are easy to identify by their basipetalous flowering sequence—the first flower opens near the inflorescence apex and each subsequent flower, closer to the base.

In Thailand there are over 26 species currently recorded (Ridley, 1899; Sirirugsa, 1987, 1992; Larsen, 1993, 1997; Saensouk & Larsen, 2002; Kharukanant & Tohdam, 2003; Mood et al., 2013, 2014). During preparation for a revision of *Boesenbergia* for the *Flora of Thailand*, the authors compared the available Thai specimens to the protologues and types of the c. 26 species. Surprisingly, the Thai taxon considered as

*Boesenbergia longipes* (King & Prain ex Ridl.) Schltr. (Sirirugsa, 1992) did not match the type, *Wray 4220* (K), the protologue (Ridley, 1899) or the expanded description of Holttum (1950). To confirm the description of Sirirugsa, c. 10 similar specimens collected in Thailand and annotated as “*B. longipes*” were examined (AAU, BK, BKF, QBG). It was evident that the vegetative form of the Thai taxon varied considerably from *Wray 4220*. Additionally, flowering plants observed in Peninsular Thailand, near locations as noted on the specimens, did not match Ridley or Holttum’s floral descriptions. Since this taxon showed no similarity to any other known *Boesenbergia*, it is here considered a new species and is described as *Boesenbergia purpureorubra*.

During examination of specimens, *Maknoi T38* (PSU, QBG), an unidentified *Boesenbergia* from Yala Province on the Malaysian border, was found to match the type and protologue of *B. longipes* (King & Prain ex Ridl.) Schltr., thus making it a new record for Thailand.

### Taxonomy

***Boesenbergia purpureorubra* Mood & L.M.Prince, sp. nov.**

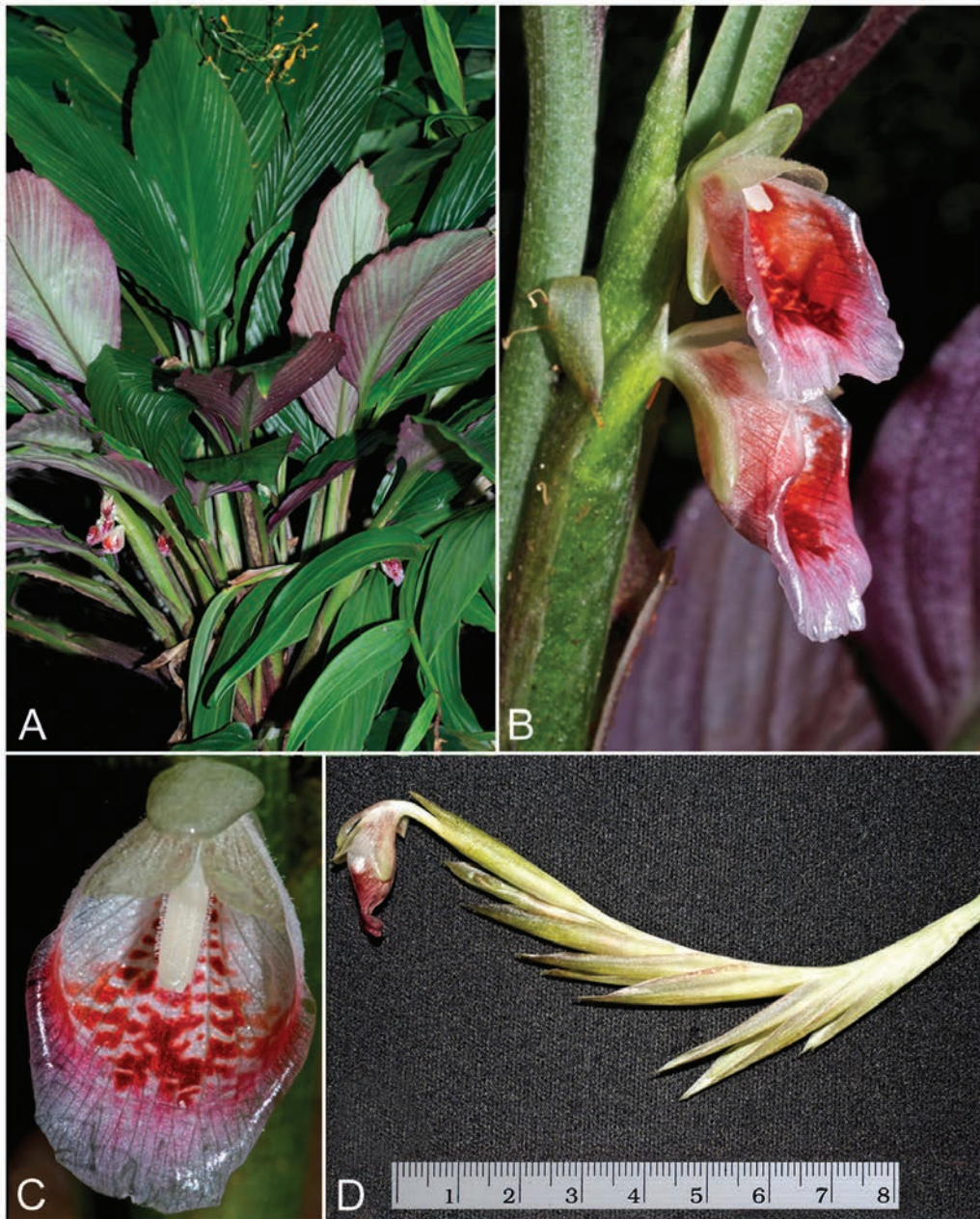
*Boesenbergiae pulcherrimae* (Wall.) Kuntze *similis, planta minore* c. 40 cm alta, caule brevior c. 6 cm longo pagina corrugatissima atro purpureorubro, petiolis longioribus c. 3–8 cm longis differt. TYPE: Cultivated in Hawaii, USA, 1 August 2014, *Mood 14P19* (holotype BKF; isotype AAU). Originally from Thailand, Ranong Province, E. of Khao Niwet, 09° 57.506'N 98°39.134'E, 880 m asl, evergreen forest, 24 August 2011, *Mood & Vatcharakorn 3106*, cultivated as *M3106* (Fig. 1–3)

*Boesenbergia longipes* auct. non Schltr.: Sirirugsa, Nat. Hist. Bull. Siam Soc. 40: 76 (1992).

**Deciduous, perennial herb** up to c. 40 cm tall, forming tight clumps. **Rhizome** with multiple elements developing from the base of the previous element, c. 5 cm long, c. 8 mm diam. in a mature plant with five stems, internally and externally white (young), internally dark purple (mature); **roots** many, fleshy, to c. 20 cm long, 3–4 mm diam., externally and internally white or pink, covered in short root hairs along the full length, apex expanded, fusiform, c. 4–5 cm long, 5–10 mm diam., surface smooth, root hairs along the full length, few fibrous roots. **Stems** numerous, increasing in number each season, to 6 cm long, c. 7 mm diam., light green, glabrous, 1 or 2 leafless sheaths, 5–11 × 2.5 cm, deeply corrugate, solid or spotted purple-red, glabrous. **Leaves** 2 or 3, upper two nearly opposite; **leaf sheaths** c. 11–14 cm long, light green, sparsely sericeous, corrugate, covered in part by the leafless sheaths; **ligule** bilobed, up to 17 mm, lobes oblong to lanceolate, green, few hairs; **petiole** 3–8 cm long, 2 mm wide, light green or with purple-red spots, sparsely sericeous; **lamina** elliptic, sometimes asymmetric, 18 × 8 cm (lower) to 25 × 8 cm (upper), base attenuate to rounded, often oblique, apex acuminate, adaxially dark, glossy green, veins prominent, few long hairs,



**Fig. 1.** *Boesenbergia purpureorubra* Mood & L.M.Prince. Ink line drawing with watercolour of the type plant. (Drawn by Linda Ann Vorobik).



**Fig. 2.** *Boesenbergia purpureorubra* Mood & L.M.Prince. **A.** Mature plant in flower. **B.** Flowers in side and semi-side view. **C.** Flower in front view. **D.** Inflorescence (scale in cm). (Photos: J. Mood of M3106)



**Fig. 3.** *Boesenbergia purpureorubra* Mood & L.M.Prince. **A.** Flower dissection. **B.** Inflorescence with bracts spread showing their attachment. **C.** Anther and stigma (mature). **D.** Underground architecture (rhizome, roots, tuberous roots). (Photos: J. Mood of M3106)

abaxially purple, dark red or green, sericeous. **Inflorescence** terminal, basal  $\frac{3}{4}$  clasped between the leaf sheaths, apical  $\frac{1}{4}$  exposed; *peduncle* c. 1 cm long, 4 mm diam., white, glabrous; *spike* fusiform, c. 9–13 cm long, c. 1 cm wide at the middle, c. 7 mm thick, longitudinally furrowed on the flowering side; *bracts* 16–24, narrowly ovate, c.  $35 \times 6$  mm, light green, sericeous, compressed together radially on the flowering side, the rachis exposed on the non-flowering side; *bracteole* narrowly ovate, open to the base, c.  $32 \times 10$  mm, white, glabrous, on the opposite side of the floral tube from the bract. **Flowers** c. 3.5 cm long, labellum oriented toward the bract apex, all deflexed downward; *calyx* tubular, c. 7 mm long, light green with red dots, few hairs, apex undulate, with 2–3 lobes; *floral tube* 30–35 mm long, 1.5 mm diam. at the base, white, glabrous; *dorsal corolla lobe* c.  $12 \times 5$  mm, slightly convex, oblong, white, glabrous, apex cucullate, *lateral corolla lobes* c.  $15 \times 6$  mm, oblong, white, glabrous, apex cucullate; *androecial cup* c. 4 mm long, c. 4 mm wide, oriented c.  $90^\circ$  to the floral tube, throat mostly glabrous; *labellum* deeply saccate, elongate to oval (natural shape), c.  $2.8 \times 1.6$  cm, throat glossy dark red with transverse red bars on the sides and red spots in the centre, apical area glossy violet-pink, lighter and slightly transparent on the margin, internally glabrous, externally with short, glandular hairs, apex rounded, slightly undulate, deflexed; *lateral staminodes* obovate, c.  $10 \times 8$  mm, yellowish-white, externally covered in short, glandular hairs, apex truncate to rounded. **Stamen** c. 10 mm long, *filament* c.  $2 \times 1$  mm, white; *anther* c.  $8 \times 3$  mm, connective tissue with glandular hairs from the base up  $\frac{2}{3}$  the length, apical part glabrous, anther thecae c.  $7 \times 1.5$  mm (each), dehiscent throughout the full length, white, anther crest absent, pollen white. **Ovary** trilocular, cylindrical, c.  $3 \times 2.5$  mm, light green, glabrous; *style* filiform, c. 3.7 cm long, white; *stigma* orbicular, white, ostiole circular, ciliate; *epigynous glands* linear, two, c. 3 mm long, white. **Fruit** not seen. (Measurements based on living, cultivated material of M3106).

**Distribution.** Peninsular Thailand.

**Ecology.** This species is found in evergreen forest between 50–300 m on soils derived from granite or sandstone.

**Phenology.** In cultivation in Hawaii, flowering begins in late June and continues through October. Flowers open in the morning and close early the following day. Observations in the wild are similar.

**Etymology.** Named for the purple-red colour of the leafless sheaths and lamina underside.

**Additional specimens examined:** THAILAND. **Ranong:** Kapis, Kampon, 100 m, 20 Nov 1973, T. Sandsuk 633 (BKF); 10 km south of Khao Khai, 2 Aug 2013, J. Mood & P. Vatcharakorn 3376 (AAU); Kampuan, 11 Jul 1999, C. Maknoi 53 (QBG). **Surat Thani:** Ban Tung Tao, 4

Aug 1927, *Klein?*13153 (BK); Khao Sok, 25 Oct 1990, *K. Larsen* 40887. **Phang Nga:** 8 km north of Bang Wan, 2 Aug 2013, *J. Mood & P. Vatcharakorn* 3380 (AAU); Bangwan Stream, 14 Aug 2006, *T. Muadsub* 116 (PSU, BKF). **Trang:** Khao Chong, 200 m., 12 Aug 1975, *J.F. Maxwell* 75-797 (BK); Muang Dist., Khao Chong N.P., 14 Jul 1985, *P. Sirirugsa* 1021 (PSU, BKF); Khao Chong forest, 150 m, 30 Oct 1984, *J.F. Maxwell* 84-375 (BKF). **Narathiwat:** Waeng, 50 m, 23 Aug 2006, *M. Poopath* 23 (BKF).

*Notes.* It is not known how this ginger initially came to be identified as *Boesenbergia longipes*, as the species was originally described from Perak, Malaysia (Ridley, 1899). The type, *Wray* 4220 and a similar specimen *Corner S.F.N. 31673*, cited by Holttum (1950), are quite distinct from the Thai taxon. Some of the vegetative differences for the Perak plants are the loose, spreading leaf sheaths with short stem, long petioles and inflorescence close to the ground. *Boesenbergia purpureorubra* has short leaf sheaths tightly clasped, short petioles and an inflorescence at the top of the plant. Ridley named Wray's plant "long foot", noting the "rhizome rather far creeping". The new species is a very tightly clumped plant with multiple stems from a short rhizome. A noticeable character of the new taxon is its deeply corrugated, dark purple-red leafless sheaths. The underside of the lamina is also the same colour even when mature. These characters are quite noticeable on the Thai specimens such as *Maxwell* 75-797 (BKF).

Ridley described the flower of *Boesenbergia longipes* has having an oblong, crisped and thickened labellum, a rounded apex and a thick, central bar. Colour notes were not included. Holttum (1950) broadened the description and provided colour notes based on a flower in alcohol from *Corner S.F.N. 31673*, collected near the type locality. Holttum mentions that since the Corner flower was larger than the type (which was only a broken portion) he was not sure if "one or two species exist." It is the experience of the first author that flower size can be quite variable based on the vigour, age of the plant and population variation. More important is that both Wray's type and Corner's specimen closely match in overall morphology.

Recently, by request of the authors, the type locality was visited by Lim Chong Keat (Penang, Malaysia) in order to ascertain whether *Boesenbergia longipes* was still extant in this area. The species was found and the plants matched the vegetative morphology of the descriptions and specimens, while the floral structure and colours were exactly as Holttum described. With this added validation it is quite clear that *Boesenbergia longipes* is strikingly different from the Thai taxon described here as *B. purpureorubra* (Table 1).

True *Boesenbergia longipes* has, however, once been collected in Thailand as recently discovered by the first author. The specimen, *C. Maknoi* T38 (QBG, PSU), annotated as *Boesenbergia* sp., was collected near the Malaysian border in Yala Province, Betong, Ban Chulaporn Pattana 10, 5 August 1999. The forest is evergreen, similar to the type locality in Perak. The collector noted, "Lip white with yellow median band and red lines on either side from base to half of length" matching Holttum (1950). This specimen constitutes a new record for Thailand.

**Table 1.** Comparison of *Boesenbergia purpureorubra* and *B. longipes*

Character	<i>B. purpureorubra</i> (M3106)	<i>B. longipes</i> (M3106)
Plant height	40 cm	c. 60 cm
Petiole length	3–8 cm	to 23 cm
Lamina	18–25 × 8 cm	30 × 10 cm
Inflorescence	9–13 cm long	5 cm long
Floral tube	3–3.5 cm	4.5 cm
Labellum	2.8 cm long, oval, saccate	2 cm long, obovate, non saccate
Labellum colour	white, red, violet-pink	white, red, yellow median band
Filament	2 mm	4 mm
Anther	7 mm	4 mm
Anther crest	none	oblong, rounded, fleshy

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