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Three new species of *Paraboea* (Gesneriaceae) from Thailand

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ABSTRACT. Three new species of *Paraboea*, *P. chumphonensis* Triboun, *P. puglisiae* Triboun & D.J.Middleton, *P. romklaoensis* D.J.Middleton & Triboun, are described. Conservation assessments are proposed for each species.

KEY WORDS: *Paraboea*, Chumphon, conservation, Kanchanaburi, limestone, Phitsanulok, taxonomy.

INTRODUCTION

Paraboea is one of the largest genera of Gesneriaceae (Weber, 2004). It is found in tropical Asia with a concentration of species in Thailand (Xu *et al.*, 2008; Puglisi *et al.*, 2011). In their revision of the genus, Xu *et al.* (2008) recognised 89 species and five varieties but since then the delimitation of the genus has been expanded to include the genera *Phylloboea* and *Trisepalum* (Puglisi *et al.*, 2011) and many new taxa have been described (Chen *et al.*, 2008, 2012; Kiew, 2010, 2012; Triboun & Middleton, 2012; Xu *et al.*, 2012; Triboun, 2013; Wen *et al.*, 2013; Puglisi *et al.*, 2015 in press). We estimate there are now around 130 species.

As part of ongoing work to revise this genus for the Flora of Thailand the authors, amongst others, have collected many specimens in formerly poorly collected areas, particularly from limestone habitats. Even though some 23 species have already been newly described from Thailand since the revision by Xu *et al.* (2008) (Kiew, 2010; Triboun & Middleton, 2012; Triboun, 2013; Puglisi *et al.*, 2015 in press), more new species are still being found with further exploration. Three of these new species are here described, and IUCN conservation assessments are proposed following the guidelines of IUCN (2012).

Paraboea chumphonensis Triboun, **sp. nov.**

Paraboea chumphonensis is similar to *P. tarutaoensis* Z.R.Xu & B.L.Burtt and *P. minor* (Barnett) B.L.Burtt in its small stature, small and slender inflorescences with fewer than 15 flowers each, and creamy white or very pale pinkish flowers. It differs, however, by having an attenuate leaf base, a densely scabrid indumentum on the leaves and inflorescences, a short and stout peduncle, larger flowers, and a straight capsule. Type: Thailand, Peninsular, Chumphon, Pa Thio, Ko Khai, 13 Aug. 2011, *Triboun et al. 4630* (holotype **BK**). Figs. 1A–B.

Lithophytic perennial herb to 15 cm tall. *Leaves* 6–10 per stem, congested opposite decussate; sessile; blade elliptic to obovate, 5–10 × 2–3.3 cm, apex acute or obtuse, base attenuate, margin crenate to subdentate, dull green above, secondary veins ca 10 on each side of the midrib, above with a dense indumentum, scabrid, dense pale brown matted indumentum beneath. *Inflorescences* 3–4 per plant, subterminal, compound dichasium with 3–4 orders of branching; peduncle 5–8.5 cm long, ca 1.6 mm in diam., densely covered with glandular hairs, bracts linear, ca 4.5 mm long, flowers paired; pedicels 6–9 mm long, with a dense indumentum. *Calyx* green, 4.5–5.5 mm, fused at base for 1.5 mm, 5-lobed; lobes narrowly linear, 3–4 × ca 0.8 mm, apex acuminate. *Corolla* white to pink, with a short tube and spreading

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lobes; tube ca 4 mm; limb bilabiate, not resupinate, upper lip 2-lobed with lower half of lobes strongly imbricate, lobes asymmetrical, lower lip 3-lobed, all lobes obovate to oblanceolate, 5–7.5 × 4.5–5.5 mm, apices rounded. *Stamens* 2, inserted near base of corolla tube; filament white, ca 4 mm long, geniculate; anthers yellow, ca 2.5 × ca 2.5 mm; staminodes 3, white, ca 0.1 mm. *Ovary* light green, ca 2.5 × ca 1.2 mm, pubescent; style ca 3 mm long, glabrous; stigma capitate. *Capsules* cylindric, ca 1.8 × ca 0.2 cm, straight, green to brown, covered with glandular hairs.

Thailand.— PENINSULAR: Chumphon [Pa Thio, Ko Khai, 13 Aug. 2011, *Triboun et al. 2404* (in spirit collection, **BK**); ibidem, *Triboun et al. 4630* (**BK**)].

Distribution.— Endemic to Thailand. So far known only from the type locality.

Ecology.— In shade on limestone rocks under a cliff on a small isolated limestone island, alt 100–300 m.

Phonology.— Flowering and fruiting in July to October.

Vernacular.— Cha hin (ชาหิน).

Etymology.—The specific epithet refers to the collection locality in Chumphon Province in Thailand.

Proposed IUCN conservation assessment.— Endangered (EN D). This species is only known from two small populations at the type locality on the same island. The population is estimated to contain fewer than 100 individuals and the locality currently has no protected status.

Paraboea puglisiae Triboun & D.J.Middleton, **sp. nov.**

Paraboea puglisiae is similar to *Paraboea longipetiolata* (B.L.Burtt) C.Puglisi in its habit, the shape and other characters of the leaves, the shape, size and colour of the flower, and the linguiform stigma. It differs, however, by having a short peduncle covered with white to light brown arachnoid hairs, small bracts, and in having an equally 5-partite calyx. Type: Thailand, South-Western, Kanchanaburi, Thong Pha Phum, 6 Aug. 2012, *Middleton et al. 5263* (holotype **BKF**; isotypes **BK**, **E**). Figs. 2A–C.

Lithophytic perennial herb. *Stem* erect, 25–60 cm tall, ca 5 mm in diam., rarely branching, internodes white, all part covered with dense white hairs. *Leaves* 14–23 per plant, opposite decussate, upper pairs smaller than the lower ones; petiole attenuately winged and forming an auricle at the node with the opposite one; blade coriaceous, ovate, elliptic or obovate, (3–)9–14 × (1.4–)4.7–6.2 cm, apex acute or obtuse, base cuneate and attenuate, margin crenulate, secondary veins 7–9 on each side of midrib, tertiary veins reticulate, slightly covered with white arachnoid hairs beneath. *Inflorescences* 8–12 per plant, subterminal to axillary, compound dichasium with 2–3 orders of branching, or monochasial; peduncle 2.5–7 cm long, the upper axes shorter than the lower ones, covered with white to light brown arachnoid hairs; bracts ovate to elliptic, ca 1 × ca 0.5 cm, flowers paired; pedicels ca 7 mm long. *Calyx* green and covered with white arachnoid hairs, cotyliform, 6–7 mm, fused at base for ca 2 mm long, 5-lobed, upper 3 lobes fused at base, ca 2 mm long, 2 lower lobes free, lobes linear to narrowly lanceolate, 3–4 × ca 2 mm, outside covered with white arachnoid hairs, inside glabrous. *Corolla* campanulate, white at base and purple on upper tube and limb; tube 6–7 mm long, sometimes with 2 greenish elongated bands inside; limb bilabiate, upper lip 2-lobed, lobes asymmetrical, base of lobes slightly imbricate, lower lip 3-lobed, all lobes widely ovate, 4.5–5 × 6–7 mm, apices rounded. *Stamens* 2, inserted near base of corolla tube; filament white, 3–4 mm long, geniculate; anthers yellow, ca 2.2 × ca 2.5 mm; staminodes 3, white, ca 0.4 mm. *Ovary* light green, fusiform to cylindric, 2–2.2 × ca 1 mm; style 3–4 mm long, glabrous; stigma white, linguiform. *Capsules* cylindric, 1.5–1.8 × ca 0.2 cm, twisted, darkish brown, slightly glaucous.

Thailand.— SOUTH-WESTERN: Kanchanaburi [Thong Pha Phum, 15 Sept. 2014, *Triboun et al. 5610* (TISTR herbarium); Thong Pha Phum, 6 Aug. 2012, *Middleton et al. 5263* (**BK**, **BKF**, **E**)].

Distribution.— Endemic to Thailand. So far known only from the type locality.

Ecology.— In fissures in limestone rocks in open sun at 50–250 m altitude. Flowering and fruiting in July to December.

Vernacular.— Phu kra ding (ฟู่กระดิ่ง).

Etymology.—The specific epithet honours

Dr Carmen Puglisi (E), a researcher on the taxonomy and evolutionary history of the Old World Gesneriaceae.

Proposed IUCN conservation assessment.— Critically Endangered (CR B1ab(iii)). This species is only known from the type locality which is in eroded and disturbed rocky ground in an area that shows signs of intermittent burning. The exact Extent of Occurrence is unknown but as surrounding areas have also been collected, and this species has not been found anywhere else, we calculate the EOO must be less than 100 km^2.

Note.— *Paraboea puglisiae* is particularly interesting because it has characters that would have conflicted in order to decide whether it belonged to either *Paraboea* and *Trisepalum* before these two genera were merged, largely on the basis of molecular data. *Paraboea puglisiae* is, however, the first known species which is likely to belong to the clade of *Paraboea* that contains the species formerly placed in *Trisepalum* (based on its overall appearance and the stigma shape) that has an equally 5-partite calyx, rather than the 3-partite calyx found in species that formerly belonged to *Trisepalum*. Conversely, another species of *Paraboea* which has the calyx structure of a *Trisepalum*, *Paraboea trisepala* W.H.Chen & Y.M. Shui, was found to belong to one of the two clades of *Paraboea* sensu stricto by Puglisi *et al.* (2011).

Paraboea romklaoensis D.J.Middleton & Triboun, **sp. nov.**

Most similar to *Paraboea doitungensis* but differing in the much smaller and non-showy calyx and the glandular pubescence on the outside of the corolla. Type: Cultivated plant from the Royal Botanic Garden Edinburgh (accession number 20092157) grown from seed of a plant cultivated at Queen Sirikit Botanic Garden Rom Klao Satellite Garden from a plant originally from Thailand, Northern, Phitsanulok, Chat Trakan, Rom Klao, vouchered and selected as type as *Middleton 5249* (holotype **BKF**, isotype **E**). Figs. 1C–D.

Perennial herb, erect to 80 cm tall including inflorescence, stems covered in dense pale brown matted hairs. *Leaves* opposite, congested at top of short stem except for 1–2 progressively smaller pairs of leaves at base of inflorescence; petiole 1.5–5 cm long, narrowly winged to base; blade elliptic, 6.8–12 × 2.7–7.2 cm, apex short acuminate or apiculate, base attenuate, margin weakly dentate, dull dark green above, secondary veins 7–9 on each side of midrib, weakly visible above, prominent beneath, with arachnoid hairs all over above, otherwise glabrous, dense pale brown matted indumentum beneath. *Inflorescence* a large terminal panicle, ca 75 cm long (including section with 1–2 sets of reduced leaves), ca 44 cm from uppermost normal leaves to lowest branch point of inflorescence, branches dichasial; leaves within inflorescence subsessile, 3–7 × 2–4.7 cm, with arachnoid hairs above and dense brown matted indumentum beneath; bracts otherwise 0.5–1.5 cm long, glabrous or glabrescent; lower parts of inflorescence with pale brown matted indumentum, most of inflorescence beyond branching points glabrous; pedicels 0.7–1 cm long, glabrous. *Calyx* of 5 free lobes, mostly green, pink at very base, narrowly triangular, ca 2.5 × ca 0.5 mm, apex acute, glabrous. *Corolla* with pink tube and white to pale pink lobes, campanulate, limb spreading, densely short glandular pubescent on tube and bases of lateral and upper lobes outside, dorsally glandular pubescent in tube inside; tube wide, pouched ventrally and depressed dorsally, ca 8 mm long to base of upper lobes, ca 1.3 cm long to base of lower lobes; limb bilabiate, upper lip with lobes ca 0.8 × ca 1.1 cm, apices rounded, lower lip with lateral lobes ca 0.7 × ca 1 cm, apices rounded, medial lobe 0.9–1 × ca 1 cm, apex rounded. *Stamens* 2, inserted at base of corolla tube; filaments yellow, strongly twisted, ca 1 cm long, narrow at base for ca 3.5 mm, abruptly widening and somewhat flattened into an upper part with sessile glands; anthers white, semi-circular, adnate face to face, ca 1.8 × 5.3 mm; lateral staminodes ca 3.5 mm long, medial staminode ca 0.8 mm long. *Disc* a 5-lobed annular ring, ca 0.3 mm high. *Ovary* fusiform, ca 9 mm long, glabrous; style ca 2.5 mm long, glabrous; stigma capitate. Mature capsule not seen but very immature capsule slightly twisted.

Thailand.— NORTHERN: Phitsanulok [Chat Trakan, Rom Klao, *Middleton 5249* (**BKF**, **E**)].

Distribution.— Endemic to Thailand. So far known only from the type locality.

Ecology.— Unknown.

Phenology.— Flowering and fruiting in July to November.

Figure. 1. A.–B. *Paraboea chumphonensis* Triboun; C.–D. *Paraboea romklaoensis* D.J.Middleton & Triboun (Photos: A–B. by P. Triboun, C–D. by D.J.Middleton).

Figure 2. A–C. *Paraboea puglisiae* Triboun & D.J.Middleton (Photos: All by P. Triboun).

Vernacular.— Rom klao (ร่มเกล้า).

Etymology.— The specific epithet refers to the collection locality in Rom Klao, Chat Trakan District, Phitsanulok Province in Thailand.

Proposed IUCN conservation assessment.— Data Deficient (DD). The only material known is from cultivated plants and the wild distribution and population size are unknown.

Notes.— This species is related to *Paraboea glutinosa* (Hand.-Mazz.) K.Y.Pan, *P. thorelii* (Pellegr.) B.L.Burtt, *P. martinii* (H.Lév.) B.L.Burtt, *P. paramartinii* Z.R.Xu & B.L.Burtt and *P. doitungensis* Triboun & D.J.Middleton. It differs from *Paraboea glutinosa* in having smaller thicker leaves and a glandular pubescence on the outside of the corolla; from *P. thorelii* in the lack of pubescence on the upper surface of the leaves and the lack of glandular hairs on the inflorescence axes; from *P. martinii* in the glabrous inflorescence axes and the pinkish purple rather than blue corolla; from *P. paramartinii* in the much smaller thicker leaves which are densely pubescent all over beneath rather than pubescent only on the veins; and from *P. doitungensis* by the much smaller and non-showy calyx and the glandular pubescence on the outside of the corolla.

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