



Gomphostemma phetchaburiense (Lamiaceae), a new species from a limestone karst in southwest Thailand

B. Bongcheewin^{1*}, M. Poopath², A. Paton³

Key words

convective heat
Gomphostemma
Lamiaceae
leaf serration
limestone
Primulina

Abstract *Gomphostemma phetchaburiense*, a new species from Phetchaburi Province, Thailand, is described and illustrated. A key to the species of *Gomphostemma* in Thailand is provided and conservation status and the dimorphic leaf characters are discussed.

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INTRODUCTION

Gomphostemma Wall. ex Benth. belongs to the tribe *Gomphostemmateae* Scheen & Lindqvist (*Lamioideae-Lamiaceae*) (Scheen et al. 2010, Zhao et al. 2021). During the preparation of the *Lamiaceae* account for the Flora of Thailand, *Gomphostemma phetchaburiense* Bongch. & Poopath, a new species was found from a limestone karst in Phetchaburi Province, southwest Thailand. Some other species have been discovered from the limestone areas in Phetchaburi, e.g., *Aristolochia phuphatanaphongiana* T.V.Do (*Aristolochiaceae*), *Rhynchoglossum ausculum* Patthar. & Poopath (*Gesneriaceae*) (Do et al. 2015, Pattharahirantrich & Poopath 2021). *Gomphostemma* is mostly found in evergreen forests (Harley et al. 2004, Walsingham 2019, Bongcheewin et al. 2022) but the new species grows on the limestone karst, which is seasonally dry. At first sight, the new species (Fig. 1a) closely resembles the genus *Primulina* Hance (*Gesneriaceae*) by its plant habitat and distinctly 2-lipped corolla lobes. In October–November 2020, the authors revisited the locality to collect the species and found that it belonged to the genus *Gomphostemma*.

In 1891, Prain classified *Gomphostemma*, based on corolla and nutlet characters, into three subgenera, i.e., *G.* subg. *Pogosphon* Prain, *G.* subg. *Stenostoma* Prain, and *G.* subg. *Eugomphostemma* (illegitimate name for the autonym *Gomphostemma*). The classification of *Gomphostemma* by Prain (1891) is not consistent with morphological and chemical evidence (Bongcheewin et al. 2014, 2022). *Gomphostemma phetchaburiense* shares morphological characters with the

three subgenera sensu Prain (1891). In the recent taxonomic revision of the genus, two informal groups were recognised (Bongcheewin et al. 2022). The new species belongs to one of the informal groups recognised by Bongcheewin et al. (2022), in which the corolla is glabrous inside and has an inflated corolla throat (Group Glabrous, subgroup I).

Gomphostemma in Thailand contains 10 species, i.e., *G. crinitum* Wall. ex Benth., *G. curtisii* Prain, *G. flexuosum* Bongch., *G. javanicum* (Blume) Benth., *G. mastersii* Benth. ex Hook.f., *G. microdon* Dunn, *G. parviflorum* Wall. ex Benth., *G. pedunculatum* Benth. ex Hook.f., *G. strobilinum* Wall. ex Benth. (Bongcheewin et al. 2015, 2022), and the new species, *G. phetchaburiense*.

TAXONOMY

Gomphostemma phetchaburiense Bongch. & Poopath, sp. nov. — Fig. 1, 2

This species is recognised by having several stems arising from a woody base growing in limestone crevices, densely dendroid hairs and stellate hairs with a multi-celled stalk on the stems and prominently branching calyx venation. It is morphologically similar to *G. velutinum* Benth. by having a similar corolla morphology, whitish hairs on stems, and cymes axillary and sessile. *Gomphostemma phetchaburiense* differs from *G. velutinum* by having an ascending habit with stout stems (vs sprawling habit with flaccid stems), outer bracteoles longer than the calyx (vs shorter than the calyx), and the calyx tube glabrous inside and constricted at throat with prominent branching veins between teeth (vs pubescent with adpressed simple hairs, not constricted at throat and with unbranched veins). — Type: *Poopath et al. 2580* (holo BKF; iso K), Thailand, Phetchaburi Province, Khao Yoi, E-bit Mountain, 60 m alt., 5 Oct. 2020. Paratypes: *Poopath et al. 2580* (holo BKF; iso K), Thailand, Phetchaburi Province, Khao Yoi, E-bit Mountain, 60 m alt., 5 Oct. 2020; *Bongcheewin 1130A* (BKF, K, PBM), Thailand, Phetchaburi Province, Khao Yoi, E-bit Mountain, 60 m alt., 14 Nov. 2020; *Bongcheewin 1130B* (BKF), Thailand, Phetchaburi Province, Khao Yoi, E-bit Mountain, 60 m alt.

Etymology. The specific epithet *phetchaburiense* is derived from the type locality, Phetchaburi Province, southwest Thailand.

¹ Department of Pharmaceutical Botany, Faculty of Pharmacy, Mahidol University, Bangkok, 10400, Thailand; corresponding author e-mail: bhanubong.boc@mahidol.ac.th.

² The Forest Herbarium, Department of National Parks, Wildlife and Plant Conservation, Chatuchak, Bangkok, 10900, Thailand.

³ Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AB, UK.



Fig. 1 *Gomphostemma phetchaburiense* Bongch. & Poopath. a. Habitat, showing plant growing outside the limestone karst with incised serrate leaf margins; b. cyme and lateral view of corolla; c. habitat, showing plant growing inside the limestone cave entrance with shallowly serrate leaf margins. — Photos by a: Youngyut Rukkachatsuwan; b, c: Preecha Karaket.

Perennial, ascending herbs, 30–50 cm tall. *Stems* stout, much-branched from a woody base, obtusely quadrangular, longitudinally grooved. *Indumentum* dense, hairs dendroid and stellate with multi-celled stalks. *Leaves* chartaceous, densely tomentose with stellate hairs; blades ovate or elliptic, 4–9 by 2.5–3.5(–4) cm, apex acute, base cuneate or sometimes oblique, margin shallowly serrate or incised serrate, lower side pale green; petioles 15–30 mm long. *Inflorescence* thyrsoid with sessile condensed opposite cymes forming verticillasters, lax with adjacent nodes, 20–40 mm apart, becoming condensed above; cymes 5–7-flowered; bracts subtending cymes leaf-like; outer bracteoles sessile, lanceolate or elliptic, 15–20 by 3–7 mm, with dense dendroid hairs on both sides; inner bracteoles narrowly lanceolate or elliptic-lanceolate, 5–10 mm long, with dense dendroid hairs on both sides. *Flowering calyx* pale green, infundibular, 8–11 mm long; tube 5–7 mm long, outside

with dense, long simple hairs, inside glabrous, constricted at throat due to folding of the base of the sinus and prominent branching veins between teeth; teeth equal, ovate-triangular tapering into the apex, 2–3 mm wide at base, outside densely tomentose with a mixture of long simple and stellate hairs, inside sparsely tomentose with short hairs. *Fruiting calyx* infundibular, 11–15 mm long; tube 7–8 mm long; teeth equal, triangular, 3–4 mm wide at base, apex subulate. *Corolla* pinkish white, 25–28 mm long, throat inflated; tube 23–25 mm long, incurved, outside tomentose with short hairs, inside glabrous; upper lip 1-lobed, shorter than lower lip, broadly ovate, apex emarginate, outside sparsely tomentose, inside glabrous; lower lip 3-lobed, pinkish purple; middle lobe tongue-like, margin undulate; lateral lobes spreading. *Stamens* included underneath upper lip; filaments fleshy, white, sparsely tomentose with minute glandular hairs; anthers yellowish white. *Disc* slightly lobed. *Style*

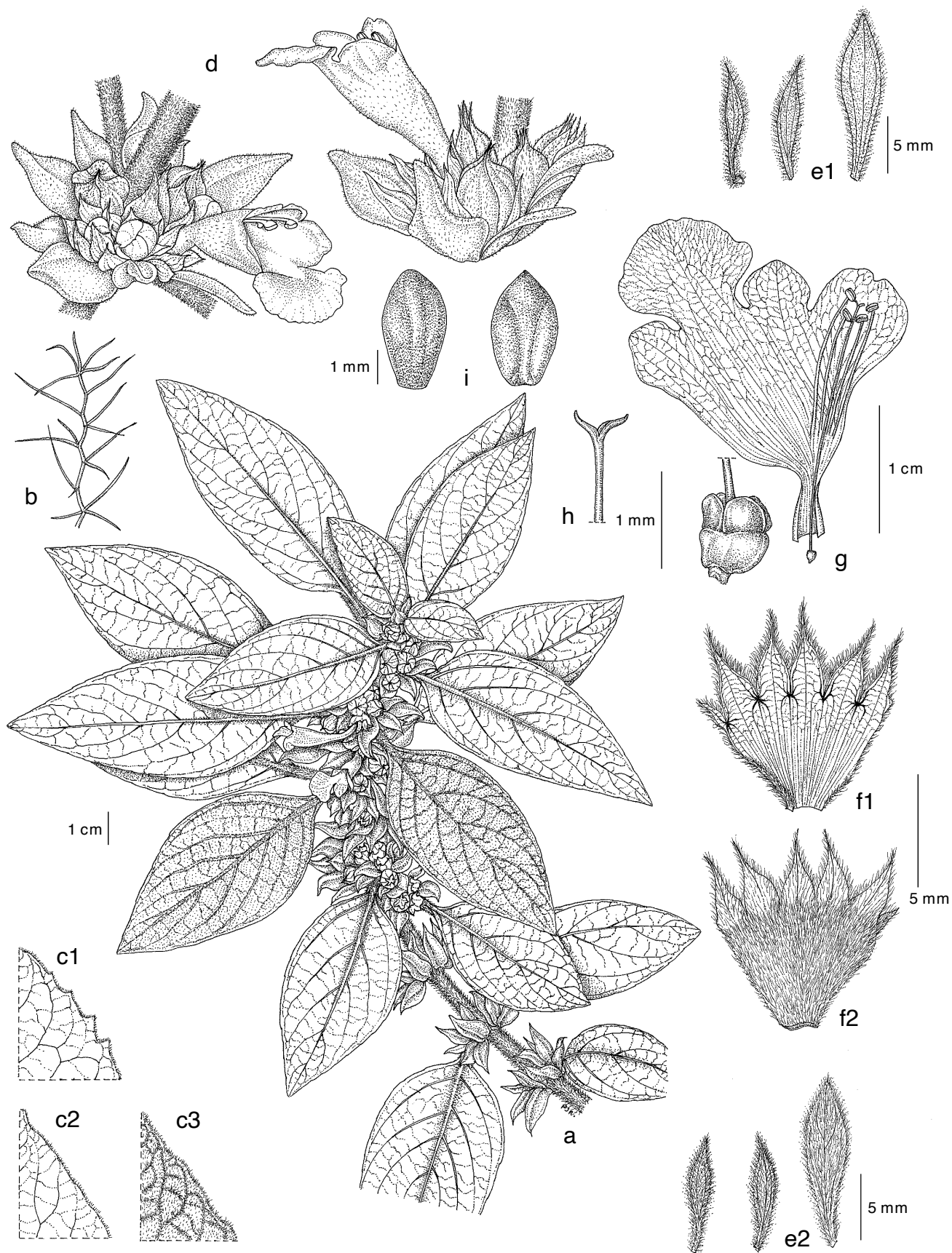


Fig. 2 *Gomphostemma phetchaburiense* Bongch. & Poopath. a. Habit; b. dendroid hair with a multi-celled stalk from stems; c1. incised serrate leaf margins, upper surface; c2. shallowly serrate leaf margins, upper surface; c3. shallowly serrate leaf margins, lower surface; d. cymes; e1. bracteoles, two inner and one outer, inside; e2. bracteoles, two inner and one outer, outside; f1. opened flowering calyx, inside; f2. opened flowering calyx, outside; g. opened corolla showing stamens and pistil; h. pistil; i. nutlets. (a, b, c2, c3, d, e, i: *Poopath et al.* 2580, BKF; c1: *Bongcheewin* 1130B, BKF; f, g, h: *Bongcheewin* 1130A, BKF). — Drawn by Pajaree Intachub.

slender, glabrous, shorter than corolla with apex subequally lobed. *Nutlets* 2 fully developed, narrowly obovate, 3–5 mm long, smooth and glabrous, apex acuminate.

Distribution — Endemic to southwestern Thailand.

Habitat & Ecology — Moist places inside the entrance to limestone caves or growing in rock crevices on the limestone cliff outside with a high degree of exposure to the sunlight; c. 60 m altitude. Flowering & fruiting: October to November.

Vernacular name — Pradapha phetchaburi (ประดับผาเพชรบุรี, in Thai).

Conservation status — Critically Endangered. *Gomphostemma phetchaburiense* is known from only one location on a limestone mountain in Phetchaburi Province. Only three clumps of plants were seen around a single cave entrance, c. 20 m high. The mountain is dominated by a colony of hundreds of Rock Pigeons (*Columba livia*, family *Columbidae*), which invade the habitat of *G. phetchaburiense*. Furthermore, the bird excrement, which is acidic, may have a detrimental effect to the growth of the new species. There are fewer than 50 mature individuals in a single location, in which is not a protected area. Therefore, we assess the species as Critically Endangered, B2ab(ii,iv,v)+D (IUCN 2019).

Note — *Gomphostemma phetchaburiense* shows two forms of leaves, which is seemingly induced by ecological conditions. The leaves with incised serrate leaf margins were found on plants growing in the rock crevices outside the limestone karst (Fig. 1a, 2ci), those with shallowly serrate leaf margins were found inside the cave entrances or in moister places (Fig. 1c, 2cii, 2ciii). The climate condition outside the cliff was rather dry due to direct exposure to the sun. The shaded wall of the cave entrance was cooler and more humid. This observation is consistent with the size of leaf teeth being related to the convection coefficient, i.e., the ability of heat to flow through the leaves (Gottschlich & Smith 1982).

KEY TO THE SPECIES OF GOMPHOSTEMMA IN THAILAND

- 1. Inflorescence terminal, condensed at apex of leafy stem axis 10. *G. strobilinum*
- 1. Inflorescence axillary or basal with flowers condensed or arranged in verticillasters or short raceme-like flowering shoots 2
- 2. Cymes inserted at the lower nodes from which leaves have fallen 3
- 2. Cymes inserted at the upper nodes at which leaves are present 4
- 3. Stems tomentose with stellate hairs with a very short or 1-celled stalk; corolla tube glabrous inside 2. *G. curtisii*
- 3. Stems densely tomentose with densely dendroid hairs and stellate hairs with a multi-celled stalk; corolla tube usually glabrous inside, occasionally with an annulus of simple hairs inside 8. *G. pedunculatum*
- 4. Corolla tube with annulus of simple hairs inside 6. *G. microdon*
- 4. Corolla tube glabrous inside 5
- 5. Corolla throat narrow, not inflated or gradually expanding near the throat; nutlets single 6
- 5. Corolla throat inflated, tube abruptly expanding near the throat; nutlets 1–4 7

- 6. Bracteoles 1–3 mm wide, narrower than the calyx 1. *G. crinitum*
- 6. Bracteoles 4–7 mm wide, broader than the calyx 7. *G. parviflorum*
- 7. Bracteoles prominent, longer than the calyx; stems much-branched already with densely dendroid hairs and stellate hairs with a multi-celled stalk 9. *G. phetchaburiense*
- 7. Bracteoles less prominent, shorter than the calyx; stems throughout sparsely branching or unbranched with hairs various, rarely with dendroid hairs 8
- 8. Roots tuber-like; plants not higher than 0.4 m 5. *G. mastersii*
- 8. Roots fibrous, not tuber-like; plants always 0.4–3 m 9
- 9. Sprawling to ascending herb; stems slender, not more than 3 mm diam; internodes of leafy and flowering shoots with curving stem appearing wavy, always twisting 3. *G. flexuosum*
- 9. Erect herb, clearly standing upright; stems robust, up to 8 mm diam; internodes straight 4. *G. javanicum*

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