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Research

Boeica konchurangensis sp. nov. (Gesneriaceae) from Gia Lai plateau, Vietnam

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Boeica konchurangensis B.H.Quang, D.V.Hai & Mich.Möller, a new species of Gesneriaceae from the Gia Lai Province of Vietnam is described, illustrated, and colour photographs of the species are provided. This new species has an almost actinomorphic corolla and shows morphological similarities with *B. porosa*, but differs from it by a shorter peduncle, a near-actinomorphic purple corolla with a distinctly broad campanulate tube and a shorter capsule.

Keywords: flora, Kon Chu Rang Nature Reserve, Plateau Vietnam, taxonomy

Introduction

Boeica C.B.Clarke is a genus of Gesneriaceae and was first published by Clarke (1874). It is distributed widely from northern and northeastern India, Bhutan, Myanmar, China, Thailand, Vietnam and Peninsular Malaysia (Pellegrin 1926, Burtt 1977, 2001, Wang et al. 1990, 1998, Ho 2000, Li and Wang 2004, Phuong 2005, 2017, Weber et al. 2013, Wen et al. 2016). The genus is placed in the subfamily Didymocarpoideae, tribe Trichosporeae, subtribe Leptoboecinae (Weber et al. 2013). *Boeica* plants are usually terrestrial, often lithophytic, or occasionally epiphytic perennial herbs. The genus includes 14 species after *B. griffithii* C.B.Clarke was reduced to variety and one new each from China and India were recently described (Chakrabarty et al. 2016, Möller et al. 2016, Wen et al. 2016, Hareesh et al. 2018). From Vietnam, five species have been recorded (Pellegrin 1926, Ho 2000, Phuong 2005, 2017, Wen et al. 2016), although Burtt (1962) regards *B. confertiflora* (Drake) Pellegr. as belonging to *Tetraphyllum* C.B.Clarke and made the recombination *Tetraphyllum confertiflorum* (Drake) B.L.Burtt. Recently, the generic name *Tetraphyllum* was replaced by *Tetraphylloides* Doweld because of priority reasons and the new combination *Tetraphylloides confertiflora* (Drake) Doweld has been made (Doweld 2017). This leaves four species of *Boeica* in Vietnam, *B. ferruginea* Drake, *B. porosa* C.B.Clarke, *B. stolonifera* K.Y.Pan, and the recently described *B. ornithocephalantha*



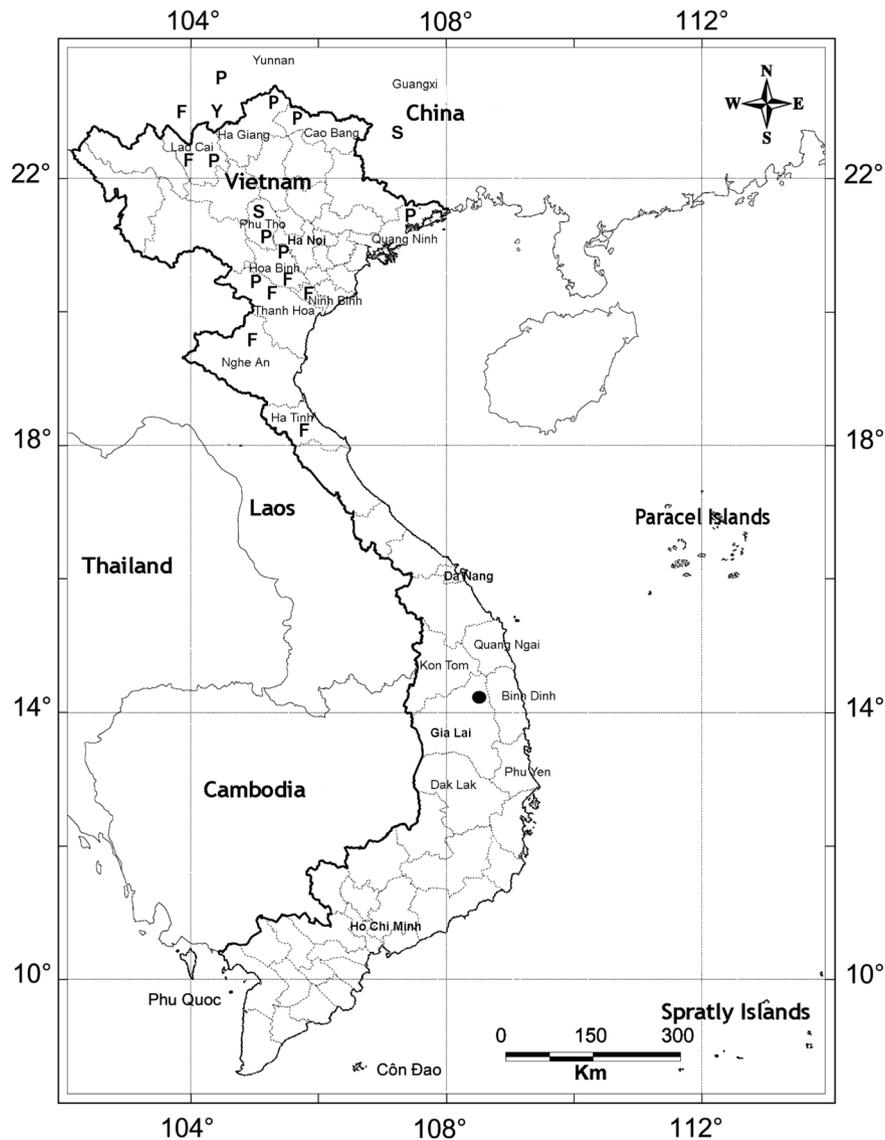


Figure 1. Distribution map of *Boeica* in China and Vietnam. *Boeica konchurangensis* sp. nov. (●) in the Kon Chu Rang Nature Reserve in Gia Lai province, Vietnam, *B. ferruginea* (F) and *B. porosa* (P) in north Vietnam and southeast Yunnan, China, *B. stolonifera* (S) in north Vietnam and Guangxi, China, *B. ornithocephalantha* (O) in north Vietnam, and *B. yunnanensis* (Y) in southeast Yunnan of China.

F.Wen, T.V.Do & Y.G.Wei (Wen et al. 2016). All of these are distributed in the north of the country (Fig. 1). All species, except the last one, also occur in south China, where the purely Chinese *B. yunnanensis* also occurs (Fig. 1).

During a floristic exploration in the Kon Chu Rang Nature Reserve of Gia Lai Province of the southern Plateau, Vietnam, material of a species was collected that was identified as belonging to *Boeica* based on its short-tubed campanulate and weakly zygomorphic corolla, presence of four free fertile stamens, capsular fruit and alternate leaf arrangement (Weber 2004). However, a closer scrutiny of the available literature and examination of the type specimens and protologues showed no match with any known taxon of *Boeica*.

Most species in *Boeica* possess a strongly zygomorphic two-lipped corolla with a longer lower lip, and this is true

also for the two species occurring in Vietnam (and south China), *B. ferruginea* and the recently described *B. ornithocephalantha* (Wen et al. 2016). In contrast, the newly collected specimens show an almost actinomorphic corolla which is reminiscent of the Peninsular Malaysian *B. brachyandra* Ridl. and *B. nutans* Ridl. However, these are stemless or nearly stemless herbs (Ridley 1905, 1912) as opposed to the caulescent habit of the newly collected plants here. The south Chinese *B. yunnanensis* (H.W. Li) K.Y.Pan also has a quite regular corolla but in this species it is saccate at the base and the style has two broad and flat wing-like appendages (Li 1982, Wang et al. 1998). Of the two species occurring in Vietnam (and south China) with almost regular corollas, *B. stolonifera* has distinct 10–30 cm long stolons (Pan 1988), which are absent in the new material studied here.

Table 1. Comparison of diagnostic characters of *B. konchurangensis* and *B. porosa*. *Based on the original species description, holotype specimen (K000858445) species description in Wang et al. (1998) with amendments from own observations.

Character	Species	
	<i>B. konchurangensis</i>	<i>B. porosa</i> *
Inflorescence	peduncle 0.5–1.5 cm long, ca 0.5–1.0 cm in diameter, purplish brown hispid	peduncle 3.5–8(–10) cm long, ca 1–2 mm in diameter, densely white villous
Calyx	divided to base, 5(–6)-lobed, lobes linear lanceolate, 3–5 mm long, ca 0.5 mm wide at base, outside reddish erect glandular puberulent, margin entire	divided almost to base, 5-lobed, lobes narrowly lanceolate to elliptic, 4–5 mm long, 1.0–1.3 mm wide, outside green densely villous, margin entire to dentate
Corolla	nearly actinomorphic, 5(–6)-lobed, purplish, 15 mm across, inside and outside glabrous; tube distinctly broad campanulate, 3–5 mm long, 4–5(–6) mm wide	zygomorphic, 5-lobed, white to pinkish, 3–7 mm across, inside glabrous and outside glabrescent; tube not swollen, 1.0–1.5 mm long
Stamens	filaments purplish to white, slightly flattened, 1.0–1.5 mm long, 0.4–0.6 mm in diameter; anthers light yellow, staminode absent	filaments white, cylindrical, 0.6–1.5 mm long, 0.3–0.4 mm in diameter; anthers yellow, staminode ca 0.3 mm
Pistil	ovary ovoid, 1.0–1.5 mm long, ca 0.3–1.0 mm in diameter, glabrous; style dark purplish to white, 6–10 mm long, 0.8–1.0 mm in diameter, glabrous	ovary conical, 1.2–1.5(–2.0) mm long, ca 0.4–0.6 mm in diameter, puberulent and glandular puberulent; style white, 1.5–3.0 mm long, 0.2–0.5 mm in diameter puberulent
Capsule	conical, grooved with 4 rounded edges, glabrous, 1.0–1.5 cm long	linear, without grooves, tomentose, 2.0–2.8 cm long
Flowering and fruiting	Flowering from July to August and fruiting from September to October	Flowering June–August, fruiting August

The other species, *B. porosa*, is overall the most similar species to the newly collected material but differs in particular in leaf, inflorescence, calyx, corolla and fruit characteristics (Table 1). The new species has an unusual feature in that, besides the usual pentamerous flowers with five sepals and corolla lobes and four stamens, hexamerous flowers were frequently observed, possessing six sepals and corolla lobes and five stamens. Whether this is linked to the near actinomorphic morphology of the corolla is as yet unclear. The populations of the new species are furthermore geographically disjunct from the other species of *Boeica* in north Vietnam (Fig. 1). Taken together with the morphological differences from known species, it is apparent that the newly collected material indeed represented a species new to science, which we compare in detail to *Boeica porosa* and illustrate and described here as *Boeica konchurangensis* B.H.Quang, D.V.Hai & Mich.Möller.

Material and methods

Specimens of the new species were collected from Gia Lai Province in July 2017 and September 2018 by B. H. Quang, D. V. Hai, N. S. Khang, L. N. Han, T. D. Binh, D. H. Son and L. T. M. Linh, during an expedition conducted by the Institute of Ecology and Biological Resources (IEBR), and deposited at HN and E. All specimens of *Boeica* kept in different herbaria such as Royal Botanic Garden Edinburgh (E), Institute of Ecology and Biological Resources (HN), Institute of Tropical Biology (VNM), Vietnam National Museum of Nature (VNMN) and photographs of type specimens housed in virtual herbaria (K, KUN, P, PE) were studied. The observed morphological characters were complemented

with those from relevant literature (Ridley 1912, Pellegrin 1926, Li 1982, Pan 1988, Wang et al. 1990, 1998, Ho 2000, Phuong 2005, 2017, Wei et al. 2010, Wen et al. 2016).

Taxonomic treatment

***Boeica konchurangensis* B.H.Quang, D.V.Hai & Mich. Möller, sp. nov. (Fig. 2–5)**

A species morphologically most similar to *Boeica porosa* C.B.Clarke, but distinguished by a shorter peduncle with different indumentum (0.5–1.5 cm long, purplish brown hispid versus 3.5–8(–10) cm long, densely white villous), corolla shape, colour and indumentum (nearly actinomorphic with a tube distinctly broad campanulate 3–5 mm long, purplish, 4–5(–6) mm wide, inside and outside glabrous versus zygomorphic with a short tube 1.0–1.5 mm long, white to pinkish, 3–7 mm across, inside glabrous and outside glabrescent), and capsule characters (conical, grooved with 4 rounded edges, glabrous, 1.0–1.5 cm long versus linear, without grooves, tomentose, 2.0–2.8 cm long).

Type: Vietnam, Gia Lai Province, Kon Chu Rang Nature Reserve, 14°29'18.5"N, 108°34'16.7"E, 1012 m a.s.l., 25 July 2017, B. H. Quang 206 (holotype: HN!, isotype: E!).

Paratypes: Vietnam, Gia Lai Province, Kon Chu Rang Nature Reserve, 14°29'18.5"N, 108°34'16.7"E, 1012 m a.s.l., 26 July 2017, B. H. Quang, D. V. Hai, N. S. Khang, L. N. Han, T. D. Binh, D. H. Son and L. T. M. Linh; KCR 059 (HN!). – Vietnam, Gia Lai Province, Kon Chu Rang Nature Reserve, 14°30'27.5"N, 108°32'48.6"E, 1076 m a.s.l., 19 Sep 2017, B. H. Quang, D. V. Hai, L. N. Han and

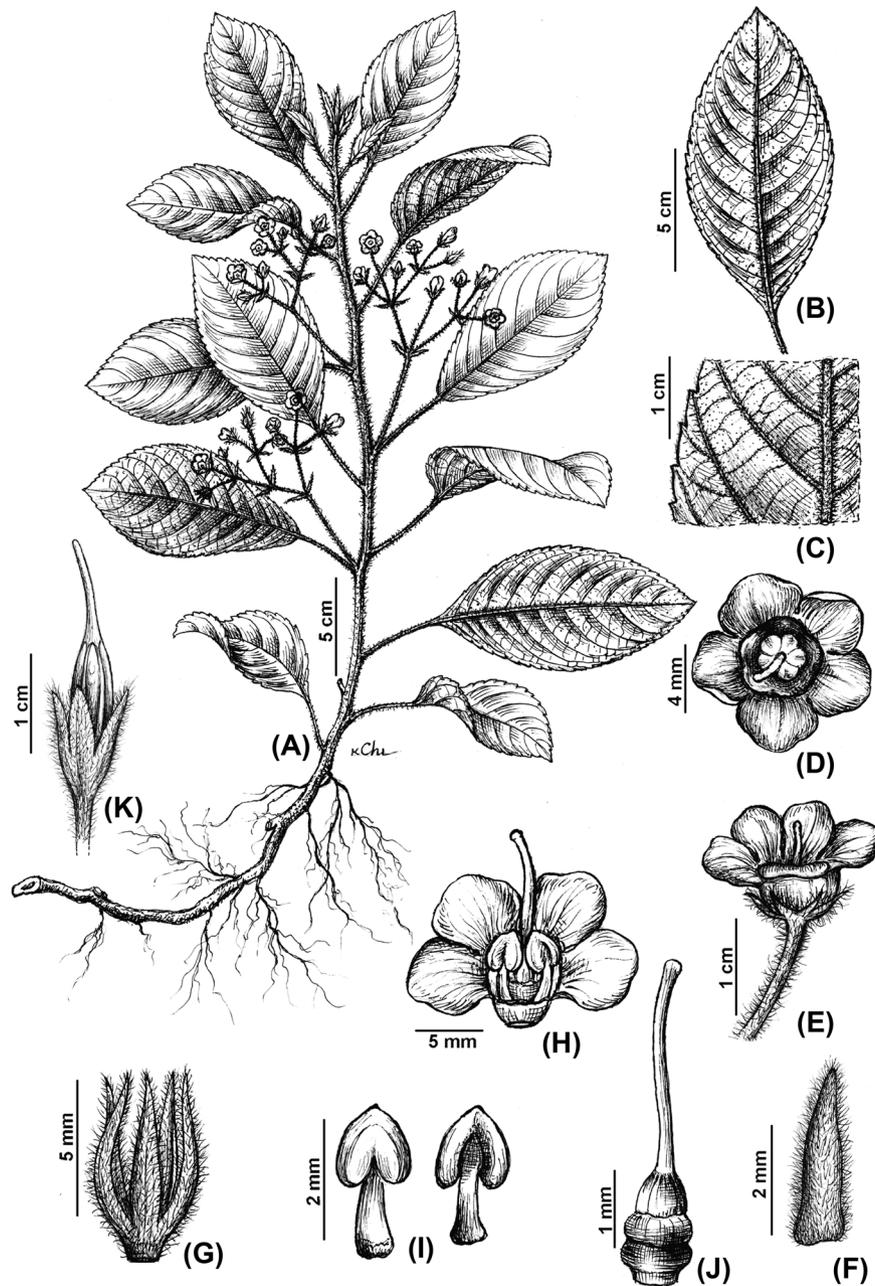


Figure 2. *Boeica konchurangensis* sp. nov. (A) flowering branch, (B) leaf abaxially, (C) leaf margin, (D) flower top view, (E) flower side view, (F) one of two bracts, (G) calyx, (H) cut open flower showing stamens and pistil, (I) front and back view of anther, (J) pistil, (K) capsule. Drawings by Le Kim Chi, based on the holotype, B. H. Quang 206, HN.

T. D. Binh; KCR 313 (HN!). – Vietnam. Gia Lai Province, Kon Chu Rang Nature Reserve, 14°29'20.5"N, 108°34'18.7"E, 1036 m a.s.l., 9 Sep 2018, B. H. Quang 229 (HN!).

Etymology

This species is named after the 'Kon Chư Răng Nature Reserve' where it was discovered.

Vernacular name

Bê ca Kon Chư Răng (in Vietnamese).

Description

Subshrub, up to 10–20(–30) cm tall, unbranched, with densely yellowish-brown woolly indumentum; stems ca 2–4 mm in diameter. Leaves simple, alternate; petiole 1.0–1.2(–1.6) cm long, densely covered with long brown tangled hairs; leaf blade elliptic to obovate, dark green above, pale greenish below, 5–10 cm long, 3.0–4.5 cm wide, adaxially setose, abaxially setulose, greenish villous along veins, cuneate at base, with margins entire to serrate in upper half, usually fringed with hairs along the margin, at apex acute

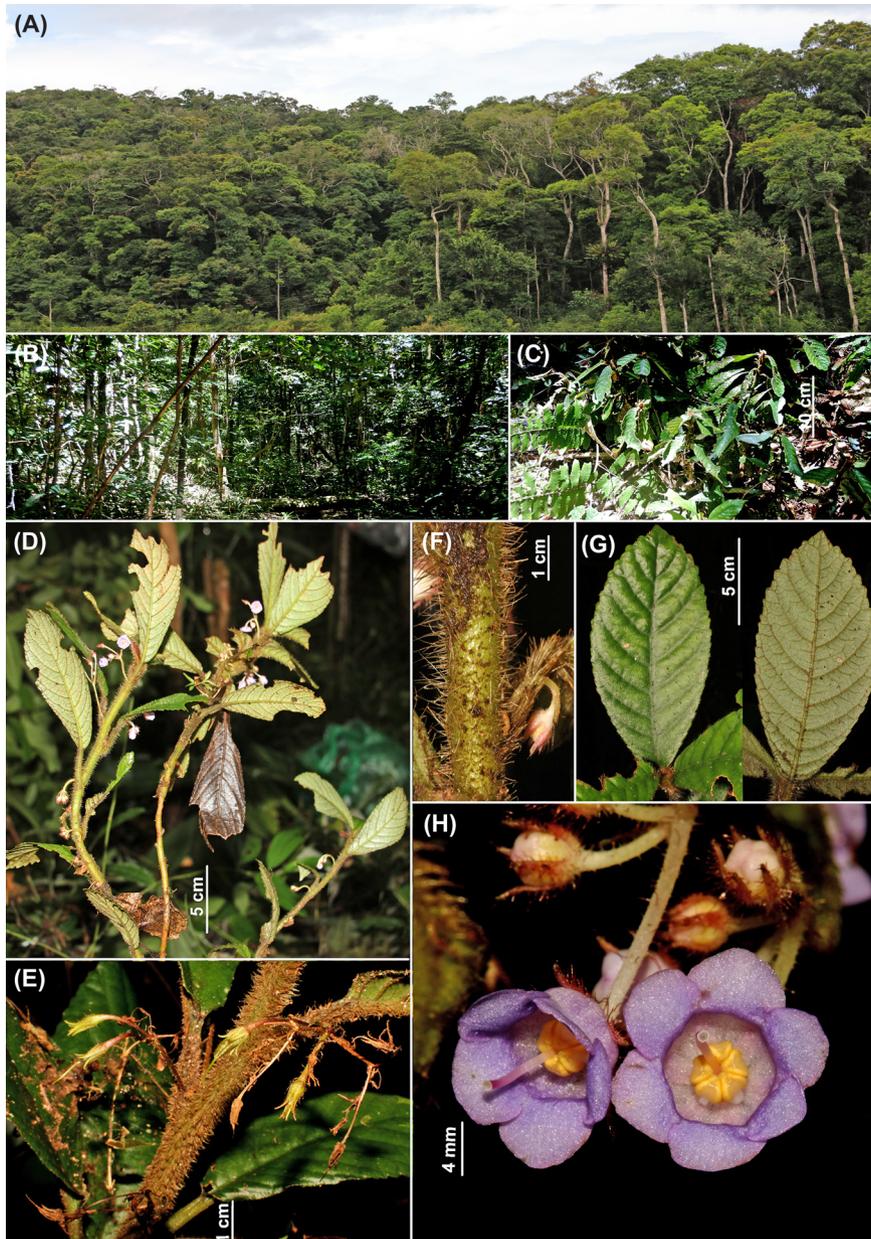


Figure 3. *Boeica konchurangensis* sp. nov. (A–B) habitat, (C) habit, (D) flowering shoot with inflorescences, (E) infructescences with immature capsules, (F) branch with young inflorescence, (G) adaxial (left) and abaxial (right) leaf surfaces, (H) flowers with the usual 5 and rarely 6 lobes. All photos by B. H. Quang and D. V. Hai.

to broadly acute; lateral veins 8–10 on each side of midrib. Inflorescences axillary, each a dichasium, 9–12-flowered; peduncles 0.5–1.5 cm long, ca 0.5–1.0 mm in diameter, hispid from purplish brown hairs borne on distinct multicellular feet, bracts 2, narrowly linear, ca 2–3 mm long, ca 0.5 mm wide, sparsely purplish brown or white erect glandular pubescent and with purplish brown rigid hairs borne on distinct multicellular feet, pedicels 0.5–1.0 cm long, 0.5–1.0 mm in diameter, sparsely purplish brown and white erect glandular pubescent. Calyx divided to the base, 5–(6) lobed, pinkish; lobes linear lanceolate, 3–5 mm long, ca 0.5 mm wide at base, outside reddish erect glandular puberulent,

with entire margin. Corolla purplish, almost actinomorphic, 15 mm across; tube distinctly broad-campanulate, 3–5 mm long, 4–5(–6) mm wide, glabrous inside and outside; lobes 5–(6), broadly to oblong, obtuse at apex, 2–5 mm long, 2–4 mm wide. Stamens 4 (or 5 when 6 lobes are present); filaments purplish to white, slightly flattened, 1.0–1.5 mm long, 0.4–0.6 mm in diameter, glabrous, adnate to the base of corolla; anthers light yellow, large, their thecae confluent apically, glabrous, 0.8–1.0 mm long, 0.5–1.2 mm wide at base, dehiscing apically poricidally; staminode absent. Ovary ovoid, purplish to white, 1.0–1.5 mm long, ca 0.3–1.0 mm in diameter, glabrous, unilocular, with bifid intrusive

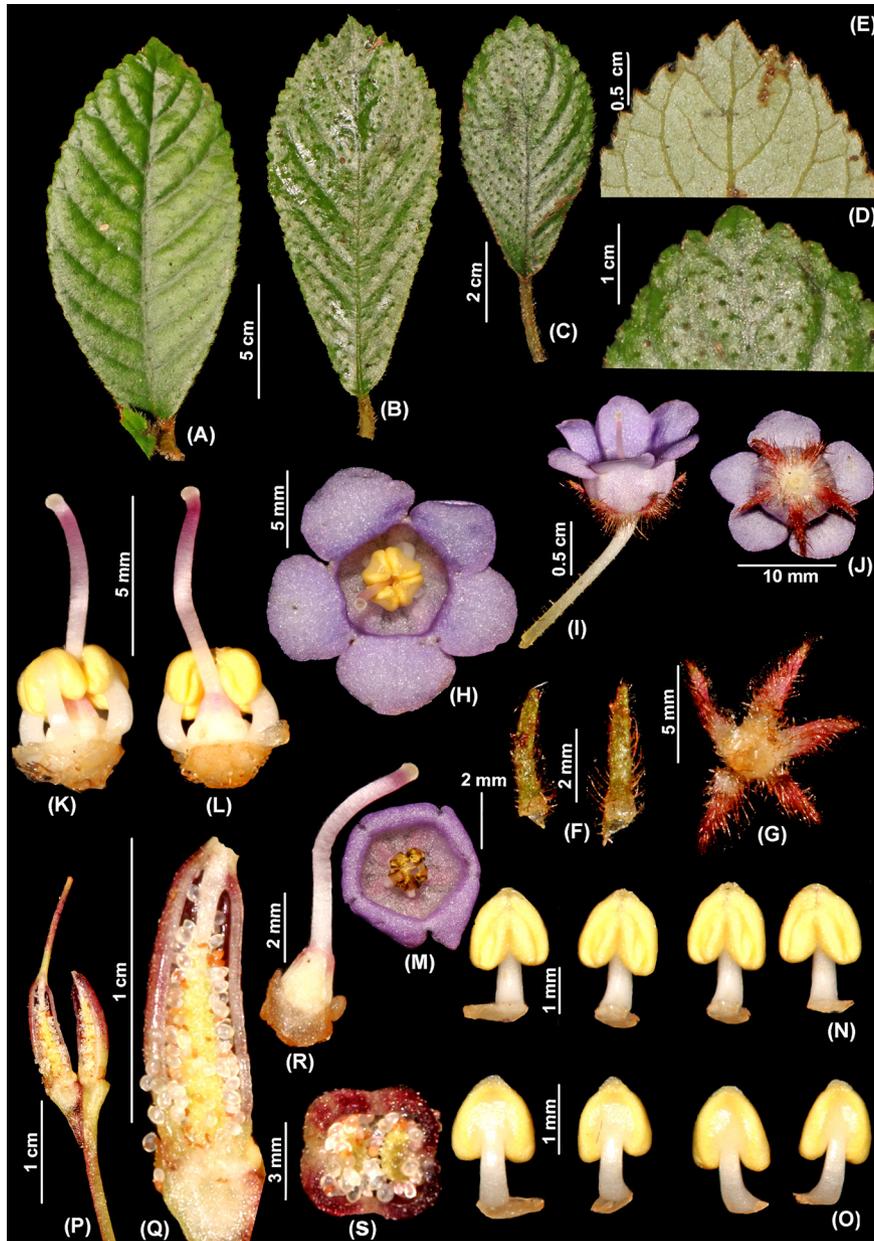


Figure 4. *Boeica konchurangensis* sp. nov. (A–C) leaves, (D) leaf apex adaxially, (E) leaf apex abaxially, (F) bracts, (G) calyx, (H) flower top view, (I) flower side view, with rare six lobes (J) flower bottom view, (K–L) flower with sepals, lobes and tube removed to show arrangement of stamens and pistil, (M) flower top view, showing anther dehiscence, (N) front and (O) back view of the four anthers, (P) cut open immature capsule, (Q) detailed view of opened capsule, (R) pistil with ovary sectioned, (S) cross section of immature capsule. All photos by B. H. Quang and D. V. Hai.

parietal placentation; style cylindrical, dark purplish to white, 6–10 mm long, 0.8–1.0 mm in diameter, glabrous; stigma capitate, globose, dark purplish to purple, 0.1–0.2 mm long; disc 0.5–1.0 mm, glabrous, ring-like, white. Capsule conical, longitudinally grooved with 4 rounded edges, glabrous, 1.0–1.5 cm long, 4–6 mm in diameter.

Phenology

Flowering in July–August and fruiting from September to October.

Distribution and habitat

Boeica konchurangensis is only known from its type locality, Gia Lai Province, K’Bang district, Son Lang Commune, Kon Chu Rang Nature Reserve in southern Vietnam (Fig. 1), at elevations between 1000 and 1200 m a.s.l. The species is found in the understory of mountain forests, growing in damp and heavy soil. It was found associated with *Pavetta bauchei* Bremek., *Lasianthus biflorus* (Blume) M.Gangop. & Chakrab., *Staurogyne aff. debilis* (T.Anders.) C.B.Clarke, *Popowia pisocarpa* (Blume) Endl. ex Walp., *Huperzia*

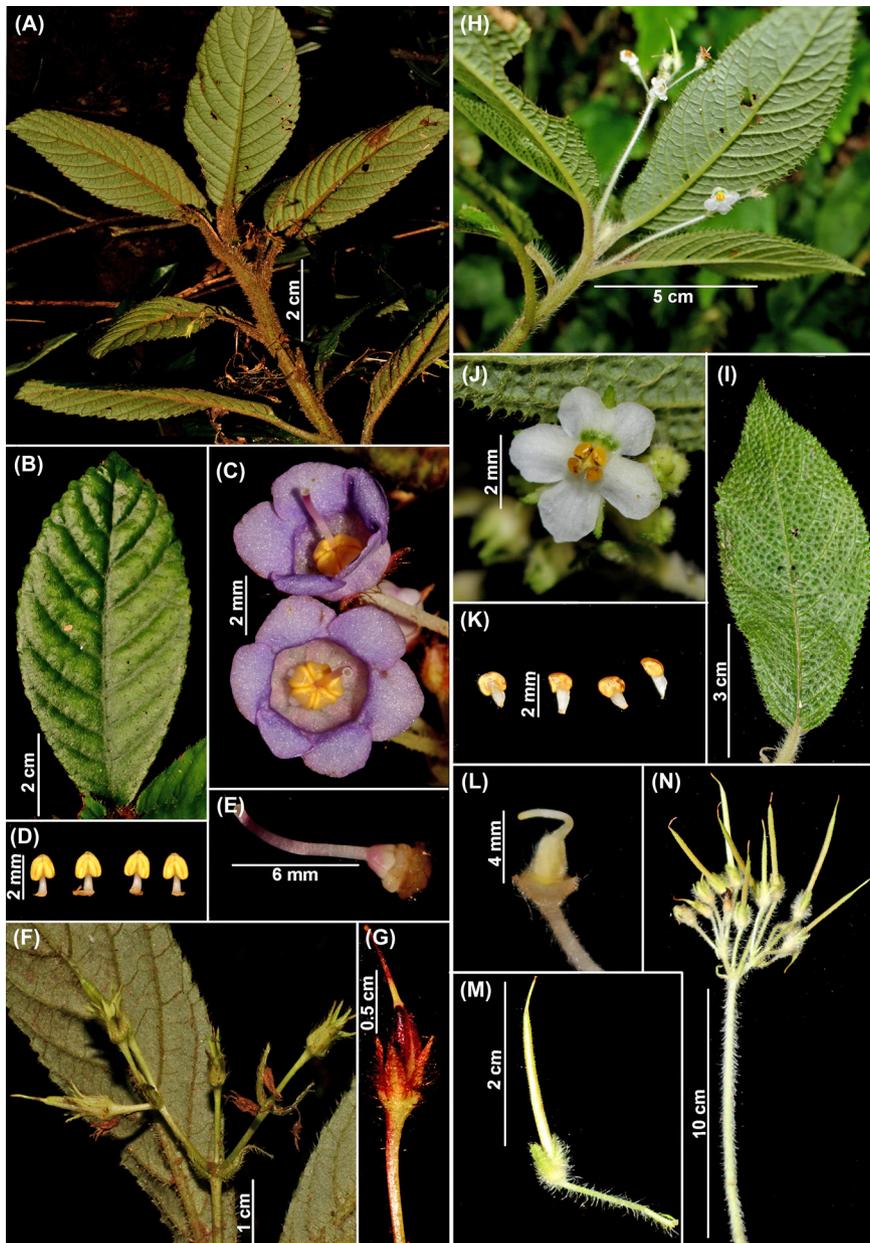


Figure 5. Morphological comparison between *B. konchurangensis* sp. nov. and *B. porosa*. *Boeica konchurangensis* sp. nov. (Quang 206, type specimen): (A) habit, (B) leaf adaxially, (C) flowers, (D) anthers, (E) pistil, (F) infructescence with immature capsule, (G) capsule. *Boeica porosa* (Vietnam, Thanh Hoa province, Quan Hoa district, B.H.Quang et al. DLT 188): (H) habit, (I) leaf adaxially, (J) flower, (K) anthers, (L) pistil, (M) capsule, (N) infructescence with immature capsules. All photos by B. H. Quang and D. V. Hai.

phlegmaria (L.) Rothm., *Hedyotis effusa* Hance, *Ardisia verbascifolia* Mez and other herbs near streams in primary subtropical evergreen forests.

Proposed IUCN conservation assessment

As far as currently known, there are two populations with 20–30 and 100–150 plants, respectively. However, no anthropogenic threat was detected as they grow at undisturbed sites in a nature reserve. However, this area is prone to landslides due to heavy rain, and some insects feeds on its

leaves (Fig. 3B, D, G), and thus the small populations may be affected by these factors. Thus, we suggest at present a status of ‘Vulnerable’ VU D2 (IUCN 2012) for the new species *Boeica konchurangensis*.

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