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Paraboea villosa (Gesneriaceae), a new species from Northern Vietnam

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ABSTRACT: Based on morphological data, *Paraboea villosa* from limestone areas of northern Vietnam is described and illustrated as a new species. It is similar to *Paraboea middletonii* Triboun*, P. rufescens* (Franch.) B.L. Burtt and *P. umbellata* (Drake) B.L. Burtt, but differs in its almost ebracteate inflorescence, small white flowers, very short peduncles, absence of staminodia, bright yellow, swollen, gibbous filaments and large anthers.

KEY WORDS: flora of Vietnam, Gesneriaceae, limestone endemism, *Paraboea villosa*, plant diversity, plant taxonomy.

INTRODUCTION

The limestone areas of northern Vietnam show particularly high levels of plant biodiversity among Asian floras (Myers *et al.*, 2000, Clements *et al.*, 2006). Many new genera and species of ferns, gymnosperm and seed plants have been found here recently (Farjon *et al.*, 2002; Smith and Zhang 2002; Averyanov *et al.*, 2018, 2019). The genus *Paraboea* (C.B. Clarke) Ridl. has recently been recircumscribed (Burtt *et al.*, 1984; Middleton *et al.*, 2010; Puglisi *et al.*, 2011; Puglisi *et al.*, 2016), and has become one of the larger genera in the Old World Didymocarpoid Gesneriaceae (Xu *et al.*, 2017; Middleton, 2018). As a large extent of Asian limestone karsts remains unexplored, fewer than 20 species have been recorded in Vietnam until now (Middleton, 2018). More new species of *Paraboea* are certainly expected to be found as a result of further field and herbaria investigations (Puglisi *et al.*, 2016).

In the course of floristic surveys in the limestone areas of northern Vietnam in 2013, we collected unusual plants of *Paraboea.* These plants were subsequently cultivated in the garden of the Komarov Botanical Institute of the Russian Academy of Sciences (Saint Petersburg, Russia). After inspection of relevant literature (Wang *et al.*, 1998, Xu *et al.*, 2008, Triboun and Middleton 2012; Triboun, 2013; Wen *et al.*, 2013, Xu *et al.*, 2017; Middleton, 2018), as well as herbarium specimens (E, K, HN, IBK, IBSC, KUN, PE and VNMN), a new species of *Paraboea* was identified based on detailed examination of the salient morphological and anatomical features. Measurements of the vegetative and floral parts were made on living cultivated plants. Images of type specimens are available in Herbarium LE open access database (http://en.herbariumle.ru/?t=occ&s=Paraboea&f=%5Ball%5D) in high resolution.

TAXONOMIC TREATMENT

Paraboea villosa Aver., W.B. Xu & K.S. Nguyen, ***sp. nov.*** **Fig. 1**

***Type*:** VIETNAM, northern Vietnam, Cao Bang province, Thong Nong district, flowers white, or with greenish tint, herbarium specimen prepared from living collection *CPC5443*, 15 May 2019, *L. Averyanov, CPC 5443.1* (holotype – LE 01055082, isotype – LE 01055081 and HN 0000074119).

***Diagnosis*:** *Paraboea villosa* is similar to *Paraboea middletonii* Triboun*, P. rufescens* (Franch.) B.L. Burtt and *P. umbellata* (Drake) B.L. Burtt in its leaves dense brownish woolly indumentum and congested compound dichasium, but differs in its almost ebracteate inflorescence, small white flowers, very short peduncles, absence of staminodia, bright yellow, swollen, gibbous filaments and large anthers.

***Etymology*:** Species epithet refers to the characteristic villous indumentum of the stem, leaf petioles and inflorescence peduncles.

***Description*: Lithophytic or terrestrial perennial herb**. **Stem** erect, 40–60 cm tall, (0.8)1–1.2(1.4) cm in diameter, densely covered with brown hairs. **Leaves** petiolate, (6)8–10(12), opposite decussate, congested at the apex of the stem; petiole (2)3–6(8) cm long, grooved adaxially, densely covered with long brown hairs; leaf blade slightly coriaceous, narrowly ovate or elliptic, (8)10–15(16) cm long, (4.5)5–7(8) cm wide, apex roundish, base obscurely cordate, margin serrulate to finely crenulate and ciliate; adaxial surface dark green, finely tuberculate, densely covered with soft erect hairs; abaxial surface densely covered with light brown hairs, with prominent veins, secondary veins 7–9 on each side of midrib, tertiary veins reticulate. **Inflorescences** (1)2–4(6), axillary near the apex, compound dichasia, 2–3(4)

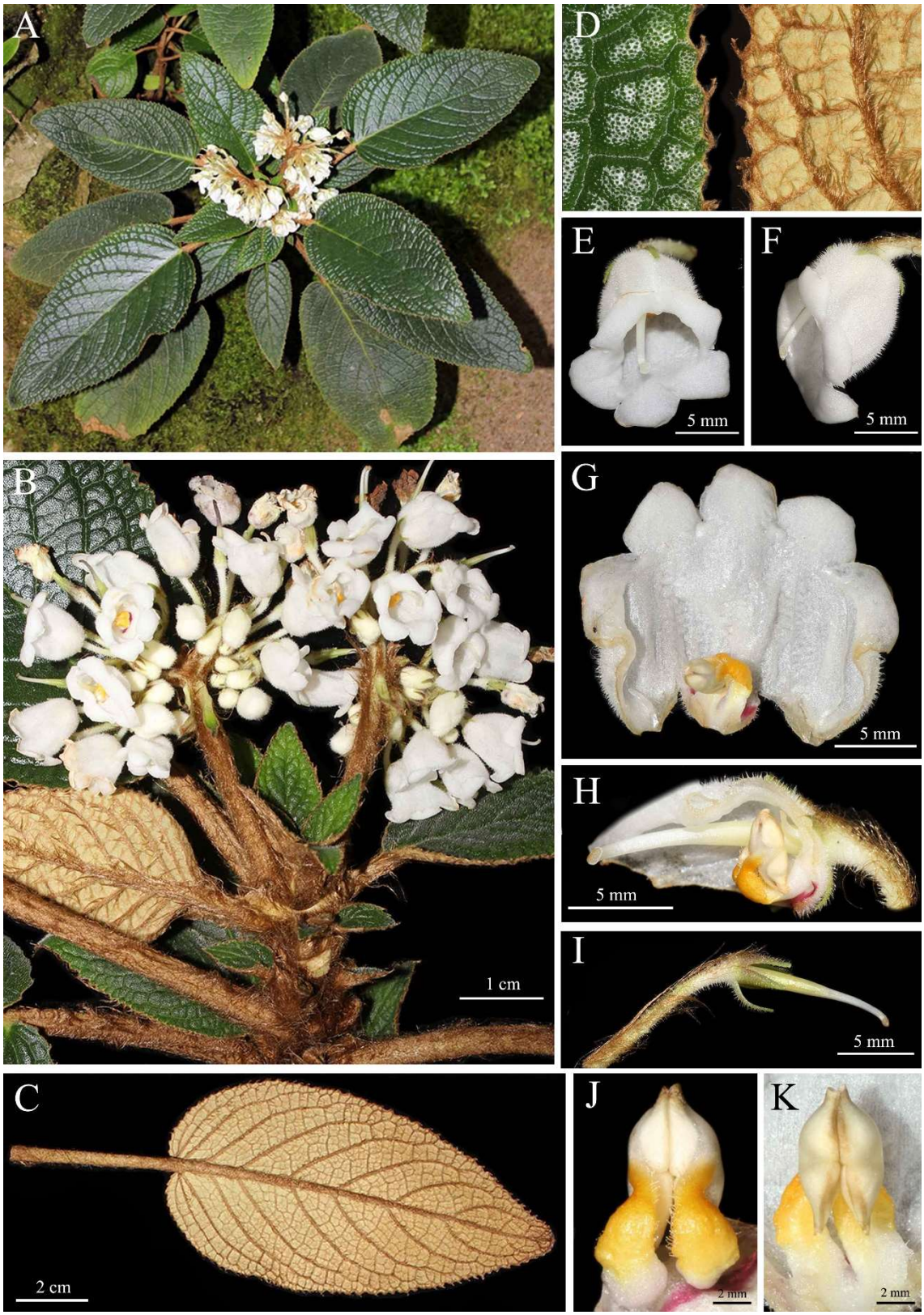

Fig. 1. *Paraboea villosa.* **A:** Habit. **B:** Inflorescences. **C:** Lower surface of leaf. **D:** A part of leaf blade showing upper and lower surface and margin. **E:** Flower face view. **F:** Flower side view. **G:** Opened corolla showing stamens. **H:** Opened corolla showing stamens and pistil. **I:** Pistil and calyx. **J:** Stamens back view. **K:** Stamens face view. All photos taken by L. Averyanov & T. Maisak, and designed by Z.C. Lu.

Table 1. Detailed comparison of *Paraboea villosa, P. middletonii, P. rufescens* and *P. umbellata*

characters	***Paraboea villosa***	***P. middletonii***	***P. rufescens***	***P. umbellata***
Leaf blade	upper surface densely covered with soft erect hairs, lower surface densely covered with light brown hairs	upper surface densely covered with multicellular glandular hairs, lower surface densely covered with brown hairs	upper surface densely pubescent, lower surface covered with a ferrugineous matted indumentum	upper surface densely pubescent, lower surface covered with ferrugineous matted indumentum
Inflorescence	axillary near the apex	axillary near the apex	axillary	subterminal
Peduncles	0.8–3.5 cm long	5–12 cm long	4–12 cm long	5–10 cm long
Bracts	Absent or rudimentary bracts less than 1 cm long, 2.5 mm wide	two, large, 1.5–2 × 1–1.8 cm, orbicular to elliptic	two, large, 0.7–1.2 × 0.4–1.1 cm, ovate to subrounded	two, large, 0.8–1.8 × 0.8–1.9 cm, more or less rounded
Corolla	white	white	violet or blue	violet or blue
Filaments	bright yellow, 4.5–5.5 mm long, distinctly swollen and gibbose in the middle part	white, 6 mm long, slightly curved	white, ca. 3.5 mm long, slightly curved	white, ca. 3 mm long, slightly curved
Anthers	2.2–2.4 × 5.5–6.5 mm	1.5 × 4–4.5 mm	ca. 2 × 4 mm	ca. 1.2 × 3.5 mm
Staminodes	absent	3	2	2
Florescence	May–June	August–September	June–September	June–September

orders of branching; peduncle (0.8)1.2–3(3.5) cm long, (2.5)3–4(4.5) mm in diameter, densely covered with brown hairs; bracts oblong, insignificant, 4–6 mm long, 1.5–2.5 mm wide or absent; the first order branch axis (3)4–8(10) mm long, densely covered with light brown hairs, the upper orders densely congested, less than 5 mm long; flowers paired; pedicels (5)6–10(11) mm long, densely covered with stiff white hairs throughout and with light brown hairs near base. **Calyx** 5-lobed, lobes subequal in size, covered with stiff whitish multicellular hairs, lobes fused at base for 0.8–1 mm; lobes narrowly linear-lanceolate, 3.4–3.6 mm long, 0.6–0.8 mm wide, acute, light green. **Corolla** white, campanulate, tube (6)7–9(10) mm long, (6.5)7–8(8.5) mm in diameter; lobes suborbicular, all lobes similar in size, 2.5–3 mm long, 3.5–4 mm wide, reflexed. **Stamens** 2, inserted near the base of corolla tube; filaments bright yellow, 4.5–5.5 mm long, prominently swollen in middle part to 2.2 mm in diameter, strongly curved to gibbose, hairy with dense stiff white hairs; anthers ellipsoid, white with yellowish tint, 2.2–2.4 mm long, 5.5–6.5 mm wide, coherent with each other, dorsifixed, apertured at the upper end, apex turned towards the gynoecium, staminodia absent. **Ovary** indistinct, pistil enantiostylous, narrowly conoid (8.5)9–11(11.5) mm long, in basal part light greenish, (0.9)1–1.1(1.2) mm in diameter, tapering into slightly curved white filiform style, stigma capitate, white, 0.4–0.5 mm in diameter. **Young capsule** narrowly cylindric, 1.8–2 cm long, 1.4–1.8 mm in diameter, glossy green, glabrous (ripe capsule probably twisted).

Ecology, habitat and conservation status**:** Primary coniferous forests with *Pseudotsuga brevifolia* on karstic limestone at elevation of about 1300 m a.s.l., commonly in shady places on middle part of mountain slopes. Locally common. Since no special surveys were carried out for delimiting its distribution, and the information about threat is unclear, so this species was considered as meeting the criteria of Data Deficient (DD) in terms of IUCN Red list categories and criteria (IUCN, 2017).

Phenology**:** Flowers in May–June.

Notes**:** Within the genus *Paraboea,* this new species belongs to the group of species with campanulate corollas, axillary congested cymes and an enantiostylous arrangement of stamens and pistil. Among the members of this group, it is most similar to *Paraboea middletonii* Triboun, which is endemic to northern Thailand, and also similar to *P. rufescens* (Franch.) B.L. Burtt and *P. umbellata* (Drake) B.L. Burtt, which distribute from southern China to northern Vietnam. More detailed comparison between the new species and another similar species are presented in Table 1.

Paratype**:** VIETNAM, Cao Bang province, Thong Nong district, Yen Son municipality, Ngan Vai village, around point 22°46'53"N, 105°52'58.7"E, primary fractionally logged coniferous forest with *Pseudotsuga brevifolia* along highly eroded rocky limestone ridge at elevation of about 1300 m a.s.l., terrestrial and lithophytic herb to 0.5 m tall in shady places on middle part of mountain slope, common, 7 October 2013, *L. Averyanov, N.T. Hiep, L.M. Tuan, N.S. Khang, T. Maisak, L. Osinovets, CPC 5443* (herbarium of Center for Plant Conservation, Hanoi).

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