

TWO NEW SPECIES OF *PARABOEA* (GESNERIACEAE) FROM VIETNAM

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Two new species, *Paraboea stellata* D.J.Middleton and *Paraboea minutiflora* D.J.Middleton, are described and provisional conservation assessments given.

Keywords. Ha Giang, Quang Binh.

INTRODUCTION

In recent years, many new species and one new genus of Gesneriaceae have been described from Vietnam (e.g. Middleton *et al.*, 2014a,b; Middleton, 2015; Nguyen *et al.*, 2016; Wen *et al.*, 2016; Chen *et al.*, 2017, 2018a,b; Hong *et al.*, 2018; Yang *et al.*, 2018). These have come about both through new exploration and through study of existing collections. Here two new species of *Paraboea* (C.B.Clarke) Ridl. from northern and central Vietnam are described from material in the Royal Botanic Garden Edinburgh.

Paraboea is one of the larger genera in the Gesneriaceae, with an estimated 130 species (Triboun & Middleton, 2015; Puglisi & Phutthai, 2017). The genus was revised by Xu *et al.* (2008) but much expanded later through the inclusion of *Phylloboea* Benth. and *Trisepalum* C.B.Clarke, and the description of many new species (Chen *et al.*, 2008; Kiew, 2010; Middleton *et al.*, 2010; Puglisi *et al.*, 2011; Chen *et al.*, 2012; Kiew, 2012; Triboun & Middleton, 2012; Triboun, 2013; Wen *et al.*, 2013; Puglisi *et al.*, 2015; Triboun & Middleton, 2015; Puglisi & Phutthai, 2017). There are an estimated 70 species in Thailand, yet fewer than 20 species have been recorded from Vietnam, with no clear biogeographical or habitat reasons for such a marked difference in diversity. Many of the species known from Thailand and China are locally endemic, and it is highly likely that several more species from Vietnam will be discovered and described with increased collecting across the country, particularly in the limestone areas in the north.

Images of the specimens are available via the online Herbarium Catalogue of the Royal Botanic Garden Edinburgh and Tropicos, the botanical information system at the Missouri Botanical Garden:

http://data.rbge.org.uk/search/herbarium/?specimen_num=674785&cfg=zoom.cfg&filename=E00658392.zip

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http://data.rbge.org.uk/search/herbarium/?specimen_num=674648&cfg=zoom.cfg&filename=E00658355.zip

<http://www.tropicos.org/Image/100549537>

<http://www.tropicos.org/Image/100549538>

***Paraboea stellata* D.J.Middleton, sp. nov.**

Differs from all other *Paraboea* species in the combination of (sub)orbicular leaves with entire margin, branched hairs and straight fruit. – Type: Vietnam, Quang Binh, Bo Trach Distr., Tan Trach Municipality, about 1.5 km SE of A Rem village, 750–900 m, 25 i 2005, *L. V. Averyanov, P.K. Loc, P.V. The, A. Averyanova, N.T. Vinh, N.Q. Vinh & N.T. Binh* HAL6145 (holo E [E00658392]; iso HN n.v., MO [MO3035004]).

Rosulate lithophytic herb. *Leaves*: petiole 3.7–11.4 cm long, densely hirsute throughout with both simple and branched hairs; blade thickly coriaceous, (sub)orbicular, 3.3–7 × 2.8–5.6 cm, 1.1–1.5 times as long as wide, base rounded to cordate, apex rounded, margin entire, 4–6 secondary veins on each side of midrib, slightly impressed above, prominent beneath, tertiary venation mostly obscure, sometimes scalariform, very densely hirsute with both simple and branched hairs beneath, glabrous above. *Inflorescence* scapose, dichasial, 10–24.7 cm long; peduncle 8–20.7 cm long, densely hirsute at base, becoming glabrescent upwards but hirsute at nodes along with hairy aborted flowers; bracts spatulate, c.6 × 1.7 mm, densely hirsute outside, glabrous at base inside, densely hirsute in upper half; pedicels 8–11.5 mm, glabrous. *Sepals* oblong, apex rounded, 4.2 × 0.9 mm, glabrous. *Corolla* light blue, campanulate, c.12.5 mm long, glabrous inside and outside, upper lip 2-lobed, lower lip 3-lobed, all lobes orbicular, apices rounded; tube c.6 mm; upper lobes c.2 × 2.5 mm, lateral lobes c.4 × 4 mm, lower lobe c.5 × 5.2 mm. *Stamens* inserted in tube c.1.5 mm from base; filaments c.4 mm long, with few short-stalked glands; anthers adnate face to face, c.2 × 4.4 mm, few short-stalked glands dorsally; lateral staminodes c.0.7 mm, medial staminode c.0.3 mm. *Disc* absent. *Ovary* glabrous, c.4 mm long, c.1 mm wide; style c.3.8 mm long, with short-stalked glands; stigma capitate. *Fruit* a capsule, straight, >1.4 cm long (only one damaged fruit seen). *Seeds* c.0.5 × 0.2 mm.

Distribution. Known only from two localities in Quang Binh province in Vietnam.

Ecology. Reported from primary, selectively logged, closed, evergreen, broadleaved forest and from closed, coniferous forest. In both cases, it is reported from steep and rocky slopes and ridges, is reported not to be uncommon, and grows on wet and rich humus and in shaded cracks in rock. The rock is reported to be solid, marble-like, highly eroded, stratified, crystalline limestone at 663–900 m a.s.l.

Provisional IUCN conservation assessment. Endangered ENB2ab(iii). The area of occupancy is calculated at only 8 km², but it is known from two localities that are not so far apart and could not, therefore, be described as fragmented. Although one of the localities is in a protected area, the other is not and with reports of selective logging.

Additional specimen studied. VIETNAM. **Quang Binh:** Minh Hoa Distr., Hoa Son Municipality, B'Lam Lang limestone mt., around point 17°42'11.9"N, 105°47'37.4"E, 15 viii 2011, *N.T. Hiep, N.Q. Hieu, N.V. Tap, N.S. Khang, N.Q. Vinh & L.T. Kien* CPC4289 (E [E00547445]).

This new species is extremely distinctive due to the dense covering of multibranched hairs. Branched hairs are already known in *Paraboea* in *P. vulpina* Ridl. and *P. tarutaensis* Z.R.Xu & B.L.Burt from southern Thailand and Peninsular Malaysia. Both these species also have straight fruits as in *Paraboea stellata* but *P. tarutaensis* is caulescent and has a dentate leaf margin and a white corolla, and *P. vulpina* has a crenate leaf margin, the leaves are pubescent above and the corolla tube is much shorter (2–2.5 mm).

***Paraboea minutiflora* D.J. Middleton, sp. nov.**

Most similar to species in the *Paraboea martinii* (H.Lév. & Vaniot) B.L.Burt group (see Xu *et al.*, 2008) in the large, branched inflorescence with reduced leaves at the base and long internodes, but distinct in the combination of non-winged petioles, cordate leaf blade base, corolla < 1 cm long and straight fruit. With the small campanulate corolla, it is most similar to *Paraboea thorelii* (Pellegr.) B.L.Burt but differs in the lack of glandular hairs on the inflorescence axes, in the leaf base shape and in the straight fruit (twisted in *Paraboea thorelii*). – Type: Vietnam, Ha Giang, Phong Quang Municipality, Man Village, 595–787 m, 22°53'21"N–22°53'35"N, 104°56'45"E–104°56'35"E, 15 ii 2001, *D.K. Harder, P.K. Loc, L.V. Averyanov, G.E. Schatz & S. Bodine* 6322 (holo E [E00658355]; iso HN n.v., MO [MO3035005]).

Rosulate herb with woody rootstock. *Leaves:* petiole 5.5–13.6 cm long, densely covered with a brown matted indumentum, not winged; blade ovate, 9.4–15.4 × 5.7–12.2 cm, base cordate, apex rounded and apiculate or abruptly acuminate, margin entire to minutely crenulate, 7–9 secondary veins on each side of midrib, densely covered with a brown matted indumentum throughout beneath, more sparsely so above. *Inflorescence* scapose, possibly arising terminally (but rather obscured on the specimens), 29.8–31 cm long, with distantly spaced branches; peduncle 15.5–19 cm long, with a dense matted indumentum in lower parts, glabrescent distally, then red-purple shiny; bracts green, lower pair c.14 mm long, upper pairs progressively smaller; pedicels 2–4 mm long, glabrous. *Calyx* green, lobes oblong, 3–3.5 × 0.8–1.1 mm, apex rounded, glabrous. *Corolla* white and red-pink, campanulate, 6–7 mm long (slightly immature), with short-stalked glands outside, upper lip 2-lobed, lower lip 3-lobed, all lobes orbicular, apices rounded; tube c.4 mm long; upper lobes c.1.8 × 1.8 mm, lateral lobes c.1.5 × 2 mm, lower lobe c.1.5 × 2.5 mm. *Stamens* inserted in tube at c.0.8 mm from base; filaments c.2 mm long, with few short-stalked glands; anthers adnate face to face, c.1.7 × 3.3 mm, glabrous; lateral staminodes c.0.8 mm, medial staminode c.0.2 mm. *Disc* absent. *Ovary* (slightly immature) c.2 mm long, c.1 mm wide, glabrous; style c.1 mm long, glabrous; stigma capitate. *Fruit* a capsule, straight, 2.1–2.8 cm long (old dehisced fruit).

Distribution. Vietnam, Ha Giang Province. Known only from the type collection.

Ecology. Among limestone peaks and ridges in secondary forest and adjacent grassland, frequent on rocks and in pockets of soil on rocks.

Provisional IUCN conservation assessment. Data Deficient (DD). This species is known only from the type collection from 2001, although it is reported in secondary forest, which suggests some tolerance of disturbance.

There are only slightly immature corollas on the specimens available for study, and it is unclear to what extent the corolla and fertile parts might further expand with maturity, so the dimensions in the description should be viewed in this light. The flowers are sufficiently mature to see that they will be small even when fully mature, and the diagnostic characters to assess that it is indeed new do not rely on comparing corolla dimensions.

The species in the *Paraboea martinii* group, to which *P. minutiflora* is compared above, have twisted fruits, whereas *P. minutiflora* has straight fruit (see the MO isotype). *Paraboea minutiflora* is not similar to any straight-fruited species. Xu *et al.* (2008) noted instances of otherwise similar species differing in twisted and non-twisted fruits, and Puglisi *et al.* (2011) found that species with straight and twisted fruits were scattered through the phylogeny.

REFERENCES

- CHEN, W. H., MÖLLER, M., SHUI, Y. M. & ZHANG, M. D. (2008). A new species of *Paraboea* (Gesneriaceae) from a karst cave in Guangxi, China, and observation on variations in flower and inflorescence architecture. *Bot. J. Linn. Soc.* 158(4): 681–688.
- CHEN, W. H., MÖLLER, M., ZHANG, M. D. & SHUI, Y. M. (2012). *Paraboea hekouensis* and *P. manhoensis*, two new species of Gesneriaceae from China. *Ann. Bot. Fenn.* 49(3): 179–187.
- CHEN, W. H., MIDDLETON, D. J., NGUYEN, H. Q., NGUYEN, H. T., AVERYANOV, L. V., CHEN, R. Z., NGUYEN, K. S., MÖLLER, M. & SHUI, Y. M. (2017). Two new species of *Oreocharis* (Gesneriaceae) from Northwest Vietnam. *Gard. Bull. Singapore* 69: 295–305.
- CHEN, W. H., NGUYEN, H. Q., CHEN, R. Z., NGUYEN, T. H., NGUYEN, K. S., NGUYEN, V. T., MÖLLER, M., MIDDLETON, D. J. & SHUI, Y. M. (2018a). Two new species of *Oreocharis* (Gesneriaceae) from Fan Si Pan, the highest mountain in Vietnam. *PhytoKeys* 94: 95–106.
- CHEN, W.-H., ZHANG, Y.-M., LI, Z.-Y., NGUYEN, Q.-H., NGUYEN, T.-H. & SHUI, Y.-M. (2018b). *Hemiboea crystallina*, a new species of Gesneriaceae from karst regions of China and Vietnam. *Phytotaxa* 336(1): 95–99.
- HONG, X., LI, Z.-L., MACIEJEWSKI, S., WEN, F. & DO, T. V. (2018). *Didymocarpus puhoatensis* (Gesneriaceae), a new species from Vietnam. *PhytoKeys* 94: 87–93.
- KIEW, R. (2010). Two new species of *Paraboea* (Gesneriaceae) from Peninsular Malaysia and Thailand. *Edinburgh J. Bot.* 67(2): 209–217.
- KIEW, R. (2012). *Paraboea* (Gesneriaceae) in Sabah, Borneo, including a new species. *Malayan Nat. J.* 64: 1–8.
- MIDDLETON, D. J. (2015). A new species of *Gyrocheilos* (Gesneriaceae) from Vietnam. *Edinburgh J. Bot.* 72(2): 235–238.

- MIDDLETON, D. J., PUGLISI, C., TRIBOUN, P. & MÖLLER, M. (2010). Proposal to conserve *Paraboea* against *Phylloboea* and *Trisepalum* (Gesneriaceae). *Taxon* 59(5): 1603.
- MIDDLETON, D. J., ATKINS, H. J., LUU, H. T., NISHII, K. & MÖLLER, M. (2014a). *Billolivia*, a new genus of Gesneriaceae from Vietnam with five new species. *Phytotaxa* 161(4): 241–269.
- MIDDLETON, D. J., LEONG-ŠKORNIČKOVÁ, J. & NGUYỄN, Q. B. (2014b). A new species of *Billolivia* (Gesneriaceae) from Vietnam. *Gard. Bull. Singapore* 66: 189–194.
- NGUYEN, Q. D., DINH, N. L., NGUYEN, H. C., VU, N. L. & LUU, H. T. (2016). *Billolivia cadamensis* (Gesneriaceae), a new species from Central Vietnam. *Tap Chi Sinh Hoc* 38(4): 492–496.
- PUGLISI, C. & PHUTTHAI, T. (2017). A new species of *Paraboea* (Gesneriaceae) from Thailand. *Edinburgh J. Bot.* 75(1): 51–54.
- PUGLISI, C., MIDDLETON, D. J., TRIBOUN, P. & MÖLLER, M. (2011). New insights into the relationships between *Paraboea*, *Trisepalum*, and *Phylloboea* (Gesneriaceae) and their taxonomic consequences. *Taxon* 60(6): 1693–1702.
- PUGLISI, C., SUDDEE, S., TRIBOUN, P. & MIDDLETON, D. J. (2015). A new species of *Paraboea* (Gesneriaceae) from Thailand. *Gard. Bull. Singapore* 67: 101–106.
- TRIBOUN, P. (2013). *Paraboea middletonii* (Gesneriaceae), a new species from Thailand. *Thai Forest Bull., Bot.* 41: 45–47.
- TRIBOUN, P. & MIDDLETON, D. J. (2012). Twenty new species of *Paraboea* (Gesneriaceae). *Gard. Bull. Singapore* 64: 333–370.
- TRIBOUN, P. & MIDDLETON, D. J. (2015). Three new species of *Paraboea* (Gesneriaceae) from Thailand. *Thai Forest Bull., Bot.* 43: 18–23.
- WEN, F., HONG, X., CHEN, L.-Y., ZHOU, S.-B. & WEI, Y.-G. (2013). A new species of *Paraboea* (Gesneriaceae) from a karst limestone hill in southwestern Guangdong, China. *Phytotaxa* 131(1): 1–8.
- WEN, F., DO, T. V., HONG, X., MACIEJEWSKI, S. & WEI, Y. G. (2016). *Boeica ornithocephalantha* (Gesneriaceae), a new species from northern Vietnam. *Gard. Bull. Singapore* 68: 139–144.
- XU, Z. R., BURTT, B. L., SKOG, L. E. & MIDDLETON, D. J. (2008). A revision of *Paraboea* (Gesneriaceae). *Edinburgh J. Bot.* 65(2): 161–347.
- YANG, L.-H., CHEN, J.-L., WEN, F. & KANG, M. (2018). *Primulina malipoensis* (Gesneriaceae), a new species from Sino-Vietnamese border area. *PhytoKeys* 94: 107–116.

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