

The genus *Octarrhena* (Orchidaceae, Thelasiinae) in Vietnam with description of two new species

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Abstract

The genus *Octarrhena* (Orchidaceae) is distributed predominantly in Malesia and Papuasias. Its presence in eastern Indochina was uncovered as recently as in 2015 simultaneously with a description of *O. minuscula* from the Central Highlands of Vietnam. Here, we describe two more species of the genus, *O. emarginata* and *O. perpusilla*, also endemic to this mountain system. All three Vietnamese species of *Octarrhena* are local endemics with very limited allopatric distribution. We summarize the current knowledge on the genus in Vietnam and present a key for their identification, and a map with location of all known populations. Finally, we briefly discuss modern views on the worldwide species diversity of *Octarrhena*.

Keywords: Central Highlands, eastern Indochina, endemism, orchids, plant diversity, plant taxonomy, plant geography

Introduction

Octarrhena Thwaites (1861: 305) belongs to a group of morphologically close genera, which also includes the Asian and Australasian genera *Phreatia* Lindley (1830: 63) and *Thelasis* Blume (1825: 385). They are sympodial plants with very small flowers, which are difficult for morphological analysis in herbarium material. These three genera belong to the subtribe Thelasiinae of the tribe Podochileae (Dressler 1993). Almost all representatives of this tribe are small epiphytes with short stems bearing flattened or subterete distichous leaves and axillary inflorescences with simultaneously opening resupinate flowers.

The genus *Octarrhena* comprises about 50 currently accepted species (Seidenfaden & Wood 1992, Schuitman 1999, Comber 2001, Schuitman & de Vogel 2003, Govaerts *et al.* 2020). The number of species in this genus has increased recently as a result of inclusion of the New Guinean genus *Chitonanthera* Schltr. in Schumann & Lauterbach

(1905: 193) into *Octarrhena* (Schuiteman & de Vogel 2003). Earlier, a transfer of ten species of *Phreatia* to *Octarrhena* has been proposed by Hunt (1970), but these transfers have never been adopted (see also Kores 1989). *Octarrhena* is widely distributed in tropical regions of Asia, Australia and Oceania from Sri Lanka to Fiji with the highest species diversity in New Guinea (Fig. 1). One species of *Octarrhena* was reported from each of Sri Lanka (Jayaweera 1981, Fernando & Ormerod 2008), Australia (Clements & Jones 1992, Backhouse *et al.* 2019), Fiji (Kores 1989, Smith 1991), two species from each of the following regions: Peninsular Malaysia and Singapore (Seidenfaden & Wood 1992), Sumatra (Schuiteman 1999, Comber 2001), Java (Comber 1990, Schuiteman 1999), Borneo (Wood & Cribb 1994, Schuiteman 1999), New Caledonia (Morat *et al.* 1986), three species from Sulawesi (Schuiteman 1999), four species from the Philippines (Agoo 2007), and 39 species from New Guinea (Millar 1978, van Royen 1979, Schuiteman 1999, Schuiteman & de Vogel 2003, Cámara-Leret *et al.* 2020). Additionally, Govaerts *et al.* (2020) indicate Bismarck Archipelago, Solomon Islands, and Vanuatu to be inhabited by some species of *Octarrhena*.



FIGURE 1. Known worldwide species diversity of *Octarrhena* (including the species described here). The red dashed line denotes the distribution area of the genus. Figures in white circles indicate species number per geographical region.

Not a single species of *Octarrhena* has been reported from Thailand, Laos, Cambodia and Vietnam (Schuiteman & de Vogel 2000, Averyanov & Averyanova 2003, Newman *et al.* 2007, Schuiteman *et al.*, 2008, Pedersen *et al.* 2011, 2014, Cho *et al.* 2016) until the recent discovery of *O. minuscula* Aver. & Duy (2015: 174) endemic to southern Vietnam. Here, we describe and illustrate two more species of this genus found in the same area and provide the key for their identification. Notably, the Vietnamese species of *Octarrhena* are known from quite a narrow geographical area, all of them found within the southern part of the Central Highlands (Tay Nguyen Plateau).

Taxonomic treatment

Octarrhena Thwaites (1861: 305)

Comber (1990: 204–205, 2001: 563–565), Seidenfaden & Wood (1992: 337–338), Wood & Cribb (1994: 235).

Type:—*O. parvula* Thwaites (1861: 305).

About 50 species with the highest number in New Guinea. In Vietnam, the genus is represented by 3 species endemic to the southern part of the Central Highlands (Tay Nguyen Plateau) having very limited, albeit allopatric, distribution areas (Fig. 2). Two of these species are described and illustrated as new to science below.

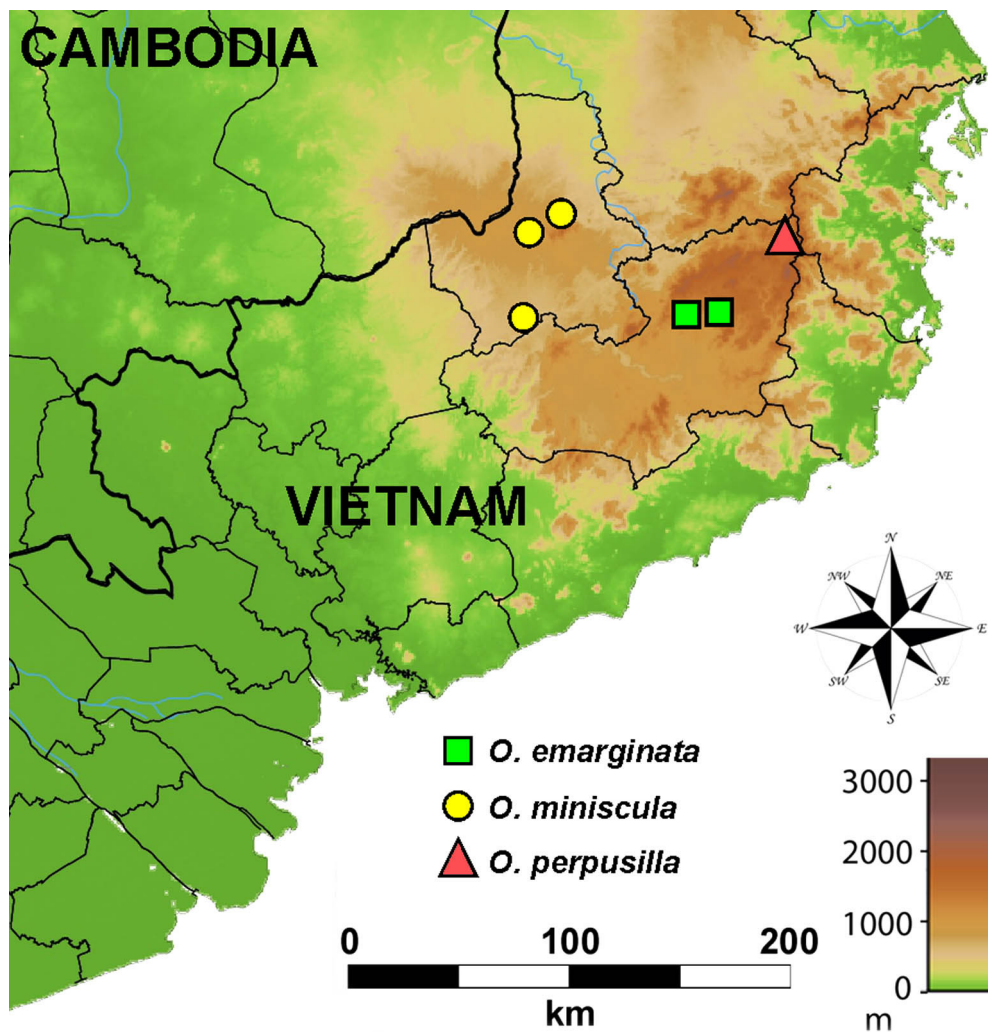


FIGURE 2. Distribution map of the species of *Octarrhena* in Vietnam.

Distribution:—Sri Lanka, Vietnam, Peninsular Malaysia, throughout the Malay Archipelago to Papua New Guinea, Australia and the Pacific Islands (including New Caledonia and Fiji).

Key to species of *Octarrhena* in Vietnam

1. Leaves terete or obscurely triangular in cross section, less than 1 cm long, blunt or roundish at apex; inflorescence at least twice longer than leaves; peduncle terete with 6–10 sterile bracts, longer than rachis; lip epichile reniform, much broader than hypochile; lip disk with two low callosities 1. *O. perpusilla*
- Leaves laterally flattened, narrowly elliptic in cross section, more than 1 cm long, obtuse or acute at apex; inflorescence shorter or slightly longer than leaves; peduncle somewhat flattened, naked or with 1–2 sterile bracts, much shorter than rachis; lip epichile semicircular, slightly broader than hypochile; lip disk without callosities or with a single low callosity 2
2. Petals deltoid, fleshy, blunt or obtuse at apex; lip fleshy, obscurely half-obconoid; lip epichile fleshy, almost straight, truncate or round at apex, entire along margin 2. *O. miniscula*
- Petals narrowly obovate, thin, roundish at apex; lip thin, flat, obovate; lip epichile thin, down curved, emarginate at apex, finely erose along margin 3. *O. emarginata*

1. *O. perpusilla* Aver. & Eskov, *sp. nov.* (Fig. 3, 4)

Type:—VIETNAM. Lam Dong Province: Lac Duong District, Bidoup Nui Ba National Park, near Giang Ly forest station, around point 12°11'54.3"N 108°40'35.0"E, 1544 m a.s.l., *Pinus kesiya* woodlands on hills with ericaceous scrub and *Brainea insignis* in lower strata, epiphyte, 15 November 2018, A.K. Eskov, N.G. Prilepsky, AL 491 (holotype LE: LE01055436 – <http://en.herbariumle.ru/?t=occ&id=5859>).

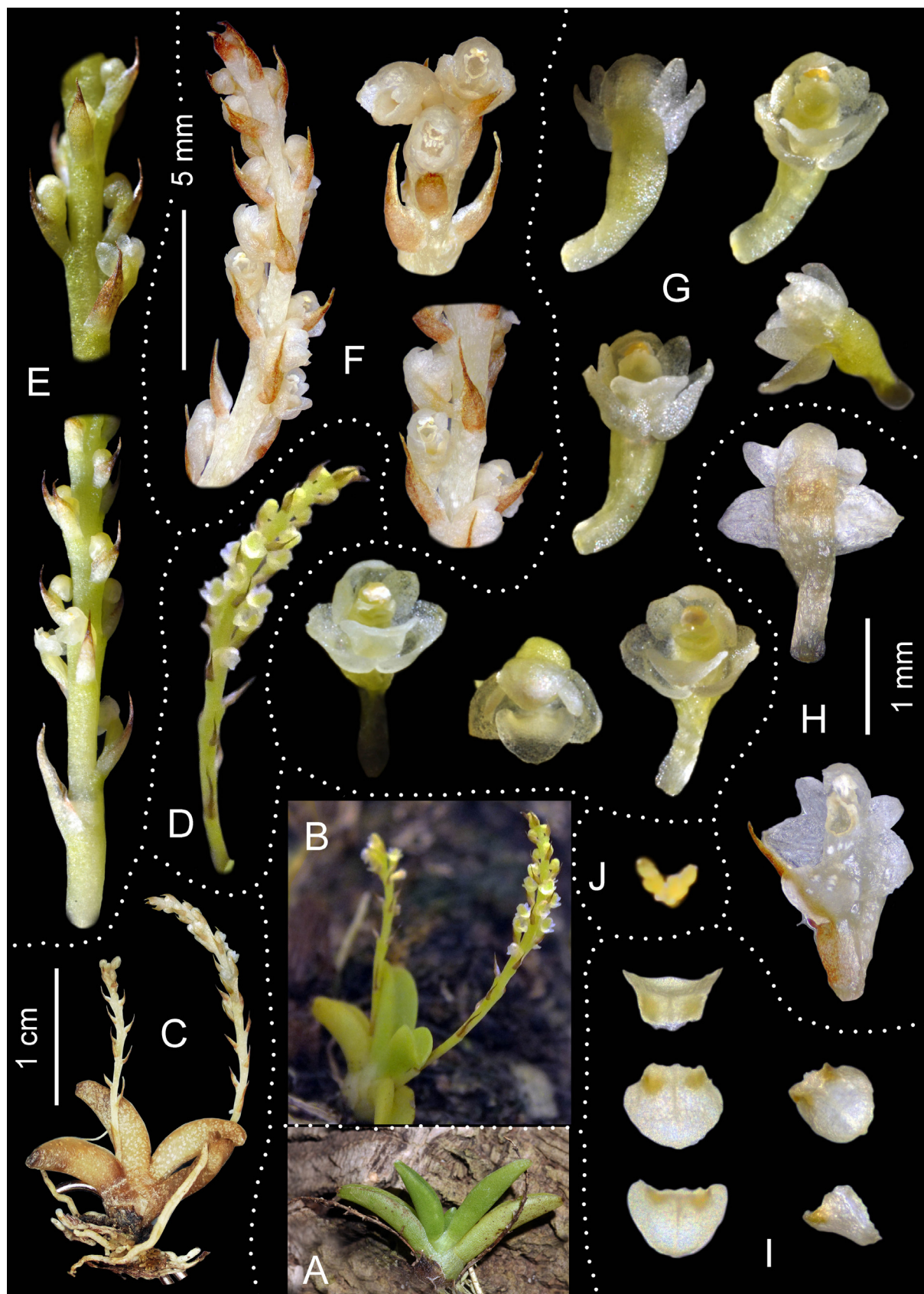
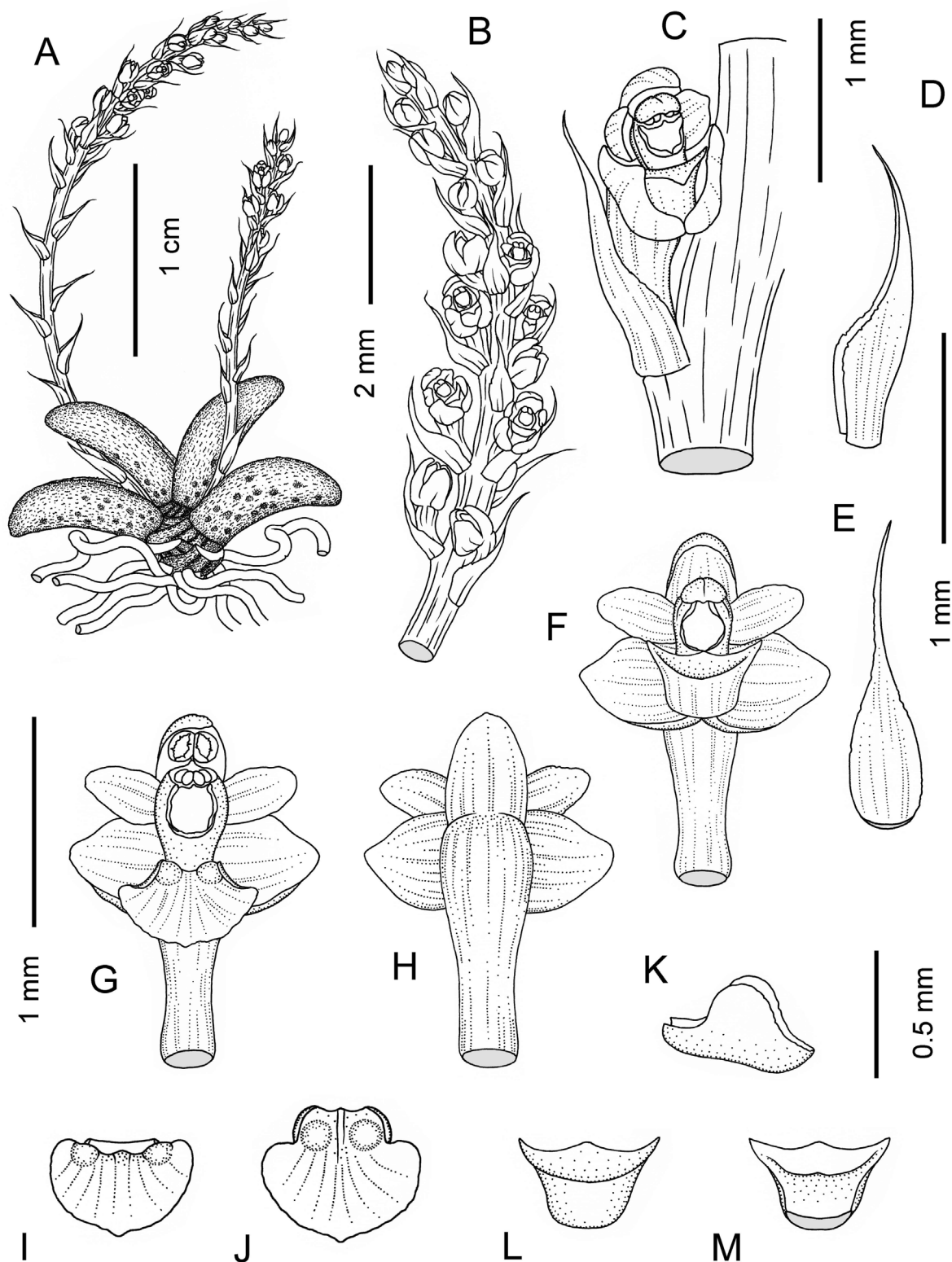


FIGURE 3. *Octarrhena perpusilla*. A. Sterile plant. B. Plant with flowers in its habitat. C. Alcohol-preserved flattened plant. D. Flattened inflorescence. E. Portions of fresh inflorescence. F. Portions of alcohol-preserved inflorescences. G. Fresh intact flowers at different views. H. Flattened alcohol-preserved flowers, front view and view from behind. I. Alcohol-preserved lip at different views. Photos made from the type specimen (*AL 491*) prior to preparation of herbarium voucher specimen by A. Eskov and L. Averyanov, correction and design by L. Averyanov and T. Maisak.



Octarrhena perpusilla
AL 491 Type

FIGURE 4. *Octarrhena perpusilla*. A. Flowering plant. B. Apical part of inflorescence. C. Intact flower, floral bract and portion of rachis. D, E. Floral bracts, side and adaxial views. F. Flattened flower, front view with intact lip. G. Flattened flowers with artificially recurved lip. H. Flattened flower, view from behind. I. Intact lip, front view. J. Flattened lip, adaxial surface. K. Intact lip, side view. L. Intact lip, front view. M. Intact lip, view from behind. All drawn from the type (AL 491) by L. Averyanov and T. Maisak.

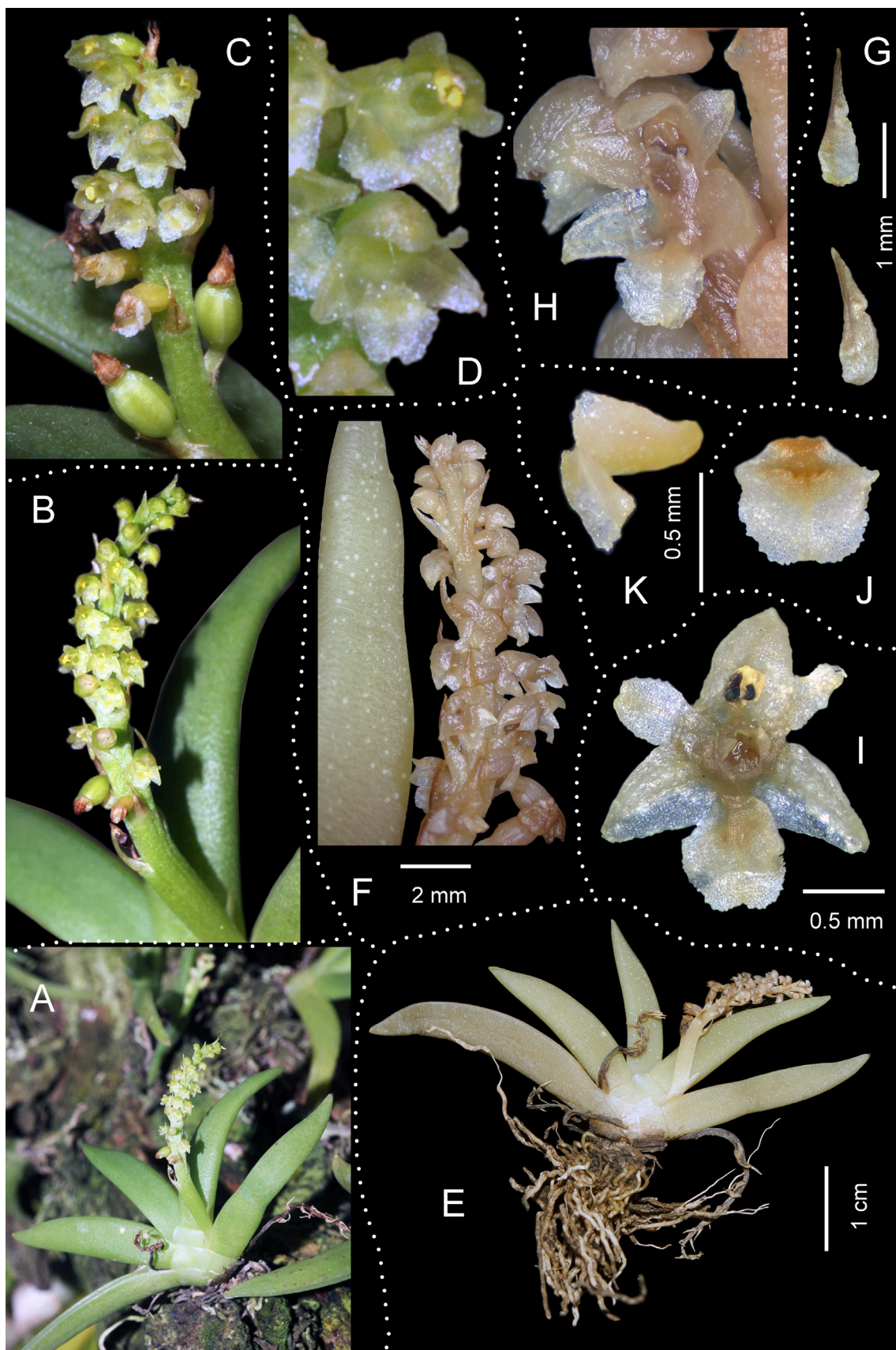


FIGURE 5. *Octarrhena emarginata*. A. Flowering plant in its habitat. B. Intact inflorescence. C. Portion of inflorescence with flowers and young fruits. D. Fresh intact flowers. E. Flattened alcohol-preserved plant. F. Flattened leaf and inflorescence preserved in alcohol. G. Floral bract preserved in alcohol, adaxial and abaxial views. H, I. Flattened alcohol-preserved flowers, front view. J, K. Alcohol-preserved lip, front and side views. Photos made from the type (*AL* 1216) and paratype (*BV* 358) specimens prior to preparation of herbarium voucher specimens by L. Averyanov and Truong Ba Vuong, correction and design by L. Averyanov and T. Maisak.

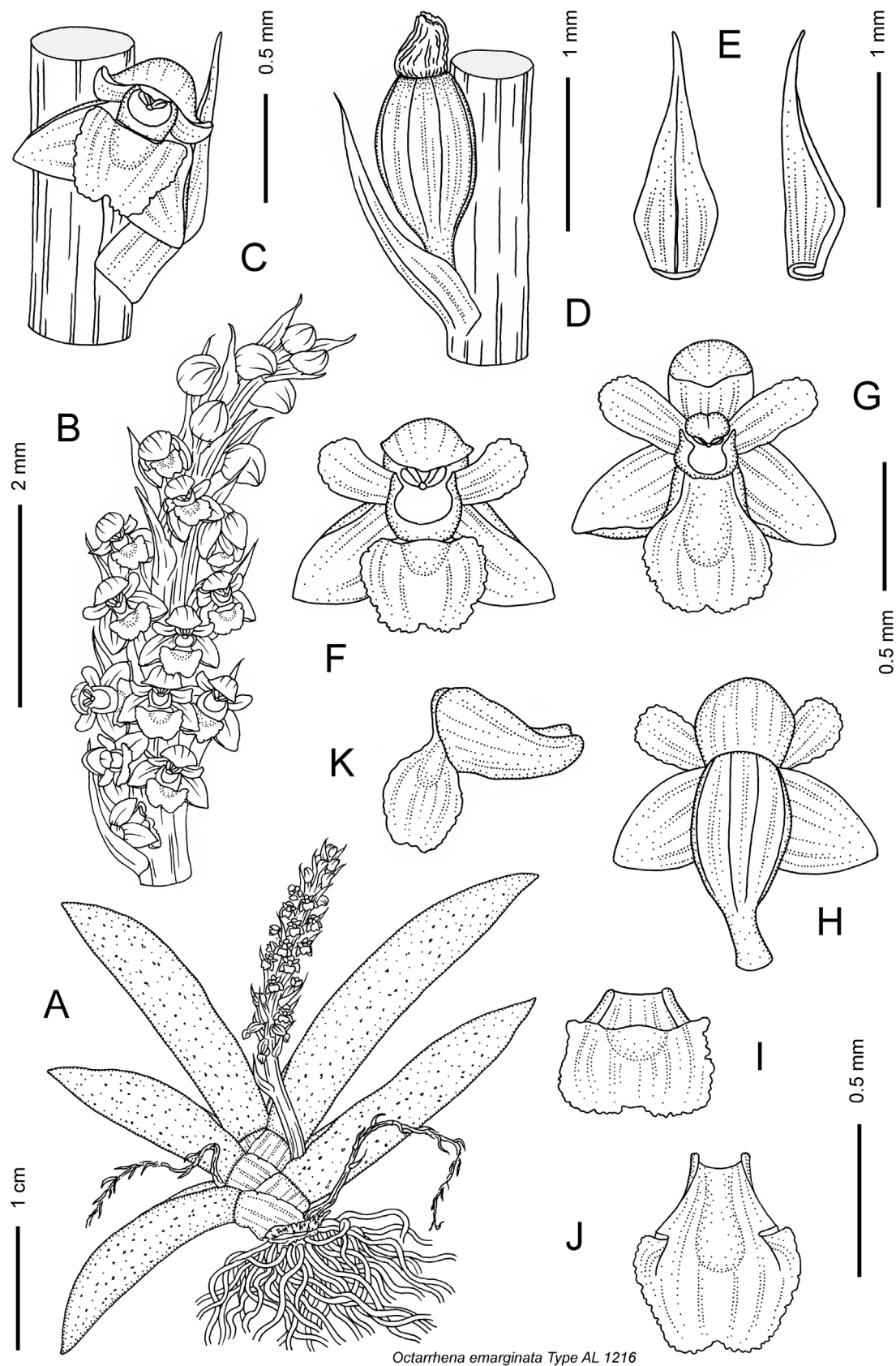


FIGURE 6. *Octarrhena emarginata*. A. Flowering plant. B. Apical part of inflorescence. C. Intact flower, floral bract and portion of rachis. D. Unripe fruit, floral bract and portion of rachis. E. Floral bract, adaxial and side views. F. Intact flower, front view with intact lip. G. Flattened flower with artificially flattened lip. H. Intact flower, view from behind. I. Intact lip, front view. J. Flattened lip, adaxial surface. K. Intact lip, side view. All drawn from the type (AL 1216) by L. Averyanov and T. Maisak.

Diagnosis:—The new species is morphologically similar to *O. minuscula*, from which it differs in more tiny habit, twice smaller leaves and floral parts, long inflorescence, reniform lip concave at the base and lip disk with two characteristic callosities at the base of epichile.

Etymology:—The species name refers to the particularly tiny habit of the described plant.

Description:—Glabrous miniature perennial sympodial epiphytic herb (0.5)0.8–1(1.2) cm tall. *Stems* abbreviate, very short, (2)3–4(5) mm long, completely covered by overlapping equitant imbricate leaf sheaths, with several flexuose whitish or pale yellowish roots at the base. *Leaves* (3)4(5), distichous, articulate at base, fleshy, subterete or triangular in cross section, laterally slightly compressed, shallowly grooved adaxially, oblong, commonly broadest near the middle, narrowing to roundish or blunt apex, straight or slightly recurved, (5)6–7(8) mm long, (2)2.5–3(3.5) mm wide. *Inflorescence* a subaxillary raceme, arising from leaf axil, almost straight or slightly curved, somewhat secund, (1.2)1.4–1.8(2.2) cm long, 1–1.2 mm in diameter; peduncle light green, terete, stout, erect, straight or slightly curved, (6)8–10(12) mm long, with 6–10 distant small triangular acuminate sterile bracts; rachis straight or slightly curved, (3)4–10(12) mm long, 0.4–0.5 mm in diameter, with many flowers. *Floral bracts* light pale yellowish, scarious, triangular, obscurely conduplicate, acuminate at apex, more or less straight or spreading and slightly incurved, 1-veined, (0.8)1–1.4(1.6) mm long, (0.2)0.3–0.4(0.5) mm wide. *Flowers* subsessile (on very short indistinct pedicel), uniformly light pale greenish, resupinate, campanulate, not widely opening, 0.8–1.0 mm in diameter. *Ovary* ovoid, 0.5–0.6 mm long. *Sepals* forward directed or hardly spreading, broadly ovate, concave, somewhat fleshy, obtuse to acute at apex, entire along margin, 0.5–0.6 mm long, 0.5–0.55 mm wide. *Petals* forward directed, ovate, obtuse at apex, entire along margin, as long as sepals, twice narrower than sepals. *Lip* sessile, solidly fused with column base, simple, concave in basal half, somewhat fleshy, entire along margin, orbicular at apex, 0.7–0.8 mm long and wide, with transversally recurved elliptic to reniform epichile, much broader than hypochile; disk with two obscure callosities at base of epichile. *Column* shortly cylindric, 0.55–0.60 mm long, 0.25–0.28 mm in diameter, at front with large orbicular stigma. *Anther* cap light greenish to dull yellowish-white, hemispheric, 0.2 mm in diameter, 2-celled; pollinia 4, bright yellow. *Fruits* unknown.

Habitat, phenology and conservation status:—Miniature branch and canopy epiphyte. Primary and old secondary coniferous open submontane forests and woodlands with *Pinus kesiya* at elevations about 1550 m a.s.l. Flowering in March–April (under cultivation). Very rare. Estimated IUCN Red List status: DD (IUCN 2019) due to a lack of sufficient data on species distribution.

Distribution:—Vietnam: Lam Dong Province (Lak Duong District: Bidoup Nui Ba National Park). Endemic.

Notes:—The single species of *Octarrhena* earlier reported from eastern Indochina, *O. minuscula*, differs from all its hitherto known Asian congeners in remarkably dwarf habit, short abbreviated stem and very small, not widely opening campanulate flowers (Averyanov *et al.* 2015). *Octarrhena perpusilla* shares with the former species such characters as tiny habit, abbreviated stem and subsessile, very small flowers, but differs in smaller leaves 5–8 mm long (vs. 1–2 cm long), long subaxillary inflorescence 1.2–2.2 cm long, much longer than leaves (vs. short subdense inflorescence 0.8–1.8 cm long, distinctly shorter than leaves), peduncle with 6–10 distant sterile bracts (vs. 0–2 sterile bracts), smaller flowers 0.8–1 mm in diameter (vs. larger flowers 1.8–2.2 mm in diameter), sepals and petals 0.5–0.6 mm long (vs. sepals and petals 1.2–1.5 mm long), lip 0.7–0.8 mm long and wide, concave in basal half (vs. lip 1.2–1.4 mm long and 1.0–1.1 mm wide, not concave at base), lip epichile reniform, much broader than hypochile, thin and orbicular at apex (vs. epichile ovate, not much broadening, at apex fleshy and truncate) and lip disk with two obscure callosities at base of epichile (vs. disk without callosities).

Additional material studied:—VIETNAM. Lam Dong Province: Lac Duong District, Bidoup Nui Ba National Park, near Giang Ly forest station, around point 12°11'54.3"N 108°40'35.0"E, at elevation 1544 m a.s.l., *Pinus kesiya* woodlands on hills with ericaceous scrub and *Brainea insignis* in lower strata, epiphyte, photos made from living cultivated plants on 20 March 2019 by L.V. Averyanov, T.V. Maisak, AL 491.1 (LE: photos LE01073043 – <http://en.herbariumle.ru/?t=occ&id=15141>).

2. *O. minuscula* Aver. & Duy (2015: 22, fig. 12F, 16)

Type:—VIETNAM. Dak Nong Province: Dak Song District, 5 December 2014, N.V. Canh, Q.V. Hoi, L.V. Averyanov, N.V. Duy, N.T. Hiep, CPC 7694 (holotype LE: LE01069069 – <http://en.herbariumle.ru/?t=occ&id=15266>, photos: LE01073129 – <http://en.herbariumle.ru/?t=occ&id=15412>).

Habitat, phenology and conservation status:—Miniature branch and canopy epiphyte. Primary and old secondary broad-leaved, evergreen, humid, submontane forests at elevations 800–1000 m a.s.l. Flowering in April–May,

September–November (under cultivation). Very rare. Estimated IUCN Red List status: DD (IUCN 2017) due to a lack of sufficient data on species distribution.

Distribution:—Vietnam: Dak Nong Province (Dak Song, Dak R’Lap and Krong No Districts). Endemic.

Notes:—*Octarrhena minuscula* was the first species of the genus discovered in eastern Indochina, found in 2014 (Averyanov *et al.* 2015). The nearest locations of representatives of the genus were reported earlier from Peninsular Malaysia (Seidenfaden & Wood 1992), Sumatra (Schuiteman 1999, Comber 2001), Java (Comber 1990, Schuiteman 1999), and Borneo (Wood & Cribb 1994, Schuiteman 1999).

Additional material studied:—VIETNAM. Dak Nong Province: Dak R’Lap District, Nhan Dao Municipality, 950–1000 m, around point 11°53’32”N 107°36’33”E, 17 September 2011, *N.V. Duy, L.V. Averyanov, CPC 7693* (paratype Herbarium of Tay Nguyen Institute of Scientific Researches; LE: photos LE01073128 – <http://en.herbariumle.ru/?t=occ&id=15411>); Dak Nong Province: Krong No District, Nam Nung Municipality, evergreen forest at elevation about 800 m a.s.l., 2014, *Nguyen Van Canh s.n.*, photos made on 26 April 2015 by *L.V. Averyanov, T.V. Maisak, AL 27* (LE: photos LE01073130 – <http://en.herbariumle.ru/?t=occ&id=15413>).

3. *O. emarginata* Aver., Vuong & V.C. Nguyen, *sp. nov.* (Fig. 5, 6)

Type:—VIETNAM. Lam Dong Province: Lam Ha District, evergreen broad-leaved and coniferous submontane forest at elevation about 1000 m a.s.l., epiphyte on tall trees, flowers light greenish, *Ngo Quang Dang s.n.*, herbarium specimen collected from cultivated plant on 28 October 2019, *L.V. Averyanov, N.V. Canh, T.V. Maisak, AL 1216* (holotype LE: LE01068469 – <http://en.herbariumle.ru/?t=occ&id=15264>, photos: LE01061348 – <http://en.herbariumle.ru/?t=occ&id=12462>, LE01073082 – <http://en.herbariumle.ru/?t=occ&id=15218>).

Diagnosis:—The new species is morphologically close to *O. minuscula*, from which it differs in thin, narrowly obovate petals, thin emarginate lip with finely erose margin, and down recurved epichile.

Etymology:—The species name refers to the emarginate apex of the lip.

Description:—Glabrous miniature perennial sympodial epiphytic herb (1.8)2–2.8(3.2) cm tall. Stems abbreviate, short, (5)6–9(10) mm long, completely covered by overlapping equitant imbricate leaf sheaths, with many flexuose whitish roots at the base. *Leaves* (3)4–5(6), distichous, articulate at base, somewhat fleshy, strongly laterally flattened, narrowly elliptic in cross section, narrowly grooved adaxially near the base, commonly broadest near the middle, narrowing to obtuse or acute apex, usually slightly recurved, (1.6)2–3(3.4) mm long, (3.5)4–5(5.5) mm wide. *Inflorescence* subdense to dense raceme, arising from leaf axil, almost straight or slightly curved, somewhat secund, (1.6)1.8–2.2(2.4) cm long, 3–4 mm in diameter; peduncle light green, somewhat flattened, stout, erect, straight or slightly curved, (5)7–8(10) mm long, with (0–)1(–2) small narrowly triangular acute sterile bracts; rachis straight or slightly curved, (1.4)1.6–1.8(2) cm long, 0.1–1.2 mm in diameter (when fresh), with many flowers. *Floral bracts* light greenish, later yellowish, scarious, erect, commonly straight, narrowly triangular, cymbiform, obscurely conduplicate, tapering to obtuse or acute apex, 1-veined, (1.4)1.5–2(2.2) mm long, (0.4)0.6–1(1.2) mm wide. *Flowers* shortly pedicellate, uniformly light pale greenish, resupinate, campanulate, not widely opening, 1.5–1.6 mm in diameter. Pedicel terete, 0.3–0.4 mm long. *Ovary* obovoid, 0.8–1 mm long, 0.6–0.7 mm in diameter, with 6 shallow longitudinal grooves. *Sepals* forward directed or hardly spreading, triangular ovate, thin, concave, obtuse to acute at apex, entire along margin, 0.6–0.7 mm long, 0.5–0.55 mm wide. *Petals* forward directed, narrowly obovate, thin, roundish at apex, finely erose along margin, slightly shorter than sepals, 3–4 mm wide. *Lip* sessile, solidly fused with column base, simple, broadly obovate, concave in basal half, thin, finely erose along margin, orbicular and emarginate at apex, 0.6–0.7 mm long, 0.55–0.65 mm wide, with recurved semicircular epichile; disk with one obscure callosity in the center. *Column* shortly cylindric, 0.3–0.4 mm long, 0.3–0.35 mm in diameter, at front with large orbicular stigma and 2 triangular acute stelia. Anther cap yellow, hemispheric, 0.2 mm in diameter, 2-celled; pollinia 4, bright yellow. *Fruits* light green, ellipsoid or obovoid, 2.2–2.8 mm long, 1.4–1.6 mm in diameter.

Habitat, phenology and conservation status:—Miniature branch and canopy epiphyte. Primary and old secondary coniferous evergreen submontane forests at elevations about 1000 m a.s.l. Flowering in September–October, December–January (under cultivation). Very rare. Estimated IUCN Red List status: DD (IUCN 2019) due to a lack of sufficient data on species distribution.

Distribution:—Vietnam: Lam Dong Province (Da Lat City area and Lam Ha District). Endemic.

Notes:—*Octarrhena emarginata* is very close to *P. minuscula*, sharing with the latter characters such as, laterally flattened, acute leaves, short peduncle, naked or with 1–2 sterile bracts, dense inflorescence, ovate to broadly obovate lip and roundish (not reniform) epichile. The new species differs from *P. minuscula* mainly in thin, narrowly obovate

petals roundish at apex (vs. petals fleshy, deltoid, blunt or obtuse at apex), thin, flat lip (vs. lip fleshy, obscurely half obconoid), and thin, down curved epichile, emarginate at apex and finely erose along margin (vs. epichile fleshy, almost straight, truncate or round at apex, entire along margin).

Paratype:—VIETNAM. Lam Dong Province: Da Lat City area, 3 December 2018, *B. V. Truong, Q. D. Ngo, BV 358* (LE: LE01068470 – <http://en.herbariumle.ru/?t=occ&id=15265>, photos LE: LE01073080 – <http://en.herbariumle.ru/?t=occ&id=15216>, LE01073081 – <http://en.herbariumle.ru/?t=occ&id=15217>).

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