New Orchids (Orchidaceae: Cymbidieae and Vandeae) in the Flora of Vietnam

Leonid V. AVERYANOV1,*, Van Canh NGUYEN2, Ba Vuong TRUONG3, Tatiana V. MAISAK3, Hong Truong LUU4, Khang Sinh NGUYEN2, Quang Diep DINH4, Hoang Tuan NGUYEN2, Xuan Canh CHU3, Gioi TRAN4, Van Khang NGUYEN5, Hong Son LE4

1. Komarov Botanical Institute of the Russian Academy of Sciences, Prof. Popov Street 2, 197376, St. Petersburg, Russia.
2. Center of scientific research and practice, Thu Dau Mot University No. 6 Tran Van On Street, Phu Hao Ward, Thu Dau Mot city, Binh Duong province, Vietnam; nguyenvancanh@gmail.com
3. Institute of Tropical Biology, Dept. of Biological Resources, Vietnam Academy of Science and Technology, 85 Tran Quoc Viet St., Distr. 3, Ho Chi Minh City, Vietnam.
4. Southern Institute of Ecology, Vietnam Academy of Science and Technology, Contact add.: 1 Mac Dinh Chi Street, Ho Chi Minh City, Vietnam; lhtruong@site.vast.vn; trangioi_tl14@yahoo.com; lhson27@gmail.com
5. Institute of Ecology and Biological Resources, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet Road, Nghia Do, Cau Giay, Hanoi, Vietnam.
6. Department of Landscaping and Environmental Horticulture, Nong Lam University, Ho Chi Minh City, Vietnam; dpdiep@gmail.com
7. 15 Le Thanh Tong, Hoan Kiem, Hanoi University of Pharmacy, Hanoi, Vietnam; tuandl50@yahoo.com
8. 92 Thanh Nhan Street, Hai Ba Trung District, Hanoi, Vietnam; e-mail: cxcanh@gmail.com
9. Can Tho University, 3/2 street, Ninh Kieu district, Can Tho City, Vietnam; vankhanguyen1996@gmail.com
*Corresponding author’s e-mail: av_leonid@mail.ru

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ABSTRACT: The paper continues publication of new original data on orchid diversity in Vietnam (tribes Cymbidieae and Vandeae) obtained in 2016–2018. It includes data on 2 genera and 10 species new for the flora of Vietnam. Among them, six species are new to science (Ascocentrum hienii, Biermannia canhii, Cymbidium tamphianum, Gastrochilus setosus, Malleola luongii, Robiquetia orlovii). Four other species are found on the territory of Vietnam for the first time (Bogoria raciborskii, Lesliea mirabilis, Pennilabium struthio, Uncifera obtusifolia). Two genera, Bogoria and Lesliea, are newly recorded for the flora of Vietnam. One new nomenclature combination (Ascocentropsis malipoensis), one new name (Ascocentropsis yunnanensis) and one lectotype (for Uncifera obtusifolia) are proposed. When the new data presented in this paper are included, the known orchid flora of Vietnam comprises about 1220 documented species from 174 genera.


INTRODUCTION

The paper continues publication of new original data on orchid diversity in Vietnam obtained in the field studies mostly during years 2016–2018 since last our publications (Averyanov et al., 2016a–d, 2017a, b; Averyanov and Maisak, 2017a, b; Nguyen Hoang Tuan and Averyanov, 2017). It summarizes the results of joint efforts of professional botanists and orchid enthusiasts on studies of Vietnamese native orchids from tribes Cymbidieae and Vandeae leading to discovery of 2 genera and 10 species new for the flora of Vietnam. Among them, six species are new to science, namely Ascocentrum hienii Aver. et V.C. Nguyen, Biermannia canhii Aver., Cymbidium tamphianum Aver., Gastrochilus setosus Aver. et Vuong, Malleola luongii Aver. et V.C. Nguyen and Robiquetia orlovii Aver. Four other species are found on the territory of Vietnam for the first time, including Bogoria raciborskii J.J. Sm., Lesliea mirabilis Seidenf., Pennilabium struthio Carr and Uncifera obtusifolia Lindl. Two genera, Bogoria J.J. Sm. and Lesliea Seidenf., are new records for the orchid flora of Vietnam. When the new data presented in this paper are included, the known orchid flora of Vietnam comprises about 1220 documented species from 174 genera. Valid name, synonyms, type, citations of relevant taxonomic regional publications, data on ecology, phenology and distribution, estimated IUCN Red List status and studied specimens as well as brief taxonomic and biological notes are provided for each studied species. One new combination, Ascocentropsis malipoensis (Z.J. Liu et L.J. Chen) Aver., comb. nov., one new name Ascocentropsis yunnanensis Aver., nom. nov. (= Vanda malipoensis L.H. Zou, Jiu X. Huang et Z.J. Liu) and lectotypification for Uncifera obtusifolia Lindl. are proposed. An illustrated annotated list of all studied species arranged in alphabetical order is presented below.
MATERIALS AND METHODS

Materials used in present studies were collected mainly during years 2016–2018. Some previously collected herbarium specimens and living samples also provided significant additional information of the current investigation. Fresh plants, as well as flowers and inflorescences from living plants, were fixed and stored in 60–65% ethanol. Measurements of the floral parts for descriptions were taken on both herbarium and liquid-fixed materials as fresh flowers and their fleshy parts often shrank up to 10–15% in size during the drying process when herbarium specimens were made. In describing quantitative characters, infrequent extreme values (i.e. rarely occurring minimal and maximal values) of a variation range are parenthesized before and after the normal variation range. Detailed analytical photos of plant parts compiled into plates referred to here as “digital plates” or “digital epitypes” were made from the living plants prior to preparation of the appropriate herbarium specimens. Taxa distribution in Vietnam is indicated in the text by mentioning concerned provinces according to the official administrative country division (Viet Nam Administrative Atlas, 2007). The online version of the IUCN Red List of Threatened Species (2017) was used for estimation of preliminary species conservation status. Place of housing of cited specimens are indicated by accepted acronyms or respected Herbaria. The studied taxa are listed below in alphabetical order.

TAXONOMIC TREATMENT

List of new orchids in the flora of Vietnam

Ascocentrum hienii Aver. & V.C. Nguyen, sp. nov.

Figs. 1A–E & 2.

Described from southern Vietnam. **Type:** “Dak Lak province, M’Drak district, Chu Mu Mt., evergreen forest at elevation about 1200 m a.s.l., very rare, flowers purple, 10 August 2017, N.V. Canh et al., AL 331” (holotype – LE).

**Etymology.** Species epithet refers the name of the plant discoverer, Mr. Pham Vo Hien, Vietnamese orchid lover from Ea H’Leo town of Dak Lak province.

**Description.** Miniature monopodial epiphyte. Stem erect, rigid, rather straight, (8)10–14 (16) cm long, densely covered by distichous overlapping leaf sheaths, flattened, with several dull green stout thick wiry roots distant in basal leafless half of stem. Leaves sessile, joined, obovate-lanceolate, strongly conduplicate in basal part, (3.5)4–6.5 (7) cm long, (8)10–12 (14) mm wide, unequally bilobed at apex; apical lobes oblique round. Inflorescence erect raceme or few branched panicle; peduncle rigid, straight, glabrous, terete, (5)6–7 (10) cm long, with (1)2–3 (4) distant, sterile triangular, acute bracts, (1.5)2–3 (3.5) mm long, (0.8)1–1.4 (1.6) mm wide; rachis longitudinally obscurely angled and ribbed, glabrous, (0.5)1–4 (6) cm long with many subdense, spirally arranged flowers; floral bracts distant, narrowly triangular, (1.5)2–2.5 (3) mm long, greenish to dull purple, acute, suddenly broadening at the base; flowers simultaneously opening. Flowers subsessile, widely opening, 6–7 mm across, purple, with yellow lip side lobes, hairy with scattered scurfy hairs. Pedicel and ovary purple, erect, straight, with scattered brownish scurfy hairs, terete, 6-ribbed, (7)8–10 (11) mm long, 0.5–0.6 mm in diameter, much twisted. Sepals and petals free, ovate, spreading, slightly concave, blunt to round at apex; sepals (2.8)3–3.2 (3.4) mm long, (1.8)2 (2.2) mm wide, lateral sepals broadly attached to column foot; petals little smaller. Lip spurred, 3-lobed, firmly adnate to the column foot; lateral lobes small, insignificant, each in form of broad incurved fleshy fold below column base; median lobe fleshy, deltoid-sagittate, 1–1.2 mm long and wide, with 2 laterally spreading triangular side lobules and triangular, up curved, forward directed median lobe; spur twice longer as sepals, (5.8)6–6.5 (6.8) mm long, 1.2–1.8 mm wide, forward curving, dorsally flattened at the middle, laterally compressed at apex, with no ornamentation inside; spur front-wall fleshy, forming concave hollow at the base of median lobe. Column dark purple, shortly cylindrical (0.7)0.8–1 (1.1) mm tall and broad; rostellum in form of rather large, elliptic, bifid plate 0.7–0.8 mm long at front of column apex, stigma concave, almost circular; column foot continued as a fleshy spur back wall. Operculum dark purple, hemispheric, helmet-shaped, 0.75–0.8 mm in diameter, with small up curved narrowly triangular beak. Pollinia 2, globular, each deeply grooved forming 2 joined subequal halves; stipe in form of linear conduplicate lamella 0.7–0.8 mm long; viscidium narrowly elliptic 0.6–0.7 mm long, 0.25–0.3 mm wide, bifid at apex. Fruits not known.

**Habitat, phenology and conservation status.** Miniature monopodial branch and trunk epiphyte. Primary evergreen broad-leaved submontane forests. 1200 m. Fl. July–August. Very rare. Estimated IUCN Red List status – DD.

**Distribution.** Vietnam province: Dak Lak (M’Drak district). Endemic.

**Notes.** New species may be solely compared with Ascocentrum rubescens (Rolfe) P.F. Hunt, but differs in many features, like much smaller size of whole plant, with leaves 3.5–7 cm long, 8–14 mm wide (vs. 7–12 × 1.5–2.5 cm), inflorescence 5–10 cm long (vs. 10–20 cm long), flowers 6–7 mm across (vs. flowers 8–9 mm across), sepals 2.8–3.4 mm long (vs. 4–4.5 mm long), short, hardly visible lip side lobes (vs. prominent semicircular side lobes 1–1.5 mm long), deltoid-sagitate median lip lobe (vs. simple, narrowly triangular median lobe), spur 5.8–6.8 mm long, distinctly flattened.
dorso-ventrally at the middle, inflated and flattened laterally at apex (vs. spur 8–10 mm long, terete throughout its length).

The newly described plant and *A. rubescens*, are aberrant species, which share some morphological characters with *Aerides* Lour. Both species have rather isolated taxonomical position and may be segregated in rank of a separate genus having intermediate taxonomic position between *Ascocentrum* and *Aerides*. This idea was mentioned in earlier studies (Averyanov, 1988; Seidenfaden, 1992). The new species probably has also some relations to another aberrant species *Ascocentrum pusillum* Aver., which presently regarded as a member of the monotypic genus *Ascocentropsis* Senghas et Schildh. (= *Gunnaria* Z.J. Liu et L.J. Chen) with one presently included species, *A. pusilla* (Aver.) Senghas et Schildh. (Senghas, Schildhauer, 2000; Liu, Chen, 2009). When accepted this genus should also include *Ascocentropsis malipoensis* (Z.J. Liu et L.J. Chen) Aver., comb. nov. (= *Singchia malipoensis* Z.J. Liu et L.J. Chen, 2009, Journ. Syst. Evol. 47: 602) and *Ascocentropsis yunnanensis* Aver., nom. nov. (= *Vanda malipoensis* L.H. Zou, Jiu X. Huang et Z.J. Liu, 2014, Phytotaxa 186, 2: 94). The formal inclusion of the mentioned into *Vanda* R. Br. (Gardiner, 2012; Zou et al., 2014) are not supported by their overall morphology.

According to available information, *A. hienii* is extremely rare and locally endemic with very restricted distribution in the eastern mountainous part of Dak Lac province of southern Vietnam.

**Biermannia canhii** Aver., sp. nov.

Figs. 1F-H & 3.

Described from northern Vietnam. **Type:** Type herbarium specimen prepared from plant cultivated by N.V. Canh originated from northern Vietnam with no data about exact locality, 18 October 2017, *N.V. Canh, L. Averyanov, T. Maisak, AL 323a* (holotype – LE).

**Etymology.** Species epithet refers the name of the plant discoverer, eminent Vietnamese orchid enthusiast, Nguyen Van Canh.

**Description.** Miniature monopodial epiphyte. Stem 1–1.6 cm long, densely covered by distichous leaf sheaths, slightly flattened, with several pale green wiry roots clustering near stem base. Leaves (4)5–6(7), sessile, joined, oblong-elliptic, slightly falcate, (4)5–8(9) cm long, (1.2)1.4–1.8(2) cm wide, unequally bilobed at apex. Inflorescence stout, straight; peduncle glabrous terete, (2)3–4(5) mm long, with (1)2-3(4) distant, sterile triangular, acute bracts, about (1)1.2–1.4(1.6) mm long and wide; rachis flattened (rectangular in cross section), with scattered brownish scurfy hairs and (4)6–8(10) distichous triangular floral bracts; floral bracts distant on (1.6)1.8–2.2(2.4) mm, triangular, acute, (1)1.4–1.8(2) mm long and wide; flowers in apical half of rachis, 1–2 at a time. Flowers subsessile, widely opening, fugacious, sepals and petals pale yellow, with scattered scurfy brownish hairs at the base. Pedicel and ovary light green, with scattered brownish scurfy hairs, terete, 6-ribbed, (2.8)3.2–3.6(3.8) mm long, (0.4)0.5–0.6(0.7) mm in diameter. Sepals suborbicular, narrowly ovate, (6.6)6.8–7.2(7.4) mm long, (2.4)2.6–3(3.2) mm wide, apiculate, straight, spreading; lateral sepals attached to column foot. Petals narrowly ovate, obtuse to blunt at apex, as broad as sepals, but little shorter, straight, slightly concave. Lip narrow, obscurely 3-lobed, firmly adnate at right angle to the column foot, lying almost parallel to the column, as long as sepals, (3.8)4.2(4.4) mm wide, white, with four pale brownish blotches near the base; lateral lobes insignificant, broadly triangular, erect; median lobe fleshy, broadly conoidal, (2.8)3.4–3.6(3.8) mm long, at front with 2 low ridges diverging from the apex; disc concave, with 2 hemispheric calluses at the base on lip median lobe. Column pale yellow, short and broad (1.7)1.8–2.2(2.3) mm tall, (0.9)1–1.2(1.3) mm wide; stigma large, almost circular, concave; column foot as long as column, at apex with pale yellow prominent subglobular callus 0.7–0.8 mm in diameter, slightly bifid at apex. Operculum hemispheric, (0.7)0.8–0.9(1) mm in diameter, with very short insignificant beak. Pollinia 2, globular, 0.3–0.4 mm in diameter, with small, hardly visible cavity; stipe broadly elliptic, 0.4–0.45 mm long, viscidium twice smaller, ovate.


**Distribution.** Northern Vietnam. Endemic.

**Notes.** The new species looks superficially similar with Himalayan *B. bimaculata* (King et Pantl.) King et Pantl., but well differs in scattered scurfy hairs on rachis, sepals and petals (vs. glabrous rachis and tepals), pale yellow, widely opening flowers (vs. flowers white, not widely opening), low insignificant broadly triangular lip side lobes (vs. prominent triangular falcate acute forward directed side lobes), disc with no 2 elongate basal calluses at the base (vs. disc with 2 elongate basal calluses), large, prominent subglobular callus placed in the front of the column foot apex (vs. nor particular swellings on column foot), and in broadly obovate pollinarium stipe (vs. lanceolate to almost linear stipe). Three other species of the genus, *B. calcara* Aver., *B. longheila* Aver. et Nuraliev and *B. sigalidi* Seidenf. recorded in Vietnam (Averyanov and Averyanova, 2003; Averyanov et al., 2018) have no visual morphological affinity with the newly described species.

Described from Java ("Java: Kota Batoe, bei Buitenzorg"). **Type** ("Raciborski") – BO? 

**Habitat, phenology and conservation status.** Branch and canopy epiphyte on small trees. Primary broad-leaved evergreen lowland forests along streams. 400 m. Fl. February–April. Very rare. Estimated IUCN Red List status – EN. 

**Distribution.** Vietnam province: Ninh Thuan (Ninh Hai district, Nui Chua national park). Java. 

**Notes.** The genus *Bogoria* J. J. Sm. includes four presently known species spreading from Sumatra, Java, and Kalimantan to the Philippines and New Guinea. Its type species, *B. raciborski* J. J. Sm. was hitherto reported as a rare endemic of Java growing in lowland forests from sea level to elevation 500 m (Comber, 1990). The surprising discovery of this species in southern Vietnam reveals its remarkable disjunction isolated by vast ocean space and extending primary known area to the north on more than 2000 km. It is one more record of true Malesian orchid genera in the flora of continental Asia, like *Abdominea* J. J. Sm., *Cordiglottis* J. J. Sm., *Grammatophyllum* Blume, *Hymenorchis* Schltr., *Macropodanthus* L.O. Williams, *Microtatorchis* Schltr. and *Octarrhena* Thwaites discovered recently also in southern Vietnam (Averyanov, 2012; Averyanov et al., 2012, 2015; Averyanov et al., 2016d; Choudhary et al., 2013). These data show remarkable evidence that floristic relations between eastern Indochina and western Malesia are closer than it was expected years ago. 

**Studied specimen.** **Southern Vietnam.** Ninh Thuan province, Ninh Hai district, Vinh Hai commune, Vinh Hy Bay, Nui Chua National Park, about 400 m a.s.l., epiphyte on small trees along streams in seasonal lowland tropical forest, 2015, Pham Ngoc Lieu sine no. Collected living plant later cultivated by Dinh Thao. Specimen for herbarium was fixed on 24 March 2016, Luu Hong Truong, Tran Giao, Pham Ngoc Lieu, 1215 (SGN, LE). d-EXSICCATES OF VIETNAMESE FLORA 0723/Luu et al., 1215 (Fig. 4). 

**Cymbidium tamphianum** Aver., sp. nov. 

Figs. 11-M & 5. 

Described from southern Vietnam. 

**Type:** 10 October 2016, Nguyen Phi Tam, L. Averyanov, T. Maisak, AL 230 (holotype – LE) prepared from plant cultivated and flowered in private garden of Nguyen Phi Tam in Dalat City, collected in Lam Dong province, Lac Duong district, Da Nhım municipality, around point 12°12’34”N, 108°60’74”E, open coniferous sub-montane grassy forest and woodlands with *Pinus kesiya* at elevation 1600 m a.s.l., September 2015, Nguyen Phi Tam, sine no. 

**Etymology.** Species epithet refers name of its discoverer, Mr. Nguyen Phi Tam. 

**Description.** Terrestrial, perennial, ephemeral, autotrophic rhizomatous herb. Stems slightly swelling or hardly pseudobulbous at the base, erect, underground, very short, hardly visible; old stems leafless, covered at the base by brownish remnants of old cataphylls and leaves; young stems with (3)–4–(6) imbricate, cuneate, conduplicate cataphylls and (3)–4–(6) leaves; all stems densely clustered each other on very short plagiotropic rhizome; with large dense nest of numerous thick, fleshy, white flexuose roots (3.5)–4–(5) mm in diam. Cataphylls narrowly triangular to almost linear, (1)1.5–4.5(6) cm long, (4)5–(6) mm wide, greenish to yellowish-green, fast becoming dark brown, papyraceous and eventually fibrous with age. Leaves sessile, erect, slightly recurved, rather coriaceous, conduplicate, dark glossy green, linear to narrowly lanceolate, (35)–40–(55) cm long, (6)8–10(12) mm wide, obscurely articulate at the base, tapering into acute apex, deciduous in dry season, emerging in early rainy season, only terminal pseudobulb with leaves during growing period. Inflorescence lax raceme, arising from the base of leafless pseudobulb before leaf formation, peduncle erect, dull pink to pink-brown, (12)15–20(25) cm tall, with (1)2–(3)4 scarios, lanceolate, acute sterile bracts; rachis (4)5–8(10) cm long with (3)4–(5)6 spirally arranged flowers, floral bracts dull pink, narrowly triangular-lanceolate, (6)8–12(15) mm long. Pedicel and ovary pink, ovary pinkish-brown, slender, suberect, (1.8)2–2.8(3.2) cm long, 1.2–1.6 mm in diam., ovary slightly broadening toward flower base, shallowly grooved. Flowers widely opening, (2.8)3–4(4.2) cm across; sepals and petals yellowish to pinkish with dull purple stripes; lip white or light yellowish with purple or purple-brown marks and white keels; column white with many fine streaks at front; anther light yellowish to almost white. Sepals subsimilar, spreading, narrowly lanceolate to lanceolate, (2.2)2–4(2.6) cm long, (2.4)2.5–3(3.2) mm wide, 5–7–veined, acute to acuminate; lateral sepals slightly oblique. Petals little broader than sepals, forward directed, loosely clasp column, later spreading, broadly lanceolate, slightly oblique, obtuse, (1.7)1.8–2.2(2.2) cm long, (3.5)4–5.5(5) mm wide. Lip narrowly oblong in outline, not fused to the column base, (1.5)1.6–1.8(1.9) cm long, (5.5)6.5–7.5(8) mm wide, 3-lobed; lateral lobes suberect, almost semicircular (1.8)2–2.4(2.6) mm tall and broad; median lobe oblong, distinctly longer than side lobes, (8)9–10(11) cm long, (3.8)4–5(5.5) mm wide, strongly recurved, with irregularly undulate and denticulate incurved margin, densely papillose; disk with 2 longitudinal glabrous, lamellae keels extending from lip base to the base of median lobe, rising and connivent distally, forming almost close tube. Column stout and short, slightly curved, 8–9(10) mm tall, distinctly shorter than half of median sepal, slightly broadening toward the apex. Anther cup hemispheric, 3–3.5 mm across. Pollinia yellowish, 4, in 2 pairs, narrowly ovoid, 1–1.2 mm long, on small scarios viscidium.
Fig. 4. New orchids in the flora of Vietnam. *Bogoria raciborskii* J.J. Sm. Plate – d-EXSICCATES OF VIETNAMESE FLORA 0273/Luu et al., 1215. Photos by Hong Truong Luu, correction and design by L. Averyanov.
**Habitat, phenology and conservation status.** Perennial terrestrial epemheroid herb. Open secondary dry grassy coniferous forests and woodlands with *Pinus kesiya*. 1400–1600 m. Fl. July–October. Rare. Estimated IUCN Red List status – DD.

**Distribution.** Vietnam province: Lam Dong (Lac Duong district). Endemic.

**Notes.** **The species is very remarkable for its ephemerooid mode of life. According to morphological characters, this species is most close to Chinese *C. defoliatum* Y.S. Wu et S.C. Chen known from Fujian, Guizhou, Sichuan, and Yunnan (Liu et al., 2006, 2009: Puy and Cribb, 2007). However, it is quite well different from the latter species in 3–8 leaves per stem (vs. 2–4 leaves) and distinctly larger flowers: 2.8–4.2 cm across (vs. 2–3 cm in diameter), sepal 2–2.6 cm long (vs. 1.2–2 cm long), petals 1.7–2.2 cm long (vs. 1–1.6 cm long) and column 8–10 mm tall (vs. 7–8 mm tall). Other specific characters, which strikingly segregate the new species from *C. defoliatum* are narrow sepals, proportionally short column (much shorter than half of median sepal), small short lip side lobes (much shorter than median lobe) and proportionally long median lip lobe with roughly papillose center. Like *C. defoliatum* our plant in its natural habitats remains leafless (or with few leaves?) during the dry season surviving by means of winter buds placed on short underground rhizome and dense nest of numerous fleshy storage roots. This plant flowers in the early rainy season and forms leaves after flowering. According to available observations, it is herbaceous element of dry open coniferous woods and woodlands with *Pinus kesiya* widely spreading in Lam Dong province and allied areas of Central Highlands or Tay Nguyen Plateau at elevations 1400–1600 m a.s.l.

**Gastrochilus setosus** Aver. & Vuong, sp. nov.

Described from northern Vietnam. **Type.** “Lao Cai province, Si Ma Cai district, Si Ma Cai Forest. 2 February 2018, Truong Ba Vuong, BV 316” (holotype – VNM, isotype – LE). 4-EXSICCATES OF VIETNAMESE FLORA 0306/BV 316, 317.

**Etymology.** Species name refers the characteristic setose indumentum covering the lip and adaxial spur surface.

**Description.** Miniature epiphyte. Stem creeping or pendulous, simple or few branched, slender, (2)3–4.5(5) cm long, leafy throughout, covered by leaf sheaths, with several distant, white, wiry roots arising from nodes. Leaves sessile, distichous, rigid, close together, narrowly ovate, (1.2)1.4–2.2(2.2) cm long, (4)5–7(8) mm wide, green to dark green, with small sparse dull purplish marks along margin, tapering to acute apex bearing abaxially short unguiculate seta; apical half of leaf often recurved or twisted; at base articulate to short green sheath about 3 mm long, tinged with dull purple.

Inflorescence lateral, arising from apical half of stem, subumbellate, with (2)4–8(10) simultaneously opening flowers; scape (0.3)4–6(8) mm long, rachis (2)3–4(5) mm long, scape bract 1 to 2, broadly triangular, tubular, 1–2 mm long; floral bracts minute, green, triangular, acute,(0.4)0.5–1(1.2) mm long. Pedicel and ovary terete, straight to slightly curved, green, (3.5)4–5(6) mm long, spreading to suberect, glabrous or with sparse minute scurfy brownish hairs. Flowers not widely opening, slightly fragrant; sepals and petals yellowish-green, with purple median vein and few sparse purple speckles near the base; lip white, with greenish center of epichile and few small purple marks on hypochile; spur greenish with small sparse purplish speckles; column white; anther cap yellow. Sepals and petals subsimilar, narrowly ovate, (2.6)2.8–3.2(3.4) mm long, (1.4)1.5–1.8(2) mm wide, concave, blunt to almost round at apex. Lip spurred, distinctly divided into hypochile and epichile; hypochile broad, concave, almost round, (1.8)2–2.2(2.4) mm across, with no distinct side lobes, inside densely haired with long stiff white hairs; epichile reniform to half circular, (2.6) 2.8–3(3.2) mm long, (4.4)2–4.8(5) mm wide, concave to almost flat, sparsely ciliate throughout, in center with obscurely triangular cushion densely haired with long, erect, stiff hairs, at apex shallowly emarginate, with small triangular dent; spur spreading almost parallel to ovary, shortly cylindrical, terete or slightly laterally flattened, (3)3.2–3.6(3.8) mm long, (1.8)2(2.2) mm in diameter, blunt to almost round (sometime slightly swollen) at apex, with dense stiff white hairs inside. Column short and broad, about 1 mm tall and wide, with no column foot, rostellum in form of small, furcate forward directed dent. Anther cap glabrous, hemispheric, 1.2–1.4 mm across, with small forward directed triangular beak. Pollinia 2, subglobose, porate, attached to a slender, simple, filiform, hyaline linear stipe, viscidium small, simple, narrowly elliptic. Fruits unknown.


**Distribution.** Vietnam province: Lao Cai (Si Ma Cai district, Si Ma Cai Forest). Endemic.

**Notes.** The new species has certain resemblance with Taiwanese *G. hoi* T.P. Lin and *G. matsudaee Hayata* in plant habit, flower color, and epichile hairiness, but differs in distinctly smaller flowers with sepals 2.6–3.4 mm long, 1.4–2 mm wide (vs. 4.5–6 mm long, 3–3.7 mm wide), reniform to almost round epichile 2.6–3.2 mm long, 4–5 mm wide (vs. semicircular epichile 3–5 mm long, 6–8 mm wide), spur back directed, parallel to ovary, 3–3.8 mm long, 1.8–2.2 wide (vs. spur forward curved, almost perpendicular to ovary, 3–5 mm long, 2–4 mm across) and many dense long setose hairs inside spur (vs. few or no hairs inside spur). Flowers on the
Fig. 6. New orchids in the flora of Vietnam. *Gastrochilus setosus* Aver. & Vuong. Digital epitype – d-EXSICCATES OF VIETNAMESE FLORA 0306/BV 316, 317. Photos by Ba Vuong Truong, correction and design by L. Averyanov.
newly discovered plant may be somewhat similar with G. raraensis Fukuyama also recorded from Taiwan (Lin et al., 2016; Zhou, 2016). However, our plant differs from this later species in compact plant habit with a rather stout stem 2–5 cm long, covered with crowded leaves touching each other (vs. stem slender, elongate to 15 cm long, with distant leaves), purple-spotted lip with soft hairiness (vs. unspotted white to greenish lip with straight setose hairs) and shortly cylindrical spur parallel to ovary (vs. conoid spur almost perpendicular to ovary). The new plant may be also close to the invalidly published G. prionophyllus H. Jiang et D.P. Ye found in Yunnan (Xu et al., 2010). The plant from Yunnan has a similar appearance of the whole plant, but its flower lip is entirely glabrous.

**Studied specimen** (paratype). Northern Vietnam, Lao Cai province, Si Ma Cai district, Si Ma Cai Forest. 2 February 2018, Truong Ba Vuong, BV 317 (VNM).


Fig. 7.

Described from northern Thailand ("Ban Mussoe, Tak"). **Type** ("Tagawa et al. 8626") – KYO.

**Habitat, phenoology and conservation status.** Miniature branch and canopy epiphyte. Primary and old secondary dry evergreen broad-leaved lowland forest, commonly along stream valleys. Fl. September–October. Very rare. Estimated IUCN Red List status – DD.

**Distribution.** Vietnam province: Gia Lai (Chu Prong district). Thailand, southern China (Yunnan).

**Notes.** Lesliea is morphologically a well-segregated monotype genus having relations to the Phalaenopsis alliance according to recent molecular data (Govaerts et al., 2018). The one species of this genus is a very rare miniature canopy epiphyte recorded in few locations in Thailand and Yunnan (Seidenfaden, 1988; Li et al., 2011). This new record in southern Vietnam essentially expands its known area of distribution in the southeastern direction.

**Studied specimen.** Southern Vietnam. Gia Lai province, Chu Prong district, La Ve commune, dry evergreen broad-leaved lowland forest, epiphyte along stream. 22 September 2017, Tong Thi Song Ha, Nguyen Hoang Tuan, sine no (LE). d-EXSICCATES OF VIETNAMESE FLORA 0292/T.T. S. Ha, N.H. Tuan sine no 22.09.2017 (Fig. 7).

Malleola luongii Aver. & V.C. Canh, sp. nov.

Figs. 8A-C & 9.

Described from southern Vietnam. **Type:** Lam Dong province, Dalat town area, Lam Ha District, Nam Ba town environs, Ta Nung pass, evergreen forest along stream at elevation about 1350 m a.s.l., epiphyte along stream, very rare, flowers purple-violet, 10 June 2017, N.V. Canh et al., sine no, herbarium specimen prepared by L. Averyanov and T. Maisak at 18 October 2017 AL 322 (holotype – LE).

**Etymology.** Species epithet refers the name of the plant discoverer, Nguyen Van Luong, farmer and orchid lover from Nam Ha town, Lam Dong province.

**Description.** Miniature monopodial canopy epiphyte. Stem slender, hanging, (1.5)2–3.5(4) cm long, densely covered by distichous leaf sheaths, slightly flattened, with many pale green wiry roots clustering near stem base, leafy in apical half. Leaves (4)6–10(12), sessile, joined, broadly lanceolate to narrowly elliptic, oblique falcate, pure green, (2.5)3–4(4.5) cm long, (4.5)5–7(8) mm wide, spreading horizontally, apex oblique unequally bilobed. Inflorescence slender, glabrous, (1.5)2–2.5(3) cm long; peduncle greenish to dull purple, thin, terete, (0.6)0.8–1.2(1.4) cm long, naked or with 1 distant, sterile triangular, acute bracts, 1–1.2 mm long and wide; rachis terete, slightly longitudinally angled with (3)5–8 flowers; floral bracts distant on (0.6)1–2.2(2.2) mm, triangular, acute, (0.6)0.8–1(1.2) mm long and wide; flowers spirally arranged, spreading at right angle to rachis, simultaneously opening. Flowers subsessile, widely opening. (4)4.5–5(5.2) mm across, sepals and petals spreading, pink-purple, glabrous. Pedicel and ovary white, glabrous or with few short scantly scattered brownish hairs, terete, obscurely 3-angular, (3.8)4–5(5.2) mm long, (0.4)0.5–0.6(0.7) mm in diameter. Sepals (2.4)2.5–2.6(2.7) mm long; median sepal narrowly ovate, (0.9)1–1.2(1.3) mm wide (being flattened), concave, cymbiform, dorsally gibbous and hooded, obscurely attenuate and blunt at apex; lateral sepals broadly obovate, broadening from narrow base, strongly oblique, (1.4)1.5–1.8(1.9) mm wide, almost round at apex. Petals oblong narrowly ovate, (1.9)2(2.1) mm long, (0.9)1(1.1) mm wide blunt to almost round at apex. Lip 3-lobed, spurred, firmly fused by lateral sides with column base, with spur lying almost parallel to ovary; side lobes purple, oblong half-round, (0.7)0.8–0.9(1) mm long and wide, erect, forward directed, lower margin inward curved; median lobe pure white to light pink, narrowly ligulate conoidal, subterete, attenuate, acute, (0.7)0.8–0.9(1) mm long, 0.2–0.3 mm wide, downward revolute to almost helicoid; spur glossy white, shortly cylindrical, with no constriction, (2.4)2.5–2.8(3) mm long, (1.3)1.4–1.5(1.6) mm in diameter, oblique conical and round at apex. Disk rather fleshy, adaxially with small but prominent squarish callus at the base of median lobe. Column white, footless, erect, shortly cylindrical, 1.4–1.6 mm tall, 1.3–1.4 mm in diameter, apex with 2 lateral conoid forward directed finely warty stelidia 0.5–0.6 mm long, 0.25–0.3 mm in diameter at the base; rostellum small, placed between stelidia; stigma large, concave, triangular cordate. Oerculum light pale yellowish, proportionally very large, as tall and broad as column,
ovoid, with large, narrow, down directed beak. Pollinia 2, globular, 0.38–0.4 mm in diameter (0.2 mm when dry), with small, oblong groove on outer surface; stipe linear, translucent, longitudinally conuplicate, bent in the middle and suddenly much widening into broad plate with incurved lateral margins, 1.5–1.6 mm long, 0.9–1.1 mm wide in widest part; viscidium very small, ovate, about 0.1 mm long. Fruits unknown.

**Habitat, phenology and conservation status.**


**Distribution.** Vietnam province: Lam Dong (Lam Ha district). Endemic.

**Notes.** The newly discovered plant belongs to the so-called *Malleola dentifera* – *vietnamensis* complex, taxa of which spread from Indochina and Malacca Peninsula to Greater Sunda Islands (O’Byrne, 2017). It may be close in its morphology to two widespread, polymorphic species, *Malleola dentifera* J.J. Smith and *Malleola vietnamensis* (Guillaumin) Guillaumin solely recorded so far from eastern Indochina (Seidenfaden, 1988, 1992; Averyanov and Averyanova, 2003). Meanwhile, our plant differs from all known Indochinese plants regarded presently as a type subspecies of *M. vietnamensis* (including *M. dentifera* as a synonym of *M. vietnamensis*: O’Byrne 2017) in a series of distinct morphological features. From the closest *M. vietnamensis* var. *vietnamensis* our plant differs in distinctly smaller size with stem 1.5–4 cm long (vs. 10–45 cm long), leaves 2.5–4.5 cm long (vs. 3.2–10 cm long), inflorescence 1.5–3 cm long with 3–8 lax purple flowers 4–5.2 mm across (vs. inflorescence 2–7.5 cm long with 10–30 subdense yellow-brownish flowers 5.5–8.5 mm across), lip side lobes almost round (vs. side lobes triangular acute forming forward directed tooth), lip disc with distinct squarish callus at the base of median lobe (vs. disc fleshy with no particular calli), spur shortly cylindric with distinct squarish callus at the base of median lobe (vs. disc fleshy with no particular calli), spur shortly cylindric with distinct squarish callus at the base of median lobe (vs. disc fleshy with no particular calli), spur shortly cylindric with distinct squarish callus at the base of median lobe (vs. disc fleshy with no particular calli), spur shortly cylindric with distinct squarish callus at the base of median lobe (vs. disc fleshy with no particular calli), spur shortly cylindric with distinct squarish callus at the base of median lobe (vs. disc fleshy with no particular calli), spur shortly cylindric. Polliinae 0.38–0.4 mm in diameter when dry (vs. pollinia 0.4–0.5 mm in diameter). Fruits unknown.

**Habitat, phenology and conservation status.**


**Distribution.** Vietnam provinces: Gia Lai province (K'bang district, Chu Mom Ray nature reserve), Khanh Hoa (Khanh Son district), Kon Tum (Ngoc Linh Mountains), Lam Dong (Dalat City area, Ta Nung Pass). Malay Peninsula (Thailand and Malaysia).

**Notes.** The discovery of this species, known earlier only in southern part of Malayan Peninsula, in several locations of southern Vietnam reveals an obvious lack of our knowledge about miniature canopy epiphytes often overlooked in botanical surveys. The discovered locations expand the formal species distribution with more than 800 km. They form an isolated area separated from the earlier known populations by vast ocean space of Siam Gulf.


**Robiquetia orlovii** Aver., sp. nov. **Figs. 8F-L & 10.**

Described from northern Vietnam. **Type:** *Vietnam*, western part of Nghe An province, Pu Mat national park, 18°57'24.6"N 104°41'04.3"E, humid lowland primary broad-leaved evergreen shady forest with bamboo along rocky stream at elevation 420 m a.s.l., small pendulous epiphyte at nodes of rotten bamboo stems in wet place above the water, flowers simultaneously opening, sepals and petals dull yellow to dull orange, lip white, lobes...
purple, spur, column and anther white, 20 May 2016, N.L. Orlov et al., sine no” (holotype – LE).

**Etymology.** The specific epithet honors Prof. Nicolai Orlov, the discoverer of the plant.

**Description.** Perennial monopodial epiphytic miniature herb. Stem simple or basally few branched, rigid, pendulous, (0.6)0.8–1.2(1.6) cm long, (2.5)3–4(4.5) mm in diam., at base with many wiry, much flexuose, terete, greenish roots; internodes (3.5)4–5(5.5) mm long. Leaves (2)3–4(5), sessile, dorso-ventral, leathery, straight or slightly curved, conduplicate, linear-subulate, (4)5–10(12) cm long, (3.5)4–5(6) mm wide, acuminate, tapering to the apex. Inflorescence pendulous raceme (8)10–14(16) cm long, scape and rachis grassy green; scape (5)6–10(12) cm long, terete, down curved at base, with (1)2–3(4) short, broad, dull pale brownish sterile scarios bracts (4)5–7(8) mm long; rachis straight or slightly curved, somewhat thicker than scape, longitudinally ridged, with many spirally arranged, subdense flowers. Floral bracts pale greenish to yellowish, thick, narrowly triangular, acute, (1.8)2–2.6(3) mm long, (0.4)0.6–8(1) mm wide. Pedicel and ovary (2)2.2–3.8(4) mm long and (0.6)0.7–0.8(0.9) mm in diameter, longitudinally ridged, light green to dull olive, glabrous or with very small scattered rusty trichomes, straight or slightly curved, slightly broadening at the base. Flowers more or less widely opening, (5.5)6–7(7.5) mm across; sepal and petals rather fleshy, on both surfaces sparsely hairy with very small rusty trichomes, orange-brown, with light yellowish to almost white base; lip white, with purple lobes; column and anther white; pollinia yellowish. Median sepal forward directed, broadly ovate, cucullate, strongly concave, almost hemispheric, round at apex, (2.2)2.4–2.8(3) mm long, (1.6)1.8–2.2(2) mm wide. Lateral sepals spreading, oblique ovate, slightly concave, blunt to rounded at apex, (3)3.2–3.6(3.8) mm long, (2.8)3–3.2(3.4) mm wide. Petals forward directed, broadly obovate, to broadly obtriangular, truncate, (1.7)1.8–2(2.2) mm long and broad, slightly oblique, finely irregularly denticulate along margin. Lip spurred, (4.6)4.8–5(5.2) mm long (from spur apex to the apex of median lobe), 3-lobed; side lobes ovate to almost round, parallel and forward protruding, (1.8)2–2.2(2.3) mm long and broad at the base, each side lobe at front with fleshy enrolled fold forming inside miniature pocket; median lobe fleshy, narrowly ovate, (1.8)2–2.2(2.3) mm long, (1.2)1.4–1.6(1.8) mm wide, acute or hardly emarginate, forward directed or slightly upright, disc at the base of median lobe with tall narrow emarginate callus, median and apical part with 2 fleshy keels, separated by deep longitudinal furrow; spur obovoid to almost globular, narrowing at the base, saccate, (1.2)1.4–1.6(1.8) mm long and wide, with entire, round apex and incomplete longitudinal septum rising on front wall in the spur middle part. Back-wall callus in form of large, flat, pocket with scarious wall, 0.6–0.8 mm long and wide, with irregularly dentate margin, opening proximally. Column short, broad, slightly back bent, (1.2)1.4–1.5(1.6) mm high and wide, with large, fleshy, forward-directed conoid, finely verruculose arms as long as column, with forward directed lamellate roundish twin keel at front supporting distally viscidium; stigma concave, transversely oblong. Anther cap helmet-shaped, 1–1.2 mm tall and broad, 3-lobed; side lobes obovate, convex; median lobe narrowly triangular, tapering to the apex, forming prominent down directed straight, acute beak 0.6–0.7 mm long, twice longer than side lobes. Pollinia 2, ovoid, 0.7–0.8 mm long, each split into 2 unequal adaxially flattened halves. Stipe (tegula) in form of simple, almost filiform conduplicate stalk 1.8–2.2(2.2) mm long, slightly broadening at base and apex; caudicles insignificant; viscidium attached to the stipe base, simple, in form of ovate concave plate, 0.25–0.3 mm long. Fruits cylindric, robbed, recurved capsule (1.8)2–2.6(3) cm long, (2.4)2.6–3.4(4) mm in diam.

**Habitat, phenology and conservation status.** Miniature pendulous epiphyte. Primary and secondary broad-leaved evergreen humid forests on silicate rocks, commonly on nodes of rotten bamboo stems in shady places along streams above the water. 400–450 m. Fl. April–May. Very rare. Formally IUCN Red List status should be estimated as – Data Deficient (DD). However, in fact, species probably stands on the verge of full extinction. At least one known habitat, where type specimens were originally collected, presently is destroyed.

**Distribution.** Vietnam provinces: Binh Phuoc (sine loc.), Nghe An (Con Cuong district, Pu Mat national park). Endemic.

**Note.** The genus *Robiquetia* Gaudich. in traditional sense (excluding taxa sometime included on the base of molecular data with no morphological support) includes about 40 species distributed from Himalayas to Australia and the south-west tropical Pacific Islands with highest diversity in Kalimantan and Philippines (Comber, 1990, 2001; Seidenfaden, 1992; Seidenfaden and Wood, 1992; Pearce and Cribb, 2002; Chen and Wood, 2009). Almost all known species are rather large plants with long stout pendulous stem and large broad leaves. The newly discovered species strikingly differs from all its congeners in linear, subulate, fleshy leaves, miniature habit and curious structure of the lip and back wall callus. According to available collections and observation, the new species is endemic to Vietnam. It is noteworthy, that in all known locations the plants were found growing along shady streams at nodes of dead or rotten bamboo stems, which, probably, represent its specific ecologic requirements.

**Studied specimen (paratype).** Southern Vietnam, Binh Phuoc province, humid evergreen lowland forest, small pendulous epiphyte at nodes of rotten bamboo stems, flowers simultaneously opening, sepal and petals dull orange-brown, lip white, lobes dull brownish-pink, spur, column and anther white, April 2014, C.X. Cau, X., Cau et al., sine no (LE – photo).

Fig. 8M, N.

Described from northeastern India (“Base of Khasia, J.D.H. & T.T. (194”) .

**Type:** “194 Base of Khasia J.D.H. & T.T. 22/8/50” – K (lectotype – K000895710, designated here; isolectotype – K000974381).

**Habitat, phenology and conservation status.** Pendulous medium sized epiphyte. Primary and secondary broad-leaved evergreen humid forests. 1700 m. Fl. in cultivation July–August. Very rare. Estimated IUCN Red List status – DD.

**Distribution.** Vietnam province: Lai Chau (Sin Ho district). Nepal, Bhutan, NE. India, Thailand, S. China (Yunnan).

**Note.** This is one more Himalayan orchid species found in the flora of Vietnam. Earlier records of this species for Laos and Vietnam were not supported by any cited herbarium collections (Xu et al., 2010; Zhou et al., 2016).

**Studied specimen.** Northwestern Vietnam, Lai Chau province, Sin Ho district, Sa De Phin, around point 22°18’55.0’’N 103°13´31.8´´E, at elevation about 1690 m a.s.l., 1 June 2017, N.L. Orlov, L.K. Iohanssen, sine no, herbarium voucher specimen prepared from cultivated flowering plant in August 2017, N.L. Orlov, L. Averyanov Al. 276 (LE).

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**LITERATURE CITED**


