New Orchids (Orchidaceae: Epidendroideae and Vandoideae) in the Flora of Vietnam

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ABSTRACT: The paper continues our recent publication of new original data on orchid diversity in Vietnam (Averyanov et al., 2018a-c) obtained in 2016–2017. It includes data on 5 orchid species new for science (Calanthe nguyenthinhii Aver., Dendrobium truongcuongii Aver. & Canh, Gastrodia khangii Aver., Nephelaphyllum thaovyae Aver. & Canh and Podochilus truongtamii Aver. & Vuong) and 15 species, new for the flora of Vietnam (Calanthe ceciliae, Dendrobium eriiflorum, D. griffithianum, D. hekouense, D. minusculum, D. stuposum, D. xichouense, Eria lancifolia, E. xanthocheila, Geodorum terrestre, Liparis condylobulbon, L. tenuis, Luisia teres, Pomatocalpa maculosum, Porpax ustulata). Annotated species list includes the valid name, synonyms, type, citations of relevant taxonomic regional publications, data on ecology, phenology and distribution, estimated IUCN Red List status, studied specimens, brief taxonomic notes, and illustrations for each recorded species. Lectotypes for two species, Liparis tenuis, and Dendrobium exsculptum are proposed. When the new data presented in this paper are included, the documented orchid flora of Vietnam reaches at least 1243 species.


INTRODUCTION

This paper continues our recent publications of new original data on orchid diversity in Vietnam (Averyanov et al., 2018a-c) obtained in the field studies mostly during years 2016–2017 since last our publications (Averyanov et al., 2016a-d, 2017a, b; Averyanov and Maisak, 2017a, b; Nguyen and Averyanov, 2017). Like previous papers, it summarizes the results of joint efforts of professional botanists and orchid enthusiasts on studies of Vietnamese native orchids from subfamilies Epidendroideae and Vandoideae leading to the discovery of 5 species new for science, namely Calanthe nguyenthinhii Aver., Dendrobium truongcuongii Aver. & Canh, Gastrodia khangii Aver., Nephelaphyllum thaovyae Aver. & Canh and Podochilus truongtamii Aver. & Vuong. Additionally, fifteen species are reported and documented here as a new for the flora of Vietnam. These species are: Calanthe ceciliae Rchb.f., Dendrobium eriiflorum Griff., D. griffithianum Lindl., D. hekouense Z.J. Liu et L.J. Chen, D. minusculum Aver., D. stuposum Lindl., D. xichouense S.J. Cheng et Z.Z. Tang, Eria lancifolia Hook.f., E. xanthocheila Ridl., Geodorum terrestre (L.) Garay, Liparis condylobulbon Rchb.f., L. tenuis Downie, Luisia teres (Thunb.) Blume, Pomatocalpa maculosum (Lindl.) J.J. Sm. and Porpax ustulata (E.C. Parish et Rchb.f.) Rolfe. When the new data presented in this paper are included, the documented orchid flora of Vietnam reaches at least 1243 species. 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. Lectotypes for two species, Liparis tenuis, and Dendrobium exsculptum 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 2016–2017. 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. In describing of 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 the housing of cited specimens is 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


Fig. 1

Described from Malayan Peninsula (“Most probably this Calanthe, from the Malayan peninsular… Messrs. H. Low & Co. ….”). Type (“cult. Low”) – W-RCHB 2196 (holotype).

Habitat, phenology and conservation status.


Distribution. Vietnam: Dak Lak (Chu Yang Sinh Mountains) and Lam Dong (Bao Loc town area) provinces, northern Vietnam (with no exact location). Myanmar, Peninsular Thailand, Peninsular Malaysia, Sumatra, Java.

Notes. It is one more new addition of the typical

Malesian species to the orchid flora of Vietnam. It shows remarkable geographical variation in its flowers color. Plants with pink-purple flowers are most common in Java and Sumatra (Comber, 1990, 2001). White flowers tinged with violet are typical for the plants in Malay Peninsular (Seidenfaden and Wood, 1992; Clayton and Cribb, 2013). According to available collections and observations, the flowers in Vietnam are pure white with light yellow callosity at the lip base. Specimens from Vietnam also differ from Malesian plants in spreading, obtriangular, truncate lip side lobes (vs. side lobes somewhat forward directed, ovate with roundish apex) and small median lobe much narrower than side lobes with almost entire margin (vs. median lobe distinctly wider than side lobes, finely denticulate along margin). Studied Vietnamese plants certainly represent distinct geographical race, but the identification of its taxonomical rank needs further studies and analysis of more material.


Calanthe Nguyenthinhii Aver., sp. nov.

Fig. 2

Described from southern Vietnam. Type (“16 October 2017, Nguyen Phi Tam, L. Averyanov, T. Maisak, AL 287”) – LE (holotype), was prepared from the flowering plant cultivated in Dalat Town by Nguyen Phi Tam. The living plant was collected in Lam Dong province, Lac Duong district, Da Chais municipality, Bidoup Mountains, an evergreen forest at elevation 1600 m a.s.l., 21 January 2017 by Nguyen Van Thinh, s.n. Digital epitype – d-EXSICCATES OF VIETNAMESE FLORA 0297/AL 287 (Fig. 2).

Etymology. The specific epithet refers the name of the plant discoverer, Nguyen Van Thinh, orchid explorer and grower from Dalat town, Lam Dong province.

Description. Terrestrial herb with few erect abbreviated stems densely clustering on the short rhizome. Rhizome plagiotropic, epigeous, very short, insignificant. Stems (1.3)–6(8), dull green, touching each other, erect, slightly swelling; narrowly conoid, (1.5)–2.5(3) cm long, (0.6)0.8–1.2(1.5) cm in diameter, covered by light green broadening leaf bases or their whitish fibrous remnant. Leaves (3)4–6(7), subglabrous above, finely puberulent below, sessile, imbricate, with narrowing petiole-like basal part, broadening and sheathing at the base; petiole-like basal parts light green,
Fig. 1. New orchids in the flora of Vietnam. *Calanthe ceciliae* H. Low ex Rchb.f. Plate – d-EXSICCATES OF VIETNAMESE FLORA 0291/Nguyen Hoang Tuan et al., s.n. 15.08.2017. All photos by Nguyen Hoang Tuan, design and correction by L. Averyanov.
channeled, (2)3–8(10) cm long, (2)3–4(6) mm wide (being flattened), broadening at the base into short overlapping sheath embracing stem; leaf blade dark velvety green, ovate elliptic, (8)12–20(24) cm long, (3)3–6(8) cm wide, plicate, wavy along margin, acute to acuminate at the apex. Inflorescence arising from the apical part of stem, erect, dense raceme, (60)70–110(120) cm tall; peduncle light green, soft densely puberulent, (45)60–100(110) cm long, with (3)5–6(8) distant, narrowly ovate to narrowly triangular acuminate herbaceous sterile bracts, diminishing from the base of peduncle toward the apex, (12)–(15) cm long, (3)4–10(14) mm wide; rachis puberulent, (4)5–8(9) cm long, with many, spirally arranged flowers forming dense cylindric raceme (2)2.2–2.8(3) cm in diameter. Floral bracts persistent, puberulent, horizontally directed, olive-green, later dull brownish, ovate to narrowly triangular, acute to shortly acuminate, (2.5)3–(6)7 mm long, (1.4)1.6–3(4) mm wide. Pedicel and ovary light green, straight to slightly downcurved, (8)9–12(13) mm long, hairy by many scaly dark brownish short hairs; pedicel cylindric (2.5)3–4(4.5) mm long. 0.8–1 mm in diameter; ovary obconic, (5.5)6–7(7.5) mm long. 1.5–2 mm in diam., slightly globose, obscurely 3-angled in section. Flowers widely opening, (1)1.2–1.4(1.5) cm across; sepal and petals strongly recurved coming almost parallel to ovary, light pale green; lip down spreading, pure white with bright yellow central callus. Sepals thin, subparallel, almost flat, hairy with short dark brownish scaly hairs, ovate, (6.5)7–8(8.5) cm long, (4.8)5–5.5(5.8) mm wide, acute to shortly apiculate at apex, lateral sepal slightly oblique. Petals as long as sepals, twice narrower than sepals, narrowly obovate, (2.4)2.6–2.8(3), acute. Lip spurred, 3-lobed, massively fused with the column wings, being flattened broadly ovate in outline, (9.5)10–12(12.5) mm long, (11)12–14(14.5) cm wide, glabrous; side lobes oblique broadly ovate, flat, laterally spreading, obtuse or obscurely dentate at apex, (5.5)6(6.5) mm long and wide; median lobe narrowly obovate, deeply 2-lobitate, down spreading, flat or slightly convex, (7.2)7.5–8(8.2) mm long, (5.5)6(6.5) mm wide, lobules separated by deep sinus, narrowly obovate, (5.8)6(6.2) mm long, finely irregularly denticulate at rounded or somewhat truncate apex; disc at the lip base with large 3-lobed yellow callus and allied numerous, fleshy, bright yellow, finger-like irregular protuberances; spur light pale green, narrowly cylindric, obtuse, straight to slightly curved, (13.5)14–15(15.5) mm long, 1–1.2 mm in diameter, sparsely shortly hairy outside, with dense long white hairs inside near throat. Column pure white, stout, fleshy, broadening from narrow base, massively fused by lateral wings to the lip, truncate at apex, (3.2)3.5–4(4.2) mm tall, 3.4–3.6 wide, rostellum 2-lobed. Anther cup white, apical, hemispheric, (1.1)1.2–1.3(1.4) mm across, with short, forward-directed beak. Pollinia 8, light gray to dull yellowish, clavate, 1–1.1 mm long, on small common viscidium. Fruit unknown.

**Habitat, phenology and conservation status.** Terrestrial perennial herb with clustering much abbreviate erect stems. Primary and secondary evergreen broad-leaved montane forest on granite. 1600 m. Fl. September–October. Very rare. Estimated IUCN Red List status – DD.

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

**Notes.** New species belongs to a group of related species from the sect. Calanthe with large, well developed subradical leaves, erect abbreviated stem and long, erect subapical inflorescence bearing short terminal raceme. In Vietnam, this group includes such widespread and common species as *C. argenteostriata* C.Z. Tang et S.J. Cheng, *C. herbacea* Lindl., *C. leonidii* P.J. Cribb et D.A. Clayton, *C. odorata* Griff. and *C. triplicata* (Willemet) Ames (Clayton and Cribb, 2013). Among them, our plant has the closest relation to *C. triplicata* and *C. leonidii*, but strikingly differs in proportionally very long inflorescence, much dense raceme (vs. raceme subdense or lax), short pedicel and ovary 0.8–1.3 cm long (vs. 2.5–4 cm long), smaller flowers with sepals 6.5–8.5 mm and lip 9.5–12.5 mm long (vs. sepals 10–12 mm and lip 12–18 mm long), shorter spur 13–15 cm long (vs. about 2 cm long), lobules of median lip lobe straight, down directed, parallel each other (vs. lobules of median lip lobe strongly divergent) and in prominent 3-lobed callus and numerous, fat brightly yellow protuberances on lip disc near the lip base (disc more or less warty or tuberculate, but with no prominent 3-lobed callus and numerous finger-like papillae). Most probably, new species is local endemic with very limited distribution in western mountain slopes of Bidoup Mountains.


**Fig. 3A & B**

Described from northeastern India (“Khasyah Mountains. Assam Herb. 230. In Ceraso, Myrung: November 9th, 1835”). **Type** – K000943903 (holotype).

**Habitat, phenology and conservation status.** Trunk and branch clustering epiphyte. Primary broad-leaved evergreen forests on karstic rocky limestone, commonly on tops of remnant hills and mountains. 1100–1300 m. Fl. September–October. Rare. Estimated IUCN Red List status – DD.

**Distribution.** Vietnam: Son La province (Moc Chau district). Nepal, Bhutan, N. India, Myanmar.

**Notes.** This discovery represents one more Himalayan species in the flora of northern Vietnam. Its discovered location extends the known area of this species on 800 km in SEE direction. Vietnamese plants
Fig. 2. New orchids in the flora of Vietnam. *Calanthe nguyenthinhii* Aver. Digital epitype – d-EXSICCATES OF VIETNAMESE FLORA 0297/AL 287. All photos, design and correction by L. Averyanov.
Dendrobium griffithianum Lindl., 1835, Bot. Reg. 21, tab. 1756.

Described from Myanmar (“Hab. in regno Burmano supra arbores, ...”). Syntypes (“Wm. Griffith 1834”) – K000894344, K000894407.

Habitat, phenology and conservation status. Trunk and branch epiphyte. Primary humid broad-leaved evergreen and mixed forests on rocky karstic limestone. 1100–1170 m. Fl. July. Rare. Estimated IUCN Red List status – DD.

Distribution. Vietnam: Ha Giang (Bac Me district) and Tuyen Quang (Na Hang district) provinces. NE. India, Myanmar, Thailand.

Notes. This discovery represents one more East-Himalayan species in the flora of northern Vietnam. Its discovered location extends the known area of this species on about 500 km in E direction. Miniature ornamental species desirable for ornamental horticulture.


Fig. 3C

Described from southern China, SE. Yunnan (“China. Yunnan, Hekou, growing on tree trunk, alt. 1000 m, ...”). Type (“... 23.VIII.2008 Z.J. Liu 4093”) – NOCC (holotype).


Distribution. Vietnam: Ha Giang province (Bac Quang district). S. China (SE. Yunnan).

Notes. Unfortunately, discoverer of Vietnamese population did not provide any information about the species ecology in Vietnam. In one known location in China, it grew as a trunk epiphyte mostly on Fagaceae trees (species of Castanopsis, Lithocarpus, and Quercus), in primary evergreen, broad-leaved limestone submontane subtropical forests at elevations 1000–2000 m a.s.l. The flowering period is from August to September, in the middle of the rainy season (Liu and Chen, 2011). Discovered species is a typical local endemic of the South Chinese floristic province accepted in the regional floristic regionalization (Averyanov et al., 2003a, b). This is very attractive miniature plant highly desirable for ornamental horticulture. Specimens discovered in Vietnam look identical with plants from the Chinese type population (Fig. 3c). Authors of the species floral morphology of this species better fits with sect. Breviflores Hook.f.


Dendrobium minusculum Aver., 2016, Turczaninowia 19, 3: 26, fig. 5, 6.

Fig. 3D & E

Described from NE. Laos (“Xiangkhouang province, Peak district, Oran village, primary and secondary broad-leaved evergreen dry forest on shale-sandstone slopes and along edge at elevation 1750–1850 m a.s.l., clustering epiphyte on the tall mossy tree, not common, 14 November 2014, L. Averyanov et al., CPC 7431a / TM 1130 (LE).


Fig. 3F

Described from India (“Native of India ...”). Type (“India, cult. Lodgiges s.n.”) – K-LINDL.


= Dendrobium pristinum Ames, 1915, Orchidaceae 5: 133.


Described from NE. India (“… Ostenstien …”). Type – W?

Habitat, phenoology and conservation status. Trunk and brach epiphyte. Primary broad-leaved evergreen forests on any kind of parental rocks. Fl. June–July. Rare. Estimated IUCN Red List status – DD.

Distribution. Vietnam: Son La (sine loc.), Ha Giang (Bac Quang district), Da Lak (sine loc.) and Lam Dong (Da Nhim and Lac Duong districts) provinces. Bhutan, NE. India, Myanmar, S. China (S. Yunnan), Thailand, Indonesia, Philippines.

Notes. This is not a much surprising discovery of quite widespread species overlooked in botanical inventories in Vietnam for a long time due to its small, rather unattractive flowers.


Southern Vietnam, Lam Dong province, Da Nhim – Lac Duong, 18 June 2017, Nguyen Phu Tan s.n. (LE).

Dendrobium truongcuongii Aver. & Canh, sp. nov.

Figs. 3G, H & 4

Described from southern Vietnam. Type (“19 October 2017, Nguyen Van Canh, L. Averyanov, T. Maiak, AL. 339”) – LE (holotype), prepared from the plant collected on 20 August 2017 in Bidoup Mountains, Lam Dong province, and cultivated privately in Buon Ma Thuot town by Nguyen Van Canh, s.n.

Etymology. Species epithet refers the name of the plant discoverer, officer of Bidoup Nui Ba National Park, Truong Quang Cuong.

Description. Clustering branch epiphyte. Stem yellowish, clustering on short rhizome, erect and arching, slender, not swelling, laterally compressed, to (30)40–60(70) cm long, 3–4 mm in diam., unbranched, many-nodal, leafy in basal half, becoming leafless (or with rudimentary leaves) in upper part, internodes slightly widening toward apex, (1)1.5–2.5(3) cm long. Leaves sessile, rigid, leathery, laterally compressed, distichous, ascending, slightly overlapping or alternate, oblique narrowly triangular, acute, (1.2)2–2.3(4) cm long, (3.4) – 5(7) mm wide, base dilated into sheaths as long as leaf, embracing stem. Inflorescences lateral, arising from nodes on leafless, apical half of stem, 1-flowered; peduncle (1.5)2–2.5(3) mm long. Floral bracts papyraceous, triangular, 0.5–1 mm long. Pedicel and ovary light green, slightly curved, (8)10–11(12) mm long. Flowers widely opening, 8–10 mm across, white with yellowish green tint, lip and column foot heavily speckled with purple, column yellowish-white, anther white. Median sepal narrowly ovate, obtuse, (6.8)7–5.7(7.7) mm long, (2.4)2.6–2.8(3) mm wide. Lateraleals broadly oblique triangular, acute, as long as median sepal, (9.5)10–11(11.5) mm wide at base, connate laterally to column foot, distally connate each other firming short mentum 0.8–1 mm long, 2 mm broad. Petals oblong broadly lanceolate, little shorter and narrower than dorsal sepal, obtuse to blunt. Lip simple, movably joined to column foot apex, long claved, strongly recurved, narrowly obdeltoid, (13.5)14–15.5(15.5) mm long, broadening to truncate or shallowly emarginate apex, (4.5)5(5.5) mm wide, apex margin strongly recurved to revolute; disk with no particular ornamentation. Column erect, very short and broad, 0.8–1 mm tall, 1.8–2 wide; column foot as broad as column, down directed, slightly curved, (9)10(11) mm long; anther cap oblate, slightly toothed at front. Fruit unknown.

Habitat, phenoology and conservation status. Densely clustering branch epiphyte. Primary and secondary evergreen broad-leaved montane forest on granite. Fl. September–November. Rare. Estimated IUCN Red List status – DD.


Notes. Our plant belongs to D. sect. Aporum (Blume) Blume and superficially looks close to D. spatella Rchb. f., widely distributed in mainland southeast Asia and very common in Vietnam. Meanwhile, it distinctly differs in larger flower, 8–10 mm across (vs. 6–7 mm across), sepals 6.8–7.7 mm long (vs. 3–5 mm long), lip long claved, narrowly oblong obdeltoid, 13.5–15.5 mm long (vs. lip short-claved, almost rhomboid, 4–5 mm long) and also in much longer column foot 9–11 mm long (vs. 2–2.5 mm long). The described plant also well differs from all other species of its section hitherto recorded in Indochina. However, it shows somewhat resemblance with D. bilobulatum Seidenf. and D. terminale C.S.P. Parish et Rchb. f. and theoretically may be a natural hybrid of any of these species and D. spatella.


Fig. 5A & B

Described from southeastern Yunnan (“Yunnan: Xichou, Fadou Commune, Donzuncao, alt. c. 1900 m, on trees in the forest on lime-stone mountain, 20 VII 1982, R.Z. Zhou 821192”). Type – IBSC?

Habitat, phenoology and conservation status. No information in Vietnam. Fl. in cultivation in September–October. Rare. Estimated IUCN Red List status – DD.

Distribution. Vietnam: Cao Bang province (sine
Fig. 4. New orchids in the flora of Vietnam. *Dendrobium truongcuongii* Aver. & Canh. **A**-Flowering plant. **B**- Apical portion of stem with flower. **C**- Flattened flowers with dissected mentum and removed lip, frontal view. **D**-Flattened lip, frontal view. All drawn from the type (AL 339) by L. Averyanov.
loc.). S. China (SE. Yunnan).

Notes. This species regarded earlier as a local endemic of SE. Yunnan, in fact, is very close to widespread, very variable *Dendrobium moniliforme* (L.) Sw. and may be regarded as its variety. This point of view is strongly supported by visual morphology and available data of molecular cladistics (Xiang et al., 2013). Its type material probably lost (Chen et al., 2009). Any information on species ecology in Vietnam is not yet available. In one location known in China, the plant grows as a trunk epiphyte in limestone broad-leaved evergreen mountain forests at an elevation about 1900 m a.s.l. (Chen et al., 2009).

**Studied specimens.** Northern Vietnam. Hanoi area, wild-collected plant originated from the street market, 16 September 2016, Nguyen Hoang Tuan, s.n. (LE – photos). Northern Vietnam. Hanoi area, wild-collected plant originated from the street market, 16 September 2016, Nguyen Phong, AL 213 (LE – photos). Northern Vietnam, Cao Bang province with no exact locality, 13 October 2016, Vo Van Cong, L. Averyanov, T. Maisak, AL 252 (LE, LE – photos). The species also recorded as a medicinal plant occurring in Cao Bang province, Nguyen Binh district (Vu Nong and Thinh Tuc communes) and Bao Lac district (Khanh Xuan commune) with no citing of any voucher collections in some online resources (Nguyen, 2017).


Described from Peninsular Malaysia (“Perak; at low elevations, King’s Collector”). **Type** (“Perak, 300–500 ft. July 1885 King’s Collector 7927”) – K000364361.

**Habitat, phenology and conservation status.** Clustering sympodial epiphyte and lithophyte. Primary evergreen broad-leaved lowland forests. 500–550 m. Fl. August–September. Very rare. Estimated IUCN Red List status – DD.

**Distribution.** Vietnam: Kien Giang province (Phu Quoc Island). Southern Thailand, Peninsular Malaysia.

Notes. This is very rare, insufficiently known species for many years was regarded as a local endemic of the middle part of Malay Peninsula. Its present discovery in Phu Quoc Island of southern Vietnam distant at about 600 km to the NNE direction crossing Siam Gulf. It demonstrates well connections of the flora of Malay Peninsula and the coastal mountain flora of southern Vietnam.

**Studied specimen.** Southern Vietnam, Kien Giang province, Phu Quoc Island, Phu Quoc National Park, Nui Chua Mountain, evergreen forest at elevation 500–520 m a.s.l., epiphyte and lithophyte, 28 August 2017, Truong Ba Vuong s.n., voucher herbarium specimen prepared in 16 October 2017, L. Averyanov, T. Maisak, AL 395 (LE). Plate – d-EXSICCATES OF VIETNAMESE FLORA 0301/AL 395 (Fig. 7).

*Gastrodia khangii* Aver., *sp. nov.*

Described from northern Vietnam. **Type** (“Vietnam, Son La province, Van Ho district, Van Ho commune, Hua Tat village, around point 20°46′21.7N 104°47′47.5E, dense bamboo forest on alluvial slope of remnant mountain composed with highly eroded karstic light gray marble-like limestone at elevation about 1100 m a.s.l., terrestrial aehorophyllous mycotrophic tuberiferous herb, flowers dark brown, lip and column wings red, column itself, anther and lip calli white, rare, 2 October 2016, L. Averyanov, Nguyen Tien Hiep, Nguyen Sinh Khang, Chuong Quang Nhan, T. Maisak, Nguyen Thanh Son, CPC 8240”) – LE (holotype), Herbarium of the Center for Plant Conservation (isotype). Digital epitype – d-EXSICCATES OF VIETNAMESE FLORA 0264/CPC 8240 (Fig. 8).

**Etymology.** The species is named in honor of its discoverer, Dr. Nguyen Sinh Khang.

Description. Terrestrial tuberiferous leafless aehorophyllous mycotrophic perennial herb. Tubers more or less plagiotropic, cylindric to fusiform, (2)3–5(6) cm long, (0.5)0.6–1(1.2) cm in diam., fleshy, pale brown, rootless, hairy, covered with many small triangular, acute, thin, papyraceous scales. Stem erect, fleshy, glabrous, soft, straight or slightly flexuose, white to light yellowish-brown, (4.5)5–8(10) cm tall, (3.5)4–5(6) mm thick, with (3)4–7(8) distant, tubular, scarious, obtuse bracts, 5–7 mm long densely adpressed to the stem, rootless at the base. Inflorescence terminal subdense raceme with (2)3–8(9) close flowers; rachis fleshy, straight, (0.8)1–4.5(5.5) cm long. Floral bracts white to
Fig. 6. New orchids in the flora of Vietnam. *Eria lancifolia* Hook.f. Plate – EXSICCATES OF VIETNAMESE FLORA 0300/AL 394. All photos by Truong Ba Vuong, design and correction by L. Averyanov.
Fig. 7. New orchids in the flora of Vietnam. *Eria xanthocheila* Ridl. Plate – d-EXSICCATES OF VIETNAMESE FLORA 0301/AL 395. All photos by Truong Ba Vuong, design and correction by L. Averyanov.
Fig. 8. New orchids in the flora of Vietnam. *Gastrodia khangii* Aver. Digital epitype – d-EXSICCATES OF VIETNAMESE FLORA 0264/CPC 8240. All photos, design and correction by L. Averyanov.
light yellowish-brown, triangular-ovate, acute, (4)5–9(11) mm long, 1.5–2 mm wide. Pedicel and ovary during anthesis (1.2)1.4–1.8(2) cm long, ovary obconic, (3.5)4–6(6.5) mm in diam. at apex, light brownish, longitudinally ribbed; pedicel in fruit erect, terete, white to light pink-brownish, elongate to 6–8(10) cm long, (2)2.5–3.5(4) mm in diam. Flowers bell-shaped, nodding, not widely opening, fleshy, glossy, dark brown; tepals connate on 2/3 forming broad verruculose perianth tube (1.6)1.8–2(2.2) cm long, (0.8)1–1.2(1.3) cm broad, slightly flattened from adaxial side. Sepals subisimlar, oblong ovate, (1.6)1.8–2(2.2) cm long, (0.7)0.8–0.9(1) cm wide, free apex triangular, very fleshy, verruculose, straight to slightly incurved, (5)6–7.5(8.5) mm long and broad. Petals light brown, thin, broadly ovate, almost flat, (2.6)2.8–3.2(3.4) mm long and wide, twice shorter than free sepal apices. Lip entire, flat, orange-brown with red base, narrowly triangular deltoid, adnate to the apex of short column foot, (10)11–12(13) mm long, (5.2)5.5–6(6.2) mm wide, white hairy on flanges, with roundish, straight or recurved apex; disc at the base with 2 massive, irregularly lobed, glossy white calli 2–3 mm across, in apical half with white keel rising apically. Column dorsally dull brown, white at front, stout, slightly curved, (10.5)11–12(12.5) mm tall, (1.7)1.8–2(2.1) mm wide, with thin broad red lateral wings; ovary obconic, with no stelidia; stigma at column base, ovate, convex, yellow-brown, 1.4–1.6 mm across; column very short, 2–3 mm long, at straight angle to column base. Anther cup white, hemispheric, about 0.7–0.8 mm across. Pollinia 2, granular-farinaceous, with no caudicles. Fruits cylindric, straight or slightly curved, light brownish erect capsule (2)2.5–3(3.5) cm long, (4.5)5–6(7) mm in diam., finely longitudinally ribbed.

Habitat, phenology and conservation status.

Distribution. Vietnam: Son La province (Van Ho district), Endemic.

Notes. Species belongs to the group of dwarf unattractive species with rather small, dark brown, finely verruculose, campanulate flowers often hardly visible among leaf litter. This group in Southeast Asia includes Gastrodia pubilabiata Sawa (Sawa, 1980) and G. shimizuana Tuyama (Chung and Hsu, 2006; Suetsugu et al., 2012) distributed mainly in Japan and Taiwan (Asian species of the genus with a similarly pubescent lip) new species differs in the narrow lip, simple column, connivent (newer recurved) perianth lobes and verruculose perianth tube. Like almost all mentioned species, our plant inhabits secondary humid shady bamboo forests and has pedicels much elongated during fruit formation.


Described from Java (“Rumph. amb. 6. t. 52. f. I.”).

Type – LINN 1062.19

Described from Malay Peninula (“… discovered in Pulo-Pinang, or Prince of Wales’s Island…”). Type – (herbarium hardly exist).

Habitat, phenology and conservation status. Terrestrial tuberiferous herb. Lowland open secondary evergreen broad-leaved forest, woodlands, and scrub on alluvial soils. 400 m. Fl. March–May, October–November. Rare. Estimated IUCN Red List status – LC.

Distribution. Vietnam: Dak Lak province (Buon Don district). NE. India, Bangladesh, Myanmar, Thailand, Malaysia, Sunda Islands, the Philippines, New Guinea, northern Australia, tropical Pacific islands.

Notes. The discovery of this species in Vietnam is not too surprising as it has very broad distribution in tropical Asia.

Studied specimen. Southern Vietnam. Dak Lak province, Buon Don district, Yok Don National Park, Dipterocarp forests at an elevation about 400 m a.s.l., 24 April 2017, Chu Xuan Canh, Nguyen Van Canh, Nguyen Hoang Tuan, s.n. (LE). Plate – d-EXSICCATES OF VIETNAMESE FLORA 0285/Chu Xuan Canh, Nguyen Van Canh, Nguyen Hoang Tuan, s.n. (Fig. 9). Northern Vietnam, sine loc., herbarium prepared from wild collected plants cultivated in Hanoi by Nguyen Minh Duc, 25 October 2017, L. Averyanov, T. Mairesk, AL 402 (LE.)

Liparis condylobulbon Rchb.f., 1862, Hamburger Garten–Blumenzeitung 18: 34; Seidenfaden, 1976, Dansk Bot. Arkiv 31, 1: 70, fig. 44; Comber, 1990, Orch. Java: 140, fig.; id., 2001, Orch. Sumatra: 152, fig.; Wood, Cribb, 1994, Checklist Orch. Borneo: 92; Chen, 2009, Fl. China 25: 224; Zhou et al., 2015). From all these species our plant distinctly differs in narrowly triangular lip long hairy on flanges, very large, irregularly lobed lip calli, and simple flat alate column with no apical stelidia. From Gastrodia pubilabiata Sawa (Sawa, 1980) and G. shimizuana Tuyama (Chung and Hsu, 2006; Suetsugu et al., 2012) distributed mainly in Japan and Taiwan (Asian species of the genus with a similarly pubescent lip) new species differs in the narrow lip, simple column, connivent (newer recurved) perianth lobes and verruculose perianth tube. Like almost all mentioned species, our plant inhabits secondary humid shady bamboo forests and has pedicels much elongated during fruit formation.


Described from Java (“Rumph. amb. 6. t. 52. f. I.”).

Type – LINN 1062.19

Described from Malay Peninula (“… discovered in Pulo-Pinang, or Prince of Wales’s Island…”). Type – (herbarium hardly exist).

Habitat, phenology and conservation status. Terrestrial tuberiferous herb. Lowland open secondary evergreen broad-leaved forest, woodlands, and scrub on alluvial soils. 400 m. Fl. March–May, October–November. Rare. Estimated IUCN Red List status – LC.

Distribution. Vietnam: Dak Lak province (Buon Don district). NE. India, Bangladesh, Myanmar, Thailand, Malaysia, Sunda Islands, the Philippines, New Guinea, northern Australia, tropical Pacific islands.

Notes. The discovery of this species in Vietnam is not too surprising as it has very broad distribution in tropical Asia.

Studied specimen. Southern Vietnam. Dak Lak province, Buon Don district, Yok Don National Park, Dipterocarp forests at an elevation about 400 m a.s.l., 24 April 2017, Chu Xuan Canh, Nguyen Van Canh, Nguyen Hoang Tuan, s.n. (LE). Plate – d-EXSICCATES OF VIETNAMESE FLORA 0285/Chu Xuan Canh, Nguyen Van Canh, Nguyen Hoang Tuan, s.n. (Fig. 9). Northern Vietnam, sine loc., herbarium prepared from wild collected plants cultivated in Hanoi by Nguyen Minh Duc, 25 October 2017, L. Averyanov, T. Mairesk, AL 402 (LE.)


Fig. 5C & D

Described from Java (“Java”). Type (“Feb. 1862, Schiller s.n.”) – W (Herb. Reichenbach 46205).

Habitat, phenology and conservation status. Clustering trunk and branch epiphyte, or lithophyte. Rather open submontane evergreen broad-leaved and coniferous forests at elevations 1200–1400 m. Fl.
Fig. 9. New orchids in the flora of Vietnam. *Geodorum terrestre* (L.) Garay. Plate – d-EXSICCATES OF VIETNAMESE FLORA 0285/Chu Xuan Canh, Nguyen Van Canh, Nguyen Hoang Tuan, s.n. All photos by Nguyen Hoang Tuan, design and correction by L. Averyanov.
September—November. Very rare. Estimated IUCN Red List status – DD.

**Distribution.** Vietnam: Lam Dong province (Dalat town area). Myanmar, Thailand, Taiwan, Indonesia, New Guinea, Moluccas, Sulawesi, Philippines, Solomon Islands, Australia, New Caledonia, tropical Pacific Islands.

**Notes.** This is the first, but a not surprising record of the species very common in southwestern Indochina and Malesia. In Vietnam, this species according to available data is very rare. This species was also found in Taiwan (Lin, 1976, Lin et al., 2016).


**Liparis tenuis** Downie, 1925, Bull. Misc. Inform. Kew 1925: 372; Seidenfaden, 1976, Dansk. Bot. Ark. 31, 1: 94, fig. 64. **Fig. 5E & F**

Described from northern Thailand (“Doi Suthep 3200 ft.”). **Type** (“Kerr 250”) – K000596220 (lectotype, proposed here), K000596221 (islectotype).

- **Liparis tenuis** auct. non Downie: Aver., Averyanova, 2005, Turczaninowia 8, 1: 76, tab. 2a (= L. filiformis Aver., 2013, Turczaninowia 16, 1: 102, Fig. 52k-n); Aver. et al., 2016, Turczaninowia 19, 2: 42, fig. 4i; SA-C (= L. delicatula Hook. f.).

**Habitat, phenoology and conservation status.**

Primary broad-leaved, mixed and coniferous evergreen humid forest on rocky crystalline karstic limestone. 1500–1550 m. Fl. in culture February–June. Very rare. IUCN Red List status – DD.

**Distribution.** Vietnam: Cao Bang province (Bao Lac district). NW. Thailand.

**Notes.** For a long time, this miniature species was regarded as a local endemic of Doi Suthep Mountains at northwestern Thailand. Discovered population in northern Vietnam expands known area of this species about 1000 km to the northeastern direction. Some specimens identified earlier as L. tenuis (Averyanov and Averyanova, 2005, Averyanov et al., 2016) belong in fact to L. filiformis Aver., and L. delicatula Hook.f.

**Studied specimen.** Northern Vietnam. Cao Bang province, Bao Lac district, Hong An municipality, Mi Lung village, primary broad-leaved and mixed humid evergreen forest (with Podocarpus, Pinus, Fokienia, and Tsuga) on very steep slopes and along rocky ridge composed with solid crystalline highly eroded limestone at elevation 1500–1550 m a.s.l. around point 22°50′15.4″N 105°49′53″E, canopy epiphyte on mossy tree on shady, humid slope, Rare, 21 November 2014, fl. 10 May 2016 and 1 March 2017, L. Averyanov, Nguyen Tien Hiep, Nguyen Sinh Khang, T. Maisak, L. Osinovetz, CPC 7504 / TM 1185a, fl. on 7 March 2018 (LE).


**Description.** Small terrestrial herb with the short creeping rhizome-like stem. Stem flexuoso, (4)6–10(12) cm long, composed with several cylindrical or fusiform, oblique pseudobulbs sympodially arising from the oblique apical part of each other. Pseudobulbs 1-leaved, dull violet to pale brownish-violet, fleshy, smooth, ascending, (1.2)1.5–2.5(2.8) cm long, (2.5)3–4(5) mm in diameter, with narrowing oblique petiole-like apical part, young cowered by scarious-papyraceous sheath, old naked with few fibrous remains and 1(2) villous roots at the base. Leaves sessile, joined to apex of petiole-like apical part of pseudobulb, which is terete, fleshy, erect to oblique, (4.5)5–7(7.5) mm long, 1–1.2 mm in diameter; leaf blade narrowly cordate, (2.5)3–3.5(3.8) cm long, (1.2)1.5–2.7(2) cm wide, somewhat fleshy, pale gray-violet, mottled with darker, unclear, dull violet spots, with prominent median vein, acute, straight along the margin. Inflorescence arising from pseudobulb apex, sheathed at the base, erect slender raceme, apically with (1)2–4(5) spirally arranged, lax flowers; peduncle thin, glabrous, (5)6–8(10) cm long, dull purple-violet to pale purple-brownish, with (1)2–3(4) persistent, membranous, well distant, narrowly triangular, acute, sterile bracts; rachis (0.8)1–4(4.5) cm long, straight, purple-violet.
Floral bracts horizontally directed, yellowish membranous to papyraceous, narrowly triangular acuminate, (4)5–7(10) mm long 1–1.5 mm wide. Pedicel and ovary (3.5)4–5(6) mm long, hairy with sparse scurfy dirty-brownish short hairs, pedicel (2.2)2.5–3(3.2) mm long terete, 0.25–0.3 mm in diameter, ovary obconoid, (1.6)1.8–2(2.2) mm long, (0.9)1–1.2(1.3) mm in diameter, longitudinally grooved. Flowers not resupinate, widely opening, (1.4)1.6–1.8(2) cm across. Sepals and petals subsimilar, dull yellowish, with 3 pale violet veins, spreading, broadly lanceolate, (8)9–10(11) mm long, (1.7)1.8–2(2.1) mm wide, acute to shortly apiculate, with sparse scurfy hairs on adaxial surface. Lip immobile, broadly attached to column base, almost parallel to column, 3-lobed, finely hairy in basal part, shortly spurred; lip blade white with 3 purple-violet nerves and few purple marks on sides, flat or slightly concave, rather straight, narrowly obovate in outline, (9.5)10–11(11.5) mm long, (5.5)6–6.5(7) mm wide, wavy or crispy along the margin; side lobes triangular falcate, erect, forward directed acute to acuminate, 2–3 mm long; median lobe broadly ovate, (3.8)4–4.2(4.4) mm long and wide, acute to apiculate,
with 3 low parallel, verruculose keels in apical half; disk flat, with no ornamentation; spur pale olive-brownish with violet tint, saccate, slightly flattened, (1.8)2–2.2(3.3) mm long, 1.4–1.6 mm in diameter, with 2 hemispheric lobes at apex, finely verruculose. Column white, erect, simple, (3.4)3.5–3.8(4) mm tall, (0.9)1–1.2(1.3) mm wide, finely crenulate at apical sides, footless. Oerculum white to very light yellowish, subquadrate, at front truncate, 2-locural, (1.1)1.2–1.4(1.5) mm tall, long and wide, slightly flattened, with 2 low lateral conical deep purple horns at apex. Pollinia 8 in 4 groups of 2, rather soft, with no caudicles, stipe, or viscidium. Fruits unknown.

**Habitat, phenoology and conservation status.** Creeping terrestrial herb. Evergreen broad-leaved humid forests on granite. 1000–1200 m a.s.l. Fl. July–August. Very rare. Estimated IUCN Red List status – DD.

**Distribution.** Vietnam: Dak Lak province (M’Drak district, Chu Mu Mountain). Endemic.

**Notes.** New species differs well from its known congeners in broad flat or slightly concave lip having no prominent keels or any other ornamentations. In general habit, our plant solely resembles Himalayan *Podochilus truongtamii* Aver. & Vuong, *sp. nov.* Fig. 12 & 13.

Described from southern Vietnam. **Type** ("Khanh Hoa Province, Hon Ba Nature Reserve, Hon Ba Mountain, evergreen broad-leaved humid submontane forest around point 12°07.232'N, 108°58.377'E, at elevation about 900 m, lithophytic herb in rather open place, 13 June 2017, Truong Ba Vuong, Mang Van Lam, BV 285 / AL 391") – VNM (holotype), LE (isotype). Digital epitype – d-EXSICCATES OF VIETNAMESE BV 285 / AL 391 – VNM (holotype), LE (isotype). Flowers opening in succession, tepals and lip white with light pink-purple apex, not widely opening, (2)2.2–2.4(2.5) mm across. Sepals fleshy, subimpress, narrowly ovate, (2.4)2.8–3(3.2) mm long, (0.7)0.8–1(1.1) mm wide; lateral sepals oblique, adnate with their flesh base with very short base of the column, forming no distinct mentum. Petals not much fleshy, narrowly ovate, much shorter than sepals, forward directed. Lip fleshy, sparsely, entire, shortly cylindrical, slightly recurved, being flattened narrowly elliptic, (2)2.1–2(2.5) mm long, (0.7)0.8–0.9(1) mm wide, simple, at the base with erect fleshy, finely tuberculose, transversal wall divided into two equal lobes by deep sinus; joined to column foot apex. Column shortly cylindrical, (0.8)0.9–1(1.1) mm tall and wide, with prominent fleshy lateral wings and narrow forward directed foot; rostellum in form of thin plate, bifurcate at apex; stigma large, concave; anther cap obscurely triangular 0.35–0.45 mm long, at front obuse. Pollinaria 0.35 mm long, with narrowly ellipsoid viscidium. Fruits unknown.

**Habitat, phenoology and conservation status.** Clustering lithophytic herb. Primary humid broad-leaved evergreen submontane forests on granite. 900 m. Fl. June–July. Not common. Estimated IUCN Red List status – DD.

**Distribution.** Vietnam: Khanh Hoa province (Hon Ba Mountains). Endemic. New species in its vegetative habit and ecology resembles *Podochilus banaensis* Ormerod, *P. khasianus* Hook.f. (= *P. intermedius* Aver.) and *P. microphyllus* Lindl., widely distributed in eastern Indochina including Vietnam. In its floral morphology it is probably most close to *P. khasianus*, but well differs in much longer inflorescence to 3.5 cm long with scape longer than rachis (vs. inflorescence 5–6 mm long, with scape much shorter than rachis, when rachis looks almost sessile), in the lip with erect fleshy wall at the base (vs. lip at the base flat, with two acute plain lateral lobes, with no fleshy erect wall) and long forward directed column foot, longer than lip breadth (vs. very short column foot, much shorter than lip base). It is noteworthy, that new species was found in the same geographic area as recently described local endemic, *P. rotundipetala* Aver. et Vuong. (Averyanov et al., 2016d).

Both species, however, have no close relation and grow
Fig. 12. New orchids in the flora of Vietnam. *Podochilus truongtami* Aver. & Vuong. Digital epitype – EXSICCATES OF VIETNAMESE FLORA 0305/BV 285 / AL 391. All photos by Truong Ba Vuong, design and correction by L. Averyanov.
at different elevations, which probably, support their biological isolation. Additionally, *P. truongtamii* grows in rather dry habitats, when *P. rotundipetala* commonly are found on humid wet rocks along stream valleys.


**Fig. 14**

Described from Sri Lanka (“Hab in Zeylona, supra arbores, Macrae”). **Type** (“Macrae, J 39”) – K00034622.


Described from Java (“Java”). **Type** – L0062053.


Described from northwestern Thailand (“Mae Tang, Lampang 360 m Kerr 301”). **Type** (“FLORA OF SIAM A.F.G. Kerr 301”) – K000942433.

=Pomatocalpa lineafolium Seidenfaden, 1988, Opera Bot. 95: 98, fig. 58.

Described from peninsular Thailand (“Ao Luk, Krabi”). **Type** (“Chermisrivatanav & Kasem 1335”) – BK (holotype BK257275).

**Habitat, phenoology and conservation status.** Trunk and branch epiphytic undershrub. Primary and secondary broad-leaved evergreen submontane humid forests on granite. 600–800 m. Fl. May–June. Rare. Estimated IUCN Red List status – LC (IUCN, 2017).

**Distribution.** Vietnam: Kon Tum (Ngoc Hoi district) and Thua Thien – Hue (Hue town area) provinces. Sri Lanka, Andaman and Nicobar Islands, Myanmar, Thailand, Laos, Malaysia, Java, Sumatra, Borneo, Philippines.

**Notes.** This species widely distributed in tropical Asia represents quite expected addition to the flora of Vietnam. Meanwhile, it was for a long time overlooked in botanical surveys of the country as a rather rare plant. Noteworthy this species is fairly common in lowland areas of Laos allied to Vietnam, but placed to the west of Truong Son Range.

**Studied specimen. Southern Vietnam, Thua Thien – Hue province, Hue town area, Nguyen Van Canh s.n., September 2015 (LE – photo).** **Southern Vietnam**, Kon Tum province, Ngoc Hoi district, Dak Xu – Dak Nong commune, broad-leaved evergreen humid forest at elevations 600–800 m, 15 May 2017, Bui Duc Nam, Nguyen Hoang Tuan, s.n. (LE). Plate – d-EXSICCATES OF VIETNAMESE FLORA 0288/B.D. Nam, N.H. Tuan s.n. a. 2017 (Fig. 14).

**Porpax ustulata** (E.C. Parish et Rchb.f.) Rolfe, 1908, Orchid Rev. 16: 8; Seidenfaden, 1986, Opera Bot. 89: 122, fig. 73; Chen et al., 2009, Fl. China 25: 360; Xu Z.H. et al., 2010, Wild Orch. Yunnan: 305, fig. 419; Zhao et al., 2016, Phytotaxa 276: 123. – *Eria ustulata* E.C. Parish et Rchb.f., 1874, Trans. Linn. Soc. London 30: 147. **Fig. 10C & D**

Described from Peninsular Myanmar (“NEIGHBOURHOOD OF MOULMEIN MOULMEIN”. **Type** (“… No 62. Eria (Conchidiium) ustulata Par. Rchb.f. Presented by REV. C. PARISH, April 1872…””) – K001085616.

**Habitat, phenoology and conservation status.** Miniature lithophyte. Primary submontane evergreen broad-leaved forest. 900–1000 m. Fl. September. Very rare. Estimated IUCN Red List status – DD.

**Distribution.** Vietnam: Gia Lai province (Chu Mon Ray National Park). Myanmar, Thailand, southern China (Yunnan).

**Notes.** This is typical east Himalayan species with a rather surprising newly discovered isolated enclave in southern Vietnam. Our discovery extends formal species area for about 1200 km in southeastern direction.

**Studied specimen. Southern Vietnam, Gia Lai province, Chu Mon Ray National Park, primary submontane evergreen broad-leaved forest, lithophyte, 900–1000 m a.s.l., 4 June 2017, Nguyen Van Canh s.n., fl. in cult in September 2017, Nguyen Van Canh, L. Averyanov AL 403 (LE).

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**LITERATURE CITED**


