Taiwania 61(4): 319–354, 2016
DOI: 10.6165/tai.2016.61.319

New Species of Orchids (Orchidaceae) in the Flora of Vietnam

Leonid V. AVERYANOV[1*], Van Duy NONG[2], Khang Sinh NGUYEN[3], Tatiana V. MAISAK[1], Van Canh NGUYEN[4], Quang Thinh PHAN[5], Phi Tam NGUYEN[6], Thien Tich NGUYEN[†], Ba Vuong TRUONG[7]

1. Komarov Botanical Institute of the Russian Academy of Sciences, Prof. Popov Street 2, 197376, St. Petersburg, Russia.
2. Tay Nguyen Institute for Scientific Research, Vietnam Academy of Science and Technology, 116 Xo Viet Nghe Tinh St., Da Lat City, Lam Dong, Vietnam.
3. Institute of Ecology and Biological Resources, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Cau Giay, Ha Noi, Vietnam.
4. 3/12/3 Vo Van Kiet str., Buon Ma Thuot City, Dak Lak province, Vietnam.
5. 77/9 Mau Luong, Kien Hung, Ha Dong, Ha Noi, Vietnam.
6. Viet Nam Post and Telecommunications Group - VNPT Lam Dong, 8 Tran Phu Street, Da Lat City, Lam Dong Province, Vietnam.
7. Institute of Tropical Biology, Dept. of Biological resources, Vietnam academy of Science and technology, 85 Tran Quoc Toan St., Distr. 3, Hochiminh City, Vietnam.
[*] *Corresponding author Email: av_leonid@mail.ru; av_leonid@yahoo.com*

(Manuscript received 12 May 2016; accepted 7 October 2016; online published 14 November 2016)

ABSTRACT: This paper summarizes results of joint efforts of professional botanists and orchid enthusiasts on studies of Vietnamese native orchids during years 2013–2016. It provides new original data about the discovery of 1 genus (*Grammatophyllum* Blume) and 29 orchid species new for the flora of Vietnam. Valid name, main synonyms, data on type, ecology, phenology, estimated IUCN Red List status, distribution, studied specimens, as well as brief taxonomic and biological notes are provided for each species and varieties. Eight species (*Bidupia khangii*, *Bulbophyllum striatulum*, *B. tipula*, *Cleisostoma dorsisacculatum*, *Cymbidium repens*, *Dendrobium congianum*, *Flickingeria xanthocheila*, *Podochilus rotundipetala*) and two varieties (*Phreatia densiflora* var. *vietnamensis*, *P. formosana* var. *continentalis*) are described as new for science. One combination (*Bulbophyllum bicolor* var. *funingense*) is proposed. An illustrated annotated list of all studied species and varieties is arranged in alphabetical order. Including present data, the known orchid flora of Vietnam comprises currently at least 1210 documented species from 172 genera.

KEY WORDS: Flora of Vietnam, Indochina, Nature protection, New species, Orchidaceae, Plant geography, Taxonomy.

INTRODUCTION

The paper includes new original data on orchid diversity in Vietnam obtained in the field studies mostly during years 2014–2016. Published landmark inventories show the steadily increasing number of known orchid species in Vietnam from 411 species recorded in the year 1934 (Gagnepain and Guillaumin 1934) to 718 species in 1992–1994 (Seidenfaden, 1992; Averyanov, 1994), 897 species in 2003–2005 (Averyanov and Averyanova, 2003; Nguyen *et al*., 2005), 1005 species in 2009 (Averyanov *et al*., 2009) and 1090 species figured in the last survey undertaken in 2011 (Averyanov, 2011). Since this last inventory, 100 species and 11 genera have been newly discovered and documented for the flora of Vietnam (Averyanov, 2012a, b, 2013; Averyanov *et al*., 2012a, b, 2013, 2015a, b, 2016a–c; Schuiteman *et al*., 2013; Choudhary *et al*., 2013, Kumar *et al*., 2014; Averyanov and Vuong, 2015; Duy and Averyanov, 2015; Nuraliev *et al*., 2014, 2015). When the new data presented in this paper are included, the known orchid flora of Vietnam comprises at least 1210 documented species from 172 genera. Despite the proceeding studies, explorations and inventory works, the orchid flora of Vietnam remains far from complete, and each new botanical investigation, particularly in remote mountainous areas, reveals new discoveries. This paper summarizes the results of joint efforts of professional botanists and orchid enthusiasts on studies of Vietnamese native orchids during the last three years. It provides new original data about the discovery of 1 genus (*Grammatophyllum* Blume) and 29 orchid species new for the flora of Vietnam. Valid name, synonyms, type, citations of most important taxonomic regional publications, data on ecology, phenology, distribution, estimated IUCN Red List status, studied specimens, as well as brief taxonomic and biological notes are provided for each species. Eight species (*Bidupia khangii*, *Bulbophyllum striatulum*, *B. tipula*, *Cleisostoma dorsisacculatum*, *Cymbidium repens*, *Dendrobium congianum*, *Flickingeria xanthocheila*, *Podochilus rotundipetala*) and two varieties (*Phreatia densiflora* var. *vietnamensis*, *P. formosana* var. *continentalis*) are described as new for science. One new combination (*Bulbophyllum bicolor* var. *funingense*) is proposed. An illustrated annotated list of all studied species and varieties arranged in alphabetical order is presented below.

MATERIALS and METHODS

Materials used in present studies were collected

臺灣大學學術期刊資料庫

mainly during years 2013–2016. 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 65-70% ethanol. Measurements of the floral parts for descriptions were taken on both herbarium and liquid-fixed materials. Fresh flowers and their fleshy parts often shrank up to 10–15% in size during the drying process when making herbarium specimens. 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. 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). Online version of the IUCN Red List of Threatened Species (2016) was used for estimation of preliminary species conservation status. Place of housing of cited specimens are indicated by accepted acronyms or respected Herbaria.

ANNOTATED CHECKLIST OF NEW ORCHID IN VIETNAM

Ascocentrum ampullaceum (Roxb.) Schltr., 1913, Repert. Spec. Nov. Regni Veg. Beih. 1: 975; Pearce, Cribb, 2002, Orch. Bhutan: 500; Chen, Wood, 2009, Fl. China, 25: 502. – *Aerides ampullacea* Roxb., 1832, Fl. Ind. ed. 1832, 3: 476. **Fig. 1A-C.**

Described from India ("Found by Mr. M.R. Smith growing on trees in the forest, in blossom in May"). **Type** ("M.R. Smith, Roxburgh's drawing *2347*") – K.

Habitat, phenology and conservation status. Trunk and branch epiphyte. Broad-leaved evergreen forests. 1100–1500 m. Fl. April–May. Very rare. Estimated IUCN Red List status - DD.

Distribution. Vietnam: northwestern provinces allied to Laotian border. Nepal, Bhutan, India, Andaman Islands, Myanmar, SW. China (Yunnan), Thailand, Laos.

Notes. The discovery of this montane Himalayan species in northwestern Vietnam essentially expands its known area in southeastern direction. This ornamental plant highly demanded on local markets undoubtedly becomes very rare and certainly stands in our days on the verge of full extinction in the nature. Meanwhile, any field data about its habitats in Vietnam are not yet available.

Studied specimens. Plant received from Hanoi street market, originated expectedly from NW. Vietnam, 22 April 2015, *V.Q.Binh, L.Averyanov, T.Maisak, P.K.Loc, AL 2* (LE).

Ascocentrum rubrum (Lindl.) Seidenf., 1988, Opera Bot. 95: 312; Pearce, Cribb, 2002, Orch. Bhutan: 500. – *Saccolabium rubrum* Lindl., 1833, Gen. Sp. Orch. Pl.: 222. **Fig. 1D-F.**

Described from Nepal and peninsular Myanmar ("Hab. in Napalia, Moalmyne, as ripas fluminis Attran, *Wallich*"). **Type** ("Moulmein, *Wallich 7310A*") - K-LINDL.

Habitat, phenology and conservation status. Epiphyte. Broad-leaved evergreen forests. Fl. April–May. Very rare. Estimated IUCN Red List status – DD.

Distribution. Vietnam: northern provinces allied to Laotian and Chinese border. Nepal, Malacca Peninsula.

Notes. Poorly known species allied to *A. ampullaceum*. The occurrence of this species in Vietnam needs confirmation by field data.

Studied specimens. Vietnam: Plant received from Hanoi street market, originated expectedly from northern Vietnam. 22 April 2015, *V.Q.Binh, L.Averyanov, T.Maisak, P.K.Loc, AL 3* (LE).

Bidupia khangii Aver., ***sp. nov.*** **Fig. 2.**

Described from northern Vietnam (Nghe An province, Ky Son district, Na Ngoi municipality, eastern slopes of Phu Xai Lai Leng Mountain, around point 19°12′54″N 104°12′01″E). **Type** ("26 October 2013, *L.Averyanov, N.T.Hiep, N.S.Khang, L.M.Tuan, N.A.Trang, L.H.Dan CPC 6323a*") – LE (holotype). Digital epitype – d-EXSICCATES OF VIETNAMESE FLORA *0259/CPC 6323a.*

Description. Perennial sympodial terrestrial creeping herb. Plagiotropic stem dull brownish-pink, epigeous, leafless, fleshy, rooting at nodes, to 16 cm long, 4–6 mm in diam.; floriferous stem erect, to (18)20–24(28) cm, at the base with (3)4(5) closely spaced, spirally arranged leaves, terminated by lax spike. Leaves shortly petiolate; petiole and sheath (1)1.5–3(3.5) cm long, (3)4–5(6) mm wide; leaf blade narrowly ovate to ovate, slightly oblique, irregularly undulate along margin, with 1 main vein, acute, (5)6–8(9) cm long, (1.6)2–3(3.4) cm wide, dark velvety olive-brown with white median stripe above, uniform glossy pale pink-brownish below. Scape and rachis straight, hairy with short soft hairs; scape with (3)2(1) sterile tubular, broadly lanceolate, obtuse bracts (0.6)1–1.8(2) cm long, (4)5–6(7) mm wide (when flat); rachis (5)6–8(10) cm long, with (12)14–16(20) spirally arranged flowers, spaced on (4)5–6(8) mm. Floral bracts reddish-brown, outside sparsely hairy, triangular broadly lanceolate, tubular-convolute, obtuse, (6)8–10(12) cm long, (3)3.5–4(4.5) mm (when flat), scarious, entire. Ovary glabrous, narrowly conoid, dull reddish–brown, (8)9–11(12) mm long, (2)2.2–2.8(3) mm in diameter near the base, narrowing to the apex, twisted on 180°, placed almost perpendicular to the rachis. Flowers sessile, widely opening, (0.6)0.8–19(1.2) cm in diameter; sepals pale brownish-pink or brown-greenish; petals white at the base, olive-brownish in apical part; lip white, spur reddish-brown, claw white; column reddish-brown, anther cap dull yellowish. Sepals free, with no distinct veins, subglabrous; median sepal narrowly ovate, concave, straight, erect, slightly

臺灣大學學術期刊資料庫



Fig. 1. New orchids in the flora of Vietnam. **A-C** - ***Ascocentrum ampullaceum*** (Roxb.) Schltr. (*V.Q. Binh et al., AL 2*). **D-F** - ***Ascocentrum rubrum*** (Lindl.) Seidenf. (*V.Q. Binh et al., AL 3*). **G** - ***Bulbophyllum bicolor*** Lindl. var. ***bicolor*** (*L.Averyanov et al., CPC 6892*). **H, I** – ***B. psychoon*** Rchb.f. (*L.Averyanov et al., HAL 11748a*). Photos by L. Averyanov.

臺灣大學學術期刊資料



Fig. 2. New orchids in the flora of Vietnam. ***Bidupia khangii*** Aver. Digital epitype - d-EXSICCATES OF VIETNAMESE FLORA *0259/CPC 6323a.*

臺灣大學學術期刊資

attenuate and acute, (5.8)6–7(7.2) mm long, (2.5)2.6–2.8(3.1) mm wide; lateral sepals oblong ovate, (8.4)8.6–9(9.2) mm long, (3.4)3.6–3.8(4) mm wide, more or less flat, horizontally or upward spreading, somewhat twisted at the base, with acute falcate apex. Petals little longer than median sepal, (2.3)2.4–2.6(2.7) mm wide, glabrous, straight, strongly oblique, narrowing from broad, strongly oblique base to acuminate, falcate, acute apex, 1-veined, connivent and forming narrow hood with the dorsal sepal. Lip glabrous, trilobed, spurred, clawed, apically 2-lobuled, about 5 mm long, distinctly divided into hypochile, mesochile (claw) and epichile. Hypochile rudimentary, in form of small rectangular concave hollow 2.8–3.0 mm long, 2.5–2.7 mm wide, closed by flat, triangular side lobes firmly adpressed to each other. Mesochile (claw) in form of short subterete, straight or slightly incurved tube, (1.4)1.5–2(2.2) mm long, 0.1–1.2 mm in diameter, grooved adaxially. Epichile in form of 2-lobuled plate, placed at the apex of mesochile; lobules adaxially spreading, broadly obovate to almost circular, (3.8)4–4.2(4.3) mm long and wide, finely denticulate and round apex, joined to each other by a small down recurved neck. Spur small, hemispheric, (2.7)2.8–3(3.1) long and wide, inside with low longitudinal keel rising near apex of hypochile into prominent flat dent 1.0–1.2 mm tall, outside longitudinally shallowly grooved and obscurely notched at apex, inside with 2 massive, fleshy, stalked, discoid glands 1.6–1.8 mm tall and wide. Column shortly cylindrical, (2.4)2.6–2.8(3.4) mm tall and broad; in basal half at front with 2 large lamellate keels, 2.8–3 mm long, 1.8–2 mm tall and 0.8–1 mm wide, each divided distally into 2 small denticulate diverging plates; stigma in form of 2 hardly connected lobes, placed at front of column, each lobe convex, almost circular, glossy orange-brown; rostellum prominent, narrowly triangular, longitudinally concave, forward directed, straight or slightly curved, 1.4–1.6 mm long; anther cap obovoid, (2.6)2.8–3(3.2)mm long, (1.3)1.4–1.6(1.7) mm wide, with narrowly triangular, straight or slightly curved, conduplicate, beak; viscidium lanceolate, 1.0–1.4 mm long, whitish. Pollinia 2, white, stalked, clavate, secund, sectile, (2.7)2.8–3(3.1) mm long, each consisting of 2 hemipollinaria, 0.4–0.5 mm in diameter.

Etymology. Species is named after it's discoverer – Dr. Khang Sinh Nguyen.

Habitat, phenology and conservation status. Creeping terrestrial herb. Primary broad-leaved and coniferous evergreen humid forests (with *Cunninghamia konishii*) on sandstone and shale, commonly on rich soils in shady places of steep slopes. 1100–2000 m. Fl. June–August. Not common. Estimated IUCN Red List status - DD.

Distribution. Vietnam provinces: Ha Giang (Bac Me district), Nghe An (Phu Xai Lai Leng Mountains) and Tuyen Quang (Na Hang district). Endemic.

Notes. This is remarkable discovery of the second species of earlier monotype genus recently described from Bidoup Mountains in Lam Dong province of southern Vietnam (Averyanov *et al*., 2016c). New species closely allied to the type species, but distinctly differs in twice smaller flowers, ovary twisted on 180° (not 360°), short straight mesochile (claw), 1.4–2.2 mm long (not strongly recurved, 3.8–4.7 mm long), almost circular lobules of epichile (not elliptic lanceolate), lamellate (not triangular-pyramidal) keels at front of column, bifid stigma with almost separate round lobes (not entire), discoid glands inside spur (nor pyramidal glands), and short, narrowly triangular, straight anther cap beak and rostellum, 1.4–1.6 mm long (not linear, arcuate, 2.8–3.2 mm long).

Studied specimen (paratype). **Vietnam:** Northern Vietnam, border area between Phieng Luong municipality (Ha Giang Prov., Bac Me Distr.) and Sinh Long municipalitiy (Tuyen Quang Prov., Na Hang Distr.), primary broad-leaved humid evergreen and mixed forest on very steep slopes and along rocky ridge composed with solid crystalline highly eroded limestone at 1100–1170 m, 22°38′24.3″N 105°20′21.3″E, creeping terrestrial herb, occasional, 14 November 2014, *L.Averyanov et al., CPC 7431b / TM 1143* (LE).

Bulbophyllum bicolor Lindl., 1830, Gen. Sp. Orch. Pl.: 49; Chen, J.J. Verm., 2009, Fl. China, 25: 428; Barretto, Cribb, Gale, 2011, Orch. Hong Kong: 556; Aver. *et al*., 2012, Taiwania, 57, 2: 127; Aver., 2016, Turczaninowia 19, 3: 11, fig. 2. – *Cirrhopetalum bicolor* (Lindley) Rolfe, 1893, Journ. Linn. Soc. Bot. 36: 14.

B. bicolor var. ***bicolor*** **Fig. 1G**.

Described from China ("Hab. in China…"). **Type** ("*Reeves* drawing") – K.

Distribution. Vietnam provinces: Dien Bien (Dien Bien City area) and Thanh Hoa (Thuong Xuan district). SE. China (Hong Kong), NE. Laos (Houphan province).

Habitat, phenology and conservation status. Creeping lithophyte and epiphyte in primary evergreen broad-leaved forests on rocky karstic limestone. 100–950 m. Fl. May–June, August. Locally common. Estimated IUCN Red List status – DD.

Notes. This variety regarded earlier as a local endemic of Hong Kong (Chen and Vermeulen, 2009; Barretto *et al*., 2011) was observed as locally fairly common plant in discovered localities both in Laos and in Vietnam. It is noteworthy that in eastern Indochina the species was observed exclusively in forests on rocky limestone. Ornamental.

Studied specimens. **Laos:** Northeastern Laos, Houphan province, Viengxay district, Vieng Xai village, 7 April 2015, *N.T.Hiep, L.Averyanov, N.S.Khang et al., LA-VN 1152a / TM 1271* (LE). **Vietnam:** Northern Vietnam, Dien Bien prov., Dien Bien City area, May–Jun 2010, *P.K. Loc, CXC 5* (CPC Herbarium, LE). Northern Vietnam, Thanh Hoa province, Thuong Xuan district, Van Xuan municipality, Hang Cao village, Xuan Lien natural reserve, remnants of primary and secondary broad-leaved evergreen forest on highly eroded rocky limestone hills at 100–200 m, 19°50′47.2″N 105°14′42.7″E, creeping lithophyte on open mossy rocks near mountain top, occasional, 8 November 2013, *L.Averyanov et al., CPC 6892* (LE).

臺灣大學學術期刊資料庫

B. bicolor var. ***funingense*** (Z.H. Tsi et H.C. Chen) Aver., ***stat. et comb. nov.*** – *B. funingense* Z.H. Tsi et H.C. Chen, 1981, Bull. Bot. Res., Harbin 1, 1–2: 112; Aver., Averyanova, 2003, Updated Checklist Orch. Viet.: 15; Chen, J.J. Verm., 2009, Fl. China, 25: 423.

Described from SW. China ("Yunnan: Funing … alt. 1000 m"). **Type** ("22 Apr. 1940, in saxo *C. W. Wang 88792*") – PE (holotype – 00027313; isotype – 00201501).

Habitat, phenology and conservation status. Creeping lithophyte and epiphyte. Primary evergreen broad-leaved and coniferous forests (often with *Pinus wangii*) of rocky karstic limestone, commonly near mountain or hill tops on mossy substratum. 1300–1500 m. Fl. March–April, August. Locally common. Estimated IUCN Red List status – DD.

Distribution. Vietnam province: Hoa Binh (Mai Chau district). S. China (SE. Yunnan).

Notes. This variety described as a rare plant from southeastern Yunnan was observed as locally fairly common orchid in discovered locality in northwestern Vietnam. Flowers of studied samples have strong unpleasant smell of rotten fish. Ornamental.

The relation between two mentioned varieties, *B. chinense* (Lindl.) Rchb.f. and *B. blaoense* Aver. et Tich remains unclear due to scarcity of available materials for study. It is quite probable that all these taxa are desire varietal status of lone variable *B. bicolor* widely distributed in southern China, Vietnam and Laos with extreme northeastern enclave in Hong Kong. Available specimens of var. *funingense* differs from the type variety in entire margin of median sepal (not denticulate or fimbriate) and curiously ciliate or fimbriate frontal surface of operculum.

Studied specimens. Vietnam: Northern Vietnam, Hoa Binh province, Mai Chau district, Hang Kia municipality, near Pa Khong village, 20º44'40"N 104º52'32"E, primary broad-leaved evergreen dry forest with *Pinus wangii* along tops of highly eroded remnant karstic limestone ridge at 1300–1440 m, epiphyte and lithophyte, not common, 9 April 2001, *N.T.Hiep et al., HAL 783* (HN, LE).

Bulbophyllum psychoon Rchb.f., 1878, Gard. Chron. n.s., 10: 170; Aver., 2013, Turczaninowia 16, 4: 30. – *B. lockii* Aver. et Averyanova, 2006, Komarovia 4: 5. **Fig. 1H, I.**

Described from NE. India ("… coming from Assam"). **Type** ("… *Freeman … W. Bull …*") – W?

Habitat, phenology and conservation status. Clustering miniature epiphyte. Primary evergreen broad-leaved and coniferous humid forests on any kind of soils, but preferably on limestone, commonly on mossy trees near mountain tops. 500–1600 m. Fl. November–April, June. Not common. Estimated IUCN Red List status – DD.

Distribution. Vietnam provinces: Dien Bien (Tua Chua district), Ha Giang (Quan Ba district), Hoa Binh (Mai Chau district) and Quang Binh (Minh Hoa district). NE. India, N. Thailand, Laos.

Notes. This uncommon species is close to *Bulbophyllum levinei* Schltr. (= *Bulbophyllum insulsum* (Gagnep.) Seidenf.), rather common plant in humid highlands of the northern Vietnam, but well differs in serrulate or finely denticulate petals and densely clustered, finely wrinkled pseudobulbs "… reminding … eggs of certain butterflies when seen under through a good lens, hence the name" (Richenbach, 1878). Flowers usually pale yellowish, or yellowish with light purple tint, with purple lip and strong, very unpleasant smell.

Studied specimens. Vietnam: Northern Vietnam, Dien Bien province, Tua Chua district, Sin Chai municipality, 22°03′38″N 103°19′56″E, primary humid evergreen broad-leaved forest on very steep rocky slopes and on tops of remnant mountain composed with highly eroded marble-like solid crystalline limestone at 1350–1500 m, epiphyte on mossy tree, flowers light yellowish, lip purple, not common, 14 December 2010, *L.Averyanov, P.K.Loc, P.V.The, N.T.Vinh, CPC 921* (LE). Northern Vietnam, Ha Giang province, Quan Ba district, Apr. 2013, *N.S.Khang s.n.* (LE - photo). Northern Vietnam, Hoa Binh province, Mai Chau district, Pa Co municipality, 20°44'33"N 104°53'54"E, 1150–1250 m, in logged primary closed evergreen tropical seasonal coniferous (*Pinus wangii*) on top ridges submontane forests of limestone mountains, epiphyte, rare, 2 December 2003, *Phan Ke Loc, P 10687* (LE - photo). Northern Vietnam, Quang Binh province, Minh Hoa District, Dan Hoa municipality, Vietnam - Laotian border, around Cha Lo border gate, 17º42′50″N 105º45′54″E, broad-leaved primary forest on very steep slopes and along ridge of remnant mountain composed with highly eroded solid marble-like gray limestone at 500–750 m, epiphyte on mossy trees along ridge edge, occasional, 20 April 2008, *L.Averyanov, P.K.Loc, N.T.Vinh, N.S.Khang, HAL 11748a* (LE).

Bulbophyllum striatulum Aver., ***sp. nov.*** - *B. careyanum* auct. non (Hook.) Spreng: Seidenf., 1992, Opera Bot., 114: 275, p.p. **Fig. 3; 4 A-D.**

Described from southern Vietnam ("Province Gia Lai – Kon Tum, Kon Tum, Dacuy, epiphyte in dry woodlands, abundant"). **Type** ("25 May 1985, *L.Averyanov et al., LX-VN 2218/213*") – LE (holotype), HN, LE (isotype).

Description. Creeping trunk or branch epiphyte. Rhizome long, rigid, semi-woody, (3.5)4–5(5.5) mm in diam., with erect pseudobulbs distant on (5)6–8(9) cm. Pseudobulbs pale dull yellowish-green to olive-brownish, often with purple-brown tint, narrowly conical, (2)2.5–4.5(5.5) cm tall, (0.7)1–1.5(1.8) cm in diam., glossy, at the base often with wooly, light gray bract remnants. Leaf petiolate; leaf blade rigid, coriaceous, oblong broadly lanceolate, (8)10–22(25) cm long, (1.2)1.5–3(3.5) cm wide, narrowing into terete, shallowly grooved petiole, (0.8)1–3(3.5) cm long, 2–3(3.5) mm in diam., obtuse at apex. Inflorescence with horizontal peduncle and pendulous dense flowered raceme; peduncle (12)15–20(22) cm long, (1.4)1.6–2.2(2.5) mm in diam., straight, erect and down arching at the middle, yellowish-pink to dull brownish-purple, with (3)4–5(6) sterile, broadly ovate, obtuse, pinkish bracts more or less distant along the scape; rachis (7)8–12(14) cm long, glabrous, pinkish, stout, straight down drooping, with

臺灣大學學術期刊資料庫

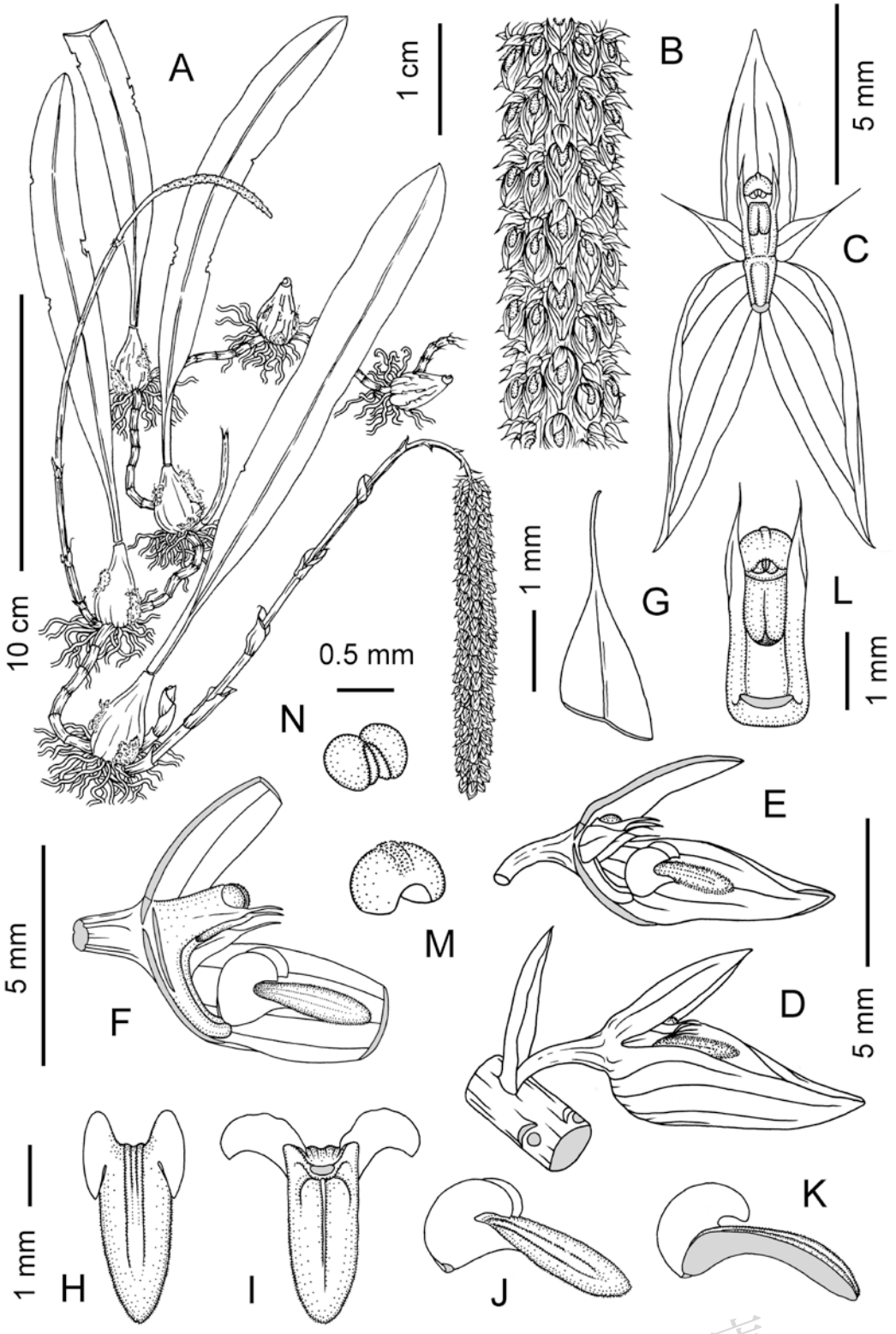


Fig. 3. New orchids in the flora of Vietnam. ***Bulbophyllum striatulum*** Aver. **A** – flowering plant. **B** – portion of inflorescence. **C** – flattened flower, frontal view. **D** – intact flower, pedicel, ovary, floral bract and portion of the rachis, side view. **E** – flower with lateral sepal removed, side view. **F** – flower with lateral sepal and petal removed, side view. **G** – petal. H – lip, frontal view. **I** – flattened lip, view from below. **J** – lip, side view. **K** – lip, sagittal section. L – column, frontal view. **M** – operculum, half side view. **N** – pollinarium, half side view. All drawn from the type – *LX-VN 2218/213* by L. Averyanov.

臺灣大學學術期刊資料庫

many flowers opening simultaneously. Floral bracts light dull pinkish or yellowish, papyraceous, narrowly triangular, broadly lanceolate, erect, acuminate, (4)5–7(8) mm long, (0.6)0.8–1.2(1.4) mm wide. Pedicel and ovary (1.8)2.5–4(4.2) mm long, ovary obconical, longitudinally slightly grooved (0.6)0.8–1(1.2) mm in diam near flower base. Flowers with strong, unpleasant smell, not much opening, 5–6 mm across, spirally arranged into dense spike-like cylindrical raceme (7)8–12(14) cm long, (1)1.2–1.5(1.6) cm in diam. Sepals 3-5–veined, dull light yellowish-orange, each with 3 purple-brown longitudinal irregular stripe and purple-brown along the margin, spreading, narrowly triangular-ovate, acute to slightly acuminate, glabrous, median sepal (5)5.5–6.5(7) mm long, 1.8–2.2 mm wide; lateral sepals oblique, (7.5)8–8.5(9) mm long, (2.4)2.5–3(3.2) mm wide, free or joined at apex. Petals dull light yellowish-orange, purple-brown along margin, triangular, narrowing from broad base into aristate apex, (2.4)2.5–2.8(3) mm long, (0.8)0.9–1.1(1.2) mm wide near the base; with subulate arista (0.6)0.8–1(1.1) mm long. Lip white finely speckled with pink or dull purple, fleshy, oblong narrowly ovoid, (3)3.2–3.5(3.6) mm long, (0.9)1–1.2(1.3) mm wide, recurved near the base, broadly grooved, finely papillose and shortly ciliate along margin, without distinct keels, rounded or blunt at apex, at the base with 2 forward directed, broad, falcate, obtuse ears. Column white, shortly cylindric, broad, (1.4)1.5–1.8(2) mm tall, (0.8)1(1.2) mm wide, with oblong, concave stigma and long, acuminate stelidia 0.8–1(1.2) mm long, much exceeding operculum; operculum yellow, hemispheric, papillose, 0.7–0.8 mm in diam.

Etymology. Species name refers contrasty striated coloration of sepals.

Habitat, phenology and conservation status. Creeping trunk and branch epiphyte. Dry broad-leaved evergreen and semideciduous forests and woodlands on basalt, shale and granite. 600–1000 m. Fl. November–December. Locally common. Estimated IUCN Red List status - DD.

Distribution. Vietnam provinces: Dak Lak (Chu Yang Sin Mountains) and Kon Tum (Dak Ha disrict, Dak Uy commune). Endemic.

Notes. The species belongs to *Bulbophyllum* sect. *Racemosae* Benth. et Hook.f. and most close to widespread *Bulbophyllum careyanum* (Hook.) Spreng., but distinctly differs in long scape, much longer rachis and distinctly larger flowers. In floral morphology it also has some similarity with Malayan species - *B. lilacinum* Ridl., from which differs in aristate petals and subulate stelidia much exceeding anther cap. Described plant differs additionally from both mentioned species in yellow-orange color of flowers with sepals sharply striated with brownish-purple, as well as white lip speckled with pink or purple, and broad, almost half-circular lip auricles.

Studied specimens. **Vietnam**: Southern Vietnam, Dak Lak province, Chu Yang Sin Mountains, 2 December 2015, *Le Van Duc, L.Averyanov, T.Maisak, AL 138* (LE, LE – photo).

Bulbophyllum subtenellum Seidenf., 1979, Dansk Bot. Ark. 33, 3: 46, fig. 21. **Fig. 4E-G.**

Described from NE. Thailand ("Buen Kan, Nonkhai 120 m"). **Type** ("*TS s.n.*") – C.

Habitat, phenology and conservation status. Tiny creeping or clustering branch epiphyte. Primary broad-leaved evergreen humid forests on granite. (120)1000–1500 m. Fl. September–December. Very rare. Estimated IUCN Red List status – DD.

Distribution. Vietnam province: Khanh Hoa (Hon Ba Mountains; Tay Nguyen Plateaus). NW. Thailand.

Notes. Species belongs to *Bulbophyllm* sect. *Minutissima* Pfitzer. Specimens from Vietnam look indistinguishable from Thailand plants though their localities are situated on much lower elevations and distance between them is rated more than 1400 km. Species is very close to *B. moniliforme* E.C. Parish et Rchb.f., differing solely in little smaller flowers and lateral sepals with 3 (not 4–5) nerves.

Studied specimens. **Vietnam:** Southern Vietnam, Khanh Hoa province, Hon Ba nature reserve, Cam Lam district, Hon Ba Mountains, September 2014, *Truong Ba Vuong, s.n.* (LE - photo). Southern Vietnam, Tay Nguyen Plateaus (Central Highlands), herbarium specimen collected from cultivated plant, flowers dull orange, tepals with reddish nerves, lip red, operculum white, 17 December 2015, *Nguyen Phong, L.Averyanov, T.Maisak, P.K.Loc, AL 208* (LE, LE - photo).

Bulbophyllum tipula Aver., ***sp. nov.*** **Fig. 5.**

Plant was collected in northern Vietnam ("Ha Giang province, Bac Me district, Phieng Luong municipality, around Phieng Luong village, at elevation 1100–1150 m a.s.l. around point 22°38′07.1″N 105°19′22.1″E, 13 November 2014, *CPC 7398a, L.Averyanov, N.T.Hiep, N.S.Khang, T.Maisak, L.Osinovetz*"). **Type** ("27 June 2016, *CPC 7398a/TM 1133, L. Averyanov*") – LE (holotype). Digital epitype – d-EXSICCATES OF VIETNAMESE FLORA *0256/CPC 7398a / TM1133.*

Description. Creeping branch and canopy epiphyte. Rhizome creeping, tiny, (7)9–12(16) cm long, (0.5)0.7–0.8(0.9) mm in diam., with erect pseudobulbs distant on (1)1.5–2.5(3) cm. Pseudobulbs light pale green, often with purple-brown tint, narrowly ovoid to ovoid, (4.5)5–7(9) mm tall, (2.5)3–4(5) mm in diam., glossy, irregularly finely grooved and wrinkled, young with papyraceous, yellowish-white bract remnants. Leaf shortly petiolate; leaf blade rigid, coriaceous, narrowly ovate, (1.5)1.6–1.8(2.2) cm long, (7)8–9(10) mm wide, adaxially finely rugose dark green, with prominent conduplicate fold, abaxially smooth, light pale green, speckled with white, notched or shortly bilobed at apex; petiole very short, subterete, shallowly grooved, (0.8)1–1.2(1.4) mm long and wide. Inflorescence arising from

臺灣大學學術期刊資料庫

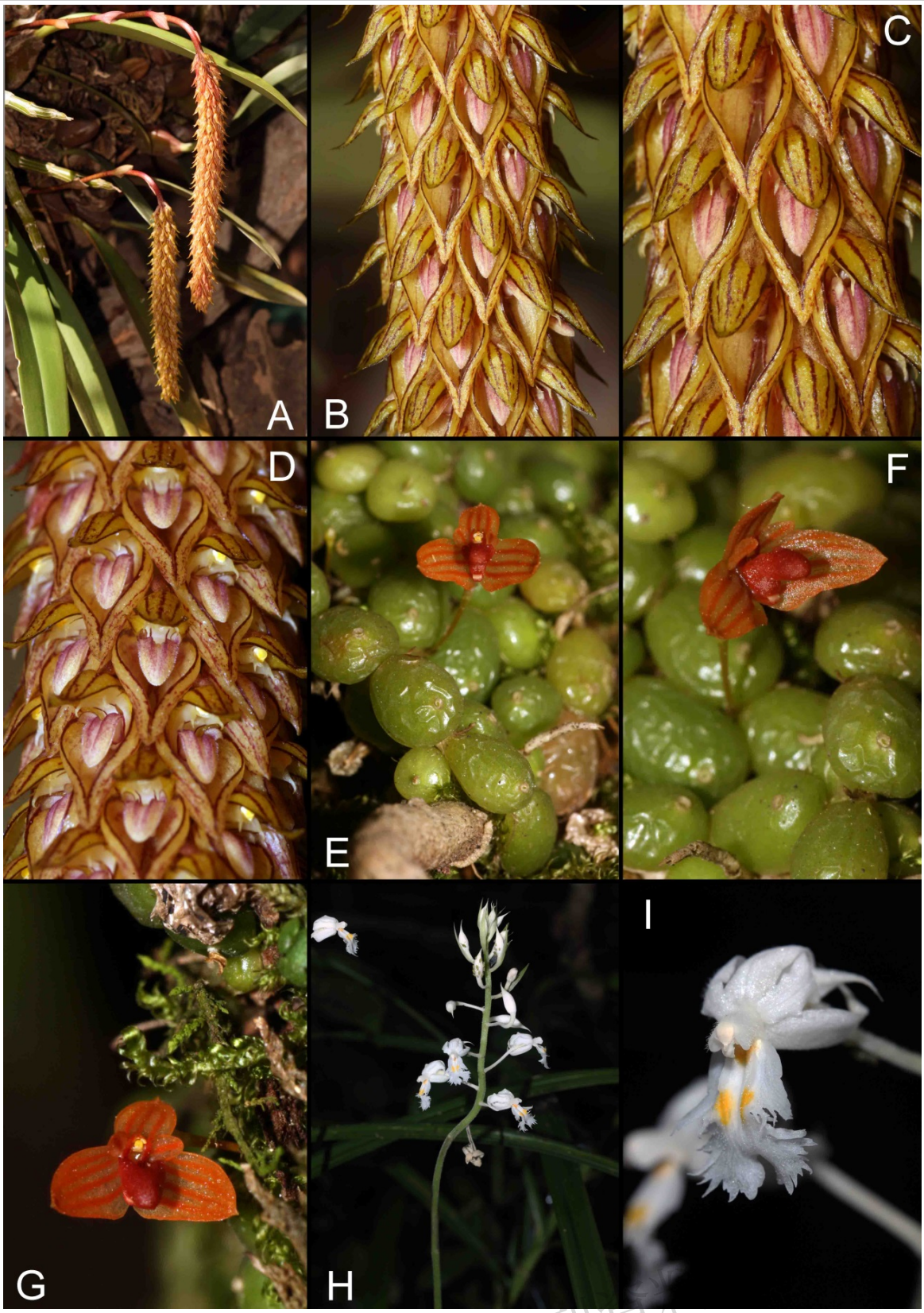


Fig. 4. New orchids in the flora of Vietnam. **A-D** - ***Bulbophyllum striatulum*** Aver. (*Le Van Duc et al., AL 138*). **E-G** – ***B. subtenellum*** Seidenf. (*N.Phong et al., AL 208*). **H, I** - ***Cephalantheropsis laciniata*** Ormerod (15 January 2015, *Truong Ba Vuong, s.n.*). Photos by L. Averyanov (**A-G**) and Truong Ba Vuong (**H, I**).

臺灣大學學術期刊論文



Fig. 5. New orchids in the flora of Vietnam. ***Bulbophyllum tipula*** Aver. Digital epitype - d-EXSICCATES OF VIETNAMESE FLORA *0256/CPC 7398a / TM1133*

臺灣大學學術期刊資料庫

base of pseudobulb, 1-flowered; peduncle rather rigid, filiform, (4)4.5–5.5(6) cm long, slightly curved to almost straight, erect yellowish to dull brownish-purple, with 1–3 negligible sterile whitish scarious distant bracts. Floral bract scarious, whitish to light pale yellowish-pink, narrowly ovate, obtuse, (1.6)1.8–2(2.2) mm long, (0.6)0.7–0.8(0.9) mm wide. Pedicel and ovary light yellowish-green speckled with purple, (5)5.5–6.5(7) mm long, ovary narrowly obconical, longitudinally slightly grooved (1.3)1.4–1.5(1.6) mm long, (0.6)0.7–0.8(0.9) mm in diam. near flower base. Flowers almost odorless, widely opening, (1.7)1.8–1.9(2.1) cm long, (4.2)4.6–4.8(5.2) mm wide. Sepals and petals straight, entire along margins, yellow with purple-brown stripes along nerves, apical part of lateral sepals entirely purple-brown. Median sepal erect, ovate, 5–5.5 mm long, 4.4–4.6 mm wide, concave, acute, with 5 nerves. Lateral sepals free, obliquely falcate, (13)14–15(16) mm long, (2.4)2.5–2.6(2.7) mm wide near the base, with (4)5 nerves, in basal part twisted, in apical half with inverted connivent margins forming attenuate, obtuse tube 0.8–1 mm in diam. Median and lateral sepals distant on column foot, which bears on its sides broadly triangular segment (1.2)1.3–1.4(1.5) mm wide, attenuate into shortly-cylindric, yellowish, finger–like fleshy seta, (0.3)0.4–0.5(0.6) mm long. Petals obliquely triangular narrowly ovate, (2.4)2.6–2.8(3) mm long, (1.5)1.6–1.8(2) mm wide near the base, obtuse, with 3 nerves. Lip yellow above, white below, finely speckled with purple in basal part, fleshy, narrowly triangular, (3.7)3.8–4(4.2) mm long, (0.7)0.8–1(1.2) mm wide, recurved, broadly grooved, smooth, without keels or ears, rounded or blunt at apex, movably attached to column foot apex. Column white, speckled with purple at front finely, shortly cylindric, broad, (1.9)2–2.2(2.3) mm tall and wide, with half-round, concave stigma and large triangular forward directed wings bearing in apical part erect, small triangular, stelidia; operculum dull yellow, hemispheric, smooth, (0.7)0.8–0.9(1) mm in diam.

Etymology. Flower of this species resembles long legs Diptera (*Tipula*, Tipulidae).

Habitat, phenology and conservation status. Creeping branch and canopy epiphyte. Primary broad-leaved humid evergreen forests on crystalline karstic highly eroded limestone. 1100–1150 m. Fl. June–July. Not common. Estimated IUCN Red List status – DD.

Distribution. Vietnam province: Ha Giang (Bac Me district). Endemic.

Notes. This new species has no clear relations. Additional outer perianth segment is curious and rare (apomorphic?) character observed only in *Bulbophyllum bisetum* Lindl. and *B. bisetoides* Seidenf.; both from *B.* sect. *Racemosae* Benth. et Hook.f. At the same time, the plant has long lateral sepals (much longer than median sepal) twisted at the base with connate margins forming tube at their apical half that fits well with characters of *B.* sect. *Cirrhopetalum* (Lindl.) Rchb.f. On the other hand, such features as entire margin of sepals and petals, as well as free at base lateral sepals and 1-flowered inflorescence place this plant to *B.* sect. *Micromonanthe* Schltr. among such similar species as *Bulbophyllum monanthos* Ridl., *B. nanopetalum* Seidenf. or *B. tenuifolium* Lindl. In fact, discovered plant has indefinite intermediate position among mentioned sections according to its unique combination of morphological features. This illustrates once again still tentative sectional division in the genus *Bulbophyllum* Thouars.

Cephalantheropsis laciniata Ormerod, 1998, Orchid Digest 62: 157. **Fig. 4H, I.**

Described from Malacca Peninsula ("Peninsular Malaysia, Kedah Peak, 1160 m). **Type** ("30 Nov. 1915, *Robinson & Kloss 5998*") - K [holotype K000718292].

Habitat, phenology and conservation status. Terrestrial herb. Primary and old secondary broad-leaved evergreen submontane forests. Fl. June–July, January. Very rare. Estimated IUCN Red List status - DD.

Distribution. Vietnam province: Khanh Hoa (Khanh Son district). Malacca Peninsula.

Notes. This species is closely related to *C. obcordata* (Lindl.) Ormerod, but differs in the white flowers and the erose-dentate to irregularly laciniate margins on the epichile and lip claw. It was recorded as a local endemic of Kedah Peak Mountains situated at the middle part of Malacca Peninsula (Ormerod, 1998). Discovered location of this rare plant in southern Vietnam is at a distance more than 1200 km to the northeast from early known area of its distribution.

Studied specimens. Vietnam: Southern Vietnam, Khanh Hoa province, Khanh Son district, Son Trung municipality, O Kha (Suoi Che) Mt., 11 July 2013, *Nguyen Thien Tich, Tich 11–07–13* (SGN). Southern Vietnam, Khanh Hoa province, Hon Ba nature reserve, Cam Lam district, Hon Ba Mountains, 15 January 2015, *Truong Ba Vuong, s.n.* (LE).

Chiloschista lunifera (Rchb.f.) J.J. Sm., 1905, Orch. Java: 553; Seidenf., 1988, Opera Bot. 95: 175, fig. 107, pl. 18b; id., 1992, Opera Bot., 114: 411; Newman *et al.*, 2007, Checkl. Vasc. Pl. Lao: 258; Schuit. *et al*., 2008, Nord. Journ. Bot., 26: 274. – *Thrixspermum luniferum* Rchb.f., 1868, Gard. Chron. 1868: 786. – *Chiloschista javanica* Schltr., 1919, Repert. Spec. Nov. Regni Veg. Beih. 4: 275; Comber, 1990, Orch. Java: 301, fig. – *Sarcochilus segawae* Masam., 1934, Trans. Nat. Hist. Soc. Formosa 24: 212. – *Chiloschista segawae* (Masam.) Masam. et Fukuy., 1938, Bot. Mag. (Tokyo) 52: 247; Su Horng-Jye, 2000, Fl. Taiwan 5: 804, pl. 339; Chen, Wood, 2009, Fl. China, 25: 471. – *C. hoii* S.S. Ying, 1987, Quart. Journ. Exp. Forest. Taiwan 1, 1: 89. **Fig. 6A-C.**

Described from Myanmar ("… Burmah possesses this species"). **Syntypes** ("Messrs. Veitch & Sons") – W ("Herb.

臺灣大學學術期刊資料庫

Reichenbach 26237 [W 0017162], Herb. *Reichenbach 41550* [W 0017163], Herb. *Reichenbach 41549* [W 0017164], Herb. *Reichenbach 11583* [W 0017165]").

Habitat, phenology and conservation status. Canopy and branch epiphyte. Lowland secondary broad-leaved evergreen dry forests, commonly on tall trees along streams and rivers. 300–1000 m. Fl. April–May. Very rare. Estimated IUCN Red List status – EN.

Distribution. Vietnam province: Dak Lak (Lak district, Krong No commune). Myanmar, Taiwan, Thailand, Laos, Java.

Notes. Peculiar ornamental species highly demanded on national and international orchid market.

Studied specimens. Vietnam: Southern Vietnam, Dak Lak province, Krong No commune, Nam Ha municipality, secondary broad-leaved evergreen dry closed forest on rocky slopes of river valley composed by brown volcanic tuffs at 360 m, 27 November 2014, *L.Averyanov, N.T.Hiep, N.V.Duy, Q.V.Hoi, CPC 7681* (LE). Southern Vietnam., Dak Lak province, Ea H'leo district, Ea Drang, evergreen dry forest, 29 April 2015, *Le Thanh Son, L.Averyanov, T.Maisak, AL 45* (LE).

Cleisostoma dorsisacculatum Aver., ***sp. nov.***

Fig. 6D-G; 7.

Described from southern Vietnam ("Lam Dong province, Bao Loc town area"). **Type** ("28 November 2015, *Hoang Thai Ha, L.Averyanov, T.Maisak, AL 98*") – LE (holotype).

Description. Perennial monopodial epiphytic herb. Stem simple or basally few branched, rigid, ascending to erect, (8)15–25(35) cm long, (3.5)4–5(5.5) mm in diam., with few wiry, straight or flexuose roots branching at apex; internodes (0.6)1–2(2.4) cm long. Leaves sessile, dorsiventral, leathery, straight or slightly recurved, oblong lanceolate, (6)8–12(14) cm long, (1.4)1.6–2(2.2) cm wide, unequally bilobed, with oblong, apically rounded lobes. Inflorescence lateral panicle (12)15–30(35) cm long, scape and rachis grassy green; scape (10)12–15(18) cm long horizontal or ascending, often curved or slightly flexuose, with 2–4 short, broad, light pale gray-brownish sterile bracts, with (4)5–12(14) branches (1)2–10(12) cm long, raceme rachis straight to slightly flexuose, branch rachides almost straight, with many spirally arranged, lax flowers distant on (1)2–4(5) mm. Floral bracts minute, triangular, acute, about 1 mm long and wide. Pedicel and ovary (4)4.5–5.5(6) mm long and (0.6)0.7–0.9(1) mm in diam., light green to dull olive, sometime hardly hairy with sparse very small rusty trichomes, usually S-curved, abruptly broadening at the base. Flowers widely opening, (6)6.5–7(7.5) mm across; sepals and petals rather fleshy, very sparsely hairy with very small rusty trichomes, spreading, later turned back, brown, sometime with 1 indistinct brown-yellowish longitudinal strip and dull yellowish along the margin; lip white, with purple apex of side lobes; column white, sometime with light purple tint, apically at sides with dark purple spots; anther cap white with light yellow tint; pollinia yellow. Sepals oblong obovate, concave, cucullate, blunt to rounded at apex, (3.2)3.4–3.6(3.8) mm long, (2)2.2(2.4) mm wide, lateral sepals slightly oblique. Petals oblong broadly lanceolate, blunt, as long as sepals, (0.8)0.9–1.1(1.2) mm wide, slightly oblique. Lip spurred, (4.2)4.5–4.8(5) mm long (from spur apex to the upper side of side lobes), 3-lobed; side lobes narrowly triangular, truncate, parallel and forward protruding, (1.1)1.2–1.4(1.5) mm long, 0.5–0.6 mm wide at the base, each side lobe at the base (on upper margin) with small enrolled fold and prominent broadly conic papillose boss placed near the middle on internal surface; median lobe fleshy triangular to obscurely sagittate, (1.2)1.4–1.5(1.6) mm long, (1.6)1.8–2(2.2) mm wide, blunt to roundish or subtruncate, straight, forward directed or slightly upright, finely irregularly rough, disc with 2 papillose inflations separated by median furrow ending proximally by small hairy boss continuing into the spur in form of high almost glabrous keel (incomplete septum); spur ovoid, saccate, vertically down directed, at the apex sometime slightly back curved, flattened, dorsally strongly concave, (2.8)3–3.2(3.4) mm long, (2)2.2–2.4(2.6) wide with entire, round apex and incomplete longitudinal septum inside. Back-wall callus in form of large, flattened, pillow-like, half-ovoid, finely papillose container 2–2.2 mm long, 1.6–1.8 mm wide, swelling during anthesis and sometimes opening with age at apex by two narrow lateral splits. Column short, broad, (1.6)1.8–2(2.2) mm high, 2.4–2.5(2.6) mm wide, with large, forward directed subquadrate arms of rostellum supporting at apices viscidium lobes; stigma concave, transversely oblong with adaxial margin in form of fleshy shortly conoid swelling. Anther cap hemispherical, 0.9–1 mm broad, elliptic viscidia. Pollinia 2, each deeply split into 2 with elongate, apically bifid beak. Stipe (tegula) 0.8–1 mm long, in form of plate, flat at the base, conduplicate folded and bent at apex, in flat part attached to viscidium; viscidium saddle-shaped with two parallel narrowly subequal hemispheric portions, 0.35–0.45 mm in diam. Fruits unknown.

Etymology. Species name refers unusual pillow-like container placed on the spur back-wall, unique among its congeners.

Habitat, phenology and conservation status. Canopy epiphyte. Primary and secondary broad-leaved evergreen forests on silicate rocks. 800–1200 m. Fl. October–December. Very rare. Estimated IUCN Red List status – DD.

Distribution. Vietnam province: Lam Dong (Bao Loc). Endemic.

Note. This species belongs to artificial group known as *Cleisostoma* sect. *Paniculata* Seidenf. (Seidenfaden, 1975, 1992), which includes in eastern Indochina five species, namely *C. chapaense* (Guillaum.) Garay, *C. duplicilobum* (J.J.Sm.) Garay, *C.*

臺灣大學學術典藏資料庫

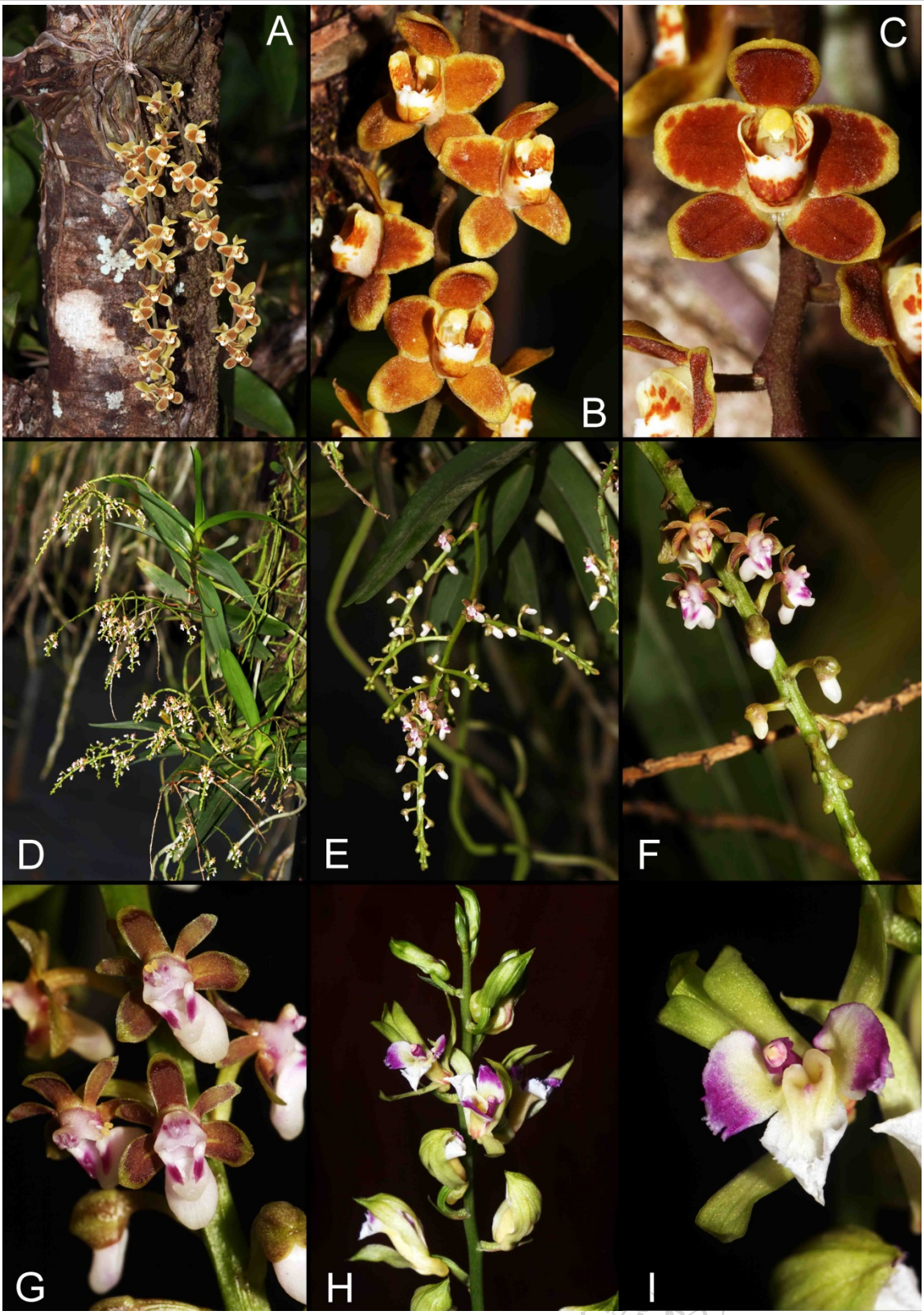


Fig. 6. New orchids in the flora of Vietnam. **A-C** - ***Chiloschista lunifera*** (Rchb.f.) J.J. Sm. (*Le Thanh Son et al., AL 45*). **D-G** - ***Cleisostoma dorsisacculatum*** Aver. (type - *Hoang Thai Ha et al., AL 98*). **H, I** - ***Collabium chapaensis*** (Gagnep.) Seidenf. et Ormerod (*L.Averyanov et al., CPC 7011*). Photos by L. Averyanov.

臺灣大學學術期刊資料

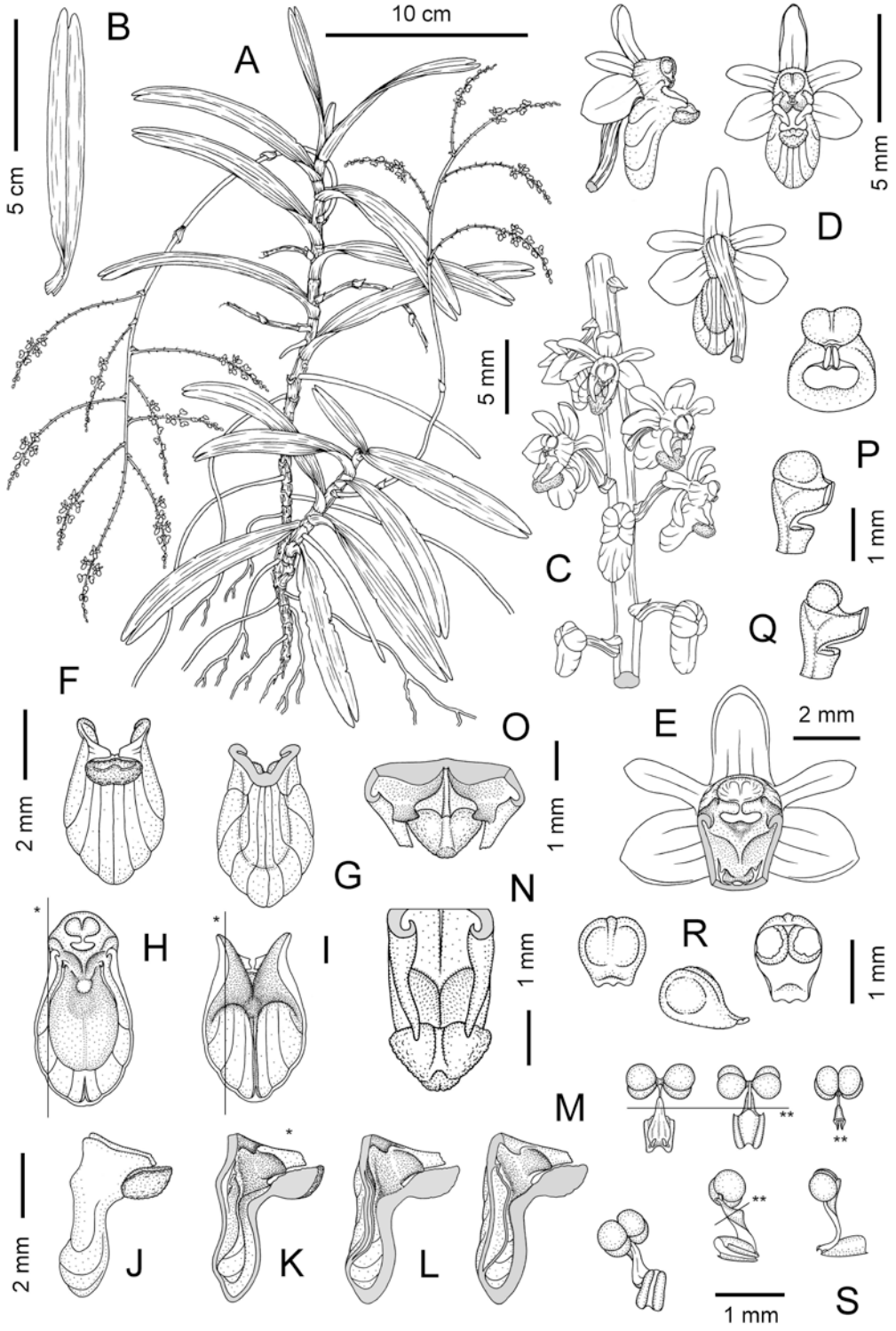


Fig. 7. New orchids in the flora of Vietnam. ***Cleisostoma dorsisacculatum*** Aver. **A** – flowering plant. **B** – leaf. **C** – portion of inflorescence. **D** - flower, frontal, side views and view from behind. **E** – flattened flower, with lip, anther cap and pollinarium removed. **F, G** – lip, frontal view and view from behind. **H** – column and spur back wall, view from inside. **I** – spur frontal wall, view from inside. **J** – intact spur, side view. **K** – spur, tangential section (along line marked on figure H and I as line *). **L, M** – spur, sagittal section at the beginning (L) and at the end of anthesis (M). **N** – intact lip, view from above. **O** – flattened lib, view from below. **P** – intact column with anther cap, frontal and side view. **Q** – lip with anther cup removed, side view. **R** – anther cup, view from above, half-side view and view from below. **S** – pollinarium, views from different sides. All drawn from the type – *Hoang Thai Ha et al., AL 98* by L. Averyanov and T. Maisak.

臺灣大學學術期刊資料庫

equestre Seidenf., *C. inflatum* (Rolfe) Garay and *C. paniculatum* (Ker-Gawl.) Garay. Among them new species may be more or less close to *C. duplicilobum*, *C. inflatum* and *C. paniculatum* with superficially similar flowers and pollinarium stipe of complicated structure. However, it strikingly differs from them, as well as from all other congeners in large, inflated, flattened, pillow-like container placed on back wall inside spur. This mysterious formation is unique in the genus. It is swelling during anthesis and sometimes opening with age at its apex by two narrow lateral splits. Adaptive significance of this strange air filled hollow is very unclear. The discovery of this unusual species confirms supposition, which suggests that many small-flowered species of the genus remain in Vietnam undescribed (Averyanov *et al.*, 2015a). New species is probably strict endemic of Di Linh – Bao Loc Plateau comprising southern part of the highland area known in Vietnam geography as Tay Nguyen Plateau or Central Highlands.

Collabium chapaensis (Gagnep.) Seidenf. et Ormerod, 2001, Oasis, Suppl. 2: 8. – *Tainia chapaensis* Gagnep., 1932, Bull. Mus. Natl. Hist. Nat. (Paris) 2 ser. 4: 707. – *Collabiopsis formosanum* auct. non (Hayata) Ying: Aver., Averyanova, 2003, Updated Checklist Orch. Viet.: 24. – *Collabium formosanum* auct. non Hayata: Seidenf., 1983, Opera Bot. 72: 25, fig. 10; id., 1992, Opera Bot., 114: 324, fig. 218; Aver., 1994, Ident. Guide Vietnam. Orch.: 294; P.H. Ho, 2000, Ill. Fl. Vietnam 3: 921. – *Chrysoglossum chapaense* (Gagnep.) Tang et F.T. Wang, 1951, Acta Phytotax. Sin. 1: 77; Lang et Tsi, 1976, Icon. Corm. Sinic. 5: 684, fig. 8198.

Fig. 6H, I.

Described from northern Vietnam ("Chapa"). **Lectotype** ("Tonkin, Chapa, 1500 m 2 October 1929, *Petelot 5148*" proposed by Ormerod, 2001, Oasis, Suppl. 2: 8) – P [lectotype P0063223, isolectotypes P00436689, P00436690], AMES (isolectotype).

Habitat, phenology and conservation status. Primary broad-leaved, mixed and coniferous humid submontane and montane forests on granite and sandstone, commonly on steep shady slopes near mountain tops. 1200–1900 m. Fl. July–October. Rare. Estimated IUCN Red List status - DD.

Distribution. Vietnam provinces: Son La (Van Ho district) and Lao Cai (Chapa district). Endemic.

Notes. Local endemic of NW. Vietnam closely related to Taiwanese *Collabium formosanum* Hayata, from which differs in green flowers, white column (purple at apex), long, narrowly lanceolate floral bracts and shortly conical, saccate spur (Ormerod, 2001). This rare, poorly known species was earlier found only by three collections from lone type locality.

Studied specimens. Vietnam: Northern Vietnam, Lao Cai, Tonkin, Chapa, 1900 m, July 1929, *Petelot 5165* (P P00436691). Northern Vietnam, Lao Cai, Tonkin, Chapa, 1600 m, October 1930, *Petelot 5880* (P P00436688). Northern Vietnam, Son La province, Van Ho district, Chieng Xuan municipality, Co Hong village, territory of Xuan Nha natural reserve, Pha Luong Mountain, primary coniferous and mixed forest with *Pinus cernua* on very steep slopes along ridge edge composed by brown sandstone at 1200–1400 m, creeping herb in shady places, leaves green with unclear dark green spots, not common, 13 November 2013, *L.Averyanov, N.T.Hiep, N.S.Khang et al., CPC 7011* (CPC Herbarium, LE).

Cymbidium repens Aver. et Q.T. Phan, ***sp. nov.***

Fig. 8; 9.

Described from northern Vietnam ("Phu Tho province"). **Type** ("25 August 2015, *Quang Thinh Phan, PT 25*") – LE (holotype).

Description. Short creeping sympodial epiphytic vine. Rhizome plagiotropic, simple or few branching, semi-woody, (0.4)0.5–1(1.5) m long, (4)5–7(8) mm in diam., densely covered by terete, imbricate greenish or yellowish-green (later dull pale gray-brownish, papyraceous), obtuse bracts, (0.8)1.2–1.6(2) cm long, bearing 3–5(7) orthotropic stems distant on (10)15–20(25) cm long. Stem not swelling, erect, (3)4–7(9) cm long, covered at the base by (3)4–5(7) imbricate, cuneate, conduplicate cataphylls and (6)8–12(14) leaves. Cataphylls (1.5)2–6(8) cm long, (0.8)1–1.5(1.8) cm wide, greenish to yellowish-green, becoming gray, papyraceous and eventually fibrous with age. Leaves sessile, imbricate, distichous, sheathing and conduplicate at the base, with distinct articulation, leaf blade coriaceous, linear, arcuate, (30)40–60(70) cm long, (0.6)0.8–1.2 (1.4) cm wide, tapering into acute apex. Inflorescence erect, lax raceme (25)30–35(40) cm tall, arising from the stem base; peduncle light green, (8)10–12(14) cm long, covered by (5)6–7(8) cymbiform, acute, whitish, scarious bracts up to 6.5 cm long, 1 cm broad (being flattened), spreading apically and with cylindrical base; rachis (18)22–26(30) cm long, with (12)15–22(25) spirally arranged flowers. Floral bracts light green, narrowly triangular, acute to acuminate, (2)3–4(6) mm long, 1–2 mm wide. Pedicel and ovary light green, slender, curved, (1.8)2–2.5(2.7) cm long, 1.2–1.6 mm in diam., ovary slightly broadening toward flower base, shallowly grooved. Flowers widely opening, (3.5)4–4.5(5) cm across, sepals and petals spreading to recurved, light yellowish-green, lip whitish, side lobes striped with dull purple, medial lobe dull purple with yellow center, disc and keels white, column light yellowish-green, anther cap light pale yellow. Sepals rather fleshy, subsimilar, narrowly obovate, slightly concave, (2.2)2.4–2.6(2.8) cm long, (8)9–11(12) mm wide, blunt to obtuse at apex, lateral sepals slightly oblique. Petals narrower than sepals, broadly elliptic as long as sepals, (5)5.5–6.5(7) mm wide, obtuse. Lip 3-lobed, joined by narrow basal junction, not fused to the column base, being flattened deltoid in outline, (1.5)1.6–1.7(1.8) cm long, (1.2)1.4–1.6(1.8) cm wide, glabrous; side lobes triangular, erect, obtuse, (9)10–11(12) mm long, (3.5)4–5(5.5) mm tall; median lobe almost rounded

臺灣大學學術期刊資訊平臺

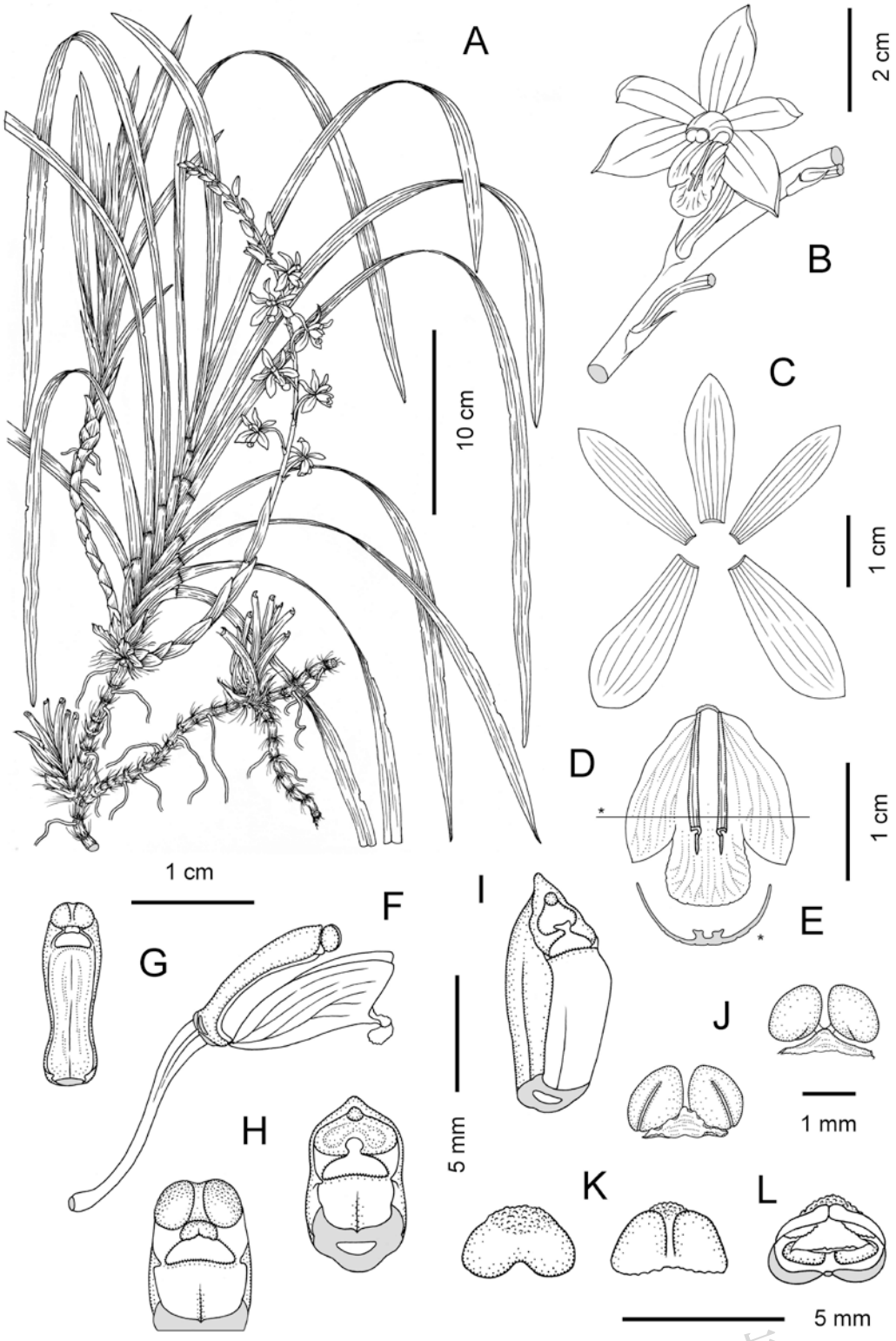


Fig. 8. New orchids in the flora of Vietnam. ***Cymbidium repens*** Aver. et Q.T. Phan. **A** – flowering plant. **B** – flowers, and portion of rachis. **C** – flattened sepals and petals. **D** – flattened lip. **E** – transversal lip section along line marked by asterisk on figure **D. F** – pedicel, ovary, column and lip, side view. **G** – column, frontal view. **I** – column, half side view. **J** – pollinarium, frontal view and view from behind. **K** – anther cap, frontal view and view from behind. **L** – anther cap, view from below. All drawn from the type – *Quang Thinh Phan, PT 25* by L. Averyanov and T. Maisak.

臺灣大學學術期刊資料庫



Fig. 9. New orchids in the flora of Vietnam. ***Cymbidium repens*** Aver. et Q.T. Phan. Digital epitype – d-EXSICCATES OF VIETNAMESE FLORA *0245/PT 25*. Photos by Quang Thinh Phan, design and image correction by L. Averyanov.

臺灣大學學術期刊資料庫

(5)6–7(8) mm across, strongly decurved, finely irregularly undulate along the margin; disc with 2 prominent, glabrous, slightly longitudinally folded keels extending to the base of epichile in form of low oblong cushions. Column stout, slightly curved, (0.8)1–1.2(1.4) cm long, (3)3.5–4(4.5) mm wide, slightly broadening and weakly winged toward the apex, concave at the base. Anther cup hemispheric, obscurely bifid, 2.5–3 mm across. Pollinia 2, yellow, ovoid slightly oblate, 1.2–1.4 mm across, deeply cleft, on triangular crescent concave scarious viscidium.

Etymology. Species name refers creeping rhizomatous plant habit unique among its congeners.

Habitat, phenology and conservation status. Short creeping epiphytic vine. Primary and old secondary broad-leaved evergreen forests on rocky karstic limestone, commonly on trunks of *Livistona chinensis*. 400–600 m. Fl. August–September. Very rare. Estimated IUCN Red List status - DD.

Distribution. Vietnam provinces: Hoa Binh (Lac Son district) and Phu Tho. Endemic.

Notes. It is unique species in the genus for its creeping rhizomatous habit. Discovered plant in combination of its characters has no similarity with any hitherto known species (Liu *et al.*, 2006; Puy and Cribb, 2007). It has no swelling pseudobulbous stems and grows as a short creeping vine on vertical trunks of *Livistona chinensis* (Jacq.) Mart. The species has no obvious relations among its congeners and certainly desires segregation in rank of separate section or subgenus. Available attempts for cultivation of this rare species were not successful.

Studied specimen (paratype). **Vietnam:** Northern Vietnam, Hoa Binh province, Lac Son district, Tu Do municipality, Coi Gao village, 20°26′07″N 105°17′19″E, secondary rich forest on steep rocky slopes of limestone mountain at 400–600 m, creeping epiphyte on *Livistona chinensis*, very rare, 24 March 2011, *N.Q.Hieu, L.Averyanov, N.T.Hiep et al., CPC 1461* (LE).

Dendrobium congianum Aver., ***sp. nov.*** **Fig. 10.**

Plant originated from southern Vietnam ("Lam Dong province, Dalat City area, 1 December 2015, *Vo Van Cong s.n.*"). **Type** ("Prepared from cultivated plant, 25 April 2016, *L. Averyanov, AL 123*") – LE (holotype). Digital epitype – d-EXSICCATES OF VIETNAMESE FLORA *0250/AL 123*.

Description. Perennial clustering sympodial epiphytic herb. Rhizome very short, creeping, simple or few branching, (0.5)1–1.5(2) cm long, composed densely allied stem bases. Roots few, white to light gray, flexuose. Stems densely clustering, terete, erect, rigid, slightly swelling, (5)7–14(16) cm long, (4)5–6(7) mm in diam., with (5)6–10(12) nodes and (2)3–5(6) leaves in apical part; young stems glossy yellow-green, enveloped by white to light greenish hyaline leaf sheaths densely haired by short black hairs, old roughly grooved, dirty gray-brownish, naked or with brownish papyraceous sheath remains at nodes. Leaves, distichous, sessile, sheathed; sheath tubular, as long as internode or little shorter, completely disintegrating or remaining in form of papyraceous remnants on second-year stems; leaf blade conduplicate, with prominent median vein, suberect or oblique, herbaceous to coriaceous, broadly oblanceolate to narrowly obovate, (2.5)3–6(7.5) cm long, (0.8)1–1.6(1.8) cm wide, obtuse, shortly unequally bilobulate at apex, sparsely hairy with short black hairs adaxially. Inflorescence 1(2), arising from the apical part of mature leafy stem, suberect, 1–2(3) flowered, very short (3)4–6(8) mm long, light green, black hairy, with 1–2 small narrowly triangular, scarious, light yellowish, hairy, sterile bracts (2)3–4(5) mm long, (0.6)1–1.4(1.6) mm wide. Floral bracts, light greenish, narrowly triangular, straight, conduplicate, tapering and acute at apex, (4)6–8(10) mm long, (1)1.5–1.8(2) mm wide. Pedicel and ovary light green to almost white, cylindric, glabrous, (3.2)3.5–3.8(4) mm long, erect, curved at apex; ovary slightly longitudinally grooved. Flowers horizontally oriented, widely opening, rather coriaceous, (2.2)2.4–2.8(3) cm across, white, lip disc white or with light pinkish tint. Sepals spreading, narrowly ovate, attenuate, (1.5)1.6–1.8(2) cm long, (6)7–8(9) mm wide; lateral sepals at the base oblique broadening to (1.4)1.6–1.8(2) cm wide, forming long, cylindric, slightly curved, obtuse mentum, (0.8)1–1.2(1.4) cm long, (2.2)2.5–3(3.5) mm wide. Petals spreading, narrowly obovate, round and finely irregularly undulate at apex, as long as sepals, (8)9–11(12) mm wide, distinctly broader than sepals. Lip 3-lobed, rhomboid in outline, (1.9)2–2.2(2.3) cm long and wide, glabrous, recurved; side lobes erect, straight, obliquely obovate, 1.4–1.6 cm long, 0.8–1 cm wide, round and finely irregularly crenulate at apex; median lobe narrowly obovate, 8–10 mm long, 6–8 mm wide, strongly recurved, irregularly denticulate and crisped along the margin; disc with simple low, wide fleshy keel and fleshy lateral nerves coming to side lobes. Column white, erect, stout, shortly cylindric, 3.5–4.5 mm tall, 2.6–2.8 mm wide, at apex with prominent lateral triangular-subulate stelidia 1.5–1.8 mm tall, slightly exceeding operculum; stigma large, sub-circular, concave; rostellum in form of small, fleshy, truncate plate; column foot much longer than the column proper, thick, concave, 1.5–1.8 cm long, 2.8–3.2 mm wide, slightly forward curved. Anther cap white, simple, obscurely cubiform, rather smooth, 2.2–2.4 mm tall and wide, at front truncate, in basal part long papillose. Pollinia 4 in two pair, yellow, narrowly oblong ovoid, each 1.8–2 mm long, 0.3–0.4 mm wide.

Etymology. Species is named after its discoverer Mr. Vo Van Cong.

Habitat, phenology and conservation status. Clustering epiphytic herb. Primary broad-leaved evergreen forests on granite. 1500–1800 m. Fl. March–

臺灣大學學術典藏資料庫



Fig. 10. New orchids in the flora of Vietnam. ***Dendrobium congianum*** Aver. Digital epitype – d-EXSICCATES OF VIETNAMESE FLORA *0250/AL 123*. Photos, design and image correction by L. Averyanov.

臺灣大學學術期刊

April. Very rare. Estimated IUCN Red List status – DD.

Distribution. Vietnam province: Lam Dong (Dalat City area). Endemic.

Notes. Our plant belongs to *Dendrobium* sect. *Formosae* (Benth. et Hook.f.) Hook.f. and allies to the group of species with white flowers, broad petals and narrow epichile, such as *D. infundibulum* Lindl., *D.multilineatum* Kerr. and *D. wattii* (Hook.f.) Rchb.f. well segregated morphologically (Averyanov *et al*., 2016a). New species differs from these taxa in much smaller flowers and relatively long median lip lobe. It may be close to *Dendrobium vocongii* Schettler et D.M. Pham (Schettler and Minh, 2016) closely allied to *D. wattii*, from which differs in smaller, almost pure white flowers and entire acute (not emarginate) epichile. It is highly probable that *D. vocongii* is natural hybrid, which exhibits visible intermediate vegetative and floral morphology between *D. wattii* and our new species and obviously originated by means their natural hybridization.

Dendrobium transparens Wall. ex Lindl., 1830, Gen. Sp. Orch. Pl.: 79; Pearce, Cribb, 2002, Orch. Bhutan: 414, pl. 23; Schuit. *et al*., 2008, Nord. Journ. Bot., 26: 288. **Fig. 11A-C.**

Described from Nepal ("Hab. in Napalia"). **Type** ("*Wallich Cat. no. 2008.1*") – K (holotype [K000894335]; isotypes [K001114893, K001114894]), E (isotype [E00383699]).

Habitat, phenology and conservation status. Trunk and branch epiphyte. Broad-leaved evergreen dense humid forests. 500–1500 m. Fl. March–May. Rare. Estimated IUCN Red List status – DD.

Distribution. Vietnam: northwestern provinces allied to Laotian border. Nepal, Bhutan, N. India, Bangladesh, Myanmar, NW. Laos.

Notes. The discovery of this Himalayan species in northwestern Vietnam is not too surprising, but still needs verification by field observations and more voucher herbarium collections. Its discovery essentially expands known area of the species in eastern direction. This ornamental plant is highly demanded on local markets undoubtedly become very rare and certainly stands in accessible areas on the verge of full extinction. Data on its ecology are based on data from Bhutan (Pearce and Cribb, 2002).

Studied specimens. Vietnam: Plants received from Hanoi street market, originated expectedly from NW. Vietnam, 22 April 2015, *Vu Quoc Binh, L.Averyanov, T.Maisak, P.K.Loc, AL 4* (LE). Northern Vietnam. Lai Chau province, 27 April 2015, *V.V.Cong, sine no* (LE - photo). Vietnam, 5 December 2014, *N.V.Canh, sine no* (LE - photo).

Flickingeria xanthocheila Aver., ***sp. nov.***

F. fugax auct. non (Rchb.f.) Seidenf.: Aver., 1994, Ident. Guide Vietnam. Orch.: 401; Aver., Averyanova, 2003, Updated Checkl. Orch. Vietnam: 36; id., 2006, Manual Ident. Fl. Plants Cuc Phuong National Park, 2: 180.

Fig. 11D-F; 12.

Described from northern Vietnam ("Hoa Binh province, Lac Son district, Tu Do municipality, Mon village, secondary evergreen dry broad-leaved forest on steep rocky slopes of remnant mountain composed with highly eroded marble-like solid crystalline limestone at elevation about 300 m a.s.l., creeping epiphyte on tall tree, locally abundant. **Type** ("23 March 2011, *N.Q. Hieu, L. Averyanov, N.T. Hiep, P.K. Loc, P.V. The, N.T. Vinh, T.B. Ngan, N. Tap, D.D. Dao, V.T. Ha, T. Maisak, L. Osinovetz, CPC 1387a*") – LE (holotype).

Description. Perennial sympodial rhizomatous epiphytic or lithophytic herb with erect stems ascending near base. Rhizome creeping, few branching, (4)5–15(25) cm long, composed by plagiotropic, terete, (4)5–7(8)-nodal segments, each (1.5)2–5(6) cm long, (2.5)3–4(5) mm wide, rooting at nodes. Roots numerous, white to gray, wiry, flexuose, much branching. Stem rigid, simple or few branching, twig-like, at nodes with tubular papyraceous sheaths early disintegrating into fibrous remnants, (12)15–45(50) cm long, bearing 1–5(6) lateral and 1 apical terminal pseudobulb. Pseudobulbs 1-leaved, fusiform, terete, usually slightly recurved, truncate, glossy, yellowish to yellowish-green, (2)3–4(5) cm long, (3)4–8(10) mm in diam. Leaves sessile, rigid, narrowly ovate to broadly lanceolate, broadest in basal half, (5)7–12(15) cm long, (1.2)1.5–2.5(3) cm broad, acute, at apex entire or shortly bilobed, with very small unequal teeth, without median seta at sinus. Inflorescence 1–2-flowered, arising below leaf base, from bundle of many dry, fibrous, overlapping scales placed on adaxial and abaxial sides of pseudobulb apex. Flowers on short glabrous pedicel, widely opening, one-day lasting, white, light yellowish or greenish; lip white or light yellowish, epichile yellowish-pink, pink-orange, bright orange to orange-red, keels edge pale pink-orange to olive-green. Sepals and petals strongly recurved or curled back; sepals oblong narrowly ovate, obtuse, (14)15–17(18) mm long, (4.5)5–6(6.5) mm wide, lateral sepals suddenly broadened basally forming broadly conoid to almost hemispheric mentum 4–4.5 mm long, 5–6 mm wide; petals oblong lanceolate, obtuse, (11)13–14(15) mm long, 2.8–3(3.2) mm wide. Lip (1.3)1.5–1.8(2) mm long, (12)13–15(16) mm wide, 3-lobe, entire along margin; disc with keels arising from the lip base to the middle of claw; keels between side lobes lamellate, flat and straight, rising abaxially, on claw finely crisped; side lobes obliquely broadly triangular with blunt or roundish apex, erect, partially embracing column; median lobe with distinct claw, 3.5–4 mm tall, 2.5–3 mm broad, bilobulate, the lobules strongly undulate on lateral sides near the base, spreading, almost perpendicular to the lip axis, diverging, obtriangular, truncate roundish at apex, 7–8 mm long, 5–6(7) mm wide, with small triangular tooth in very broad sinus. Column pure white to yellowish, 4–5 mm long and

臺灣大學學術期刊資料庫

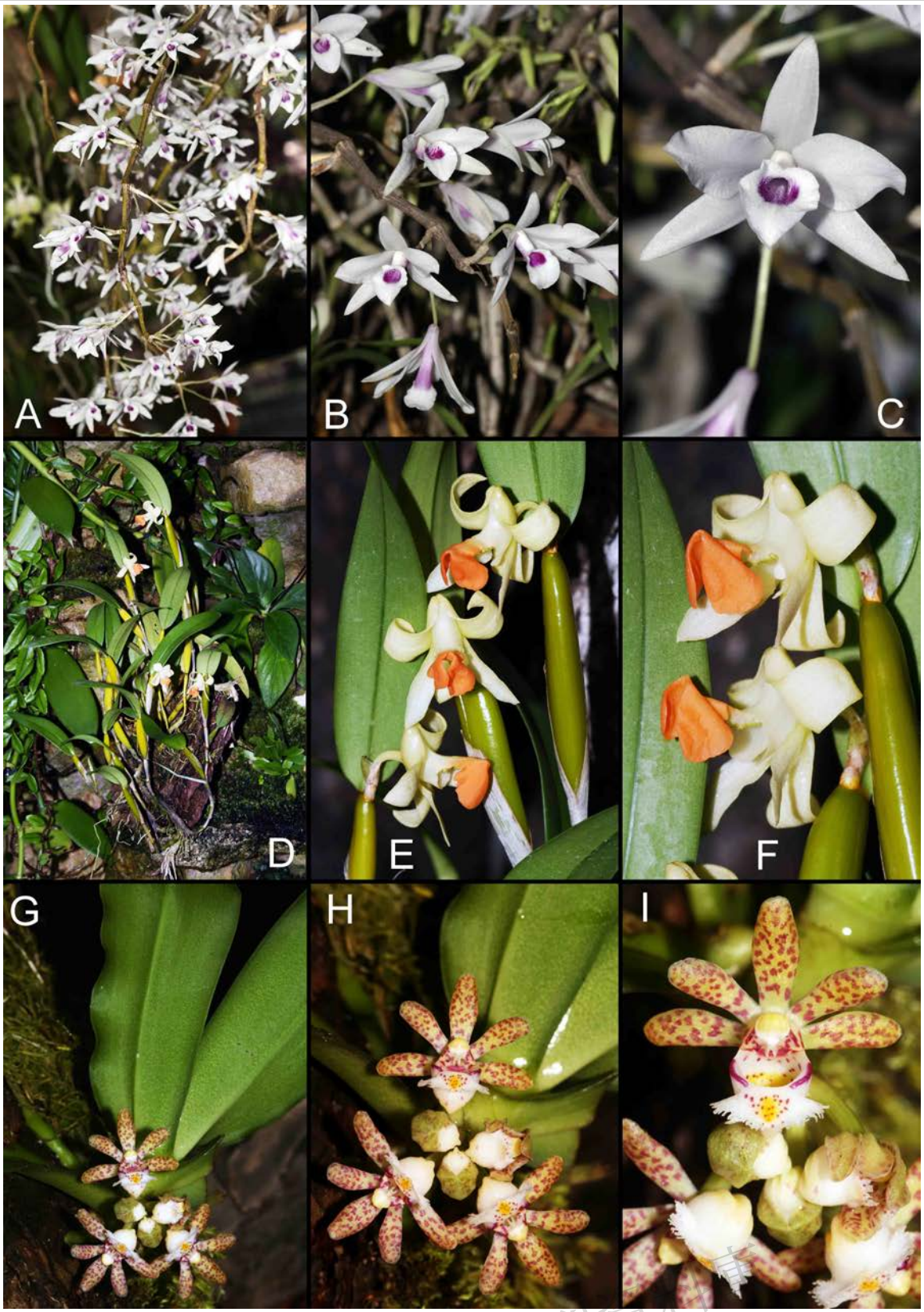


Fig. 11. New orchids in the flora of Vietnam. **A-C** – ***Dendrobium transparens*** Wall. ex Lindl. (A - 5 December 2014, *N.V.Canh, sine no*; B, C - *Vu Quoc Binh et al., AL 4*). D-F - ***Flickingeria xanthocheila*** Aver. (type - *N.Q.Hieu et al., CPC 1387a*"). G-I - ***Gastrochilus suavis*** Seidenf. (*N.T.Hiep et al., CPC 3661*). Photos by L. Averyanov.

臺灣大學學術期刊資料庫

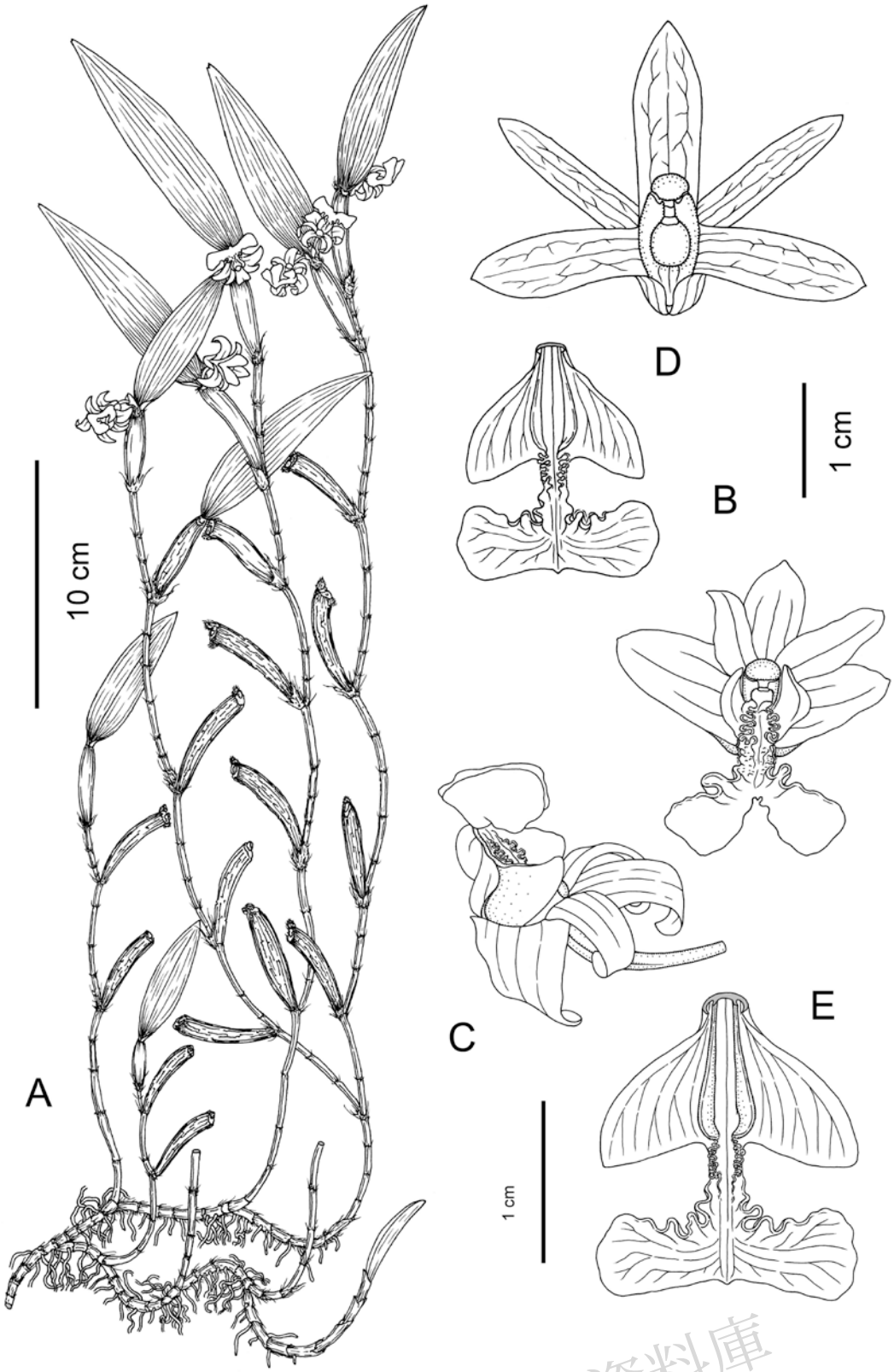


Fig. 12. New orchids in the flora of Vietnam. ***Flickingeria xanthocheila*** Aver. **A** – flowering plant. **B** – flower, frontal view. **C** – opening flower, side view. **D** – flattened flowe and lip. **E** – flattened lip. All drawn from the type – *N.Q. Hieu et al., CPC 1387a* by L. Averyanov and T. Maisak.

臺灣大學學術期刊資料庫

wide; operculum white to yellowish, hemispheric, 2 mm across, truncate at front.

Etymology. Species name refers golden-yellow color of flower labellum.

Distribution. Vietnam provinces: Bac Kan (Ba Be district, Ba Be national park, Cho Don and Na Ri districts), Cao Bang (Tra Linh and Trung Khanhdistricts), Ha Giang (Quang Ba and Vi Xuyen districts),Ninh Binh (Nho Quan district, Cuc Phuong national park), Son La (Moc Chau district) and Thai Nguyen (Vo Nhai district). S. China?

Habitat, phenology and conservation status. Creeping epiphyte and lithophyte. Primary and secondary broad-leaved, mixed and coniferous evergreen lowland and submontane forests on rocky eroded limestone, commonly on mountain tops. 250–1100 m. Fl. May–August. Locally very common. Estimated IUCN Red List status - LC.

Notes. This species has been a long time identified in earlier studies of Vietnamese flora as Himalayan *Flickingeria fugax* (Rchb.f.) Seidenf. (Averyanov, 2000; Averyanov and Averyanova, 2003, 2006; Nguyen Tien Ban *et al.*, 2005), with which it has some superficial resemblance. Meanwhile, close studies of more obtained materials revealed distinct dissimilarity of Vietnamese plants, which distinctly differ in larger, flowers, white to yellowish or yellowish-green sepals and petals (without purple markings), pink-orange to bright orange epichile with widely spreading obovate lobules, roughly irregularly wavy at the base (along adaxial margin), straight, white lamellate keels on the disk and finely plicate, green to yellow keels on the claw. New species is integral element of the flora of rocky remnant karstic limestone mountains and hills widely spreading in northern Vietnam. It is very common in intact primary forests and often appears as co-dominant of epiphytic and lithophytic herbaceous plant communities. Open flowers sometime have distinct celery fragrance. The species was observed as abundant plant in some locations near Chinese border why it may be certainly found in similar habitats on the territory of China.

Studied specimens (paratypes). **Vietnam:** Northern Vietnam, Ha Nam Ninh, Cuc Phuong, May Bac., 2 May 1985, *L.Averyanov et al., LX-VN 1825 / 68* (HN, LE). Northern Vietnam, Cao Bang province, Tra Linh district, Co Muoi municipality, vicinities of Lung Dat village, about 22 km from Cao Bang town to the N, primary mixed semideciduous forest (with *Pseudotsuga brevifolia*) along tops of limestone ridge at 900–1000 m, epiphyte on high trees, not rare, 12 December 1998, *L.Averyanov, N.Q.Binh, N.T.Hiep et al., CBL 1144* (HN, LE, MO). Northern Vietnam, Son La province, Moc Chau district, Chieng Hac municipality, vicinities of Co Liu village, primary evergreen broad-leaved wet forest on very steep slopes and bluffs of remnant karstic limestone ridge at 1000–1100 m, epiphyte on high trees, flowers light yellowish, epichile yellow-pink orange, very common, 29 May 1999, *N.T.Hiep, P.H.Hoang, L.Averyanov, NTH 2956* (LE). Northern Vietnam, Bac Can province, Na Ri district, Kim Hy municipality, vicinities of Lung Hin Con village, 27 km to 55° of Bac Can City, primary evergreen mixed mossy forest with *Pseudotsuga brevifolia* and bamboo along tops of karstic remnant limestone ridge at 650–700 m, epiphyte on high trees, very common, 20 October 1999, *N.T.Hiep, P.K.Loc, L.Averyanov, NTH 3729* (LE). Northern Vietnam, Thai Nguyen province, Vo Nhai district, Than Sa municipality, vicinities of Kim Son village, 23.3 km to 18° of Thai Nguyen city, primary broad-leaved evergreen dry forest on very steep rocky slopes of karst remnant limestone ridge at 300–450 m a.s.l., epiphyte and occasional lithophyte, common, 23 October 1999, *N.T.Hiep, P.K.Loc, L.Averyanov, NTH 3799* (LE). Northern Vietnam, Ha Giang province, Quang Ba district, Sin Suoi Ho village, east side of Sin Suoi Ho River, degraded forest along north ridge slope, limestone substrate and exposed rock outcrops at 1000–1100 m, lithophyte, pseudobulbs light green-yellow, occasional, 3 April 2000, *D.K.Harder, N.T.Hiep, L.V.Averyanov et al., DKH 5199* (LE, MO). Northern Vietnam, Ha Giang province, Vi Xuyen district, Phong Quang municipality, Man village, limestone peaks and ridges NE of the village, 595–787 m, occasional, creeping, lithophytic, to 0.5 m tall, stems and pseudobulb yellow-green, leaves light green, 15 February 2001, *D.K.Harder, P.K.Loc, L.Averyanov et al., DKH 6411* (LE, MO). Northern Vietnam, Ninh Binh province, Nho Quan district, Cuc Phuong municipality, Cuc Phuong national park, Dang locality, secondary closed evergreen seasonal broad-leaved lowland forest on limestone hills at 400 m, lithophyte and epiphyte on mossy rocky outcrops on top of hill, flowers: tepals light yellowish with green tint, lip light yellowish with orange epichile, common, 19 May 2002, *L.Averyanov, P.K.Loc, M.V.Sinh et al., HAL 1646* (LE). Northern Vietnam, Bac Kan province, Cho Don district, Ban Thi municipality, Cho Dien village, Then Su Mt., heavily logged primary closed evergreen wet broad-leaved forest on very steep slopes and cliffs of remnant mountains composed with highly eroded crystalline limestone near top of ridge at 250–350 m, lithophyte and epiphyte, common, 26 December 2002, *P.K.Loc, L.Averyanov, N.A.Duc et al., HLF 850* (LE). Northern Vietnam, Bac Kan province, Ba Be district, Nam Mau municipality, Ba Be national park, mountain near Ban Cam, fractionally logged primary evergreen closed broad-leaved forest on mountain top composed with crystalline highly eroded marble-like limestone at 423 m, lithophyte and epiphyte, very common, 27 December 2002, *N.T.Hiep, D.H.Chung, V.H.Van et al., HLF 703* (LE). Northern Vietnam, Cao Bang province, Trung Khanh district, Ngoc Khe municipality, Pac Nga village at 800–850 m, remnants of primary broad-leaved and coniferous forest on ridge tops and on very steep slopes and cliffs of rocky ridge composed with light gray solid marble-like highly eroded crystalline limestone, lithophyte and epiphyte, flowers white, light yellowish, lip light yellowish with olive-green keels and orange epichile, common, 9 June 2004, *L.Averyanov, P.K.Loc, P.V.The, N.T.Vinh, HAL 5480* (LE).

Gastrochilus suavis Seidenf., 1988, Opera Bot. 95: 298; Aver. *et al.*, 2016, Turczaninowia 19, 3: 35. – *G. obliquus* (Lindl.) Kuntze var. *suavis* (Seidenf.) Z.H. Tsi, 1996, Guihaia 16: 141; Pearce, Cribb, 2002, Orch. Bhutan: 524. **Fig. 11G-I.**

Habitat, phenology and conservation status. Trunk and branch epiphyte. Primary and old secondary broad-leaved evergreen forests on rocky limestone, often on shady humid places along streams and small rivers. 100–500 m. Fl. March–May, October. Not common. Estimated IUCN Red List status – DD. Ornamental.

Distribution. Vietnam provinces: Quang Binh (Minh Hoa district) and Thanh Hoa (Thuong Xuan district). N. India, N. Thailand, NW. Laos.

Notes. This species regarded earlier as endemic of Thailand (Seidenfaden, 1988) was recently also found

臺灣大學學術期刊電子版

in northern Laos, Houaphan province (Averyanov *et al*., 2016b). Flowers in all samples observed in Vietnam were odorless.

Studied specimens. Vietnam: Northern Vietnam, Quang Binh province, Minh Hoa district, Thuong Hoa municipality, environs of Mo O village, 17°39′11.6″N 105°54′53″E, primary broad-leaved closed forest on very steep rocky slope of remnant mountain composed with highly eroded solid crystalline limestone at 400–500 m, epiphyte on tall tree, not common, 24 July 2011, *N.T.Hiep, L.Averyanov, N.S.Khang, N.Q.Vinh, CPC 3661* (LE). Northern, Vietnam, Thanh Hoa province, Thuong Xuan district, Van Xuan municipality, Hang Cao village, Xuan Lien nature reserve, remnants of primary and secondary broad-leaved evergreen forest on highly eroded rocky limestone hills at 100–200 m, 19°50′47.2″N 105°14′42.7″E, epiphyte on mossy trees on shady, very steep, rocky slope, flowers odorless, tepals yellowish with brown spots, lip white with purple marks, locally common, 8 November 2013, *L.Averyanov, N.T.Hiep, N.S.Khang et al., CPC 6932* (LE).

Grammatophyllum speciosum Blume, 1825, Bijdr.: 378; Seidenf., 1983, Opera Bot., 72: 96, fig. 54, pl. 7b; id., 1992, Opera Bot., 114: 345; Comber, 1990, Orch. Java: 383, fig.; id., 2001, Orch. Sumatra: 242, fig.; Seidenf., Wood, 1992, Orch. Malay. Sing.: 557, fig. 253a-f.; P.H. Ho, 2000, Ill. Fl. Vietnam 3: 920, fig. 11423; Newman *et al*., 2007, Checkl. Vasc. Pl. Lao: 270; Schuit. *et al*., 2008, Nord. Journ. Bot., 26: 293.

Fig. 13A.

Described from Java ("Crescit: circa Buitenzorg in arboribus"). **Type** – not located.

Habitat, phenology and conservation status. Large humus epiphyte. Primary and secondary broad-leaved evergreen lowland forests, commonly along streams. 5–300 m. Flowering of individual plant may be observed in any time of the year, but usually one time during 2–3 years.

Distribution. Vietnam province: Kien Giang (Phu Quoc Island). Myanmar, Thailand, Laos, Peninsular Malaysia, Singapore, Sumatra, Java, Borneo, Sulawesi, New Guinea, Philippines, Solomon Islands.

Notes. This remarkable species was observed as an extremely rare plant in alone location of Phu Quoc Island in Siam Gulf. Almost all samples from very small known population were currently removed to cultivation. Presently species stands on the verge of full extinction in the nature. Record of Pham Hoang Ho (2000) was not based on voucher herbaria and remains uncertain.

Studied specimens. Vietnam: Southern Vietnam, Phu Quoc Island, Bai Thom forest, 5 June 2010, *N.T.Tich s.n.* (LE – photo).

Habenaria falcatopetala Seidenf., 1977, Dansk. Bot. Ark. 31, 3: 74, fig. 39; id., 1992, Opera Bot. 114: 56; Kurzweil, 2011, Fl. Thailand 12, 1: 101, fig. 54. – *H. stenopetala* auct. non Lindl.: Gagnep., 1934, Fl. Gen. Indo-Chine 6: 610. **Fig. 13B.**

Described from NW. Thailand ("Eastern spur of Doi Inthanond, ending in Doi Pa Mawn"). **Type** ("*Garrett 470*") – K [holotype K000796997; isotype K000796998].

Habitat, phenology and conservation status. Tuberiferous ephemerid geophyte. Old secondary mixed and coniferous submontane evergreen forests and woodlands with *Pinus kesiya* Gordon, commonly on steep open rocky slopes between mossy boulders. 1500 m. Fl. August–September. Very rare. Estimated IUCN Red List status – DD.

Distribution. Vietnam province: Lam Dong (Langbian Mountain; Lac Duong district). NW. Thailand.

Notes. Extremely rare species known except recent Mr. Nguyen Phi Tam discovery only by two collections separated geographically on more than 1300 km. Vietnamese plants somewhat differs from the type in rather distant leaves, little smaller flowers and much shorter spur and ovary. They probably represent separate variety which needs more material for further study. Flowers of Vietnamese plant observed during anthesis were white with light greenish tint (Fig. 13B).

Studied specimens. Vietnam: Sothern Vietnam, Langbian, *Eberhardt 1886* (P P00426410). Southern Vietnam, Lam Dong province, Lac Duong district, Dung K'no village, evergreen mixed and coniferous forest, among big mossy granite boulders, on slopes at 1500 m, 12 August 2015, *Nguyen Phi Tam, AL 85* (LE).

Lecanorchis nigricans Honda, 1931, Bot. Mag. (Tokyo) 45: 470; Garay, Sweet, 1974, Orch. South. Ryukyu Islands: 49; T. Hashimoto, 1990, Ann. Tsukuba Bot. Gard. 9: 27, fig. 20–22; Su Horng-Jye, 2000, Fl. Taiwan 5: 934; Chen, Cribb, Gale, 2009, Fl. China, 25: 172.

Fig. 13C, D.

Described from Japan ("Hondo: Iwada, prov. Kii"). **Type** ("*K. Kashiyama*, anno 1931 – typus in Herb. Imp. Univ. Tokyo") – TI (holotype).

Habitat, phenology and conservation status. Terrestrial achlorophyllous leafless mycotrophic herb. Primary and secondary broad-leaved evergreen shady lowland and submontane forests. Fl. June–September. Very rare. Estimated IUCN Red List status - DD.

Distribution. Vietnam provinces: Binh Thuan (Tanh Linh district) and Khanh Hoa (Khanh Son district). SE. China (Fujian), Taiwan, Japan.

Notes. This small ephemeral leafless achlorophyllous herb with tiny unattractive flowers is often overlooked during botanical surveys and observations, why species distribution may be much broader than it is indicated by its scarce available collections.

Studied specimens. Vietnam: Southern Vietnam, Binh Thuan province, Tanh Linh district, Nui Ong Mt., 841 m, 26 June 2011, *N.T.Tich, Tich 26–6–11* (SGN). Southern Vietnam, Khanh Hoa province, Khanh Son district, Son Trung municipality, O Kha (Suoi Che) Mt., 10 September 2013, *N.T.Tich, T.Gioi, L.H.Truong, Tich 11–9–13* (SGN, LE - photo).

臺灣大學學術期刊資料庫

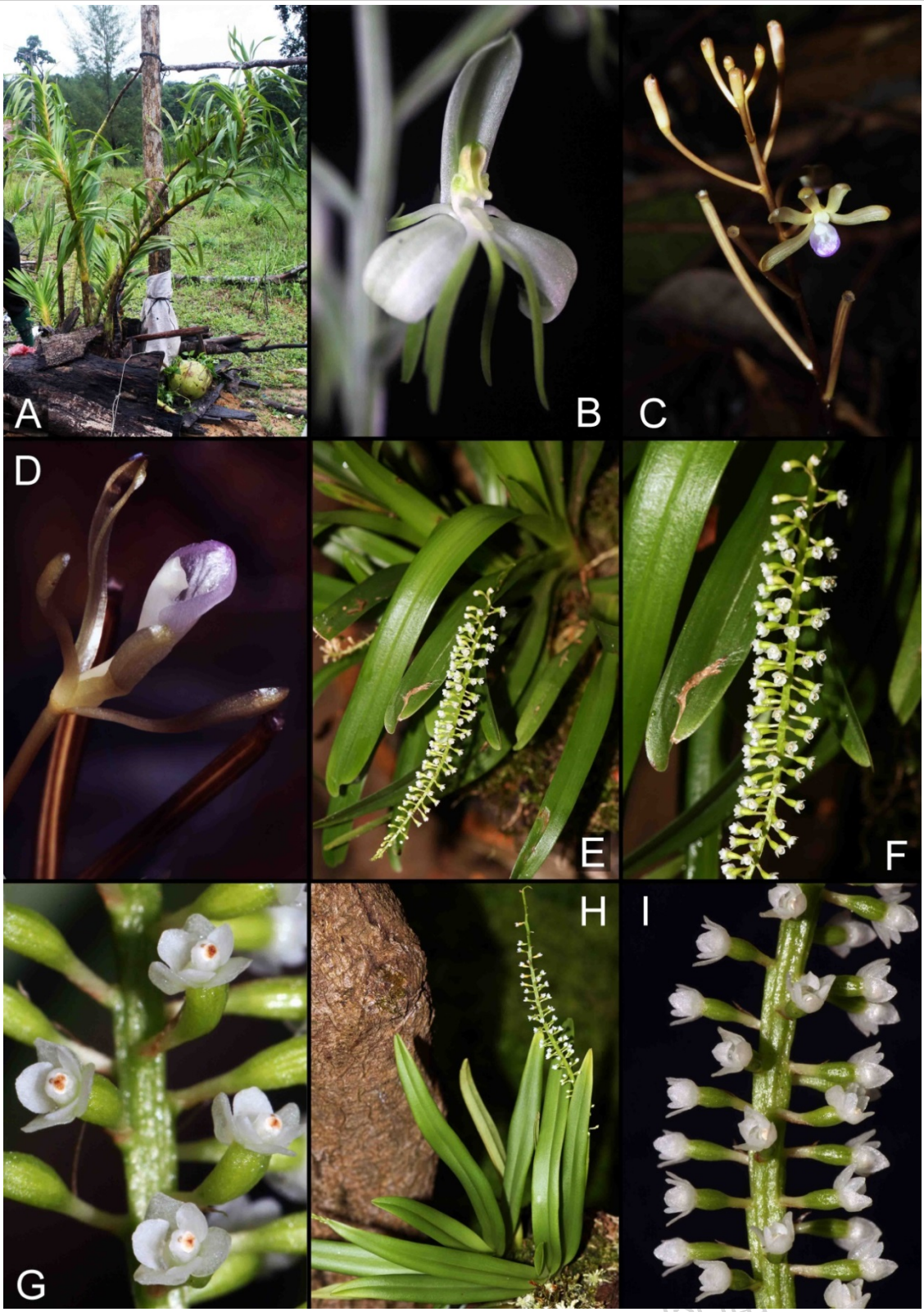


Fig. 13. New orchids in the flora of Vietnam. **A** – ***Grammatophyllum speciosum*** Blume (5 June 2010, *N.T.Tich s.n.*). **B** - ***Habenaria falcatopetala*** Seidenf. (*Nguyen Phi Tam, AL 85*). **C, D** - ***Lecanorchis nigricans*** Honda (*N.T.Tich et al., 11-9-13*). **E-G** - ***Phreatia densiflora*** (Bl.) Lindl. var. ***vietnamensis*** Aver. (type - *L. Averyanov, T. Maisak, AL 38*). **H, I** – ***P. formosana*** Rolfe ex Hemsl. var. ***continentalis*** Aver. (*L. Averyanov et al., CPC 7473b / TM 1167*). Photos by N.T. Tich (**A, C, D**), N.P. Tam (**B**) and L. Averyanov (**E-I**).

臺灣大學學術期刊資料庫

Phreatia densiflora (Blume) Lindl. var. ***vietnamensis*** Aver., ***var. nov.*** **Fig. 13E-G; 14.**

Described from southern Vietnam ("Kon Tum province, Kon Tum town area, submontane evergreen broad-leaved forest, wild collected plants received from street market"). **Type** ("28 April 2015, *L. Averyanov, T. Maisak, AL 38*") – LE (holotype).

Description. Perennial epiphytic or occasionally lithophytic herb. Stem erect, not pseudobulbous, (0.5)1–2.5(3) cm tall, (4)5–10(12) mm in diam., covered by imbricate, distichous leaf sheaths and their fibrous remnants. Leaves (3)4–8(10), sessile, with articulation, conduplicate, oblong, ligulate, (4)6–15(18) cm long, (3)4–8(10) mm wide, with two large, unequal, rounded lobes. Inflorescence as long as leaves, shorter or little longer, (8)10–16(18) cm tall, scape as long as rachis. Floral bracts pale yellowish-brown, scarious, (2)2.5–4.5(5) mm long, with broad base, 0.5–1 mm wide, suddenly narrowing into acuminate to filiform apex. Pedicel and ovary 2.5–3(0.4) mm long, ovary narrowly ovoid, 0.5–0.6 mm in diam. Flowers spirally arranged or slightly secund, nectariferous, placed close together, pure white, widely opening, (2)2.2–2.4(2.5) mm across. Sepals and petals broadly ovate, 0.8–1 mm long, lateral sepals slightly oblique and concave at the base. Lip glabrous, sigmoid, 1–1.2(1.4) mm long, 0.7–1 mm wide, slightly longitudinally concave and narrowing to the base, blunt to obtuse, rarely obscurely 3-lobed at apex.

Etymology. Varietal epithet refers country of its main distribution.

Habitat, phenology and conservation status. Epiphytic or occasionally lithophytic erect miniature herb. Primary broad-leaved and mixed evergreen shady forests on granite, gneiss and limestone, commonly on mossy substratum on mountain tops or along stream valleys. 500–1500 m. Fl. March–May. Not common. Estimated IUCN Red List status – DD.

Distribution. Vietnam provinces: Khanh Hoa (Hon Ba Mountains; Khanh Son district), Kon Tum (Kon Tum town area), Lam Dong (Lac Duong district) and Quang Binh (Minh Hoa district). Endemic.

Note. Vietnamese plants represent East-Indochinese race of widely distributed *P. densiflora* s. lat. widely distributed in Thailand, Malacca Peninsula, Malaysia, Indonesia and Philippines. *Phreatia densiflora* var. *vietnamensis* is rather common plant in Vietnam and also may be found in allied areas of Cambodia and Laos. It differs from the type variety in short inflorescence with scape as long as rachis (not much exceeding leaves with scape twice longer than rachis), suddenly, long attenuate floral bracts with broad base (not narrowly triangular tapering to the apex), broadly ovate petals (not ovate with narrowed base), deltoid lip (not fan-shaped with round apex) and short, stout column as tall as broad (not rather cylindric, taller than broad). Both known varieties have certainly close relation. Their distribution and variation in Indochina need further studies.

Studied specimens. **Vietnam:** Northern Vietnam, Quang Binh province, Minh Hoa district, 72 km to NWW from Dong Hoi, Thuong Hoa municipality, vicinities of Yen Son village, limestone massif Ke Bang, 17°40'N 105°57'E, primary evergreen open broad-leaved dry forest on top of limestone mesas at 500–550 m, epiphyte on tops of mesas, not common, 16 May 1997, *L.Averyanov, N.T.Hiep, P.K.Loc, VH 4673* (LE). Southern Vietnam, Khanh Hoa province, Khanh Son district, 42 km to NE from Dalat city, primary closed broad-leaved evergreen forest along bluffs of giant waterfall in upper reaches of Lieng Ly River on E macroslope of Hon Giao Ridge at 1300 m, 12°12'N 108°44'E, lithophyte on shadow rocks, flowers white, very common, 24 April 1997, *L.Averyanov, N.Q.Binh, N.T.Hiep, VH 4296* (LE, MO, P [P00408456]). Southern Vietnam, Khanh Hoa province, Hon Ba Mountains, May 2014, *T.B.Vuong 135* (PSU, LE photo). Southern Vietnam, Lam Dong province, Lac Duong district, Da Chay municipality, 35 km to NE from Dalat City, closed primary broad-leaved mountain forest along stream canyon on W macroslope of Gia Rinh Ridge at 1500 m, 12°09'N 108°41'E, epiphyte on mossy stems of large trees along stream, not common, 19 March 1997, *L.Averyanov, N.Q.Binh, P.K.Loc, VH 2885* (LE, MO).

Phreatia formosana Rolfe ex Hemsl. var. ***continentalis*** Aver., ***var. nov.*** **Fig. 13H, I; 15; 16A.**

– *P. evrardii* Gagnep., 1931, Bull. Mus. Natl. Hist. Nat. 2, 3: 684.

Described from central Vietnam ("Quang Binh province, Minh Hoa district, Dan Hoa municipality, Vietnam–Laotian border, around Cha Lo military station, point 17º42'50''N 105º45'54''E, broad-leaved primary forest on very steep slopes and along ridge of remnant mountain composed with highly eroded solid marble-like gray limestone at elevation 500–750 m a.s.l.,"). **Type** ("20 April 2008, *L. Averyanov, P.K. Loc, N.T. Vinh, N.S. Khang, HAL 11740*") – LE (holotype).

Description. Perennial epiphytic herb. Stem erect, not pseudobulbous, (0.5)1–1.5(2) cm tall, (2)3–5(7) mm in diam., covered by imbricate, sub-distichous leaf sheaths and their fibrous remnants. Leaves (4)6–8(10), sessile, with articulation, conduplicate, oblong, ligulate, (3)4.5–10(12) cm long, (5)7–10(12) mm wide, obtuse or obscurely hardly bilobed at apex. Inflorescence much longer than leaves, (7)8–16(18) cm tall, scape as long as, or shorter than rachis. Floral bracts pale yellowish-brown, scarious, narrowly triangular ovate, (1.5)2–3(3.5) mm long, tapering to acute apex. Pedicel and ovary 2.5–3 mm long, ovary narrowly ovoid, 0.6–0.7 mm in diam. Flowers spirally arranged or slightly secund, placed close together, pure white, campanulate, (2)2.2–2.5(2.6) mm across. Sepals and petals, fleshy, broadly ovate, (1.2)1.4–1.5(1.6) mm long, lateral sepals slightly oblique and concave at the base. Lip (1)1.2–1.3(1.4) mm long, (0.8)1–1.1(1.2) mm wide, distinctly divided into concave, almost hemispheric hypochile and broad transversely broadly lunate epichile, densely papillose at center, entire and round at apex, often slightly undulate along margin.

Etymology. Varietal epithet refers its mainland distribution.

臺灣大學學術期刊資料庫

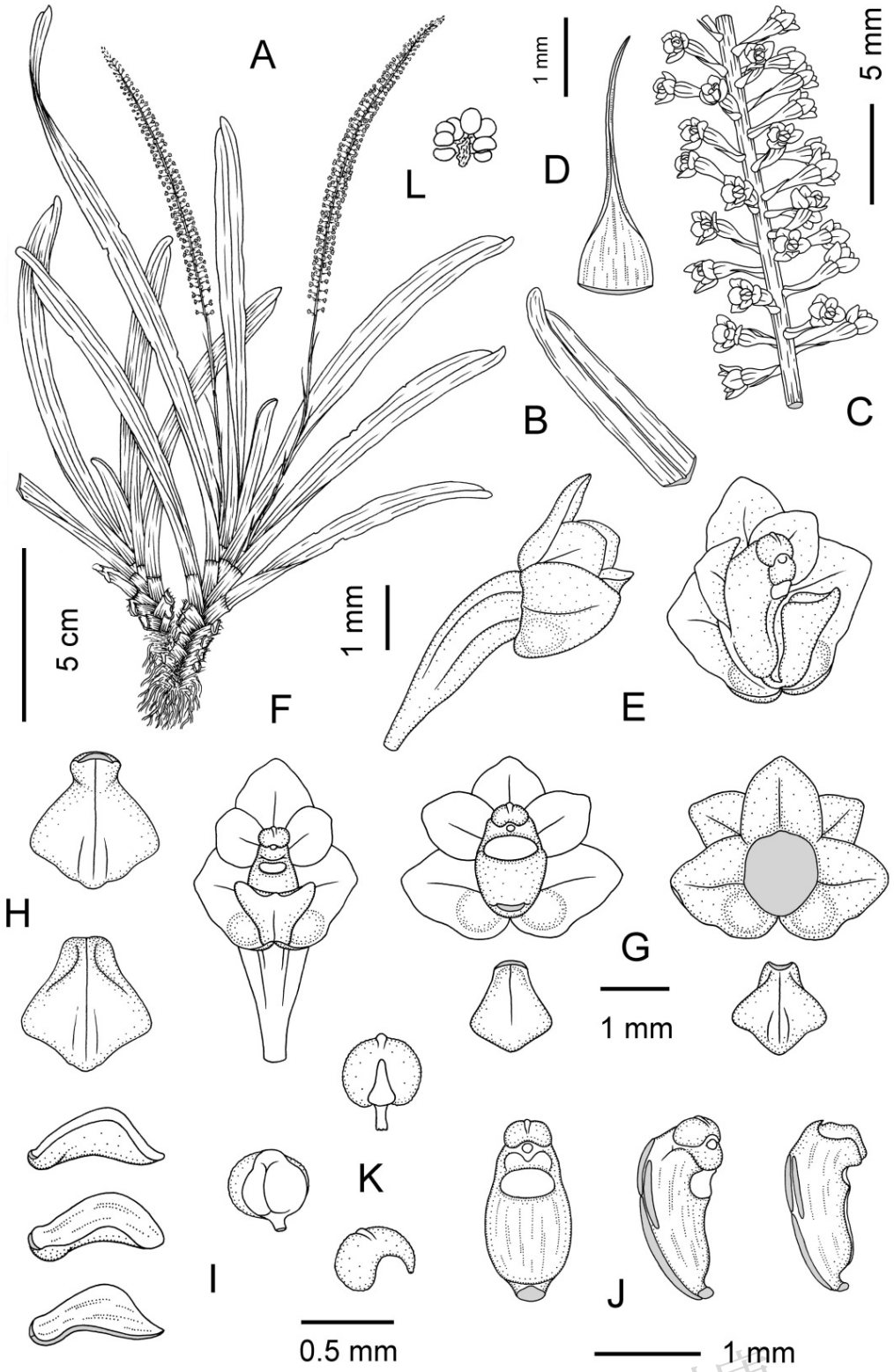


Fig. 14. New orchids in the flora of Vietnam. ***Phreatia densiflora*** (Bl.) Lindl. var. ***vietnamensis*** Aver. **A** – flowering plant. **B** – apical half of leaf. **C** – portion of inflorescence. **D** – floral bract. **E** – flower, side and half-side views. **F** – flower, frontal view. **G** – flattened flower with removed lip, frontal view and view from behind. **H** – flattened lip, adaxial and abaxial view. **I** – lip, side, half-side views and sagittal section. **J** – column, frontal, half-side and side views. **K** – anther cap, view from above, from below and frontal view. **l** - pollinarium. All drawn from the type – *L. Averyanov, T. Maisak, AL 38* by L. Averyanov and T. Maisak.

臺灣大學學術期刊電子版

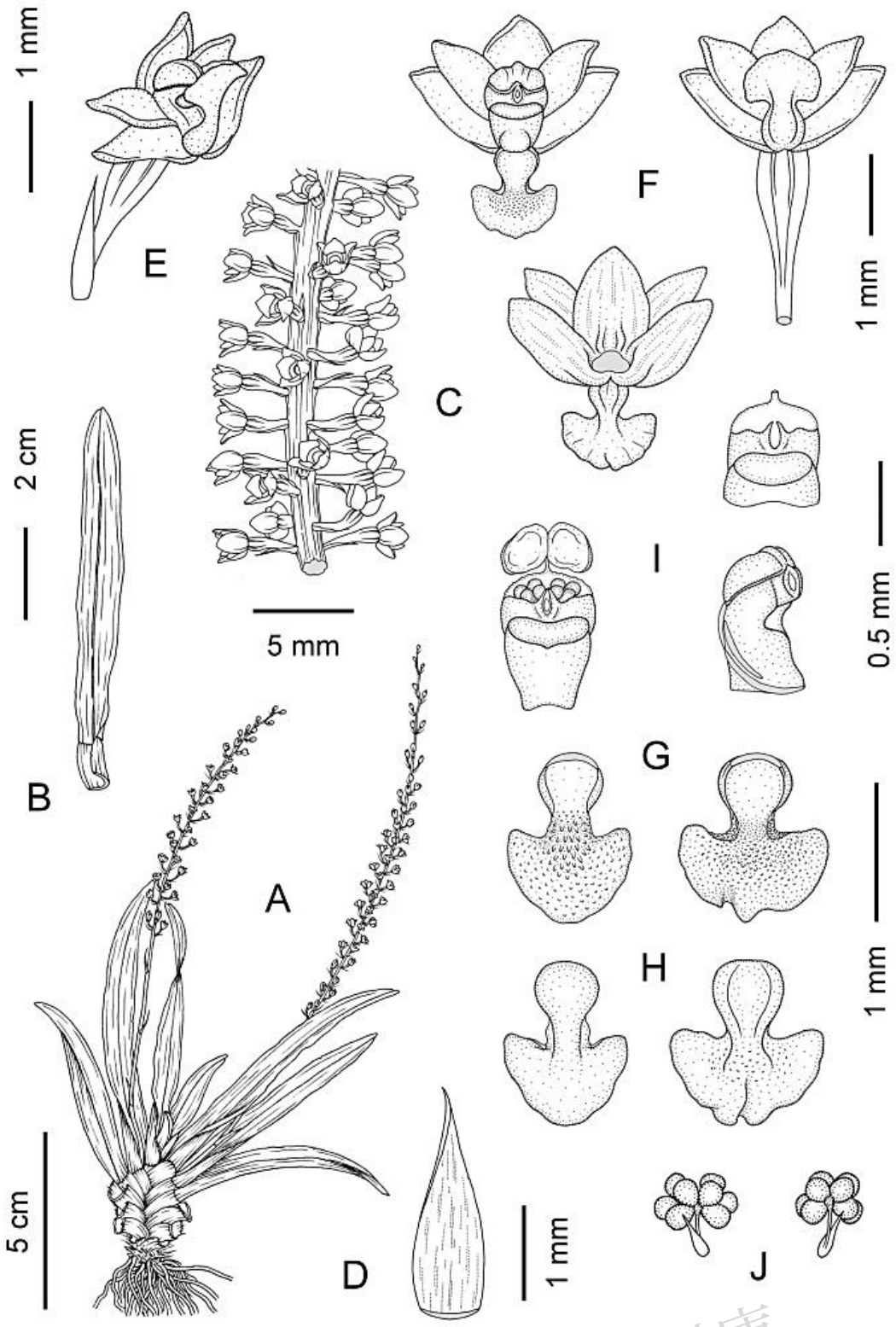


Fig. 15. New orchids in the flora of Vietnam. ***Phreatia formosana*** Rolfe ex Hemsl. var. ***continentalis*** Aver. **A** – flowering plant. **B** – Leaf. **C** – portion of inflorescence. **D** – floral bract. **E** – flower, side view. **F** – flower, frontal view (flower with intact and retorted lip) and view from behind. **G** – lip, adaxial view. **H** – lip, abaxial view. **I** – column, frontal view with retorted anther cap, intact column, side view and frontal view with removed anther cap and pollinarium. **J** – pollinarium. All drawn from the type – *HAL 11740* by L. Averyanov and T. Maisak.

臺灣大學學術典藏資料庫

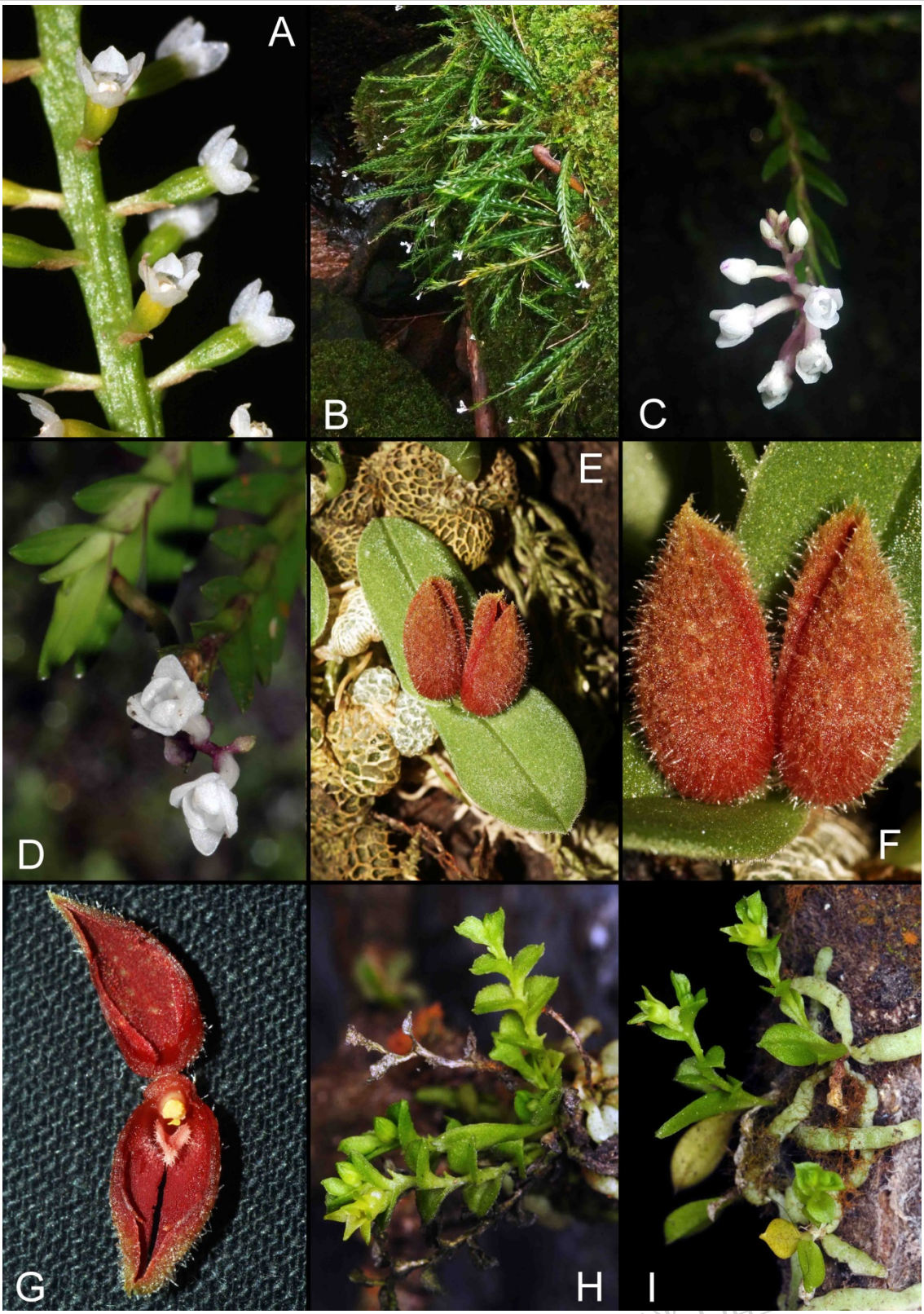


Fig. 16. New orchids in the flora of Vietnam. **A** –***Phreatia formosana*** Rolfe ex Hemsl. var. ***continentalis*** Aver. (*L. Averyanov et al., HAL 11740*). **B-D** - ***Podochilus rotundipetala*** Aver. et Vuong. (type – *Truong Ba Vuong, BV / AL 86*). **E-G** - ***Porpax grandiflora*** Seidenf. (*L. Averyanov et al., CPC 5372 / TM 1031*). H, I - *Taeniophyllum javanicum* (J.J. Sm.) Kocyan et Schuit. (30 March 2016, *T.B. Vuong s.n.*). Photos by L. Averyanov (**A, E-G**) and T.B. Vuong (**B-D, H, I**).

臺灣大學學術期刊資料庫

Habitat, phenology and conservation status. Epiphytic erect miniature herb. Primary broad-leaved evergreen forests on limestone, shale, granite and gneiss, commonly as branch epiphyte on mossy trees on mountain tops, very steep slopes or along humid canyons. 500–1400 m. Fl. March–August. Not common. Estimated IUCN Red List status – DD.

Distribution. Vietnam provinces: Ha Giang (Bac Me district), Kon Tum (Ngoc Linh Mountains; Kon Plong district), Lam Dong (Dalat City area) and Quang Binh (Minh Hoa district). Endemic.

Note. Vietnamese plants differ from true *P. formosana* s. str. known from Taiwan in densely papillose center of epichile rather than 2 hairy areas on each side on the epichile base (P. Ormerod, pers. comm., 2016), as well as in broader leaves and little smaller flowers. Specimens recorded from Thailand and Yunnan (Chen, Wood, 2009a) may also belong here. Obviously, *P. evrardii* Gagnep. described from Dalat City area of southern Vietnam also belongs to this continental variety. Flowers of some specimens from Vietnam has strong sweet fragrance and produce a lot of viscid sugary nectar.

Studied specimens. ***Vietnam:*** *Northern Vietnam, Quang Binh province, Minh Hoa district, Hoa Son municipality, around point 17°42′38.5″N 105°48′52″E, primary logged evergreen broad-leaved forest and woodlands on slope of limestone mountain at 550–650 m, epiphyte, occasional, 18 August 2011, N.T.Hiep, N.V.Tap, N.S.Khang, L.T.Kien, CPC 4425 (LE). Northern Vietnam, Ha Giang province, Bac Me district, Phieng Luong municipality, 22º39′29″N 105º19′35″E, heavily logged primary closed evergreen broad-leaved forest along rocky stream valley at the base of steep slopes of mountains composed with solid highly eroded shaly limestone at 900 m, epiphytic herb in shady places on mossy trees, common, 6 March 2005, L.Averyanov, P.K.Loc, N.T.Vinh, A.Averyanova, HAL 6516 (LE, MO). Northern Vietnam, Ha Giang province, Bac Me district, Phieng Luong municipality, around Phieng Day village, degraded primary broad-leaved humid evergreen forest along rocky canyon of small stream at the base of mountains composed with solid crystalline highly eroded limestone at 900–1000 m, 22°38′43.8″N 105°19′19.8″E, clustering epiphyte on old mossy trees, not rare, 16 November 2014, L.Averyanov, N.T.Hiep, N.S.Khang et al., CPC 7473b / TM 1167* (LE). Southern Vietnam, Kon Tum province, NW slopes of Ngoc Linh Mountain system at 1400 m, primary evergreen forest, epiphyte on large trees, 23 February 1995, *L.Averyanov et al., VH 122a* (LE). Southern Vietnam, Kon Tum province, primary evergreen dry forest on top of ridges at 1400 m on W slope of Ngoc Linh Mountain system above Ngoc Linh village, epiphyte, especially on *Quercus* and *Lithocarpus* ssp., flowers yellowish white, very common, 6 April 1995, *L.Averyanov et al., VH 1205* (LE, MO, P [P-P00408457]). Southern Vietnam, Kon Tum province, Kon Plong district, Mang Canh, Thach Nham protected forest, 13 km NNE from Mang Den town, epiphyte along river, 14°42'30"N 108°19'05"E, 1050 m, 16 April 2015, *M.S.Nuraliev 1376* (LE). Southern Vietnam, Lam Dong province, Dalat: petit ravin qui tombe dans parc forestier en face de Manline, 1924–8–23, *F.Evrard 1173* (P P00408458). Southern Vietnam, Lam Dong province, Dalat City area, 1984, *L.Averyanov et al., SRV* (Socialist Republic of Vietnam) *84-126* (LE).

Podochilus rotundipetala Aver. et Vuong, ***sp. nov.***
Fig. 16B-D; 17.

Described from southern Vietnam ("Khanh Hoa province, Hon Ba nature reserve, Hon Ba Mountain, around point 12°06′658 N 108°56′394 E, evergreen mountain forest at elevation about 1467 m a.s.l., lithophyte along stream"). **Type** ("2015, *Truong Ba Vuong, BV 130 / AL 86*") – LE (holotype).

Description. Perennial clustering lithophytic herb. Stem few to many, erect, slender, rigid, rather straight, simple, leafy throughout, covered by sheathing leaf bases, (8)10–15(17) cm tall, densely tufted on short insignificant plagiotropic rhizome. Leaves numerous, distichous, lying in one plane, rigid, coriaceous, sessile, joined, sheathing at base, elliptic, (8)10–12(14) mm long, (1.2)1.5–2(2.4) mm wide, with prominent median vein, acute. Inflorescence terminal, short, (1)2–7(10) flowered, raceme. Scape and rachis (2)4–7(10) mm long, greenish with purple tint to light, pale pink-purple; scape with few small conduplicate papyraceous bracts or several greenish conduplicate rudimentary leaves. Floral bracts greenish to pale purple, triangular, conduplicate, acute, persistent, (1.2)1.5–2(2.2) mm long, (0.5)0.6–1(1.2) mm wide. Pedicel and ovary white, cylindrical, slightly curved, (2)2.2–2.8(3) mm long, (0.6)0.8–1(1.2) mm in diam. Flowers opening in succession, entirely white, not widely opening, (2)2.2–2.4(2.5) mm across. Sepals fleshy, subsimilar, broadly ovate to sub-circular, (1.4)1.6–1.8(2) mm long and wide; lateral sepals slightly oblique, adnate with their flesh base with very short base of the column, forming no mentum. Petals fleshy, almost circular, little shorter than sepals, forward directed. Lip fleshy, spurless, entire, shortly cymbiform, being flattened broadly obovate to sub-circular, (1.3)1.4–1.5(1.6) mm long, (0.9)1–1.2(1.3) mm wide, with fleshy apex and large inflated callus on each side at the base, joined to column base by short narrow stalk. Column shortly cylindrical, footless, (0.7)0.8–1(1.2) mm tall and wide, simple; rostellum in form of thin plate, bifurcate at apex; stigma large, concave; anther cap 0.6–0.8 mm in diam., bilobe, with small umbo at apex. Pollinarium 0.5 mm long, with narrowly ellipsoid viscidium and two half funnel-like stipes, each bearing 2 narrowly conoid pollinia. Fruit obovoid, ribbed, dirty purple capsule, (2.8)3–4(4.2) mm long.

Etymology. Species epithet refers almost circular petals.

Habitat, phenology and conservation status. Clustering lithophytic herb. Primary humid broad-leaved evergreen montane forests on granite. 1400–1500 m. Fl. January–February, May–June. Rare. Estimated IUCN Red List status – DD.

Distribution. Vietnam province: Khanh Hoa (Hon Ba Mountains). Endemic.

Notes. 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. Meanwhile, it strikingly

臺灣大學學術典藏資料庫

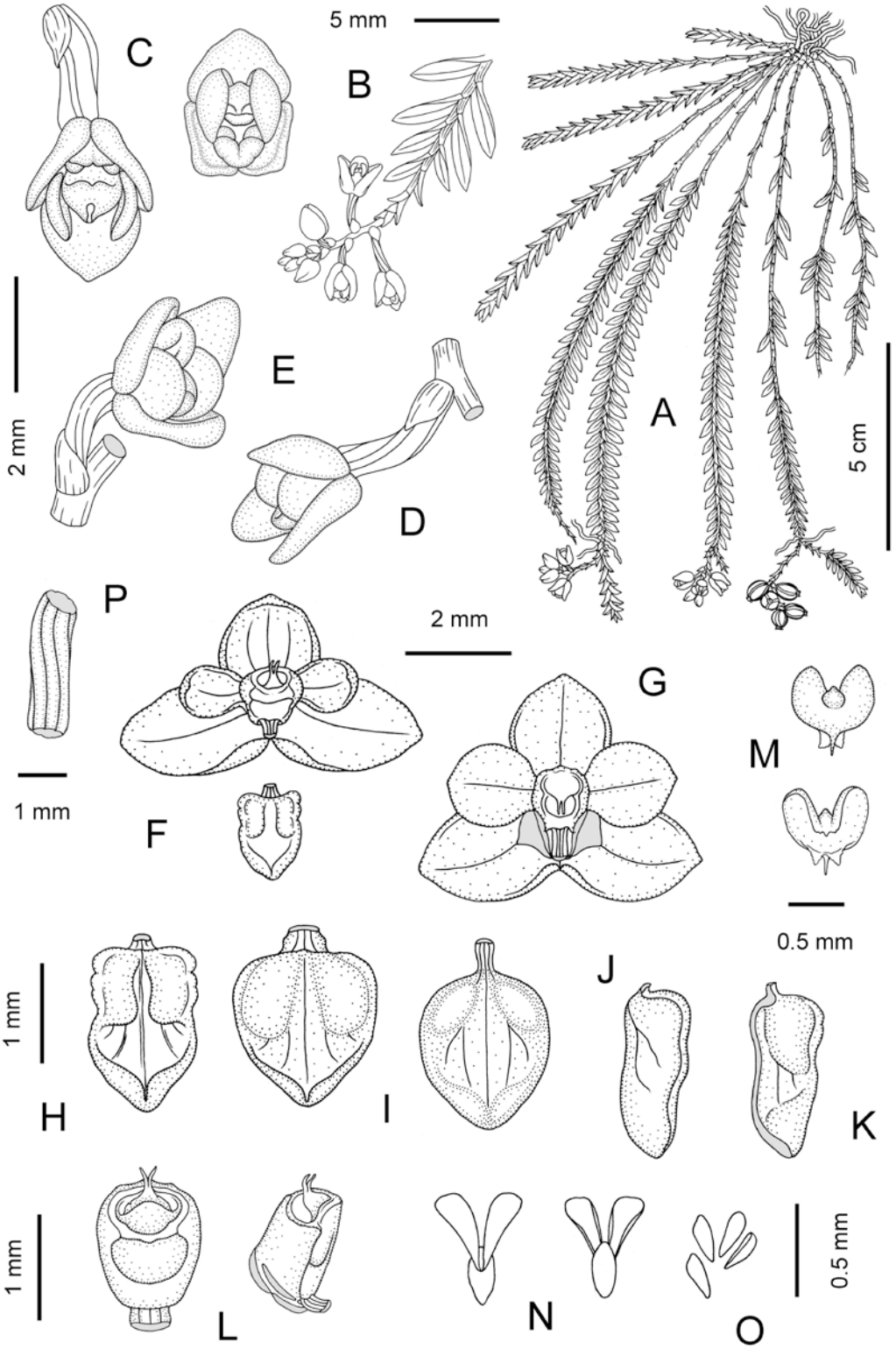


Fig. 17. New orchids in the flora of Vietnam. ***Podochilus rotundipetala*** Aver. et Vuong. **A** – flowering plant. **B** – apical part of shoot with inflorescence. **C** – flower, frontal views. **D, E** – flower, half-side views. **F** – flower and lip, frontal view. **G** – flattened flower, frontal view. **H** – intact lip, adaxial view. **I** – fattened lip, adaxial view. **J** – lip, side view. **K** – lip, sagittal section. **L** – column, frontal and side views. **M** – anther cap, views from above and from below. **N** - pollinaria. **O** – pollinia. **P** – pedicel and ovary. All drawn from the type – *Truong Ba Vuong, BV / AL 86* by L. Averyanov and T. Maisak.

臺灣大學學術期刊典藏庫

differs from these species in almost circular sepals, actually footless, simple column having no distinct stelidia, bifurcate rostellum and broadly ovate or even almost circular lip (being flattened) bearing 2 large, prominent lateral swellings at the base. In its floral morphology *P. rotundipetala* has no similar species in the flora of mainland Asia. Surprisingly, it was not yet found anywhere in eastern Indochina outside Hon Ba Mountains.

Porpax grandiflora Seidenf., 1977, Bot. Tidsskr. 72: 5, fig. 3. **Fig. 16E-G.**

Described from NW. Thailand ("Doi Pa Mawn Spur, Doi Inthanond 1740 m"). **Type** ("*Garett 393*") – C.

Habitat, phenology and conservation status. Miniature branch epiphyte. Primary coniferous and broad-leaved evergreen forests on rocky karstic, highly eroded limestone, commonly on mountain tops. 1400 m. Fl. May–June. Locally common. Estimated IUCN Red List status - DD.

Distribution. Vietnam province: Cao Bang (Nguyen Binh district). NW. Thailand.

Notes. This tiny epiphyte grows on branches of tall trees. It is difficult for observation and collecting hence its general distribution and Red List status remains unclear. Discovered location distant more than on 1000 km to the northeast from its earlier known area elevated on 1700–1800 m a.s.l.

Studied specimens. **Vietnam**: Northern Vietnam, Cao Bang province, Nguyen Binh district, Ca Thanh municipality, Ta Pin village, primary coniferous forest with *Pseudotsuga sinensis* along highly eroded rocky limestone ridge at 1400 m, clustering epiphyte on mossy trees in shady places along ridge, not rare, 3 October 2013, *L.Averyanov, N.T.Hiep, L.M.Tuan et al., CPC 5372 / TM 1031* (CPC Herbarium, LE).

Taeniophyllum javanicum (J.J.Sm.) Kocyan et Schuit., 2014, Phytotaxa 161, 1: 72. – *Microtatorchis javanica* J.J. Sm., 1918, Bull. Jard. Bot. Buitenzorg 2, 26: 115. **Fig. 16H, I; 18A.**

Described from Java ("Java: Priangan, Tjidadap bei Tjibeber, in c. 1000 m ü. d. M., auf Theesträuchern wachsend. (*R.C. Bakhuizen van den Brink*, bl. Und fr. Im Oktober 1916; *W.F. Winckel*, bl. Und fr. Im Januar 1918)"). **Type** ("Cult. in Hort. *J.J. Sm.*") – L [L 0061689].

Habitat, phenology and conservation status. Miniature canopy epiphyte. Primary broad-leaved evergreen humid forests on granite. 1400–1500 m. Fl. January, March, June. Very rare. Estimated IUCN Red List status – DD.

Distribution. Vietnam provinces: Khanh Hoa (Hon Ba Mountains) and Lam Dong (Dalat City area). Malacca Peninsula, Indonesia, New Guinea.

Note. This rare species grows as a twig epiphyte commonly in peripheral zone of canopies of large trees on tops of mountains and ridges. It is very difficult for observation and collecting, hence its occurrence and distribution in eastern Indochina remains very unclear.

Studied specimens. **Vietnam:** Southern Vietnam, Khanh Hoa province, Hon Ba Mountains, 15 January 2015, *T.B. Vuong s.n.* (LE - photo). Southern **Vietnam**, Khanh Hoa province, Hon Ba Mountains, 30 March 2016, *T.B. Vuong s.n.* (LE - photo). Southern Vietnam, Lam Dong province, Dalat City area *N.T. Tich s.n.*, June 2011 (LE - photo).

Taeniophyllum pusillum (Willd.) Seidenf. et Ormerod, 1995, in Seidenf., Descr. Epidendrorum J.G.Konig 1791: 23; Chen, Wood, 2009, Fl. China, 25: 444. – *Limodorum pusillum* Willd., 1805, Sp. Pl. 4: 126. – *Taeniophyllum obtusum* Blume, 1825, Bijdr. 8: 357; Seidenf., 1988, Opera Bot. 95: 18; id., 1992, Opera Bot. 114: 353; Comber, 1990, Orch. Java: 361, fig.; id., 2001, Orch. Sumatra: 981, fig.; Seidenf., Wood, 1992, Orch. Malay. Sing.: 577, fig. 261h-j; Aver., 1994, Ident. Guide Vietnam. Orch.: 403; Aver., Averyanova, 2003, Updated Checklist Orch. Viet.: 57. – ? *T. vietnamense* Tixier et Guillaumin, 1962, Bull. Mus. Natl. Hist. Nat. (Paris) 2 ser. 34, 3: 262; P.H. Ho, 2000, Ill. Fl. Vietnam 3: 942, fig. 11507. **Fig. 18B-D.**

Described from Malacca Peninsula ("Habitat in arboribus Indiae orientalis"). **Type** ("Thailand, Phuket, *Koenig s.n.*") – not located (Seidenfaden, 1995).

Habitat, phenology and conservation status. Tiny canopy and branch leafless epiphyte. Primary and secondary broad-leaved evergreen lowland forests along streams. 300–500 m. Fl. June–November. Rare. Estimated IUCN Red List status – DD.

Distribution. Vietnam provinces: Dak Lak (Ban Me Thuot City area), Khanh Hoa (Khanh Vinh district) and Dong Nai? S. China (S. Yunnan), Thailand, Cambodia, Malacca Peninsula, Indonesia.

Notes. This tiny unattractive leafless epiphyte with very small flowers grows on small branches in shady dump places. It is easily overlooked during botanical surveys and scarcely presented in botanical collections hence its Red List status remains unresolved. *Taeniophyllum vietnamensis* Tixier et Guillaumin described from Dong Nai province of southern Vietnam ("environs de Dink-Quan") may be conspecific with *T. obtusum*. However, insufficient conditions of the type material do not permit surely solve this question.

Studied specimens. **Vietnam:** Southern Vietnam, Dak Lak province, 2013, *N.V.Canh, s.n.* (LE – photo). Southern Vietnam, Khanh Hoa province, Khanh Vinh district, Khanh Son municipality, Son Trung village, epiphyte on trees on stream banks, 7 November 2014, *Nguyen Phu Khue, Tran Thanh Tung 27* (LE). Southern Vietnam, Dak Lak province, Ban Me Thuot City area, wild collected plant received from street market, 27 April 2015, *L.Averyanov, T.Maisak, AL 31* (LE).

Thecopus secunda (Ridl.) Seidenf., 1984, Opera Bot. 72: 101. – *Thecostele secunda* Ridl., 1896, Journ. Linn. Soc. Bot. 31: 299; Seidenf., 1971, Bot. Tidsskr. 66, 4: 347, fig. 33b. **Fig. 18E, F.**

Described from Kalimantan ("Sarawak (*H.*

臺灣大學學術期刊資料庫

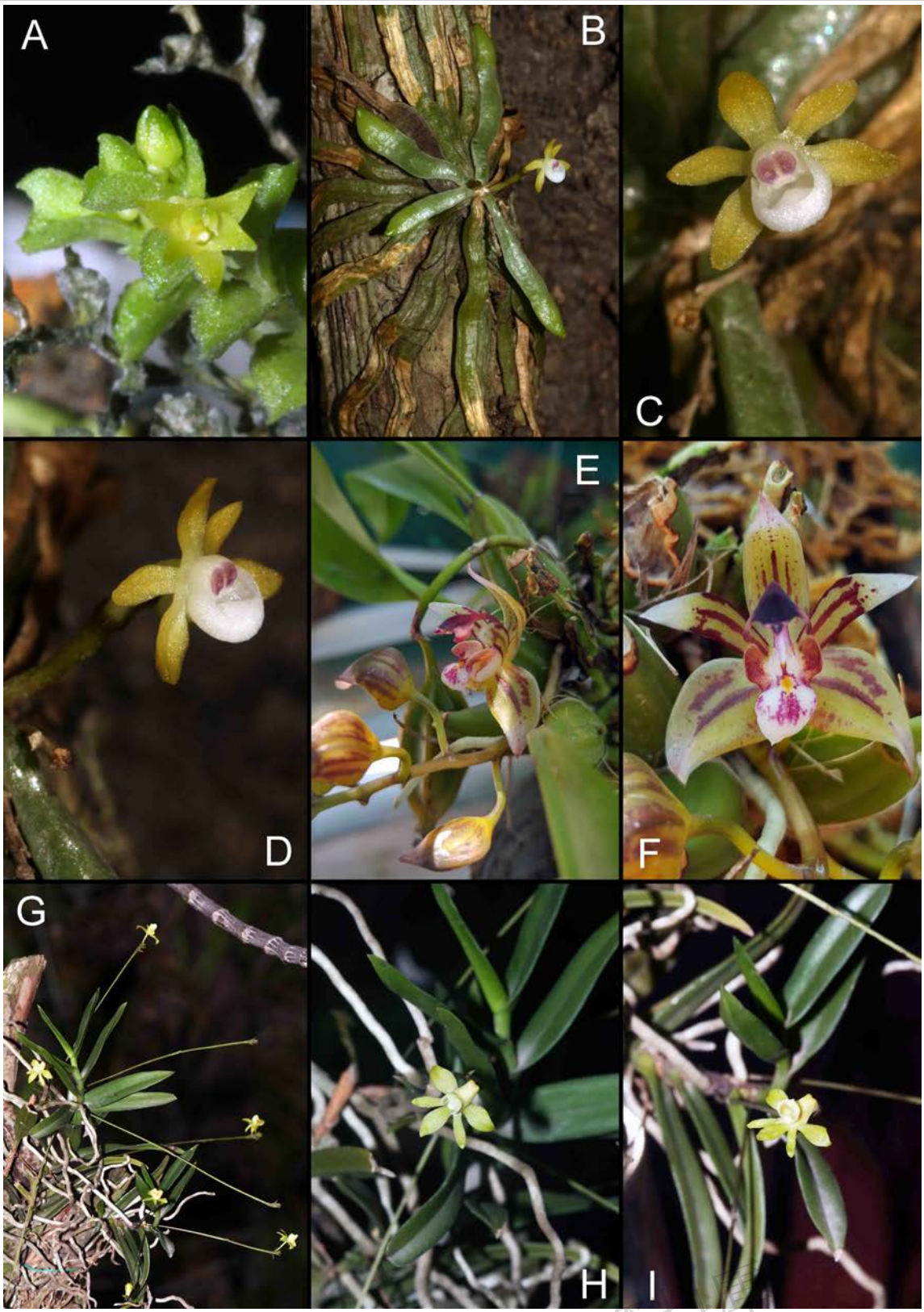


Fig. 18. New orchids in the flora of Vietnam. **A** – ***Taeniophyllum javanicum*** (J.J. Sm.) Kocyan et Schuit. (30 March 2016, *T.B. Vuong s.n.*). **B-D** – ***T. pusillum*** (Willd.) Seidenf. et Ormerod (*L.Averyanov, T.Maisak, AL 31*). **E, F** - ***Thecopus secunda*** (Ridl.) Seidenf. (20 January 2016, *Nguyen Van Canh, s.n.*). **G-I** - ***Thrixspermum hystrix*** (Blume) Rchb.f. (*L.Averyanov et al., AL 8*). Photos by T.B. Vuong (**A**), L. Averyanov (**B-D, G-I**) and N.V. Canh (**E, F**).

臺灣大學學術資料庫

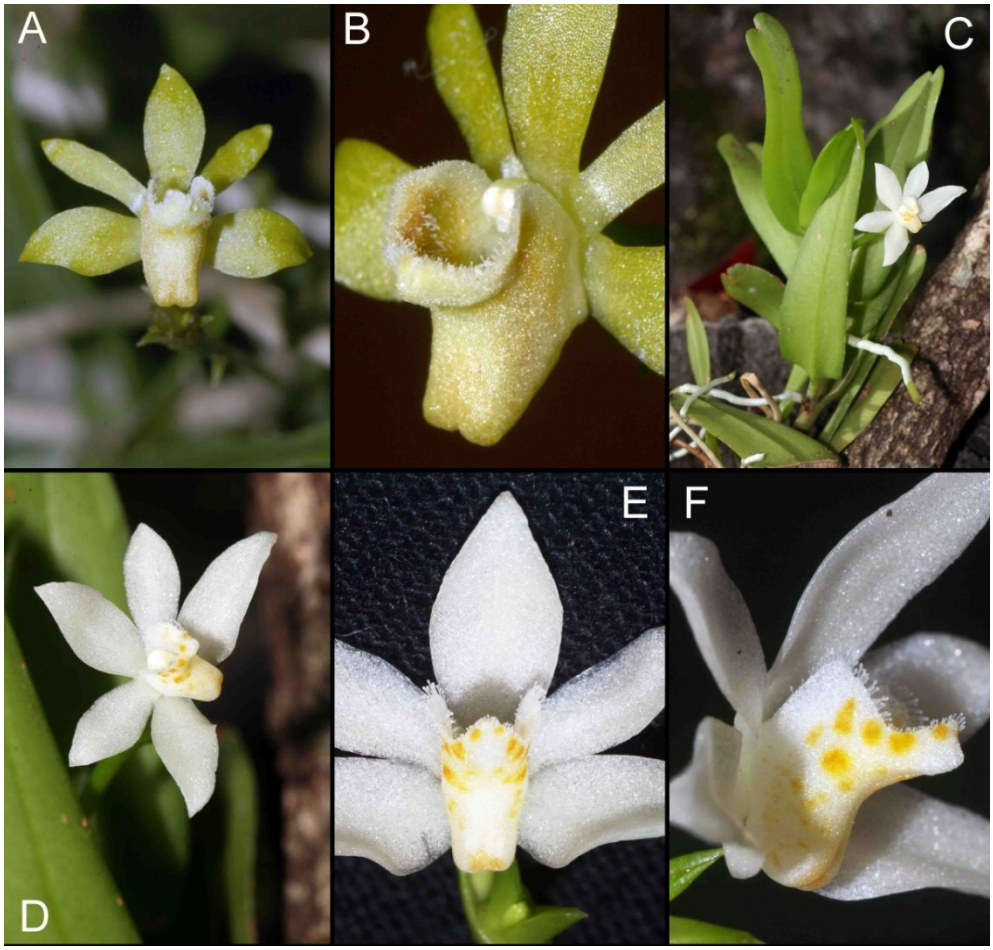


Fig. 19. New orchids in the flora of Vietnam. **A, B** – ***Thrixspermum hystrix*** (Blume) Rchb.f. (*L.Averyanov et al., AL 8*). **C-F** – ***T. trichoglottis*** (Hook.f.) Kuntze (*L.Averyanov, T.Maisak, AL 22*). Photos by L. Averyanov.

Everett!). Also in Perak, Malay Peninsula, *v.v.*"). **Type** ("01–01–1891 *Everett, A.H. s.n.*") - SING (holotype).

Habitat, phenology and conservation status. Trunk and branch epiphyte. Broad-leaved evergreen forests. Fl. January. Very rare. Estimated IUCN Red List status - DD.

Distribution. Vietnam province: Khanh Hoa (Chu Yang Sin Mountains). Malaya, Borneo.

Notes. Very rare West-Malesian species in the flora of Vietnam. It is close to *Thecopus maingayi* (Hook.f.) Seidenf., but well differs "in half-moon shaped median keels on the disk of the lip not with the backwards protruding hooks and lip side lobes not broadening to the apex" (Seidenfaden, 1971, 1984: 101).

Studied specimens. Vietnam: Southern **Vietnam**, Khanh Hoa province, Khanh Vinh district, Chu Yang Sin Mountains, 20 January 2016, *Nguyen Van Canh, s.n.* (LE).

Thrixspermum hystrix (Blume) Rchb.f., 1874, Trans. Linn. Soc. London 30: 136, 145. – *Cleisostoma fratrum* Guillaumin, 1956, Bull. Mus. Natl. Hist. Nat. ser. 2, 28: 239. – *Dendrocolla hystrix* Blume, 1825, Bijdr.: 291. – *Thrixspermum trichoglottis* auct. non (Hook.f.) Kuntze:Comber, 1990, Orch. Java: 322; id., 2001, Orch. Sumatra: 964, p.p. **Fig. 18G-I; 19A, B.**

Described from Java "Crescit: ad arbores circa Buitenzorg". **Type** ("*Blume*") – not located.

Habitat, phenology and conservation status. Tiny branch and canopy epiphyte. Primary and secondary broad-leaved evergreen and semi-deciduous forests and woodlands. Fl. March–May. Rare. Estimated IUCN Red List status – DD.

Distribution. Vietnam provinces: Khanh Hoa (Cam Ranh), Lam Dong (Dalat City area). S. China, Thailand, Malacca, Java, Sumatra, Kalimantan, Philippines.

Notes. Tiny canopy epiphyte difficult for observation and collecting in natural habitat. It is easy overlooked during botanical surveys and scarcely presented in herbaria hence its distribution and conservation status remains unclear. Most probably *Cleisostoma fratrum* Guillaumin, alone specimen of which, housed at Paris Herbarium [P-P00324384] belongs here. This species is very close to *Thrixspermum trichoglottis* (Hook.f.) Kuntze and obviously mixed with it in many regional floristic assessments (Comber, 1990, 2001; Seidenfaden,

臺灣大學學術期刊資料庫

Wood, 1992; Averyanov, 1994; Pham Hoang Ho, 2000; Averyanov, Averyanova, 2003; Chen, Wood, 2009b). According to available observations, it differs in lanceolate, acute leaves (not broadly oblong, apically bilobe), in slender (not rather thick), long inflorescence scape (longer than leaves), pale yellow (not white) flowers and short glandular (not long glandular) hairiness of the lip (Fig. 19A, B). This is first verified, documented and well-illustrated record of this species for Vietnam.

Studied specimens. Vietnam: Southern Vietnam, Annam: Dalat, *C.R.S.T. no 162* / Leg. = 40 / EP, 1955, type of *Cleisostoma fratrum* Guillaumin (P-P00324384). Southern Vietnam, Khanh Hoa province, Cam Ranh town area, 2014, *Nguyen Phong, sine no*, flowered in cult. 23 April 2015, *L.Averyanov, T.Maisak, P.K.Loc, AL 8* (LE).

Thrixspermum trichoglottis (Hook.f.) Kuntze, 1891, Revis. Gen. Pl. 2: 682; Seidenf., 1988, Opera Bot. 95: 162, fig. 100, pl. 17a; Comber, 1990, Orch. Java: 322, p.p.; id., 2001, Orch. Sumatra: 964, p.p.; Seidenf., Wood, 1992, Orch. Malay. Sing.: 655, fig. 296c-o, pl. 44d; Aver., 1994, Ident. Guide Vietnam. Orch.: 363; P.H. Ho, 2000, Ill. Fl. Vietnam 3: 951, fig. 11541; Aver., Averyanova, 2003, Updated Checklist Orch. Viet.: 59; Newman *et al.*, 2007, Checkl. Vasc. Pl. Lao: 282; Schuit. *et al*., 2008, Nord. Journ. Bot., 26: 312; Chen, Wood, 2009, Fl. China, 25: 469. – *Sarcochilus trichoglottis* Hook.f., 1890, Fl. Brit. India 6: 39; id., 1892. Icon. Pl. tab. 2121. **Fig. 19C-F.**

Described from Malacca Peninsula ("Perak, …. Singapore…"). **Syntypes** ("*Scortechini*, King's Collector, … *Ridley*") – ?

Habitat, phenology and conservation status. Tiny branch and canopy epiphyte. Primary and secondary broad-leaved evergreen lowland forests along streams. 100–500 m. Fl. March–August, November. Rare. Estimated IUCN Red List status – DD.

Distribution. Vietnam provinces: Dak Lak (Yok Don national park) and Khanh Hoa (Cam Ranh town area). NE. India, Myanmar, China (S. Yunnan), Thailand, Laos, Malacca Peninsula, Singapore, Indonesia.

Notes. The distribution of this and previous species remains unclear due to insufficiency of verified field observations and collections available for sure identification lacking flowers (or having flowers strongly deformed). Alone specimen, previously recorded for Vietnam (Averyanov 1994: 363 [*Cleisostoma fratrum* Guillaumin P-P00324384]) presently identified as *Thrixspermum histrix* Rchb.f. Presented report is first documented and illustrated record of this species in Vietnam. Meanwhile, it may be enough common in lowland areas of the southern part of the country.

Studied specimens. Vietnam: Southern Vietnam, Dak Lak province, Yok Don, evergreen dry forest, January 2015, *Nguyen Van Canh*, flowered in cult. *14 August 2015, L.Averyanov, T.Maisak, AL 22* (LE). Southern Vietnam, Ninh Thuan province, Ninh Phuoc district, sunny dry forest, *Pham Ngoc Lien*, fl. and coll. in April 2014, *Dinh Quang Diep, s.n.* (LE).

ACKNOWLEDGEMENTS

We cordially thank authorities of the Center for Plant Conservation (Vietnam Union of Science and Technology Associations) and Tay Nguyen Institute for Scientific Research (Vietnam Academy of Science and Technology) for organizing of our field surveys, which were financially supported in part by the research program of U.S.A. National Geographic Society – "*Exploration of primary woods along constructed highway Hanoi–Ho Chi Minh for their sustainable conservation (in limits of Ha Tinh and Nghe An provinces of central Vietnam*" (#9129-12) and Rufford Small Grant - "*Mapping and assessment of Xanthocyparis vietnamensis subpopulations in Cao Bang, Ha Giang and Lang Son provinces"* (2014). Laboratory studies were funded and supported by a *Tay Nguyen 3 programme* (Vietnam) and Russian Foundation for Basic Research (*Plant taxonomy, geography and biology in local floras of eastern Indochina, 15-04-00419 A*). We particularly thank following persons: Le Thanh Son, Nguyen Phong, Nguyen Phu Khue, Nguyen Van Canh, Phan Ke Loc, Tran Thanh Tung, and Vu Quoc Binh for help and kind success to home gardens and significant data about wild species cultivated in their private collections. We are also grateful to André Schuiteman and Paul Abel Ormerod for fruitful discussion on orchid taxonomy.

LITERATURE CITED

Averyanov, L.V. 1994. Identification guide to Vietnamese orchids (Orchidaceae Juss.). World & Family. St. Petersburg (on Russian).

Averyanov, L.V. 2000. Rare species of Orchidaceae in the flora of Vietnam. 1. The genera *Acanthephippium - Didymoplexiopsis*. Bot. Journ. (St.-Petersburg) **85(3)**: 128–138.

Averyanov, L.V. 2011. Present data on the inventory of the orchid family in eastern Indochina (Laos, Cambodia and Vietnam). Programme and abstracts. 20th World Orchid Congress, 13–20 November 2011: 27. Singapore Botanical Garden. Singapore.

Averyanov, L.V. 2012. New orchids (Orchidaceae) in the flora of Vietnam. Turczaninowia **15 (1)**: 11–18.

Averyanov, L.V. 2012a. New orchid taxa and records in the flora of Vietnam. Taiwania **57(2)**: 127–152.

Averyanov, L.V. 2013. The orchids of Vietnam. Illustrated survey. Part 4. Subfamily Epidendroideae (tribes – Arethuseae and Malaxideae). Turczaninowia **16(1)**: 5–163.

Averyanov, L.V. and A.L. Averyanova. 2003. Updated checklist of the orchids of Vietnam. Vietnam National University Publishing House. Hanoi.

Averyanov, L.V. and A.L. Averyanova. 2006. Orchidaceae. In Manual of Identification Flowering Plants of Cuc Phuong National Park. 2. Agric. Publ. House. Ho Chi Minh. 264 p.

Averyanov, L.V. and B.V. Truong. 2015. Review of the genus *Miguelia* (Orchidaceae) with a new species, *M. cruenta*, from southern Vietnam. Taiwania **60(1)**: 33–38.

Averyanov, L.V., A.L. Averyanova, P.K. Loc and N.T. Hiep. 2009. Orchid flora of Vietnam: new discoveries and some of their characteristics. Advances Nat. Sci. **10(3)**: 353 –365.

Averyanov, L.V., J. Ponert, P.T. Nguyen, V.D. Nong, K.S. Nguyen, V.C. Nguyen. 2016a. A Survey of *Dendrobium* Sw. sect. *Formosae* (Benth. et Hook.f.) Hook.f. in Cambodia, Laos and Vietnam. Adansonia, ser. 0, 00, 0: 00–00 (in print).

臺灣大學學術期刊論文

Averyanov, L.V., K.S. Nguyen, N.T. Tich, P.T. Nguyen, V.D. Nong, V.C. Nguyen, C.C. Xuan. 2015b. New orchids in the flora of Vietnam. Wulfenia **22**: 137–188.

Averyanov, L.V., K.S. Nguyen, T.V. Maisak, E.L. Konstantinov, T.H. Nguyen, S. Bounphanmy. 2016b. New and rare orchids (Orchidaceae) in the flora of Cambodia and Laos. Turczaninowia **19(3)**: 5–58.

Averyanov, L.V., M.S. Nuraliev, A.N. Kuznetsov and S.P. Kuznetsova. 2013. *Vietorchis furcata* – a new orchid species (Orchidaceae) from southern Vietnam. Taiwania **58(4)**: 251–256.

Averyanov, L.V., N.T. Tich and N.V. Canh. 2015a. New species of the genus *Cleisostoma* in the flora of Vietnam. Taiwania **60(3)**: 107–116.

Averyanov, L.V., N.V. Duy and P.K. Loc. 2012a. *Hymenorchis phitamii* (Orchidaceae) – new genus and species in the flora of Vietnam. Taiwania **57(4)**: 372–376.

Averyanov, L.V., P.A. Ormerod, N.V. Duy, T.V. Tien, T. Chen and D.X. Zhang. 2016c. *Bidoupia phongii*, new orchid genus and species (Orchidaceae, Orchidoideae, Goodyerinae) from southern Vietnam. Phytotaxa **266(4)**: 289–294.

Averyanov, L.V., P.K. Loc, V.T. Pham and N.T. Hiep. 2012b. *Lockia sonii* and *Schoenorchis scolopendria*. Two species from the limestone region of northwestern Vietnam new for science. Lindleyana **81(7)**: 362–371.

Barretto, G., P.J. Cribb and S.W. Gale. 2011. The wild orchids of Hong Kong. Natural History Publications (Borneo). Hong Kong.

Chen, X. and J.J. Vermeulen. 2009. *Bulbophyllum* Thouars. In: Wu, Z.G., P.H. Raven and D.Y. Hong (eds.), Flora of China, 25: 404–440. Science Press and MBG Press. Beijing and St. Louis.

Chen, X. and J.J. Wood. 2009a. *Phreatia* Lindl. In: Wu, Z.G., P.H. Raven and D.Y. Hong (eds.), Flora of China, 25: 366–367. Science Press and MBG Press. Beijing and St. Louis.

Chen, X. and J.J. Wood. 2009b. *Thrixspermum* Loureiro. In: Wu, Z.G., P.H. Raven and D.Y. Hong (eds.), Flora of China, 25: 466–470. Science Press and MBG Press. Beijing and St. Louis.

Choudhary, R.K., T.T. Bach, D.V. Hai, B.H. Quang, L.V. Nong, P. Kumar, S.-H. Park and J. Lee. 2013. *Cordiglottis longipedicellata* (Orchidaceae), a new species from Vietnam. Ann. Bot. Fenn. **50 (1–2)**: 95–98.

Comber, J.B. 1990. Orchids of Java. Bentham-Moxon Trust. Kew.

Comber, J.B. 2001. Orchids of Sumatra. The Royal Botanic Gardens. Kew.

Duy, N.V. and L.V. Averyanov. 2015. *Bulbophyllum bidoupense* and *Schoenorchis hangianae* – new species of orchids (Orchidaceae) from southern Vietnam. Phytotaxa **213(2)**: 113 –121.

Gagnepain, F. and A. Guillaumin. 1934. Orchidacees. In: Lecomte, H. and H. Humbert (eds), Flore Generale de l'Indo-chine 6: 142– 647. Masson. Paris.

IUCN (2016): The IUCN Red List of Threatened Species. Version 2014.2. http://www. iucnredlist. org [Accessed: 18 August 2016]

Kumar, P., S.W. Gale, A. Kocyan, G.A. Fischer, L. Averyanov, R. Borosova, A. Bhattacharjee, J.-H. Li and K.S. Pang. 2014. *Gastrochilus kadooriei* (Orchidaceae), a new species from Hong Kong, with notes on allied taxa in section Microphyllae found in the region. Phytotaxa **164(2)**: 91–103.

Liu, Z.J, X. Chen, Z.Z. Ru. 2006. The genus *Cymbidium* in China. China Science Publishing & media Ltd. Beijing.

Nguyen, T.B., L.V. Averyanov and D.D. Huen. 2005. 248. Orchidaceae Juss. 1789. In: Nguyen, T. B. (ed.), Conspectus of Vietnamese plants **3**: 512–666. Agriculture Publishing House. Ha Noi.

Nuraliev, M.S., L.V. Averyanov, A.N. Kuznetsov and S.P. Kuznetsova. 2015. The genus *Plocoglottis* (Orchidaceae) in Eastern Indochina. Wulfenia **22**: 191–201.

Nuraliev, M.S., P.G. Efimov, L.V. Averyanov, A.N. Kuznetsov and S.P. Kuznetsova. 2014. *Cephalanthera exigua* (Orchidaceae), a new species and genus for the flora of Vietnam. Wulfenia **21**: 95–102.

Ormerod, P. 1998. A review of *Cephalantheropsis*. Orchid Digest **62(4)**: 155–159.

Ormerod, P. 2001.A memorial contribution to the Orchid Flora of Thailand. Oasis **2**: 7–10.

Pearce, N.R. and P.J. Cribb. 2002. The orchids of Bhutan. The Charlesworth Group. Huddersfield.

Pham, H.H. 2000. An Illustrated Flora of Vietnam 3. Nha Xuat Bantre. Tp. Ho Chi Minh.

Puy, D.D. and P. Cribb. 2007. *Cymbidium*. A Monograph. The Royal Botanic Gardens & Natural History Publications. Kota Kinabalu.

Richenbach, H.G. 1878. *Bulbophyllum psychoon*, n. sp. The Gardeners Chronicle **10**: 170–171.

Schettler, R. and P.D. Minh. 2016. A new species of *Dendrobium* Blume from Vietnam. Orchideen Journal **4(1)**: 3.

Schuiteman, A., L. Averyanov and R. Rybkova. 2013. *Vanilla atropogon*, a new species from Vietnam. OrchideenJournal **1(1)**: 10–16.

Seidendaden, G. 1971. Contributions to the orchid flora of Thailand III. Bot. Tidsskr. **66 (4)**: 303–361.

Seidenfaden, G. 1975. Orchid genera in Thailand II. Cleisostoma Bl. Dansk Botanisk Arkiv. **29(3)**: 1–80.

Seidenfaden, G. 1984. Orchid genera in Thailand XI. Cymbidieae Pfitz. Opera Bot. **72**: 5–124.

Seidenfaden, G. 1988. Orchid genera in Thailand 14. Fifty-nine vandoid genera. Opera Bot. **95**: 1–398.

Seidenfaden, G. 1992. The orchids of Indochina. – Opera Bot. **114**: 1–502.

Seidenfaden, G. and J.J. Wood. 1992. The Orchids of Malaysia and Singapore. Fredensborg. Olsen & Olsen.

Vietnam Administrative Atlas. 2007. – Hanoi, Cartographic Publishing House.

臺灣大學學術期刊資料庫