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New Orchids in the Flora of Vietnam Ⅲ (Collabieae, Malaxideae, Nervilieae and Orchideae)

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ABSTRACT: The paper presents new data on the orchid diversity in Vietnam obtained in 2016–2020. It contains descriptions of one genus (*Apetalanthe*) and two species new to science (*Apetalanthe gracilis*, *Nervilia appressifolia*), as well as one genus (*Neottianthe*) and four species (*Calanthe tricarinata*, *Collabium yunnanense*, *Dendrobium praecinctum*, *Neottianthe secundiflora*) new for the flora of Vietnam. *Apetalanthe* is particularly remarkable for the reduction of petals. The accepted name, synonyms, type, citations of relevant regional taxonomic publications, data on ecology, phenology and distribution, estimated IUCN Red List status, studied specimens, brief taxonomic notes, and illustrations are provided for each recorded species.

KEY WORDS: Indochina, nature protection, new genus, new species, new records, orchids, plant geography, plant taxonomy.

INTRODUCTION

This paper continues the successive publication of new data on the orchid diversity in Vietnam (Averyanov *et al.*, 2018a–g, 2019a–f; Gruss *et al.*, 2019, 2020; Nguyen *et al.*, 2020a, b) obtained in 2016–2020. Similar to the previous papers, it summarizes the results of joint efforts of professional botanists and orchid enthusiasts on studies of the Vietnamese native orchids. We report here one genus, *Apetalanthe* and two species new to science, *Apetalanthe gracilis* (Orchideae, Orchidinae), *Nervilia appressifolia* (Nervilieae, Nerviliinae), as well as one genus, *Neottianthe* and four species, *Calanthe tricarinata*, *Collabium yunnanense* (Collabieae), *Dendrobium praecinctum* (Malaxideae, Dendrobiinae) and *Neottianthe secundiflora* (Orchideae, Orchidinae) new for the flora of Vietnam. In the suprageneric classification we followed the most recent taxonomic treatment of the orchid family proposed by M.W. Chase *et al.* (2015). The accepted plant name, synonyms, type, citations of relevant regional taxonomic publications, data on ecology, phenology and distribution, estimated IUCN Red List status, studied specimens, brief taxonomic notes, and illustrations are provided for each recorded species.

MATERIALS AND METHODS

Voucher specimens and photo materials cited here were obtained during the years 2016–2020. Collected plants, inflorescences and flowers were herbarized directly or fixed and stored in 60–65% ethanol prior to preparation of herbarium specimens. In the descriptions of quantitative characters, infrequent extreme values (i.e. rarely occurring minimal and maximal values) of a variation range are parenthesized before and after the normal variation range. Detailed analytical photos of plant parts were made from the living or liquid-preserved plants prior to preparation of the voucher herbarium specimens. In the citation of the taxa distribution in Vietnam, including the provinces, we follow the modern official administrative division of the country (Vietnam Administrative Atlas, 2015; Provinces of Vietnam, 2019). The online version of the IUCN Red List of Threatened Species (2016) was used for tentative estimation of species conservation status. Place of the housing of cited specimens is indicated by internationally accepted herbarium acronyms (Thiers, 2020). The studied specimens are available in the database of the LE Herbarium (http://en.herbariumle.ru).

Fig. 1. New orchids in the flora of Vietnam. ***Apetalanthe gracilis*** Aver. & Vuong. Living plant and details of fresh flowers. Photos by Nguyen Thanh Luan, design by L. Averyanov and T. Maisak (made from living plants used for preparation of the type specimen *AL 1238*).

The studied taxa are listed below in alphabetical order.

TAXONOMIC TREATMENT

List of new orchids in the flora of Vietnam

Apetalanthe Aver. & Vuong, ***gen. nov.*** (Orchideae: Orchidinae)

Type: *A. gracilis* Aver. & Vuong

Diagnosis. The new genus differs from the most morphologically close genera *Orchis* L. and *Ponerorchis* Rchb.f. in the emarginate median sepal, visual absence of petals (completely reduced or fused with median sepal), naked viscidia without bursicle and large swelling rostellum hanging above stigma. Monotypic genus.

Etymology. The name of the genus refers to its apetalous flowers.

A. gracilis Aver. & Vuong, ***sp. nov.***

Fig. 1–3

Described from NW Vietnam. ***Type*:** VIETNAM, Lao Cai Province, Fansipan Mountain, 23 June 2019, *Truong Ba Vuong, Nguyen Thanh Luan, AL 1238* (holotype - LE LE01076866, http://en.herbariumle.ru/?t=occ&id=18974; photo of living plant prior to preparation of holotype, LE LE01061298, http://en.herbariumle.ru/?t=occ&id=12492; drawing of the type specimen, LE LE01087235, http://en.herbariumle.ru/?t=occ&id=18950).

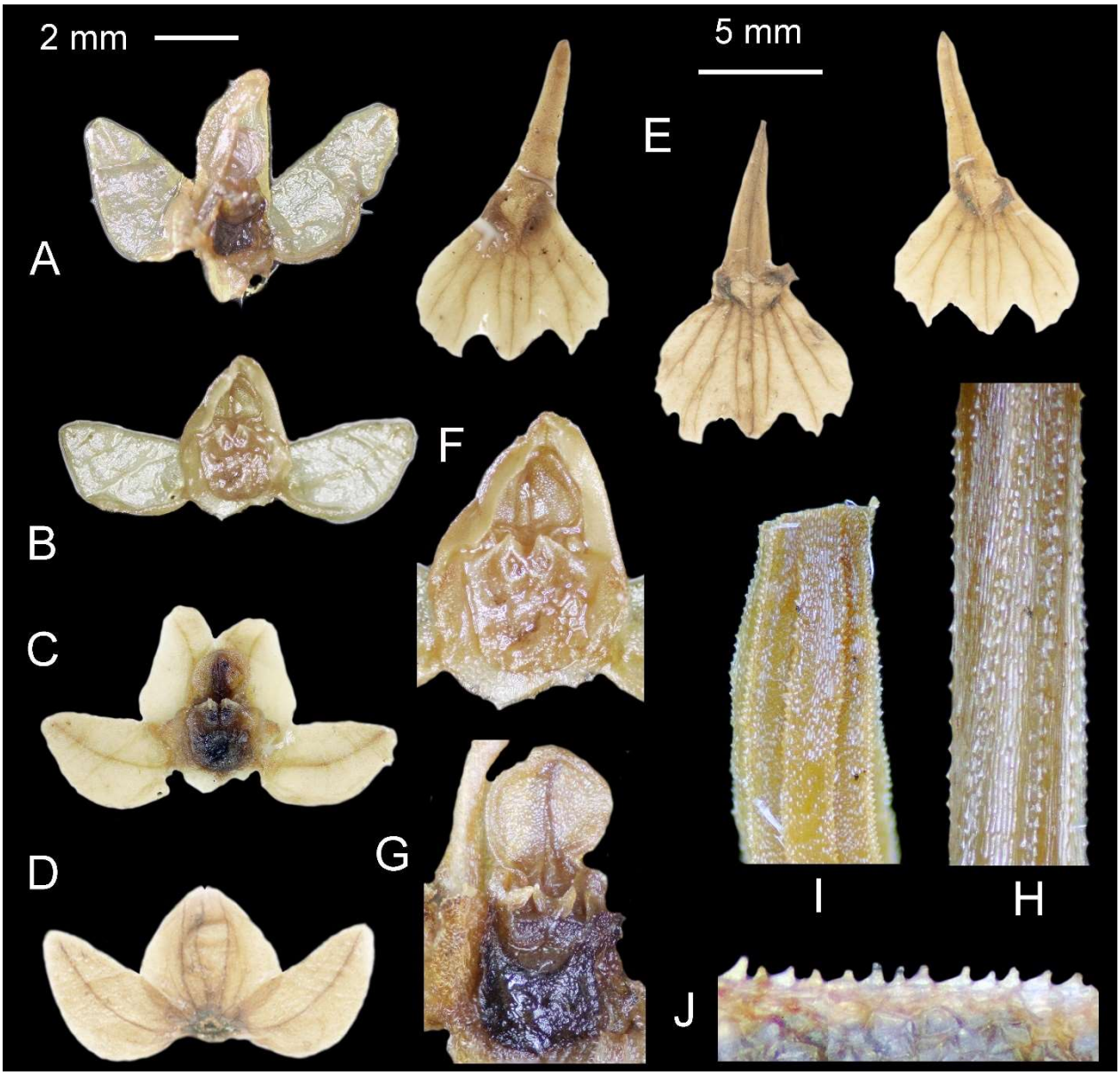

Fig. 2. New orchids in the flora of Vietnam. ***Apetalanthe gracilis*** Aver. & Vuong. Morphological details. **A**. Flattened flower with lip removed, median sepal in side view. **B**. Flattened flower with lip removed, median sepal in front view. **C**. Flattened flower with lip removed, median sepal flattened and sagittally dissected at the cucullate apex. **D**. Flattened flower with lip removed, view from behind. **E**. Lips of flowers of different individuals. **F**. Column and median sepal, front view. **G**. Column with pollinaria removed, front view. **H**. Portion of stem. **I**. Apical half of ovary. **J**. Papillae typical of margins of leaves, sepals, petals, as well as on ridges of stem and ovary. Photos and design by L. Averyanov and T. Maisak (made from alcohol-preserved material used for the preparation of the type specimen *AL 1238*).

Description. *Herb* terrestrial or lithophytic, tuberiferous, stoloniferous, generally glabrous. *Tuber* underground, subglobular, ovoid or shortly cylindrical, pale yellowish to light brownish, (4)4.5–7(8) mm long, densely covered with root hairs; tuber of the next generation developing at the apex of underground terete whitish stolon (4)5–10(or more?) mm long and 1–1.2 mm in diameter. *Roots* (0)1–2, at base of stem, short and fleshy, hairy. *Stem* arising from tuber, ascending, oblique or erect, (3.5)4–8(9) cm tall, (0.8–)1(–1.2) mm in diameter, white at base, grassy green in distal half, with fine longitudinal papillulose ribs, at base bearing 3–4 tubular white or light greenish bracts 3–12 mm long and 1.4–1.8 mm wide (when flattened) with obtuse or acute apex, at middle with 1 suberect or horizontally recurved cauline leaf. *Leaf* sessile, narrowly lanceolate, often slightly falcate, conduplicate, uniformly grassy green, (2)2.5–3(3.5) cm long, (2.5)3–4(4.5) mm wide, tapering from wide base to obtuse apex, finely papillulose along margin, abaxially with prominent median vein. *Inflorescence* a terminal lax somewhat secund spike with (1)2–3 flowers; peduncle ebracteate,

grassy green, (1.8)2–2.2(2.4) cm long; rachis grassy green, (0.8)1–1.8(2) cm long. *Floral bracts* leaf-like, narrowly to broadly lanceolate, horizontally recurved, grassy green, (8)12–15(17) mm long, (2.5)3–4(4.2) mm wide, tapering from broad base to acute apex, papillulose along margin. *Flowers* distant with 6–8 mm between them on rachis, sessile, resupinate, widely opening, white with lip bearing 7 longitudinal purple stripes along veins and at spur base, (7.5–)8(–8.5) mm across. *Median sepal* erect, 3-veined, broadly ovoid, cymbiform, (2.8)3–3.2(3.3) mm long, (3.7)3.8–4(4.1) mm wide (when flattened), obscurely 4-dentate and cucullate at apex, sparsely papillulate abaxially and along margin, embracing column. *Lateral sepals* reflexed or recurved, 1-veined, obliquely narrowly obovate, (3.9)4–4.2(4.3) mm long, (1.9–)2(–2.1) mm wide, blunt to rounded at apex, papillulate along margin. *Petals* absent during flowering. *Lip* horizontal to downwards directed, 7-veined, spurred, broadly obovate, almost flat, (5.8)6–6.5(6.7) mm long, (5.7)5.8–6.2(6.3) mm wide, with 2 small ovoid papillulose transversal calli at entrance of spur, 3-lobed at apex; lobes broadly triangular, 1–1.2 mm long, 2–2.2 mm wide, finely denticulate or irregularly serrulate along margin; spur at right angle to lip, horizontal or upward directed, narrowly cylindrical-conical, straight to slightly curved upwards, obtuse, as long as ovary, (6.3)6.5–7(7.2) mm long, (1.4)1.5–1.8(1.9) mm broad at base, papillulose inside. *Column* erect, stout, (1.9)2–2.2(2.3) mm tall, 1–1.2 mm wide; anther erect, 1–1.2 mm tall, with 2 broad parallel, adjacent thecae narrowing at base into short tubes embracing caudicles; viscidia 2, exposed (lacking separate or common bursicle), each viscidium between narrowly acute erect teeth of large swelling hemispheric lateral rostellum lobes; auricles broadly conoid, finely verruculose; stigma entire, rectangular lunate, slightly concave to almost flat, as wide as rostellum, placed below rostellum, facing to broad, almost circular spur entrance. *Pollinarium* clavate, consisting of sectile pollinium with numerous massulae, short fleshy terete caudicle and ovate to almost circular viscidium at base. *Ovary* straight to recurved, grassy green, terete to fusiform, (5.5)6–8(10) mm long, (1.4)1.5–1.8(2) mm in diameter, with longitudinal papillulose ribs. *Fruit* a fusiform capsule.

Etymology. The species name refers to the slender and elegant plant appearance.

Habitat, phenology and conservation status. Terrestrial and lithophytic tuberiferous herb. Wet mossy open places on rocky outcrops in humid evergreen broad-leaved forest between 2000 and 3000 m a.s.l. Very rare. Flowers in June–July, fruits in August–September. Estimated IUCN Red List conservation status: DD.

Distribution. NW Vietnam (Lao Cai Province, Hoang Lien Son Range, Fansipan peak area). Endemic to NW Vietnam. Only known from the one location.

Notes. The new genus is apparently close to *Orchis* L. and *Ponerorchis* Rchb.f. (= *Chusua* Nevski) in plant habit and general floral morphology. Superficially, it particularly resembles some forms of the rare Himalayan taxon, *Orchis chusua* var. *nana* King & Pantl. (= *Ponerorchis nana* (King & Pantl.) Soó). However, our plant differs from all representatives of *Orchis* and *Ponerorchis* in emarginate median sepal (vs. median sepal round, obtuse or acute, but never emarginate), absence of petals (vs. petals well developed, as long as sepals and entirely free from them), presence of 2 small ovoid transversal calli at entrance of spur (vs. lip lacking swellings at entrance of spur), viscidia exposed and lacking a bursicle (vs. viscidia covered by 2 separate bursicles or 1 common bursicle), and large fleshy hemispheric rostellum as large as stigma, situated above stigma at the base of the anther and bearing at apex 4 narrowly pyramidal acute erect teeth (vs. rostellum mostly represented by its median lobe forming more or less prominent fold placed between the bases of thecae and forming distally 2 rostellar arms). The mentioned combination of morphological characters is unique and was not observed in any members of other related Asian *Orchis*-associated genera, like *Amitostigma* Schltr., *Hemipilia* Lindl., *Hemipiliopsis* Y.B.Luo & S.C.Chen, *Neottianthe* Schltr., and *Tsaiorchis* Tang & F.T.Wang. Such characters as emarginate median sepal, visual absence of petals and swelling globular rostellum are apomorphies observed only in the discovered plant.

It is noteworthy that an orchid with similar modification of perianth is currently accepted (Chase *et al.*, 2015) as the monotypic genus *Steveniella* Schltr. (comprising the species *S. satyrioides* (Spreng.) Schltr., distributed in Iran, Turkey, the Caucasus and the Crimea). The reduction in the number of perianth segments in *Steveniella* is caused by the fusion of all three sepals into a synsepalum with the formation of a broad hood, whereas in *Apetalanthe* the petals are apparently absent (or fused with median sepal).

A possible interpretation of the perianth of *Apetalanthe* is the complete union of the petals with the median sepal. The presence of three vascular traces in the median sepal of *Apetalanthe* makes this organ similar to the lip of many Orchidaceae (Rudall, Bateman, 2002; Rudall *et al.*, 2013). As it has been argued by Rudall *et al.* (2013) with respect to the three-traced lip, the hypothesis of the compound lip nature (implying a union of the median petal with two outer staminodes) can hardly be endorsed or refuted at the current state of knowledge. In the same way, the idea of the union of the petals with the median sepal in *Apetalanthe* rather than their complete reduction cannot be discarded.

The ecology and distribution of *Apetalanthe* in Vietnam are probably very similar with those of another regional endemic from the same subtribe, the monotypic genus *Tsaiorchis* Tang & F.T. Wang.

Apetalanthe gracilis is a rare highland orchid currently

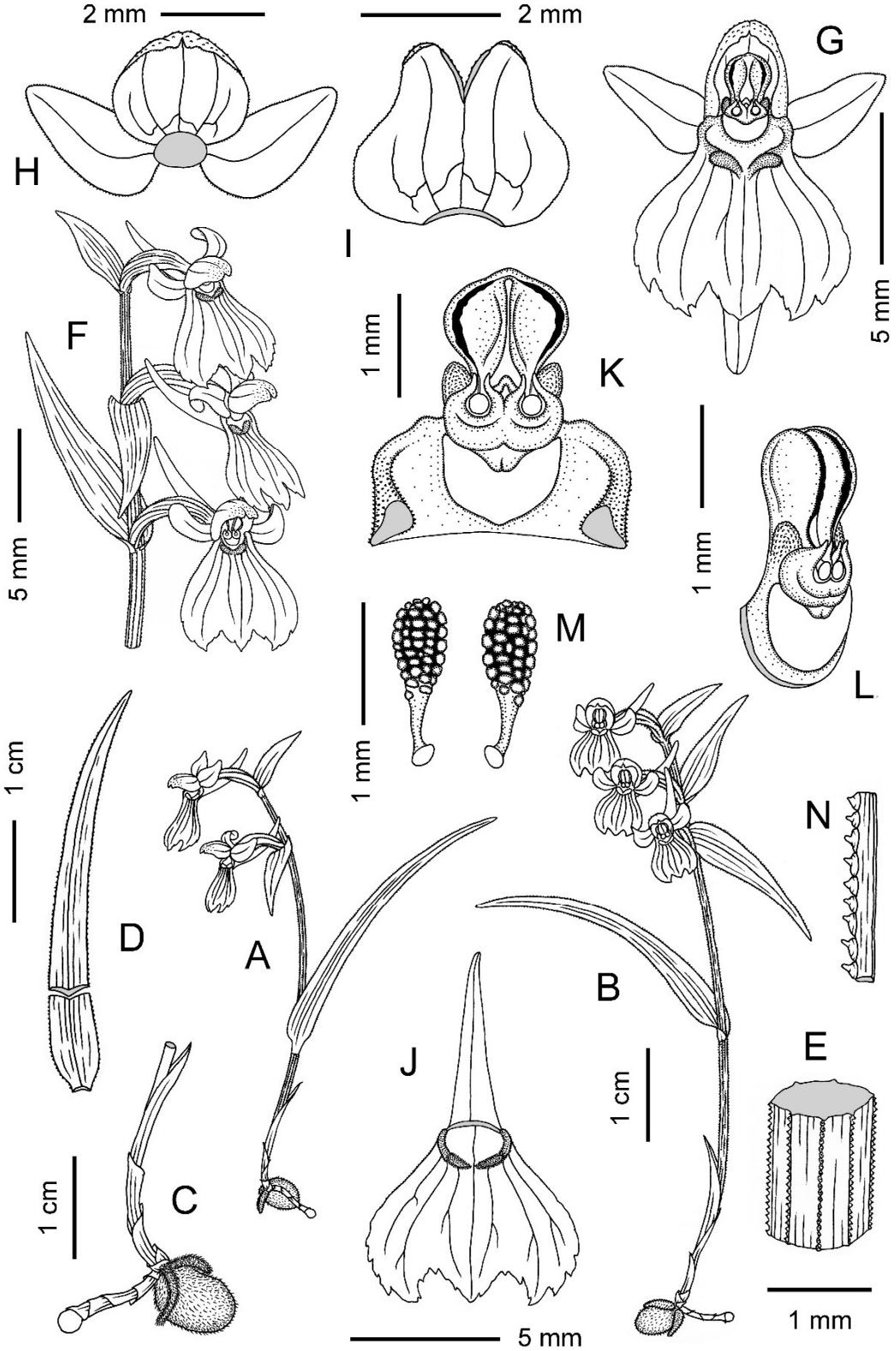

Fig. 3. New orchids in the flora of Vietnam. ***Apetalanthe gracilis*** Aver. & Vuong. **A**, **B**. Flowering plants. **C**. Basal portion of stem, tuber, roots and stolon with young tuber of the next generation. **D**. Leaf, adaxial side. **E**. Portion of stem from its middle part. **F**. Inflorescence. **G**. Flower, front view. **H**. Sepals, front view. **I**. Flattened median sepal dissected in apical cucullate part. **J**. Flattened lip, abaxial side. **K**. Column, front view. **L**. Column, half-side view. **M**. Pollinaria. **N**. Structure of micro-papillae observed along margins of leaves, sepals and petals, as well as on ridges of stem and ovary. All drawn from the type *AL 1238* by L. Averyanov and T. Maisak.

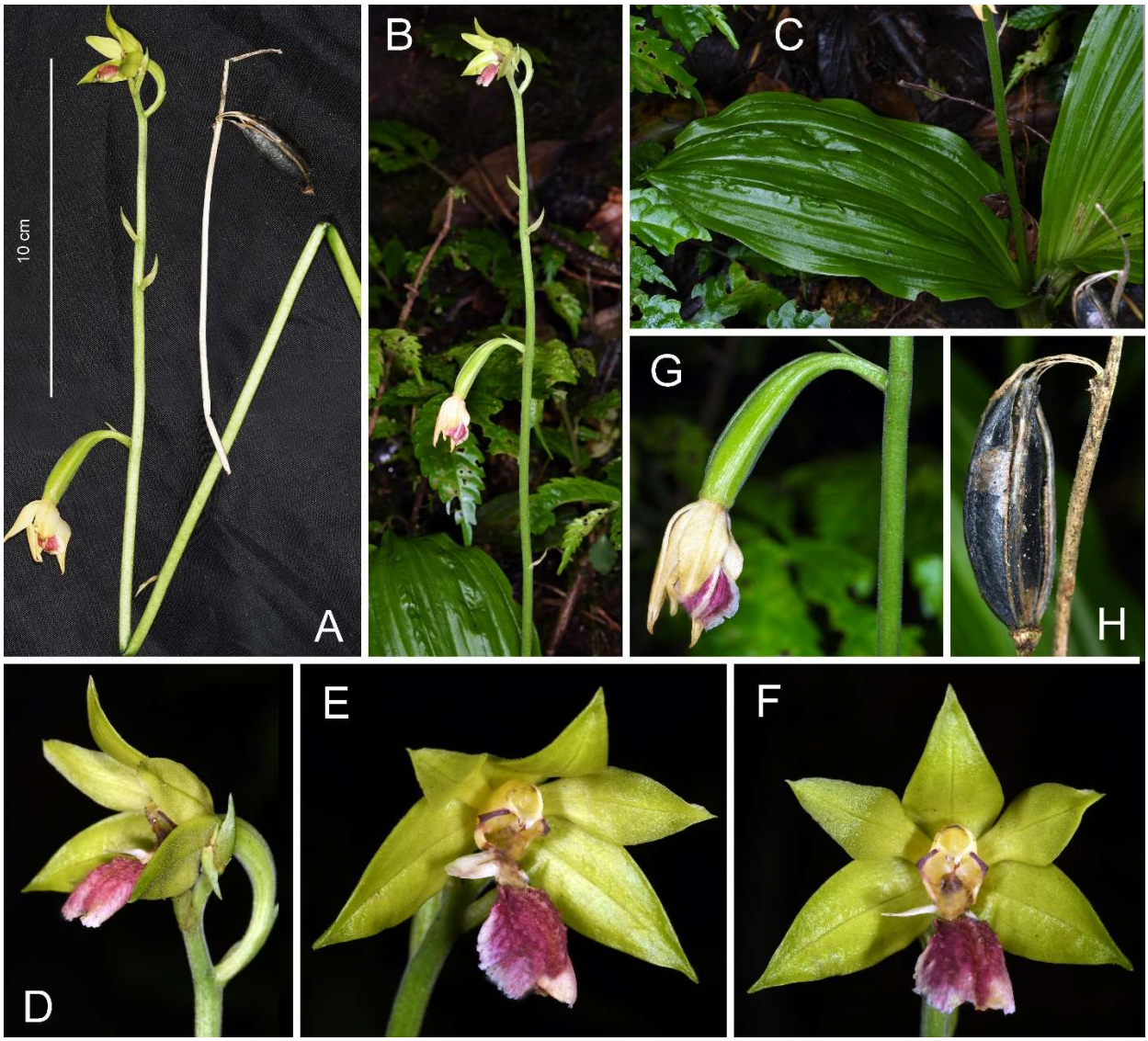

Fig. 4. New orchids in the flora of Vietnam. ***Calanthe tricarinata*** Lindl. **A**. Inflorescence prior to preparation of a voucher herbarium specimen. **B**. Inflorescence in the natural habitat. **C**. Leaves. **D**–**F**. Flowers in different views. **G**. Ripening fruit. **H**. Old dehisced capsule. Photos by Nguyen Thanh Luan from the specimen *Truong Ba Vuong, Nguyen Thanh Luan, AL 1234*, design by L. Averyanov and T. Maisak.

known only from the area of Fansipan peak. Consequently, its conservation status may be assessed as "Data Deficient" (DD) following the IUCN Red List terms and criteria. Meanwhile, it is probable that this species inhabits some other high peaks of Hoang Lien Son Range including its NW extension in SE Yunnan (China). The discovered plant represents the ninth genus of Orchidaceae endemic (and subendemic) to Vietnam along with *Ascocentropsis* Senghas & Schildh., *Bidoupia* Aver., Ormerod & Duy, *Cleisostomopsis* Seidenf., *Eparmatostigma* Garay, *Hayata* Aver., *Lockia* Aver., *Vietorchis* Aver. & Averyanova and *Zeuxinella* Aver. Similar to all these genera, the newly discovered plant deserves special attention for its conservation as a local endemic of a high taxonomical rank having very limited distribution.

Calanthe tricarinata Lindl. 1833, Gen. Sp. Orchid. Pl.: 252; Su Horng-Jye, 2000, Fl. Taiwan 5: 790, photo 94; Pearce, Cribb, 2002, Orchids of Bhutan: 291, fig. 65, pl. 11; Chen *et al.*, 2009, Flora of China 25: 297, fig. 426; Clayton, Cribb, 2013, Genus *Calanthe*: 148, fig. 47, pl. 21A, B; Rokaya *et al.*, 2013, Nord. J. Bot. 31: 519; Lin *et al.*, 2016, Taiwania 61, 2: 86; Zhou *et al.*, 2016, Phytotaxa 276: 25.

Fig. 4

Described from Nepal ("Lindl. in Wall. Cat. no 7339 in Hab. in Napalia"). ***Type*** – "7339 *Calanthe tricarinata* Lindl. Napalia 1821 *Calanthe ecalcarata*, Wall. Monthes vallii Napalia Julio 1821 fl." (K – K001127196 http://specimens.kew.org/herbarium/K001127196).

Habitat, phenology and conservation status (in Vietnam). Terrestrial herb. Primary humid evergreen

broad-leaved montane forest on granite at elevations of 2000–2500 m a.s.l. Flowers in June–July. Rare. Estimated IUCN Red List status: DD.

Distribution. NW Vietnam (Lao Cai Province, Fansipan Mountain). Bhutan, Nepal, NE India, Pakistan, N Myanmar, Thailand, mainland China, Korea, Taiwan, Japan.

Notes. This species is a typical element of the subtropical and warm temperate flora of mainland Asia. Its discovery in Vietnam extends its known distribution area to the highland regions of northern Indochina situated within the tropical latitudes. Studied plants from Vietnam slightly differ from the typical *C. tricarinata* by the very small keel or plate on the lip disc and can represent a separate variety.

Studied specimen. **NW Vietnam**, Lao Cai Province, Fansipan Mountain, 22 June 2019, *Truong Ba Vuong, Nguyen Thanh Luan*, *AL 1234* (LE LE01066670 http://en.herbariumle.ru/?t=occ&id=12428).

Collabium yunnanense Ormerod, 2013, Taiwania 58(1): 22, fig. 2.

Fig. 5

Described from southern China, Yunnan ("Lushui Xian, Luobenzhuo Xiang, E'ga Cun, on forest road at km 30, E side of Gaoligongshan, 2200 m"). ***Type*** – "9 Aug 2005, Gaoligong Shan Biodiversity Survey, *H. Li et al., 25814*" (holotype – CAS).

Habitat, phenology and conservation status (in Vietnam)**.** Terrestrial and lithophytic creeping herb. Primary evergreen broad-leaved montane forests, swampy and cloudy highland thickets on granite and sandstone at elevations of 1700–1900 m a.s.l. Flowers in May–June. Not common. Estimated IUCN Red List status: DD.

Distribution. NW Vietnam: provinces Lao Cai (Bat Xat District, Bat Xat Nature Reserve) and Son La (Moc Chau District, Pha Luong Mountain). S China (Yunnan Province).

Notes. This species, which was described after the publication of the "Flora of China" (Chen *et al.*, 2009), is readily distinguishable from the closely related *Collabium chapaense* (Gagnep.) Seidenf. & Ormerod and *C. formosanum* Hayata by a short column and the lower lip portion with two thick fleshy keels interposed apically by a short transverse keel-like callus (Ormerod, 2013). In China, *C. yunnanense* was reported as an epiphytic plant growing in subtropical forest on granite at an elevation of 2200 m a.s.l. This unattractive, rarely flowering plant probably has a wide distribution in highland areas of NW Vietnam, but is not yet well documented by herbarium collections.

The protologue of *C. yunnanense* (Ormerod, 2013) is illustrated only with a drawing. Here, we publish the analytical photos of this species for the first time.

Studied specimens. **NW Vietnam**, Son La Province, Moc Chau District, Chieng Son Commune, Pha Luong Village, primary cloud evergreen broad-leaved forest on flat Pha Luong Mountain summit composed with eroded red-brown sandstone at an elevation of 1750–1850 m a.s.l. around point 20°40'23.0N 104°37'52.0E, creeping terrestrial and lithophytic herb on shady mossy boulders, not common, 23 September 2016, *L.Averyanov, N.T.Hiep, N.S.Khang, C.Q.Ngan, T.V.Maisak, N.T.Son, CPC 8001* (LE LE01055650 http://en.herbariumle.ru/?t=occ&id=7320); additional herbarium specimens prepared on 13 May 2019 by *L. Averyanov and T. Maisak, CPC 8001a*, flowers odorless, tepals grassy green, lip white with small sparse deep purple marks, column and anther white (LE LE01055080 http://en.herbariumle.ru/?t=occ&id=5561, LE LE01055649 http://en.herbariumle.ru/?t=occ&id=7319); Plate – d-EXSICCATES OF VIETNAMESE FLORA 0358 / CPC 8001a (Fig. 4, LE LE01087362 http://en.herbariumle.ru/?t=occ&id=30039). Lao Cai Province, Bat Xat District, Bat Xat Nature Reserve, 4 km SSE of Y Ty Village, disturbed swampy forest, 22°37'30"N 103°37'28"E, elevation 1840 m, *Nuraliev M.S. 2659*, 7 June 2019 (LE LE01059480 http://en.herbariumle.ru/?t=occ&id=10036, LE LE01058723 http://en.herbariumle.ru/?t=occ&id=9376; MW).

Dendrobium praecinctum Rchb.f. 1877, Gard. Chron., n.s., 7: 750; Seidenfaden, 1995, Opera Bot. 124: 28; Pearce, Cribb, 2002, Orchids of Bhutan: 416, pl. 23; Jin Xiao-Hua *et al.*, 2010, Acta Bot. Yunnan. 4: 333; Zhou *et al.*, 2016, Phytotaxa 276: 50. Origin of the type unknown. ***Type*** – "cult. Veitch" (W – Herb. No. 39641).

Fig. 6A-C

= *Dendrobium pauciflorum* King & Pantl. ex King, 1896, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 64: 332; King & Pantl., 1898, Ann. Roy. Bot. Gard. Calcutta 8: 54, pl. 76; Seidenfaden, 1985, Opera Bot. 83: 97, fig. 57, pl. 12C.

Described from NE India ("Sikkim above Engo, at an elevation of about 4,000 feet; in flower in June."). Type not located (CAL?).

Habitat, phenology and conservation status (in Vietnam). Epiphyte on tall trees. Evergreen broad-leaved montane forests. Flowers in June–July. Very rare. Estimated IUCN Red List status: DD.

Distribution**:** Vietnam (NW: Lai Chau Province; in addition one unlocalised specimen from the country). Bhutan, NE India, N Myanmar, N Thailand, S China (Yunnan Province).

Notes. With respect to its distribution, *D. praecinctum* is a typical East Himalayan species. The discovered locations of this species in Vietnam represent the southeastern limit of its distribution.

Studied specimens. **Vietnam,** sine loc., cult. in Pleicu Town, 21 July 2016, *Cong Danh Vo, s.n.* (LE photo LE01087334 http://en.herbariumle.ru/?t=occ&id=28548). **NW Vietnam**, Lai Chau Province, 29.06.2020, *Nguyen Van Canh, s.n.* (LE photo LE01087080 http://en.herbariumle.ru/?t=occ&id=18174).

Neottianthe secundiflora (Kraenzl.) Schltr. 1919, Repert. Spec. Nov. Regni Veg. 16: 291; Pearce, Cribb, 2002, Orchids of Bhutan: 172; Chen *et al.*, 2009, Flora of China 25: 132, fig. 178 (12–15); Rokaya *et al.*, 2013, Nord. J. Bot. 31: 537; Jalal, Jayanthi, 2015, Lankesteriana 15, 1: 34; Zhou *et al.*, 2016, Phytotaxa 276: 93.

Fig. 6D-H

≡ *Peristylus secundiflorus* Kraenzl., 1898, Orchid. Gen. Sp. 1: 518.
≡ *Ponerorchis secundiflora* (Kraenzl.) X.H. Jin, Schuit. & W.T. Jin, 2014, Molec. Phylogen. Evol. 77: 51.

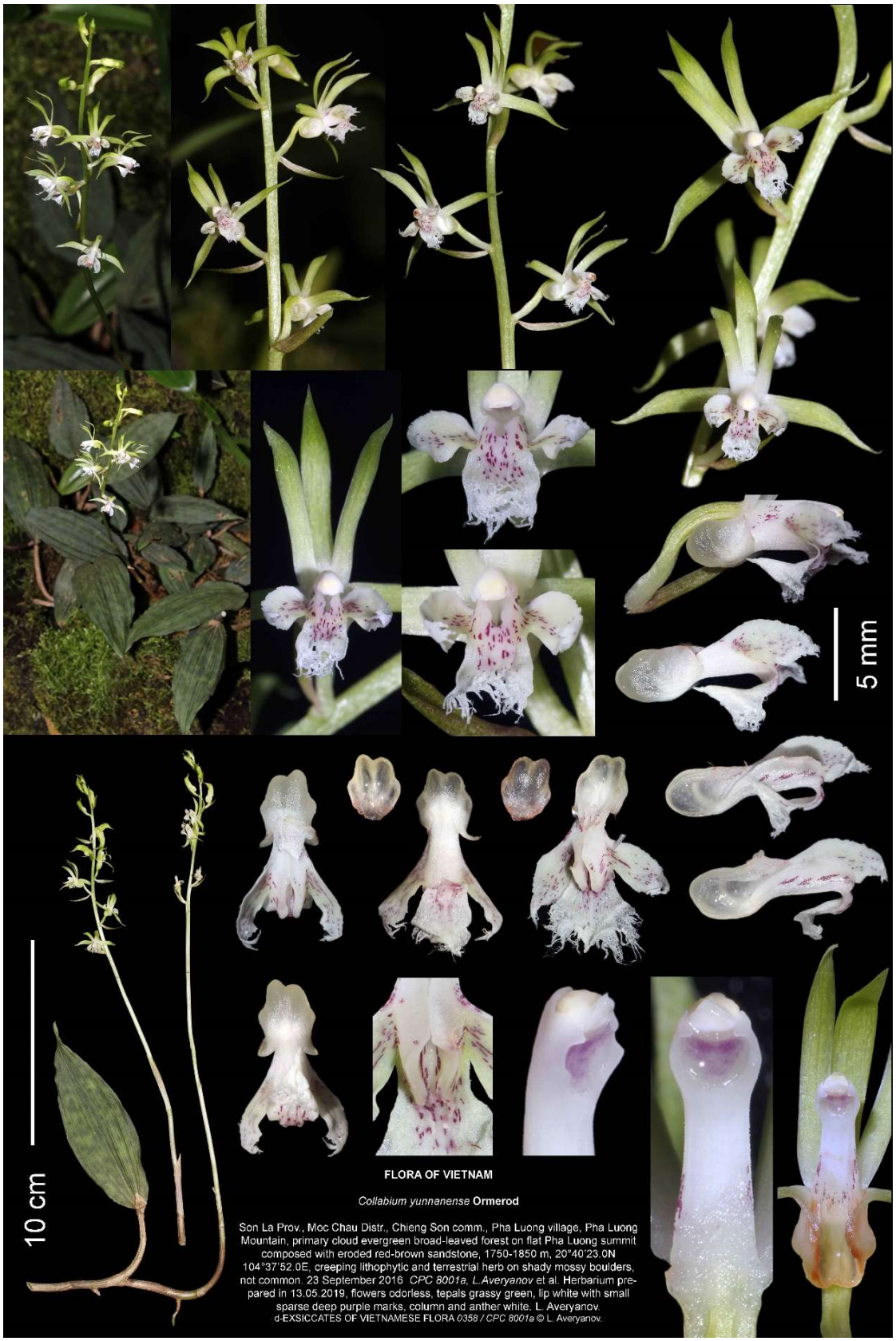

Fig. 5. New orchids in the flora of Vietnam. ***Collabium yunnanense*** Ormerod. Analytical plate (d-EXSICCATES OF VIETNAMESE FLORA 0358 / CPC 8001a) corresponding to the herbarium specimen *CPC 8001a.* All photos by L. Averyanov, design by L. Averyanov and T. Maisak.

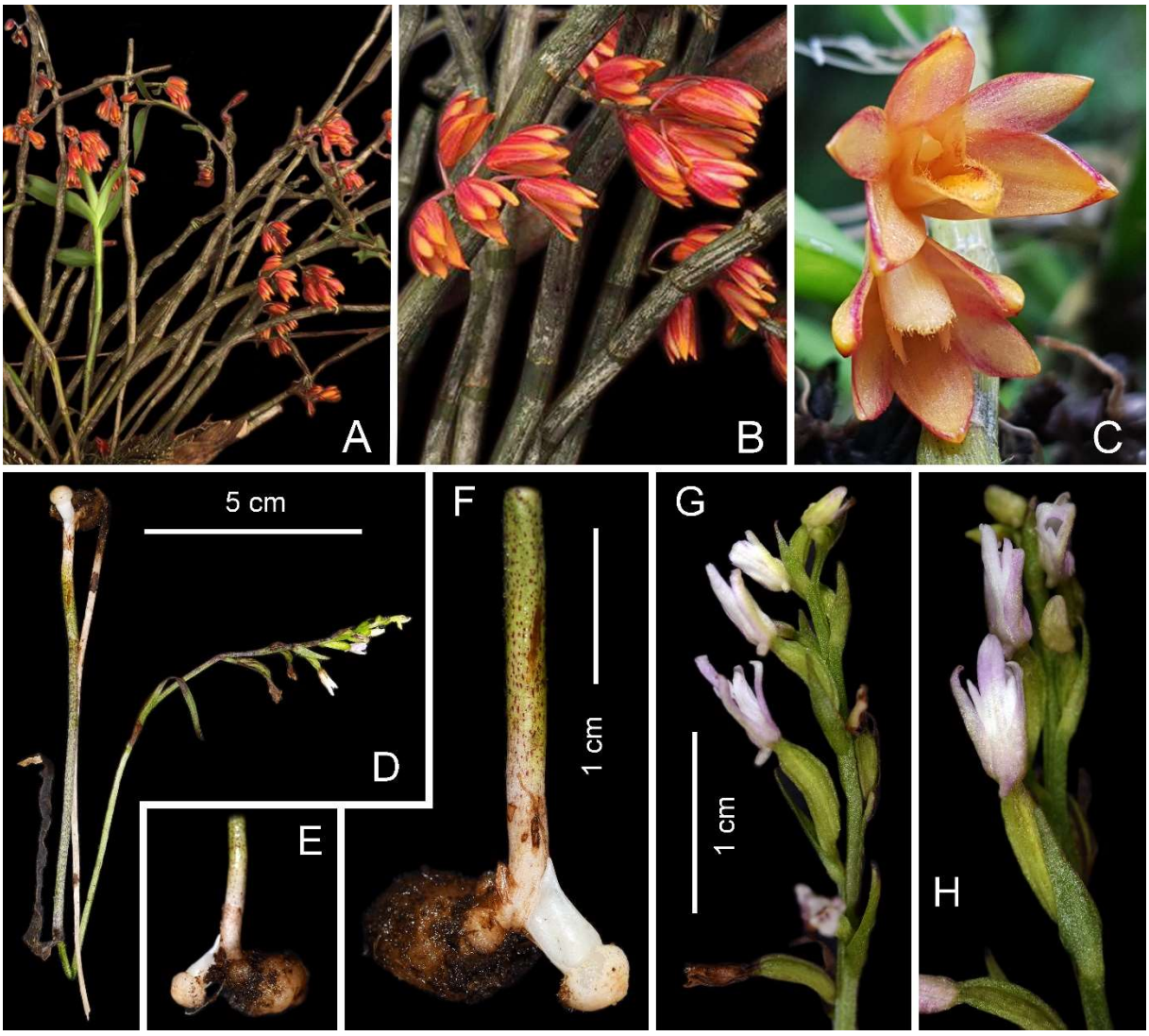

Fig. 6. New orchids in the flora of Vietnam. ***Dendrobium praecinctum*** Rchb.f. (**A-C**) and ***Neottianthe secundiflora*** (Kraenzl.) Schltr. (**D-H**). **A**, **B**. Photos by Cong Danh Vo (21 July 2016, *Cong Danh Vo s.n.*). **C**. Photo by Nguyen Van Canh (29 Jun 2020, *Nguyen Van Canh, s.n.*). **D**. Plant prior to the preparation of a voucher specimen. **E**, **F**. Tubers and basal portion of the stem. **G**. Apical portion of inflorescence. **H**. Flowers, half-side view and view from below. Photos by Truong Ba Vuong from the specimen *AL 1239*, design by L. Averyanov and T. Maisak.

≡ *Habenaria secundiflora* Hook.f., 1890, Fl. Brit. India 6: 165; id., 1895, Icon. Pl. 24, tab. 2321, nom. illeg., non Barbosa Rodr., 1881. Described from the Himalayas ("Subalpiner Teil des Himalaya, 3000–3300 m; … Sikkim 4400 m; … Chumbi"). ***Syntypes*** – NW India, Kumaon, *J.F. Duthie 3421* (K000796374 https://apps.kew.org/herbcat/getImage.do?imageBarcode=K000796374); NE India, Sikkim, *Hooker 278* (K000974209 https://apps.kew.org/herbcat/getImage.do?imageBarcode=K000974209); China, Tibet, Chumbi, *Dungboo s.n.* (K000796373 https://apps.kew.org/herbcat/getImage.do?imageBarcode=K000796373).

Habitat, phenology (in Vietnam) ***and conservation status***. Terrestrial tuberiferous herb. Open mossy and grassy slopes in humid evergreen broad-leaved montane forest at elevations of 2000–3000 m. Flowers in June–July. Very rare. Estimated IUCN Red List status: DD.

Distribution. NW Vietnam (Lao Cai Province, Fansipan Mountain). Bhutan, Nepal, N India, N Myanmar, S China (Sichuan, Yunnan, Xizang provinces).

Notes. *Neottianthe secundiflora* in its distribution and ecology is a typical species of the subalpine subtropical zone of the high Himalayas. The remarkable discovery of this species in Vietnam considerably expands its known distribution area in the SE direction. This fact also provides an additional evidence for the not yet fully uncovered richness of the flora of the highest mountain peaks of NW Vietnam in subtropical and temperate floristic elements. In this connection, such highland areas play a role of unique disjunctive refuges of subtropical and temperate plant species within the tropical latitudes.

Studied specimen. **Vietnam,** Lao Cai Province, Fansipan Mountain, 23 June 2019, *Truong Ba Vuong, Nguyen Thanh Luan, AL 1239* (LE LE01066673 http://en.herbariumle.ru/?t=occ&id=12431).

Nervilia appressifolia Aver. & V.C. Nguyen, ***sp. nov.***
Figs. 7-9

Described from S Vietnam. ***Type***: VIETNAM, Dak Lak Province, Yok Don National Park, open dipterocarp forest and woodlands with low bamboo at elevations of 200–300 m a.s.l., terrestrial tuberiferous herb in seasonally flooded and wet soil, very rare, 7 June 2019, *Nguyen Van Canh, AL 1109* (holotype – LE LE01076868, http://en.herbariumle.ru/?t=occ&id=19023). Photos of living plants used for the preparation of the type specimen - LE LE01087399 (http://en.herbariumle.ru/?t=occ&id=38798). Photos of liquid preserved specimen and floral parts used for the preparation of the type specimen – LE LE01087291 (http://en.herbariumle.ru/?t=occ&id=19013).

Etymology. The species name refers to the leaf blade tightly appressed to the ground.

Description. *Herb* ephemeroid, terrestrial, tuberiferous, stoloniferous, leafless at anthesis, forming leaves after flowering, glabrous. *Tuber* underground, globular, (4.5)5–6(6.5) mm in diameter, annually substituting, with few short finger-like outgrowths, producing stem at base. *Stem* underground, erect or suberect, sparsely verruculose, ebracteate, (7)9–18(20) mm long, (0.9)1–1.1(1.2) mm in diameter (in liquid preserved material); at anthesis bearing a terminal peduncle and a lateral vegetative bud covered by 1–2 small scarious bracts; after anthesis bearing a single leaf, epigeous stolons and infructescence (when fruits are developed). *Hypogeous stolons* arising from tuber outgrowths or from underground portion of stem, white, (3)4–10(14) mm long, about 1 mm in diameter, forming at apex a tuber of an individual plant of the next generation. *Epigeous stolons* horizontal, creeping, appressed to the ground, light greenish, up to 12 cm long, 0.8–1 mm in diameter, forming new plants at nodes. *Leaves* sessile or subsessile, with petiole less than 1.5 mm long; leaf blade cordate to orbicular or reniform, convex, umbrella-shaped, (1.2)1.5–2.4(2.6) cm in diameter, blunt or broadly obtuse at apex, margin entire, with 5–11(13) arcuate main veins, tightly appressed to the ground. *Inflorescence* 1-flowered; peduncle erect, pale olive greenish, (3.5)4–6(6.5) cm long, (0.8)0.9–1(1.1) mm in diameter, at middle with 1–2 broad tubular obtuse scarious sterile bracts (5)7–12(14) mm long, 2–3 mm wide (when flattened); floral bracts inconspicuous, broadly triangular, less than 1 mm long. *Flowers* nutant, not widely opening. *Sepals and petals* subsimilar, broadly lanceolate or narrowly elliptic, shallowly cymbiform, almost straight, pale olive greenish, (7.5)7.8–8.2(8.4) mm long, (1.6)1.8–2(2.2) mm wide, acute at apex, 3-veined. *Lip* 3-lobed, pandurate in outline, (7.8)8–8.2(8.4) mm long, (2.4)2.6–2.8(3) mm wide; side lobes narrowly rectangular or narrowly obtriangular, erect and embracing column, green, 3–3.4 mm long, 0.7–0.8 mm wide, obtuse or blunt at apex; median lobe obovate, conduplicately folded, (3.4)3.6–4(4.2) mm long, (2.4)2.6–2.8(3) mm wide (when flattened), apex blunt to roundish, white and sparsely speckled with purple, on adaxial surface bearing a fleshy papillose longitudinal ridge, its proximal part forked into 2 low keels running to middle of hypochile; lip abaxially with narrow longitudinal groove running along almost its entire length. *Column* simple, erect, stout, clavate, dorsally prominently gibbous, light greenish, (4.2)4.4–4.5(4.6) mm long, 1.2–1.4 mm wide; anther cap helmet-shaped, subquadrate at front view, white to light pinkish, 0.8–0.9 mm long and wide; stigma concave, triangular obovate; rostellum inconspicuous, in form of two lateral horizontal teeth meeting above stigma. *Ovary* ovoid, olive brown, (2)2.2–2.5(2.6) mm long, (1.2)1.4–1.5(1.6) mm in diameter, shallowly longitudinally grooved. *Fruit* unknown.

Habitat, phenology and conservation status. Terrestrial tuberiferous ephemeroid herb growing on wet lateritic soil at the bottom of small occasionally flooded (during torrential rains) puddles in open semideciduous seasonally flooded dipterocarp forest and woodland with domination of small bamboo, at elevations of 200–300 m a.s.l. Flowers in May–June. Very rare. Estimated IUCN Red List status: DD.

Distribution. S Vietnam (Dak Lak Province, Yok Don National Park). Endemic to S Vietnam.

Notes. The discovered plant belongs to a group of species of the genus *Nervilia* with 1-flowered inflorescence and 3-lobed lip more or less hairy or papillulate in the center. In mainland Asia this group is represented by *N. calcicola* Kerr, *N. infundibulifolia* Blatt. & McCann, *N. punctata* (Blume) Makino and *N. viridiflora* Q. Liu & J.W. Li. Among them, the new species is closest in its floral morphology to *N. viridiflora* which is endemic to southern Yunnan (Tang *et al.,* 2018), but differs in smaller floral bract less than 1 mm long (vs. 5–6 mm long), smaller, nutant, not widely opening flowers with sepals and petals 7.5–8.4 mm long (vs. flowers larger, suberect, widely opening, with sepals and petals 13–18 mm long), lip with obovate or narrowly obovate, obtuse median lobe, as wide as or narrower than the hypochile (vs. median lobe orbicular, emarginate, broader than the hypochile), conduplicately folded (vs. almost flat) lip, and median lobe of the lip with conspicuous tall papillose ridge (vs. median lobe with two insignificant low glabrous keels). At the same time, *N. appressifolia* strikingly differs from almost all known congeners in the sessile leaf tightly appressed to the ground, long green epigeous stolons and in its habitat at the moist bottom of temporary flooded puddles. Such narrow ecological preferences are not found in any other known species of the genus.

Nervilia appressifolia is presently known exclusively from a very limited area in Yok Don National Park in Dak Lak Province of southern Vietnam.

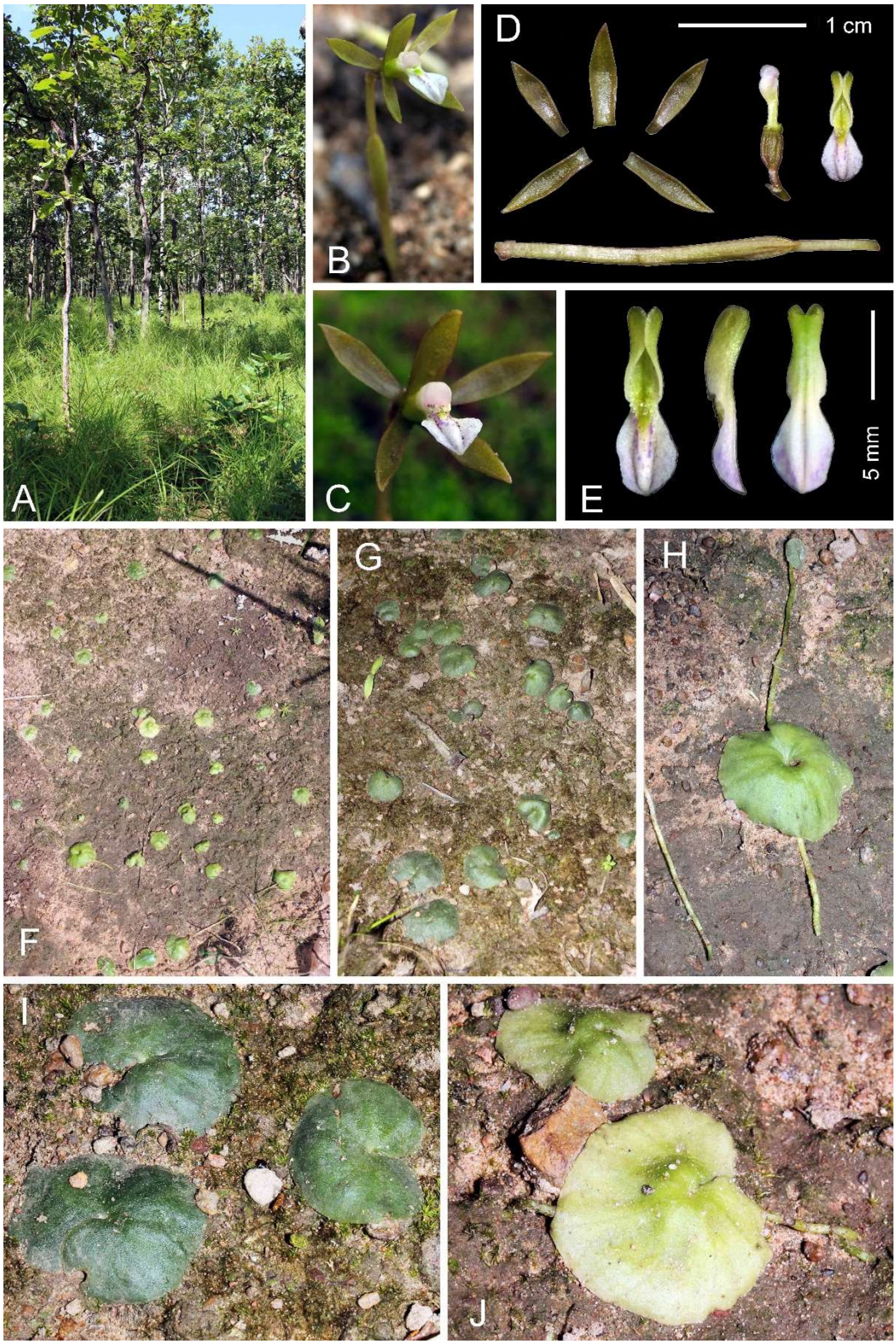

Fig. 7. New orchids in the flora of Vietnam. ***Nervilia appressifolia*** Aver. & V.C. Nguyen. **A**. Habitat at locus classicus. **B**. Flowering plant. **C**. Flower. **D**. Sepals, petals, lip, column with ovary and peduncle. **E**. Lip in natural position, adaxial, side and abaxial views. **F**. Plants growing on the bed of a small temporary flooded pool. **G**. Typical group of plants in the *locus classicus*. **H**. Plant with epigeous stolons. **I**, **J**. Plants with different colour and shape of the leaf blade. B–E: Photos of plants used for the preparation of the type (*AL 1109*). F–J: Photos of plants used for the preparation of one of the paratypes (*AL 1167*). Photos by L. Averyanov (A, F–J) and Van Canh Nguyen (B–E), design by L. Averyanov and T. Maisak.

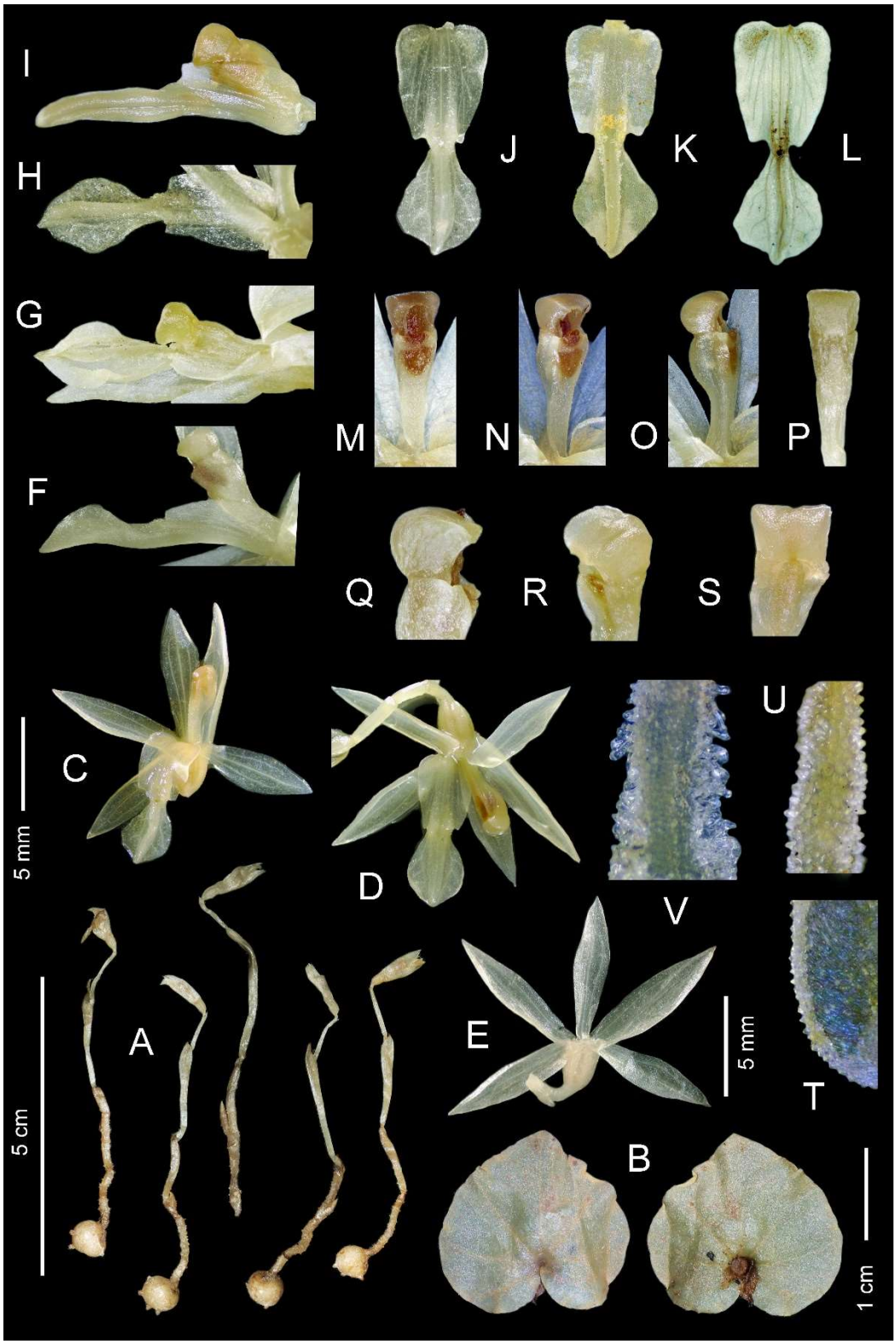

Fig. 8. New orchids in the flora of Vietnam. ***Nervilia appressifolia*** Aver. & V.C. Nguyen. **A**. Flowering plants. **B**. Leaf blade, adaxial and abaxial views. **C**, **D**. Flowers, front view. **E**. Sepals and petals, view from behind. **F**. Column and lip, side view. **G**, **H**. Lip, half-side view. **I**. Lip, view from below. **J**–**L**. Flattened lip, adaxial side. **M**–**P**. Column, front, half-side, side views, and view from behind. **Q**–**S**. Column apex and anther, side, half-side views, and view from behind. **T**. Papillose margin of lip epichile. **U**, **V**. Keel on adaxial surface of the lip, in apical part of epichile (U) and at its base (V). Photos by L. Averyanov from liquid preserved plants used for the preparation of the type specimen *AL 1109*. Design by L. Averyanov and T. Maisak.

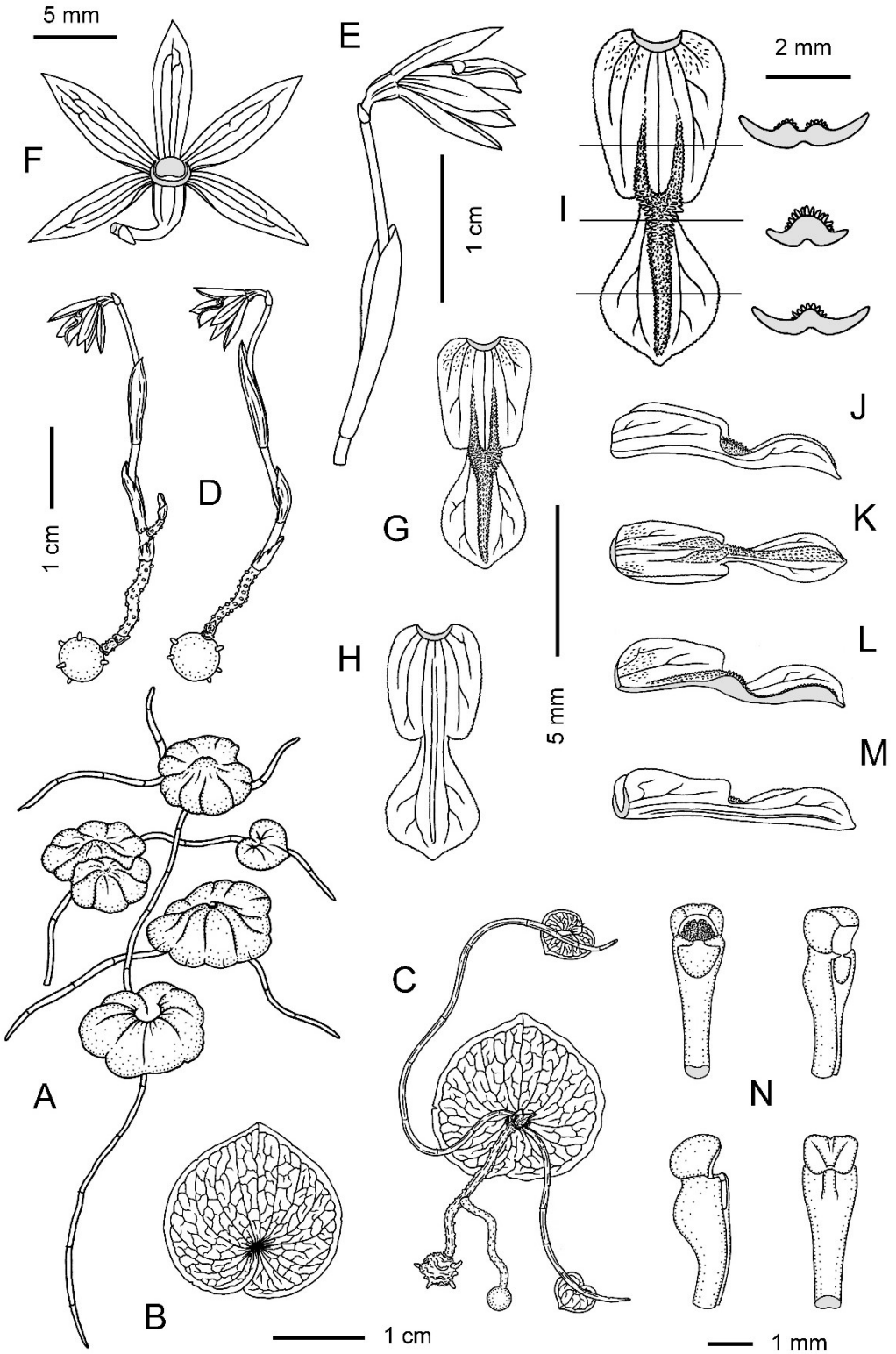

Fig. 9. New orchids in the flora of Vietnam. ***Nervilia appressifolia*** Aver. & V.C. Nguyen. **A**. Plants with stolons. **B**. Leaf, adaxial view. **C**. Plant with stolons, view from below. **D**. Flowering plants. **E**. Apical part of inflorescence, side view. **F**. Sepals and petals with ovary, front view (lip and column removed). **G**, **H**. Flattened lip, adaxial (G) and abaxial side (H). **I**. Flattened lip, adaxial side and transversal sections. **J**. Lip in natural position, side view. **K**. Lip in natural position, top view. **L**. Lip in natural position, sagittal section. **M**. Lip in natural position, half side view from below. **N**. Column, front, half-side, side views, and view from behind. Drawn from the paratype *AL 1167* (A–C) and the holotype *AL 1109* (D–N) by L. Averyanov and T. Maisak.

The observed population occupies an area of not more than 500 m^2. The attribution of a conservation status to this very rare plant in terms and criteria proposed by IUCN Red List requires additional field studies in the putative area of its distribution. The present IUCN conservation status is preliminarily estimated as "Data Deficient" (DD).

Studied specimens *(paratypes).* **S Vietnam,** Dak Lak Province, Buon Don District, Yok Don National Park, open dry dipterocarp forest and woodland, terrestrial ephemeroid tuberiferous herb with prostrate green or dark green leaves in open grassy place, at elevation of 200–300 m a.s.l., locally abundant, 10 October 2017, *N.V. Canh, AL 316* (LE LE01074054, http://en.herbariumle.ru/?t=occ&id=19021). Yok Don National Park, open dry dipterocarp forest, 3 June 2018, *Nguyen Van Canh s.n.* (photos – LE LE01087398, http://en.herbariumle.ru/?t=occ&id=38797). Yok Don National Park, open dry dipterocarp forest, 30 August 2018, *Nguyen Van Canh s.n.* (photos – LE LE01087397, http://en.herbariumle.ru/?t=occ&id=38796) and *Dinh Quang Diep, s.n.* (photos – LE LE01087292, http://en.herbariumle.ru/?t=occ&id=19014). Yok Don National Park, open dry dipterocarp forest and woodland with dense low bamboo, at an elevation of 200–300 m a.s.l., terrestrial ephemeroid tuberiferous herb with prostrate leaves in open wet place, very rare, found in one location, 24 October 2019, *L. Averyanov, Nguyen Van Canh, T. Maisak, AL 1167* (LE LE01066622, http://en.herbariumle.ru/?t=occ&id=12390).

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