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New Species of Orchids from Vietnam

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ABSTRACT: Identification of herbarium specimens collected in course of field exploration works in Vietnam during 2005-2007 revealed ten species of orchids new for science. Illustrated descriptions are provided for each discovered species, which are named as *Anoectochilus papillosus*, *Arundina caespitosa*, *Bulbophyllum paraemarginatum*, *B. sinhoënse*, *Cheirostylis foliosa*, *Goodyera rhombodoides*, *Liparis rivularis*, *Oberonia multidentata*, *O. trichophora* and *Sunipia nigricans.*

KEY WORDS: Orchidaceae, Taxonomy, *Anoectochilus papillosus, Arundina caespitosa, Bulbophyllum paraemarginatum, Bulbophyllum sinhoënse, Cheirostylis foliosa, Goodyera rhombodoides, Liparis rivularis, Oberonia multidentata, Oberonia trichophora, Sunipia nigricans,* new species, Vietnam.

INTRODUCTION

Identification of large herbarium collections documented field botanical works in Vietnam during 2005-2007 according to a number exploration programs of USA. National Geographic Society, Vietnam Botanical Conservation Program (funded from Henry Lice Foundation); American Orchid Society, WWF Indochina Programme (Green Corridor Project in Thua Thien – Hue Province) and Fauna & Flora International revealed ten species of orchids new for science. Illustrated descriptions, as well as short statement on phenology, ecology, distribution and taxonomy are provided below for each discovered species. The paper continues publication of new orchid species discovered in the country during long term work on inventory of Vietnamese orchid flora (Averyanov, 2005a, b; Averyanov and Averyanova, 2005; Averyanov and Efimov, 2006).

Anoectochilus papillosus Aver., sp. nov.

Figs. 1 & 2A

Plantae terrestres ad 16 cm alt. Folia 2-4, 2-4 cm lg., 2-3 cm lt., atroviridia nervis roseis distinctis. Flores 3-5, remoti, ca 1.5 cm in diam. Petala extrinsecus jugis papillosis longitudinalibus brevibus. Labium album, 13-14 mm lg. Mesochilium lobis rectangulatis dentatis. Epichilium bipartitum, lobis oblique lobatis. Calcar apici bifurcatum.

Type: VIETNAM, Hoa Binh Prov., Mai Chau Distr., Pa Co Municipality, Xa Linh village, Rung gia locality (Old forests), around point 20º44’30’’N, 104º56’26’’E, 968 m a.s.l. In primary and secondary closed evergreen broad-leaved sub-montane forests on foots and slopes of limestone mountain. 23 Jul. 2006. *Phan Ke Loc, Le Dong Tan, Nguyen Sinh Khang, Nguyen Tien Vinh, HAL 8978* (Holotype, HN; Isotype, LE).

Terrestrial herb with creeping rhizome and ascending leafy floriferous stem. Rhizome 3-5 cm long, dull pink-brown, juicy, rooting at nodes. Floriferous stem 14-16 cm tall, with 2-4 leaves at the base. Leaves petiolate; petiole and sheath 8-10 mm long, 3-4 mm wide at the base; leaf blade ovate to broadly-ovate or almost circular, usually slightly asymmetric, shortly acute, 2-4 cm long, 2-3 cm wide, velvety dark green, with reticulate network of pink nerves above, uniform dull pink-purple below. Scape 9-12 cm long, densely finely tomentose with simple and glandular hairs; rachis lax flowered, normally with 3-5 flowers. Floral bracts dull pink, triangular-cuneate, conduplicate, acuminate, 8-10 mm long, 2-2.5 mm wide, sparsely hairy. Pedicel and ovary 10-12 mm long, 1.5-2 mm wide, densely pubescent with simple and glandular hairs. Sepals light dull pink-brown, glabrous or sparsely hairy outside. Dorsal sepal ovate, 6-7 mm long, 2.5-3 mm wide, acuminate, with slightly upward reflexed apex. Lateral sepals oblong, obtuse, oblique, about 7-8 mm long, 2.5-3 mm wide. Petals white, glabrous, 6.5-7 mm long, 2-2.5 mm wide, strongly oblique, falcate, rising from narrow base to oblique broad median part

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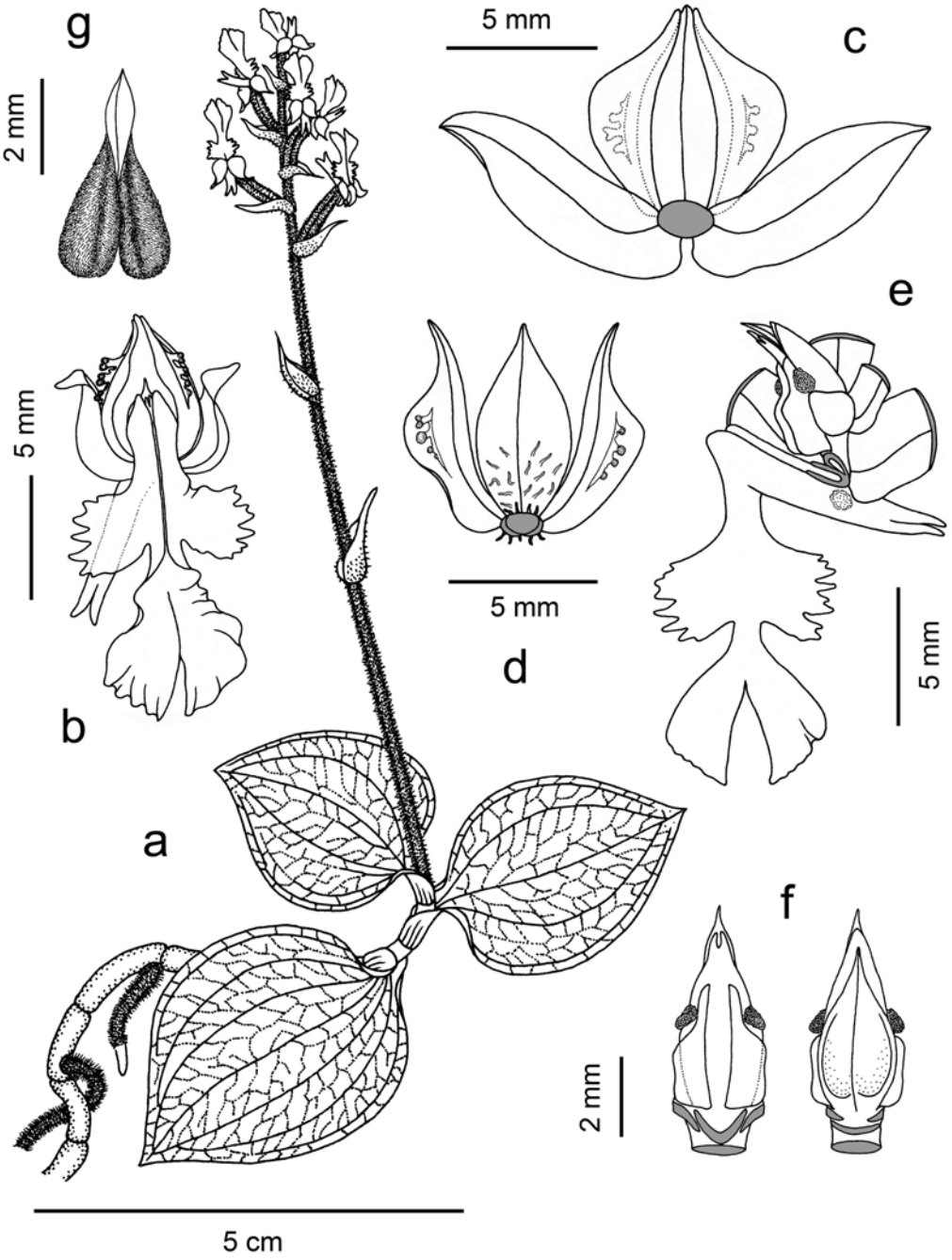


Fig. 1. *Anoectochilus papillosus* Aver. a: Flowering plant. b: Flower. c: Flattened sepals and petals, ventral view. d: Flattened median sepal and petals, dorsal view. e: Lip and column, side view. f: Column, ventral and dorsal view. g: Pollinarium (all drawn from the type by author).

ending in attenuate apex, densely connivent and forming a hood with the dorsal sepal, each on dorsal surface with short longitudinal ridge bearing few massive white, sometime forked capitate papillae. Lip, white, with dull pink-brown tint at the spur apex, 13-14 mm long from base to apex of epichile, distinctly divided into hypochile mesochile and epichile. Hypochile boat-shaped 5-6 mm long, 1.5-2 mm wide, with upturned margins, basally with cylindric spur 3.5-4 mm long, about 1 mm broad; hypochile and spur, placed at narrow angle with mesochile; spur acutely bifid at apex, with 2 large hemispheric sub-sessile glands inside. Mesochile 4-5 mm long, with narrow base and 2 rectangular lobes

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Fig. 2. New species of orchids from Vietnam. A: *Anoectochilus papillosus*, flowering plant and flower (type specimen, *HAL 8978*). B: *Arundina caespitosa* in natural habitat (paratype, *LX-VN 1966*). C: *Bulbophyllum paraemarginatum*, flowering plant and flower (type specimen, *HAL 9849*). D: *B. sinhoënse*, flowering plant (type specimen, *HAL 8791*). E: *Cheirostylis foliosa*, inflorescence (type specimen, *HAL 9415*). F: *Liparis rivularis*, flower (type specimen, *HAL 10443*). G: *Oberonia multidentata*, flowering plant and flowers (type specimen, *HAL 9839*). Photographs A & D made by Phan Ke Loc; B, C, E, F & G made by the author.

2-2.5 mm wide, 3-3.5 mm long, denticulate at the apex with 5-10 irregular more or less low cuneate blunt dents. Epichile with narrow base, 2-lobed; the lobes spreading, oblique rectangular, truncate, entire, 4.5-5.5 mm long, about 2.5 mm wide. Column ovate, 4-4.5 mm tall, with 2 short vertical wings at front and 2 lateral hemispheric stigmas; wings 1-1.4 mm long, about 1 mm tall, rising at the middle part of column. Anther large, narrowly-ovate, about 3.5 mm long.

Etymology: Specific epithet refers to unusual papillose ridges on dorsal surface of petals.

Flowering time: July – August.

Ecology: Broad-leaved evergreen forests on rocky limestone at elev. 900-1000 m a.s.l. Creeping terrestrial herb, commonly on humid shady limestone pockets with deep soil rich in humus.

Distribution: Vietnam (Hoa Binh Province, Mai Chau District).

Notes: From all known representatives of the genus new species differs in petals bearing on dorsal surface short longitudinal ridge ornamented with massive, often forked capitate papillae. On other floral morphology this species approaches to Taiwanese *A. koshunensis* Hayata, from which differs in large and broad, shallowly dentate side lobes of mesochile. Obviously, described species is endemic to rocky limestone remnant highlands spreading in north-western Vietnam along Laotian border.

Arundina caespitosa Aver., sp. nov. Figs. 2B, 3 & 4

Arundina chinensis auct. non Blume: Averyanov, 1994, Identification Guide Viet. Orch.: 88; Averyanov, Averyanova, 2003, Updated Checklist Orch. Viet.: 12, p.p.

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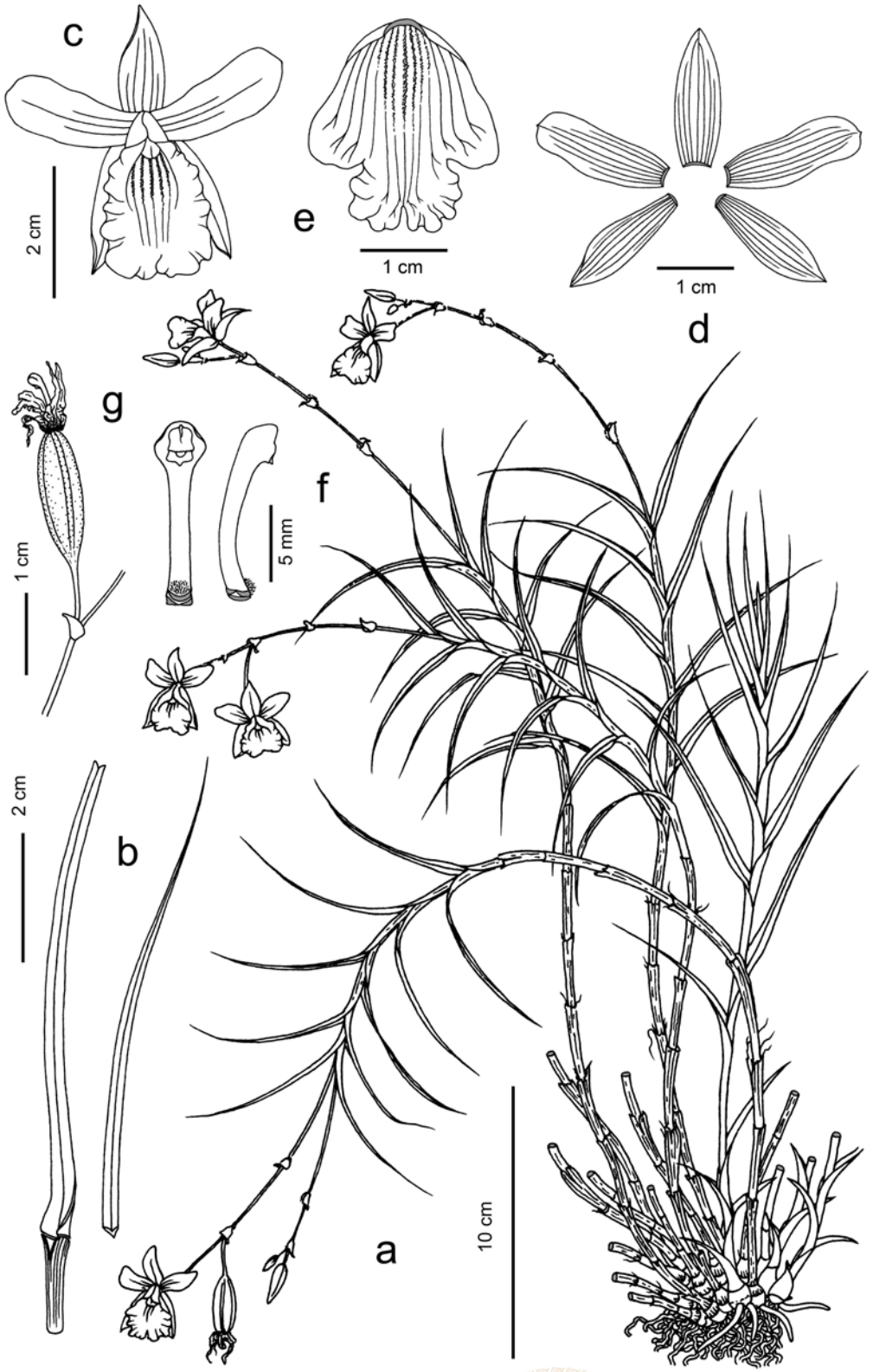


Fig. 3. *Arundina caespitosa* Aver. a: Flowering plant. b: Leaf. c: Flower. d: Flattened sepals and petals. e: Flattened lip. f: Column, frontal and side view. g: Fruit (all drawn from the type by author).

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Fig. 4. *Arundina caespitosa* Aver. Digital herbarium specimen of the type (*HAL 7953*).

Plantae ripariae herbaceae caespitosae ad 40(60) cm alt. Folia linearia, atroviridia, nitentia. Flores 1-3, intense purpurei, 2.5-3 cm in diam. Labium centro album, nervis 7-9 verruculiformibus flavescentibus.

Type: VIETNAM, Thua Thien – Hue Prov., A Luoi Distr., Huong Nguyen Municipality, in vicinities of Tra Ve forest protection station, around point 16°15'16"N, 107°26'57"E at elevation about 80 m a.s.l. Open riparian shrubs along rocky Tra Ve

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river valley on sandstone and granite outcrops. 6 May 2005. *L.Averyanov, P.K.Loc, T.V.Thao, N.T.Vinh, HAL 7953* (Holotype, HN; Isotype, LE).

Paratypes: VIETNAM, Gia Lai – Kontum Prov., Kon Ha Nung. In crevices of rocky cliffs along mountain stream, in water. Flowers purple. 15 May 1985. *Averyanov L., et al., LX-VN 1966*, Soviet Union – Vietnamese Eexpedition (HN, LE). VIETNAM, Quang Nam – Da Nang Prov., Phuoc Son, Ta De, Kham Due. Flowers purple-violet. 11 July 1986. *Averyanov L., et al., LX-VN 2851*, Soviet Union – Vietnamese Eexpedition (HN, LE). VIETNAM, Tonkin [Quang Ninh Prov.?], Taai Wong Mo Shan and vicinity Tong Fa market Ha-coi. Ht. 2 ft.; fairly common in thicket, on moist sandy soil; fl. lavender, fragrant. W.T.Tsang 29471, 3rd Indo-China Expedition (HN, LE).

Lithophytic riparian herb with short much branched rhizome and numerous dense caespitose reed-like more or less erect leafy stems. Rhizome dark brown, 2-3 mm thick, with many stems distant on 3-5 mm, covered with fibrous gray-brown remnants of cataphylls. Stems erect or curved in direction of water-stream flow, in dense clusters often with 100 and more shoots each, 25-60 cm tall, 2-4 mm thick, with 6-15 distichous leaves and terminal flower scape, leafless below. Leaves commonly abbreviated to the top of stem, sessile, linear, strongly keeled, grass-like, 10-18 cm long, 2-5(6) mm wide, acute, dark glossy green; articulate at the base with light greenish to yellowish, closed leaf sheaths 0.8-3.5 cm long. Scape erect or ascending, thin, rigid, 10-20 cm long, 0.8-1.2 mm thick, with 1-3 distant small green sterile bracts and 1-4 flowered terminal, racemose, unbranched inflorescence. Floral bracts green, short, conduplicate, infundibular broadly ovate, 2-4 mm long, 2-3 mm wide (when flatten), persistent. Pedicel and ovary glossy green, often with purple-brown tint, glabrous, 10-14 mm long, 0.8-1 mm wide. Flowers fragrant, brightly purple, developed in succession, wide opening, 2.5-3 cm across, distant on 3-18 mm. Sepals oblong narrowly-ovate, 1.6-2.2 cm long, 5-7 mm wide, obtuse. Petals oblong-elliptic, 1.8-2.4 cm long, 6-8 mm wide, broadly-obtuse to roundish at apex. Lip sessile, trumpet-shaped, broadly-ovate in outline (when flatten), 2.2-2.8 cm long, 1.8-2.4 cm wide, with white center and 7-9 low keels traced with yellow warts, 3-lobe, wavy along margin. Lip side lobes erect, embracing the column, triangular, with roundish apex, 7-9 mm long, 6-8 mm wide. Lip mid lobe semi-circular, 9-12 mm long and wide, emarginate to bilobed. Column white, erect, slender, 10-12 mm tall, 0.8-1.2 mm wide, slightly widening toward the apex, at the base with small tuft of yellow-orange papillae. Operculum white, hemispheric, 1-1.2 mm across. Fruit cylindric longitudinally ridged capsule, 1.4-2.8 cm long, 5-8 mm wide.

Etymology: Species name refers dense caespitose plant habit.

Flowering time: April – July.

Ecology: Open wet sandstone and granite stream and rivers rocks along water line at elevations 50-500 m a.s.l., particularly on small waterfall cliffs, occasionally flooded during torrential summer rains.

Distribution: Vietnam (Gia Lai Province, Kbang District, Quang Nam – Da Nang Province, Phuoc Son District, Thua Thien – Hue Province, A Luoi District), northern Vietnam ("Tonkin, Taai Wong Mo Shan and vicinity Tong Fa market Ha-coi" [Quang Ninh Prov.?]).

Note: This plant strikingly differs from widespread, common and very variable species - *Arundina graminifolia* (D.Don) Hochr. in small dimensions of all it's parts, dense caespitose habit, linear glossy dark green leaves, small brightly purple flowers and specific ecology. Described species may be close to *A. minor* Lindl., endemic of Sri Lanka, from which it differs in longer and narrower leaves, much smaller floral bracts, smaller flowers, broader sepals, brightly purple lip (without yellow) with 7-9 warty keels. In some earlier publications on orchid flora of Vietnam, *A. caespitosa* was wrongly reported under the name *A. chinensis* Blume (Averyanov, 1994; Averyanov, Averyanova, 2003), which now is regarded as synonym of *A. graminifolia*. Long-term field exploration in Vietnam certainly states that *A. caespitosa* is very rare and highly endangered species, which stands on the verge of full extinction in the nature. In our days, it vanished completely in places of its first discovery due to anthropogenic influence. Meanwhile this species has outstanding prospects for cultivation as wonderful miniature ornamental plant on wet rocks in small home-garden basins of oriental style.

Bulbophyllum paraemarginatum Aver., sp. nov. (sect. *Cirrhopetalum* (Lindl.) Reichenb. f.).
Figs. 2C & 5

Plantae repentes epiphyticae. Pseudobulbi monophylli, 2 cm alt. Inflorescentia 2 cm lg., uni-biflora. Flores 5 cm lg. Sepalum medianum et petala ovata, eroso-dentata, alba, purpureo-maculata. Sepala lateralia in tubum 4 cm lg. connata, purpureo-brunnea.

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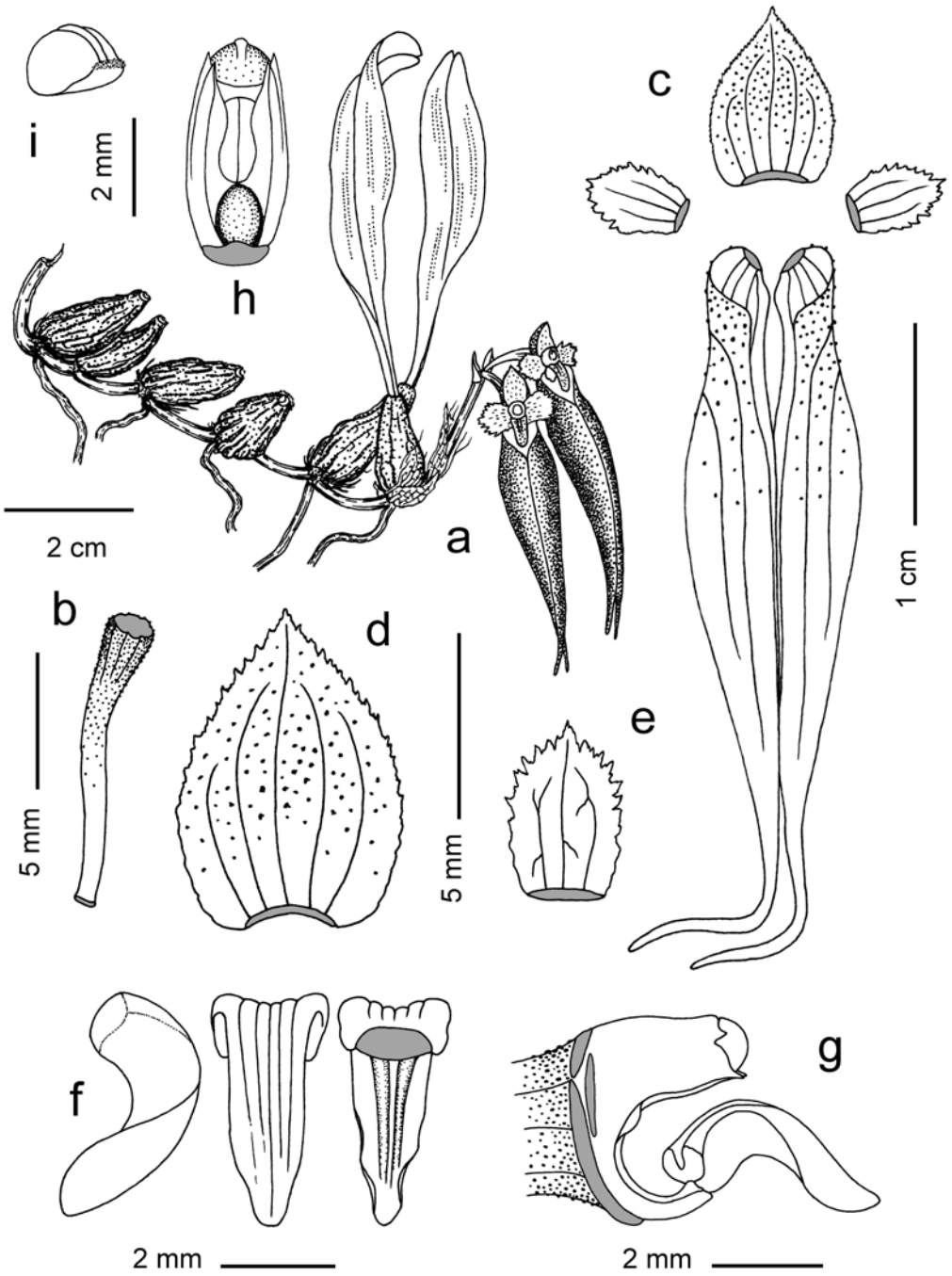


Fig. 5. *Bulbophyllum paraemarginatum* Aver. a: Flowering plant. b: Pedicel and ovary. c: Flattened tepals. d: Flattened median sepal. e: Petal. f: Lip, side view, frontal view and view from behind. g: Column and lip, side view. h: Column, frontal view. i: Operculum (all drawn from the type by author).

Type: VIETNAM, Lai Chau Prov., Sin Ho Distr., Ma Quai Municipality, Can Ti 2 village, around point 22º24’18’’N, 103º22’45’’E. Remnants of broad-leaved evergreen closed primary forest on steep mountain slopes composed with sandstone at elev. about 1100 m a.s.l. Creeping epiphyte on tall mossy trees. Flowers odorless, median sepal and petals white, lateral sepals purple-brown, lip white with finest purple-brown marks. Common. 17 Nov. 2006. *Nguyen Tien Hiep, L.Averyanov, Pham Van The, HAL 9849* (Holotype, HN; Isotype, LE).

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Creeping epiphyte. Rhizome rigid, dark gray-brown, 1.5-2.5 mm thick, with 6-10 pseudobulbs distant on 0.6-2 cm and 1-2 very rigid wiry roots at nodes. Pseudobulbs dull olive-green to brown, narrowly-ovate, 1.5-2.5 cm tall, 5-8 mm wide, often slightly oblique, erect or bending to rhizome, young smooth, later longitudinally wrinkled, with 1 apical leaf. Leaves rigid, coriaceous, oblong-lanceolate, conduplicate, slightly bilobed at apex, 3-6 cm long, 1-1.5 cm wide. Inflorescence arising from the base of pseudobulb, with 1-2 terminal flowers, on erect stout rigid purple-brown stalk 1.5-2.5 cm tall, enclosed at the base by 1-2 yellowish-brown to dull gray decaying fibrous broad bracts. Floral bracts purple-brown, narrowly-ovate to ovate, acute, 5-6 mm long, 1.5-2.5 mm wide. Pedicel and ovary purple-brown, 1-1.4 mm long, 2-2.5 mm wide, cowered with numerous fine dark brown warts. Flowers odorless, pendulous, 4.5-5.5 cm long. Median sepal white with numerous small purple marks, broadly-ovate, acute, 8-9 mm long, 5-5.5 mm wide, with 5 distinct nerves, finely erose dentate along margin, outside in the middle part with numerous fine dark brown warts. Lateral sepals purple to purple-brown, finely papillose, with sparse fine dark brown warts at basal half, connate into broad tube 3.8-4.2 cm long, 0.8-1 cm wide, with free caudate apices. Petals white to hyaline, with numerous small purple marks, obovate-rhomboid, broadly-obtuse, 4.5-5 mm long, 3.5-4 mm wide, with 3 distinct nerves, erose-dentate along margin. Lip white, with numerous fine purple-brown marks, simple, without ears, fleshy, ovate-triangular, about 3-3.5 mm long, 1-1.5 mm wide, strongly recurved, jointed with column foot apex by movable articulation. Column light lemon-yellow, erect, cylindrical, 3 mm tall, 2 mm wide, with 4 acute stelidia at the apex and ovate glossy callus at front near the base. Column foot 1.5-1.8 mm long, forward curved, apically slightly dilated. Operculum simple, hemispheric, 1.2-1.3 mm across, frontal margin shortly ciliate.

Etymology: Species name reflects closest relations of newly described species.

Flowering time: November.

Ecology: Primary and secondary evergreen broad-leaved forests on sandstone at elevation about 1100 m a.s.l. Creeping epiphyte in canopy of tall trees.

Distribution: Vietnam (Lai Chau Province, Sin Ho District).

Note: On floral morphology new species more or less close to *Bulbophyllum emarginatum* (Finet) J.J.Sm., from which differs mainly in coloration of flowers, structure of lip and distinctly erose dentate margin of median sepal and petals. In habit of growth and vegetative features both species looks indistinguishable and probably sometimes occur together in same habitats. In some areas of Lai Chau province of northern Vietnam *B. paraemarginatum* was observed as quite common plant growing as canopy creeping epiphyte on tall mossy trees.

Bulbophyllum sinhoënse Aver., sp. nov. (sect. *Desmosanthes* (Blume) J.J.Smith). Figs. 2D & 6

Plantae repentes epiphyticae. Pseudobulbi 4-6 mm alt., monophylli. Inflorescentia 1.5-2.5 cm lg., uni-biflora. Sepala anguste ovata, 7-8.5 mm lg., 1.5-2.1 mm lt., acuminata, alba, apice flavescentia. Petala alba, anguste obovata, 4-4.5 mm lg., 1.2-1.4 mm lt., trinervata, obtusa.

Type: VIETNAM, Lai Chau Prov., Sin Ho Distr., Phin Ho Mun., Ta Genh village, around point 22º28'44"N, 103º16'23"E, 1326 m. Upper slopes and ridges of limestone mountains. Epiphyte. Rare. Flowers white; sepals tips yellowish. 12 Jun 2006. *P.K. Loc, N.T. Vinh, N.S. Khang, P.N. Quan, L.H. Phong, HAL 8791* (Holotype, HN; Isotype, LE).

Dwarf creeping epiphyte or lithophyte. Rhizome filiform, wiry, young light green, later yellowish-white, 0.3-0.5 mm thick, with numerous pseudobulbs distant on 0.7-2 cm and 1-4 wiry, finely gray-hairy roots at nodes. Pseudobulbs light green, narrowly-ovate to ovate, 3-7 mm tall, 2-3 mm wide, sometimes slightly oblique, erect or slightly bending to rhizome, longitudinally irregularly grooved and wrinkled, with 1 apical leaf. Leaves rigid, coriaceous, narrowly-ovate to ovate, 7-18 mm long, 3-5 mm wide, conduplicate, bilobed at apex, attenuate at the base into very short petiole. Inflorescence arising from base of pseudobulb, with 1-2 terminal flowers, on ascending rigid, filiform, light greenish stalk 1.5-2.5 cm long, with 2 small insignificant yellowish hyaline bracts at the base and in lover third. Floral bracts light yellowish hyaline, narrowly-ovate, acute, 2.5-3 mm long, 0.5-1 mm wide. Pedicel and ovary light green, glabrous, 2.5-3 mm long, 0.5-0.7 mm wide. Flowers widely opening, 12-14 mm across, very large relatively size of the plant. Sepals sub-similar, white with light yellowish caudate fleshy apices, narrowly-ovate, 7-8.5 mm long, 1.5-2.1 mm wide, acuminate, with 3 distinct nerves; lateral sepals slightly longer and wider, oblique at the base. Petals white, narrowly-obovate to broadly-oblanceolate, obtuse, 4-4.5 mm long, 1.2-1.4 mm wide, with 3 nerves. Lip white, simple, without ears, cuneate, 2.5-2.8 mm long, 0.7-0.9 mm wide, strongly

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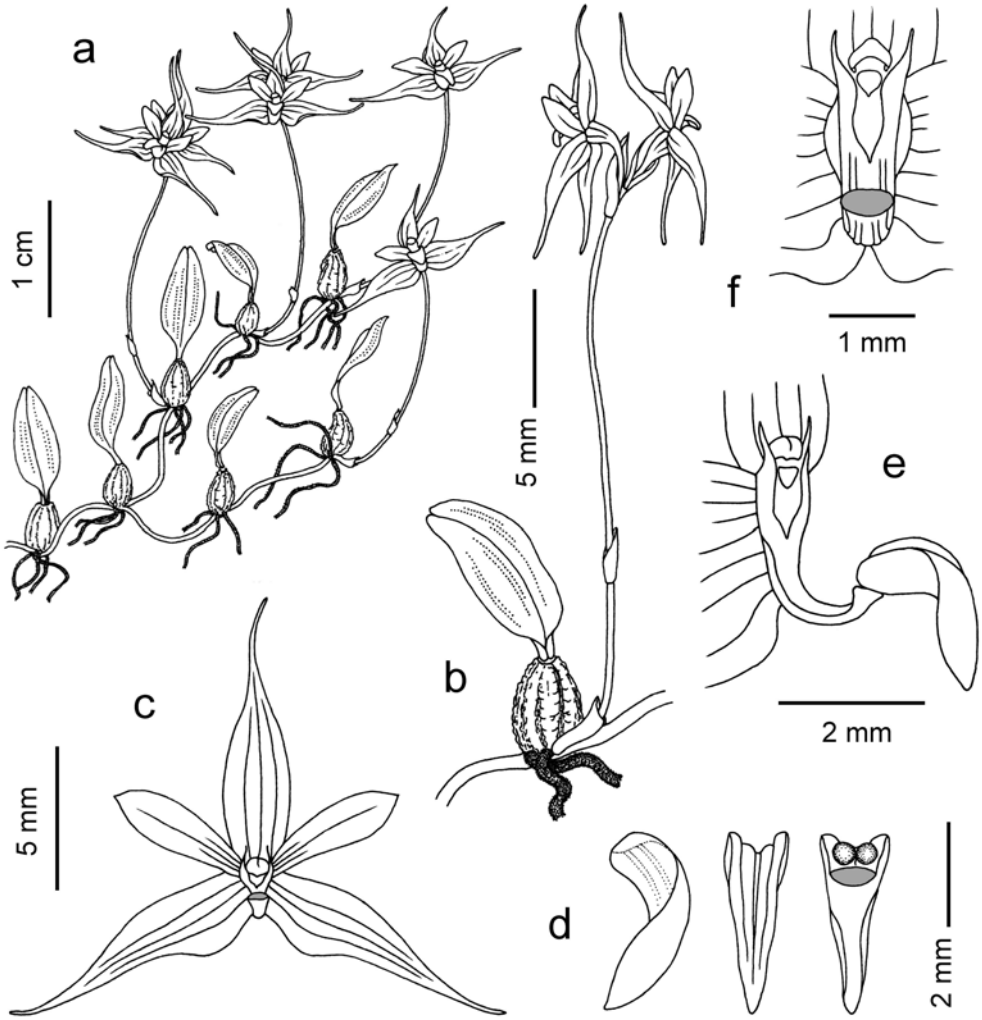


Fig. 6. *Bulbophyllum sinhoënse* Aver. a & b: Flowering plants. c: Flattened flower (without lip). d: Lip, side view, frontal view and view from behind. e: Column and lip, side view. f: Column, frontal view (all drawn from the type by author).

recurved, jointed with column foot apex by movable articulation. Column white, erect, 1.8-2.2 mm tall, 0.8-1 mm wide, with 2 long subulate acute stelidia at the apex and curved forward, apically slightly dilated column foot 1.4-1.6 mm long. Operculum white, simple, hemispheric, 0.3-0.4 mm across.

Etymology: Species name derives from name of the area of plant origin (Sin Ho district).

Flowering time: May-June.

Ecology: Primary and secondary evergreen broad-leaved forests on limestone at elevation 1200 - 1350 m a.s.l. Epiphyte and occasionally lithophyte on wet shady steep slopes.

Distribution: Vietnam (Lai Chau Province, Sin Ho District).

Notes: This unusual dwarf plant resembles Malayan *B. planibulbe* (Ridl.) Ridl. and *B. diplantherum* Carr. on its floral structure. From both mentioned species, as well as from other known species of *Desmosanthes* section it differs in very small size of plant and proportionally very large flowers. According to vegetative morphology, our plant certainly approaches to some species of section *Monilibulbus* J.J.Smith. This species may represent a local endemism of rocky limestone highlands of northwestern Vietnam.

Cheirostylis foliosa Aver., sp. nov. Figs. 2E & 7

Caulis parte basali foliosus foliis remotis. Flores 2.8-3.2 mm lg. Glandulae hypochilii jugis cristatis rectis altis conformae. Lobuli epichilii integri vel leviter denticulati.

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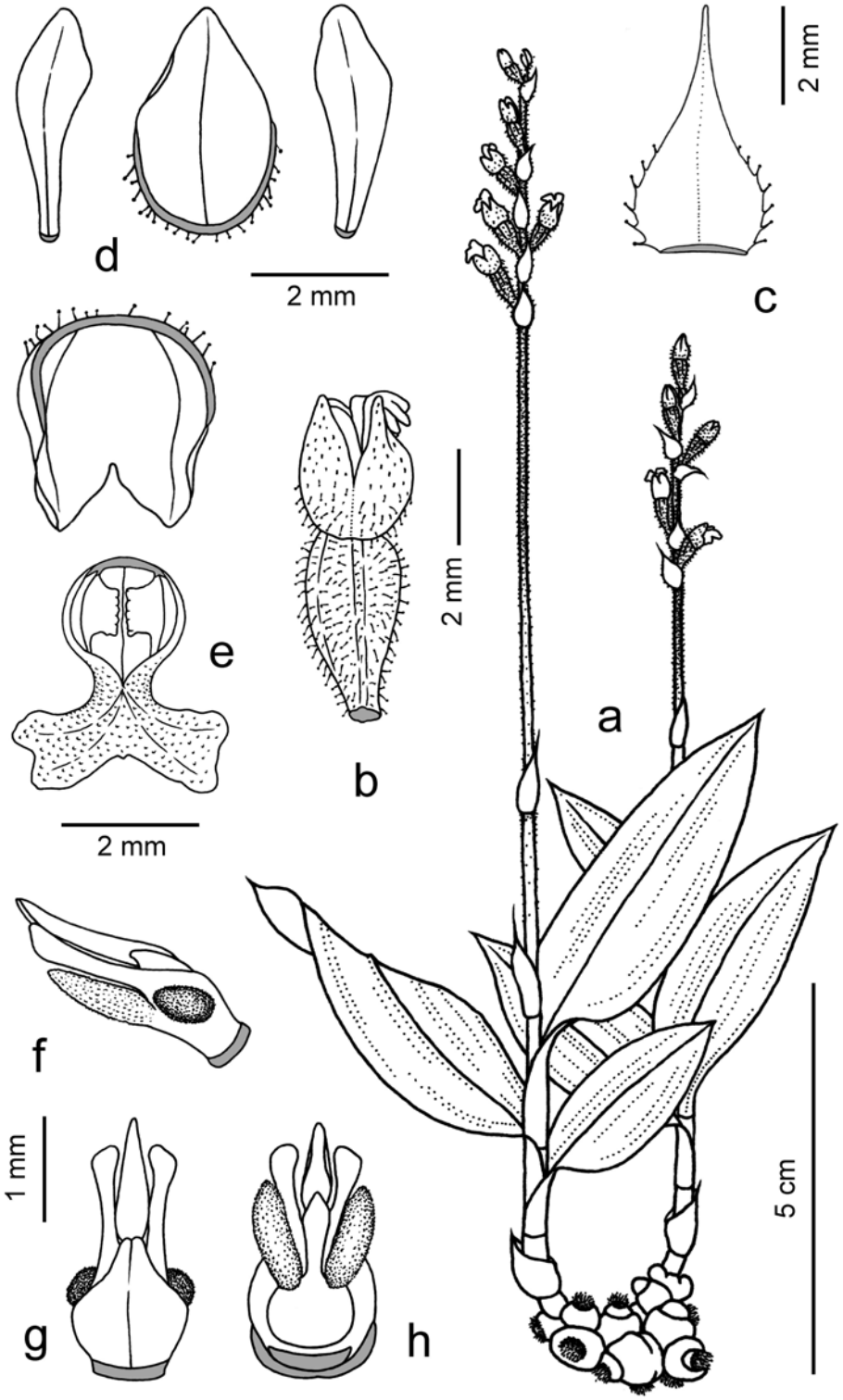


Fig. 7. *Cheirostylis foliosa* Aver. a: Flowering plant. b: Ovary and flower. c: Floral bract. d: Flattened sepals and petals. e: Flattened lip. f: Column, side view. g: Column, view from above. h: Column, view from below (all drawn from the type by author).

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Type: VIETNAM, Son La Prov., Moc Chau Distr., Chieng Hac Municipality, around point 20º51’50’’N 104º31’17’’E. Broad-leaved evergreen dry forest on steep slopes and on tops of ridge composed with rocky crystalline solid marble-like highly eroded limestone at elev. 1200-1300 m a.s.l. Lithophytic herb on mossy exposed rocks on top of ridge. Sepals olive-green, lip white. Very rare. 31 Oct. 2006. *Nguyen Tien Hiep, L.Averyanov, Pham Van The, HAL 9415* (Holotype, HN; Isotype, LE).

Lithophytic herb with erect floriferous stem and plagiotropic rhizome densely adpressed to rock crevices. Rhizome consist of numerous dense fleshy succulent swollen light green sub-spherical pseudobulb-like rootless internodes 4-7 mm across, each with dense tufts of numerous root hairs. Floriferous stem straight, 10-16 cm tall, 3-4 mm wide at the base, in lower third glabrous, with 2-4 leaves and 1-2 basal bracts. Leaves sessile or sub-sessile, with flat or slightly channeled petiole up to 7 mm long; leaf blade narrowly ovate, acute, 2.5-6 cm long, 1.5-2.2 cm wide, pure light green, sub-succulent, glossy. Scape 8-14 cm long, densely pubescent in upper part, with 1-3 hyaline acuminate bracts. Inflorescence sparse spike 1.5-2.5 cm long with 5-8 flowers and densely haired rachis. Floral bracts broadly-ovate, acuminate, sparsely glandular ciliate along margin, 5-6 mm long, 2-3.5 mm wide. Flowers hardly opening. Pedicel and ovary dark green, narrowly-ovate to ovate, 4-4.5 mm long, 2-2.2 mm wide, densely haired with glandular hairs. Sepals olive-green to dull pink-brown, sub-similar, 2.8-3.2 mm long, 1.8-2.2 mm wide, ovate, concave, connate half way to tip from base, sparsely pubescent with glandular hairs. Petals white, spathulate, falcate, broadening from narrow base to rhomboid rounded apex, 2.8-3.2 mm long, 0.7-0.9 mm wide, free, slightly shorter than sepals, sepals and petals densely connivent forming hood. Lip pure white, about 3.5 mm long and wide, distinctly separated into hypochile and epichile by constriction with very fleshy swollen papillose margins. Hypochile round, concave, cup-like, about 1.5 mm across, with 1 large longitudinal cristate straight ridge on each side. Epichile papillose, 1.2 mm wide, 2-lobed, with broad square lobes 1.2 mm wide; each lobe entire or with 2 indistinct rounded dents. Column about 2 mm long, 1.4 mm wide; anther cup lanceolate; rostellum arms narrowly spathulate, broadening to roundish apex, slightly shorter than anther cup; column wings shorter, thick, cylindrical, obtuse, with papillose surface; stigmas 2, lateral hemispheric, papillose.

Etymology: Leaves distant in lower third of floriferous stem (not arranged into rosette) is characteristic for this species, hence its name.

Flowering time: September-November.

Ecology: Broad-leaved forests on rocky crystalline solid marble-like highly eroded limestone at elev. 1200-1300 m a.s.l. Lithophyte on mossy rocky outcrops, commonly on mountain tops.

Distribution: Vietnam (Son La Province, Moc Chau District).

Note: This species may be related to *Ch. montana* Blume, from which it differs in much smaller flowers, cristate glands in hypochile and small simple or hardly toothed epichile lobules. Most probably, this rare plant is local endemic of karst rocky limestone of northwestern part of Vietnam associated with such rarest orchids, as *Paphiopedilum barbigerum* var. *coccineum* (Perner et R.Herrmann) W.Cavesrto.

Goodyera rhombodoides Aver., sp. nov. Fig. 8

Plantae terrestres ad 15 cm alt. Folia 3-5, 1.5-2.5 cm lg., 0.8-1.4 cm lt., atroviridia vitta mediana alba. Inflorescentia floribus 3-6 remotis. Flores ad 1 cm in diam. Labium 5.5-6.5 mm lg. Hypochilium hemispaericum, intus densiter pilosum. Epichilium oblongo ligulatum, obtusum. Columna 2.5-3 mm alt., alis anterioribus brevibus.

Type: VIETNAM, Lai Chau Prov., Tam Duong Distr., Ho Thau Community, Ho Thau village, around point 22°23’49’’N, 103°36’39’’E. Primary closed evergreen broad-leaved forest on steep mountain slopes and along ridges composed with granite and shale at elev. about 1900-2350 m a.s.l. Terrestrial creeping herb on very steep rocky shady slopes and along ridge edge. Leaves velvety dark green with median whitish stripe. Occasional. 3 Dec. 2006. *Nguyen Tien Hiep, L.Averyanov, Pham Van The., HAL 10338* (Holotype, HN; Isotype, LE).

Terrestrial herb with creeping rhizome and ascending leafy floriferous stem. Rhizome 5-10 cm long, green, juicy, rooting at nodes. Floriferous stem 12-15 cm tall, with 3-5 leaves at the base. Leaves petiolate; petiole and sheath 5-12 mm long, 1-2 mm wide; leaf blade ovate, sometime slightly oblique, acute, 1.5-2.5 cm long, 0.8-1.4 cm wide, velvety dark green to olive-green, with distinct whitish median stripe. Scape 3-5 cm long, short densely hairy, with 2-3 yellowish-hyaline, cuneate, acuminate, sub-glabrous, bracts 5-8 mm long, 0.5-1.5 mm wide; rachis lax flowered, normally with 3-6 flowers. Floral bracts yellowish-hyaline, cuneate, acuminate, sub-glabrous or sparsely hairy, conduplicate, 6-10 mm long, 0.5-1.5 mm wide. Pedicel and ovary dark green, 4.5-6 mm long, 0.8-1 mm wide, cylindric,

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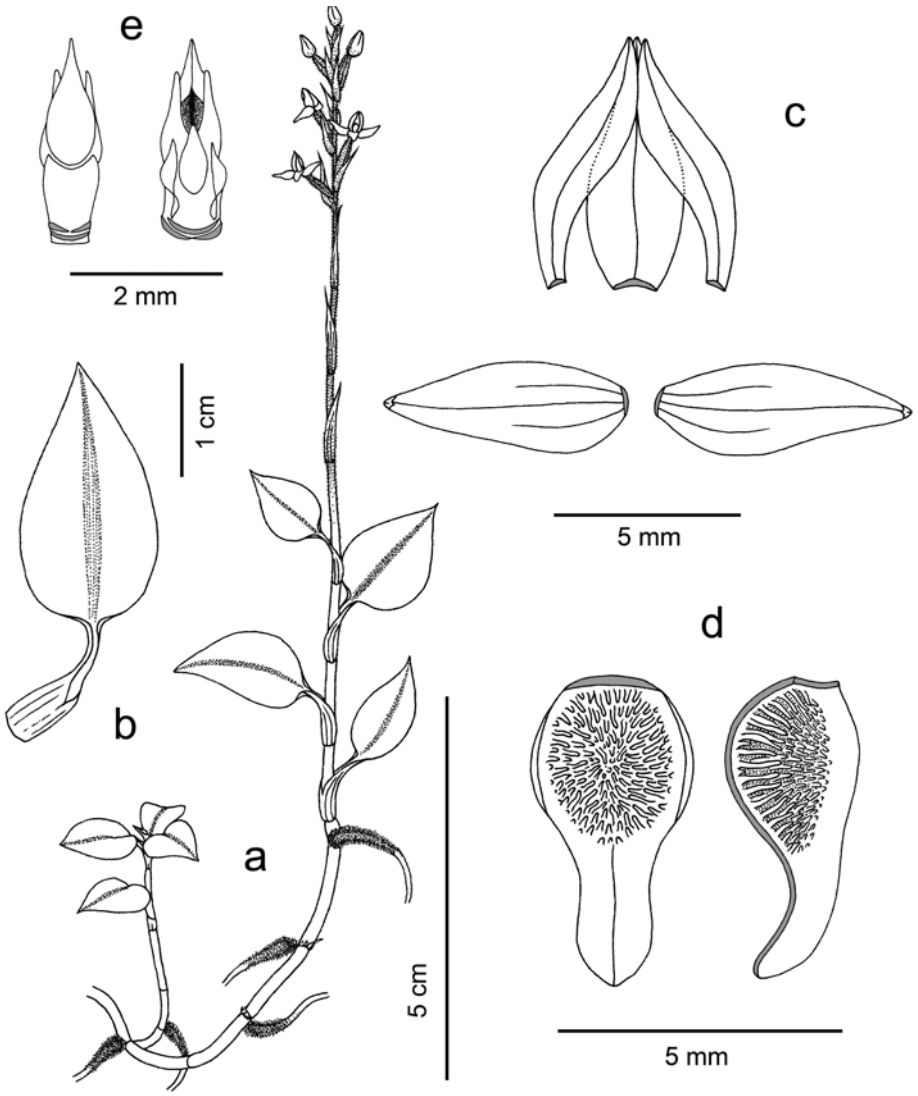


Fig. 8. *Goodyera rhonmbodoides* Aver. a: Flowering plant. b: Leaf. c: Flattened sepals and petals. d: Flattened lip, view from above, and lip longitudinal section. e: Column, dorsal and ventral and dorsal view (all drawn from the type by author).

short densely hairy, twisted. Flowers about 1 cm across, not widely opening. Sepals sub-glabrous, sub-similar, narrowly ovate. Dorsal sepal 6-7 mm long, 2-2.5 mm wide, with 1 nerve, obtuse, forward directed. Lateral sepals 6-7 mm long, 2.5-3 mm wide, slightly oblique, with 3 nerves, obtuse, cucullate, reflexed at a right angle. Petals glabrous, lanceolate, 6-7 mm long, 1-1.4 mm wide, 1-nerved, oblique, densely connivent with the dorsal sepal forming forward directed hood. Lip 5.5-6.5 mm long, about 2.5 mm wide, distinctly divided into hypochile and epichile. Hypochile concave, hemispheric, cup-like, about 2 mm across, densely hairy with long hairs inside. Epichile 2.5-3 mm long, 2-2.5 mm wide, entire, oblong-ligulate, slightly concave, obtuse to blunt at the apex. Column 2.5-3 mm tall, with 2 short vertical wings at front. Anther narrowly-ovate, acuminate, 1.6-1.8 mm long, 0.7-0.8 mm wide.

Etymology: In vegetative features (particularly in leaf coloration) species resembles some representatives of the genus *Rhomboda* (namely *R. petelotii* (Gagnep.) Ormerod, common in studied area), hence originates its specific name.

Flowering time: September – November.

Ecology: Primary broad-leaved evergreen forests on granite and shale at elev. 1900-2400 m a.s.l. Terrestrial creeping herb commonly on very steep slopes and on mountain tops.

Distribution: Vietnam (Lai Chau Province, Tam Duong District).

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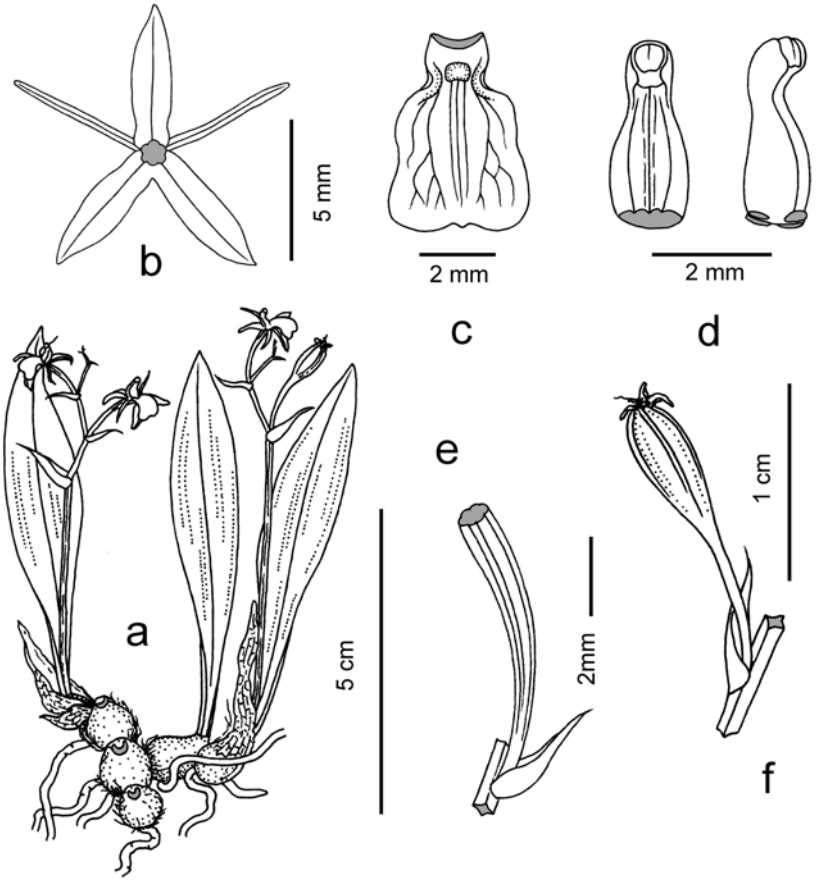


Fig. 9. *Liparis rivularis* Aver. a: Flowering plant. b: Flattened sepals and petals (view from behind). c: Flattened lip. d: Column, frontal and side view. e: Pedicel and ovary. f: Fruit (all drawn from the type by author).

Note: On floral structure species resembles *Goodyera foliosa* (Lindl.) Benth, but distinctly differs in twice smaller flowers, small size of plant and in small, dark velvety green leaves with distinct white longitudinal median stripe. Described species is probably local endemic of highland montane areas located in north-western part of Vietnam.

Liparis rivularis Aver., sp. nov. Figs. 2F & 9

Plantae lithophyticae ad 8 cm alt. Pseudobulbi monophylli. Folia late lanceolata. Inflorescentia 4-6 cm alt., laxa, apice uni-triflora. Flores 6-7 mm in diam. Sepala petalaque mononervia. Labium rectangulare, truncatum, basi callo hemisphaerico. Columna exalata.

Type: Vietnam, Lai Chau Prov., Tam Duong Distr., Ho Thau Community, Ho Thau village, around point 22°25’20’’N, 103°36’13’’E. Primary closed evergreen broad-leaved wet cloudy ericaceous forest on very steep mountain slopes and on tops of ridge composed predominantly with shale at elev. about 2600-2700 m a.s.l. Lithophytic clustering herb on wet streamlet mossy rocks. Flowers light orange. Locally very common. 7 Dec. 2006. *Nguyen Tien Hiep, L.Averyanov, Pham Van The, HAL 10443* (Holotype, HN; Isotype, LE).

Paratypes: Vietnam, Kontum Prov., evergreen primary forest along stream on N slope of Ngoc Linh mountain system at 1700 m alt. Lithophyte on open shadow rocks. Common at 1700 m alt. 13 March 1995. *L.Averyanov, et al., VH 736* (HN, LE). Vietnam, Lam Dong Prov., Lac Duong Distr., Da Chay Municipality, 32.5 km to NE from Dalat city. Closed primary broadleaved montane forest along very wet deep stream canyon on NNW slope of Bi Dup mountain system in 6-7 km to NNW from main peak at 1600 m alt. (12°07'N, 108°41' E). Lithophyte on open wet stream rocks, especially near waterfalls. Not common. 30 March 1997. *L.Averyanov, N.Q.Binh, P.K.Loc, VH 3406* (HN, LE).

Lithophytic herb 4-8(10) cm tall. Pseudobulbs densely clustered, oblique ovoid to sub-globose, 5-9 mm tall and across, at the base with fibrous remnants

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of early decaying papyraceous bracts, apically with 1 leaf having articulation at the base. Leaves rigid, conduplicate, keeled, arising from the apex of pseudobulb, broadly-lanceolate to narrowly-ovate, acute, 3-7 cm long, 0.8-1.2 cm wide, sessile or narrowing into short petiole-like base 5-1.2 mm long. Inflorescence erect, usually with 1-3 lax flowers, 4-6 cm tall. Inflorescence stalk square in section, commonly 3-5 cm long, ebracteate. Rachis zigzag curved, square in section. Pedicel and ovary longitudinally ridged, 6-8 mm long, 0.5-0.8 mm wide. Floral bracts narrowly-triangular to cuneate, acuminate, hyaline or light green, with one indistinct median vein, 4-7 mm long, 1-1.5 mm wide, shorter that ovary. Flowers 6-7 mm across, light olive, yellowish-brown to light dull orange. Sepals sub-similar, broadly-lanceolate, obtuse, with revolute edges, reflexed, with 1 prominent vein, 5-5.5 mm long, 1.4-1.5 mm wide. Petals linear, obtuse, with revolute edges, reflexed, with 1 vein, 5-5.5 mm long, 0.4-0.5 mm wide. Lip oblong- rectangular, 5 mm long, 3.5-4 mm wide, narrowing to the base, strongly recurved at basal third, with prominent hemispheric callus at the base, apex broadly-truncate, sometimes with small blunt median tooth. Column straight, slightly curved toward the apex, without wings or apically with very insignificant ears on each side, bottle-like, fleshy at the base, 2.5-3 mm long, 1.3-1.4 mm wide. Fruit narrowly-obovoid capsule, 8 mm long, 2-3 mm wide on stalk 5-7 mm long.

Etymology: Species name reflects typical habitat of the plant growing commonly on rocky cliffs along small mountain rivers and streams.

Flowering time: November-December.

Ecology: Broad-leaved evergreen montane forests on shale, sandstone and granite at elev. about 1600-2700 m a.s.l. Lithophyte on shady wet mossy cliffs of small mountain rivers and streams, often along waterfalls.

Distribution. Vietnam (Lai Chau Province, Tam Duong District, Kontum Province, Lam Dong Province, Lac Duong District).

Note: Morphologically our plant may be close to *L. luteola* Lindl., from which it distinctly differs in 1-leaved pseudobulbs, smaller and broader leaves and regularly lithophytic habit. This dwarf unattractive small flowering plant is typical element of highland Vietnamese flora. In *locus classicus* described species was alone orchid observed higher than 2400 m a.s.l. Nevertheless, it may be certainly common in many highland areas of Vietnam, which still not botanically explored. *Liparis rivularis* regularly inhabits shady wet rocks and cliffs along small mountain rivers and streams, where often forms large dense colonies immersed into thick moss cover. Sometimes plants are shortly flooded with high water during summer torrential rains. Sporadic flowering specimens were collected in November-December. However, regular flowering of this species may be observed in June-July.

Oberonia multidentata Aver., sp. nov. Figs. 2G & 10

Folia 3-4, plus minusve plana, basi non articulata. Inflorescentia 3-5 cm lg. Bracteae florum ovatae, denticulatae. Flores 1.2-1.5 mm in diam. Sepala ovata, integra. Petala anguste ovata vel ovata, eroso-denticulata. Labium trilobum. Lobi labii laterali semirotundi, profunde laciniati dentibus multis regularis cuneatis. Lobus medius rectangularis, truncatus, integer.

Type: Vietnam, Lai Chau Prov., Sin Ho Distr., Ma Quai Municipality, Can Ti 2 village, around point 22º24’18’’N, 103º22’45’’E. Remnants of broad-leaved evergreen closed primary and secondary forest on steep mountain slopes composed with sandstone and limestone at elev. about 1200 m a.s.l. Epiphyte on tall mossy trees. Flowers orange. Rare. 16 Nov. 2006. *Nguyen Tien Hiep, L.Averyanov, Pham Van The, HAL 9839* (Holotype, HN; Isotype, LE).

Miniature acaulescent epiphyte, with 3-4 close, rosulate, imbricate, laterally compressed, flat leaves. Leaves broadly-lanceolate, ensiform, straight or slightly falcate, acute, 3-8 cm long, 0.6-1.2 cm wide, not articulate at the base (subgenus *Menophyllum* Schlechter). Inflorescence 3-4 cm long, dense, many-flowered. Scape 1-1.5 cm long, 1-1.5 mm wide, covered with numerous narrowly cuneate, acuminate bracts. Rachis 2.5-3.5 cm long, thick, longitudinally ridged with many spirally arranged flowers, truncate. Floral bracts triangular-ovate, acute, with 2-3 large dents along each side, 0.8-1.5 mm long, 0.5-0.6 mm wide, more or less reflexed, shorter or slightly longer than flowers. Pedicel and ovary cylindrical, 0.8-0.9 mm long. Flowers yellow-orange, widely opening, 1.2-1.5 mm across. Sepals sub-similar, ovate, with entire margins, concave, acute, 0.5-0.7 mm long, 0.4-0.5 mm wide, often reflexed. Petals ovate to narrowly-ovate, slightly longer than sepals, finely erose-dentate along margin. Lip 3-lobed, 0.9-1.1 mm long and wide, with concave fovea at the base. Side lobes large, broad, semi-circular, deeply laciniate into numerous narrowly-cuneate regular acute dents. Median lobe rectangular, with entire edges, truncate, longer than

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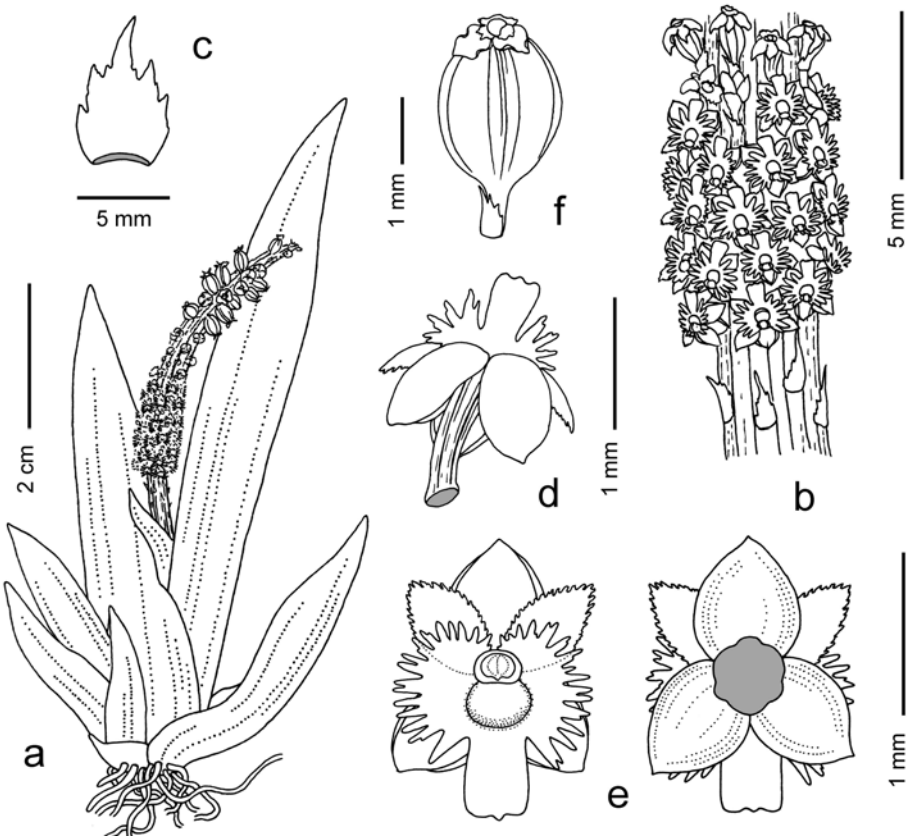


Fig. 10. *Oberonia multidentata* Aver. a: Flowering plant. b: Fragment of inflorescence. c: Floral bract. d: Pedicel, ovary and flowers, side view. e: Flower, frontal view and view from behind. f: Fruit (all drawn from the type by author).

side lobes, sometimes with small blunt median dent. Column short, stout, 0.2-0.3 mm tall and wide. Anther cup hemispherical, 0.15-2 mm across. Fruit obovoid, stalked, longitudinally ridged capsule 1.8-2.2 mm long, 1.2-1.5 mm wide.

Etymology: Species name reflects specific appearance of the lip side lobes dissected into numerous long and narrow, regular dents.

Flowering time: September-November.

Ecology: Broad-leaved evergreen forests on limestone and sandstone at elev. about 1200 m a.s.l. Canopy epiphyte on tall trees.

Distribution: Vietnam (Lai Chau Province, Sin Ho District).

Note: Species may be more or less close to such Indochinese endemics as *O. rasmussenii* Seidenf. and *O. quadridentata* Aver., which also have dentate lip side lobes. Our plant distinctly differs from both these species in numerous long narrowly cuneate regular dents of side lobes, in thick truncate inflorescence rachis and in few broad leaves. All mentioned plants are probably local endemics with very limited distribution.

Oberonia trichophora Aver., sp. nov. Fig. 11

Folia 4-6, succulenta, basi articulata. Inflorescentia 12-14 cm lg. Bracteae florum ovatae, apice longe filiformiter attenuatae. Flores 1-1.5 mm in diam. Sepala ovata, integra. Petala ovata. Labium trilobum, eroso-dentatum.

Type: Vietnam, Lai Chau Prov., Sin Ho Distr., Ma Quai Municipality, Can Ti 2 village, around point 22º24’18’’N, 103º22’45’’E. Remnants of broad-leaved evergreen closed primary forest on steep mountain slopes composed with sandstone at elev. about 1100 m a.s.l. Epiphyte on tall mossy trees. Flowers orange. Not common. 17 Nov. 2006. *Nguyen Tien Hiep, L.Averyanov, Pham Van The, HAL 9854* (Holotype, HN; Isotype, LE).

Miniature epiphyte with very short, abbreviated stem 1-2 cm long and 4-6 close, rosulate, imbricate, slightly laterally compressed or almost cylindrical, very fleshy, succulent subulate leaves. Leaves lanceolate-ensiform, straight, or slightly falcate, obtuse, ovate or almost round in section, 2-8 cm long, up to 6 mm wide, articulate at the base (subgenus

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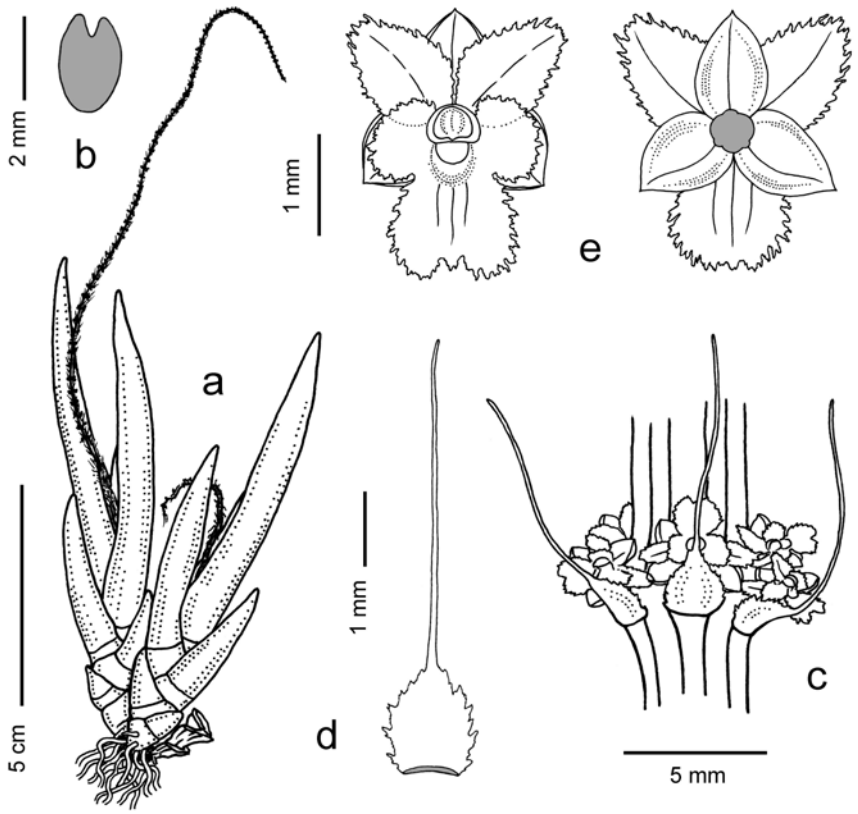


Fig. 11. *Oberonia trichophora* Aver. a: Flowering plant. b: Leaf transect. c: Fragment of inflorescence. d: Floral bract. e: Flowers, frontal view and view from behind (all drawn from the type by author).

Oberonia). Inflorescence 12-14 cm long, many-flowered, much longer than leaves. Scape 1.5-2 cm long, covered with numerous thread-like whitish bracts. Rachis 10-12 cm long, longitudinally ridged; flowers usually arranged in distant regular whorls, each with 7-9 flowers. Floral bracts broadly-ovate to ovate, irregularly-dentate along margin, 1.2-1.7 mm long, 0.8-1.2 mm wide, reflexed and spreading, suddenly drawn at the apex into very long hair-like whitish thread 5-7 mm long, much longer than flowers. Pedicel and ovary 0.9-1.1 mm long. Flowers orange, widely opening, 2-2.5 mm across. Sepals sub-similar, ovate, with entire edges, concave, obtuse to acute, 1-1.8 mm long, about 0.8 mm wide. Petals ovate, slightly longer than sepals, distinctly erose-dentate along margin. Lip distinctly 3-lobed, square in outline, 1.5-1.7 mm long and wide, with concave round fovea at the base, irregular erose-dentate along all margin. Side lobes orbicular to obliquely-ovate, about 0.6-0.7 mm long and wide. Median lobe orbicular to obovate, 0.8-1 mm across, emarginate, usually with small central dent. Column short, stout, 0.3-0.4 mm tall and wide. Anther cup hemispherical, about 0.2-0.3 mm across.

Etymology: Species name reflects characteristic appearance of scape and inflorescence rachis covered with numerous long thread-like bracts.

Flowering time: October-December.

Ecology: Broad-leaved evergreen forests on sandstone at elev. about 1100 m a.s.l. Canopy epiphyte on tall trees.

Distribution: Vietnam (Lai Chau Province, Sin Ho District).

Note: This rare species superficially resembles *O. langbianensis* Gagnep., known from southern Vietnam, but strikingly differs in numerous long-pointed thread-like floral bracts. Probably, this species is local endemic of mountain regions of northwestern part of the country.

Sunipia nigricans Aver., sp. nov. Figs. 12 & 13

Inflorescentia erecta, 7-12 cm lg., 15-22-flora. Flores late aperti, atroviolacei vel subnigri, 8-12 mm in diam. Pollinarium unum, polliniis 4 globularibus in caudicula communi indivisa dispositis.

Type: VIETNAM, Lai Chau Prov., Phong Tho Distr., Sin Suoi Ho Municipality, Sa Ma Pho village,

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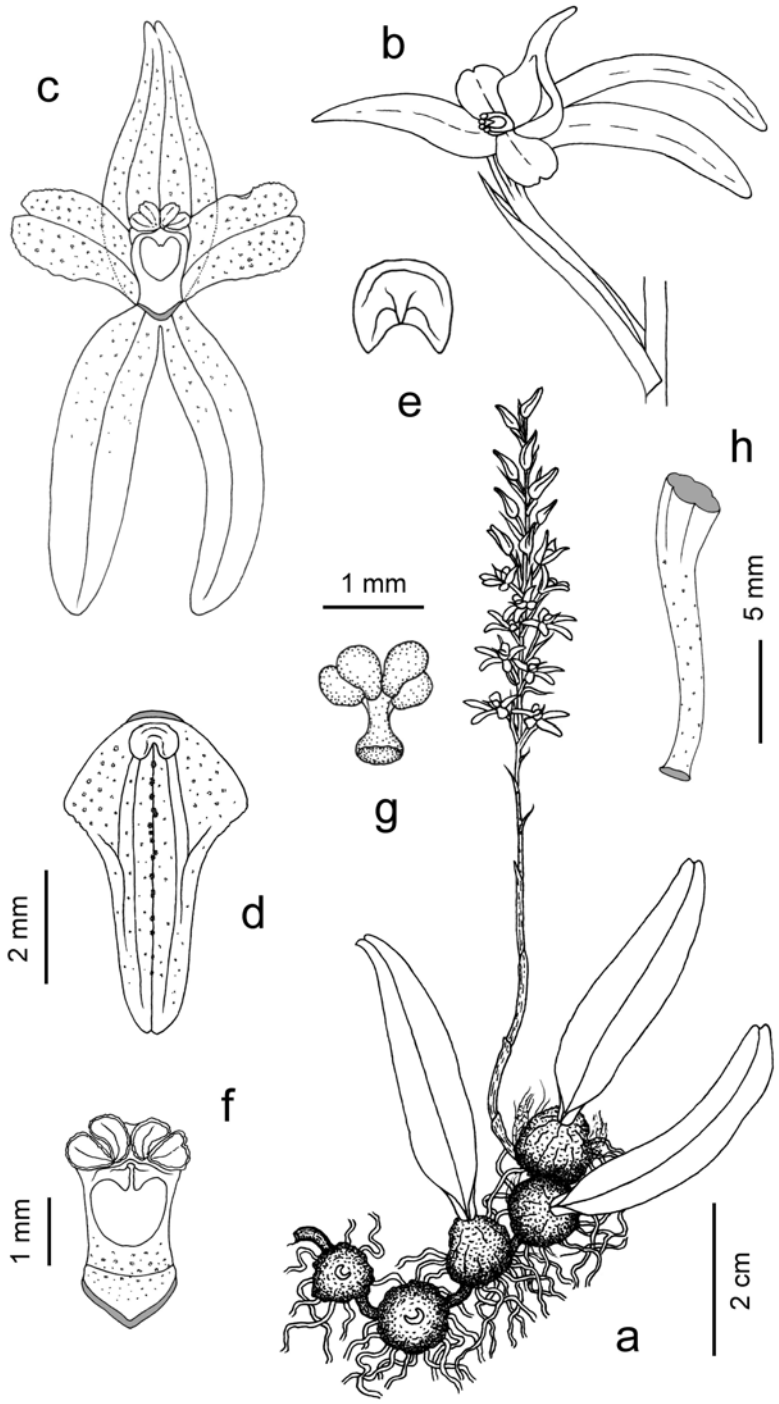


Fig. 12. *Sunipia nigricans* Aver. a: Flowering plant. b: Flower, side view. c: Flattened flower, frontal view. d: Flattened lip. e: Lip basal callus. f: Column, frontal view. g: Pollinarium. h: Pedicel and ovary (all drawn from the type by author).

around point 22°32’17’’N, 103°32’41’’E. Secondary open evergreen broad-leaved dry forest and secondary woodlands on very steep mountain slopes composed predominantly with weathered granite at elev. about 1200-1400 m a.s.l. Creeping epiphyte in canopy of tall tree on steep shady rocky slope along stream. Occasional. 15 Dec. 2006. *Nguyen Tien Hiep, L.Averyanov, Phan Ke Loc, Pham Van The, Nguyen. Tien .Vinh, HAL 10792a.* (Holotype, HN; Isotype, LE).

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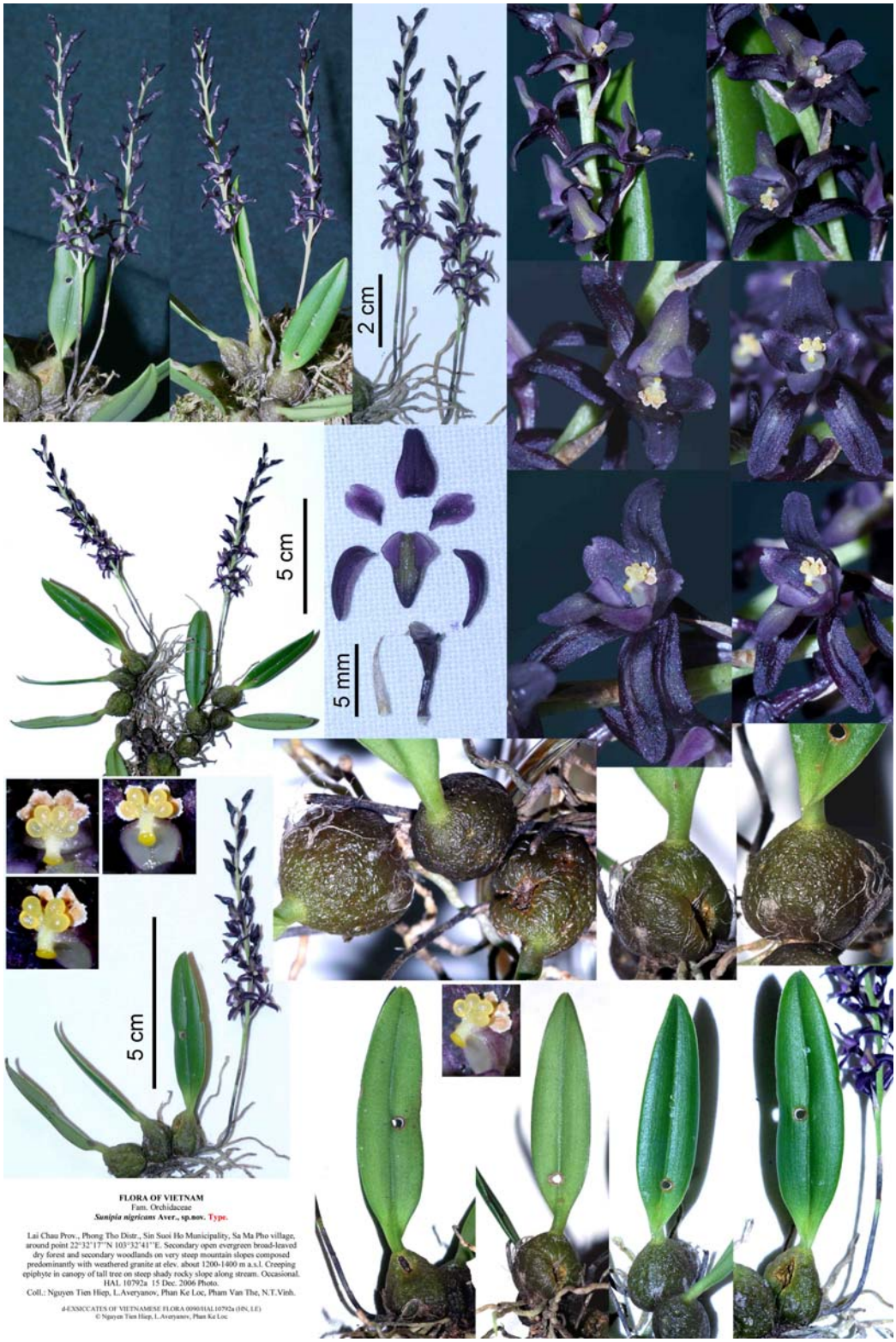


Fig. 13. *Sunipia nigricans* Aver. Digital herbarium specimen of the type (*HAL 10792a*).

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Creeping epiphyte. Rhizome rigid, dark gray, 1.5-2 mm thick, with 6-10 close pseudobulbs and numerous rigid wiry flexuose roots. Pseudobulbs broadly-ovate to sub-spherical, 7-10 mm across, green with purple-brown
tint, finely verrucose, later finely wrinkled with 1 apical leaf. Leaves rigid, coriaceous, erect, oblong-lanceolate, conduplicate, slightly unequally bilobed at apex, 3-5 cm long, 0.5-0.9 cm wide. Inflorescence arising from the base of pseudobulb, sub-dense raceme 4-6 cm long, commonly with 15-22 flowers, on erect rigid stalk, usually 4-5 cm long, covered with 3-6 black close narrow sheaths. Floral bracts yellowish, narrowly-cuneate, acute, 4-6 mm long, less than 1 mm wide. Pedicel and ovary sub-erect, dark-violet, 5-6.5 mm long, 0.5-1 mm wide. Flowers not resupinate, widely opening, with light unpleasant smell. Tepals dark violet to nearly black, straight, rigid. Median sepal narrowly-ovate, bilobed at apex, 5-6 mm long, 2.5-3.5 mm wide, with 3 distinct nerves. Lateral sepals free, narrowly-oblong, obtuse, 5-6 mm long, 2-2.5 mm wide, with 1 nerve. Petals obovate to broadly-obovate, broadly-obtuse and retuse at apex, 2.6-3 mm long, 2.2-2.6 mm wide, with 1 nerve. Lip dark violet with dull greenish-violet center, fleshy, ovate triangular, 5-6 mm long, 3-4 mm wide, indistinctly trilobe, with small bifid callus at the base, finely warty along midvein; median lobe oblong, sometimes shortly emarginate at apex, side lobes broadly-triangular with obtuse to roundish apex. Column dark to light violet, fleshy, shortly-cylindrical, 2-2.4 mm tall, 1.5 mm wide, with very short column foot and persistent, immobile operculum. Pollinia 4, solid, yellow, pyriform to nearly spherical, 0.5 mm across, on 1 fleshy, short, white, cylindrical stipe, 0.6-0.8 m long, terminated with large hemispheric viscidium.

Etymology: Species is named after dark violet, nearly black color of flowers.

Flowering time: March – April.

Ecology: Primary and secondary evergreen broad-leaved forests and secondary woodlands on steep granite mountain slopes at elevation 1200-1400 m a.s.l. Creeping epiphyte in canopy of tall trees.

Distribution: Vietnam (Lai Chau Province, Phong Tho District).

Note: From all known representatives of the genus, our plant strikingly differs in alone common unbranched pollinarium stipe terminated with 4 pyriform or spherical solid pollinia. According to this features described species occupies obviously isolated taxonomical position in the genus. Probably, this rare strictly endemic plant has very limited distribution in mountain regions of northern-western Vietnam.

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越南蘭科新種

Leonid V. Averyanov[1]

(收稿日期：2007 年 7 月 15 日；接受日期：2007 年 9 月 5 日)

摘　　要

2005-2007 年在越南野外採集的標本經鑑定後發現 10 種蘭科新種，分別命名為 *Anoectochilus papillosus, Arundina caespitosa, Bulbophyllum paraemarginatum, B. sinhoënse, Cheirostylis foliosa, Goodyera rhombodoides, Liparis rivularis, Oberonia multidentata, O. trichophora* and *Sunipia nigricans*，並提供繪圖及描述。

關鍵詞：蘭科、分類、*Anoectochilus papillosus, Arundina caespitosa, Bulbophyllum paraemarginatum, Bulbophyllum sinhoënse, Cheirostylis foliosa, Goodyera rhombodoides, Liparis rivularis, Oberonia multidentata, Oberonia trichophora, Sunipia nigricans*, 新種、越南。

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