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New orchids from Vietnam

L. V. Averyanov, A. L. Averyanova

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One genus (*Hamularia*) and 17 species of orchids (*Bromheadia annamensis*, *Bulbophyllum lockii*, *Cheirostylis latipetala*, *Cleisostoma melanorachis*, *C. subulifolium*, *Eria chlorantha*, *Gastrodia tonkinensis*, *Habenaria harderi*, *Hamularia puluongensis*, *Hemipilia discolor*, *Liparis petraea*, *L. tripartita*, *Odontochilus echinatus*, *Panisea vinhii*, *Thrixspermum hiepii*, *T. stelidioides*, *Trias nummularia*) recently discovered in Vietnam are described and illustrated as new to science. Three more combinations in *Hamularia* are also proposed. All discoveries are based on herbarium material collected in Vietnam during the expeditions of 2000–2004.

The paper continues our publications of the new orchid species discovered by the first author and his colleagues in remote unexplored mountain areas of Vietnam (Averyanov 1988a, b, 1989, 1998, 1999, 2000; Averyanov & Duong Duc Huyen 1993; Averyanov *et al.* 2000; Averyanov & Averyanova 2003). The plants described here were collected mainly during the last four years. All names are arranged in the paper in alphabetical order. References to the floristic provinces are given according to Averyanov *et al.* (2003). The following abbreviations are used to denote the collection numbers:

DKH – Dr. D. Harder (collections made in expeditions with him as the Principal Investigator),

HAL – Dr. Nguyen Tien Hiep, Prof. L. Averyanov, Prof. Phan Ke Loc (collections in their collaborative explorations),

HLF – collections of Vietnam Training Botanical Conservation Programme supported by the Henry Luce Foundation,

LX-VN – collections of Soviet-Vietnamese Expedition (without references to collectors),

NTH – Dr. Nguyen Tien Hiep (collections made in expeditions with him as the Principal Investigator),

P – Prof. Phan Ke Loc (collections made in expeditions with him as the Principal Investigator),

VH – Vietnamese Highlands (collections of the program of U.S.A. National Geographic Society “Flora of Highlands of South Vietnam”, Principal Investigator Prof. L. Averyanov).

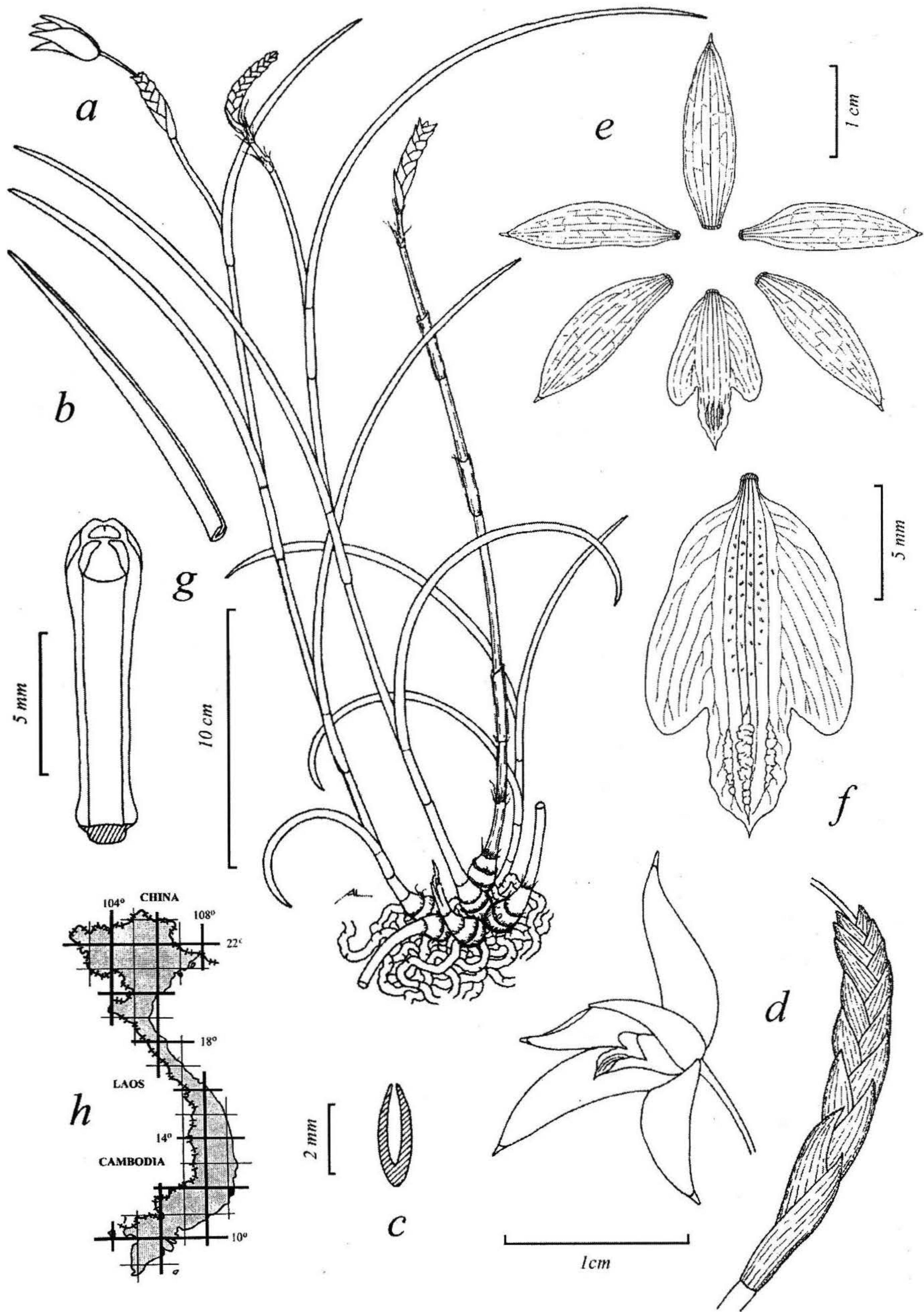


Fig. 1. *Bromheadia annamensis*:
 a – flowering plant; b – leaf; c – form of transverse leaf section; d – flower and inflorescence rachis; e – flattened sepals, petals and lip; f – flattened lip; g – column; h – distribution map (all drawn from the type by the authors).

***Bromheadia annamensis* Aver. et Averyanova, sp. nova**

Characteres diagnostici. *Lobi labii lateralis late obtusi, lobi medii terni, carinati, acuti vel apiculati; discus laevis (non calliferus).*

Type: S Vietnam, Ninh Thuan Prov., Ninh Hai Distr., Vinh Hai Municipality, NEE slopes on Nui Chua Mt. to SW of the point 11°43'52" N, 109°08'35" E at elev. about 600–700 m a.s.l. Primary evergreen closed dry forest on rocky montane slopes composed of granite. Humus epiphyte on high trees. Occasional. 27 March 2004, *J. Regalado, Nguyen Tien Hiep, Phan Ke Loc, L. Averyanov et al. HLF 4234* (HN, holotype; iso – LE).

Related species. *B. ensifolia* J.J.Smith, *B. gracilis* Kruizinga et de Vogel, *B. graminea* Kruizinga et de Vogel, *B. grandiflora* Kruizinga et de Vogel.

Diagnostic features. Broad obtuse lip side lobes; disc of the lip smooth without any callosities; three-keeled, acute to apiculate lip mid-lobe.

Sympodial epiphyte with numerous clustered erect stems up to 40 (45) cm tall, about 3 mm thick, terete or slightly flattened, with numerous thick densely wiry flexuous roots at the base. **Stem** with 3–5 leaves, not entirely covered by leaf sheaths, thickened at the base, adpressed to short woody rhizome; internodes 4–7 cm long, terminal internode equal to or a little shorter than others. **Leaves** rigid, linear, strongly conduplicate and laterally flattened, curved, 10–20 cm long, 5–6 mm wide (when flattened), acute, with articulation at the base of the blade; sheaths 1.5–3 cm long, embracing the stem and densely adpressed to it. **Inflorescence** terminal, unbranched (rarely with 1–2 short additional small branches) raceme, 1–2.5 cm long, 3–4 mm broad, with 7–30 hard persistent conduplicate, acute bracts; bracts 3–15 mm long, 2–3 mm wide; 2–3 basal bracts sterile. **Flowers** odorless, 2–3 cm across; sepals and petals pure white; lip white outside, yellow inside with purple-striped or entirely purple side lobes; column white, at front heavily streaked with purple; anther cup white. **Pedicel and ovary** 10–14 mm long, less than 1 mm thick. **Sepals** broadly lanceolate to narrowly ovate, 5 (7)-nerved, shortly acuminate; median sepal 20–22 mm long, 5–5.2 mm wide; lateral sepals oblique, 18–20 mm long, 5–5.1 mm wide. **Petals** oblique, broadly lanceolate to narrowly ovate, 5 (7)-nerved, shortly acuminate, about 20 mm long, 5.5–6 mm wide. **Lip** trilobed, 15–16 mm long, 9–10 mm wide (when flattened), flat, smooth (without any callosities) at the center, with sparsely scattered small insignificant hairs; side lobes erect, broad, at the apex semicircular, 2–3 mm long, 3–4 mm wide; mid-lobe triangular ovate, acute to apiculate, 5–5.5 mm long, about 3.5 mm wide, with 3 irregular slightly swollen keels. **Column** 10–11 mm long, 3 mm wide, with narrow lateral wings, truncate or shortly emarginate at the apex, anther cup hemispherical, about 1 mm across. Fig. 1.

Flowering period. May – July.

Ecology. Humus epiphyte. Broad-leaved evergreen closed dry submontane forests on granite at 600–700 m a.s.l.

Distribution. Vietnam (Ninh Thuan: Nui Chua Mts.). Fig. 1(h).

Etymology. The species name refers to the old name of its distribution area limited by the central part of southern Vietnam (Annam).

Notes. Our plant may be related to the species with similarly narrow conduplicate laterally compressed leaves, such as *Bromheadia ensifolia*, *B. gracilis*, *B. graminea* and *B. grandiflora*. They all have Malesian origin like *B. tenuis* J.J.Sm. recently discovered also

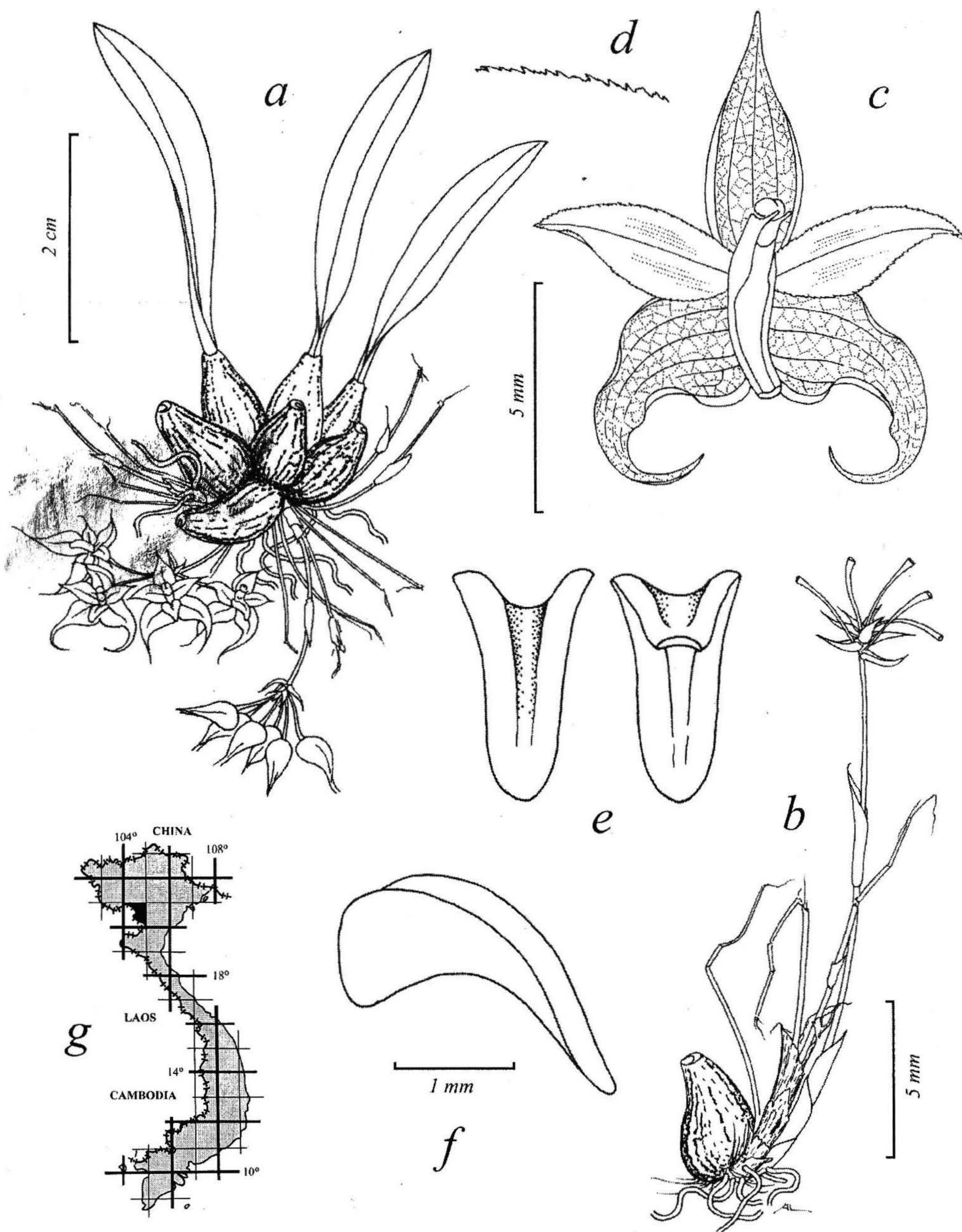


Fig. 2. *Bulbophyllum lockii*:

a – flowering plant; *b* – mature pseudobulb with several annual inflorescences; *c* – flower with flattened tepals (except lip); *d* – lip, side, frontal and back views; *e* – distribution map (all drawn from the isotype by the authors).

in southern Vietnam (Averyanov 1999). The discovery of *B. tenuis* was the first record of this genus for Vietnam, expanding the known area of *Bromheadia* to the NE. *B. annamensis* differs from all known species of *Bromheadia* in broad obtuse lip side lobes and three-keeled, acute mid-lobe, as well as in flat smooth disc of the lip having no callosity. The species is probably a strict endemic of the eastern part of South Indochinese floristic province.

***Bulbophyllum lockii* Aver. et Averyanova, sp. nova**

Characteres diagnostici. *Pseudobulbi arcte approximati, aliquot inflorescentiae annuae evolventi; sepala valde obliqua, acuminata, apice curvata; petala serrulata.*

Type: N Vietnam, Hoa Binh Prov., Mai Chau Distr., Pa Co Municipality, 20°44'33" N, 104°53'54" E, elev. about 1150–1250 m. In logged primary closed evergreen tropical seasonal submontane coniferous forest (with *Pinus kwangtungensis*) on top ridges of limestone mountains. Epiphyte. Rare. 2 December 2003, *Phan Ke Loc P 10687* (HN, holotype; iso – LE).

Related species. *B. ngoclinense* Aver., *B. pinicola* Gagnep., *B. semiteretifolium* Gagnep., *B. tixieri* Seidenf.

Diagnostic features. Close clustered pseudobulbs developing several annual inflorescences; strongly oblique sepals, acuminate and curved at the apex; finely serrate petals.

Sympodial epiphyte with 1-leaved pseudobulbs closely clustered in large dense groups. **Rhizome** short, insignificant. **Roots** numerous, narrow, wiry, at the pseudobulb base. **Pseudobulbs** narrowly ovoid to ovoid, green to purple-brown, finely longitudinally wrinkled, 9–11 mm tall, 3–4 mm broad. **Leaf** 1, narrowly elliptic to lanceolate, 3–3.5 cm long, 0.6–0.7 cm wide, acute at the apex, narrowing to the base into short petiole 2–5 mm long, about 1 mm wide. **Inflorescence** 1 (annual), (1) 2–5 (6)-flowered, umbelliform, developing from the base of pseudobulbs (a mature pseudobulb develops successively up to 5 annual inflorescences), shorter than a half of the leaf length. **Inflorescence stalk** filiform, more or less rigid, glabrous, 1–2 cm long, ascendant, horizontal or pendent, with 3–5 broad and short hyaline scales at the base and 1 narrow acuminate bract at the middle, rachis very short, less than 1 mm long. **Floral bracts** narrowly triangular, with broad base, acute to acuminate at the apex, 1.5–2.5 mm long, 0.3–0.5 mm wide at the base. **Pedicel and ovary** glabrous, 3–4 mm long, about 0.2 mm wide. **Flowers** 8–10 mm across, widely opening, tepals yellow to light yellow, sometimes with purple tint, lip bright red-purple, column and anther cup light yellow to white. **Median sepal** 4.5–6 mm long, 2–2.5 mm wide, narrowly ovate, acuminate, 3-veined. **Lateral sepals** 5–7 mm long, 2–3 mm wide, 3 (4)-veined, triangular, strongly oblique, with the broad base adnate to column foot and acuminate curved apical part. **Petals** 3.5–5 mm long, 1.7–2 mm wide, 1-veined, narrowly ovate, slightly oblique, finely irregularly serrulate along all margins, acute at the apex. **Lip** simple, 1.8–2 mm long, 1–1.4 mm wide, oblong, with broad base, deflexed centrally, apex broad, obtuse. **Column** short, about 1.4 mm tall, 0.8 mm wide, with 2 frontal prominent filiform stelia 0.3–0.4 mm long at the apex. **Column foot** centrally curved, about 1.8 mm long, 0.5 mm broad. **Anther cup** hemispherical, about 0.5 mm across. Fig. 2.

Flowering period. November – December.

Ecology. Canopy epiphyte. Coniferous and broad-leaved evergreen submontane forests on rocky limestone at 1100–1300 m a.s.l.

Distribution. Vietnam (Hoa Binh: Mai Chau). Fig. 2(g).

Etymology. The plant is named after its discoverer, the outstanding Vietnamese botanist and explorer of Vietnam, Prof. Phan Ke Loc.

Notes. *Bulbophyllum lockii* is a quite distinct species that differs from all related species in densely clustered pseudobulbs, strongly oblique sepals, acuminate and curved at the apex, and in finely serrate petals. Each mature pseudobulb of this species develops several annual inflorescences successively during several years. This is also a unique character that was not observed in the other related species listed above. The new species is probably a strict rare endemic of North Indochinese floristic province.

Cheirostylis latipetala Aver. et Averyanova, **sp. nova**

Characteres diagnostici. *Petala lata; epichilium dentibus tribus (quattuor) late rotundatis; hypochilium glandulis dactyloideis tribus.*

Type: N Vietnam, Bac Kan Prov., Na Ri Distr., Na Duong village, around the point 22°12'25" N 106°03'57" E, 400–750 m. Limestone *Burretiodendron* forest along limestone ridge. Occasional lithophyte. 25 November 2002, D. K. Harder, Nguyen Tien Hiep, L. Averyanov et al. DKH 7659c (HN, holotype; iso – LE).

Related species. *Ch. chinensis* Rolfe, *Ch. yunnanensis* Rolfe.

Diagnostic features. Broad petals, epichile with 3 (4) broadly roundish teeth and 3 finger-like hypochile glands.

Sympodial lithophytic or terrestrial **herb.** **Stem** with the creeping thick plagiotropic basal part divided into nodes 7–8.5 mm long, about 5 mm in diam., with callosities and low ridges covered with numerous root hairs on undersurface; orthotropic leafy stem part ascendant, 6–9 cm high, with 2–5 normally developed velvety black leaves. **Leaf** petiolate; petiole 4–8 mm long, 0.8–1 mm wide, broadening at the base into inflated hyaline sheath enveloping stem; sheaths 2–4 mm long, 2–3 mm wide, glabrous; leaf blade triangular ovate or cordate, with obscure veins, acute, up to 1.8 cm long, 1.1 cm wide. **Inflorescence** 2–4-flowered, stalk and rachis 5–7 cm long, with dense long gray hairs, with 2–3 yellowish hyaline bracts; inflorescence bracts lanceolate, acuminate, 8–12 mm long, 2–3 mm wide; floral bracts triangular, 5–8 mm long, 1–1.5 mm wide, attenuate toward the apex, much shorter than ovary. **Pedicel and ovary** 5–6 mm long, glabrous at the base, hairy in the apical half. **Flowers** hardly opening. **Sepals** white, hairless outside, finely papillose, obtuse or slightly emarginate at the apex, concave, connate for their lower two-thirds forming a wide tube; dorsal sepal broadly ovate, 4 mm long, 2.5 mm wide; lateral sepals narrowly ovate to oblong, with broad base, 4 mm long, 1.3 mm wide. **Petals** white, free, glabrous, falcate, much broadening in the apical part, broadly obtuse to slightly emarginate at the apex, 4 mm long, 1.5 mm wide. **Lip** white, 6–7 mm long; hypochile concave, narrowing from the broad base toward the epichile, with 3 arching finger-like glands on each side at the base; epichile with two small green spots at the base, 3 mm long, 6–7 mm wide, bilobed, lobes 3 mm long, 3 mm wide, with 3 (4) broadly roundish teeth on each lobe. **Column** narrow, 2.5 mm long, with 2 stigmas, 2 oblong wings and appendages; anther cup narrowly ovate, subacute, 1.5 mm long, 0.6 mm wide. **Immature fruit** dull green, elliptic, 4–5 mm long, 1.5–2 mm wide. Fig. 3.

Flowering period. November – December.

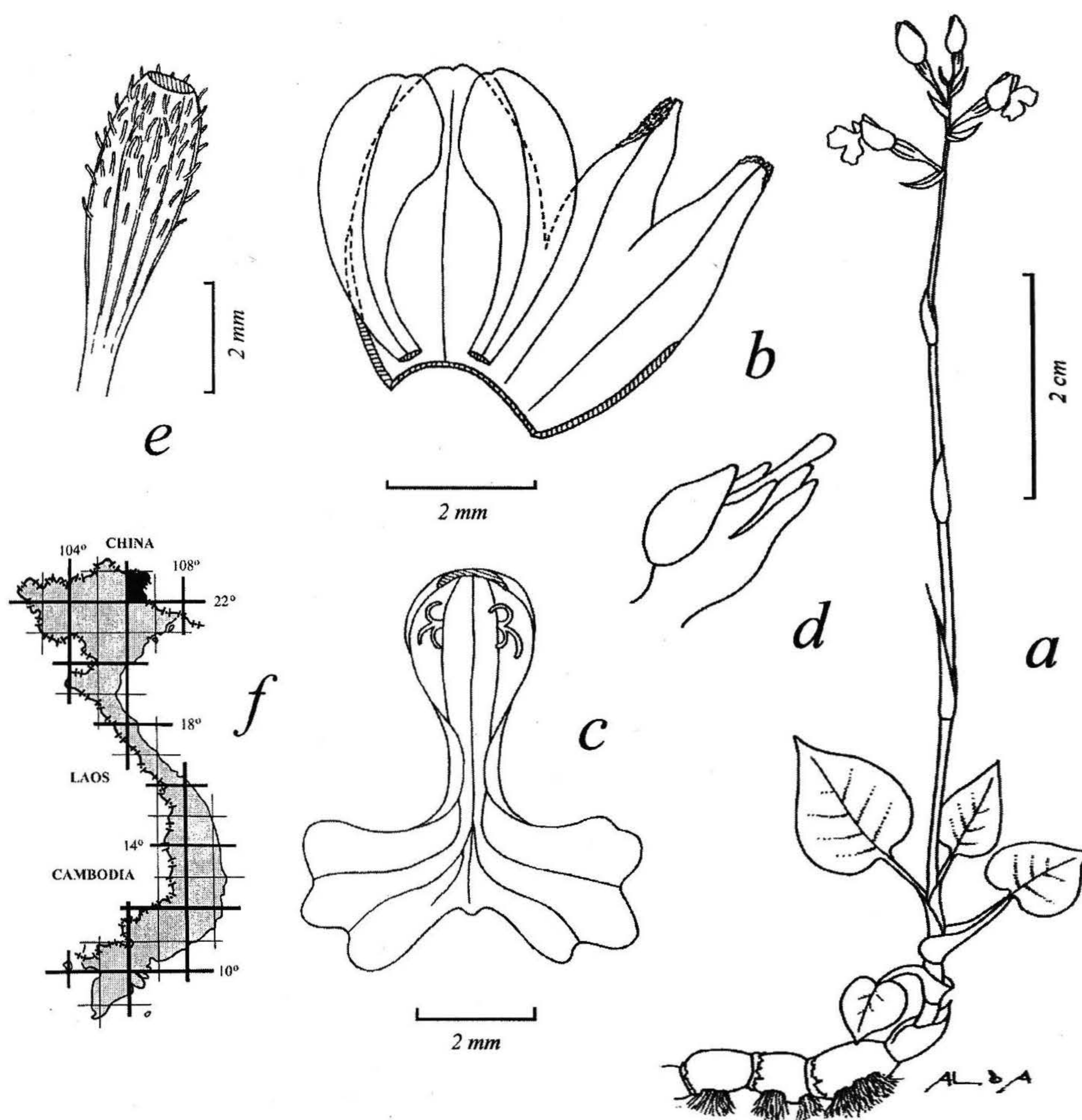


Fig. 3. *Cheirostylis latipetala*:

a – flowering plant; *b* – flattened sepals and petals; *c* – flattened lip; *d* – column, side view; *e* – pedicel and ovary; *f* – distribution map (all drawn from the isotype by the authors).

Ecology. Lithophytic and terrestrial herb. Evergreen broad-leaved closed dry lowland forest on highly eroded crystalline rocky limestone at 500–800 m a.s.l.

Distribution. Vietnam (Bac Kan: rocky limestone areas). Fig. 3(*f*).

Etymology. From Latin *latus*, broad, referring to the broad, broadly-spathulate shape of the petal.

Notes. The new species probably has relations to *Cheirostylis chinensis* Rolfe and *Ch. yunnanensis* Rolfe differing in broad petals, epichile lobes with 3(4) broadly-roundish teeth and 3 finger-like glands on each lateral side of the hypochile. This species is typical element of highly endemic aboriginal flora of rocky limestone areas of northern Vietnam.

Cleisostoma melanorachis Aver. et Averyanova, **sp. nova.** — *C. crochettii* auct. non (Guillaum.) Garay, p. p.: Aver. et Averyanova, Updated Checklist Orch. Vietnam: 21. 2003.

Characteres diagnostici. *Lobus labii medius acutus sagittatus, lobi laterales truncati obtusi, ambo callo inflato; paries laminae posticus callo trapezoideo tenui; stipes pollinarii linearis filiformis.*

Type: N Vietnam, Cao Bang Prov., Tra Linh Distr., Quoc Toan Municipality, vicinity of Thang Heng and Lung Tao villages near Thang Heng Lake. Remnant closed evergreen primary broad-leaved forest on steep slopes and bluffs of limestone ridges and mesas near karst lake at 500–650 m a.s.l. Epiphyte on shady rocky slopes and bluffs. Tepals light pink with yellow tint, lip and spur purple-violet, side lobes yellow. Not common. 25–27 May 1997, L. Averyanov, Nguyen Tien Hiep VH 4860 (HN, holotype; iso – LE).

Paratypes: N Vietnam, Ninh Binh Prov., Cuc Phuong national park. 1985, L. Averyanov s.n. (LE); N Vietnam, Vinh Phu Prov., Tam Dao. 23 January 1988, L. Averyanov LX-VN s.n. (LE); N Vietnam, Ninh Binh Prov., Cuc Phuong national park, CPNP orchid collection № 27. 9 Apr. 2003, Phan Ke Loc s.n. (LE); N Vietnam, Bac Kan Prov., Na Ri Distr., Liem Thuy municipality, Na Bo village, around the point 21°56'44" N, 106°05'09" E, at elev. of 300–600 m a.s.l. Primary selectly logged broad-leaved evergreen forest on very steep slopes and cliffs of rocky ridge composed of white solid marble-like crystalline limestone. Epiphyte. Flowers light pinkish-purple, lip deep purple-violet. Occasional. 29 May 2004, L. Averyanov, Nguyen Tien Hiep, Pham Van The, Nguyen Tien Vinh HAL 5405 (HN, LE).

Related species. *Cleisostoma crochettii* (Guillaum.) Garay, *C. parishii* (Hook.f.) Garay, *C. sagittiforme* Garay.

Diagnostic features. Acute sagittate mid-lobe; truncate obtuse side lobes, each with inflated callosity; trapezoidal thin laminar back-wall callus; linear filiform pollinarium stipe.

Monopodial epiphytic herb with wiry roots. **Stem** commonly pendent, curved and ascendant at the base, rigid, about 2–4 cm long, 4–6 mm in diam., internodes about 0.5 cm long. **Leaves** 5–8, lanceolate to oblong lanceolate and elliptic, dorsiventral, coriaceous, 7–10 (14) cm long, 1–1.5 (2) cm wide, conduplicate with distinct median vein, unequally bilobulate at the apex, with broad obtuse asymmetric lobes. **Inflorescences** lateral, long pendent raceme 20–30 cm long, commonly unbranched; scape and rachis thin, rigid, usually deep purple-brown to violet-black. **Inflorescence bracts** ovate, 4–6 mm long, 1.5–2.5 mm wide. **Flower bracts** small, triangular acute, 1–2 mm long, 0.5–1 mm wide. **Pedicel and ovary** 5–8 mm long, up to 1 mm wide. **Flowers** odorless or with slight unpleasant smell, widely opening, tepals light pink, sometimes with light yellow tint, lip and spur purple-violet, side lobes yellowish-pink to orange, column white to pink-purple, anther cup white to yellowish-pink or brown-purple, ovary purple-brown. **Sepals** subsimilar, obovate, 5.5–6 mm long, 2.8–3 mm wide. **Petals** narrowly obovate, 5.5–6 mm long, 1.5–1.6 mm wide. **Lip** tripartite, spurred, about 6 mm from the mid-lobe tip to the spur apex; side lobes broadly truncate, with incurved thin yellow tooth at the middle, in front with fleshy purple callus hanging above base of mid-lobe; mid-lobe fleshy, sagittate, acute at the apex, with acute back directed side lobes, at wide angle to the spur. **Spur** broadly conical, more or less straight or hardly bent, about 3.5 mm long, 1.4 mm wide at the base, the back-wall callus oblique trapezoidal in sagittal section, thin, without significant distal horns, spur septum thin, not

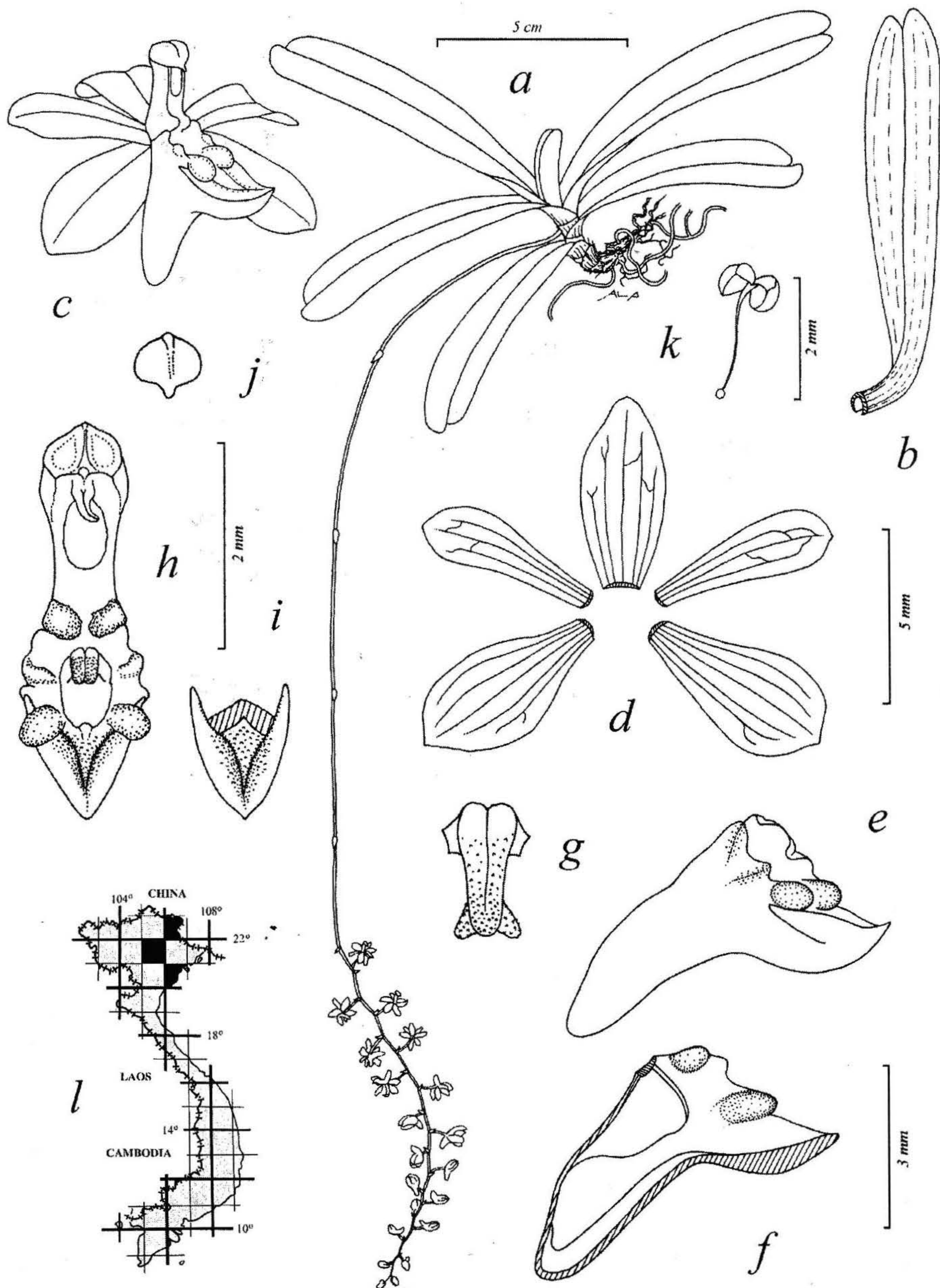


Fig. 4. *Cleisostoma melanorachis*:

a – flowering plant; *b* – leaf; *c* – flower; *d* – flattened sepals and petals; *e* – lip, side view; *f* – lip, longitudinal section; *g* – back-wall callus, frontal view; *h* – column and lip, frontal view; *i* – lip mid-lobe, frontal view; *j* – operculum; *k* – pollinarium; *l* – distribution map (all drawn from the type and paratype HAL 5405 by the authors).

complete. **Column** straight, 2–2.2 mm high, 0.8–1 mm wide, with two fleshy inflated purple callosities at the base, rostellum projection narrowly triangular, turned upwards. **Anther cup** hemispherical, 0.8 mm in diam., with prominent tooth at the front. **Tegula** filiform, 2 mm long, suddenly broadening at the apex into two broadly triangular halves. **Pollinia** 4 ovate, subequal, in two pairs. Fig. 4.

Flowering period. April – June.

Ecology. Broad-leaved evergreen closed lowland and submontane forests at 300–700 (900) m a.s.l., particularly on rocky limestone.

Distribution. Vietnam (Bac Kan: Na Ri, Cao Bang: Tra Linh, Ninh Binh: Cuc Phuong, Vinh Phuc: Tam Dao Ridge). Fig. 4(l).

Etymology. The species name reflects deep violet, often nearly black color of the scape and rachis observed in the new species.

Notes. *Cleisostoma melanorachis* may be related to *C. crochettii*, *C. parishii* and *C. sagittiforme*, but is distinguished from these species by its acute sagittate lip mid-lobe, truncate lip side lobes (each with inflated callosity at the front), trapezoidal thin back-wall callus in the spur and linear filiform pollinarium stipe. The long pendent inflorescence with black-violet scape and rachis is also very typical of this species. *Cleisostoma melanorachis* was observed as a locally common epiphyte in broad-leaved evergreen lowland forests particularly on highly eroded rocky limestone at elevations of 300–700 m a.s.l. This species probably represents local endemism of the north-eastern part of northern Vietnam, where it replaces the closely related species mentioned above.

***Cleisostoma subulifolium* Aver. et Averyanova, sp. nova**

Characteres diagnostici. *Folia succulenta, subulata, angusta; columna lata, brevis, projectura rostellii longissima; operculum amplum, columna tota tegens; calcar septulis angustissimis et parietis postici facie laevi (non callifera).*

Type: N Vietnam, Cao Bang Prov., Trung Khanh Distr., Ngoc Khe municipality, Pac Nga village, around the point 22°54'59" N, 106°31'44" E, at elev. of 700–800 m a.s.l. Closed secondary forest and remnants of primary broad-leaved evergreen forest on very steep rocky slopes of rocky ridges and mesae composed of light gray solid marble-like highly eroded crystalline limestone. Epiphyte. Flower buds white-pinkish. Locally common. 13 June 2004, L. Averyanov, Phan Ke Loc, Pham Van The, Nguyen Tien Vinh HAL 5713 (HN, holotype; iso – LE).

Related species. *Cleisostoma crochettii* (Guillaum.) Garay.

Diagnostic features. Narrow succulent subulate leaves; short broad column with very long projection of rostellum; very large operculum covering the total column; very narrow insignificant spur septum and smooth surface of the spur back wall having no callosity.

Monopodial epiphytic herb with numerous thin wiry roots. **Stem** short, plagiotropic, curved and ascendant at the base, rigid, 2–3 cm long, 4–8 mm in diam., with clustered distichous leaves, internodes about 3–4 mm long. **Leaves** 5–8, dorsiventral, linear, thick and rigid, subulate, strongly conduplicate to canaliculate with distinct abaxial keeled median vein, 10–15 cm long, 4–5 mm wide, acute at the apex. **Inflorescence** lateral erect unbranched raceme, 12–14 (16) cm long, scape and rachis very thin, often flexuous, green with pink or

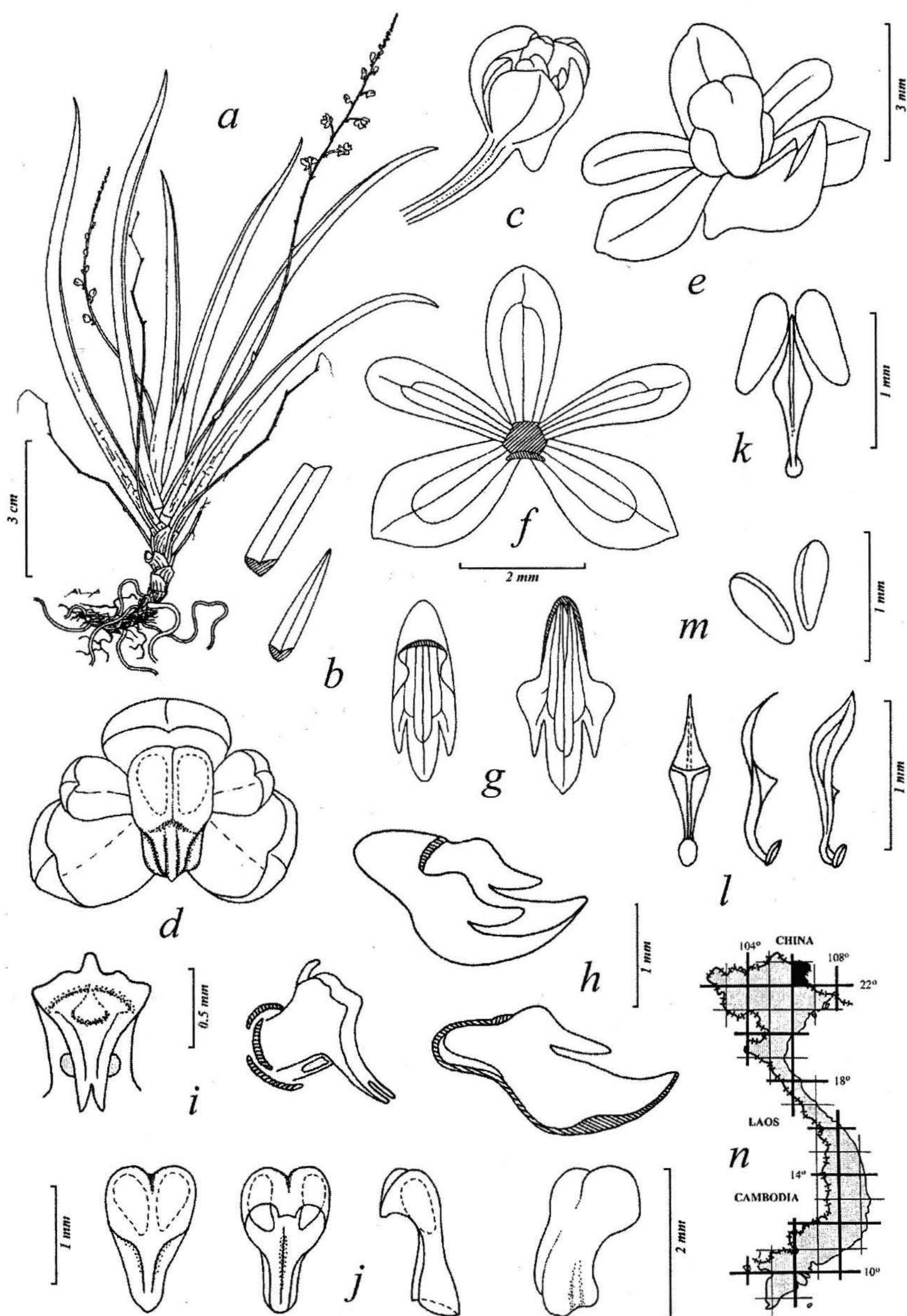


Fig. 5. *Cleisostoma subulifolium*:

a – flowering plant; *b* – leaf apex and cross section; *c*, *d* – flower; *e* – flower with reflexed tepals; *f* – flattened tepals; *g* – normal and flattened lip; *h* – lip, side view and sagittal section; *i* – column, frontal and side views; *j* – operculum, frontal, back, side and half side views; *k* – pollinarium; *l* – tegula, front, back and half side views; *m* – pollinia; *n* – distribution map (all drawn from the isotype by the authors).

purple tint. **Inflorescence bracts** ovate, 1.5–2 mm long, 0.5–1 mm wide. **Flower bracts** very small, triangular acute, about 1 mm long, 0.3 mm wide. **Pedicel and ovary** 1–1.5 mm long up to 0.3–0.4 mm wide. **Flowers** light pinkish, 2.5–3 mm in diam., not widely opening, light pink-purple, ovary green with purple tint. **Sepals** subsimilar, narrowly obovate, about 2.5 mm long, 1.4 mm wide. **Petals** oblanceolate, about 2.5 mm long, 0.8 mm wide. **Lip** distinctly tripartite, spurred, 2.5–3 mm long from the mid-lobe tip to the spur apex, 1.5–1.6 mm wide (when flattened); side lobes raised parallel with the mid-lobe, narrow, cuneate, slightly oblique-falcate, acute at the apex; mid-lobe triangular elongate, longer than the side lobes broadly acute, at very wide angle to the spur. **Spur** short, broadly conical, sac-like, straight about 0.8 mm long and wide, the back wall smooth with no callosity, spur septum very thin, insignificant, not complete. **Column** straight, short and broad, broadening toward the apex, 0.8 mm tall and wide, with projection of rostellum very long-triangular, directed forward, bifid at the apex, about 0.8 mm long. **Anther cup** very large, totally covering the column, hemispherical, 1.4 mm in diam., at the front with very large convex, prominent beak up to 2 mm long, truncate at the apex. **Tegula** narrowly rhomboid, keeled on both sides and bent at the middle, 1.2 mm long. **Pollinia** 4, very large, 0.7 mm long, narrowly ovate, subequal, in two pairs. Fig. 5.

Flowering period. June – July.

Ecology. Branch epiphyte. Broad-leaved evergreen closed forest on rocky limestone at 700–800 m a.s.l.

Distribution. Vietnam (Cao Bang: Trung Khanh). Fig. 5(n).

Etymology. The species name reflects subulate form of its leaves.

Notes. *Cleisostoma crochetii*, endemic to the Indochinese Peninsula, is the only species more or less similar to the newly described plant. Both species have a short broad column completely covered by the very large anther cup. The column has a long rostellar projection at the front, which bears a rhomboid pollinarium stalk of specific structure with very large narrowly ovoid pollinia. These unusual morphological structures, mentioned also by Seidenfaden (1970, 1975), place both species in a rather isolated position in the genus. *C. subulatum* was observed as an epiphyte common in the limestone areas of Cao Bang Province on the north-east part of Vietnam near the Chinese border. This unusual, taxonomically very isolated species is a clear example of local endemism in the flora of the South-Chinese floristic province.

***Eria chlorantha* Aver. et Averyanova, sp. nova**

Characteres diagnostici. Flores chlorochroi; labium viride brunneo-maculatum, carinis tribus fimbriatis brunneis; bractee florum triangulares parvi.

Type: S Vietnam, Kontum Prov. Close evergreen primary forest on N slope of Ngoc Linh Mts. at elev. of 2100 m a.s.l. Epiphyte. 10 March 1995, L. Averyanov, Nguyen Tien Hiep, Phan Ke Loc et al. VH 635a (LE, holotype).

Related species. *E. coronaria* (Lindl.) Reichenb.f., *E. gagnepainii* A.D.Hawkes & A.H.Heller.

Diagnostic features. Green flowers; green lip spotted with brown; three fringed brown keels on the lip; small triangular flower bracts.

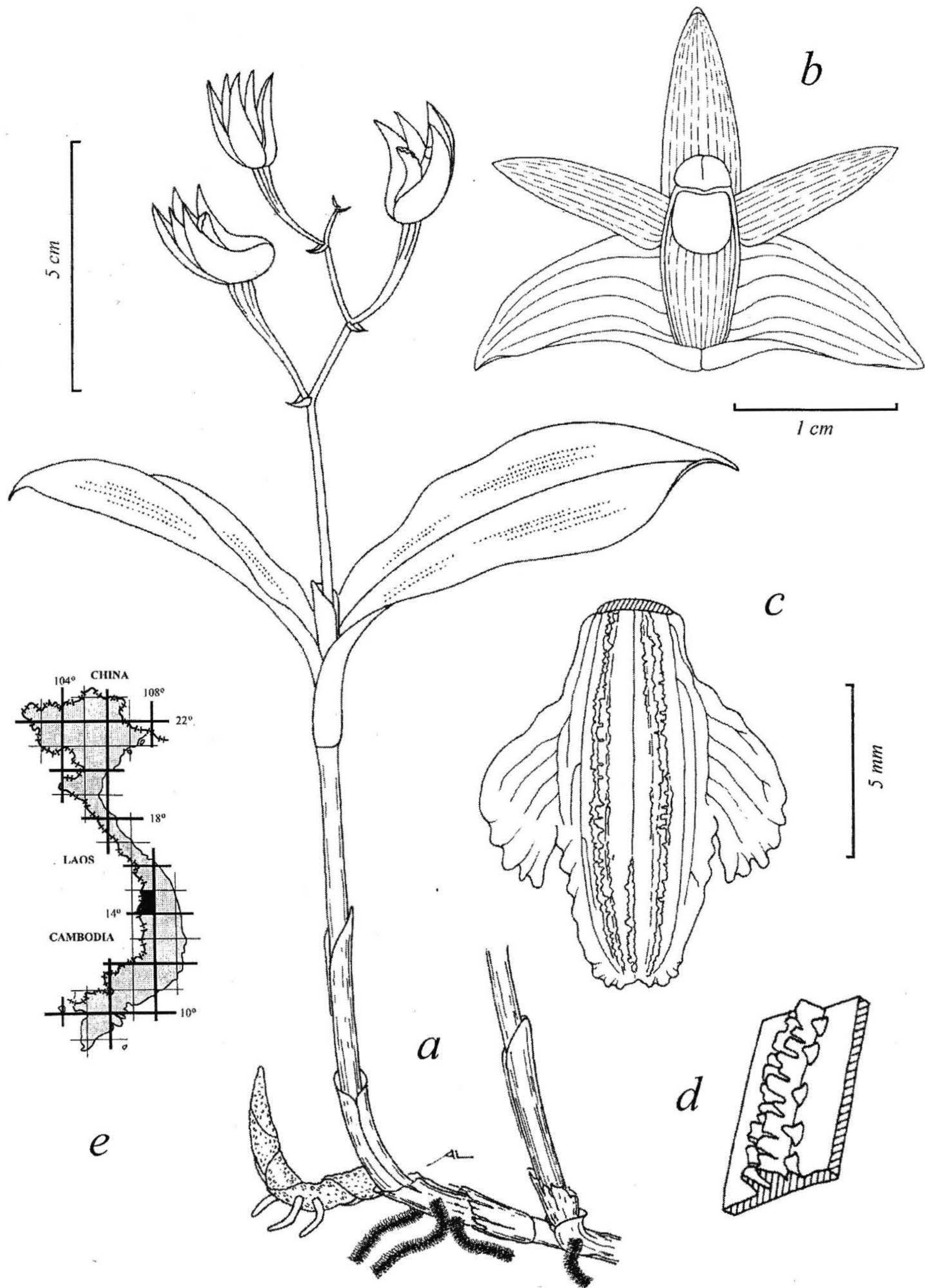


Fig. 6. *Eria chlorantha*:

a – flowering plant; *b* – flattened flower (without lip); *c* – flattened lip; *d* – fragment of lip surface with keel; *e* – distribution map (all drawn from the isotype by the authors).

Sympodial epiphyte with rigid woody rhizome and ascendant erect stems. **Rhizome** 5–7 mm thick, rooting at the nodes, young growth covered with deep green finely verrucose bracts later becoming brown or brown-black; roots rigid, wiry, densely hairy. **Stem** erect, 6–10 cm tall, 0.4–0.5 cm thick, rigid, cylindrical, not thickened, green, with 2–3 green bracts 2.5–5 cm long, densely embracing the stem, apically with two subopposite sessile leaves. **Leaves** elliptic, 8–10 cm long, 3.5–4.5 cm wide, rigid, with prominent median vein acuminate at the apex. **Inflorescence** terminal, erect, 2–4-flowered raceme, 9–11 cm long, with 1–2 light green laterally compressed bracts 0.5–1.6 cm long, 0.4–0.6 cm wide at the base. **Scape** rigid, glabrous, 4–6 cm long, 2–2.5 mm thick. **Rachis** 4–5 cm long, zigzag. **Flower bracts** at right angles to the axis, very small, triangular, acute to acuminate, 3–5 mm long, 1.5–2 mm wide. **Pedicel and ovary** erect, 2.5 cm long; pedicel cylindrical, 1–1.5 mm thick; ovary conical, broadening from the narrow base to the apex, up to 5–6 mm broad. **Flowers** odorless, 1.2–1.8 cm across, sepals and petals light green with green nerves; lip light green with brown marks and brown keels; column light green with longitudinal brown stripes; anther cup white. **Sepals** 13 mm long, obtuse to broadly acute; median sepal narrowly ovate, multiveined, about 6 mm wide, shortly cucullate at the apex; lateral sepals 7–8 mm wide, 4 (6)-veined, triangular, oblique, with broad base adnate to the column foot. **Petals** 12 mm long, 5 mm wide, multiveined, narrowly ovate, slightly oblique. **Column** short, broad, about 4–5 mm tall, 5 mm wide. **Column foot** hardly curved, about 8–9 mm long, 5 mm wide. **Anther cup** very large, hemispherical, about 4 mm across. Fig. 6.

Flowering period. November – December (in cultivation).

Ecology. Epiphyte. Broad-leaved evergreen closed montane cloud forests at 2000–2200 m a.s.l.

Distribution. Vietnam (Kontum: Ngoc Linh Mts.). Fig. 6(e).

Etymology. The species name reflects the predominant green coloration of the flowers.

Notes. The new species belongs to the group of *Eria* species with erect, not thickened bifoliate stem. This group has a rather isolated taxonomical position and may be accepted as a separate genus *Trichosma* Lindl. Our plant differs strikingly from the two Indochinese species of this group (*E. coronaria* and *E. gagnepainii*) in green tepals with deep green nerves, light green lip spotted with brown, very small triangular flower bracts and significant fringed brown keels on the lip. Like some other orchid species (such as *Aphyllorchis annamensis* Aver., *Bulbophyllum ngoclinhense* Aver., *Odontochilus acalcaratus* (Aver.) Ormerod, *O. umbrosus* (Aver.) Ormerod and *Pleione vietnamensis* Aver. et Cribb), *E. chlorantha* represents strict local endemism of Ngoc Linh mountain system in Central Annamese floristic province.

***Gastrodia tonkinensis* Aver. et Averyanova, sp. nova**

Characteres diagnostici. *Columna angusta longa; labium truncatum, suborbiculare, late ovatum; lobus labii medius succulentus, anguste triangularis, acutus; sepala lateralia cum petalis in parte basali connata.*

Type: N Vietnam, Ha Tinh Prov., Huong Son Distr., Son Hong municipality, around the point 18°34'06" N, 105°11'40" E. Heavily logged primary broad-leaved evergreen dry forest on steep montane slopes and along ridge composed of shale at elev. about 350–400 m a.s.l.

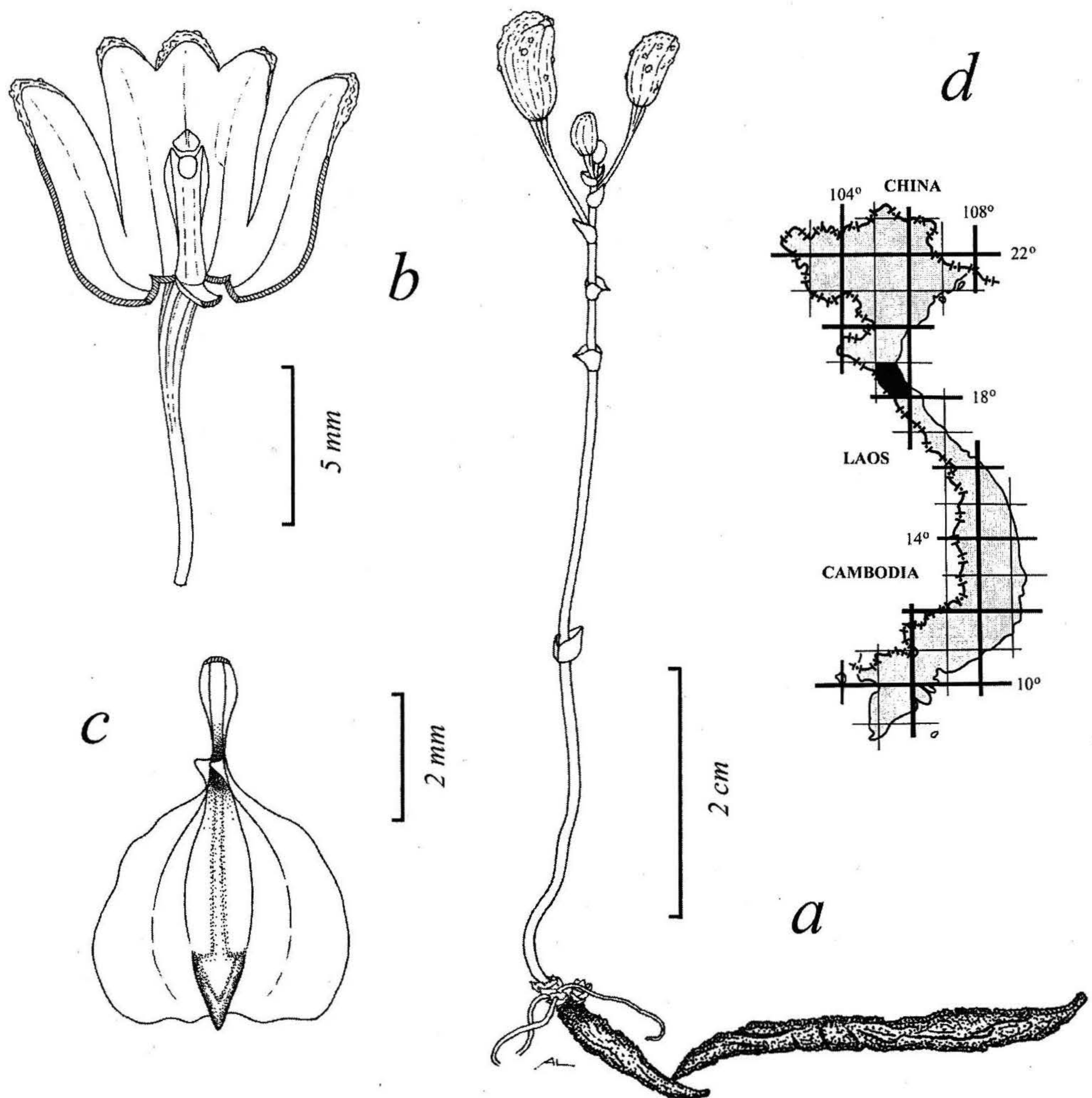


Fig. 7. *Gastrodia tonkinensis*:
 a – flowering plant; b – cut and flattened perianth tube; c – flattened lip; d – distribution map
 (all drawn from the isotype by the authors).

Small ground achlorophyllous light yellowish-brown saprophyte. Flower buds light yellow-brownish with brown stripes. Very rare. 9 May 2004, Phan Ke Loc, L. Averyanov, Pham Van The, Nguyen Tien Vinh HAL 5263 (HN, holotype; iso – LE).

Related species. *G. abscondita* J.J.Sm., *G. verrucosa* Blume.

Diagnostic features. Narrow long column; broadly ovate, almost circular truncate lip; narrowly triangular acute fleshy mid-lobe; lateral sepals connate with petals less than for a half from the base.

Terrestrial tuberiferous leafless achlorophyllous saprophyte. Tubers fleshy, gray brown, irregularly verrucose, narrowly cylindrical, 2–5 cm long, 3–5 mm thick. **Stem** erect rigid, straight or slightly flexuous, white to light gray-brown, 6–10 cm tall, 0.8–1 mm thick with 1–2 broad, ovate, obtuse bracts, 2.5–3 mm long, 1.5–2 mm wide, with few small decaying brown scales and few narrow flexuous roots at the base. **Inflorescence** terminal raceme with (4) 6–8 (10) flowers. **Flower bracts** light brown, short, broad, ovate, obtuse or broadly acute, 1.5–2.5 mm long, 1–1.5 mm wide. **Pedicel and ovary** 8–10 cm long, 0.6–0.8 mm thick, pedicel white, ovary light brown. **Flowers** bell-shaped, hardly opening, lasting one day, light brown with darker nerves, sparsely warty outside; all tepals with incurved tips never spreading. **Sepals and petals** oblong with one indistinct vein and fleshy obtuse apex. **Sepals** subsimilar, 7–8 mm long, 1.2–1.5 mm wide; median sepal connate with petals for 7/8–6/7; lateral sepals connate with each other for 4/5–3/4 and with petals for 1/5–1/4 of their length from the base. **Petals** a little shorter than sepals, 6–6.5 mm long, 1.2–1.5 mm wide. **Lip** 5-nerved, concave, broadly obovate or almost circular, truncate, about 3.5 mm long, 4.5 mm wide, slightly irregularly sinulate along the margin, with slightly thickened median band ending in narrowly triangular acute fleshy mid-lobe; lip blade narrowing at the base into short flat claw, 2 mm long, 0.5 mm wide, with two conical flattened erect calli 0.5 mm tall at the base. **Column** narrow, straight, 4–4.5 mm tall, 0.8–1 mm wide, with narrow lateral wings in the apical part, with short column foot at the base. **Anther cup** hemispheric, about 0.8 mm across. Fig. 7.

Flowering period. April – June.

Ecology. Achlorophyllous leafless ground tuberiferous saprophyte. Broad-leaved evergreen dry forests on shale at about 300–400 m a.s.l.

Distribution. Vietnam (Ha Tinh: Huong Son). Fig. 7(d). Laos?

Etymology. The species name refers to the old name of the distribution area in northern Vietnam (Tonkin).

Notes. From all species of the genus known in SE Asia the new species differs in broadly ovate, almost circular truncate lip and narrowly triangular acute fleshy mid-lobe, as well as in lateral sepals, which are connate with petals for less than half (from the base). Our plant may be related to *Gastrodia abscondita* and *G. verrucosa* described from Java. This plant is probably endemic to the low hilly area on the border of Vietnam and Laos in North Indochinese floristic province. It was discovered on Vietnamese territory very close to the border and may certainly be found also in Laos.

***Habenaria harderi* Aver. et Averyanova, sp. nova**

Characteres diagnostici. Labium lobis lateralibus falcatis denticulatis planis et lobo medio ad partem apicalem anguste falcatam dilatato.

Type: N Vietnam, Ha Giang Prov., Vi Xuyen Distr., Lung Thao village along Nap Ma stream; along a path between Tam Ve village and Nap Ma village; very degraded forest, among habitations and cultivated fields. 22°45'52" N 104°51'52" E at elev. of 520 m a.s.l. Occasional along stream on vertical rock faces. Flowers all white. 12 September 2000, D. K. Harder, Nguyen Quang Hieu, Nguyen Van Du, Phan Ke Loc DKH 5491 (HN, holotype; iso – LE, MO).

Related species. *H. tonkinensis* Seidenf., *H. viridiflora* (Rottl. ex Sw.) R.Br.

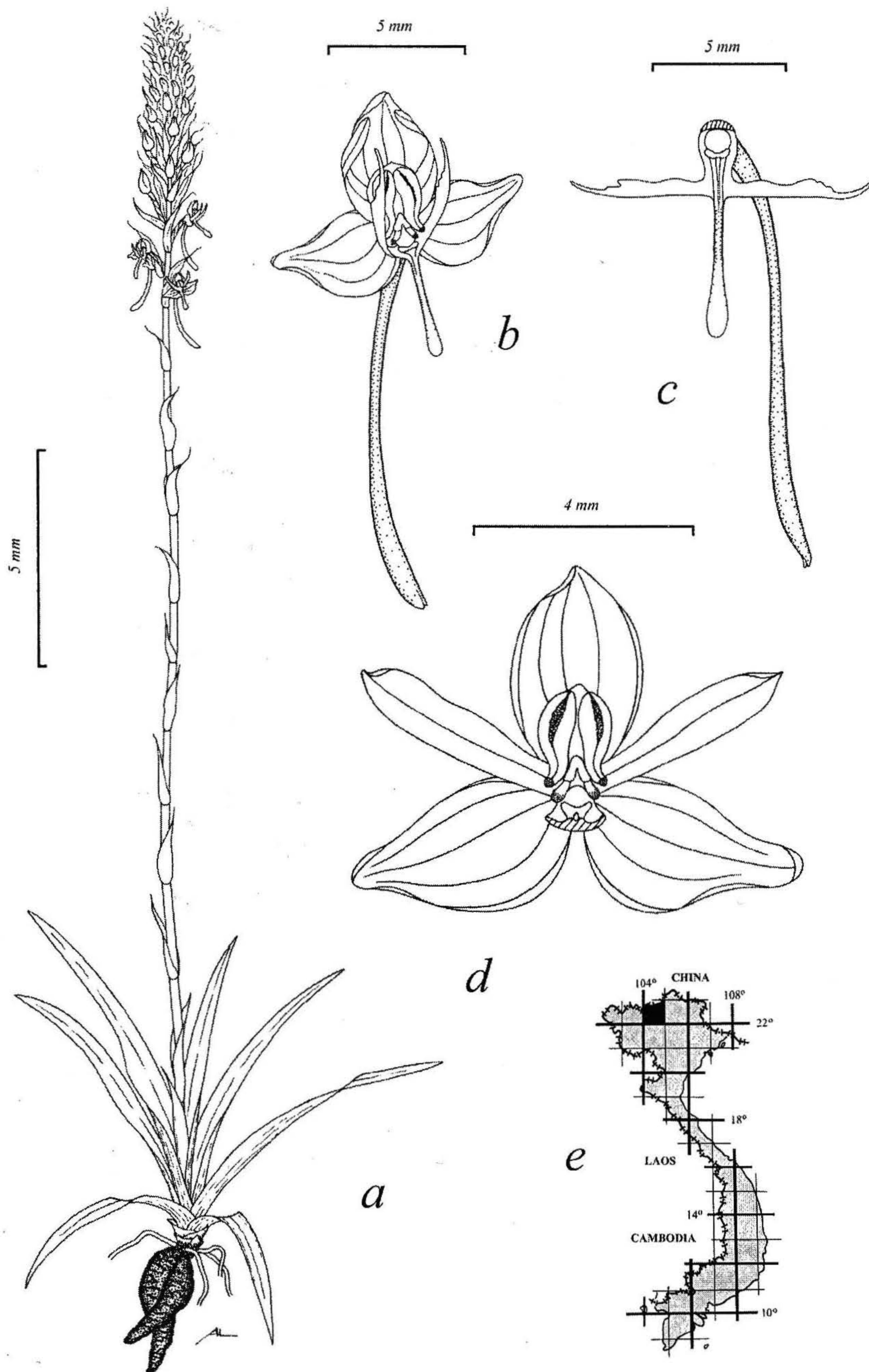


Fig. 8. *Habenaria harderi*:
 a – flowering plant; b – flower, side view; c – flattened flower without lip, frontal view;
 d – flattened lip; e – distribution map (all drawn from the isotype by the authors).

Diagnostic features. Lip with flat denticulate falcate side lobes and mid-lobe broadening to narrowly falcate apical part.

Tuberiferous lithophytic and terrestrial herb with 6–10 radical suberect leaves and erect inflorescence. **Tubers** cylindrical, 1.5–2.5 cm long, 0.5–0.8 cm broad. **Stem** with a few fleshy roots and 3–5 short broad hyaline yellowish scales at the base. **Leaves** narrowly lanceolate to lanceolate, 6–8 cm long, 0.5–0.7 cm wide, acute at the apex. **Inflorescence** many-flowered lax spike, 20–30 cm tall. **Scape** glabrous, 16–20 cm long, about 2 mm thick with 10–12 green, herbaceous, narrowly triangular, acuminate bracts 1.5–2.5 cm long, 2–4 mm wide. **Rachis** 4–10 cm long. **Flower bracts** narrowly triangular, acuminate, with broad base, 6–10 mm long, 1–3 mm wide. **Flowers** sessile, white, 6–8 mm across. **Sepals** 4 mm long, obtuse at the apex; median sepal broadly ovate, 2.4 mm wide; lateral sepals broadly ovate, oblique, 2.6 mm wide. **Petals** 4 mm long, subacute, 0.8 mm wide. **Lip** spurred, tripartite, 5–6.5 mm long, with small transverse callus at the base (near spur entrance); mid-lobe 4 mm long, 0.8 mm wide (in the broadest part at the apex), linear, cylindrical in the basal part with fine median longitudinal groove at the front, broadening to narrowly spatulate apical part; side lobes 5–5.5 mm long 0.4–0.7 mm wide, flat, falcate, irregularly denticulate along the adaxial margin; spur 14–16 mm long, narrowly cylindrical, slightly broadening toward the apical part, apex often shortly bilobed. **Column** 8–10 mm long, 0.8 mm wide, with small rostellum, short thecae and short stigma arms. **Ovary** 8–10 mm long, 0.8 mm wide. Fig. 8.

Flowering period. September – November.

Ecology. Lithophyte and terrestrial herb. Open primary and secondary forest on granite at 400–600 m a.s.l., particularly along stream canyons.

Distribution. Vietnam (Ha Giang: Vi Xuyen). Fig. 8(e).

Etymology. The plant is named after Dr. D. K. Harder, the principal investigator of the exploration project in course of which this new species was discovered.

Notes. The new species is most closely related to *H. tonkinensis*, from which it differs in the shape of lip lobes. In the new species the mid lobe broadens from the cylindrical base to the apical part into a flat narrowly spatulate plate, while the erect side lobes are falcate and irregularly denticulate along the adaxial margin. All the lip lobes in *H. tonkinensis* are filiform cylindrical, narrowing from the base to the tip. Both species are probably endemics of northern Vietnam. They commonly grow on wet granite outcrops along stream and river canyons.

Hamularia Aver. et Averyanova, **gen. nov.**

Characteres diagnostici. *Pollinia duo emarginata suboblique ovata, parva, basi stipitis (hamuli) succulenti triangularis largi affixa; columnae apex et pars media anterior stipite totaliter tecti.*

Type: *H. puluongensis* Aver. et Averyanova.

Related genera. *Acrochaene* Lindl., *Bulbophyllum* Thouars, *Monomeria* Lindl., *Sunipia* L.E.Smith.

Diagnostic features. Two small slightly oblique ovate notched pollinia attached by their bases to a single large massive fleshy triangular stipe (hamulus), which completely covers the apex and the median frontal part of the column.

Distribution. The genus comprises 4 species distributed from Indochina to W Malesia

Etymology. The generic name reflects peculiar character of peculiar pollinarium stalk (hamulus) typical of all known species of the genus.

Notes. The main character of the new genus is the unusual pollinarium structure. The pollinarium in *Hamularia* species includes two slightly oblique ovate pollinia (each notched into two unequal parts) attached by their bases to a single massive fleshy stipe derived from the apical part of rostellum (Rasmussen 1985). The hamulus is triangular in shape and completely covers the apex and the median part (at the front) of the column separating the lateral inflated stigma lobes. The variants of stipe observed in some related genera of the *Bulbophyllum* alliance (in a broad sense), such as *Acrochaene*, *Monomeria* and *Sunipia*, are small insignificant structures of different origin (derived from the epithelial layer of the upside rostellar surface). The formation of the massive hamulus covering the largest part of the column in the species of the *Bulbophyllum* alliance with certainty represents a special, highly advanced independent evolutionary trend. This evolutionary line comprises at least 4 species, for which the new generic name *Hamularia* is proposed. Most probably, the new genus is most closely related to *Sunipia* and should be regarded as a member of the *Sunipia* alliance.

Hamularia cornuta (Blume) Aver. et Averyanova, **comb. nova.** — *Ephippium cornutum* Blume, Bijdr.: 308. 1825. — *Bulbophyllum cornutum* (Blume) Reichenb.f. in Walpers, Ann. Bot. Syst. 6: 247. 1861.

Hamularia ecornuta (J.J.Smith) Aver. et Averyanova, **comb. nova.** — *Bulbophyllum cornutum* (Blume) Reichenb.f. var. *ecornutum* J.J.Sm., Orch. Java: 445. 1905. — *B. ecornutum* (J.J.Smith) J.J.Smith, Bull. Jard. Bot. Buitenzorg 2(13): 32. 1914.

Hamularia gibbolabia (Seidenf.) Aver. et Averyanova, **comb. nova.** — *Bulbophyllum gibbolabium* Seidenf., Dansk Bot. Ark. 33: 23. 1979.

Hamularia puluongensis Aver. et Averyanova, **sp. nova**

Characteres diagnostici. *Columna alis lateralibus rectis acutis brevibus et stelidiis acutis erectis binis; labium oblongum, longitudinaliter rugosum; ovarium minute irregulariter verrucosum.*

Type: N Vietnam, Thanh Hoa Prov., Ba Thuoc Distr., Thanh Son municipality, the middle part of Pu Luong range around the point 20°28'14" N, 105°05'34" E. Primary evergreen seasonal broad-leaved closed submontane forest on basalt along main ridge at elevations of 1450–1550 m a.s.l. Epiphyte. Flowers: tepals dull yellowish with numerous reddish-purple marks, lip reddish-purple. Rare. 9 October 2003, L. Averyanov, Phan Ke Loc, Do Tien Doan, Nguyen Tien Vinh HAL 4181 (HN, holotype; iso – LE).

Related species. *H. cornuta* (Blume) Aver. et Averyanova, *H. ecornuta* (J.J.Smith) Aver. et Averyanova, *H. gibbolabia* (Seidenf.) Aver. et Averyanova.

Diagnostic features. Column with short acute incurved lateral wings and acute erect paired stelidia; lip oblong, longitudinally wrinkled; ovary with fine irregular warts.

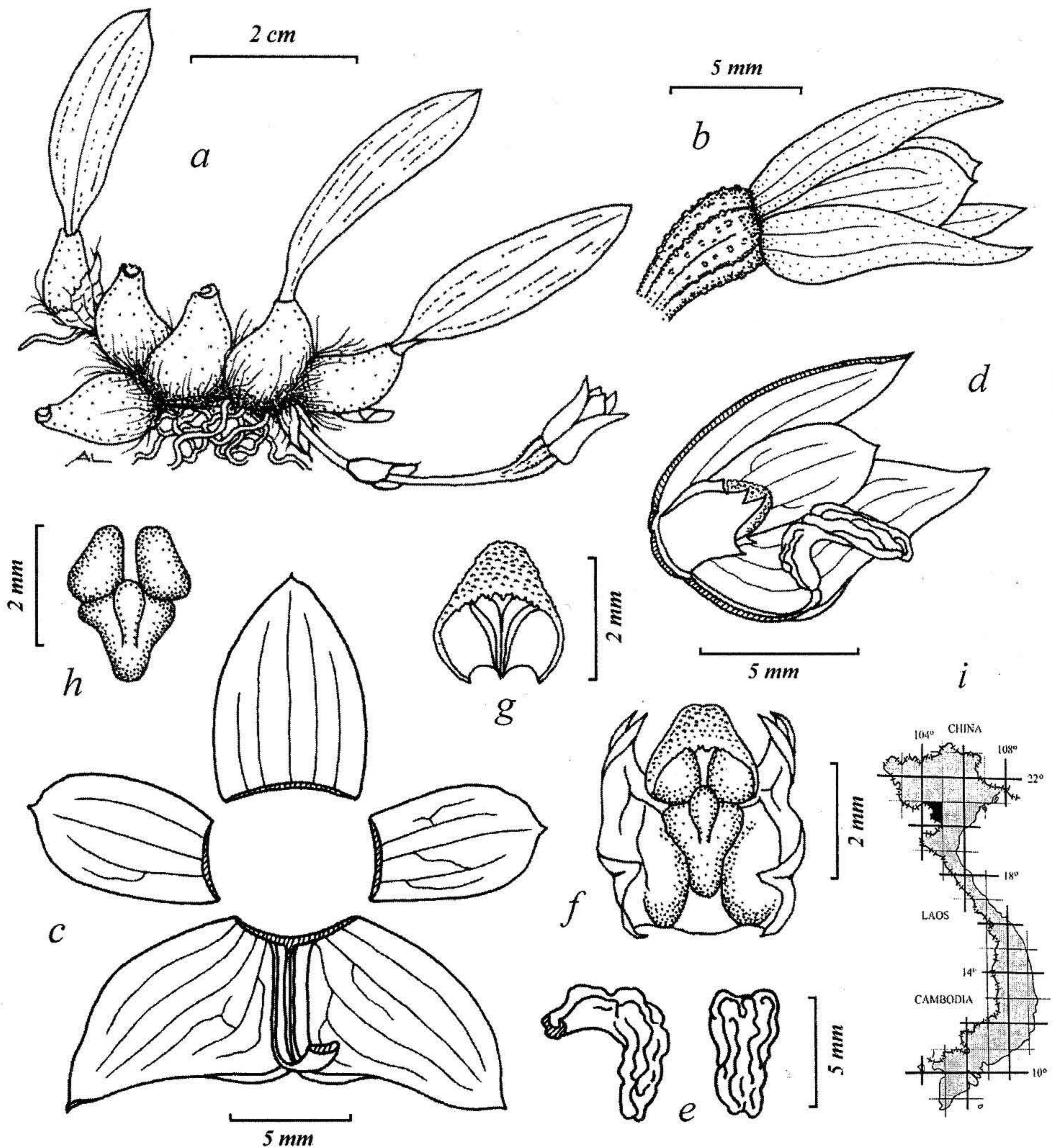


Fig. 9. *Hamularia puluogensis*:

a – flowering plant; *b* – flower, side view; *c* – flattened tepals; *d* – flower, sagittal section, side view; *e* – lip, side and frontal view; *f* – column, frontal view; *g* – anther cup (operculum), frontal view; *h* – pollinarium, with hamulus, frontal view; *i* – distribution map (all drawn from the isotype by the authors).

Sympodial epiphytic herb with 1-leaved pseudobulbs clustered on thick woody creeping plagiotropic rhizome. **Rhizome** thick, more or less straight, 1.5–2 mm in diam., covered with early decaying sheath scales. **Roots** numerous, narrow, wiry, from the pseudobulb base. **Pseudobulbs** narrowly ovoid, oblique, green, 1.2–2.4 cm tall, 0.5–1.2 mm broad, closely ranked on rhizome. **Leaf** 1, broadly lanceolate to oblong elliptic, 4–6 cm long, 1–1.4 cm

wide, broadly acute at the apex, narrowing to the base into the short petiole 2–4 mm long. **Inflorescence** 1-flowered, developing from the base of pseudobulb, peduncle slender, glabrous, 2–2.5 cm long, shorter than leaves, horizontal or slightly ascendant, with 1–2 small hyaline bracts. **Flower** 9–10 mm long, hardly opening, tepals dull yellowish with numerous reddish-purple marks, column yellowish with reddish tint. **Ovary** glabrous, with numerous fine irregular warts, 5–6 mm long. **Median sepal** with 5 nerves, triangular-ovate, broadening to the base, 9–10 mm long, 5–6 mm wide at the base, acute. **Lateral sepals** with 7 nerves, broadly triangular, 8–9 mm long, 7–8 mm wide at the base, adnate to column foot with unequally broadening base. **Petals** ovate to broadly ovate, 3-veined, about 7 mm long, 0.4–0.45 mm wide with subcircular shortly acute apex. **Lip** reddish-purple, broadly oblong, with broad base, deflexed centrally, apex broad, obtuse, longitudinally wrinkled, 4–5 mm long, 2.5–3 mm wide. **Column** broad and short, about 3 mm tall and 3 mm wide, with 2 large lateral incurved acute wings at the front, with 2 large acute paired stelidia 1–1.2 mm long at the apex; column foot slightly curved, 7–8 mm long; anther cup broadly conical, obtuse, finely papillose, about 2 mm across. **Pollinia** obliquely ovate, about 1 mm wide, each notched into two unequal portions, attached at the base to large massive, fleshy, stipe (hamulus). **Hamulus** triangular, 1.4–1.6 mm long, 1.1–1.2 mm wide, completely covering the apex and the median frontal part of the column. Stigma lobes large, inflated, situated on the sides of the column. **Fruit** unknown. Fig. 9.

Flowering period. September – November.

Ecology. Epiphyte on high trees. Primary evergreen seasonal broad-leaved closed submontane forests on basalt at 1450–1550 m a.s.l.

Distribution. Vietnam (Thanh Hoa: Pu Luong Range). Fig. 9(i). Thailand?

Etymology. The species is named after Pu Luong Mts., where it was discovered.

Notes. Most probably the plant reported by Gunnar Seidenfaden for Thailand under the name *Bulbophyllum cornutum* (Seidenfaden 1995) belongs to this species. In this case the distribution area of this rare orchid would comprise wide mountain highlands in the central and northern part of the Indochinese Peninsula.

Hemipilia discolor Aver. et Averyanova, **sp. nova**

Characteres diagnostici. *Flores chlorini maculis violaceis; labium cordatum, margine crenulatum, apice acutum.*

Type: N Vietnam, Bac Kan Prov., Cho Don Distr., Ban Thi municipality, Phia Khao village, around the point 22°16'58" N, 105°31'20" E at elev. of 800–900 m a.s.l. (Lung Chang Mt. and Lung Li Mt.). Primary broad-leaved evergreen closed and coniferous (with *Pinus kwangtungensis*) forest on very steep slopes and cliffs along tops of rocky ridge composed of solid marble-like stratified limestone. Lithophyte on wet travertine deposits on shady vertical cliff. Flowers: sepals light green, petals light green with deep violet marginal line, lip lemon yellow with light purple-violet apex, spur and column light green. Leaves light green, heavily brown-purple marked. Locally common. 20 May 2004, L. Averyanov, Nguyen Tien Hiep, Pham Van The, Nguyen Tien Vinh HAL 4717 (HN, holotype; iso – LE).

Related species. *H. calophylla* Par. et Reichenb.f., *H. limprichtii* Schlechter.

Diagnostic features. Yellowish-green flowers with violet marks; cordate lip slightly crenulate along the margin, acute at the apex.

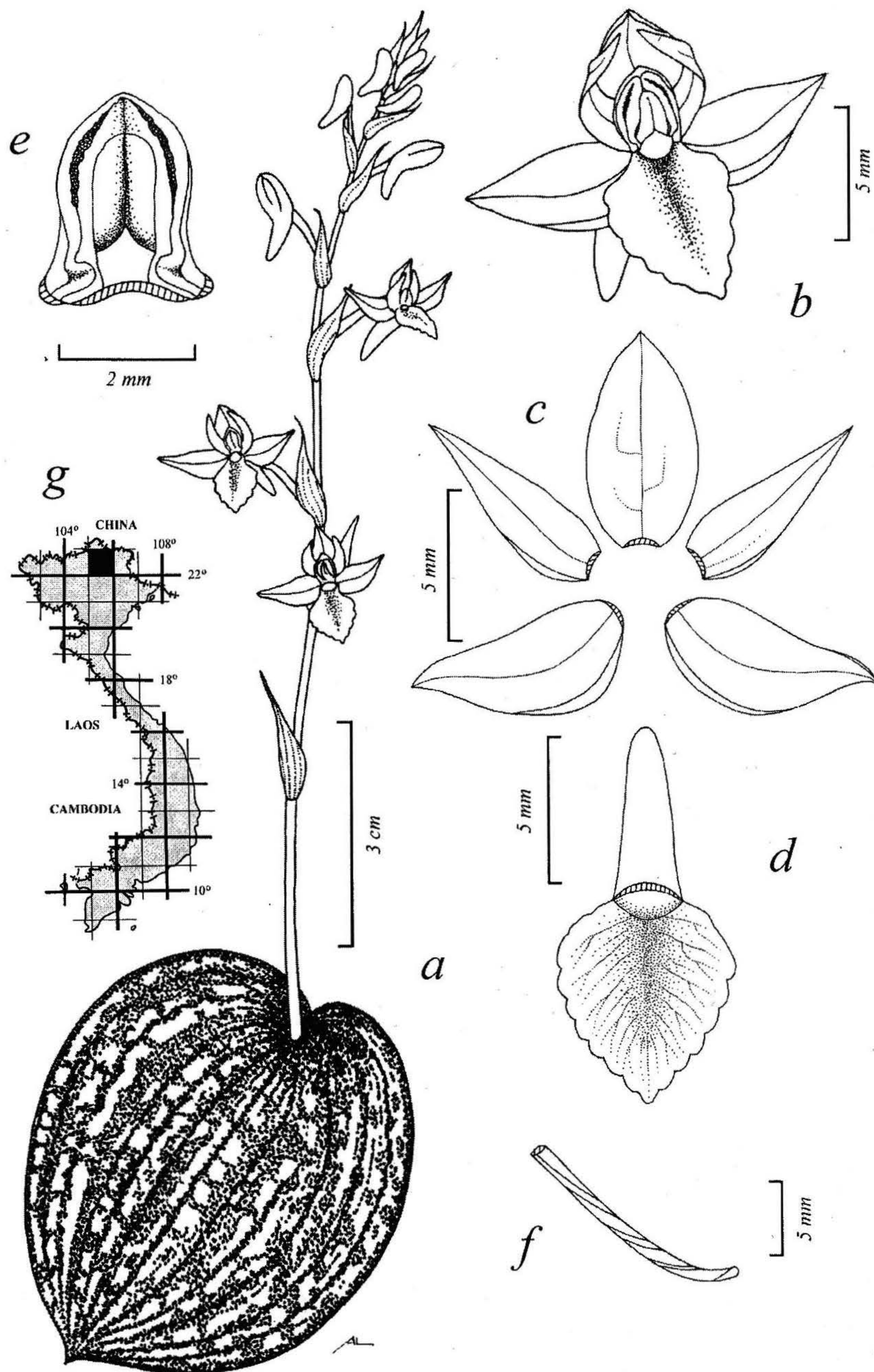


Fig. 10. *Hemipilia discolor*:
 a – flowering plant; b – flower; c – flattened sepals and petals; d – flattened lip; e – column, frontal view; f – ovary; g – distribution map (all drawn from the isotype by the authors).

Tuberiferous lithophytic herb with 1 radical prostrate leaf and erect inflorescence. **Tubers** ovate to cylindrical ovate. **Stem** with 2–4 fleshy roots and 2–4 short broad hyaline acuminate bracts at the base. **Leaf** 1 (2), flat, adpressed to the ground, broadly ovate to orbiculate, shortly acuminate at the apex, light green, heavily spotted with dull purple-brown marks. **Inflorescence** erect, 6–12 cm tall, with (1) 4–8 (12) flowers in lax spike. **Scape** glabrous, 4–6 cm long, 1–2 mm thick, ebracteate or with 1–2 herbaceous bracts; bracts and scape light green with dull purple-brown marks. **Scape and flower bracts** lanceolate with broadening base, up to 12 mm long and 4 mm wide, acute or shortly acuminate. **Flowers** sessile, resupinate, odorless, 12–15 mm across, sepals green, sometimes with light violet tint toward the apex, petals light green with deep violet marginal line, lip lemon-yellow with purple-violet apex, column and spur light green. **Sepals** narrowly ovate to ovate, acute at the apex, 7 mm long; median sepal 2.5 mm wide; lateral sepals 3 mm wide, obliquely reflexed. **Petals** cuneate, acute, narrowing toward the apex from the broad base, 7 mm long, 2–2.2 mm wide. **Lip** spurred, flat, cordate, acute at the apex, crenulate along the margin, 7 mm long, 6 mm wide. **Spur** broad, cylindrical, 6 mm long, 1.8–2.2 mm wide. **Column** short, broad, about 3 mm long, 2.5 mm wide, with large erect rostellum. **Ovary** light green with brown-purple tint, cylindrical, slightly curved, 1.2–1.6 cm long, 2–2.2 mm wide. Fig. 10.

Flowering period. May – June.

Ecology. Lithophyte on wet travertine deposited on shady vertical limestone cliffs. Coniferous and broad-leaved evergreen closed forests on rocky solid marble-like stratified limestone, particularly near the tops of ridges.

Distribution. Vietnam (Bac Kan: Cho Don). Fig. 10(g).

Etymology. From Latin «*discolor*» – versicolour or variously painted, referring to the varicoloured flowers.

Notes. *Hemipilia discolor* distinctly differs from all known species of the genus in its green tepals and cordate acute lip having a yellow base and deep purple-violet apex. With our new species the genus includes eight species with the center of diversity in temperate China (Luo 2001). The discovery of *H. discolor* extends the area of this genus to the south down to the center of northern Vietnam, which lies in the tropical zone. In its ecology and geography this species belongs to the group of local calcium-dependent endemics such as *Paphiopedilum hangianum*. They grow commonly on wet vertical travertine deposits typical of high limestone cliffs in the areas of high amount of rain precipitation.

***Liparis petraea* Aver. et Averyanova, sp. nova**

Characteres diagnostici. *Labium basi projectura calli cylindrica brevi; epichilium denticulatum, planum, latum, saturate violaceum; petala uninervia.*

Type: N Vietnam, Bac Kan Prov., Na Ri Distr., Liem Thuy Municipality, village Lung Vai, around the point 21°57'18" N, 106°06'12" E, at elev. of 500–700 m a.s.l. Primary broad-leaved evergreen closed wet forest on very steep slopes and cliffs of rocky ridges and mesae composed of white solid marble-like crystalline limestone. Terrestrial and lithophytic herb on very steep rocky slope. Flowers: tepals light yellowish-green with light violet tint, lip deep violet. Leaves dull light gray-green. Occasional. 28 May 2004, *L. Averyanov, Nguyen Tien Hiep, Pham Van The, Nguyen Tien Vinh HAL 4979* (HN, holotype; iso – LE).

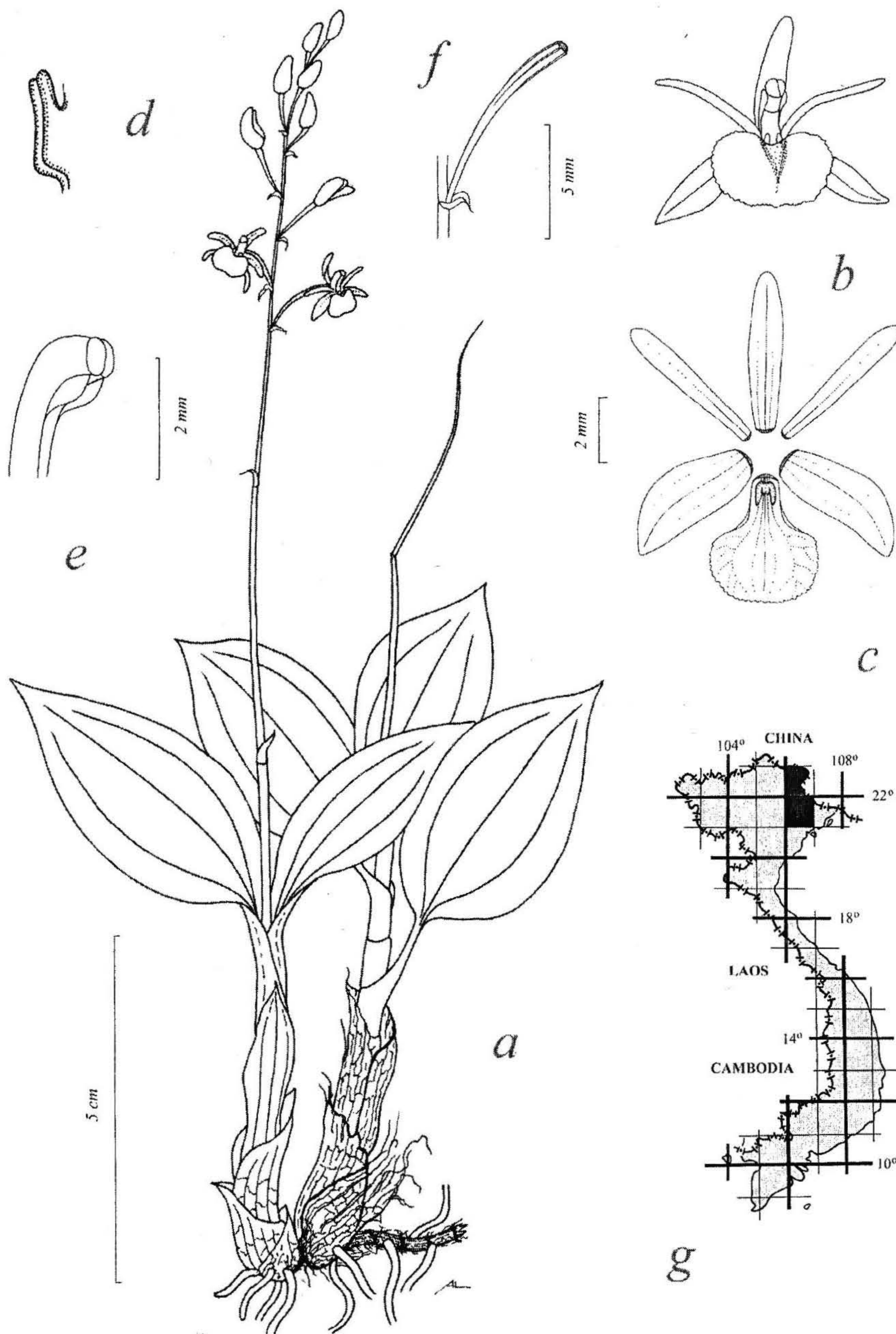


Fig. 11. *Liparis petraea*:

a – flowering plant; *b* – flower; *c* – flattened tepals; *d* – callus at the base of the lip, side view; *e* – column, side view; *f* – pedicel and ovary; *g* – distribution map (all drawn from the isotype and paratype HAL 5683 by the authors).

Paratype: N Vietnam, Cao Bang Prov., Trung Khanh Distr., Ngoc Khe municipality, Pac Nga village, around the point 22°54'59" N, 106°31'44" E, at elev. of 700–800 m a.s.l. Remnants of primary broad-leaved evergreen and coniferous forest along tops of rocky ridges and mesae composed of light gray solid marble-like highly eroded crystalline limestone. Lithophyte on very steep rocky mossy slope. Flowers dull olive-green, lip deep violet. Rare. 12 June 2004, *L. Averyanov, Phan Ke Loc, Pham Van The, Nguyen Tien Vinh HAL 5683* (HN, LE).

Related species. *L. acuminata* Hook.f., *L. nervosa* (Thunb.) Lindl., *L. odorata* (Willd.) Lindl. (= *L. paradoxa* (Lindl.) Reichenb.f.).

Diagnostic features. Short cylindrical projections of the callus at the base of the lip; deep violet, broad and flat, finely denticulate epichile; one-veined petals.

Sympodial terrestrial and lithophytic herb 16–18 cm tall. **Pseudobulbs** distant on short plagiotropic rhizome, narrowly cylindrical 3–5 cm tall, 4–5 mm wide, enveloped in leaf sheaths 0.5–3 cm long, at the base with 4–5 thin, broad, herbaceous scales 0.5–3 cm long, 0.5–1 cm wide. **Stem** pseudobulbous, erect, with 2–3 leaves and terminal inflorescence. **Leaves** thin, plicate, dull gray-green or light silvery-green, ovate to ovate elliptic, 4–6 cm long, 1.5–2.5 cm wide, acute to acuminate, narrowing toward the base into broad sheaths enveloping the stem. **Inflorescence** lax raceme, 12–14 cm long, usually with 5–9 flowers; inflorescence stalk violet, ebracteate or with 1–2 small bracts, indistinctly angular in section, 8–10 cm long, 1–1.5 mm wide; rachis deep violet, 2–3 cm long; floral bracts triangular ovate, acute, perpendicular to the rachis, 1–1.5 mm long, 0.5–1 mm wide near the base. **Flowers** odorless, middle-sized, opening in succession, tepals light green or yellowish-green, with violet tint toward the apex, lip deep purple-violet, column white, anther cup light pink. **Pedicel and ovary** white with violet tint, cylindrical to slightly angular, 7–8 mm long, less than 1 mm wide. **Sepals** 3-veined, obtuse; median sepal oblong-lanceolate, about 6 mm long, 1.2 mm wide; lateral sepals narrowly ovate, oblique, 5 mm long, about 2 mm wide. **Sepals** 1-veined, narrowly lanceolate, obtuse, 6 mm long, 1 mm wide. **Lip** 4 mm long and wide, recurved, with narrow conduplicate base and broad flat epichile, finely denticulate along the margin, with prominent callus at the base, which continues into two cylindrical forwardly directed projections. **Column** slender, curved, 2.5 mm long, about 0.8 mm wide, with small insignificant lateral wings at the front. **Operculum** hemispherical, about 0.6 mm broad. Fig. 11.

Flowering period. May – July.

Ecology. Terrestrial and lithophytic herb on rocky marble-like limestone outcrops, particularly on tops of ridges. Coniferous and broad-leaved evergreen limestone forests at 500–800 m a.s.l.

Distribution. Vietnam (Bac Kan: Na Ri, Cao Bang: Trung Khanh). Fig. 11(g).

Etymology. The species name reflects specific habitat of the plant occurring usually on rocky outcrops of highly eroded marble-like limestone on tops of ridges.

Notes. The new species has obvious relations with *L. acuminata*, *L. nervosa* and *L. odorata* but may easily be distinguished by its dull silvery-gray-green leaves (with three prominent veins), distinct short cylindrical projections of the callus at the base of the lip and flat deep violet epichile, finely denticulate along the margin. It also has smallest vegetative parts. The plants was commonly observed growing on rocky rather open outcrops of solid crystalline

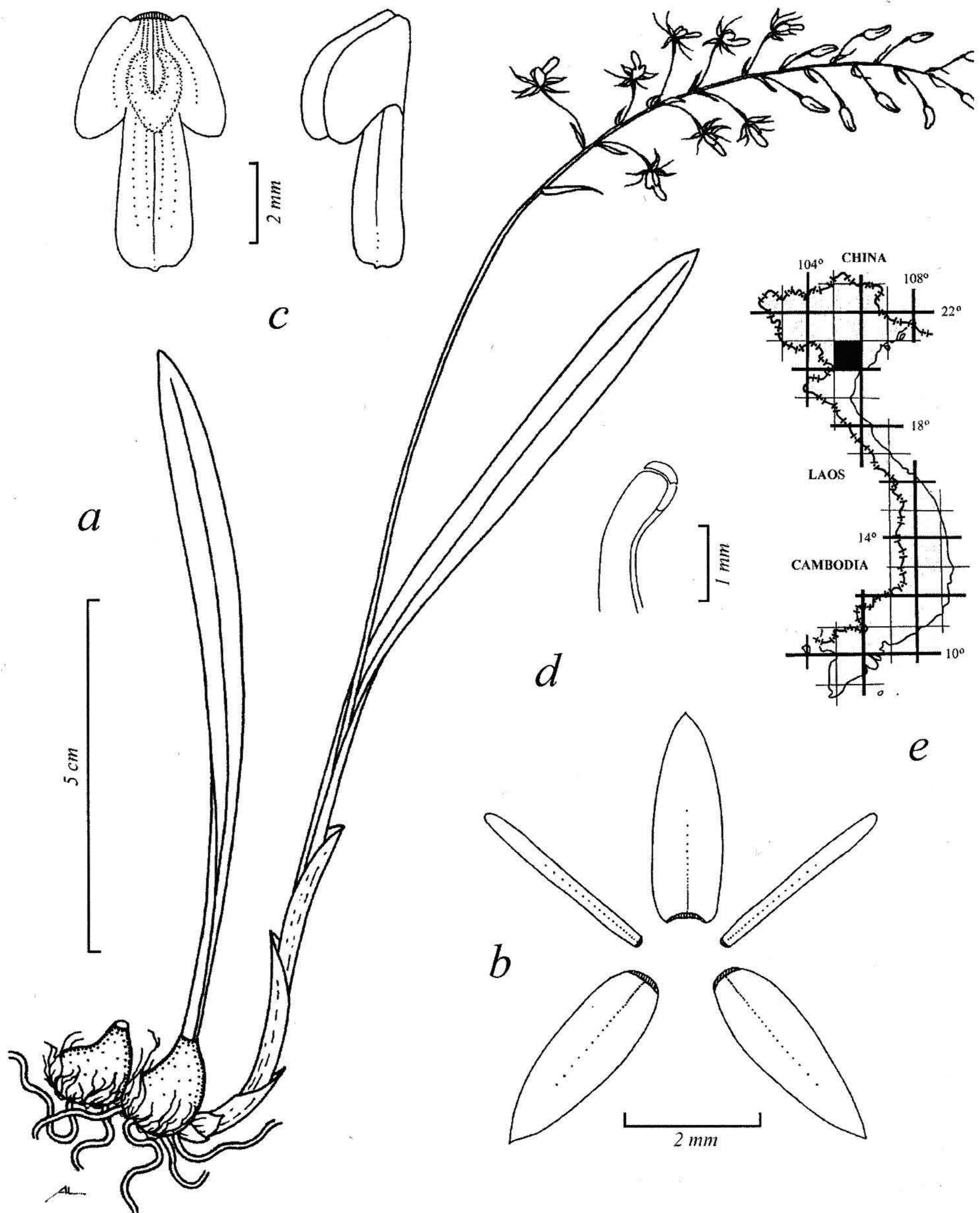


Fig. 12. *Liparis tripartita*:

a – flowering plant; *b* – flattened sepals and petals; *c* – flattened lip and its side view; *d* – column side view; *e* – distribution map (all drawn from the isotype by the authors).

marble-like white limestone on cliffs along the top of remnant highly eroded ridges and mesas. Most probably this species is a local endemic of limestone mountain systems of the eastern part of the South-Chinese floristic province.

Liparis tripartita Aver. et Averyanova, **sp. nova**

Characteres diagnostici. *Labium tripartitum, lobis lateralibus ovatis, retusis, lobo medio oblongo, retuso, lobis lateralibus multo longiore.*

Type: N Vietnam, Thanh Hoa Prov., Ba Thuoc Distr., Co Lung municipality, Eo Dieu village, around the point 20°26'06" N, 105°13'51" E. Primary evergreen seasonal broad-leaved closed submontane forest on the top of rocky ridge composed of crystalline marble-like highly eroded limestone at elev. of 900–1000 m. Lithophyte. Flowers light green. Very common. 25 September 2003, *L. Averyanov, Do Tien Doan, J. Regalado, Nguyen Tien Vinh HAL 3506* (HN, holotype; iso – LE).

Related species. *L. mannii* Reichenb.f.

Diagnostic features. Lip tripartite; side lobes ovate, retuse; mid-lobe oblong, retuse, much longer than side lobes.

Sympodial lithophytic and epiphytic herb with leaves and inflorescence 15–22 cm tall. **Pseudobulbs** subglobose to ovoid, slightly oblique, closely ranked in one row, 8–10 cm tall, 0.6–0.8 cm across, with 2–3 broad papyraceous or fibrous whitish-gray scales at the base, apically with 1 leaf having distinct articulation at the base. **Leaf** 1, conduplicate and keeled at the base, developing from the apex of pseudobulb, narrowly lanceolate to linear, acute or shortly apiculate, narrowed to sessile or shortly petiolate base, 12–18 cm long, 0.5–0.8 cm wide. **Inflorescence** lax, many-flowered raceme, 13–16 cm long; inflorescence stalk hardly winged, 6–8 cm long, ebracteate, arching; rachis curved, commonly becoming horizontal, 8–12 cm long. **Floral bracts** narrowly cuneate, acuminate, hyaline without distinct veins, 2–5 mm long, 0.4–0.6 mm wide. **Flowers** 8–9 mm across, tepals light green, lip light yellowish-green. **Pedicel and ovary** narrow, green, 12–15 mm long, 0.3 mm wide. **Sepals** subsimilar, acute, reflexed, narrowly ovate to broadly lanceolate, without distinct veins, 3.5–4 mm long, 0.8–1 mm wide. **Petals** linear, obtuse, reflexed, without distinct veins, 3.5–4 mm long, 0.3–0.4 mm wide. **Lip** tripartite, 3.5–4 mm long, 2.5–3 mm wide across the side lobes (when flattened), slightly recurved at the base of mid-lobe, with low round callus on the disk; side lobes erect, broadly ovate, obtuse, with small auricles at the base; mid-lobe straight, broad, oblong, obtuse or shortly retuse at the apex. **Column** narrow, slightly curved, 2 mm long, 1 mm wide, without wings. Fig. 12.

Flowering period. September – October.

Ecology. Lithophyte and epiphyte. Broad-leaved evergreen closed submontane forests on rocky crystalline marble-like limestone at 900–1000 m a.s.l.

Distribution. Vietnam (Thanh Hoa: Ba Thuoc). Fig. 12(e).

Etymology. The species name reflects specific form of the lip.

Notes. In all vegetative parts the new species resembles the closely related *L. mannii*. From all the other Indochinese species *L. tripartita* differs in its three-lobed lip with erect broad and obtuse side lobes and long oblong, obtuse or slightly retuse mid-lobe. This species represents local endemism of the limestone flora of the eastern part of North Indochinese

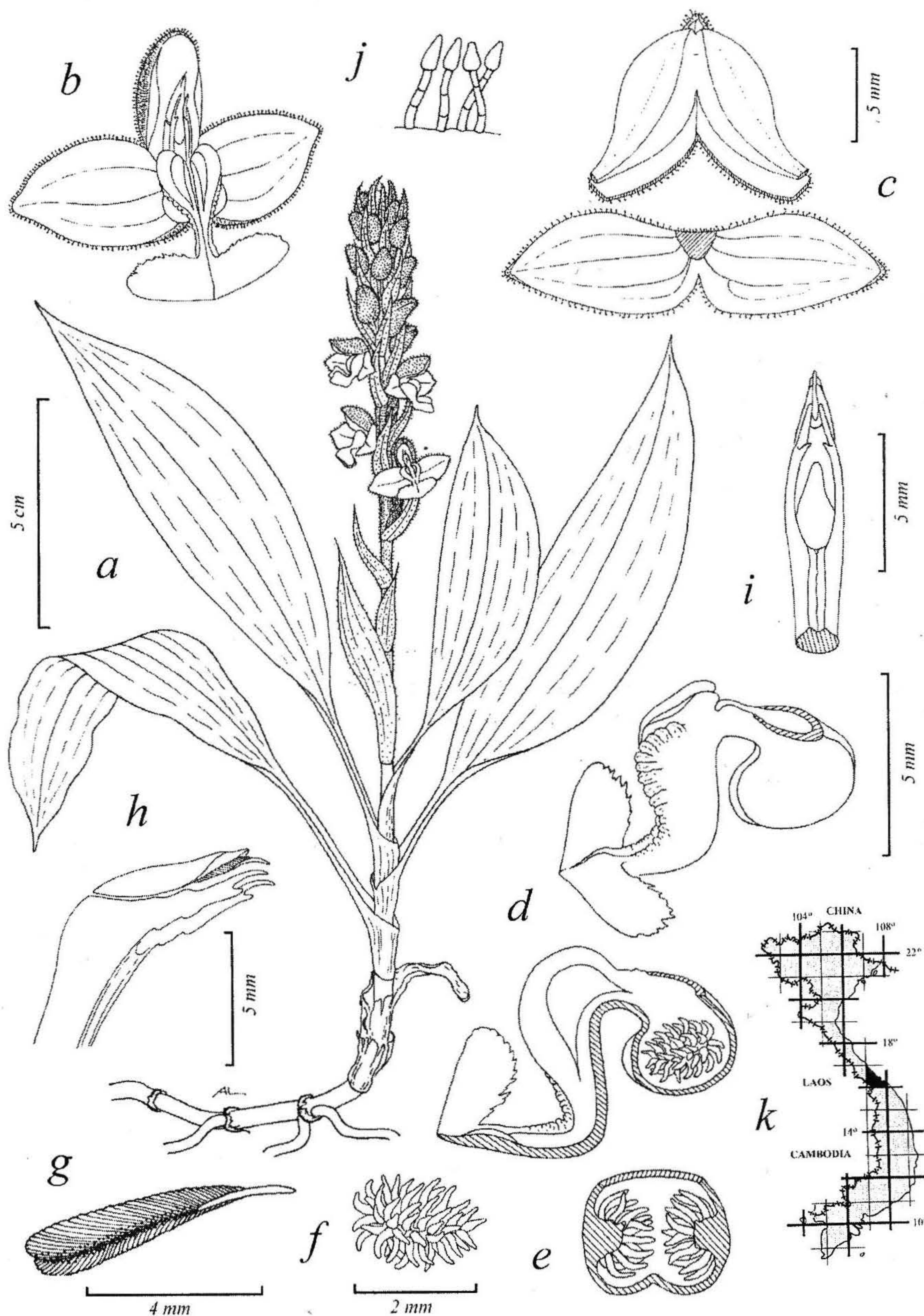


Fig. 13. *Orchipedum echinatum*:

a – flowering plant; *b* – flower; *c* – flattened sepals and petals; *d* – lip and its sagittal section, side view; *e* – transverse section of spur; *f* – side wall spur gland; *g* – pollinarium; *h* – column side view; *i* – column, frontal view; *j* – glandular hairs typical of inflorescence indumentum; *k* – distribution map (all drawn from the isotype by the authors).

floristic province. In the area of its discovery this species is very common and plays an important role in lithophytic plant communities on rocky limestone outcrops, particularly on isolated tops of ridges.

Orchipedum echinatum Aver. et Averyanova, **sp. nova**

Characteres diagnostici. *Columna angusta exalata; petala connata; calcar sphaericum glandulis duabus magnis papillis acutis longis crassis numerosis obtectis.*

Type: S Vietnam, Thua Thien Hue Prov., Phu Loc Distr., Bach Ma National Park, S slope of Bach Ma Mt. below Hai Vong Dai peak, around the point 16°11'11" N, 107°50'57" E at elev. about 1050 m a.s.l. Mixed and broad-leaved evergreen dry secondary montane forest on very steep shale/sandstone slopes. Terrestrial creeping herb about 20 cm tall on shady stream slope. Flowers: lateral sepals light green, median sepal and lateral petals dull light brownish-pink, lip pure white. Leaves uniform green. Rare. 23 April 2003, *L. Averyanov, Nguyen Xuan Tam, Nguyen Tien Vinh HLF 1296* (HN, holotype; iso – LE).

Related species. Not known.

Diagnostic features. Narrow wingless column; connate petals; spherical spur with two very large glands covered in numerous long and thick acute papillae.

Terrestrial herb with long creeping green rhizome 4–5 mm thick, rooting at the nodes, with ascendant orthotropic leafy stem. **Stem** 20–25 cm tall, with 4–6 leaves. **Leaves** with blade obliquely elliptic, uniform green, with prominent median vein, 8–13 cm long, 2.5–4 cm wide, acute to shortly acuminate, narrowing at the base into a distinct petiole 2–5 cm long, 2–3 mm wide. **Petioles** broadening at the base into a broad sheath embracing the stem. **Inflorescence** a terminal, dense, many-flowered spike, 14–16 cm tall. **Scape** 6–9 cm long, 2.5–3 mm thick, with 2–4 light yellow-brownish, broadly lanceolate to lanceolate bracts, 1.5–3 cm long, 3–5 mm wide; scape, rachis, inflorescence and flower bracts with glandular hairs. **Rachis** 7–9 cm long. **Flower bracts** narrowly lanceolate to lanceolate, 11–18 mm long, 2–4 mm wide, light green to light yellowish-brown, acuminate, densely hairy. **Flowers** sessile, odorless, 1.8–2 cm across; lateral sepals olive-green, median sepal pink-brown; petals very thin, hyaline, whitish; lip (including spur) pure white; column light pinkish. **Sepals** rather rigid, with sparse glandular hairs outside; median sepal narrowly ovate, hooded and curved, directed forward, 10–11 mm long, 4–4.5 mm wide; lateral sepals flat, reflexed, oblique ovate, 11.5 mm long, 6–6.5 mm wide. **Petals** obliquely obovate, 9.5 mm long, 4–4.5 mm wide, with very narrow base, broadening toward the apex, connate in the apical third, very closely and densely adpressed (but not adnate) to the median sepal. **Lip** spurred, rather rigid, distinctly divided into hypochile, mesochile and epichile, about 9–9.5 mm long, jointed to the base of column. **Hypochile** broadly conduplicate, with two broad semicircular lobes reflexed abaxially and two large semicircular keels on its sides. **Mesochile** thick, fleshy, irregularly grooved on the sides, narrowing toward epichile. **Epichile** bilobed, with low twin median keels, lobes flat, rhombic, 2.5–3 mm long, 1.5–2 mm wide, irregularly serrate along the margin facing to the lip base. **Spur** almost spherical, 3–3.5 mm across, completely enclosed by concave bases of sepals, inside on each lateral side with very large gland densely covered with numerous long thick acute papillae. **Column** simple, narrow, 9–10 mm long, 2–2.5 mm thick, slightly bent forward at the middle, with two narrow lateral keels at the

front, each ending in two unequal acuminate curved teeth, stigma narrowly ovate, placed between keels at the middle of column. **Anther** lanceolate, about 6 mm long, 1.6–1.8 mm wide acute at the apex. **Pollinarium** oblanceolate, 6 mm long, with short linear stipe and numerous obliquely situated linear pollen packets. **Ovary** twisted, 1.2–1.6 cm long, 2–3 mm thick, with dense glandular hairs. Fig. 13.

Flowering period. April – May.

Ecology. Creeping terrestrial herb. Mixed (with *Dacrydium elatum* and *Dacrycarpus imbricatus*) and broad-leaved evergreen closed montane forests on shale and sandstone, particularly along streams and small river canyons.

Distribution. Vietnam (Thua Thien Hue: Bach Ma Mts.). Fig. 13(k).

Etymology. From Latin «*echinatus*» – spiny, referring to the spur glands densely covered in numerous acute papillae.

Notes. Unusual species having no close relatives in the genus. It differs strikingly from all other *Odontochilus* species in the large prominent spur glands covered in numerous long thick acute papillae, which fill almost the total cavity of the spherical spur. In this papillose hairiness, as well as the narrow wingless column and the connate petals, the new plant approaches the genus *Goodyera* R.Br. Geographically this species is probably a local endemic of Bach Ma Mts. and adjoined ranges in the northern part of the Central Annamese floristic province.

Panisea vinhii Aver. et Averyanova, sp. nova

Characteres diagnostici. *Labium distincte tripartitum; labii lobus medius margine undulatus, centro carinis duabus elevatis carnosis.*

Type: S Vietnam, Ninh Thuan Prov., Ninh Hai Distr., Vinh Hai Municipality, NE slopes on Nui Chua Mt. to SW of the point 11°43'52" N, 109°08'35" E at elev. about 800–950 m a.s.l. Primary evergreen closed dry forest on rocky montane slopes composed of granite. Epiphyte. Flowers not fragrant, tepals white, lip white with light yellow turning to yellow-brown central keels. Rare. 30 March 2004, J. Regalado, Nguyen Tien Hiep, Phan Ke Loc, L. Averyanov, Nguyen Tien Vinh et al. HLF 4410 (HN, holotype; iso – LE).

Related species. *Panisea albiflora* (Ridl.) Seidenf.

Diagnostic features. Lip distinctly tripartite, mid-lobe undulate along the margin, with 2 tall fleshy keels at the center.

Sympodial epiphytic herb with closely crowded pseudobulbs. **Pseudobulbs** ovate to subspherical, 1–2 cm tall, 0.5–1.2 cm wide, with 2 apical leaves, young smooth, with 4–6 brown cataphylls at the base, old roughly irregularly wrinkled. **Leaves** elliptic to broadly lanceolate, 2–5 cm long, 0.8–1.4 cm wide. **Inflorescence** a hysteranteous short apical erect raceme with 3–6 flowers; inflorescence stalk 2–3 cm, rachis 1–2.5 cm long. **Flower bracts** white to yellowish-white, broadly ovate, caducous, 6–8 mm long, 3–4 mm wide, acute. **Flowers** odorless, white, lip with yellow central keels. **Sepals** narrowly ovate, with 3 nerves, 9–10 mm long, 2.5–3 mm wide, lateral sepals with high longitudinal keel ending at the apex in short broad mucro. **Petals** narrowly ovate to narrowly oblong, with 3 nerves, 8–9 mm long, 2–3 mm wide. **Lip** concave at the base, oblong, distinctly tripartite, 8–9 mm long and 3.5–4 mm wide; side lobes broadly triangular, erect, about 0.8 mm tall; mid-lobe elliptic to

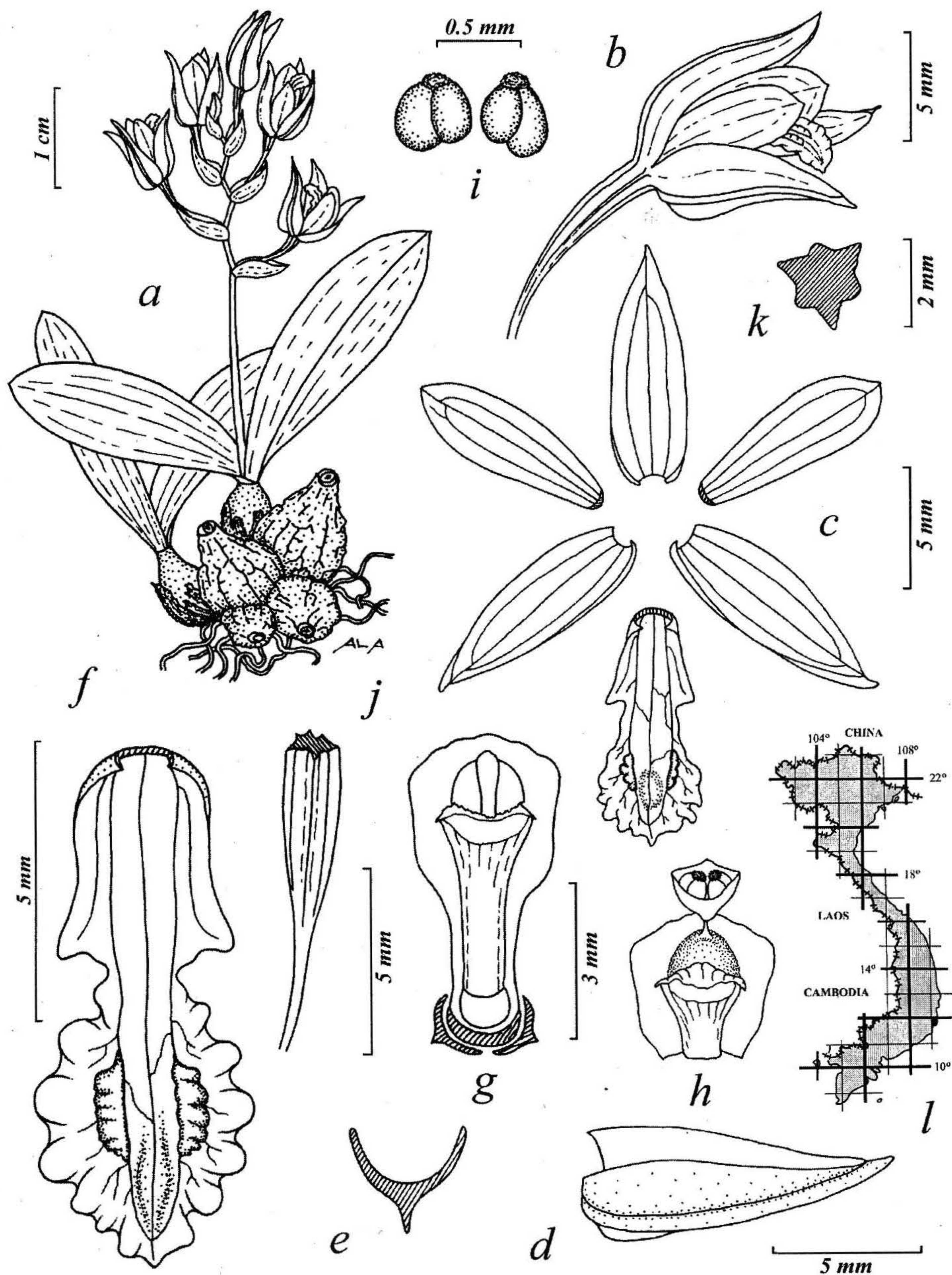


Fig. 14. *Panisea vinhii*:

a – flowering plant; *b* – flower, side view; *c* – flattened tepals; *d* – lateral sepal, side view; *e* – transverse section of lateral sepal at its middle; *f* – flattened lip; *g*, *h* – column, frontal view; *i* – pollinia; *j* – peduncle and ovary; *k* – transverse ovary section near the top; *l* – distribution map (all drawn from the isotype by the authors).

ovate, 5–5.5 mm long, 3.5–4 mm wide, with undulate margin and 2 short tall distinct fleshy keels. **Column** 5–5.5 mm tall, 2–2.5 mm wide, with wide conspicuous lateral wings, broadening to the apex; column foot in the form of a small flat plate about 1 mm long, placed at a right angle to the column. **Operculum** hemispherical about 1 mm broad. **Pollinia** 4 in 2 pairs, unequal, subspherical. **Pedicel and ovary** 6–8 mm long, 1.5–2 mm wide; ovary strongly angled with distinct longitudinal keels. Fig. 14.

Flowering period. March.

Ecology. Epiphyte on high trees. Evergreen closed dry submontane forest on granite mountains at 800–950 m a.s.l.

Distribution. Vietnam (Ninh Thuan: Nui Chua Mts.). Fig. 14(l).

Etymology. The new species is named after Mr. Nguyen Tien Vinh, a staff member of the Institute of Ecology and Biological Resources (Academy of Sciences and Technology of Vietnam), an outstanding collector who collected the type specimens.

Notes. From all the other species of this genus (Seidenfaden 1986, 1992; Lund 1987) our plant distinctly differs in its tripartite lip, undulate margin of mid-lobe and 2 short fat tall keels along the veins on the disc of the mid-lobe.

The new species is related to *P. albiflora*, endemic to the South Annamese floristic province (Averyanov & Averyanova 2003; Averyanov *et al.* 2003). *P. vinhii* is probably a vicarious species, which replaces *P. albiflora* in the western part of the South Indochinese floristic province. It represents strict local endemism of this area.

P. vinhii is a miniature plant with relatively large, simultaneously opening white attractive flowers. It has obvious horticultural significance as an ornamental plant.

Thrixspermum hiepii Aver. et Averyanova, *sp. nova*

Characteres diagnostici. *Labii facies interior laevis (epilosa, non convexa, non incrassata) absque lobi medii margine leviter elevato glabro callifero.*

Type: N Vietnam, Ha Giang Prov., Quan Ba Distr., Can Ty Municipality, Tia Sung Valley, Bat Dai Son Natural Reserve around the point 23°05'79" N, 105°01'01" E. Primary closed evergreen dry broad-leaved and coniferous forest on steep slopes and on tops of remnant limestone mountains at elev. of 1220 m a.s.l. 20 January 2003, Nguyen Tien Hiep, *To Quang Thao NTH 5420E* (HN, holotype; iso – LE).

Related species. *T. laurisilvaticum* (Fukuyama) Garay, *T. pygmaeum* (King et Pantl.) Holttum, *T. recurvum* (Hook.f.) O.Kuntze, *T. saruwatarii* (Hayata) Schlechter, *T. trichoglottis* (Hook.f.) O.Kuntze.

Diagnostic features. Smooth internal surface of the lip without indumentum, bosses or thickenings except for low insignificant glabrous callosity along the margin of mid-lobe.

Canopy branch monopodial epiphyte with short pendent, usually ascendant stem. **Leaves** 5–7 cm long, up to 8 mm wide. **Inflorescence** 5–6 cm long with few flowers opening in succession (rarely two together), aggregated at the scape apex on very short rachis. **Flowers** lasting 1–2 days, white or light yellowish, 9–11 mm in diam. **Sepals** 7 mm long, broadly acute; median sepal ovate, 3 mm wide; lateral sepals broadly rhomboid, oblique, 4.5 mm wide at the middle. **Petals** narrowly ovate to oblong, 6 mm long, about 2.5 mm wide. **Lip** broadly saccate at the base, 7–8 mm long, 9.5 mm wide (when flattened), tripartite; median

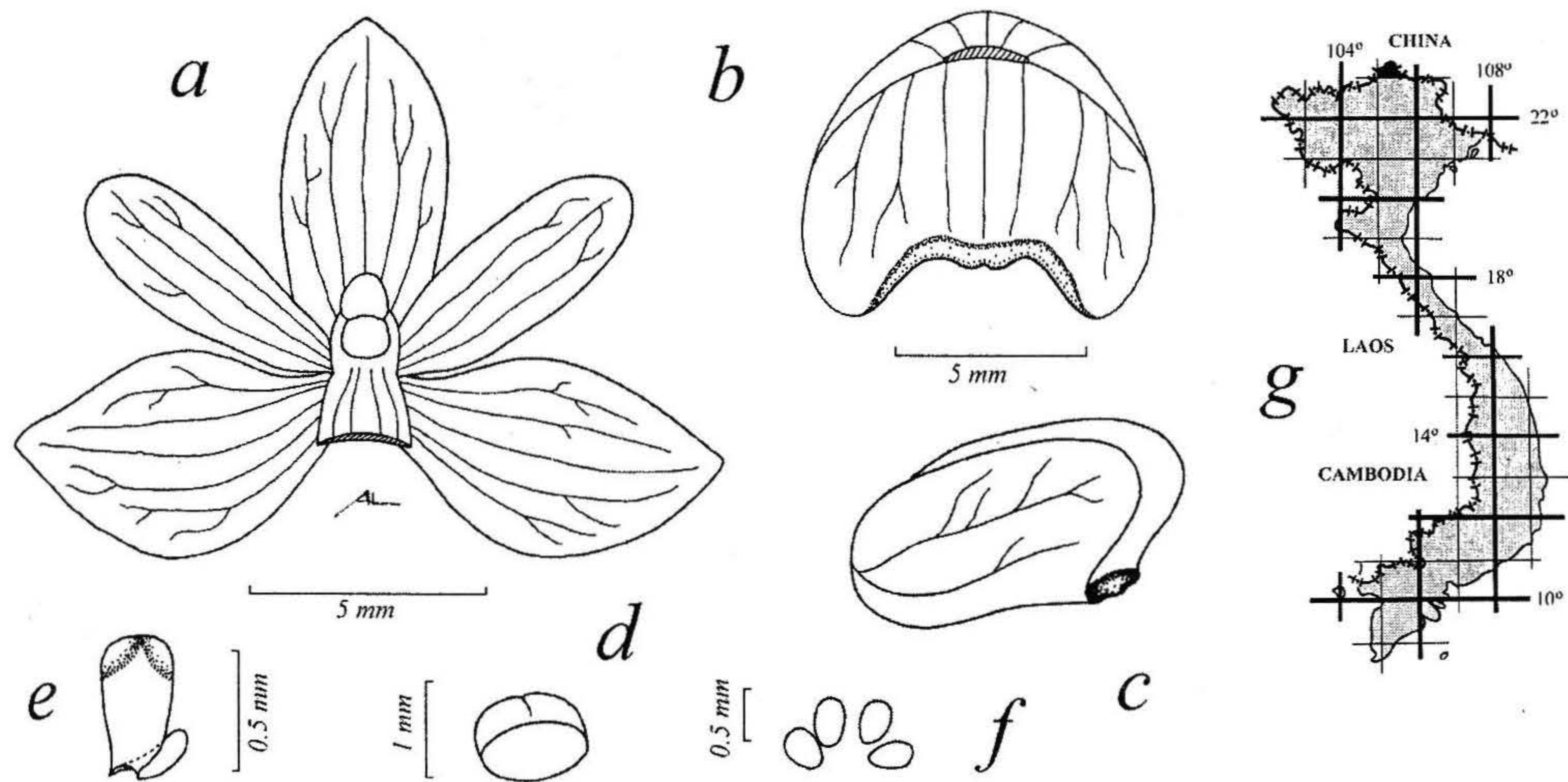


Fig. 15. *Thrixspermum hiepii*:

a – flattened flower (without lip), frontal view; *b* – flattened lip, frontal view; *c* – lip, side view; *d* – anther cup; *e* – pollinarium stipe (tegula); *f* – pollinia; *g* – distribution map (all drawn from the isotype by the authors).

lobe very small, truncate, hardly visible, with very slight thickening along the margin; lateral lobes large and broad with roundish apex; internal surface of the lip smooth, glabrous, without any bosses, callosity or indumentum. **Column** very short and broad, 1.5 mm long and wide, with short broad foot about 1.5 mm long, 2 mm wide. **Operculum** hemispherical, 1.2 mm wide. **Tegula** broad, spatulate, 0.6 mm long, 0.4 mm wide. **Pollinia** ovate, in two subequal pairs 0.5 mm in diam. Fig. 15.

Flowering period. January – February?

Ecology. Primary closed evergreen broad-leaved and coniferous forest on rocky limestone at 1100–1250 m a.s.l.

Distribution. Vietnam (Ha Giang: Bat Dai Son Mts.). Fig. 15(h).

Etymology. The new species is named after its discoverer, the famous Vietnamese botanist, Dr. Nguyen Tien Hiep.

Notes. The new species belongs to the group of small canopy epiphytes with flower lip having conspicuous erect broad side lobes and insignificant truncate mid-lobe. All of them have specific bosses or callosity covered with dense glandular hairs on the disc below the mid-lobe base. The newly discovered species has a smooth internal surface of the lip, without callosity or indumentum. The mid-lobe has a slightly thickened frontal margin also without hairs. These features make *T. hiepii* very distinct from all the other related species of this genus.

Thrixspermum stelidioides Aver. et Averyanova, sp. nova

Characteres diagnostici. *Columna apice stelidiis distinctis brevibus; labii lobi laterales magni, late falcati; labii lobus medius parvus, papillosus; labii discus callo magno, longipiloso.*

Type: S Vietnam, Thua Thien Hue Prov., Phu Loc Distr., Bach Ma National Park, N slope of Bach Ma Mts. around the point 16°13'53" N, 107°49'02" E at elev. about 400 m a.s.l. Broad-leaved evergreen wet secondary closed forest along rocky river valley and on river slopes. Epiphyte in shady place. Rare. 2 May 2003, *Nguyen Tien Hiep, L. Averyanov, Nguyen Tien Vinh et al. HLF 1587* (HN, holotype; iso – LE).

Related species. *T. annamense* (Guillaum.) Garay, *T. carnosum* (Ridl.) Schlechter, *T. merguense* (Hook.f.) O.Kuntze, *T. pygmaeum* (King et Pantl.) Holttum.

Diagnostic features. Short distinct stelidia at the column apex, very large broadly falcate side lobes of the lip, small finely papillose lip mid-lobe, as well as very large long-haired callus at the lip disc.

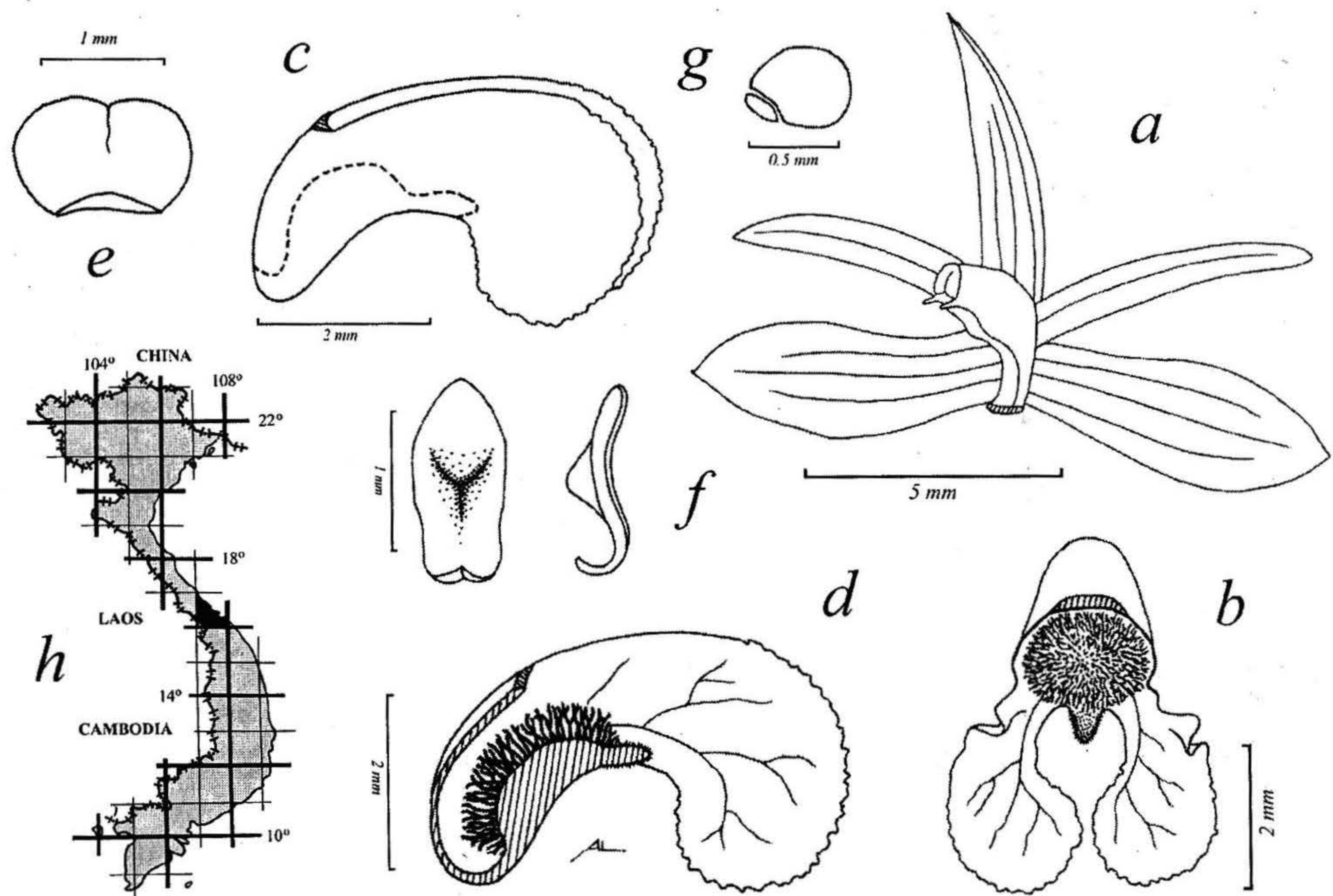


Fig. 16. *Thrixspermum stelidioides*:

a – flower (without lip), side view; *b* – flattened lip, frontal view; *c* – lip, side view; *d* – lip, sagittal section, side view; *e* – anther cup; *f* – pollinarium stipe (tegula), frontal and side view; *g* – pair of pollinia; *h* – distribution map (all drawn from the isotype by the authors).

Canopy branch monopodial epiphyte with short pendent stem. **Leaves** 4–6 cm long, about 5 mm wide. **Inflorescence** 3–5 cm long with few flowers opening in succession. **Flowers** short lasting, white, 6–7 mm in diam. **Sepals** broadly lanceolate, 4–5 mm long, about 2 mm wide, acute at the apex. **Petals** narrowly lanceolate, 4–5 mm long, about 1 mm wide. **Lip** saccate at the base, 5 mm long, 4.5 mm wide, tripartite; median lobe small tooth-like, papillose; lateral lobes very large, oblique, broadly falcate, broadening toward the apex, finely crenulate along the margin; disc of the lip at the base of mid-lobe with large long-haired callus that totally fills the lip sac. **Column** short and broad, 2 mm long, 1.5 mm wide, with short column foot about 1 mm long, with two distinct short stielidia at the apex. **Operculum** hemispherical, 1.5 mm broad. **Tegula** broad, spatulate, 1.5 mm long, 0.6 mm wide. **Pollinia** in two unequal pairs, 0.6 mm in diam. Fig. 16.

Flowering period. April – May.

Ecology. Canopy branch epiphyte. Broad-leaved evergreen wet closed lowland primary and secondary forests, particularly along shady river valleys at 300–450 m a.s.l.

Distribution. Vietnam (Thua Thien Hue: Bach Ma Mts.). Fig. 16(g).

Etymology. The species name reflects the presence of two short distinct stielidia on the column apex.

Notes. The new species belongs to the group of rare tiny canopy epiphytes with flowers which open in succession and last for only a few hours. The disc of the lip in the flower of these orchids bears various hairy bosses or callosities placed along the mid-vein between the side lobes. In our plant the central long-haired callus reaches maximal size and totally fills the saccate hypochile. The other distinct features of the new species are the small tooth-like conical mid-lobe, very large lateral spatulate side lobes (broadening toward the rounded apex) and short distinct stielidia on the lateral sides of the column apex. The flower of this plant certainly resembles the flowers of some species of *Pennilabium* J.J.Smith, but has, however, four pollinia in two unequal pairs, showing that it should be referred to of *Thrixspermum* Lour.

***Trias nummularia* Aver. et Averyanova, sp. nova**

Characteres diagnostici. *Petala parva; labium auriculatum; folia suborbicularia, succulenta, parva.*

Type: S Vietnam, Quang Tri Prov., Huong Hoa Distr., Huong Phung municipality, Sa Mu pass on Ho Chi Minh trail at elev. of 1130 m a.s.l. around the point 16°48'17" N, 106°34'28" E. Wet evergreen broadleaved forest on very steep montane slopes composed of granite and sandstones. Creeping epiphyte. Flowers odorless, tepals pure dull light yellow outside, dull light yellow with brown spots inside, lip dull green with brown spots, column and anther dull light yellow. Rare? 20 April 2004, L. Averyanov, Phan Ke Loc, Nguyen Tien Hiep HAL 4592 (HN, holotype; iso – LE).

Related species. *T. picta* (Par. et Reichenb.f.) Par. ex Hemsl., *T. rosea* (Ridl.) Seidenf., *T. cambodiana* E.A.Christenson.

Diagnostic features. Small petals, lip with auricles, small thick fleshy succulent suborbicular leaves.

Sympodial epiphyte with 1-leaved pseudobulbs distant on creeping plagiotropic rhizome. **Rhizome** slender, more or less straight, 1–1.5 mm thick. **Roots** numerous, narrow,

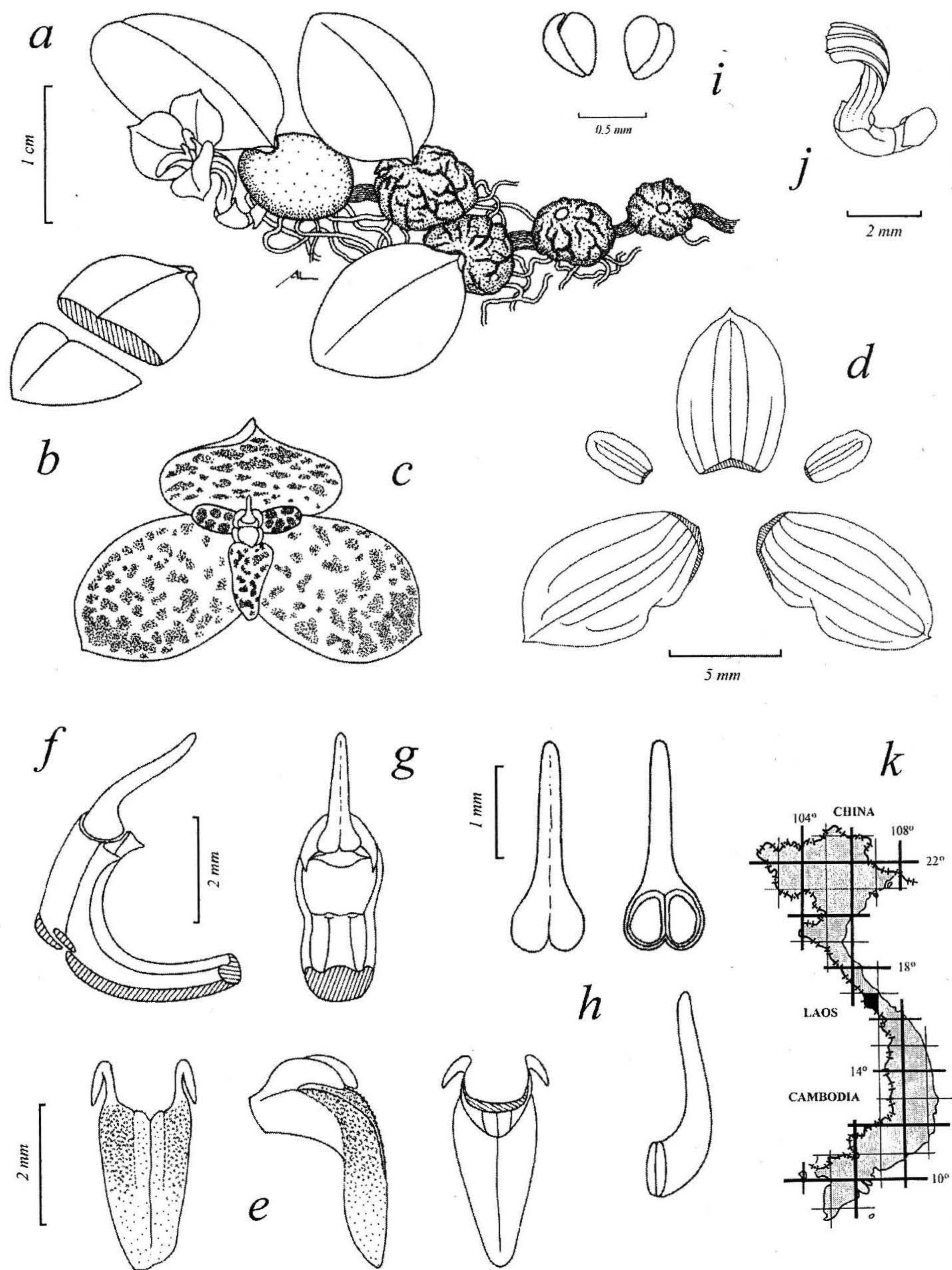


Fig. 17. *Trias nummularia*:

a – flowering plant; *b* – leaf and its cross section; *c* – flower, frontal view; *d* – flattened sepals and petals; *e* – lip, frontal, side and back views; *f* – column, side view; *g* – column, frontal view; *h* – anther cup, frontal, back and side views; *i* – pollinia; *j* – pedicel and ovary; *k* – distribution map (all drawn from the isotype by the authors).

wiry, from pseudobulb base. **Pseudobulbs** subglobose to globose, slightly compressed laterally, green, old irregularly roughly wrinkled, 5–8 mm in diam., distant on rhizome with intervals 0.6–1.2 cm. **Leaf** 1, broadly ovate to suborbiculate, succulent, 8–15 mm long, 10–12 cm wide, obtuse to broadly acute or shortly emarginate at the apex, suddenly narrowing to the base into very short petiole about 1 mm long. **Inflorescence** 1-flowered, developing from the base of pseudobulb, pedicel and ovary sigmoid, shorter than leaves, glabrous, 3.5 mm long; with 2 small broad hyaline bracts. **Flowers** odorless, 8–12 mm in diam.; sepals outside dull light yellowish-orange, inside white, heavily spotted with purple; petals white with few large deep purple spots; lip light dull green with purple-brown spots; column white; anther cup dull yellow. **Sepals** subsimilar, ovate, with 5 nerves, shortly apiculate at the apex; median sepal 7–7.5 mm long, 5 mm wide; lateral sepals 9–10 mm long, 5 mm wide, adnate to the column foot 2.5–3 mm long. **Petals** broadly oblong, 3-veined, about 3 mm long, 1.5–2 mm wide, with broadly roundish apex. **Lip** three-lobed, broadly oblong, with broad base, narrowing to the apex, deflexed centrally, 3.5 mm long, about 1.5 mm wide, apex of mid-lobe broad, subtruncate to slightly retuse; side lobes erect, falcate, acute, about 1 mm long. **Column** short and broad, 1.5–2 mm tall, 1.5 mm wide, column foot curved at straight angle, 2.5–3 mm long. **Anther cup** hemispherical, about 0.8 mm across, with narrow forward projecting prolongation 1.8–2 mm long. Pollinia 4, 0.5 mm in diam., in two pairs. **Ovary** glabrous 1.5–2 mm long, 1.5 mm wide. Fig. 17.

Flowering period. April – May.

Ecology. Creeping canopy epiphyte. Broad-leaved evergreen wet montane forest on granite and sandstones at 1100–1200 m a.s.l.

Distribution. Vietnam (Quang Tri: Sa Mu pass). Fig. 17(k).

Etymology. The species is named after its leaves, which resemble small but heavy coins.

Notes. With the description of this new species, the genus *Trias* Lindl. comprises 14 species with the center of diversity in Indochina (Seidenfaden 1976; Christenson 2003). *T. nummularia* belongs to the group of species with a simple prolongation of the operculum, such as *T. picta*, *T. rosea* and *T. cambodiana*. From all known species of the genus this species differs in very small succulent fleshy subcircular leaves, broadly ovate lateral sepals, small petals, large prominent lip auricles and coloration of the lip (green spotted with brown). This small orchid inhabits canopies of high trees and may easily be overlooked during field work. It was collected in Vietnam very close to the border with Laos and certainly may also be found in highland montane areas of that country.

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