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New species of the genus *Cleisostoma* in the flora of Vietnam

Leonid V. Averyanov[(1*)], Nguyen Thien Tich[(2)] and Nguyen Van Canh[(3)]

1.Komarov Botanical Institute, Russian Academy of Science, St. Petersburg, Prof. Popov Str. 2, Russia, 197376.
2.Department of Botany & Ecology, University of Science, Ho Chi Minh National University. 227 Nguyen Van Cu St., 5th Dist., Ho Chi Minh, Vietnam.
3.3/12/3 Vo Van Kiet street, Buon Ma Thuot City, Dak Lak province, Vietnam.
**Corresponding author: av_leonid@mail.ru; av_leonid@yahoo.com*

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ABSTRACT: A short review of the genus *Cleisostoma* in the flora of Vietnam is presented with 9 sections and 28 species among which 9 are locally endemic. Present data show the territory of Vietnam as the richest center of diversity for the genus. Two monotypic sections (*Gastrochilopsis, Pterogyne*) and three species (*Cleisostoma lecongkietii, C. phitamii, C. tricornutum*) are described as new for science, two species (*C. subulatum, C. linearilobatum*) are reported on the base of voucher specimens as a new record for the flora of Vietnam.

KEY WORDS: *Cleisostoma*, flora of Vietnam, new taxa, Orchidaceae, plant diversity, plant taxonomy.

INTRODUCTION

The polyphyletic genus *Cleisostoma* Blume, with a series of such more or less closely-allied, well-defined and widespread Asian genera such as *Acampe* Lindl., *Gastrochilus* D.Don, *Holcoglossum* Schltr., *Micropera* Lindl., *Pelatantheria* Ridl., *Pomatocalpa* Breda, *Stereochilus* Lindl., etc., and forming relatively "stable" taxonomic groups at the rank of subtribe are named in various publications including *Sarcanthinae* Benth. (Dressler, 1981), *Aeridinae* Pfitz. (Averyanov, 1991, 2008; Dressler, 1993; Pridgeon et al., 2014), *Vandinae* Rchb.f. (Averyanov, 1994) or *Gastrochilinae* Szlach. (Szlachetko, 1995), is placed in the tribe *Vandeae* Lindl. of subfamily *Vandoideae* Endl. (Dressler, 1981; Averyanov, 1991, 1994, 2008; Szlachetko, 1995) or *Epidendroideae* Lindl. (Dressler, 1993; Pridgeon et al., 2014). *Cleisostoma* includes about 100-110 species that are widely distributed within mainland tropical and subtropical Asia, Malaysia and Indonesia to the Japan, Philippines, New Guinea, Pacific islands and Australia (Seidenfaden, 1975; Comber, 1990, 2001; Seidenfaden, Wood, 1992; Su Horng-Jye, 2000; Pearce, Cribb, 2002; Chen, Wood, 2009).

Available literature suggested Thailand to be the richest area of diversity for the genus where 27 species have been reported (Seidenfaden, 1975; Comber, 2001). Publications on the orchid inventory in Vietnam listed only 20 species of the genus occurring there (Seidenfaden, 1992; Averyanov, 1994; Averyanov, Averyanova, 2003). Recent studies in Vietnam discovered and recorded additional species including *Cleisostoma chantaburiense* Seidenf. (Tich, 1991; Tran Hop, 1998), and three local endemics after the date of publication of the last inventory. These local-endemic species are - *Cleisostoma flavescens* Aver. et Averyanova, *C. melanorachis* Aver. and *C. subulifolium* Aver. (Averyanov, Averyanova, 2003, 2005). Eventually, two additional new species of the genus were recently recorded for the flora of Vietnam - *Cleisostoma linearilobatum* (Seidenf. et Smitinand) Garay and *C. subulatum* Blume (Nguyen Van Canh pers. comm.). This paper describes three new species recently discovered in Vietnam – *C. lecongkietii* Tich et Aver., *C. phitamii* Tich et Aver. and *C. tricornutum* Aver., and provides additional information about *C. linearilobatum* (Seidenf. et Smitinand) Garay and *C. subulatum* Blume - new records for the flora. The present study suggests that the flora of Vietnam contains the richest diversity of species of *Cleisostoma* with 28 currently recognized species listed in table 1. Nine species, or one third of the total, are strict endemics with very restricted distribution. Two of the described endemic species have a very isolated taxonomic position. These are segregated into separate monotypic sections - Sect. *Gastrochilopsis* (type - *C. phitamii*) and Sect. *Pterogyne* (type - *C. lecongkietii*).

It is noteworthy that the strong deformation of the complicated fleshy lip structures typically occurring on dry herbarium specimens consistently makes taxonomic studies of the genus problematic. Future investigations using living plant material or liquid-fixed specimens will undoubtedly reveal new promising perspectives for the discovery of many more novelties within this genus.

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Table 1. The genus *Cleisostoma* Blume in Vietnam

Gen. *Cleisostoma* Blume., 1825. Bijdr. 362: 20.	
Sect. 1. *Cleisostoma*; Seidenf., 1975, Dansk Bot. Ark. 29, 3:10	**Sect. 5. *Mitriformia* Seidenf., 1975, l.c.: 45**
C. aspersum (Rchb.f.) Garay	*C. arietinum* (Rchb.f.) Garay
C. crochetii (Guillaum.) Garay	*C. williamsonii* (Rchb.f.) Garay
C. discolor Lindl.	**Sect. 6. *Paniculata* Seidenf., 1975, l.c.: 34**
C. flavescens Aver. et Averyanova*	*C. chapaense* (Guillaum.) Garay*
C. lendyanum (Rchb.f.) Garay*	*C. duplicilobum* (J.J.Smith) Garay
C. linearilobatum (Seidenf. et Smitinand) Garay	*C. equestre* Seidenf.*
C. melanorachis Aver.*	*C. inflatum* (Rolfe) Garay
C. racemiferum (Lindl.) Garay	*C. paniculatum* (Ker-Gawl.) Garay
C. tricornutum Aver.*	**Sect. 7. *Pilearia* (Lindl.) Seidenf., 1975, l.c.: 55**
Sect. 2. *Complicata* Seidenf., 1975, l.c.: 63	*C. filiforme* (Lindl.) Garay
C. chantaburiense Seidenf.	*C. fuerstenbergianum* Kraenzl.
C. simondii (Gagnep.) Seidenf.	**Sect. 8. *Pterogyne* Aver., sect. nov.**
Sect. 3. *Echinoglossa* Seidenf., 1975, l.c.: 40	*C. lecongkietii* Tich et Aver.*
C. birmanicum (Schltr.) Garay	**Sect. 9. *Subulata* Seidenf., 1975, l.c.: 23**
C. striatum (Rchb.f.) Garay	*C. rostratum* (Lodd.) Seidenf.
Sect. 4. *Gastrochilopsis* Aver., sect. nov.	*C. scortechinii* (Hook.f.) Garay
C. phitamii Tich et Aver.*	*C. subulatum* Blume
	C. subulifolium Aver.*

Endemic species are marked with asterisk (*); names of described species and species recorded in Vietnam at first are underlined.

TAXONOMIC TREATMENT

Cleisostoma Blume, 1825, Bijdr. 362: 20.

Type: *Cleisostoma sagittatum* Blume.

About 110 species distributed in Sri Lanka, India, Mainland SE. Asia, Japan, Indonesia, New Guinea, Philippines, Australia, Pacific Islands of tropical zone.

In Vietnam 28 species (9 endemic) in 9 sections.

New species of the genus in the flora of Vietnam

Cleisostoma* Sect. *Cleisostoma; Seidenf., 1975, Dansk Bot. Ark. 29, 3: 23; Aver., 1994, Ident. Guide Vietnam. Orch.: 377; Pearce, Cribb, 2002, Orch. Bhutan: 508.

Type: *Cleisostoma sagittatum* Blume.

25-30 species found throughout the area of generic distribution. In Vietnam 9 species (4 endemics).

Cleisostoma linearilobatum (Seidenf. et Smitinand) Garay, 1979, Bot. Mus. Leafl. 23: 172; Seidenf., 1995, Opera Bot. 124: 60, plate 12a. – *Sarcanthus linearilobatus* Seidenf. et Smitinand, 1965, Orch. Thailand 4, 2: 684, fig. 506. – *S. sagittatus* King et Pantl., 1897, Journ. Asiat. Soc. Bengal 2, Nat. Hist. 66: 595. – *Cleisostoma sagittiforme* Garay, 1972, Bot. Mus. Leafl. Harv. Univ. 23, 4: 174; Seidenf., 1975, Dansk Bot. Ark. 29, 3: 19, fig. 5.

Fig. 1A–C.

Described from NW. Thailand ("Kawng He, Chiengmai"). **Type** ("*Kerr 363*") – K.

Distribution: Vietnam: Dak Nong (Nam Nung nature reserve). NE. India (Khasia), SW. China (Yunnan).

Studied specimens: **VIETNAM**: Dak Nong province, Nam Nung nature reserve, evergreen broad-leaved forest at elevation 600-800 m a.s.l., 8 March 2013, *Nguyen Van Canh s.n.* (LE – photo).

Note: According to observations of G. Seidenfaden "There is some variability in the color scheme, a collection from N. Thailand have the dark colors on sepals and petals indicated by Pantling for his Khasia collection, while several collections from NE. Thailand have more light colours". A single plant found in Vietnam has flowers of the same color scheme as plants from northeastern Thailand.

Ecology: Evergreen broad-leaved forest. 600-800 m. Fl. July – August. Very rare. Estimated IUCN Red List status – DD.

Cleisostoma tricornutum Aver., ***sp. nov.***

Figs. 1D–H & 2.

Described from northern Vietnam ("Thanh Hoa province, Thuong Xuan district, Van Xuan municipality, Hang Cao village, Xuan Lien natural reserve. Remnants of primary and secondary broad-leaved evergreen forest on highly eroded rocky limestone hills at elevation 100-200 m a.s.l. around point 19°50′47.2″N 105°14′42.7″E"). **Type** ("8 November 2013 *L. Averyanov et al., CPC 6894*") - LE (holotype), Center for Plant Conservation, Hanoi (isotype).

Perennial monopodial epiphytic herb. Stem simple or basally few branched, rigid, curved, suberect or pendulous and ascending, (0.5)1–4(6) cm long, 3-5 mm in diam., with many wiry, flexuose roots at the base; internodes (3)4–8(10) mm long. Leaves rigid, leathery, straight or recurved, sometime somewhat twisted, (3)4–8(10) cm long, (0.6)0.8–1.4(1.6) cm wide, unequally bilobed, with short oblique obtuse lobes. Inflorescence lateral raceme (3)4–12(16) cm long,

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Fig. 1. *Cleisostoma linearilobatum* (Seidenf. et Smitinand) Garay. A & B: Portion of inflorescence. C: Flower, half-side view (photos from specimen – "8 March 2013, *Nguyen Van Canh s.n.*" by Nguyen Van Canh). *C. tricornutum* Aver. D: Plant habit. E & F: Portion of inflorescence. G & H: Flower, half-side and frontal views (photos D, F – H from the type specimen – "*L.Averyanov et al., CPC 6894*", photo E from the paratype specimen – *P.V. The, N.T. Vinh PVT 487B* by L.Averyanov, P. Efimov and Pham Van The). Photo corrections and design by L. Averyanov.

scape and rachis green to dark purple and almost black; scape 1-8 cm long straight to slightly curved, naked or with 1-3 minute sterile bracts, simple or rarely 1–2 branched; rachis (2)3–7(8) cm long, slightly zig-zag curved, with few to many lax, spirally arranged flowers distant on (2)3–5(6) mm. Floral bracts minute, triangular, acute, about 1 mm long and wide. Pedicel and ovary (2)2.5–5(6) mm long and 0.6–1 mm in diam., yellowish-green to purple, rarely almost white, sometime hardly hairy with sparse small rusty trichomes. Flowers campanulate, not widely opening, 3–3.5(4) mm across; sepals and petals fleshy, dull pale yellowish, sometime with 2 indistinct brown-orange longitudinal bands; lip white or yellowish, with yellow to purple side lobes, median lobe and spur white or yellowish; column white to yellowish, sometime slightly pink at front; anther cap white or yellowish. Sepals broadly obovate, concave, cucullate, obtuse, 2.5–3 mm long, 1.8–2 mm wide. Petals narrowly obovate, obtuse, as long as sepals, 1–1.2 mm wide, forward directed. Lip spurred, 3.5–4 mm long (from spur apex to the apex of median lip lobe), 3-lobed; side lobes narrowly conic, horn-like, obtuse, parallel and forward protruding, 1–1.2 mm long, 0.8–1 mm wide at the base; median lobe triangular sagittate, 1.4–1.6 mm long, 1.8–2.2 mm wide, acute, straight, forward directed; disc with 3 fleshy low indistinct keels; spur broadly conical, saccate, slightly down curved at the base, 1.3–1.5 mm long and wide with entire, round apex and incomplete longitudinal septum inside. Back-wall callus simple, glabrous, in form of laterally compressed boss, indistinctly bilobed adaxially and abaxially. Column short, stout, erect, 1.5–1.8 mm high, 1–1.2 mm wide. Anther cap hemispherical, 0.6–0.8 mm in diam., shortly beaked. Stipe (tegula) 1–1.2 mm long, simple, linear-filiform, slightly widening, curved and conduplicate at apex; viscidium minute, simple in form of flat ovate plate. Pollinia 2, each half-split into 2 subequal hemispheric portions, 0.3–0.4 mm in diam. Fruits narrowly elliptic capsule 1–1.8 cm long, 2.5–3.5 mm in diam., placed horizontally or suberect on rigid stalk 2–3 mm long.

Etymology: Species name refers to the horn-shaped, forward protruding obtuse lip lobes.

Ecology: Canopy epiphyte. Primary and secondary broad-leaved, mixed and coniferous evergreen shady humid forests on highly eroded rocky limestone, commonly on steep slopes near hill or mountain tops. 100–1600 m. Fl. December – January; July – August. Occasional. Estimated IUCN Red List status – DD.

Distribution: Vietnam: Ha Giang (Meo Vac), Lai Chau (Sin Ho), Lang Son (Huu Lung), Son La (sine loc.), Thai Nguyen (Vo Nhai), Thanh Hoa (Ba Thuoc; Thuong Xuan). Endemic.

Studied specimens (paratypes): **VIETNAM**: Ha Giang province, Meo Vac district, Sung Tra municipality, Ta Cha Lang village, *L. Averyanov, P.K. Loc, T.V. Thao, P.V. The, N.S. Khang, HAL 8464B* (HN, LE); Lai Chau province, Sin Ho district, Xa De Phin municipality, Mao Xa Phin village, *P.K. Loc, N.T. Vinh, N.S. Khang, P.N. Quan,d T.A. Suu HAL 8713* (HN, LE, MO); Lang Son province, Huu Lung district, Huu Lien municipality, Huu Lien nature reserve, *P.V. The, N.T.Vinh PVT 487B* (LE-photo); Son La province, *Chu Xuan Canh, s.n.* (LE – photo); Thanh Hoa province, Ba Thuoc district, Co Lung municipality, territory of Pu Luong protected area, Co Lung village, *N.T. Hiep, L. Averyanov, N.T. Vinh, D.T. Doan HAL 1103* (HN, LE, MO); Thai Nguyen province, Vo Nhai district, Than Sa municipality, Kim Son village, *N.T. Hiep, P.K. Loc, L. Averyanov NTH 3889* (HN, LE).

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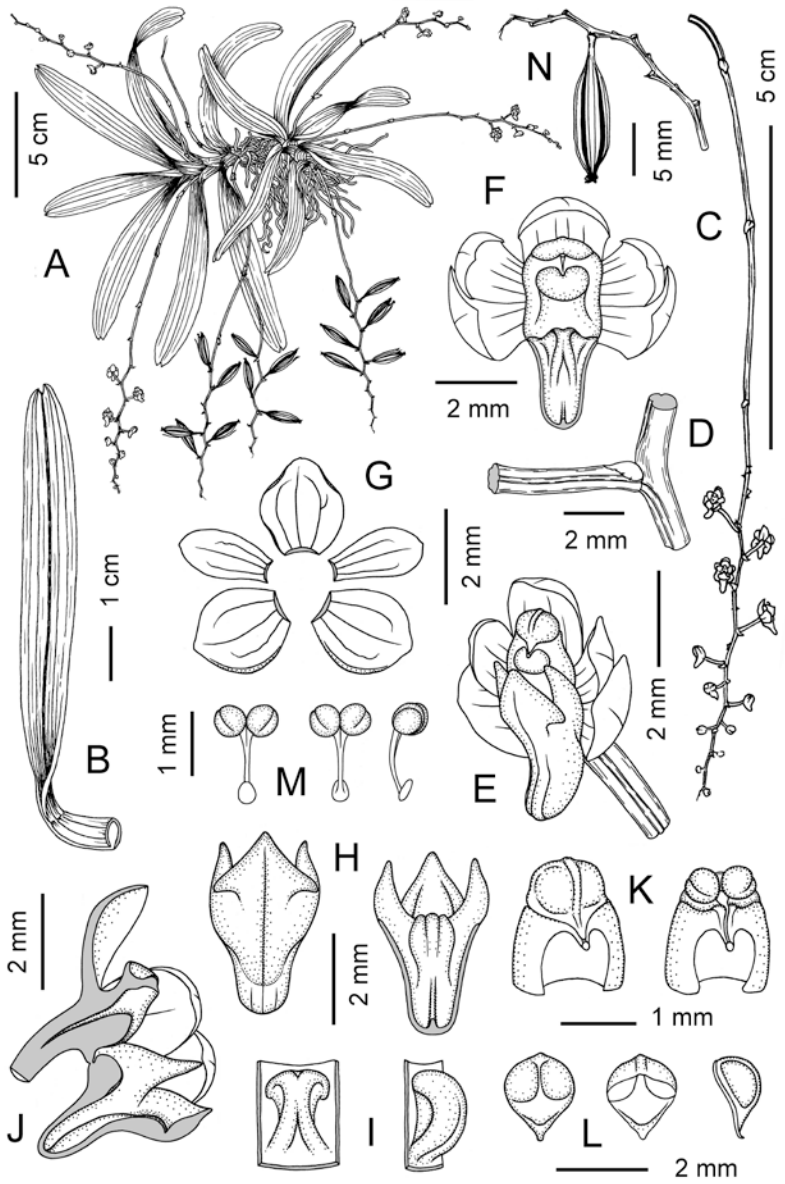


Fig. 2. *Cleisostoma tricornutum* Aver. A: Flowering plant. B: Leaf. C: Inflorescence. D: Portion of the rachis, floral bract, pedicel and ovary. E: Flower, half-side view. F: Flower with removed lip, frontal view. G: Flattened sepals and petals. H: Lip from below and from above. I: Back-wall callus, frontal and side views. J: Sagittal section of the flower and ovary. K: Column with, and without anther cap. L: Anther cup, views from above, from below and side view. M: Pollinarium, frontal view, view from behind and side view. N: Portion of the inflorescence rachis and ripe opened fruit (all drawn from the type specimen – "*L. Averyanov, N.T. Hiep, N.S .Khang et al., CPC 6894*" by L. Averyanov and T. Maisak).

Note: This species may be related to *C. crochetii* (Guillaumin) Garay (*Sarcanthus crochetii* Guillaumin, 1956, Bull. Mus. Natl. Hist. Nat. 2 ser. 28: 238), from which it differs in having a simple filiform pollinarium stipe, sub-globular pollinia and a hemispheric operculum with a short obtuse beak. Species also has some relation to *Cleisostoma parishii* (Hook.f.) Garay (=*Sarcanthus parishii* Hook.f., 1860, Bot. Mag. 86: t. 5217), but differs in having lax inflorescence and long, horn-shaped, lip side lobes. Compared to both mentioned species, the described plant also differs in having distinctly smaller flowers. *Cleisostoma tricornutum* is common and widespread in many limestone areas of northern Vietnam. It grows at various elevations in forests of any kind. At the same time, this species is easily overlooked in botanical surveys possibly due to the tiny, unattractive flowers, which are the smallest among its congeners. During herbarium processing, flowers and flower buds of this species regularly detach and fall away. This loss on

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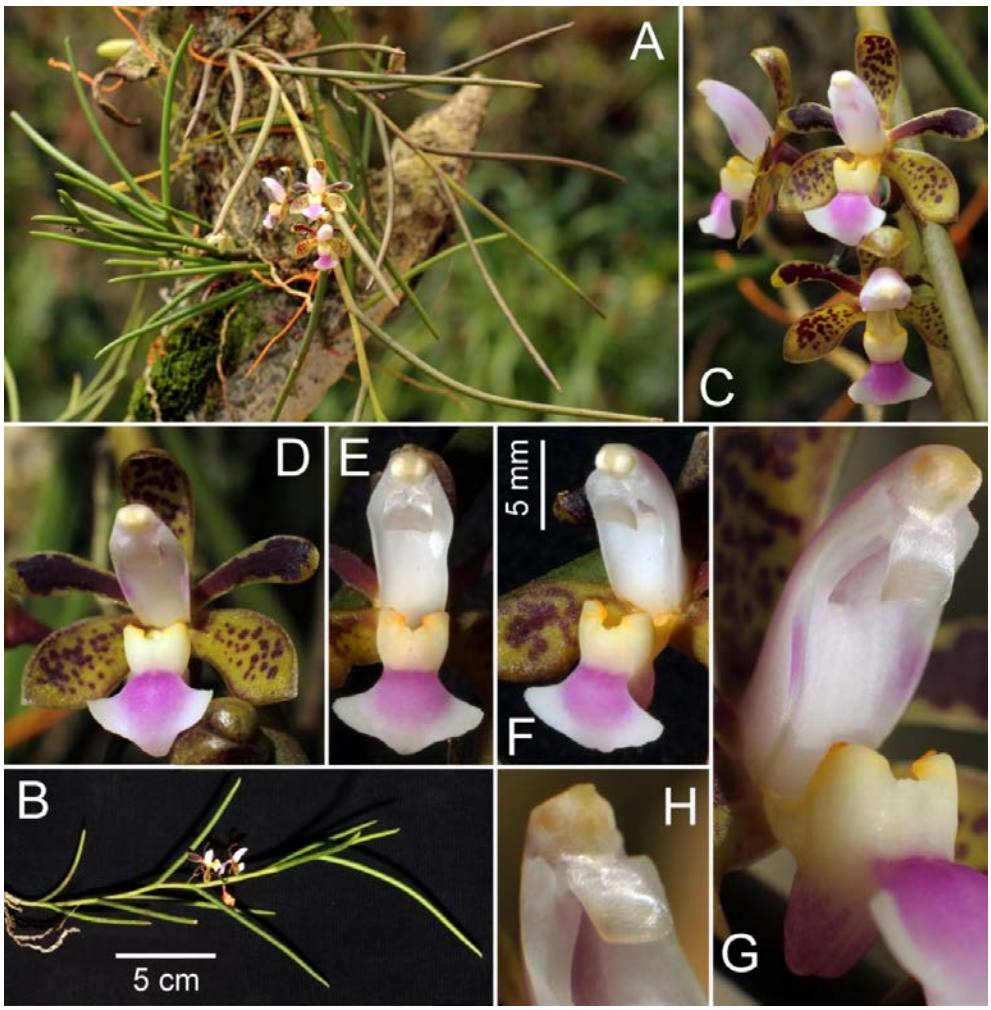


Fig. 3. *Cleisostoma phitamii* Tich et Aver. A: Flowering plant in nature habitat. B: Flattened flowering shoot. C: Inflorescence. D: Flower, frontal view. E & F: Column and lip, frontal and half-side views. G & H: Column apex, operculum and viscidium (Photos A, C – H from the paratype specimen – "October 2014, *Nguyen Thien Tich, no Tich 00.10.14*" by Nguyen Phi Tam, photo B from the type specimen – "27 September 2014, *N.T. Tich et al., no Tich 27-09-14*" by Nguyen Thien Tich). Photo corrections and design by L. Averyanov.

herbarium specimens makes identification and their study problematic. The species exhibits broad variation, particularly in the size of plant and flower, as well as the color scheme of the flowers.

Cleisostoma* Sect. *Gastrochilopsis Aver., ***sect. nov.***

Type: *Cleisostoma phitamii* Tich et Aver.

Epiphyte with pendulous stem; leaves terete, subulate, acute at apex; lip spurred, with large rhomboid back-wall plate densely hairy at front; hypochile goblet-shaped, separated at front from triangular epichile with tall fleshy transversal wall; column massive, broad; pollinarium stipe short, viscidium simple, flat, very large, subquadrate, slightly bent at middle.

Etymology: Sectional epithet reflects superficial resemblance in flowers of the type species and some species of the genus *Gastrochilus* D.Don.

Monotypic section with one species endemic to southern Vietnam.

Cleisostoma phitamii Tich et Aver., ***sp. nov.***

Figs. 3 & 4.

The type herbarium specimen was prepared from plant collected by Nguyen Thien Tich et al. in Khanh Hoa province, Khanh Son district, Son Trung municipality, Mt. O-Kha (Suoi Che) at 19 July 2013 and cultivated in Ho Chi Minh City. **Type** (27 September 2014, *Nguyen Thien Tich, Tran Gioi, Luu Hong Truong, specimens no Tich 27-09-14*) – SGN (holotype), LE (photo).

Perennial monopodial epiphytic herb. Stems simple or few branched, slender, pendent, 15–50 cm long, 2.5–3 mm in diam.; internodes 0.8–2.2 cm long. Leaves, succulent, terete, 5–9 cm long, 2–3 mm in diam., obtuse, straight to slightly curved. Inflorescence short lateral

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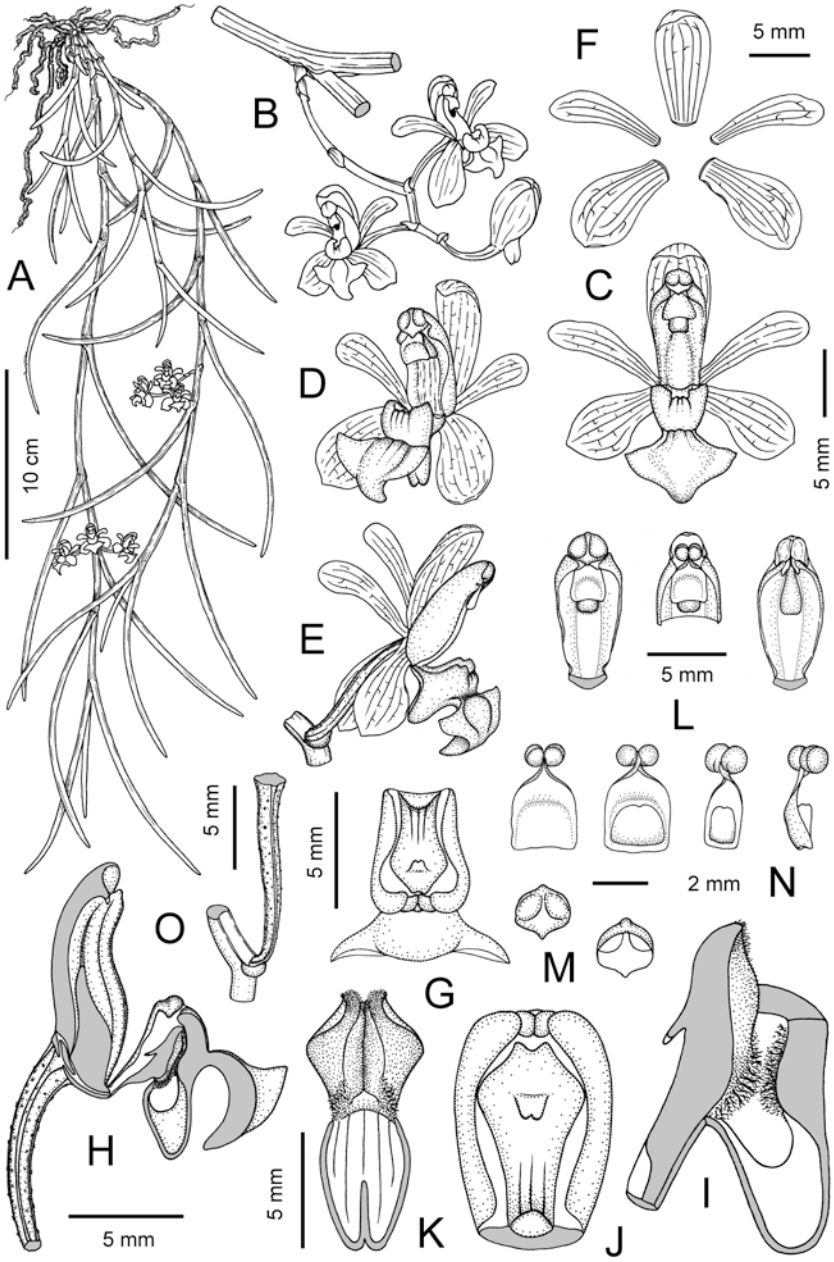


Fig. 4. ***Cleisostoma phitamii*** **Tich et Aver. A: Flowering plant. B: Inflorescence. C – E: Flower, frontal, half-side and side views. F: Flattened sepals and petals. G: Lip, view from above. H: Sagittal section of the lip and column. I: Sagittal section of basal part of the lip including back-wall callus. J: Back-wall callus, adaxial surface. K: Back-wall callus, abaxial surface. L: Column, with anther cap, with pollinarium and with removed pollinarium. M: Anther cap, views from above and from below. N: Pollinarium, frontal view, view from behind and half-side views. O: Portion of inflorescence rachis, ovary and pedicel (drawn from the type specimen – "27 September 2014,** ***N.T. Tich et al., no Tich 27-09-14*****" and the paratype specimen – "October 2014,** ***Nguyen Thien Tich, no Tich 00.10.14*****" by Nguyen Thien Tich, L. Averyanov and T. Maisak).**

raceme 2.5–3.5 cm long, 3–5 flowered, scape and rachis greenish-brown; floral bracts triangular, acute, about 1.3 mm long, 2.5 mm wide. Flowers widely opening, about 1.5 cm across; sepals and petals rigid, dull pale yellowish-green with irregular dark purple-brown spots; lip white with light purple-pink at the center of median lobe and at base of spur, yellowish along edges of side lobes; column white, pink at back. Pedicel and ovary greenish-purple, 7–10 mm long and 1 mm in diam. Dorsal sepal narrowly obovate, concave, cucullate, obtuse, 10–11 mm long, 3–5 mm wide near the apex. Lateral sepals spreading, narrowly obovate, oblique, obtuse, 9–10 mm long, 4–5.5 mm wide. Petals obliquely lanceolate spatulate, 9 mm long, 2.5–4 mm

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wide near the apex. Lip spurred, 9 mm long (from the base to the apex of median lobe), 6 mm wide (when flattened); side lobes erect, 2–3.5 mm tall, 4–5 mm long, with incurved yellowish fleshy edges fused at front together into erect wall 3 mm broad and 2 mm tall, spreading into spur entrance in form of fleshy hairy longitudinal protuberance; median lobe transversely rhomboid, fleshy and inflated at the center, indistinctly 3-lobulate, 4–5 mm long, 7–8 mm wide, lateral lobules thin, obtuse, median lobule fleshy, triangular. Spur broadly conical, more or less straight, 2–3 mm long, 1.5 mm diam., shallowly bilobed at apex, inside hairy near entrance, in apical half with longitudinal septum. Back-wall callus rhomboid, erect, straight, fleshy, raising from base of lip and back-wall of spur, 3.5–4 mm long, 2 mm wide, truncate bilobulate at apex; adaxially flat, in the center with small retrorse thin lamella; abaxially with 2 longitudinal bosses hairy at base. Column stout, erect, broad, slightly forward curved, 8.5–9 mm high, 2.5 mm wide. Anther cap hemispherical, 2 mm in diam., shortly beaked. Stipe (tegula) 3 mm long, suddenly broadening into large spatulate truncate subquadrate viscidium 2 mm long and wide. Pollinia 2, each half-split into 2 subequal hemispheric portions. Fruits unknown.

Etymology: Species name refers to the name of its discoverer and orchid enthusiast – Mr. Nguyen Phi Tam.

Ecology: Epiphyte. Evergreen broad-leaved closed submontane forests. 600-800 m. Fl. August – October. Very rare. Estimated IUCN Red List status – CR [A1ac; B1+2ab(i-iv); C1; D1+2].

Distribution: Vietnam: Khanh Hoa (Khanh Son), Lam Dong (Prenn). Endemic.

Studied specimens (paratypes): **VIETNAM**: Khanh Hoa province, Khanh Son district, Son Trung municipality, Mt. O Kha (Suoi Che), 19 July 2013, *Nguyen Thien Tich, specimens no Tich 19-07-13* (SGN); Lam Dong province, Dalat City, fresh wild collected plant found on local orchid market, 9 September 2013, *Nguyen Phi Tam, Nguyen Thien Tich, specimens no Tich 09-09-13* (SGN, LE – photo); Lam Dong province, Dalat City, Prenn area, October 2014, *Nguyen Thien Tich, specimens no Tich 00.10.14* (SGN, LE, LE – photo).

Note: Flowers of this species superficially resemble flowers observed in the genus *Gastrochilus* D.Don which it is not closely related to. At the same time the unusual lip structure with a goblet-shaped epichile bordered at the front by a high wall, as well as the broad rectangular pollinarium stipe supports the very isolated position of this plant in the genus. The plant obviously does not fit with established generic sections proposed by Seidenfaden (1975) and, due to its unique floral structure supports the segregation of it into a separate monotypic section.

Cleisostoma* Sect. *Pterogyne Aver., ***sect. nov.***

Type: *Cleisostoma lecongkietii* Tich et Aver.

Epiphyte with pendulous stem; leaves dorsiventral, flat, unequally bilobed at apex; flowers 2–2.5 cm across; lip sub-globular, fleshy, 3-lobed, at the base inside with relatively small nectar cavity separated by longitudinal septum; side lobes narrow, falcate; median lobe fleshy, broadly conical with 7 bosses; back-wall callus small, insignificant; column large, at the base on sides with large broad, protruding wings; pollinarium stipe of complicated structure, with erect conduplicate stalk and large, 2-lobed saddle-shaped viscidium.

Etymology: Sectional epithet refers to the characteristic and unusual morphology of the column bearing on its lateral sides large rectangular, concave, and forward directed wings.

Monotypic section with one species endemic to southern Vietnam.

Cleisostoma lecongkietii Tich et Aver. ***sp. nov.***; Tich, 1999, Tim Hieu Hoa Lan. – Bull. Saigon Orch. Club (1999): 6; Tich et C.K. Le, 2008, Abstr. 1 Sympos. Fl. Cambod. Laos Viet: 40, nom. invalid.

Figs. 5 & 6 A–C.

Described from southern Vietnam ("Binh Thuan, Phan Thiet"). **Type** ("*Nguyen Thien Tich, no Tich 00.09.98*") – Herbarium of the Department of Botany and Ecology, University of Science, Ho Chi Minh City Vietnam National University (holotype).

Perennial monopodial epiphytic herb. Stem suberect, arching to pendulous 20–30 cm long, leafy throughout. Leaves broadly lanceolate, straight to slightly recurved, rigid, thick, about 10 cm long and 2 cm wide, dark green above, paler below, unequally bilobe at the apex, with short round lobes. Inflorescence pendulous, simple, (15)20–25 cm long; scape cylindrical, 10–12 cm long, with 2–3 dark brown, distant sterile bracts; rachis angled at section, (8)10–15 cm long, with (5)7–15 spirally arranged flowers. Floral bracts erect, triangular, 2–3 mm long and broad. Flowers 2–2.5 cm across, widely opening; sepals yellow with numerous red-brown stripes and spots; petals red-brown with yellow margin and median yellow stripe; lip and column dull yellow, speckled with brown-purple; operculum dark purple-brown with two lateral spots at apex. Sepals obovate, thick, blunt, concave, cucullate, 9–11 mm long, 5–7 mm wide, with many small red-brown marks arranged into 2 bands inside, fewer and smaller marks on back, lateral sepals little wider with smaller and fewer reddish marks. Petals narrowly obovate, thick, as long as sepals, 5–6 mm wide, obtuse. Lip fleshy, sub-globular, 5–6 mm across, at the base with small cavity separated by longitudinal septum, at front 3-lobed; side lobes brightly yellow, narrowly triangular, falcate, parallel, slightly curved and forward directed, 3–4 mm long, 1.5–2 mm wide at the base, obtuse; median lobe thick and fleshy, shortly broadly

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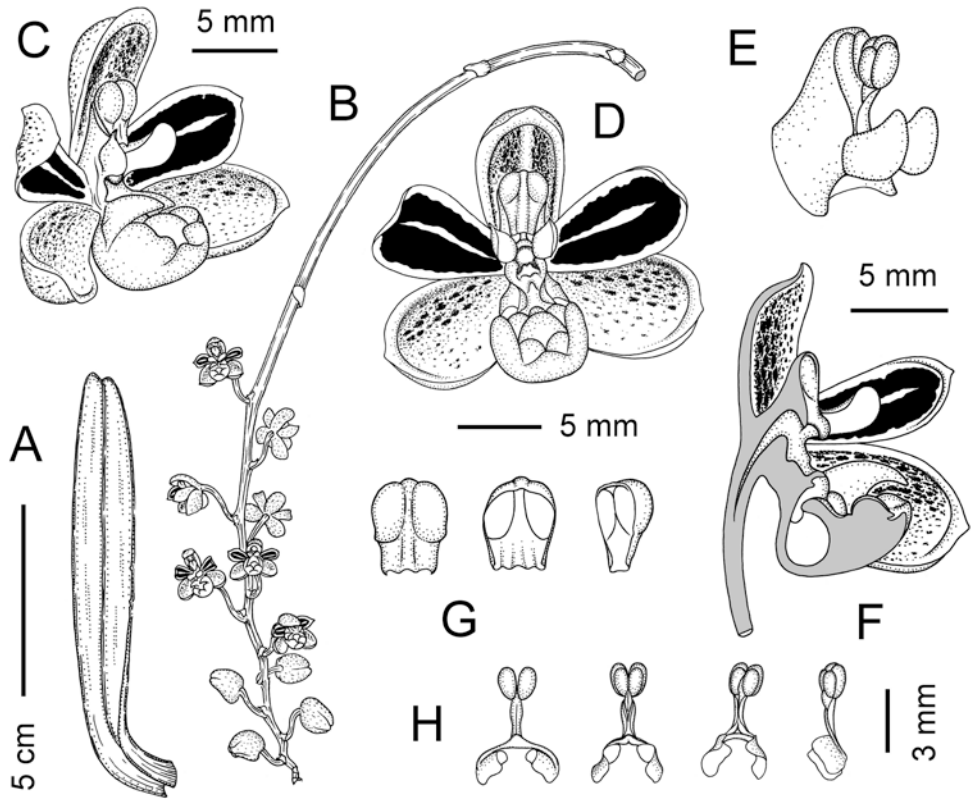


Fig. 5. ***Cleisostoma lecongkietii*** **Tich et Aver. A: Leaf. B: Inflorescence. C & D: Flower, half-side and frontal views. E: Column, side view. F: Sagittal section of the flower and ovary. G: Anther cup, views from above, from below and half-side view. H: Pollinarium, frontal view, view from behind, half-side and side views (drawn from the type specimen – "*Nguyen Thien Tich, no Tich 00.09.98*" by Nguyen Thien Tich, L. Averyanov and T. Maisak).**

conic, rounded at the apex, with 2 small erect lateral lobules and one large hemispheric callus in central part of the median lobe, continuing backward in form of 3 fleshy keels; back-wall callus insignificant, 1–1.5 mm tall, bow-shaped, placed just below column base, opposite to 3 keels of median lip lobe. Column cylindric, 5–6 mm tall, 2.5–3 mm wide, from each side at the base with 2 large concave obovate wings 3 mm long, 2 mm wide, spreading forward and surrounding viscidium and stigma hole. Anther cap large, helmet-shaped, about 3 mm long and 2 mm wide, long beaked, truncate at apex. Pollinia yellow, narrowly ovoid, 1.3–1.5 mm long, 0.5–0.6 mm wide, incompletely divided into two subequal halves; stipe stalk straight narrow, conduplicate 1.8–2.2 mm long terminated with large, 2-lobed, saddle-shaped viscidium 1.8–2 mm long and about 3 mm wide. Ovary and pedicel cylindric, ascending, glabrous, 2–2.5 cm long, 2.5–3 mm in diam., green, sometime finely purple stripped. Fruits unknown.

Etymology: Species epithet refers to the name of the famous Vietnamese botanist and professor at the University of Science, Ho Chi Minh City Vietnam National University – Dr. Le Cong Kiet.

Ecology: Epiphyte. Evergreen broad-leaved forest. 600-800 m. Fl. February – March. Very rare. Estimated IUCN Red List status – CR [A1ac; B1+2ab(i-iv); C1; D1+2].

Distribution**.** Vietnam: Binh Thuan (Phan Thiet), Dak Nong (Nam Nung nature reserve). Endemic.

Studied specimens (paratypes): **VIETNAM**: Dak Nong province, Nam Nung nature reserve, evergreen broad-leaved forest at elevation 600-800 m a.s.l., 8 March 2013, *Nguyen Van Canh s.n.* (LE – photo).

Note: A taxonomically isolated species, strikingly different from all its congeners in having large flowers, a massive sub-globular fleshy lip and a broad column bearing large, rectangular, concave, and forward-directed wings on its sides. The species certainly deserves segregation into a separate monotypic section or within a taxon of higher rank because of its unique floral morphology. Collectors noted a strong putrescent smell of the flowers, which possibly plays a role in pollination (by meat-flies?). The peculiar broad wings of the column form a curious funnel-like structure and, may possibly, orient the head of pollinator correctly and directly to the viscidium.

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Fig. 6. *Cleisostoma lecongkietii* Tich et Aver. A: Inflorescence. B: Flower, frontal view. C: Column, half-side view (photos from the paratype specimen – "8 March 2013, *Nguyen Van Canh s.n.*" by Nguyen Van Canh). *C. subulatum* Bl. D: Flowering plant (photo from the specimen – "*Nguyen Van Canh s.n.*" by Nguyen Van Canh). E: Inflorescence (photo from the specimen – "*T. Maisak et al, 845*" by L.Averyanov). Photo corrections and design by L. Averyanov

Cleisostoma* Sect. *Subulata Seidenf., 1975, Dansk Bot. Ark. 29, 3: 23; Aver., 1994, Ident. Guide Vietnam. Orch.: 376; Pearce, Cribb, 2002, Orch. Bhutan: 511.
Type: *Cleisostoma subulatum* Blume.

About 12 species distributed in throughout all area of the genus distribution. In Vietnam 4 species (1 endemic).

Cleisostoma subulatum Blume, 1825, Bijdr.: 363; Seidenf., 1975, Dansk Bot. Ark., 29, 3: 25; id., 1992, Opera Bot., 114: 390, pl. 35d; Comber, 1990, Orch. Java: 335; id., 2001, Orch. Sumatra: 894; Seidenf., Wood, 1992, Orch. Malay. Sing.: 625; Pearce, Cribb, 2002, Orch. Bhutan: 511. - *C. dealbatum* Lindl., 1843, Edwards's Bot. Reg. 29 (Misc.): 5. - *Sarcanthus dealbatus* (Lindl.) Rchb.f., 1864, Ann. Bot. Syst. 6: 892; Gagnep., 1933, Fl. Gen. Indo-Chine 6, 4: 474. Fig. 6D & E.

Described from Java ("Java, Tjilele, Parang, Tjanjor"). **Type** ("*Blume s.n.*") - L.

Ecology: Epiphyte. Dry evergreen lowland forests. 100–500 m. Fl. December–January, March–July. Locally common. Estimated IUCN Red List status – DD.

Distribution: Vietnam: Binh Phuoc (Loc Ninh). Bhutan, NE. India, S. Myanmar, Thailand, Cambodia, Malacca Peninsula, Indonesia, Philippines.

Studied specimens: **VIETNAM**: Binh Phuoc (Song Be) province, Loc Ninh district, May 1991, *Nguyen Thien Tich 00.05.91* (SGN); Binh Phuoc province, 14 May 2010, *Nguyen Thien Tich 14.05.10* (SGN); Wild collected plants originated presumably from areas of southern Vietnam adjacent to the Cambodian border, *Nguyen Van Canh sine no* (LE – photos). **CAMBODIA**: Kaoh Rong Samoloem Khong Island in Siam Gulf, to the N of Sianukwille town, low hills around point 10°36'45'N 103°18'38'', dry evergreen lowland forest, 19 November 2011, *T.Maisak, M.Telepova, L.Osinovets 845* (LE).

Note: This widespread species was observed as a fairly common plant in southern Cambodia near the border with Vietnam border hence its discovery in Vietnam was expected. At the same time, the relation of *C. subulatum* and the closely related species – *C. rostratum* (very common in northern Vietnam) remains unclear. Some specimens from central Laos have obviously intermediate morphology and sometimes are difficult to identify. In Vietnam both species look quite distinct in their morphology and distribution. Large narrow leaves, long many and dense flowered inflorescence, as well as more or less straight, broad triangular lip apex are main differences of *C. subulatum* in Vietnam. *Cleisostoma rostratum* occurring in northern part of the country has distinctly smaller leaves, always simple, few sparse flowered inflorescences and rather slender subulate lip apex strongly bent upward.

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