

Three new species of *Aspidistra* (Convallariaceae) from Vietnam

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Summary: Three new species of the genus *Aspidistra*, namely *A. atrata*, *A. graminifolia* and *A. zhangii*, discovered recently in Vietnam are described and illustrated as taxa new to science. Data on ecology, phenology, tentative relations, distribution and expected conservation status are recorded for all studied plants.

Keywords: Vietnam, *Aspidistra*, Convallariaceae, new species, flora, plant diversity

This paper continues the publication of new results of a successive investigation of species diversity of the genus *Aspidistra* Ker-Gawl. in Vietnam, which has a significant center of richness in the mainland of southeastern Asia (LANG 1981; CHEN & FANG 1982; WAN 1984; WAN & HUANG 1987; LI 1988; FANG & YU 2002; LI & TANG 2002; BOGNER & ARNAUTOV 2004; TILICH 2005, 2006, 2014; BRAUCHLER & NGOC 2005; TILICH et al. 2007; TILICH & AVERYANOV 2008; HOU et al. 2009; LIN et al. 2009, 2010, 2013a, b, 2014, 2015a, b; LIU et al. 2011; AVERYANOV & TILICH 2012, 2013, 2014, 2015, 2016; TILICH & LEONG-SKORNICKOVA 2013; VISLOBOKOV et al. 2013; HE et al. 2013; HU et al. 2014; LEONG-SKORNICKOVA et al. 2014; MENG et al. 2014; VISLOBOKOV et al. 2014a, b, 2016; COLIN 2015; GUO et al. 2015; VISLOBOKOV 2015). Three new species of the genus, *Aspidistra atrata*, *A. graminifolia* and *A. zhangii* discovered recently in Vietnam are described and illustrated as taxa new to science. Data on ecology, phenology, tentative relations, distribution and expected conservation status are recorded for all studied plants.

Materials and methods

Plants mentioned in this paper were collected during field studies in 2011–2016. Herbarium specimens of each studied species are presently housed in HN, LE and MW. Observations of flowers were made mostly on living plants in their habitats and/or in cultivation. Additionally, flowers were preserved in spirit for subsequent studies and preparation of herbarium specimens. They were fixed and preserved in 50–60% ethanol. Measurements of floral parts for description were made on both living and liquid-preserved materials. Fresh flowers or floral parts were found to shrink up to ca 15–20% in size in the drying process of making herbarium specimens. This was taken into account when dried herbarium specimens were identified. In describing quantitative characters, infrequent extreme values (i.e. rarely occurring minimum and maximum values) of a variation range are parenthesized before and after a normal variation range respectively. Detailed analytical photos of plant parts compiled into plates named here as ‘digital epitypes’ were made from living plants before they were prepared as type herbarium specimens.

Taxonomic treatment

Aspidistra atrata Aver., Tillich & Q.H. Bui, sp. nov. (Figs 1; 2A–F)

Type. Northern Vietnam, Thanh Hoa province, Quan Hoa district, Phu Son municipality, Khoa village, around point 20°29'12.5"N, 104°57'03.5"E, 16 June 2016, *B.H. Quang, V.T. Chinh, D.H. Son, T.D. Binh, DTL 29* [holotype: HN, isotypes: HN, LE].

Etymology. Species epithet refers to the almost entirely black colored flowers.

Description. Terrestrial perennial herb with hypogeous, much branching, plagiotropic rhizome. Rhizome rigid, many-nodal, (3)4–5(6) cm long, (2)2.5–4(5.5) mm in diam., with many thick, pale yellowish-gray roots, 2.5–3 mm in diam. Leafy part of rhizome plagiotropic or hardly ascending, short, (1)1.5–2.5(3) cm long, covered by papyraceous, dull yellowish-brown remains of cataphylls, with (4)5–7(8) leaves. Young cataphylls conduplicate to almost tabular, narrowly triangular lanceolate (being flattened), obtuse, brownish-green to green flushed with purple-brown, herbaceous, straight, upright, (3)4–6(7) cm long, (3.5)4–6(8) mm wide. Leaves petiolate; petiole grass-green, stiff, rigid, erect to oblique, straight or slightly curved, (12)16–24(26) cm long (1.5)2–2.5(3) mm in diam., adaxially grooved; leaf blade arching to almost horizontal, leathery, more or less flat, ovate to narrowly ovate, acuminate to attenuate and acute at apex, slightly oblique at the base, (12)14–18(22) cm long, (3.5)4–6(6.5) cm wide, straight or slightly irregularly wavy along margin, light grass-green with many dull yellowish spots on both sides, with prominent median and few rather weak secondary veins. Flowers 1–3(4), solitary, arising from apical part of leafy shoot, pedunculate; peduncle horizontal to suberect, (2)2.2–2.6(3) cm long, white, almost completely enveloped by 3–4(5) imbricate, sterile bracts; sterile bracts pure white, ovate to broadly ovate, concave, obtuse, fleshy to papyraceous, (8)10–18(20) mm long, (5)6–8(10) mm wide (being flattened). Perigone tube cupulate with slightly bulging upper part, entirely uniformly black or dark black-purple, fleshy, smooth and glossy, finely longitudinally grooved, (1.8)2(2.2) cm long, (0.9)1–1.2(1.3) cm in diam., with 6 free lobes at apex. Perigone lobes subequal, triangular, obtuse, (4)4.5–5(6) mm long, (4)4.2–4.6(4.8) mm wide, shallowly 3-grooved, almost flat at the base, with involute margins in apical half, spreading or reflexed. Stamens 6, sessile, placed in shallow hollows at the base of perianth tube; anthers almost half globular, (1.8)2(2.2) mm in diam., dark brown; pollen sacs introrse. Pistil black, the base white flushed with dirty purple; style fleshy, double conical, broadening to the base and apex (6.5)7–8(8.5) mm tall, 2–3(3.5) mm in diam.; stigma fleshy, rather smooth, peltate, (8)8.5–9.5(10) mm in diam., circular in outline, 6-undulate, with 6 triangular roundish lobes, black. Ovary inconspicuous, very indistinct, white flushed with dirty purple.

Distribution. Northern Vietnam (Thanh Hoa province). Endemic.

Habitat, phenology and conservation status. Terrestrial creeping perennial herb. Primary and secondary lowland broad-leaved evergreen forests often with bamboo (*Dendrocalamus barbatus*) on silicate rocks at elevation about 250 m a.s.l., commonly in shady, humid depressions on rich soil, usually associated with *Pellionia radicans*, *Tectaria gemmifera* and *Xanthophytum balansae*. Flowering in May–June. Not common. Estimated IUCN Red List status DD.

Notes. Superficially, the new species may be close in its morphology to *Aspidistra saxicola* Y. Wan, *A. sinensis* Aver. & Tillich and *A. zongbayi* K.Y. Lang & Z.Y. Zhu occurring in southern China.

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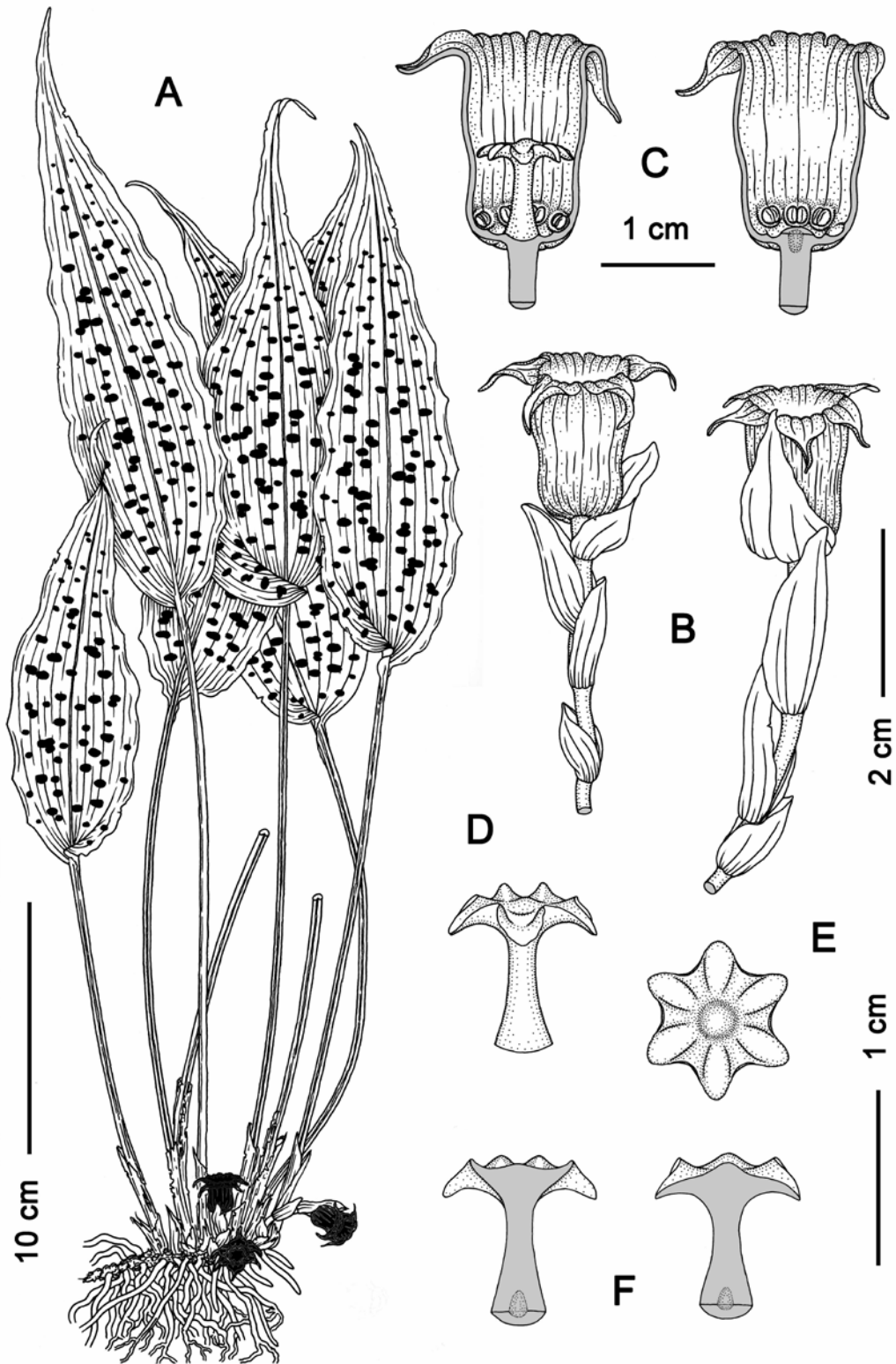


Figure 1. *Aspidistra atrata* Aver., Tillich & Q.H. Bui. A – Flowering plant; B – Flowers, side view; C – Sagittal section of flower with intact and removed pistil; D – Pistil, side view; E – Stigma, view from above; F – Pistil, sagittal sections. All drawn from the type DTL 29 by L.V. Averyanov.

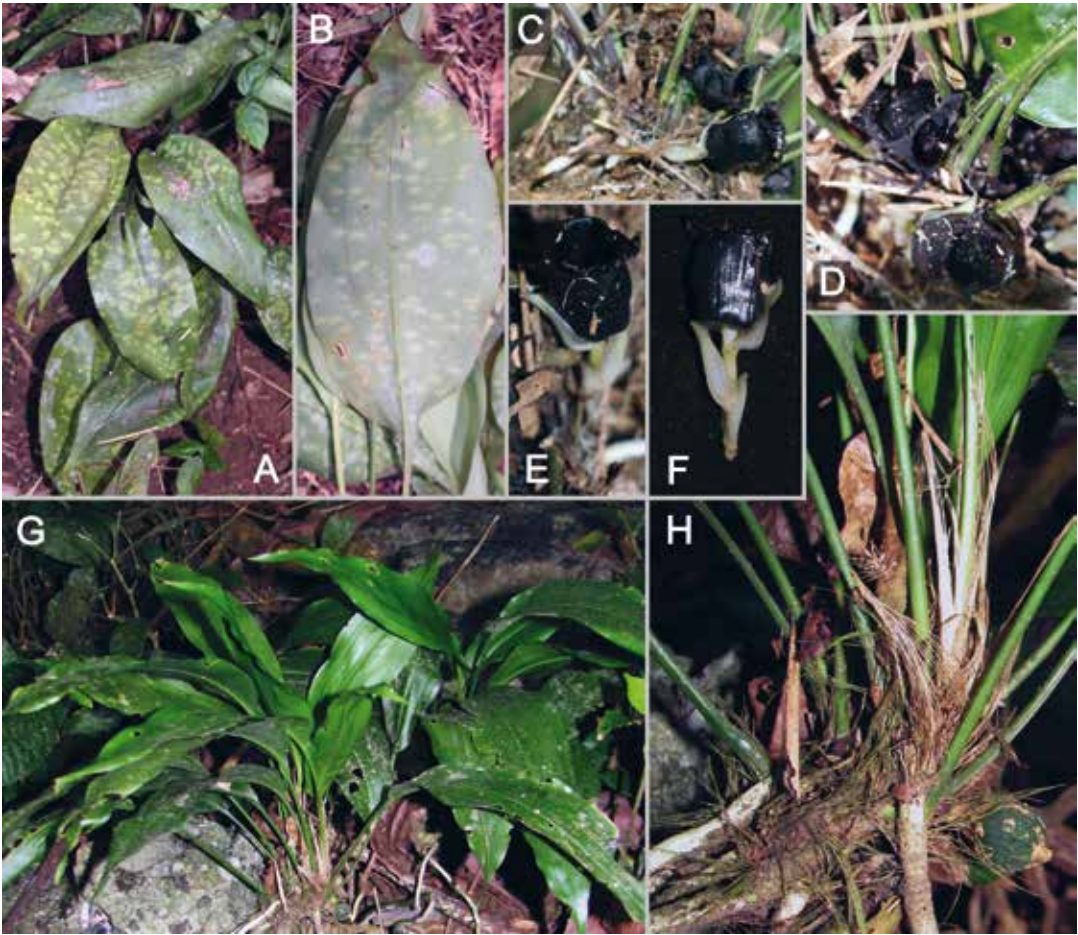


Figure 2. *Aspidistra atrata* Aver., Tillich & Q.H. Bui. A – Plant in natural habitat; B – Leaf, abaxial surface; C, D – Flowering plants in nature; E, F – Intact and removed flower. All photos from the type DTL 29 by Q.H. Bui. *Aspidistra zhangii* Aver., Tillich & K.S. Nguyen. G – Plant in natural habitat; H – Fruiting plant in nature. All photos from specimen NSK 762 by K.S. Nguyen.

However, neither these nor any other known *Aspidistra* species has such long and almost black cupulate perigone, black stigma and sessile anthers placed in shallow hollows at the base of perianth tube.

***Aspidistra graminifolia* Aver. & Tillich, sp. nov. (Fig. 3)**

Type. 28 August 2015, L. Averyanov, AL 84 [holotype: LE, isotype: MW]. Type prepared from cultivated plant collected in Vietnam in 2013 without indication of exact location (Vietnam anno 2013, sine location & collector, garden number 1285).

Etymology. Species epithet refers to narrow, lineate shape of leaves.

Description. Terrestrial perennial herb with epigeous few branching, plagiotropic rhizome. Rhizome thick, stout, 5–7(10) cm long, (0.8)1–1.5(2) cm in diam., densely covered by imbricate, light green leaf bases, later disintegrated into dull light brown, papyraceous or fibrous remains. Leafy shoot at apex of rhizome, creeping to ascending, stout, very short, simple, (0.6)1–1.5(2) cm tall, (0.8)1–1.4(1.6) cm in diam., densely nodal, with few thick underground roots.

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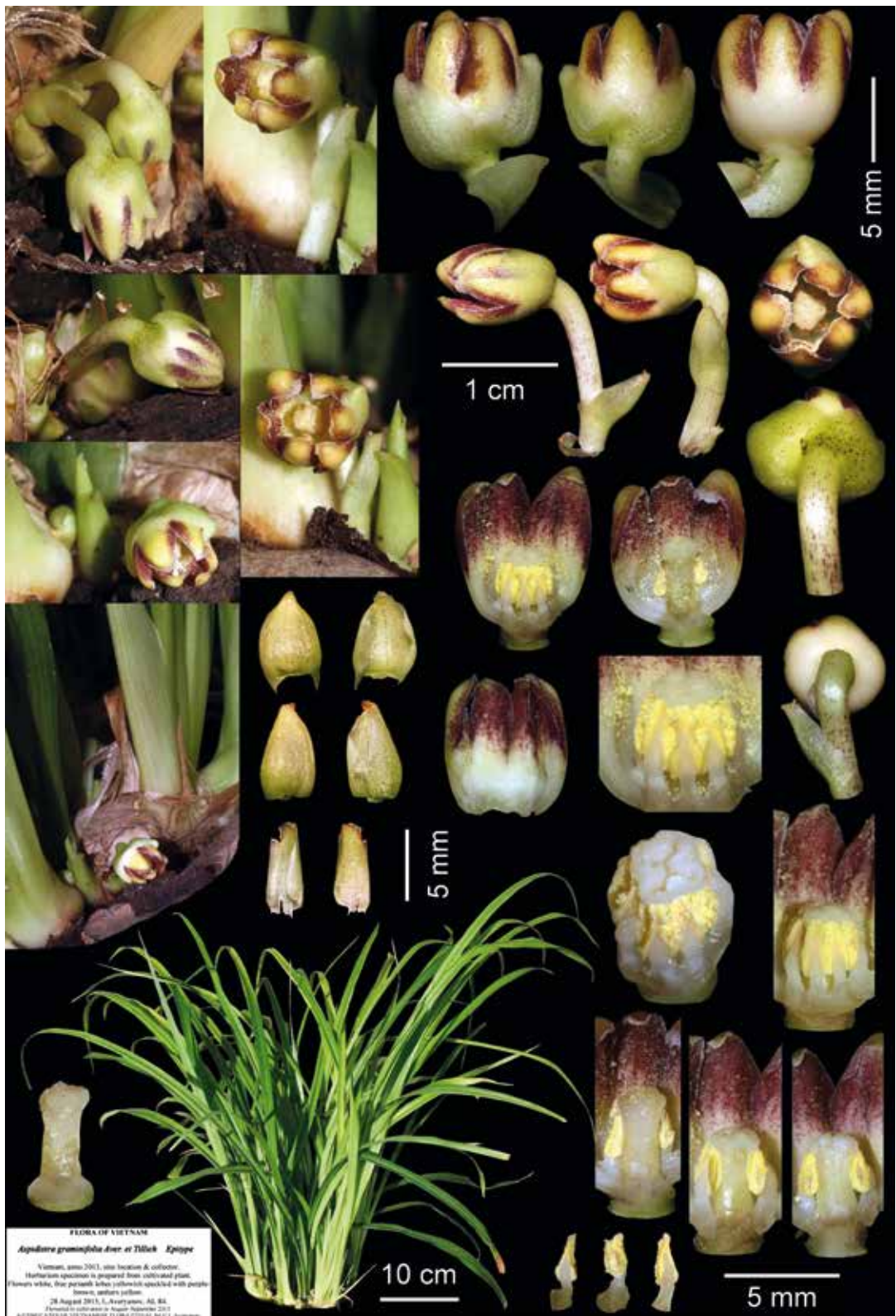


Figure 3. *Aspidistra graminifolia* Aver. & Tillich. Digital epitype, L. Averyanov, AL 84/0235. Photos, correction and design by L. Averyanov.

Cataphylls conduplicate, narrowly triangular (being flattened), acuminate, light green to whitish, herbaceous, scarious or papyraceous, usually straight, more or less upright, (5)7–12(16) cm long, (4)6–10(14) mm wide, suddenly broadening and often splitting at the base. Leaves on individual shoot (2)4–6(8), sessile, leathery, conduplicate, arching, lineate, tapering and acute at apex, (50)60–80(90) cm long, (1)1.2–1.5(1.8) cm wide, straight or slightly irregularly wavy along margin, uniformly grass-green on both sides, with prominent median vein. Flowers many, solitary, arising from basal part of leafy shoot, shortly pedunculate, odorless, (5)6–7(8) mm in diam., not opening widely. Peduncle arising obliquely, curved down at apex, white to light greenish, sparsely speckled with purple, (0.8)1–1.5(1.8) cm long, (1)1.2–1.8(2) mm in diam., with (3)4–5(6) sterile imbricate bracts; bracts broadly triangular ovate, concave, thin, uniformly light greenish or with small sparse purple speckles, scarious, papyraceous, blunt to obtuse, (4)5–6(7) mm long, (3.5)4–6(7) mm wide (being flattened), two distal bracts close to each other and to flower base. Perigone tube cupulate, outside white, fleshy, smooth and glossy, (2)2.2–3(3.5) mm long, (4)4.5–5(5.5) mm wide, with 6(7) free lobes at apex. Perigone lobes subequal, fleshy, slightly concave, rather smooth, glossy, dull yellow and heavy speckled with purple-brown along margins outside, entirely dark dirty purple-brown inside, narrowly ovate to ovate, straight erect, with scarious and nibbled margin, (3.2)3.5–4.5(5) mm long, (1.6)1.8–2(2.2) mm wide, cucullate at apex, and thus reducing perigone opening to ca. 3.5 mm. Stamens 6, on short, fleshy, white filaments 0.8–1 mm long, inserted at the base of tube close to ovary; anthers narrowly conoid, (2)2.2–2.4(2.6) mm long, (0.8)1–1.2(1.3) mm wide, densely connivent to each other and to apical part of pistil forming a tube; pollen sacs introrse; pollen light yellow. Pistil white; style fleshy, cylindrical, hardly broadening to the base and apex, (2.8)3–3.2(3.4) mm tall, (1.2)1.4–1.6(1.8) mm in diam.; stigma truncate, discoid, (2)2.2–2.4(2.6) mm in diam., circular in outline, irregularly wavy along margin and on surface, fleshy, papillose, white. Ovary inconspicuous, very indistinct, white with olive-green tint. Fruits unknown.

Distribution. Vietnam (without exact location). Endemic.

Habitat, phenology and conservation status. Terrestrial creeping herb. Flowering in cultivation in August–September. Rare. Estimated IUCN Red List status DD.

Notes. New species has closest similarity to *A. minutiflora* and *A. urceolata* in having flowers of similar size. However, our plant strikingly differs in cupulate (not urceolate to sub-globular) perianth tube and large conoid anthers densely connivent to each other and to style, forming a tube. It is also close to recently discovered *A. cylindrica* Vislobokov & Nuraliev (VISLOBOKOV et al. 2016), which clearly differs from our plant. The narrow pistil and anthers adjacent to the style are similar, but in *A. cylindrica* the tepals are flat, not cucullate, purple, spreading, and therefore the flower diameter is 10–11 mm.

Aspidistra zhangii Aver., Tillich & K.S. Nguyen, sp. nov. (Figs 2G, H; 4)

Type. 20 May 2016, *L. Averyanov*, NSK 762/AL210 [holotype: LE]. Type prepared from cultivated plant collected in northern Vietnam in 2014: Ninh Binh province, Nho Quan district, Cuc Phuong National Park, around point 20°15'03.6"N 105°41'58.7"E, at elevation about 165 m a.s.l., scattered in closed, evergreen, broad-leaved lowland secondary forests at the base of limestone, erect herb with long rhizome, fruit green, common, 9 December 2014, *Nguyen Sinh Khang*, NSK 762.

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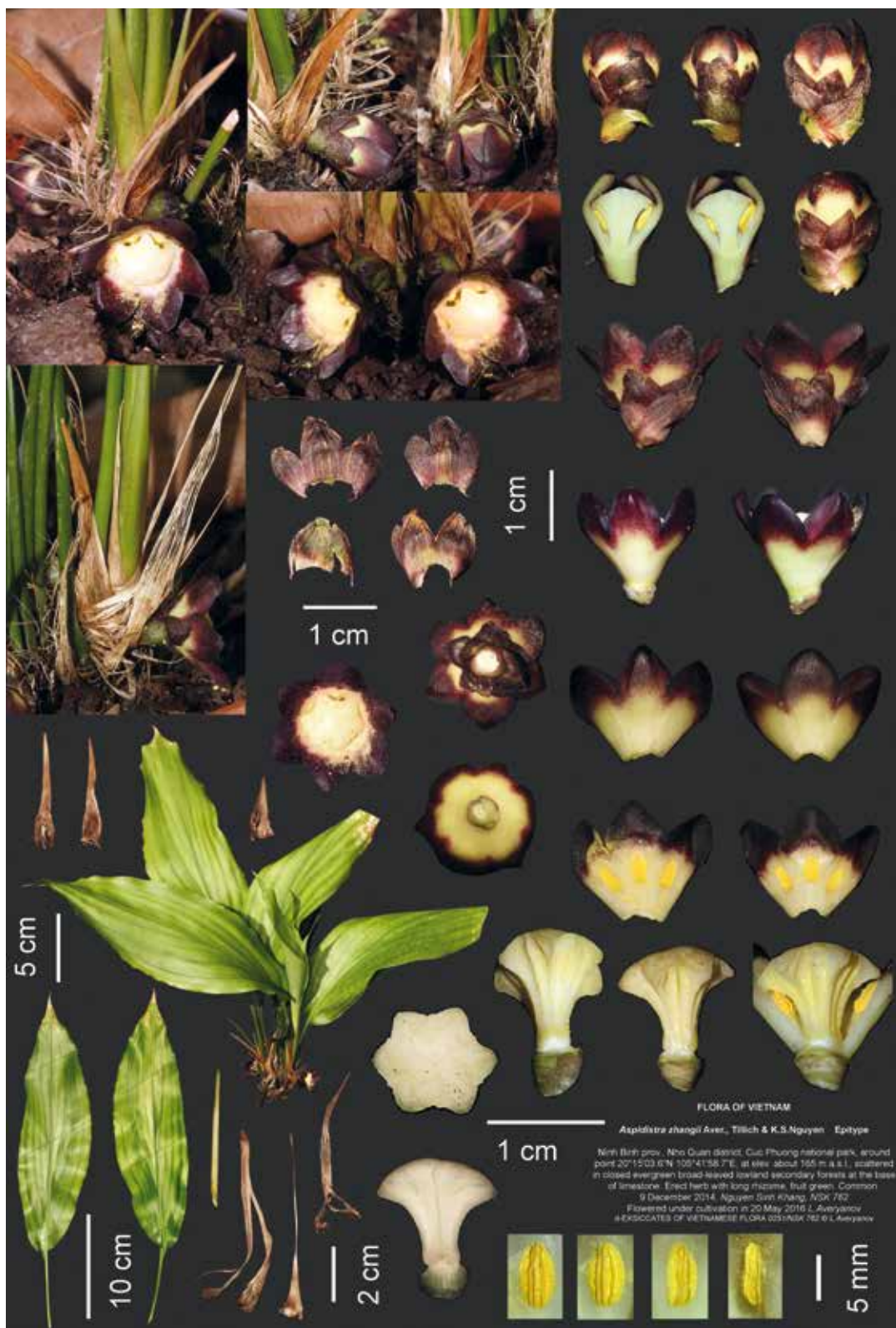


Figure 4. *Aspidistra zhangii* Aver., Tillich & K.S. Nguyen. Digital epitype, *L. Averyanov*, NSK 762/AL210/0251. Photos, correction and design by L. Averyanov.

Etymology. Species epithet refers to the name of the distinguished Chinese botanist, Professor Zhang Dianxiang, specialist in plant taxonomy and phylogeny, educator of species discoverer.

Description. Terrestrial perennial herb with epigeous few branching, plagiotropic rhizome. Rhizome thick, stout, rather long, up to 10 cm long, (4)5–6(7) mm in diam., covered by gray or yellowish-gray fibrous remains of cataphylls. Leafy shoot at apex of rhizome, ascending to suberect, very short, simple, (0.5)1–2(2.5) cm tall, (6)8–10(12) mm in diam., many-nodal, with few thick, light gray roots, 4–5 mm in diam. Young cataphylls conduplicate to almost tabular, narrowly triangular lanceolate (being flattened), obtuse, light green, herbaceous, straight, upright, (2)4–6(8) cm long, (2)4–6(8) mm wide, prominently broadening at the base. Leaves on individual shoot (2)3–5(6), petiolate; petiole dark green, stiff, rigid, erect to suberect, straight or slightly curved, (4)6–8(12) cm long, (1)1.5–2.5(3) mm in diam., adaxially grooved; leaf blade arching to almost horizontal, herbaceous to leathery, more or less flat, obliquely elliptic, slightly acuminate and acute at apex, (14)18–25(30) cm long, (3.5)4–7(8) cm wide, straight or hardly irregularly wavy along margin, uniformly grass-green on both sides, with prominent median and few secondary veins. Flowers (1)2–4(5), solitary, arising from basal part of leafy shoot, shortly pedunculate, odorless, widely opening, (1.8)2–2.2(2.4) cm in diam. Peduncle almost horizontal, very short, (2.5)3–4(5) mm long, light green to white, completely enveloped by 3–4(5) densely imbricate, sterile bracts; sterile bracts greenish tinged with dirty purple-brown to uniformly dirty purple-brown, broadly triangular, obtuse, with broad base, usually apically splitting, concave, papyraceous, (5)7–9(10) mm long, (5)6–14(16) mm wide (being flattened). Perigone tube widely obconical, white or white with greenish tint, fleshy, smooth and glossy, (1.3)1.4–1.6(1.7) cm long, (1.8)2–2.2(2.4) cm wide, with 6(7) free lobes at apex. Perigone lobes subequal, fleshy, slightly concave, smooth and glossy, uniformly dark purple-brown to almost black, broadly triangular ovate, (5.5)6–7(7.5) mm long, (6.5)7–8(8.5) mm wide, blunt to roundish at apex; petals with distinct triangular thickening abaxially near apex. Stamens 6, sessile, placed in middle part of the tube; anthers oblong elliptic, (3.6)3.8–4(4.2) mm long, (1.8)2–2.2(2.4) mm wide, distant from each other; pollen sacs introrse; pollen bright yellow. Pistil white; style fleshy, widely obconical, (8.5)9–10(11) mm tall and wide, with 12 (6 tall and 6 much smaller) longitudinal ridges, with deep grooves between them; stigma convex to almost hemispheric, (8.5)9–10(11) mm in diam., circular in outline, with 6 low, broadly triangular lobes, blunt or roundish at apex (sometimes with a small insignificant dent between lobes), fleshy, finely papillose, white. Ovary inconspicuous, very indistinct, white or white with light olive tint. Fruits globular, with rough, green surface, (1)1.2–1.4(1.5) cm in diam.

Distribution. Northern Vietnam (Ninh Binh province). Endemic.

Habitat, phenology and conservation status. Terrestrial creeping herb. Lowland broad-leaved evergreen forests on alluvial soils derived from limestone. Flowering in cultivation in May–June, fruits in nature in December–January. Locally common. Estimated IUCN Red List status DD.

Notes. The new plant with widely obconical perigone tubes resembles the flowers of *A. lateralis* Tillich and *A. petiolata* Tillich described from Vietnam. From *A. lateralis* it differs mainly in the creeping rhizome (vs. stiff erect stem), from *A. petiolata* in the smooth perigone lobes (vs. 4-keeled lobes), the spectacular pistil with 6 longitudinal grooves, each with a median narrow keel and sessile, rather big anthers.

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