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SYSTEMATICS OF *CLEMENSIELLA* (*APOCYNACEAE – ASCLEPIADOIDEAE*)

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The genus *Clemensiella* (*Apocynaceae – Asclepiadoideae*) is reported to include two species. *Clemensiella mariae*, a Philippine endemic, is redescribed, illustrated, and lectotypified. Its chromosome number ($2n = 22$) is reported for the first time. The recently described *Hoya viracensis* is synonymised with *Clemensiella mariae*. *Clemensiella omlori* is described as a new species from Borneo and Sumatra. The taxonomic relationship of *Clemensiella* to other genera of tribe *Marsdenieae* is discussed.

Keywords. Borneo, chromosome number, *Clemensiella*, *Hoya viracensis*, lectotypification, *Marsdenieae*, Philippines, Sumatra, taxonomy.

INTRODUCTION

Rudolf Schlechter (1915) described *Clemensiella* with a single validly published species, *Clemensiella mariae* (Schltr.) Schltr. *Clemensiella* was considered one of three genera of *Apocynaceae – Asclepiadoideae* endemic to the Philippines (Madulid, 1991). The other two genera, *Dolichostegia* Schltr. and *Quisumbingia* Merr., have since been put under synonymy of the genera *Dischidia* R.Br. (Livshultz, 2003) and *Sarcolobus* R.Br. (Omlor, 1998), respectively. All of them belong to the tribe *Marsdenieae* (Omlor, 1998). *Clemensiella* can no longer be considered a Philippine endemic either since specimens unambiguously assignable to this genus have been collected in Sumatra and Borneo. Omlor (1998) was the first to note that the specimen *de Wilde & de Wilde-Duyfjes* 14377 (K) from Sumatra represents a species of *Clemensiella*, although he was uncertain whether it should be considered as conspecific with *C. mariae*. We have since identified two additional collections of this same species, one from Sumatra, the other from Sarawak, Malaysian Borneo. These three specimens represent a new species closely allied to *Clemensiella mariae* but clearly distinguishable by characters of the inflorescence and corolla. Recently, we also obtained living material of *Clemensiella mariae*; the plant flowered in the greenhouse at the

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Department of Plant Systematics, Bayreuth, thereby offering an opportunity to investigate this interesting and poorly known species in more detail. In the present paper we (i) discuss the taxonomic affinities of *Clemensiella*, (ii) emend the descriptions of *Clemensiella* and *C. mariae*, (iii) lectotypify *C. mariae*, and (iv) describe a new species, *C. omlori*.

TAXONOMIC RELATIONSHIPS OF *CLEMENSIELLA*

The placement of *Clemensiella* within the tribe *Marsdenieae* of *Apocynaceae–Asclepiadoideae* was never in doubt – Schlechter (1915) originally placed it here, and assumed that *Marsdenia* R.Br. and especially *Telosma* Coville were the most closely related genera. Omlor (1998) in his generic revision of the tribe supposed, in contrast, that *Clemensiella* is rather isolated within *Marsdenieae* without any direct connection to any other genus. He nevertheless pointed out that the pollinaria are most similar to those of *Marsdenia*, whereas the habit is very *Hoya*-like.

Clemensiella possesses a number of characters that are uncommon among genera of *Marsdenieae*: epiphytic growth habit (occasionally reported in *Clemensiella mariae*), adventitious roots (known only in *C. mariae*), persistent inflorescences, and valvate corolla lobes. The combination of these four characters occurs in only two other genera of the tribe: *Hoya* R.Br. and *Dischidia*. These four characters, along with the robust dimensions of the plant, the fleshy, shallow corolla, and the fleshy corona lobes, are the basis for the misinterpretation of *Clemensiella mariae* as a species of *Hoya* (Kloppenburg & Siar, 2006). However, the corona and gynostegium of the two genera are quite different. The corona lobes of *Clemensiella* do not have the *Hoya*-characteristic fold on the underside of the corona lobes (recently interpreted as a fusion of a basal process of the staminal corona lobe and an ‘anther skirt’; Kunze & Wanntorp, 2008). The pollinia are clavate and not elongatedly ellipsoid as is usual in *Hoya*, and they do not possess any sign of a sterile pellucid germination crest typical for most species of *Hoya* (Figs 3, 4). In addition, the corpuscles are small and narrowly oblong in *Clemensiella*, but massive and rhomboid to broadly oblong in *Hoya* (Wanntorp, 2007). Caudicles are extremely long, ribbon-shaped and geniculate in *Clemensiella* (Figs 3, 4), and not short and broad as in *Hoya*.

Several characters of *Clemensiella* also link it to other genera of *Marsdenieae*. The persistent inflorescences, present in *Clemensiella*, *Hoya* and *Dischidia*, are also shared with several species of *Marsdenia*, including the type species, *Marsdenia tinctoria* R.Br. The shape of the corona lobes of *Clemensiella* is very reminiscent of several *Marsdenia* species, for example *Marsdenia gonoloboides* Schltr. (illustrated in Forster, 1995), but their massive size relative to the anthers (Fig. 4) is unknown among species of *Marsdenia*. The pollinarium structure and the depressed, umbonate style-head of *Clemensiella*, along with the very short guide-rails, oriented at 45°, of *Clemensiella mariae*, are reminiscent of the flowers of *Sarcolobus*, another genus of Southeast Asian-Australasian distribution (see Forster, 1991). The surface of the style-head umbo differs between the two genera: it is just a little uneven in *Clemensiella* and not papillate as in *Sarcolobus*.

The seeds of *Clemensiella*, obovate with a small wing, and a long, apically attached coma, are typical of most *Marsdenieae* except *Dischidia* and *Hoya* which have more cylindrical seeds with wings highly reduced or absent (Omlor, 1998). A ciliate seed margin, limited to rather scattered hairs in *Clemensiella*, is very unusual, otherwise known only in a few species of *Dischidia* such as *D. acutifolia* Hook.f. (Livshultz, pers. obs.). A ciliate seed margin has also been reported from *Finlaysonia* Wall. (Forster, 1989) and *Raphionacme namibiana* Venter & Verh. of *Apocynaceae–Periplocoideae* (Venter & Verhoeven, 1986). In the latter two taxa, however, there is no apically attached, parachute-like coma, whereas in *Clemensiella* and *Dischidia acutifolia* the marginal hairs co-occur with an apical coma.

Generic delimitation in *Marsdenieae*, particularly in drawing the boundaries of *Marsdenia*, remains problematic (Forster, 1995; Omlor, 1998). However, *Clemensiella* possesses a unique combination of characters that places it outside the range of morphological variation in *Marsdenia*. The presence of valvate corolla lobes is a potential synapomorphy for *Clemensiella*, *Dischidia* and *Hoya*. A preliminary phylogeny of chloroplast markers supports *Clemensiella* as sister to a *Hoya–Dischidia* clade (Liede-Schumann & Meve, unpubl.). This indicates that the ecology, physiology and anatomy of the occasionally epiphytic *Clemensiella* may hold important clues as to how the epiphytic growth habit evolved in the common ancestor of *Dischidia* and *Hoya*.

TAXONOMY

Clemensiella Schltr., Repert. Spec. Nov. Regni Veg. 13: 566 (1915), substitute name for *Clemensia* Schltr., Repert. Spec. Nov. Regni Veg. 13: 542 (1915), nom. illeg. (non *Clemensia* Merr. 1908, *Meliaceae*). – Type: *Clemensiella mariae* (Schltr.) Schltr. (*Clemensia mariae* Schltr.).

Large, herbaceous to slightly woody twiners with white latex. *Leaves* opposite, blades thinly coriaceous to subsucculent, elliptic, basally rounded and slightly peltate, apically acuminate, margins slightly revolute, with 1(–4) colleters adaxially on the base of the midvein, discolorous, venation pinnate with 5–8 pairs of secondaries diverging at 60–70° to the midvein, brochidodromous. *Inflorescences* extra-axillary, solitary, much shorter than adjacent leaves, few-flowered, umbelliform, development bostrychoid; peduncles succulent, persistent. *Flowers* nectariferous; *calyx* with minute, axillary colleters; *corolla* rotate to campanulate, fused for c.1/2–2/3 total length, succulent, adaxially papillose, glabrous; *corolla lobes* valvate in bud, triangular; *corolline corona* absent; *gynostegial corona* of free staminal lobes attached to the back of the anthers, longer than the gynostegium and connivent over it, lobes succulent, laterally broadened and thickened, triangular to ovate, acuminate; *pollinia* acropetal to corpusculum *in situ*, clavate, without sterile pellucid regions, basally attached to the caudicles; *caudicles* geniculate, flattened, broadened at the insertion of the corpusculum; *corpusculum* narrowly oblong, much smaller than pollinia; *style-head* 5-angled, depressed, umbonate. *Mericarps* single, fusiform, 2-ribbed, light brown, smooth, glabrous. *Seeds* obovate, light brown, marginally winged, sparsely ciliate; micropylar coma well-developed, white.

Distribution. Indonesia, Malaysia, Philippines (Fig. 1).

Key to the species

1a. Corolla rotate, gynostegium exserted for 1/3–1/2 of its length, bud apices flattened-obtuse, peduncles 1–4 cm long ____________ **1. C. mariae**
1b. Corolla campanulate, gynostegium apex barely exserted from the corolla throat, bud apices subobtuse to acute, peduncles 0.2–1 cm long ____ **2. C. omlori**

1. Clemensiella mariae (Schltr.) Schltr., Repert. Spec. Nov. Regni Veg. 13: 566 (1915), substitute name for *Clemensia mariae* Schltr., Repert. Spec. Nov. Regni Veg. 13: 543 (1915). – Type: Philippines, [Lanao del Sur]: Mindanao, Lake Lanao, Camp Keithley, iv 1906, *Mary S. Clemens* 512 (holo B, destroyed). Philippines, Leyte: Dagami, viii 1912, *Ramos* 15307 (paratype, not traced). Philippines, Laguna: Luzon, San Antonio, ix–x 1912, *Ramos* 15962 (lecto P!, designated here; isolecto BM n.v., K n.v.). **Figs 2, 3.**

Clemensiella dischidioides Elmer in Merrill, Enum. Philipp. Fl. Pl. 3: 356 (1923); Elmer, Leafl. Philipp. Bot. 10: 3549 (1938), nom. nud.

Hoya viracensis Kloppenb. & Siar, Fraterna 19(4): 5 (2006), **syn. nov.** – Type: Philippines, Catanduanes: Virac, Brgy. Kalatagan, secondary forest, soil clay loam, 2 xii 1991, *Barbon, Garcia & Alvarez* PPI 5658 (holo PNH n.v.; iso BISH n.v., BRIT!, CAHUP n.v.).

Twiners up to 6 m tall, glabrous or nearly so. *Taproots* slender, occasionally with unpaired adventitious roots on internodes when in contact with substrate. *Stems* 3–5[–10 basally] mm diameter, hollow, green, shiny. *Leaf* blades thinly coriaceous, elliptic, basally rounded and slightly peltate, apically acuminate, 6–11 × 3–6 cm, adaxially shiny, minutely ciliate, petioles 1–2 cm long, shiny. *Inflorescences* 3–7-flowered, peduncles held perpendicular to the stems, 10–40 × c.2 mm diameter, slightly conical, rachis unbranched, up to 3 cm long. *Flowers* scentless; *pedicels* c.5 mm long, conical, *sepals* broadly ovate, c.2 mm long, appressed to the corolla tube; *bud shape* thickly lenticular with flattened apex; *corolla* rotate, 1.5–2 cm diameter, sympetalous for c.1/2 of length, adaxially bright yellow to orange-brown, occasionally spotted purplish, abaxially light green, occasionally spotted or tinged purplish; *corolla lobes* ovoid-triangular, c.6 × 4 mm at base, with median depression, recurved, margins revolute; *gynostegial corona* with discoid outline, concealed in corolla tube for 1/3–1/2 of its length, c.5 mm diameter, white, lobes c.3 × 2 mm at base; *anthers* triangular, c.1 × 1.2 mm, guide-rails c.0.25 mm long, spreading at an angle of 45°; anther connective appendages triangular-lanceolate, hyaline, c.0.3 × 0.3 mm, covering style-head completely; *pollinia* positioned horizontally on style-head *in situ*, c.0.6 × 0.25 mm, ovate in cross-section; *caudicles* convexly recurved, c.0.5 mm long; *corpusculum* 0.15 × 0.05 mm, brown; *style-head* c.2 mm diameter. *Mericarps* ± pendent, c.5–8 × 0.5–0.7 cm, with small ridges along dorsal and ventral sutures, broadening towards tip; *seeds* c.6.5 × 3 mm, wing up to 0.5 mm broad, with scattered white cilia, coma c.3 cm long, white.

Distribution. Philippines: Luzon (Laguna, Sorsogon), Catanduanes, Leyte, Mindanao (Lanao del Sur), Bohol (Fig. 1).

Ecology. Vigorous climber in forests (including secondary forests) and forest edges at low to medium altitudes (c.0–800 m). Sometimes epiphytic on shrubs (*Shorea* sp.) and small trees, or growing on rocks with little soil.

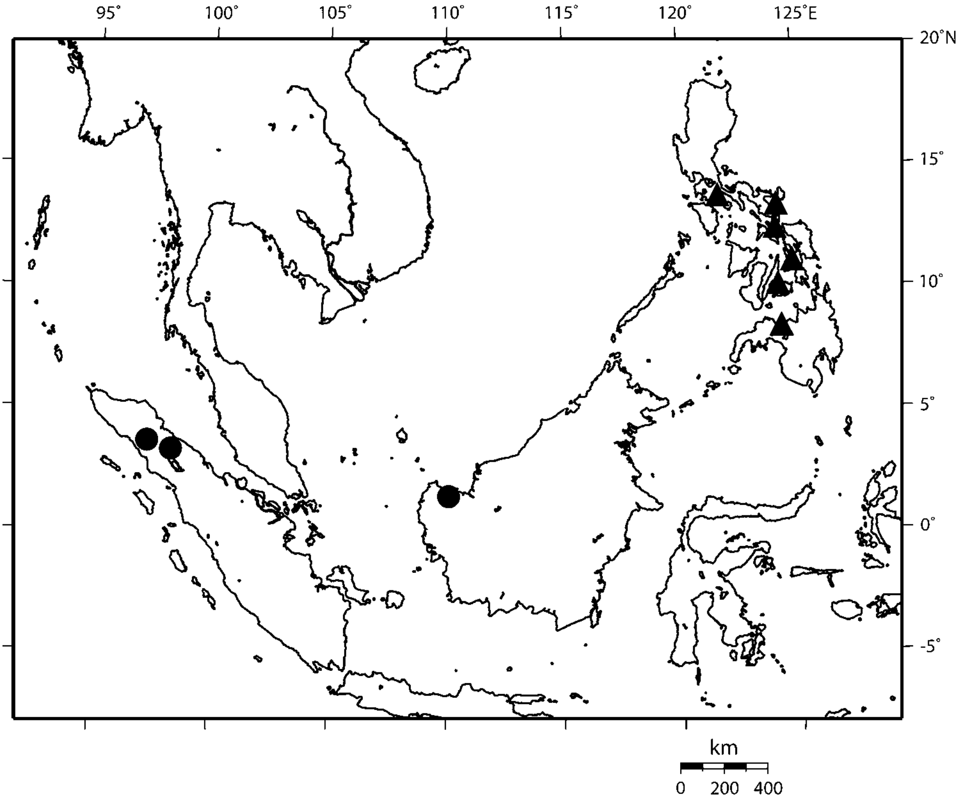

FIG. 1. Distribution of *Clemensiella*: *C. mariae* (▲); *C. omlori* (●). Presence of *Clemensiella mariae* in Leyte and Mindanao is based on specimens cited by Schlechter (1915) that are no longer extant; occurrence on Bohol is based on a specimen cited by Omlor (1998), *Ramos* 43106 (BM n.v.). Map constructed using Online Map Creation (www.aquarius.geomar.de).

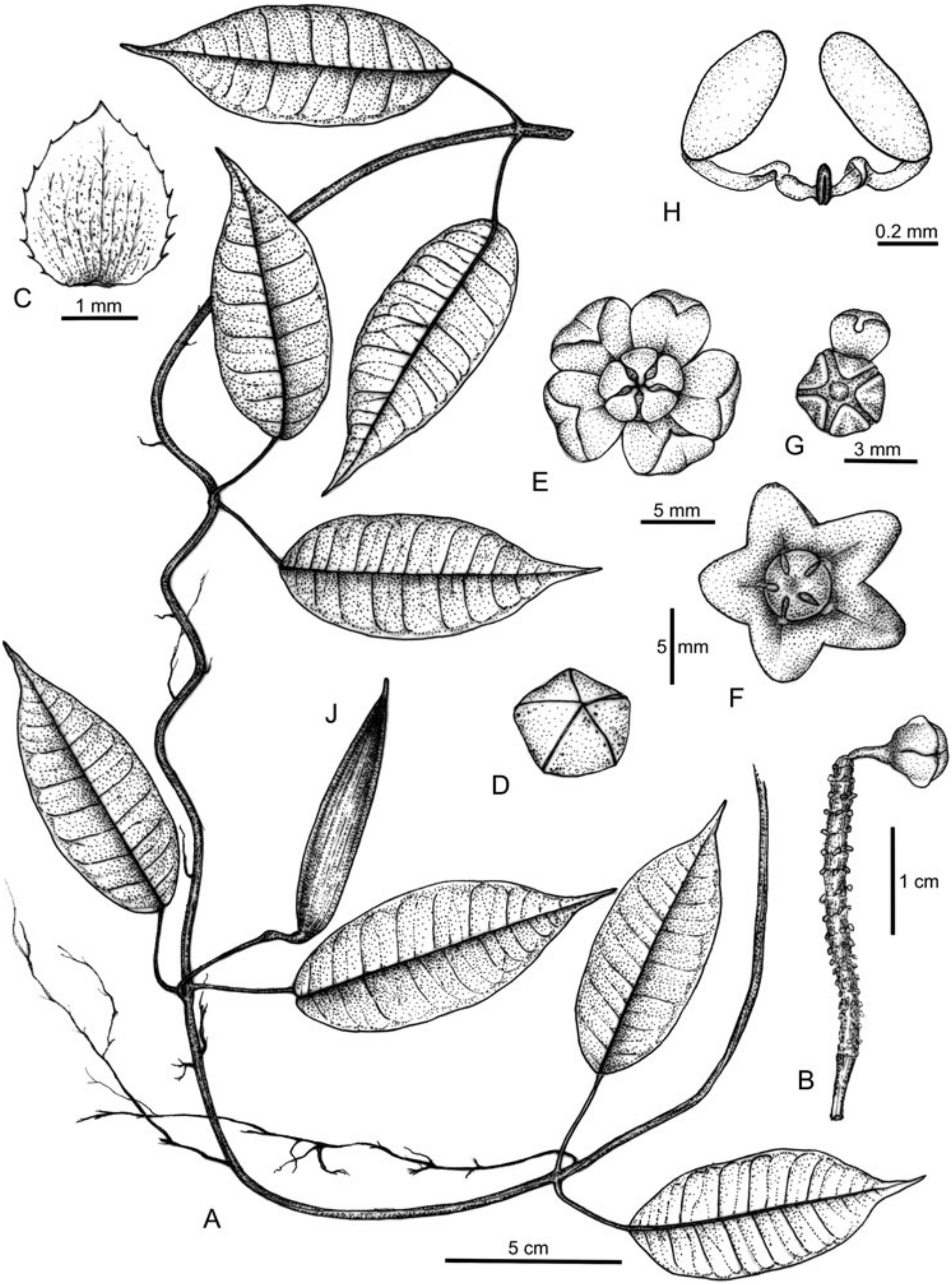

FIG. 2. *Clemensiella mariae* Schltr. A, habit of plant, with adventitious roots; B, pedunculate inflorescence; C, sepal; D, flower bud (scale as for E and F); E, top view of opening flower; F, top view of open flower; G, top view of gynostegium with corona removed (including one recurved staminal lobe); H, pollinarium; J, ripe follicle. (Drawn by B. Diego from *Laurente* 001, 002, 003 and 004 (University of Santo Tomas Herbarium, Manila, Philippines).)

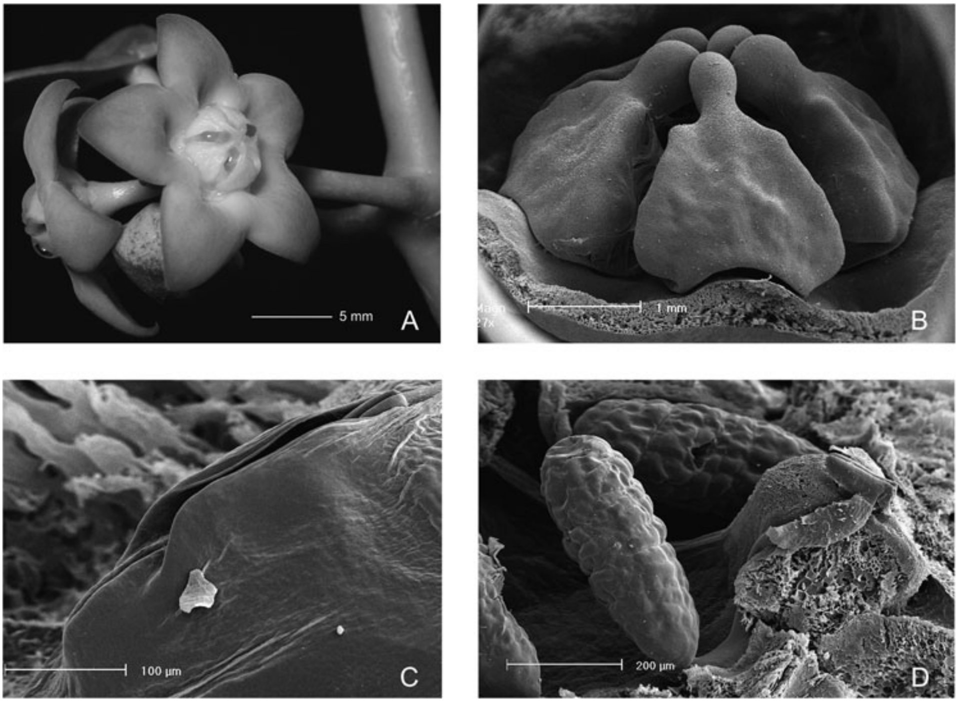

FIG. 3. *Clemensiella mariae* Schltr. A, nectariferous flowers; B, corona in lateral view (SEM); C, guide-rail in lateral view, corona lobes removed (SEM); D, pollinarium, attached to the style-head (SEM). (All from ex hort. P. Gozon (UBT).)

Chromosomes. Root tips were pretreated in 0.002 M 8-hydroxychinoline solution (Tjio & Levan, 1950), stained with carmine (Snow, 1963), and squashed. We counted $2n = 22$ chromosomes at the somatic metaphases (voucher: ex hort. P. Gozon (UBT)). On average the chromosomes are 1.27 µm long (measurement based on the analysis of four complete metaphase plates).

This count represents the first for *Clemensiella*. Because 94% of the investigated taxa of *Asclepiadoideae*, and 100% of *Marsdenieae*, have been found to have $2n = 22$ chromosomes this result was expected. The average chromosome length of 1.27 µm is also within the range of what has been reported for *Marsdenieae* (min. 0.91 – max. 1.44 µm), measured from 21 species in eight genera. However, it is above the range of 0.91–1.06 µm documented for seven species of *Hoya* (Albers & Meve, 2001; Meve, unpubl. data). As pointed out by Albers & Meve (2001), larger chromosomes are ancestral in *Asclepiadoideae*.

Specimens examined. PHILIPPINES. Sorsogon: Luzon, Irosin, Mt. Balusan, vi 1916, *Elmer* 16374 (BISH, L, P, US) and vii 1916, *Elmer* 16801 (BISH, C, L, P, US); Luzon, Irosin, road going to Lake Balusan, 9 ix 2005, *Laurente* 001 and 002, and 31 xii 2005, *Laurente* 003, and 30 iii 2006, *Laurente* 004 (CAHUP, LBC, University of Santo Tomas Herbarium, Manila); Luzon, Irosin, SW of Balusan National Park, 11 vii 1996, *Garcia & Fernando* 25051 (PNH); s.c. and s.n. (ex hort. P. Gozon) (UBT).

The holotype, which originated in Mindanao, was lost in the Berlin herbarium (B) during World War II. Of the two paratypes from Leyte and Luzon (*Ramos* 15307 and 16592, respectively), we found a sheet of *Ramos* 16592 at P, here selected as the lectotype. Omlor (1998) cited sheets of *Ramos* 16592 from BM and K, here designated as isolectotypes. A second name under *Clemensiella*, *C. dischidioides* (see a specimen under http://sciweb.nybg.org/science2/hcol/vasc/index.asp), circulated via herbarium specimen exchange by Elmer, has never been validly published, because both Merrill (1923) and Elmer (1938) realised early enough that it is a specimen of *C. mariae*.

Recently, Kloppenburg & Siar (2006) described a collection of *Clemensiella mariae* from the island of Catanduanes as a new species of *Hoya*, *H. viracensis* Kloppenb. & Siar. In citing the type specimen we have transcribed the collection number, locality, and habitat data from the (newly spotted) isotype at BRIT; these differ somewhat from the citation in the protologue. The date on the specimen is written as '02/12/91' which is interpreted as 2 December 1991. In his report on Philippine *Hoya*, Gozon (2006: 18, fig. 14) included a photograph of *Clemensiella mariae* of unknown provenance labelled as '*Dregea* (?)'. The most recent collections were made by the second author in Sorsogon Prov., Irosin, Balusan Lake for her MSc thesis on Philippine *Marsdenieae* (Laurente, 2008). Altogether, *Clemensiella mariae* seems to be rarely collected and documented, but it is not a narrow endemic, occurring throughout the Philippine archipelago (Fig. 1).

2. **Clemensiella omlori** Livsh. & Meve, **sp. nov.**

Clemensiella mariae similaribus sed pedunculis brevioribus, corollis campanulatis, alabastris cum apicem subobtusis ad acutis. – Type: Indonesia, Aceh: Gunung Leuser Reserve, Camp Simpang and vicinity, 3–5 km upstream Lau [stream] Ketambe, c.35 km NW of Kutatjane, 400–600 m, 19 viii 1972, *de Wilde & de Wilde-Duyfjes* 14377 (holo L!; iso K, scan!). **Fig. 4.**

Twiners to 10 m tall (fide *de Wilde & de Wilde-Duyfjes* 14377). *Roots* unknown, no evidence of adventitious roots. *Stems* 2–3.5 mm diameter, internodes 10–18 cm long, pith solid. *Leaf* blades elliptic, basally rounded and slightly peltate, 8.1–11.1 × 3.5–6 cm, acumen 0.7–1.2 cm long, margins ciliate, petioles 2.2–5.9 cm long × 1–1.6 mm diameter, with line of short adpressed hairs on adaxial side. *Inflorescences* up to 12-flowered, peduncles 2–10 × 1.2–1.5 mm diameter, rachis unbranched. *Flowers* with *pedicels* 3.3–3.8 × 1.3 mm diameter, sparsely puberulent, *sepals* ovate, obtuse, c.1.5 × 1 mm, sparsely puberulent or ciliate; *bud shape* cylindrical with (sub)obtuse to acute apex, with 5 sharp downward-pointed projections at bases of corolla lobes; *corolla* campanulate, pale yellow to yellow-green (fide *de Wilde & de Wilde-Duyfjes* 14377, *Anderson & Bisset* S20257), c.9–12 mm diameter, throat c.3.5 mm diameter, tube with 5 rounded ribs opposite the lobes at base, tapering

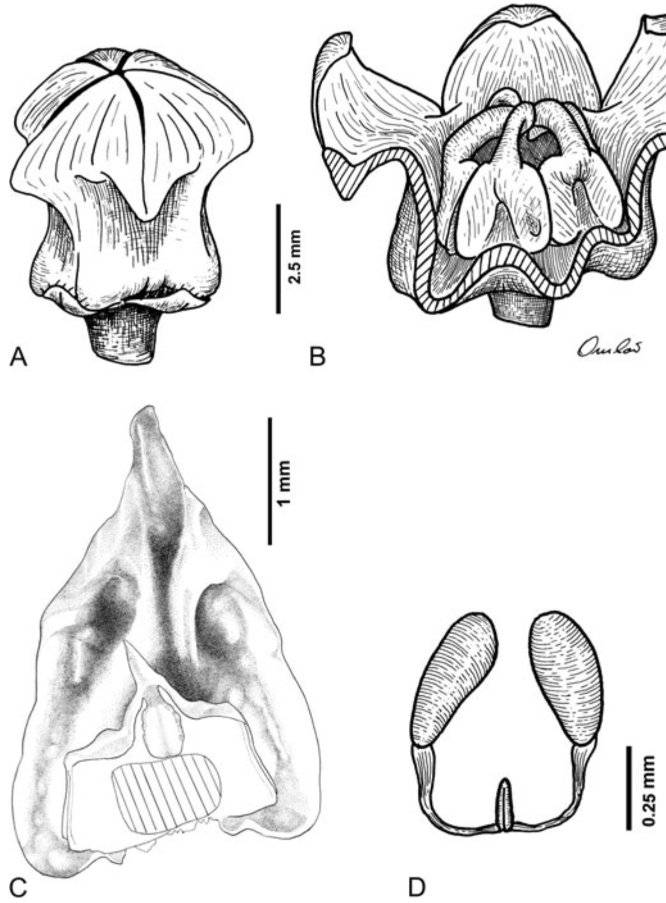

FIG. 4. *Clemensiella omlori* Livsh. & Meve. A, bud; B, flower in lateral view, parts of the corolla removed; C, anther with corona lobe, adaxial view; region of retinacle depicted with diagonal cross-hatching; D, pollinarium. (A, B and D drawn from *de Wilde & de Wilde-Duyfjes* 14377 (K). C drawn from *de Wilde & de Wilde-Duyfjes* 14377 (L). A, B and D drawn by R. Omlor; C drawn by Jennifer Prevatt; B and D from Omlor (1998), with permission.)

upwards, 3–5 × 4.5–5.5 mm diameter at base; *corolla lobes* 3.2–3.4 × 3.3–3.9 mm. *Gynostegial corona* barely exserted from corolla throat, c.2 × as tall as gynostegium, 2.9–4 × 2–2.8 mm; *anthers* 1.4–1.9 × 1–1.9 mm, guide-rails 0.4–0.7 mm long, ± parallel to the vertical axis of the gynostegium; anther connective appendages triangular, hyaline, c.1/3–1/2 total anther length, 0.6–0.8 × 0.3–0.6 mm, adpressed to and covering the style-head apex; *pollinia* c.0.4 × 0.15 mm; *caudicles* ± equal to pollinia in length, pale yellow; *corpusculum* c.0.1–0.15 × 0.05 mm, brown; *style-head* c.0.8 × 1.6 mm diameter. *Fruit* unknown.

Distribution. Known from two disjunct populations in North Sumatra and Aceh, Indonesia, and Sarawak, Malaysian Borneo (Fig. 1).

Ecology. A climber on trees in riparian rain forest (*de Wilde & de Wilde-Duyfjes* 14377) and a pendulous vine growing epilithically on damp limestone cliffs (*Anderson & Bisset* S20257), at elevations from c.60–600 m.

Chromosomes. Unknown.

Paratypes. INDONESIA. **North Sumatra**: Sibaulangit [Sibolangit], Betimaesdal, 18 iv 1918, *Lörzing* 5648 (L!). MALAYSIA. **Sarawak**: Seburan, Bau, 15 vii 1964, *Anderson & Bisset* S20257 (K, scan!, L!).

This species is very similar to the Philippine endemic *Clemensiella mariae*. The most obvious distinguishing characters are to be found in the corolla, both in bud and at anthesis. *Clemensiella mariae* has thickly lenticular (to slightly obovoid) buds with flattened to obtuse apices. In *Clemensiella omlori* the bases of the corolla lobes form sharp downward-pointed projections in bud that mark an abrupt transition zone between the basally inflated, cylindrical tube and the lobes which form a subobtuse to acute apex (Fig. 4). At anthesis, the corolla of *Clemensiella mariae* is rotate with the gynostegium exserted from the corolla throat for 1/3–1/2 of its length while that of *C. omlori* is campanulate with the tips of the corona lobes barely exserted from the throat (compare Figs 2 and 4). The orientation of the corolla lobes is depicted as somewhat erect in Fig. 4, but many flowers on herbarium specimens have rotate or reflexed corolla lobes. The guide-rails of *Clemensiella omlori* are approximately vertical (parallel to the long axis of the gynostegium) while those of *C. mariae* spread at an angle of 45° (Fig. 3C). *Clemensiella omlori* also has shorter peduncles, typically less than 1 cm long, while those of *C. mariae* are 1–4 cm long.

The cited specimens were first identified as '*Hoya* sp.', '*Secamone* sp.', and 'Asclepiadaceae gen. et sp. indet.'. There are likely other collections of this species in the world's herbaria.

This species is named in honour of Dr Ralf Omlor (Mainz, Germany) who first recognised it and discussed some of the differences between it and *Clemensiella mariae* in his generic revision of *Marsdenieae* (Omlor, 1998).

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