



The taxonomy of *Dischidia ruscifolia* (Apocynaceae, Asclepiadoideae) and the description of a new species, *Dischidia argentii*

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ABSTRACT: We document the taxonomic history of *Dischidia ruscifolia* Decne ex Becc. After a critical study of the available original material and additional specimens an epitype is designated. We confirm that *D. myrtillus* is a synonym of *Dischidia ruscifolia* and the name is typified. Clarification of the identity of *D. ruscifolia* allowed the identification of a new species that is here published and illustrated as *Dischidia argentii* Arshed, J.R. Callado & Tandang. The new species differs largely in its floral morphology and particularly in its glabrous corolla throat, absent corolline corona, gynostegium outline, and pollinium shape.

KEY WORDS: Epiphyte, epitype, lectotype, Philippines, typification.

INTRODUCTION

The largely epiphytic genus *Dischidia* R.Br. is distributed from India, Southern China across South East Asia to Melanesia and Australia (Livshultz, 2003a,b; Rodda *et al.*, 2012). It has been revised in Peninsular Malaysia and Singapore (Rintz, 1980; Middleton and Rodda, 2019); China (Li *et al.*, 1995); Australia (Forster *et al.*, 1996); India (Jagtap and Singh, 1999); Thailand (Thaithong *et al.*, 2018) and Laos and Vietnam (Livshultz *et al.*, 2005).

In preparation to a revision of *Dischidia* in the Philippines, thorough taxonomical review, correct name usage and location of type specimens are necessary. We have already clarified the identity of *Dischidia parasita* (Blanco) Arshed, Agoo and Rodda (Arshed *et al.*, 2019b), transferred the remaining species of *Conchophyllum* Blume and *Dischidiopsis* Schltr. to *Dischidia* (Arshed *et al.*, 2019a) and documented the rediscovery and typification of *Dischidia elmeri* Schltr. including the description of a new species, *Dischidia glabrata* Arshed & Tandang (Arshed *et al.*, 2021). Here, we proceed to clarify and discuss the taxonomy of *Dischidia ruscifolia* Decne ex Becc. allowing to clarify its synonymy and publish a similar new species. The latter is formally described and illustrated here.

MATERIALS AND METHODS

All available specimens of *Dischidia* from the Philippines in A, BO, CAHUP, DLSUH, E, FEUH, FI, FR, G, K, L, LBC, MA, MO, NY, PNH, P, PUH, and SING (acronyms following Index Herbariorum, Thiers, continuously updated) were examined and compared with our recently collected specimen. Further specimens were examined on JSTOR Global Plants (<https://plants.jstor.org/>, accessed on 13 Dec. 2020). Images seen are marked with '!'. Extent of occurrence (EOO) and area of occupancy (AOO) were calculated using the Geospatial Conservation Assessment Tool (GeoCAT) (Bachman *et al.* 2011; <http://geocat.kew.org>) based on distribution data retrieved from herbarium records and collections. Conservation status wherein the criteria and categories of the species were assessed using the International Union for Conservation of Nature (IUCN) criteria (IUCN, 2019). For the designation of types, the Shenzhen Code (Turland *et al.*, 2018) has been followed. Map constructed using SimpleMappr (www.simplemappr.net) based on gathered coordinates.

TAXONOMIC TREATMENT

Dischidia ruscifolia Decne ex Becc. Malesia 2: 272 (1886). **Fig. 1**



Type: PHILIPPINES, *s.d.*, Cuming, *H. 1086* (holotype FI! FI009121; isotypes G! G00136497, K! K000910998, K000910999, P! P00218739, P05207851, SING! SING0015379; PHILIPPINES, Luzon, Pampanga, Mt. Arayat, July 7, 2017, *M.J. Arshed, J.A. Ordas, N. Alfeche and M. Suba JArayat-001'* (epitype here designated PNH!, isoeotype FEUH!).

Later homonym: *Dischidia ruscifolia* Warb. ex K. Schum. & Lauterb., Fl. Schutzgeb. Südsee [Schumann & Lauterbach] 511 (non Decne.) (1900).

(=) *Hoya ruscifolia* Decne. In DC. Prodr. 8: 639 (1844) (synonymised by Merrill 1923). **Type:** PHILIPPINES, Manille (Mont. Igorrotes), 1840, *M. Callery s.n.* (lectotype P! P00639836; isoelectotype G! G00136497).

(=) *Dischidia myrtilus* Schltr. Philipp. J. Sci. 1 (Suppl. 4): 299 (1906) (synonymised by Merrill 1923). **Type:** PHILIPPINES, Luzon, Pampanga, Mt. Arayat, May 1904, *E.D.E. Elmer 3838* (lectotype here designated NY! NY03468609; isoelectotype K! K000911008).

Description: Plant succulent, epiphytic sub-shrub, stems erect then arching or pendulous upon maturity. Latex milky white in all vegetative parts. **Roots** on mature plants adventitious, nodal, occasionally produced along internodes. **Stems** terete, semi-corrugated, 0.25–1.10 mm diameter, dark to light brown, pubescent to glabrescent at maturity; internodes 0.60–1.50 cm long. **Leaves** opposite, decussate when young; petiole, semi-cylindrical, 2–3.50 mm long, 0.40–1 mm in diameter, sparsely pubescent; lamina coriaceous, deltoid to cordate-ovate, 0.90–2 × 0.50–1.5 cm, apex acuminate, base rounded to subcordate, adaxially subglabrous, sparsely pubescent along margins, abaxially glabrous; veins adaxially conspicuous, brochidodromous, 2–4 on each side of midrib. **Inflorescence** umbelliform; peduncle extra-axillary, almost sessile to 1 mm long, 0.30–0.50 mm in diameter, densely pubescent when young to sparsely pubescent at maturity; rachis one to three per peduncle, less than 1 mm long, 0.20–0.50 mm in diameter, each bearing 1–3 open flowers and 1–3 buds; bracts at base of pedicel, persistent, triangular to ovate, apex acute to obtuse, margin entire to erose; pedicels 1.5–2.08 mm long, 0.40–0.50 mm in diameter, sparsely pubescent. **Calyx** lobes triangular to oblong, 0.75–0.91 × 0.59–0.64 mm, apex acute, erose with hyaline margins, outer surface hirsute; five calycine collectors in between the calyx lobe sinuses, elliptical to oblong, 45–60 × 28–42 μm. **Corolla** ovoid-urceolate, 5-ribbed, 2.80–2.93 × 1.60–2.22 mm, white, wholly inflated; corolla tube 1.30–1.50 mm long, glabrous, corolla throat surrounded by a single layer of stiff hairs; corolla lobes valvate, triangular to ovate, 0.81–1.06 mm long, 1–1.07 mm wide, narrowing apex to 0.30–0.38 mm wide, apex acute, glabrous. **Corolline corona** of lunate ridges, below the corolla throat, at level of the gynostegial apex, alternating with the corolla lobes. **Gynostegium** not visible when viewed from above into the corolla, conical in outline, 1.15–1.33 × 1.20–1.30 mm, subsessile; anthers triangular, 1.25–1.30 × 0.65–0.67 mm, with hyaline anther appendages, covering the style-head; adpressed margins of adjacent anthers forming a narrow-mouthed

aperture, 45–50 μm wide. **Staminal corona** with five thickened inverted anchor-shaped lobes; stalks 0.35–0.39 × 0.09–0.15 mm, parallel to the axis of the gynostegium and inserted at the base of the gynostegium, apex retuse, with two down curved arms, 0.25–0.28 × 0.035–0.040 mm, extending from the bifurcation of stalk apex. **Pollinarium:** corpuscle elliptic, 127–130 × 48–51 μm, apex obtuse; caudicles 192–220 × 68–75 μm, narrowing towards the corpuscle attachment site to 35–39 μm wide, thickened on the apex (attachment site of the pollinium); pollinium oblong, 203–222 × 70–79 μm, apex rounded, base rounded to obtuse. **Ovary** bicarpellate, obclavate, 0.47–0.50 mm, each carpel 0.18–0.20 mm in basal diameter. **Follicles** and **seeds** not observed.

Vernacular name: Kabkab (Visayan), Million hearts (English)

Phenology: Mature individuals of *Dischidia ruscifolia* were observed flowering from March to September.

Distribution and Ecology: Endemic to the Philippines. Its distribution goes from North Luzon up to Mindanao (Fig. 2). The observed and collected specimens from Mt. Arayat, Pampanga were seen at 605 masl up to the peak at 1030 masl. Notes from the examined sheets concur with Merrill (1923) and Elmer (1938) records wherein this species can also be found along rivers, peaks and even at cliffs.

Provisional IUCN conservation assessment: The extent of occurrence (EOO) of *Dischidia ruscifolia* is 338,085.12 km² and the area of occupancy (AOO) is 27,500 km². Moreover, this species is recorded from twelve (including sterile specimens tentatively identified as *D. ruscifolia*) locations throughout the Philippines. Therefore, *Dischidia ruscifolia* is assessed as Least Concern (LC; IUCN, 2019).

The taxonomic history of *Dischidia ruscifolia*: Beccari (1886) first identified *D. ruscifolia* as a new species based on a sterile specimen *Cuming 1086* from the Webb Herbarium (which is now part of the National History Museum of Florence (FI)). The specimen was labelled as *Dischidia ruscifolia* by Decaisne, an unpublished name. Beccari therefore validly published it. The diagnostic characters mentioned by Beccari (1886) were branches (puberulent), leaves (widely cordate, apex abruptly acuminate with prominent ribs on leaves when dry) and the flower (likely he meant inflorescence) position (axillary sessile). The type locality is uncertain as the specimen (*Cuming 1086*) was labelled as collected from the island of the Philippines without a specific locality. Rolfe (1908) researched the localities of Cuming's collections based on a list of localities provided by Cuming and kept at Kew. The collection number *1086* falls under the set *1040-1112*, which has no precise locality data and it is possibly from Zambales, Luzon (Merrill, 1915). A description based on a sterile specimen with a not well specified locality makes the identification of the species and the separation of similar taxa very arduous.

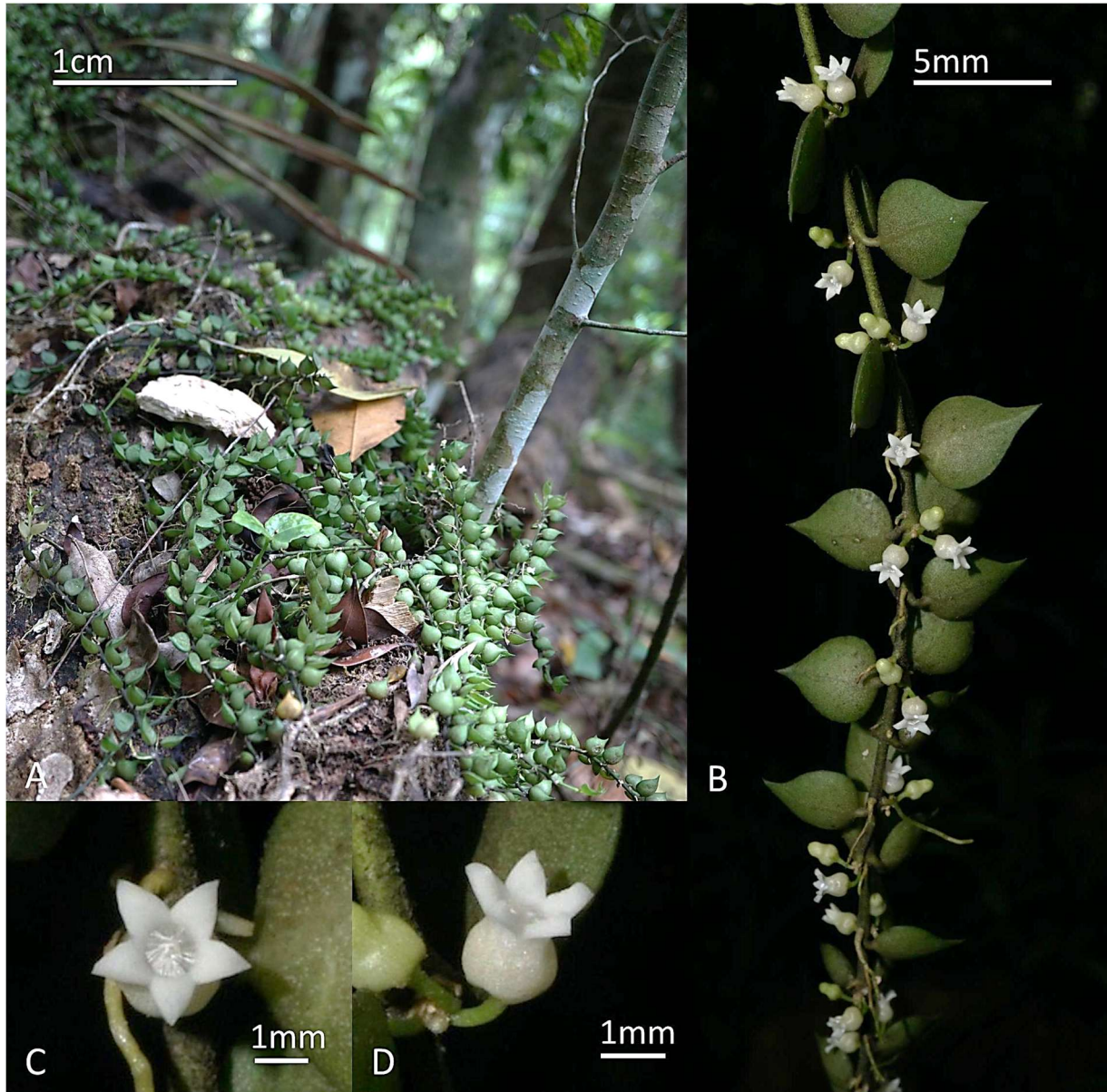


Fig. 1. *Dischidia ruscifolia* Decne ex Becc. A. Habitat, B. Habit, C. Flower top view, D. Flower side view. Photos by N.K. Alfeche. Scale bar: A = 1 cm; B = 5 mm; C = 1 mm; D = 1 mm.

According to Rodda and Simonsson (2010), when Decaisne published the name *Hoya ruscifolia* Decaisne, They were not sure whether it was a species of *Hoya* or *Dischidia*. Based on the type specimens, *D. ruscifolia* can be confused with *Hoya ruscifolia* as both species were described on sterile material. Merrill (1923) synonymized *Hoya ruscifolia* (and *Dischidia myrtillus*, more about it below) with *Dischidia ruscifolia*, and we agree with Merrill's conclusion. To fix the application of *Dischidia ruscifolia*, a recently collected fertile epitype from Mt. Arayat, Pampanga is designated.

Dischidia myrtillus was described by Schlechter (1906) from specimens collected from Sablan, Benguet (Elmer 6256), and Mount Arayat, Pampanga (Merrill,

3838). Among the two syntypes, the only extant sheet that we have been able to trace is Merrill 3838 with duplicates at K (K000911008) and NY (NY03468609). Since Schlechter did not formally select a holotype, the NY sheet is selected as the lectotype.

Merrill (1923) listed *D. myrtillus* as synonyms of *D. ruscifolia* without justifying his choice. Upon the examinations of type specimens along with its protologue and collections from the type locality in Mount Arayat, Pampanga (Merrill, 3838) which is also in central Luzon and not far from the possible type locality of *D. ruscifolia* we agree with this synonymy based on similarities in branches (pubescent), leaves (cordate-ovate, acuminate apex), and corolla.



Additional specimen examined: PHILIPPINES, Luzon: Morong, Rizal, March 1886, *Vidal s.n.* (K000910999), n.d., *Vidal 3313* (A); Baguio, Benguet, March 1907, *A.D.E. Elmer 8741a* (NY03468610), April 1910, *A.D.E. Elmer 12433* (PNH, P00218740); Mt. Guiting guitung, Magallanes, Sibuyan, May 1910, *Elmer 12433* (A, PNH252334); Mt. San Isidro Labrador, Pangasinan, November 1917, *E. Fenix 29850* (L2709964); Mt. McKinley, Davao, Sept. 13, 1946, *Edaño 1115* (PNH); Mt. Natib, Bataan, July 19, 2018, *M.J. Arshed and D. Ganado JNat-002* (FEUH, DLSUH); Sitio Pagitpit, Brgy. Naguillan, Camiguin, Calayan Cagayan, July 27, 2019, *M.J. Arshed and R. Docot CBD19-029* (FEUH, DLSUH), *M.J. Arshed and R. Docot CBD19-061* (FEUH, DLSUH). **Mindanao:** Alvenda, Mutia, Zamboanga del Norte, May 1993, *Gaerlan, Sagcal, Romero 11008* (MO5337198). **Sterile specimens (tentatively identified as *D. ruscifolia*):** PHILIPPINES, Luzon: Sibuyan, Romblon, August 27, 1989, *G. Argent & E.J. Reynoso 89138* (L2725133), May 1910, *A.D.E. Elmer 12433* (NY03468614); **Visayas:** Canlaon National Park, Brgy. Minuyan, Negros Island, B.C. Stone et al. 6181 (L3739229). **Mindanao:** Mt. Urdaneta, Cabadbaran, August 1912, *Elmer 14079* (P00218738), October 1912, *Elmer 14079* (NY03468613).

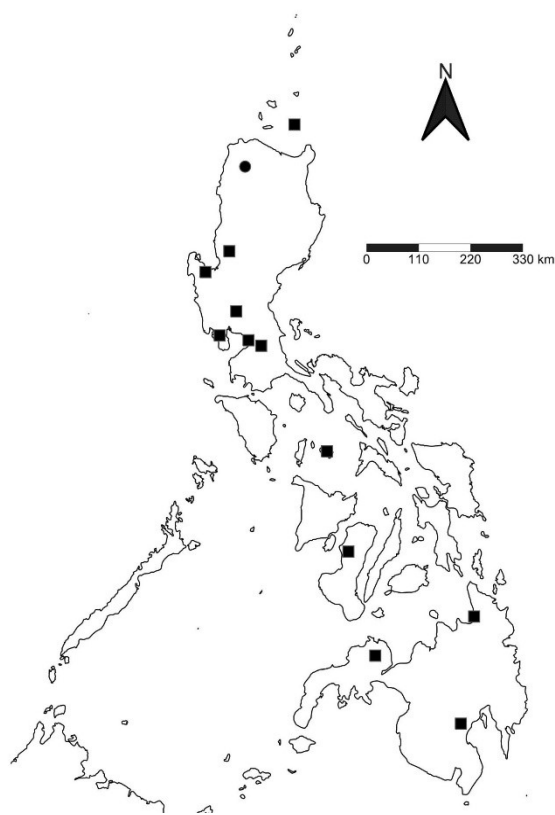


Fig. 2. Map of the Philippines. The collection site of *Dischidia argentii* Arshed, J.R. Callado & Tandang, *sp. nov.* is indicated by full circle and the collection sites of *D. ruscifolia* Decne ex Becc. are indicated by full square generated using SimpleMapp (www.simplemapp.net).

Dischidia argentii Arshed, J.R. Callado & Tandang, *sp. nov.* **Figs. 2 & 3**

Type: PHILIPPINES, Luzon: Mt. Kilang, Solsona, Ilocos Norte, 18°05'21"N, 120°54'53"E January 15, 2020, *D. Tandang & J.R. Callado s.n.* (holotype PNH!; isotype FEUH!, DLSUH!)

Diagnosis: A species similar to *Dischidia ruscifolia*

Decne ex Becc. because both species are small epiphytic sub-shrubs with erect stems becoming pendulous upon maturity, with densely placed leaves of similar size and shape (cordate-ovate) They are separated by the corolla throat surface (glabrous in *D. argentii*, vs surrounded by a single layer of stiff hairs in *D. ruscifolia*), corolline corona (absent in *D. argentii*, vs present in *D. ruscifolia*), gynostegium base (stipitate in *D. argentii*, vs subsessile in *D. ruscifolia*), and pollinium shape (clavate in *D. argentii*, vs oblong in *D. ruscifolia*).

Description: Plants succulent, epiphytic sub-shrub with stems erect becoming arching or pendulous upon maturity. Latex milky white in all vegetative parts. **Roots** on mature plants adventitious, aggregating roots internodal, additional roots, few, nodal, occasionally produced along internodes. **Stems** terete, semi-corrugated at maturity, 0.28–1.60 mm diameter, light green to light brown, tomentose to glabrescent at maturity; internodes 0.30–0.75 cm long. **Leaves** opposite, decussate when young; petiole, semi-cylindrical, 0.58–1.68 mm long, 0.20–0.72 mm in diameter, tomentose to sparsely tomentose; lamina coriaceous, cordate-ovate to lanceolate, 0.72–1.48 × 0.30–0.75 cm, apex acute, base rounded to cuneate, adaxially subglabrous, adaxially glabrous; veins both sides conspicuous, brochidodromous, 2–4 on each side of midrib. **Inflorescence** umbelliform; peduncle extra-axillary, almost sessile to 1 mm long, 0.40–0.63 mm in diameter, subglabrous; rachis one to two per peduncle, 0.40–1.1 mm long, 0.54–1.70 mm in diameter, each bearing 1–2 open flowers and occasionally 1–3 buds; bracts at the base of the pedicel, persistent, lunate to triangular, apex acute to obtuse, margin entire to erose; pedicels 0.45–1.50 mm long, 0.13–0.35 mm in diameter, glabrous. **Calyx** lobes triangular, 0.91–1.12 × 0.84–0.95 mm, apex acute to obtuse, erose with hyaline margins, outer surface subglabrous; five calycine collectors elliptical to oblong, at the base, inside each lobe sinuses, 50–70 × 30–45 μm. **Corolla** ovoid-urceolate, not ribbed, 1.35–1.40 × 1.04–1.08 mm, white, wholly inflated; corolla tube 1–1.5 mm long, glabrous; corolla lobes valvate, triangular, 0.50–0.55 mm long, 0.28–0.32 mm wide, narrowing apex to 0.05–0.09 mm wide, apex acute, glabrous. **Corolline corona** absent. **Gynostegium** visible when viewed from above into the corolla, cylindrical in outline, 0.98–1.30 × 0.72–0.85 mm, stipitate, 0.47–0.50 mm stipe height; anthers triangular, 0.85–0.87 × 0.29–0.31 mm, with hyaline, anther appendages, covering the style-head; adpressed margins of adjacent anthers forming a narrow mouthed aperture, c. 47.26 μm wide. **Staminal corona** with five stalks, parallel and inserted at the base of the gynostegium, 0.42–0.48 × 0.035–0.04 mm, apex retuse, with two recurved arms, 0.23–0.25 × 0.015–0.030 mm, extending from the bifurcation of stalk apex. **Pollinarium:** corpuscle elliptic, 70–87.67 × 27–32 μm, apex obtuse; caudicles 130.4–155.53 × 55–60 μm, narrowing towards the corpuscle attachment site to 10–15

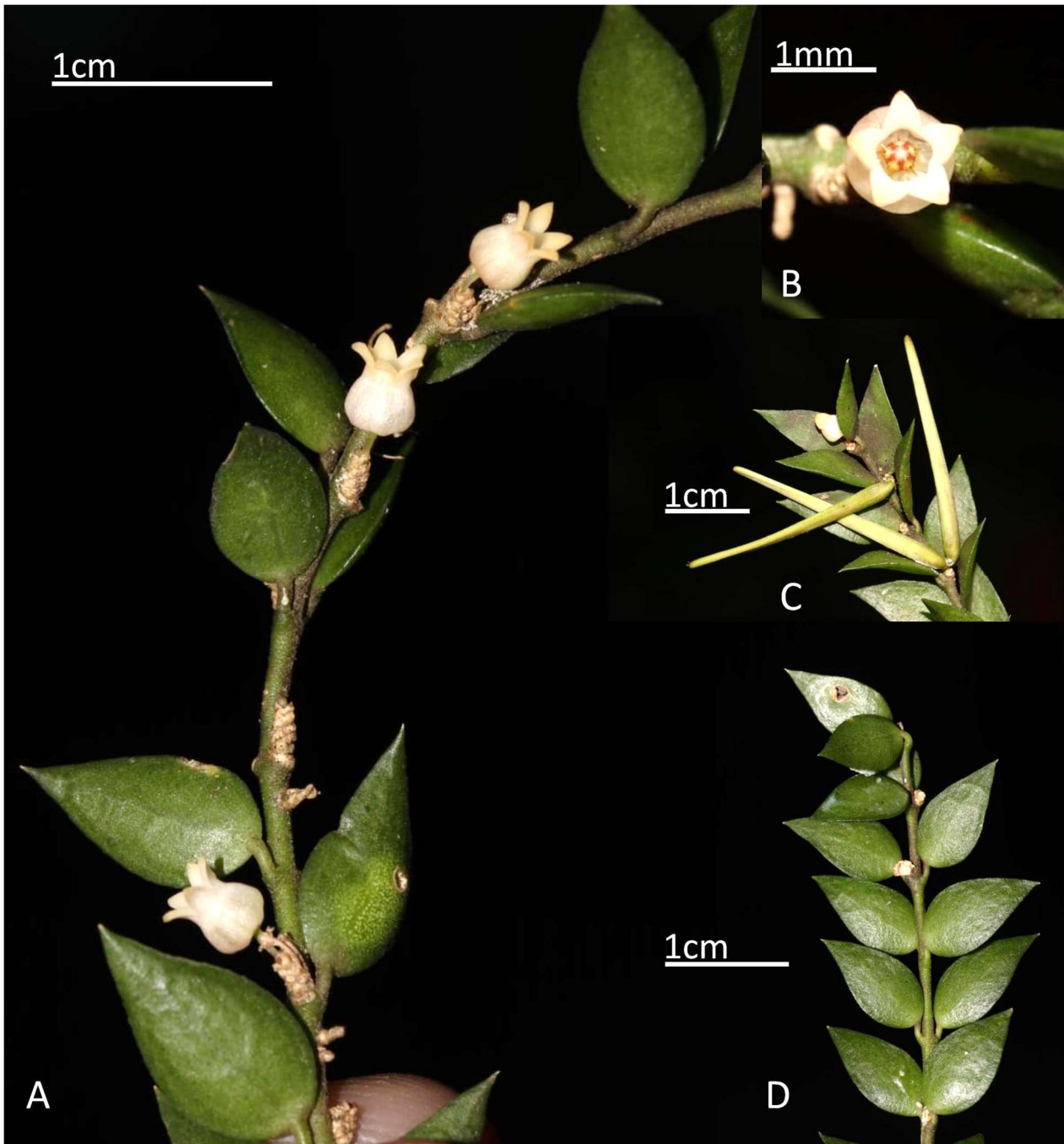


Fig. 2. *Dischidia argentii* Arshed, J.R. Callado & Tandang, *sp. nov.* A. Habit, B. Flower top view, C. Habit showing the follicles, D. Leaves. Photos by J. R. Callado. Scale bar: A = 1 cm; B = 1 mm; C = 1 cm; D = 1 cm.

μm wide, thickened on the apex (attachment site of the pollinium) and outer edges; pollinium clavate, $89.50\text{--}109.63 \times 49.5\text{--}55 \mu\text{m}$, apex rounded, base rounded to obtuse. **Ovary** bicarpellate, obclavate, $0.60\text{--}0.66 \text{ mm}$, each carpel $0.26\text{--}0.30 \text{ mm}$ in basal diameter. **Follicles** single or in pairs per pedicel, linear-lanceolate, $1.90\text{--}3.20 \times 0.11\text{--}0.28 \text{ cm}$, apex obtuse, apiculate, when paired narrowly diverging, held at a right to obtuse angle in relation to the pedicel. **Seeds** not observed.

Etymology: The new species is named after the late Dr. George Argent (1941–2019), for his contribution to the flora of the Philippines as he steered numerous biodiversity studies and taxonomical discoveries in the Philippines.

Phenology: We observed mature individuals of *Dischidia argentii* flowering from January to February (J.R. Callado pers. obs.).

Distribution and Ecology: Only known from the type specimen from Mt. Kilang, Ilocos Norte (Fig. 2), growing

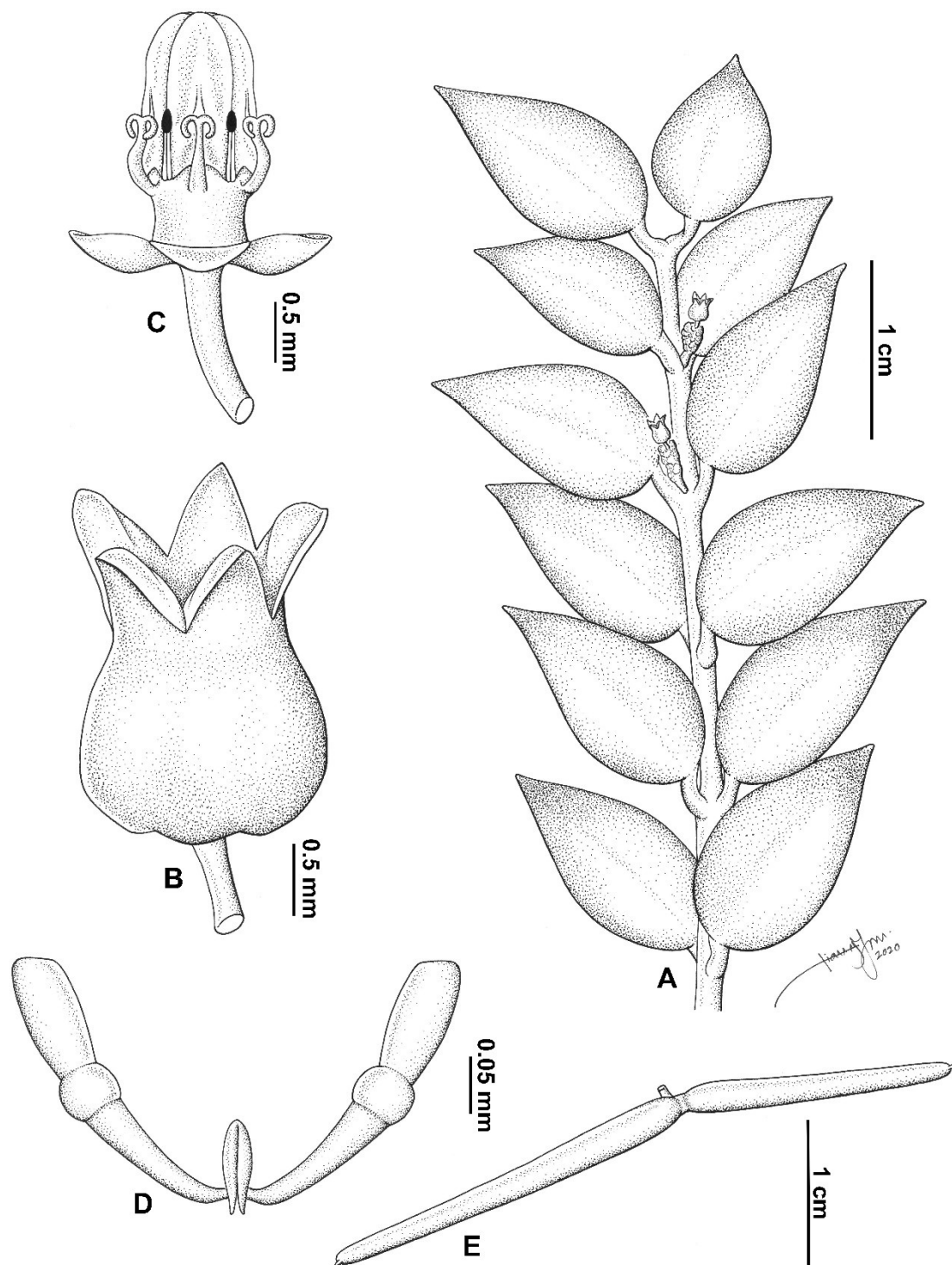


Fig. 3. *Dischidia argentii* Arshed, J.R. Callado & Tandang, *sp. nov.* **A.** Flowering branch, **B.** Flower, side view, **C.** Calyx and gynostegium, side view, **D.** Pollinarium, **E.** Fruit. Drawn by X.Y. Loh, based on D. Tandang & J.R. Callado s.n. (PNH). Scale bar: A = 1 cm; B = 0.5 mm; C = 0.5 mm; D = 0.05 mm; E = 1 cm.

**Table 1.** Comparison of morphological characters of *Dischidia argentii* sp. nov. and *D. ruscifolia*.

Characters	<i>Dischidia argentii</i>	<i>Dischidia ruscifolia</i>
Stem indumentum	Tomentose to glabrescent	Pubescent to glabrescent
Leaf apex	Acute	Acuminate
Leaf base	Rounded to cuneate	Rounded to subcordate
Corolla throat surface	Glabrous	With stiff pubescent hairs
Corolline corona	Absent	Present
Gynostegium if viewed from above into the corolla	Visible	Not visible
Gynostegium outline	Cylindrical	Conical
Gynostegium base	Stipitate	Subsessile
Staminal corona stalks	thinner, 0.035–0.04 mm	thicker, 0.09–0.15 mm
Pollinium shape	Clavate	Oblong

on a tree trunk or fallen branches in a montane forest at 1300 masl and was collected along the forest trail near the road traversing Ilocos Norte and Apayao exposing some of the population to anthropogenic disturbance.

Provisional IUCN conservation assessment: Since *Dischidia argentii* is currently known from a single collection, its conservation status is Data Deficient (DD; IUCN, 2019).

Notes: *Dischidia argentii* can be easily confused with *D. ruscifolia* especially when sterile because both species are small epiphytic sub-shrubs with pendulous stems with densely placed leaves of similar size and shape. The leaves of *D. argentii* appear to be similarly sized and shaped to the ones of *D. ruscifolia*, though some mature leaves of *D. argentii* can be lanceolate (vs deltoid in *D. ruscifolia*). However, they can be easily discriminated on flower morphology. A detailed comparison between *D. argentii* and *D. ruscifolia* is presented in Table 1.

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