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## Research

### Taxonomic novelties and changes in Philippine *Timonius* (Rubiaceae, Guettardeae)

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The Philippine species of the genus *Timonius* present numerous taxonomic problems resulting from poorly defined species boundaries, misinterpretation of the origin of type specimens, and historical collections that often bear residual reproductive structures. Based on field observations and examination of herbarium materials, the following taxonomic amendments are proposed: conspecificity of *T. philippinensis* with *T. finlaysonianus*, and *T. panayensis* with *T. valetonii*, and transfer of *T. quadrasii* to *Ridsdalea*. This study also describes six new species from the archipelago: *T. alejandroanus*, *T. dumagat*, *T. pseudoarborescens*, *T. ridsdalei*, *T. spes-vitarum* and *T. stevendarwinii*. Finally, *T. nitidus* is excluded from the Philippine flora.

Keywords: Malaspina expedition, Philippines, *Ridsdalea*, taxonomy, *Timonius*



## Introduction

The Paleotropical genus *Timonius* Rumph. ex DC. is estimated to include about 200 (Darwin 2010) to 300 species (Chen et al. 2015), and is considered as one of the highly diverse genera of Rubiaceae (Davis et al. 2009). *Timonius* belongs to the tribe Guettardeae s.l. of subfamily Cinchonoideae (Manns and Bremer 2010), and is easily distinguished by the combination of dioecism, dimorphic floral structures, valvate corolla lobe aestivation with some species exhibiting interlocking margins, and drupes with numerous free, single-seeded pyrenes. A modern concept of the genus was presented by Valeton (1909), based primarily on species from the Dutch East Indies. This was subsequently modified by Darwin (1993, 1994, 1997, 2010), who partly divided *Timonius* into three subgenera and an informal species group, namely: *T.* subgen. *Abbottia* (F. Muell.) S.P. Darwin, *T.* subgen. *Pseudobobea* (Valeton) S.P. Darwin, *T.* subgen. *Timonius* and *T. flavescens* (Jacq.) Baker alliance. However, this infrageneric classification needs further evaluation before it can be accepted, because the phylogeny of *Timonius* remains insufficiently studied.

After the establishment of *Timonius* in the Philippine flora (Fernandez-Villar 1880), the only comprehensive account for the genus is the bibliographical consolidation of species presented by Merrill (1923). The majority of the ca 30 species currently recognized are endemic (Merrill 1923, Alejandro and Liede 2003, Pelsner et al.



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[Correction added on 25th September, 2020, after first online publication: Projekt Deal funding statement has been added.]

2011, Govaerts et al. 2019), and are principally distributed in the Greater Luzon and Greater Mindanao ecoregions. Species identification is, however, difficult due to obscure species delimitations, incomplete botanical descriptions, dioecism and high levels of morphological variation and plasticity. These problems are further exacerbated by geographical bias and misinterpretations, and the inclusion of several species that are actually misplaced in *Timonius*. Furthermore, our examination of herbarium materials revealed a significant number of species yet to be described, highlighting the remarkable diversity of *Timonius* in the country.

As part of the critical efforts working toward a revision and phylogeny of Philippine *Timonius*, this contribution has been prepared to clarify taxonomic uncertainties and formalize necessary changes. Furthermore, six distinctive species from the archipelago are here described and illustrated as new additions to the genus.

## Material and methods

Assessments were based on observations of living plants, and examined herbarium materials of Guettardeae taxa kept at A, BO, CAHUP, FEUH, GH, L, P, PNH, PUH, WAG, U, US and USTH. Morphological features were observed through a stereomicroscope. Information was also obtained from high resolution images and specimen details provided by BISH, BRIT, C, CM, F, FR and PRC, as well as those in JSTOR Plants, JACQ and online databases of HAST, HBG, K, MO, NY, SING, TAIF and Z. A review of historical and fundamental literature was also conducted. Estimations of the extent of occurrence (EOO), area of occupancy (AOO) and number of locations of the species novelties presented here were performed using the ConR package (Dauby et al. 2017). AOOs were calculated with a grid resolution of 2 km, while the number of locations were estimated with a 10 km grid resolution. Conservation status were assessed according to the guidelines and criteria of IUCN (2019).

## Results and discussion

### Description of new species in *Timonius*

#### *Timonius alejandroanus* J.G.Chavez, Meve and Liede, sp. nov. (Fig. 1)

A species differing from *T. lanceolatus* Merr. by having pistillate flowers with 5-lobed corollas (versus 6-lobed), ellipsoid fruits crowned by an erect persistent calyx (versus globose fruits crowned by an incurved persistent calyx), and pyrenes arranged in ca 5 double radiating files in cross-section of the fruit (versus 6 double radiating files).

**Type:** The Philippines, Samar Island. Taft: Mt Calbiga, along road km 64, ± 250 m a.s.l., ♀, 25 May 1948, M.D. Sulit Phil.

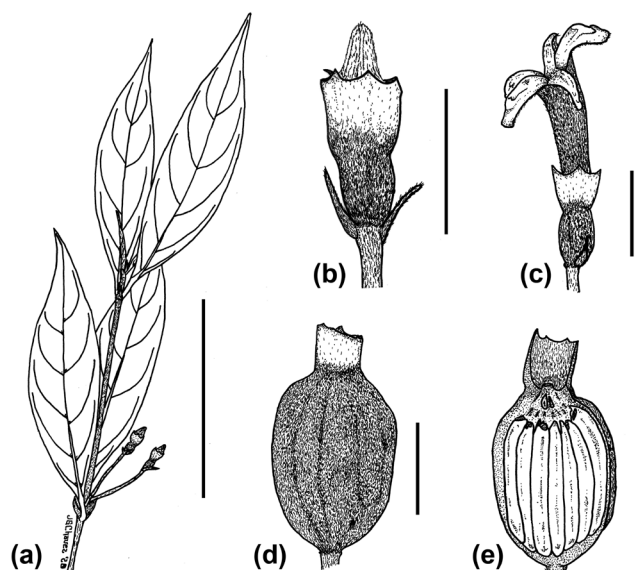


Figure 1. *Timonius alejandroanus* sp. nov. (a) flowering pistillate branch, (b) pistillate flower in bud stage, (c) pistillate flower, (d) fruit, (e) longitudinal section of fruit showing pyrenes. Scale bars: a = 5 cm, b–e = 5 mm. All based on M. D. Sulit Phil. Nat. Herb. 6459.

Nat. Herb. 6459 (also numbered M.D. Sulit and E. Coñese 3034) (holotype: PNH; isotype: L 2963914).

#### Etymology

The adjectival epithet is in reference to Prof. Dr. Grecebio Jonathan D. Alejandro (University of Santo Tomas-Manila) for his significant contributions to the knowledge of Philippine Rubiaceae.

#### Description

Shrub or tree up to 5 m tall and 1–15 cm dbh. *Branchlets* 0.7–1.7 mm wide toward apex, densely strigose becoming moderately to sparsely strigose or glabrous when mature, with trichomes 0.05–0.30 mm long. *Stipules* valvate, triangular to lanceolate, 5.1–7.5 × 2.15–3.25 mm, slightly two-ridged, with ridges converging toward the apex; outer surface densely strigose, with trichomes 0.13–0.75 mm long; inner surface densely strigose, with trichomes ≥ 1.0 mm long. *Colleters* present on inner surface of stipules and bracts. *Leaves* opposite; petioles 3.0–8.8 × 1.3–1.7 mm, densely to moderately strigose, with trichomes 0.08–0.75 mm long; lamina elliptic, 5.5–11.0 × 1.0–3.0 cm, coriaceous, its upper surface glabrous except along the midrib and secondary nerves which are moderately to sparsely strigose, with trichomes 0.25–0.88 mm long, its lower surface moderately strigose becoming densely strigose along the midrib and secondary nerves, with trichomes 0.13–0.63 mm long, acuminate at apex, attenuate to cuneate at base; secondary nerves 5–7 pairs; domatia occasionally present as trichomatous pocket, ciliate pit or intermediate between ciliate pit- and crypt-type in axils of secondary nerves. *Staminate inflorescences* not seen. *Pistillate inflorescences* 1-flowered; peduncles 3.4–19.0 × 0.5–0.9 mm,

densely strigose, with trichomes 0.13–0.5 mm long; bracts triangular to lanceolate, 1.8–2.8 × 0.4–0.75 mm, their outer surface densely strigose, with trichomes 0.18–0.5 mm long, their inner surface densely strigose, with trichomes 0.25–0.5 mm long; calyx cupuliform, usually ruptured by the expanding corolla, 5-toothed, its outer surface densely strigose becoming moderately strigose towards the apex, with trichomes 0.08–0.5 mm long, its inner surface densely strigose becoming moderately strigose towards apex, with trichomes  $\geq 0.25$  mm long; calyx tube 1.6–2.3 × 2.7–3.3 mm; calyx teeth triangular, 0.25–0.75 × 0.25–0.75; corolla infundibular, creamy-white, 5-lobed; corolla tube ca 8.0 × 2.6 mm, its outer surface densely strigose, with trichomes 0.18–0.75 mm long, its inner surface not seen; corolla lobes lanceolate, 2.5–4.0 × 1.0–1.5 mm, their upper surface glabrous, but lower surface densely strigose, with trichomes 0.13–0.5 mm long; staminodia not seen; hypanthium ellipsoid, 3.0–3.5 × 2.0–2.6 mm, densely strigose, with trichomes 0.13–0.5 mm long; style not seen. *Fruits* ellipsoid, 7.6–9.3 × 5.7–6.4 mm, neither costate nor tuberculate, densely strigose, with trichomes 0.13–0.5 mm long, with persistent calyx 1.7–2.0 mm long; schizogenous cavity absent; pyrenes ca 20 visible in transverse section of the fruit, arranged in ca 5 double radiating files, ca 7 visible in longitudinal section of the fruit, oriented subvertically, cylindrical to falcoid, 4.85–7.2 × 1.0–1.5 mm.

#### **Distribution and ecology**

At present, *Timonius alejandroanus* is only known from two localities on the island of Samar. It was reported to grow along ridges of dipterocarp forests on Mt Calbiga, and limestone forests in the municipality of Paranas.

#### **Conservation status**

The extent of occurrence (EOO) of *T. alejandroanus* cannot be measured. An estimated area of occupancy (AOO) of 8 km<sup>2</sup> suggests that the species qualifies to the 'Critically Endangered' category. Nonetheless, *T. alejandroanus* is currently known in two locations within the Samar Island Natural Park (SINP). The specimen collected in one of the locations (Mt Calbiga, Taft) dates back to 1948; the species has not been recollected in this locality since then, in spite of extensive botanical explorations made by the Philippine National Herbarium (1948–1996) in Samar and by the team which prepared the checklist of Eastern Samar Rubiaceae (Ordas et al. 2019). The specimen notes indicate that *T. alejandroanus* was found on the ridge of a dipterocarp forest, a type of habitat that was exploited for timber prior to the legal declaration of SINP as a protected area in 2003. On the other hand, the other location (Campo Uno, Paranas), secured as it may seem, is partly a tourism area within SINP. Apan et al. (2017) reported that SINP is one of the protected areas in the Philippines with the highest rate of forest loss. Infrastructure development and impacts of climate change are also seen as threats to *T. alejandroanus*. Because of this information, *T. alejandroanus* is assigned a provisional conservation status of 'Endangered' EN B2ab(ii,iii,iv).

#### **Notes**

The type material of *Timonius alejandroanus* were initially annotated by Elmer D. Merrill as a form or variety of *T. arbo-reus* Elmer. However, our examination shows that the two taxa do not exhibit any degree of morphological resemblance. The closest to *T. alejandroanus* is *T. lanceolatus* due to their relatively similar vegetative morphology, while the differences in floral and fruit structures indicated in the diagnosis make the two species easily distinguishable. Furthermore, the disk of *T. lanceolatus* expands horizontally during fruit development, whereas in *T. alejandroanus* the disk neither expands nor elongates.

#### **Additional specimen examined (paratype)**

The Philippines, Samar Island. Paranas: Campo Uno, 400 m a.s.l., 01 May 1996, ♀, Reynoso and Majaducon PPI 24013 (L, BRIT).

#### ***Timonius dumagat* J.G.Chavez, sp. nov. (Fig. 2)**

A species differing from *T. alejandroanus* by having leaves with 3–5 pairs of secondary nerves (versus 5–7 pairs), and 5.5–7.5 mm long, moderately strigose fruits crowned by a 3.5–6.0 mm long persistent calyx (versus 7.6–9.3 mm long, densely strigose fruits crowned by a 1.7–2.0 mm long persistent calyx).

**Type:** The Philippines, Luzon Island. Isabela: Divilacan, Aubarede Peninsula, west side facing Bicobian, Salniwan Spring, ca 17 km NNW of Palanan Point, 25 May 1991, ♀, L. Co 3569 (holotype: L 2957184; isotypes: A, CAHUP, PUH, US).

#### **Etymology**

The epithet is treated as a noun in apposition for the nomadic tribes of the dumagats in Divilacan and Palanan.

#### **Description**

Shrub, up to 3 m tall, ca 4 cm dbh. *Branchlets* 0.75–1.7 mm wide toward apex, densely to moderately strigose becoming sparsely strigose or glabrous when mature, with trichomes 0.08–0.50 mm long. *Stipules* valvate, triangular, 3.6–6.8 × 1.5–2.6 mm, slightly two-ridged, with ridges converging toward the apex, its outer surface densely strigose, with trichomes 0.13–0.75 mm long, its inner surface densely strigose, with trichomes 0.5–1.25 mm long. *Colleters* present on inner surface of stipules and bracts. *Leaves* opposite, sessile to petiolate; petioles 1.0–4.3 × 0.9–2.1 mm, densely to moderately strigose becoming sparsely strigose or glabrous when mature, with trichomes 0.08–0.5 mm long; lamina lanceolate to elliptic or obovate, 1.6–8.0 × 0.8–3.6 cm, coriaceous, its upper surface sparsely strigose to glabrous, with trichomes 0.2–0.63 mm long, its lower surface moderately strigose, with trichomes 0.13–0.75 mm long, acute to attenuate or acuminate at apex, attenuate to cuneate at base, rarely obtuse or rounded; secondary nerves 3–5 pairs; domatia present as tuft of trichomes, trichomatous pocket, ciliate pit or crypt in axils

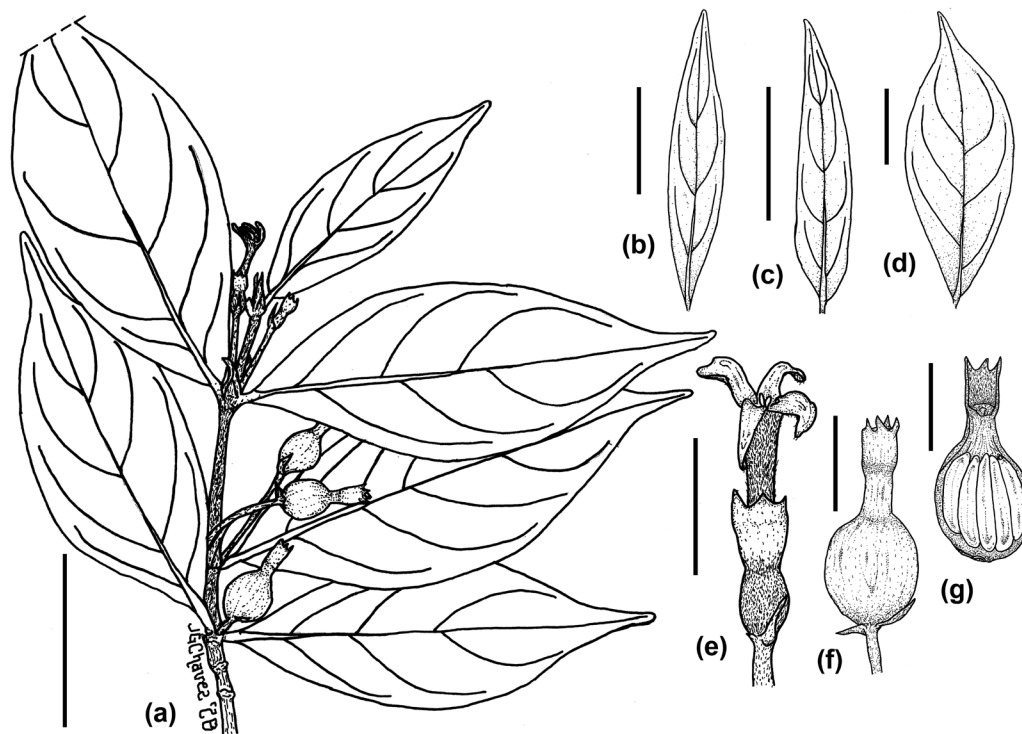


Figure 2. *Timonius dumagat* sp. nov. (a) flowering and fruiting pistillate branch, (b–d) leaf shape variation, (e) pistillate flower, (f) fruit and bracts, (g) longitudinal section of fruit showing pyrenes. Scale bars: a = 2.5 cm, b–d = 2 cm, e–g = 5 mm. Based on (a, d, f–g) L. Co 3569, (b) C. E. Ridsdale, N. Baquiran et al. ISU 416, (c, e) C.E. Ridsdale, V. Dejan and N. Baquiran ISU 121.

of secondary nerves. *Staminate inflorescences* not seen. *Pistillate inflorescences* 1-flowered; peduncles 2.9–11.8 × 0.55–1.0 mm, densely to moderately strigose, trichomes 0.18–0.75 mm long; bracts triangular to lanceolate, 1.6–3.5 × 0.35–0.6 mm, their outer surface densely strigose from trichomes 0.13–0.75 mm long, their inner surface densely strigose, with trichomes 0.13–0.75 mm long; calyx cupuliform, not ruptured by the expanding corolla, 4- to 5-toothed, its outer surface moderately strigose, with trichomes 0.08–0.5 mm long, its inner surface densely strigose becoming moderately strigose towards the apex, with trichomes 0.13–0.50 mm long; calyx tube 1.8–2.1 × 1.95–2.85 mm; calyx teeth triangular, 0.25–1.0 × 0.25–1.0 mm; corolla infundibular, white, 4- to 5-lobed; corolla tube 4.0–7.25 × 1.25–1.65 mm, its outer surface densely strigose, with trichomes 0.13–0.50 mm long, its inner surface glabrous; corolla lobes lanceolate, 2.0–3.8 × 0.8–1.0 mm, with upper surface glabrous but lower surface densely strigose, with trichomes 0.13–0.5 mm long. *Staminodia* 4–5, elliptic to lanceolate, 1.60–1.75 mm long, sagittate at base, their abaxial surface densely strigose, with trichomes 0.25–0.38 mm long; hypanthium globose to (sub-)ellipsoid, 2.0–2.9 × 1.95–2.5 mm, densely strigose, with trichomes 0.13–0.5 mm long. *Style* with 4–5 unequal stigmatic arms, densely strigose becoming glabrous towards the stigmatic arms, with trichomes 0.25–0.5 mm long. *Fruits* subglobose to ellipsoid, 5.5–7.5 × 5.1–6.2 mm, neither costate nor tuberculate, moderately strigose, with trichomes

0.08–0.18 mm long, with persistent calyx 3.5–6.0 mm long; schizogenous cavity absent; pyrenes ca 18 visible in transverse section of the fruit, arranged in ca 4 double radiating files, ca 5 visible in longitudinal section of the fruit, oriented subvertically, cylindrical to ovoid or falcoid, 3.8–5.75 × 1.6–1.95 mm.

#### **Distribution and ecology**

*Timonius dumagat* is probably endemic to the province of Isabela. It is reported from lowland riverine forests and open grassy areas on ultramafic substrates. The type material was collected near the coast and was noted to grow with populations of *Machaerina* Vahl. (Cyperaceae) and *Nepenthes* L. (Nepenthaceae).

#### **Conservation status**

*Timonius dumagat* has an EOO of 68.1 km<sup>2</sup> (after exclusion of unsuitable habitat) suggesting a conservation status of 'Critically Endangered'. However, the estimated AOO is 12 km<sup>2</sup> which fits the threshold for the category 'Endangered'. The species is known from three locations that are situated within the protected Northern Sierra Madre Natural Park (NSMNP). Satellite imagery indicates that the forest in Aubarede Peninsula remains intact, while the lowland vegetation in the two known locations in Palanan exhibit a decline in quality. Land conversion, logging and charcoal-making will remain as threats to *T. dumagat*. Given these conditions, *T. dumagat* is provisionally assessed as 'Endangered' EN B2ab(ii,iii,iv).

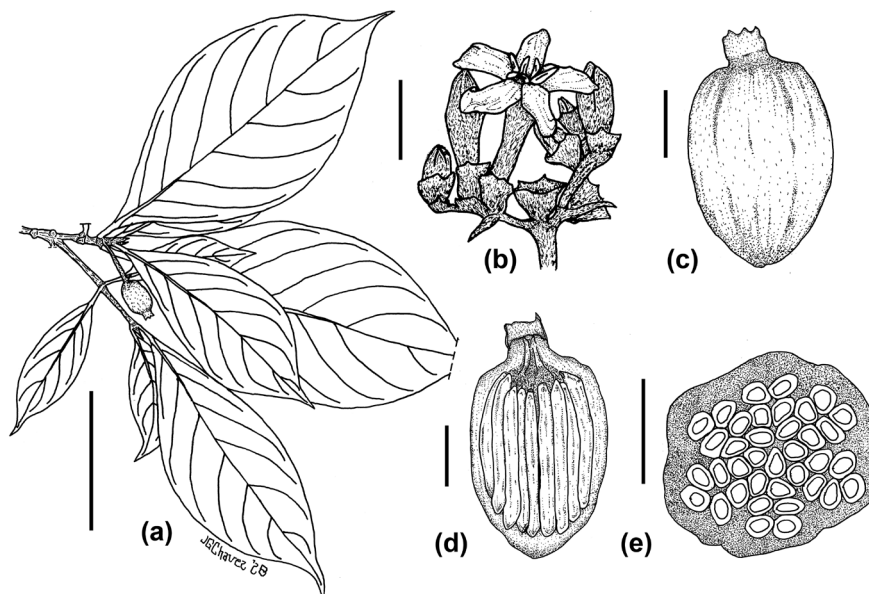


Figure 3. *Timonius pseudoarboreus* sp. nov. (a) fruiting pistillate branch, (b) staminate inflorescence with open flower, (c) fruit, (d) longitudinal section of fruit showing pyrenes, (e) transverse section of fruit showing pyrene arrangement. Scale bars: a = 5 cm, b–e = 5 mm. Based on (a) Romero, Garcia and Majaducon PPI 15415, (b) F. Gaerlan and E. Romero PPI 23645, (c–d) Barbon, Romero and Fuentes PPI 13053, (e) Barbon, Garcia and Fernando PPI 12243.

#### Notes

*Timonius dumagat* exhibits a high degree of variation in its foliage morphology (Fig. 2b–d). Leaf polymorphy is not uncommon in Philippine *Timonius* and is often observed in species growing on ultramafic soil (e.g. *T. gammillii* Elmer, *T. lanceolatus*, *T. pulgarensis* Elmer, *T. valetonii* Elmer). The disk of *T. dumagat* elongates during fruit development, resulting to the long calyx crown of the fruit (Fig. 2f–g). The fruits of *T. dumagat* were also reported to be red when ripe (L. Co 3569), which suggests bird-facilitated seed dispersal.

#### Additional specimens examined (paratypes)

The Philippines, Luzon Island. Isabela. Palanan: Diguyo, 2 m a.s.l., 22 Apr 1991, ♀, C.E. Ridsdale, V. Dejan and N. Baquiran ISU 121 (CAHUP, L 2 sheets); Digallorin, Divinisa Camp Site, 50 m a.s.l., 08 Apr 1992, ♀, C.E. Ridsdale, N. Baquiran et al. ISU 416 (CAHUP, L, PNH).

#### *Timonius pseudoarboreus* J.G.Chavez, sp. nov. (Fig. 3)

A species differing from *T. arboreus* by having 8- to 14-flowered staminate inflorescences (versus 3- to 7-flowered), and ellipsoid to obovoid fruits that are moderately strigose (versus globose to oblate, glabrous fruits).

**Type:** The Philippines, Polillo Island: Barangay Amot, Sitio Igad, Burdeos Watershed area, 02 Aug 1995, ♀, Romero, Garcia and Majaducon PPI 15415 (holotype: L 0541981; isotypes: BRIT 42618, GH).

#### Etymology

The epithet *pseudoarboreus* is given to this species due to its close resemblance to *T. arboreus*.

#### Description

Tree up to 12 m tall and 10–12 cm dbh. *Branchlets* 1.65–3.2 mm wide toward apex, densely strigose becoming moderately to sparsely strigose or glabrous when mature, with trichomes 0.08–0.50 mm long. *Stipules* valvate, triangular, 2.1–5.0 × 1.5–2.6 mm, slightly two-ridged, with ridges converging toward the apex, their outer surface densely strigose, rarely moderately strigose, with trichomes 0.13–0.63 mm long, their inner surface densely strigose, with trichomes 0.5–1.5 mm long. *Colleters* present on inner surface of stipules, bracts and bracteoles of staminate inflorescences, bracts subtending the fruit and sinus between calyx teeth of staminate flowers. *Leaves* opposite; petioles 3.9–11.0 × 0.8–1.75 mm, densely to moderately strigose, with trichomes 0.08–0.63 mm long; lamina elliptic to oblanceolate or obovate, 5.0–14.5 × 1.8–8.5 cm, chartaceous, their upper surface glabrous but lower surface moderately strigose, occasionally becoming densely strigose along the midrib and secondary nerves, with trichomes 0.13–0.75 mm long, acuminate to caudate at apex, attenuate to cuneate at base, rarely obtuse; secondary nerves 5–7 pairs; domatia present as tuft of trichomes, trichomatous pocket or intermediate between ciliate-pit- and crypt-type in axils of secondary nerves. *Staminate inflorescences* 8- to 14-flowered; peduncles 15.5–23.8 × 1.0–1.1 mm, densely to moderately strigose, with trichomes 0.08–0.63 mm long; bracts and bracteoles triangular to lanceolate, 0.5–3.9 × 0.4–0.5 mm, their outer surface densely to moderately strigose, with trichomes 0.13–0.63 mm long, their inner surface densely strigose, with trichomes 0.38–0.63 mm long; calyx cupuliform, occasionally ruptured at the apex by the expanding corolla, 5-toothed, its outer surface densely strigose becoming moderately strigose towards

apex, with trichomes 0.08–0.63 mm long, its inner surface densely strigose becoming moderately to sparsely strigose towards apex, with trichomes 0.18–0.63 mm long; calyx tube 2.5–3.6 × 2.5–3.2 mm; calyx teeth triangular, 0.1–0.4 × 0.1–0.5 mm; corolla infundibular, white, 5-lobed; corolla tube ca 9.5 × 2.2 mm, its outer surface densely strigose, with trichomes 0.4–0.63 mm long, its inner surface not seen; corolla lobes lanceolate, 3.6–4.0 × 1.6–1.8 mm, their upper surface glabrous but lower surface densely strigose, with trichomes 0.13–0.63 mm long. Stamens 5. Pistillodia bifid, densely strigose becoming glabrous towards the apex, with trichomes 0.18–0.43 mm long. *Pistillate inflorescences* not seen. *Fruits* ellipsoid to obovoid, 11.25–13.75 × 7.8–10.9 mm, 6-costate, not tuberculate, moderately strigose, with trichomes 0.05–0.25 mm long, with persistent calyx 1.4–3.3 mm long; schizogenous cavity absent; pyrenes ca 37 visible in transverse section of the fruit, arranged in ca 6 double radiating files, ca 9 visible in longitudinal section of the fruit, oriented subvertically, cylindrical to subfalcooid, 9.2–11.4 × 0.75–1.5 mm.

#### **Distribution and ecology**

*Timonius pseudoarboreus* is currently known to occur on the island of Luzon and nearby Polillo Island, where it usually grows along streams in lowland disturbed secondary forests.

#### **Conservation status**

The EOO of *T. pseudoarboreus* is 22 775.8 km<sup>2</sup> (after exclusion of unsuitable habitat) which is beyond the threshold for any threat category. Nonetheless, the AOO (32 km<sup>2</sup>) of the species fits in the category 'Endangered'. There are eight inferred locations which did not satisfy the subcriterion for the number of locations. Three of the known locations are situated within three protected areas (i.e. northern Sierra Madre Natural Park, NSMNP; Quezon Protected Landscape, QPL; Unnamed Natural Park, Presidential Proclamation no. 1636 s. 1977). However, many of the remaining forests in the islands of Luzon and Polillo are being degraded for urbanization and agricultural use. With this information, *T. pseudoarboreus* is assessed with a provisional conservation status of 'Vulnerable' VU B2ab(ii,iii,iv,v).

#### **Notes**

*Timonius pseudoarboreus* may be easily confused with *T. arboreus* in the absence of reproductive structures. Its differentiating characters occur in the staminate inflorescences, and fruits, which are too constant to be treated as isolated deviations of *T. arboreus*. For this reason, *T. pseudoarboreus* deserves recognition as a distinct species.

#### **Additional specimens examined (paratypes)**

The Philippines. Luzon Island. Cagayan. Santa Praxedes: Barangay San Juan, 520 m a.s.l., 11 Aug 1995, ♀, Garcia, Fuentes and Romero PPI 18495 (BRIT, L). Isabela. San Mariano: Barangay San Jose, Sitio Agal, 200 m a.s.l., 05 Jul 1994, ♀, Barbon, Romero and Fuentes PPI 13053 (BRIT, L). Laguna: Dahican River, Sep 1912, ♀, M. Ramos Phil. Pl. 1290; s.loc., Jun–Aug 1915, ♀, R.C. McGregor sub

B.S. 22943 (US). Quezon. Alabat: Villa Norte to Barangay Bacung, Sitio Canumay, 84 m a.s.l., 22 Mar 1996, ♂, F. Gaerlan and E. Romero PPI 23614 (BRIT, L); Pagbilao: Malikboy, Quezon National Park, 200 m a.s.l., 24 Mar 1996, ♂, F. Gaerlan and E. Romero PPI 23645 (BRIT, L); Real: Barangay Kawayan, Real Watershed area, 02 Sep 1995, ♀, Romero, Garcia and Majaducon PPI 15679 (L); Barangay Kawayan, Real Watershed area, 02 Sep 1995, ♀, Romero, Garcia and Majaducon PPI 15685 (BRIT, L); Tagkawayan: Barangay Bagong Silang II, 08 Sep 1993, ♀, Barbon, Garcia and Fernando PPI 12177 (BISH, BRIT, L); 12 Sep 1993, ♀, Barbon, Garcia and Fernando PPI 12243 (A, BRIT, L).

#### ***Timonius ridsdalei* J.G.Chavez, sp. nov. (Fig. 4)**

A species differing from *T. palawanensis* Elmer by having coriaceous leaves (versus chartaceous), staminate flowers with corolla tubes 9.8–10.7 × 1.6–2.0 mm (versus 6.0–9.0 × 2.0–3.0 mm), and 4.75–5.1 mm long anthers (versus 2.0–3.0 mm long).

**Type:** The Philippines, Luzon Island. Isabela. Palanan: Diguayo, 50 m a.s.l., 22 Apr 1991, ♂, C.E. Ridsdale, V. Dejan and N. Baquiran ISU 108 (holotype: L 2964996; isotypes: A, CAHUP, L 2970012, 2970013).

#### **Etymology**

The species is dedicated to the late Dr. Colin Ernest Ridsdale (1944–2017) of the Naturalis Biodiversity Center Leiden, who collected the type material, as well as for his innumerable contributions that helped to provide a better understanding of the Philippines' botanical diversity.

#### **Description**

Tree up to 20 m tall and 5–30 cm dbh. *Branchlets* 1.4–3.2 mm wide toward apex, moderately strigose becoming sparsely strigose or glabrous when mature, with trichomes 0.13–0.50 mm long. *Stipules* valvate, triangular to lanceolate, 7.4–10.7 × 3.5–4.6 mm, two-ridged, with ridges converging toward apex, their outer surface densely strigose, with trichomes 0.25–0.75 mm long, their inner surface densely strigose, with trichomes 0.75–1.75 mm long. *Colleters* present on inner surface of stipules, bracts and bracteoles. *Leaves* ternate, rarely opposite, subsessile to shortly petiolate; petioles 1.1–4.2 × 1.3–3.8 mm, moderately strigose, with trichomes 0.13–0.4 mm long; lamina elliptic to obovate, 8.5–16.75 × 2.75–8.25 cm, coriaceous, its upper surface glabrous to sparsely strigose, with trichomes 0.25–0.38 mm long, its lower surface moderately strigose, with trichomes 0.13–0.85 mm long, acute to shortly acuminate at apex, obtuse to rounded at base; secondary nerves 6–9 pairs; domatia present as trichomatous pocket or intermediate between ciliate pit- and crypt-type in axils of secondary nerves. *Staminate inflorescences* 3- to 7-flowered; peduncles 8.8–38.0 × 0.75–1.2 mm, moderately strigose, with trichomes 0.08–0.5 mm long; bracts and bracteoles triangular, 1.4–2.75 × 0.6–1.15 mm, their outer surface densely strigose, with trichomes 0.13–0.5 mm long, their inner

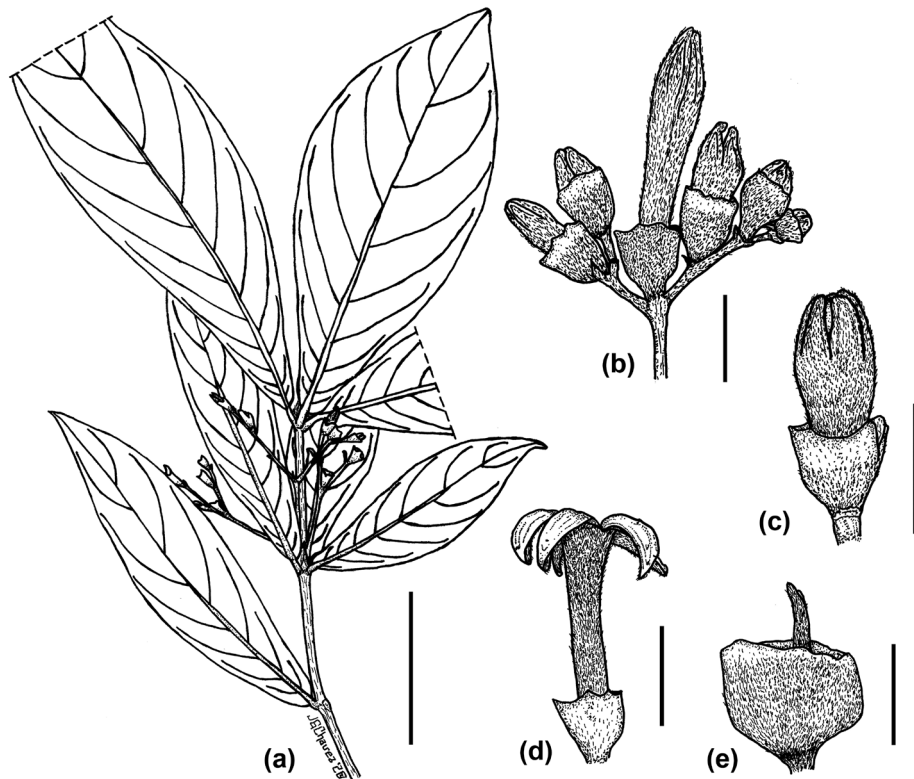


Figure 4. *Timonius ridsdalei* sp. nov. (a) flowering staminate branch, (b) staminate inflorescence in bud, (c) staminate flower bud stage, (d) staminate flower, (e) calyx with pistillodium. Scale bars: a = 5 cm, b–d = 5 mm, e = 2 mm. Based on (a) C.E. Ridsdale, V. Dejan and N. Baquiran ISU 261, (b–e) C.E. Ridsdale, V. Dejan and N. Baquiran ISU 108.

surface densely strigose, with trichomes 0.25–0.5 mm long; calyx cupuliform, ruptured at apex by the expanding corolla, 5-toothed to undulate or truncate, its outer surface moderately strigose, with trichomes 0.08–0.63 mm long, its inner surface densely strigose, with trichomes 0.13–0.63 mm long; calyx tube 2.5–5.4 × 2.9–3.6 mm; calyx teeth triangular, 0.08–0.25 × 0.13–0.5 mm; corolla infundibular, white to reddish, 5-lobed; corolla tube 9.8–10.7 × 1.6–2.0 mm, its outer surface densely strigose, with trichomes 0.08–0.75 mm long, its inner surface glabrous; corolla lobes lanceolate, 3.75–6.1 × 0.9–1.7 mm, their upper surface glabrous, their lower surface densely strigose, with trichomes 0.25–0.75 mm long. Stamens 5; anthers elliptic, 4.75–5.1 × 0.50–0.60 mm, with sagittate base, their abaxial surface densely strigose, with trichomes 0.25–0.38 mm long; filament glabrous. Pistillodia simple or bifid, if divided, with equal lobes, densely strigose, with trichomes 0.13–0.25 mm long. *Pistillate inflorescences* not seen. *Fruits* not seen.

#### Distribution and ecology

*Timonius ridsdalei* is probably restricted to Palanan in the Province of Isabela, where it occurs in low stature forests on ultramafic substrates.

#### Conservation status

The EOO of *T. ridsdalei* cannot be calculated, while its AOO (4 km<sup>2</sup>) falls into the ‘Critically Endangered’ category. On

the other hand, the species is known from two locations in Palanan which did not satisfy the associated threshold for sub-criterion ‘a’ (number of locations) in that threat category. The entire range of Palanan is covered by the protected Northern Sierra Madre Natural Park (NSMNP), but the municipality is recognized as a hotspot for illegal extraction of timber (van der Ploeg et al. 2011). Land-use change especially in one of the two known locations (Diguyo; see van der Ploeg et al. 2016) is also perceived as a threat to *T. ridsdalei*. Taking into account this information, *T. ridsdalei* is assigned a preliminary conservation status of ‘Endangered’ EN B2ab(ii,iii,iv).

#### Notes

The description of *T. ridsdalei* presented here is based on staminate individuals and needs to be amended upon discovery of pistillate plants. Among Philippine species of *Timonius* that exhibit predominantly ternate phyllotaxy (i.e. *T. palawanensis* and *T. ternifolius* (Bartl. ex DC.) Fern.-Vill.), *T. ridsdalei* is more closely related to *T. palawanensis*. Both species exhibit similar leaf shape and dimensions, while differential characters are the leaf texture and the length of the corolla tube and anthers. It is also important to note that the peduncle length of the staminate inflorescences varies. This variation is not atypical, since it has also been observed in *T. noli-tangere* J.G.Chavez, Alejandro and Meve, *T. spes-vitarum* J.G.Chavez and some Philippine populations of *T. finlaysonianus* (Wall. ex G.Don) Hook.f.

#### **Additional specimens examined (paratypes)**

The Philippines, Luzon Island. Isabela. Palanan: Diguyo, 50 m a.s.l., 25 Apr 1991, ♂, C.E. Ridsdale, V. Dejan and N. Baquiran ISU 261 (L 3 sheets); Digallorin Divinisa Camp Site, 05 Apr 1992, ♂, C.E. Ridsdale, N. Baquiran et al. ISU 354 (CAHUP, L 2 sheets, TAIF 2 sheets); Digallorin, Apr 1992, ♂, C.E. Ridsdale, N. Baquiran et al. s.n. (L 2 sheets).

#### ***Timonius spes-vitarum* J.G.Chavez, sp. nov. (Fig. 5)**

A species differing from *T. gammillii* Elmer by its imbricate stipules with glabrous outer surface (versus valvate, densely strigose), glabrous leaves (versus moderately strigose on the lower surface) and lobed calyces that are 0.95–5.0 mm long in staminate flowers and 1.40–8.0 mm long in pistillate flowers (versus toothed calyces, <1.0 mm long in both staminate and pistillate flowers).

**Type:** The Philippines, Palawan Island. Narra: Victoria Peaks, Trident Mining Company concession area, along access track, 300–450 m a.s.l., 22 May 1984, ♂, C.E. Ridsdale SMHI 1813 (holotype: PNH; isotypes: CAHUP, L 2964361, 2964362, 2964363).

#### **Etymology**

The specific epithet is composed of two Latin words, *spes* (= hope) and *vitarum* (= life), to signify hope for the protection and conservation of biodiversity on the island of Palawan, which is considered as the Philippines' last ecological frontier.

#### **Description**

Shrubs to trees up to 10 m tall and 10–25 cm dbh. *Branchlets* 1.6–5.0 mm wide toward apex, densely to moderately strigose becoming sparsely strigose or glabrous when mature, with trichomes 0.05–0.13 mm long. *Stipules* imbricate, triangular to ovate, 5.0–12.0 × 2.55–8.50 mm, two-ridged, with ridges converging toward the apex, their outer surface glabrous, ciliate, their inner surface densely strigose becoming glabrous towards the margin and apex, with trichomes 0.25–1.75 mm long. *Colleters* present on inner surface of stipules, bracts and bracteoles, and sinus between calyx lobes. *Leaves* opposite; petioles 2.8–16.4 × 1.1–4.0 mm, glabrous; lamina elliptic to obovate, rarely orbicular, 4.5–17.0 × 1.5–8.5 cm, chartaceous to coriaceous, its upper surface glabrous, its lower surface glabrous, acute to acuminate at apex, attenuate to cuneate at base; secondary nerves 3–6 pairs; domatia rarely present as tuft of trichomes in axils of secondary nerves. *Staminate inflorescences* 5- to 24-flowered; peduncles 2.30–25.75 × 1.05–1.80 mm, densely to moderately strigose, with trichomes 0.08–0.38 mm long; bracts and bracteoles triangular to lanceolate, 0.5–4.0 × 0.3–1.2 mm, their outer surface densely to sparsely strigose, occasionally becoming glabrous, with trichomes 0.05–0.75 mm long, their inner surface densely to moderately strigose, occasionally becoming glabrous, with trichomes 0.13–0.75 mm long; calyx cupuliform, not ruptured at the apex by the expanding corolla, 4-lobed, its outer surface densely to moderately strigose on the tube, and moderately to sparsely strigose on the lobes, with trichomes 0.1–0.5 mm long, its inner surface densely

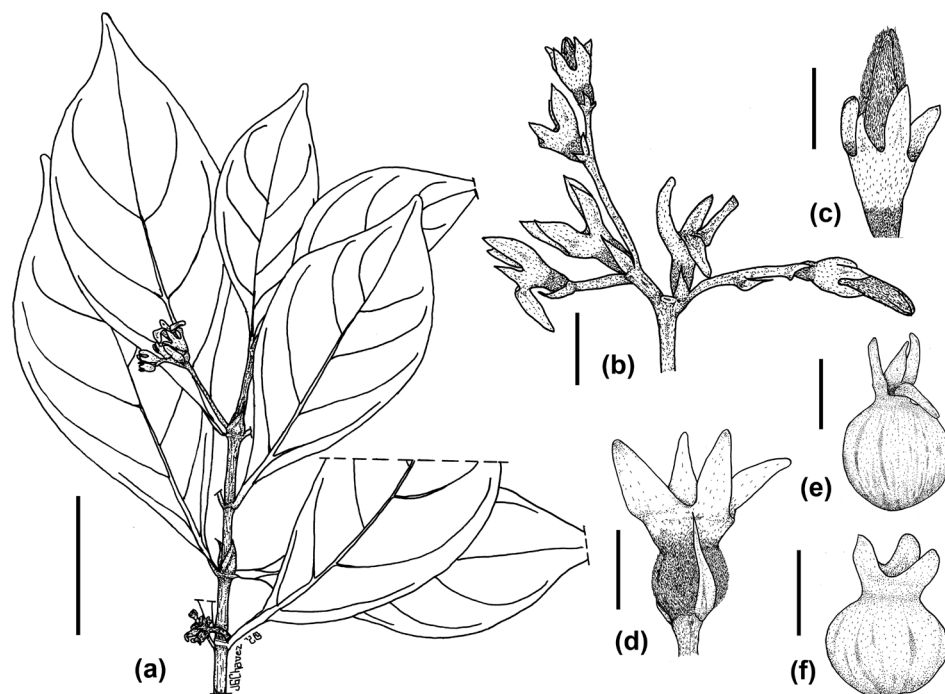


Figure 5. *Timonius spes-vitarum* sp. nov. (a) flowering staminate branch, (b) staminate inflorescence (corollas mostly fallen), (c) staminate flower in bud stage, (d) bracts, calyx and hypanthium of pistillate flower, e–f) fruit. Scale bars: a = 3 cm, b, e–f = 5 mm, c–d = 3 mm. Based on (a) D.D. Soejarto and D.A. Madulid 9011, (b–c) A.L. Claustro and R.S. Madulid PCM 182, (d) D.D. Soejarto, F. Gaerlan, E. Sagcal and O. Fernando 8403, (e) J.R. Velasco 9894, (f) C.E. Ridsdale SMHI 1814.



strigose on the tube, and densely to moderately strigose on the lobes becoming sparsely strigose or glabrous towards the apex and margin, with trichomes 0.08–1.0 mm long; calyx tube 1.5–3.1 × 1.5–2.6 mm; calyx lobes lanceolate to elliptic, 0.95–5.0 × 0.5–2.2 mm; corolla infundibular, white to yellow, 4-lobed; corolla tube 3.25–4.75 × 0.75–1.35 mm, its outer surface densely strigose, with trichomes 0.13–0.40 mm long, its inner surface not seen; corolla lobes lanceolate, 1.70–2.75 × 0.95–1.25 mm, their upper surface glabrous, their lower surface densely strigose, with trichomes 0.08–0.5 mm long. Stamens 4; pistillodia not seen. *Pistillate inflorescences* 1-flowered, rarely 3-flowered; peduncles 12.3–48.5 × 1.1–1.75 mm, densely to moderately strigose, with trichomes 0.08–0.15 mm long; bracts lanceolate to ovate, 2.5–7.0 × 1.0–2.0 mm, sparsely strigose, with trichomes 0.08–0.18 mm long, their inner surface densely strigose, with trichomes 0.25–0.63 mm long; calyx cupuliform, not ruptured by the expanding corolla, 4-lobed, its outer surface moderately strigose on the tube and sparsely strigose or glabrous on the lobes, with trichomes 0.08–0.25 mm long, its inner surface densely strigose on the tube and moderately strigose or glabrous on the lobes, if moderately strigose becoming sparsely strigose or glabrous towards apex and margin, with trichomes 0.05–0.75 mm long; calyx tube 1.3–2.0 × 2.5–3.0 mm; calyx lobes lanceolate to elliptic, 1.40–8.0 × 0.95–3.0 mm; corolla not seen; hypanthium globose 2.4–5.5 × 2.5–5.5 mm, densely strigose, with trichomes 0.08–0.18 mm long. Staminodia and style not seen. *Fruits* globose to ellipsoid, 4.5–7.5 × 7.0–7.5 mm, shallowly 5-cositate, not tuberculate, densely to moderately strigose, with trichomes 0.05–0.18 mm long, with persistent calyx 1.5–4.7 mm long; schizogenous cavity not seen; pyrenes not seen.

#### **Distribution and ecology**

This species is endemic to the island of Palawan, where it occurs in disturbed forests on ultramafic substrates at low to mid altitude.

#### **Conservation status**

*Timonius spes-vitarum* has an EOO of 4797.8 km<sup>2</sup> (after exclusion of unsuitable habitat) and an AOO of 48 km<sup>2</sup>, both are within the 'Endangered' category. However, specimen records indicate that *T. spes-vitarum* occurs in nine locations, two of which were affected by ceased mining activities. Intensive efforts to preserve the remaining forests of Palawan are being implemented, but it has been recently recognized as the highest among terrestrial protected areas in the Philippines when it comes to forest loss (Apan et al. 2017). Logging and rapid urbanization increase the pressure on Palawan's natural environment. Furthermore, climate change has been predicted to trigger extreme male-sex biased ratio in populations of dioecious plants (Hultine et al. 2016), which may lead to the reduction of mature individuals of *T. spes-vitarum* in the future. Considering the above-mentioned facts, *T. spes-vitarum* is provisional assessed as 'Vulnerable' VU B1+2ab(i,ii,iii,iv,v).

#### **Notes**

Although herbarium material of *T. spes-vitarum* bear only residual floral structures, its identification is unequivocal. It is the only species of Philippine *Timonius* to date that has a profoundly lobed calyx, while others are toothed to rarely truncate or undulate. Furthermore, the majority of the historical collections of *T. spes-vitarum* are staminate individuals suggesting that this species may have male-biased sex ratios in the wild. This phenomenon has also been observed in certain populations of an undescribed *Timonius* from the province of Aurora on the island of Luzon (digital image DOL: 81116; URL: <<http://phyto-images.siu.edu>>).

A flowering staminate specimen collected from the forest along the Karaniogan River in Aborlan (M.D. Sulit 3794, also numbered M.D. Sulit Phil. Nat. Herb. 12354) highly resembles *T. spes-vitarum*. The specimen only differs by its 5-lobed corolla and indument cover on the inner surface of calyx lobes which is densely strigose throughout. We hypothesize that this may represent a new variety, but the limited available materials deter its description.

#### **Additional specimens examined (paratypes)**

The Philippines. Palawan Island. Bataraza: Barangay Sumbiling, Sitio Ganayon, 01 Aug 1988, ♂, D.D. Soejarto and D.A. Madulid 9011 (L); Barangay Rio Tuba, Belanjao Range, Gamayon settlement on Rio Tuba-Sumbiling road, 100–200 m a.s.l., 19 Jun 1994, ♀, D.D. Soejarto, F. Gaerlan, E. Sagcal and O. Fernando 8403 (L). Narra: Victoria Peaks, Trident Mining Company concession area, 490–590 m a.s.l., 19 May 1984, ♂, C.E. Ridsdale SMHI 1753 (CAHUP, L 3 sheets, PNH); Victoria Peaks, Trident Mining Company concession area, along access track, 300–450 m a.s.l., 22 May 1984, ♀, C.E. Ridsdale SMHI 1814 (L 2 sheets); Victoria Mountain Range, vicinity of Trident Mine, 50 m a.s.l., 24 Jul 1988, ♀, D.D. Soejarto and D.A. Madulid 6171 (A, L); Barangay Calatigas, Dampsite village, logging trail from village to Calatigas Range, 30–200 m a.s.l., 04 Jul 1994, ♂, D.D. Soejarto, D.A. Madulid, F. Gaerlan, E. Sagcal and O. Fernando 8722 (L). Puerto Princesa: Bacungan, along road, 17 May 1954, ♀, J.R. Velasco 9894 (CAHUP); Bacungan, along road, 17 May 1954, ♂, J.R. Velasco 9895 (CAHUP); Bacungan, along road km 20, 18 May 1954, sterile, J.R. Velasco 10302 (CAHUP); *s.loc.*, 22 Mar 1957, ♂, Y. Kondo and G. Edaño Phil. Nat. Herb. 36555 (L, PNH); Santa Cruz rest house, road km 20 north of Puerto Princesa, 40 m a.s.l., 10 May 1984, ♂, A.C. Podzorski SMHI 2070 (L); along road km 36 to Roxas, 10 m a.s.l., 12 May 1984, ♂, J. Dransfield SMHI 1249 (L 2 sheets, PNH); Nagtabon Hills, above beach, 10–50 m a.s.l., 01 Aug 1988, ♂, D.D. Soejarto and E. Reynoso 6298 (L); Olympic Mines, near Bivouac Point, 26 Jan 1991, ♂, B.C. Stone et al. PPI 185 (BRIT, L); Tagburos, 28 Jan 1991, ♂, B.C. Stone, E.M. Romero and F. Gaerlan PPI 256 (BRIT, L); Bacungan, Oct 1991, ♂, A.L. Claustro and R.S. Madulid PCM182 (USTH).

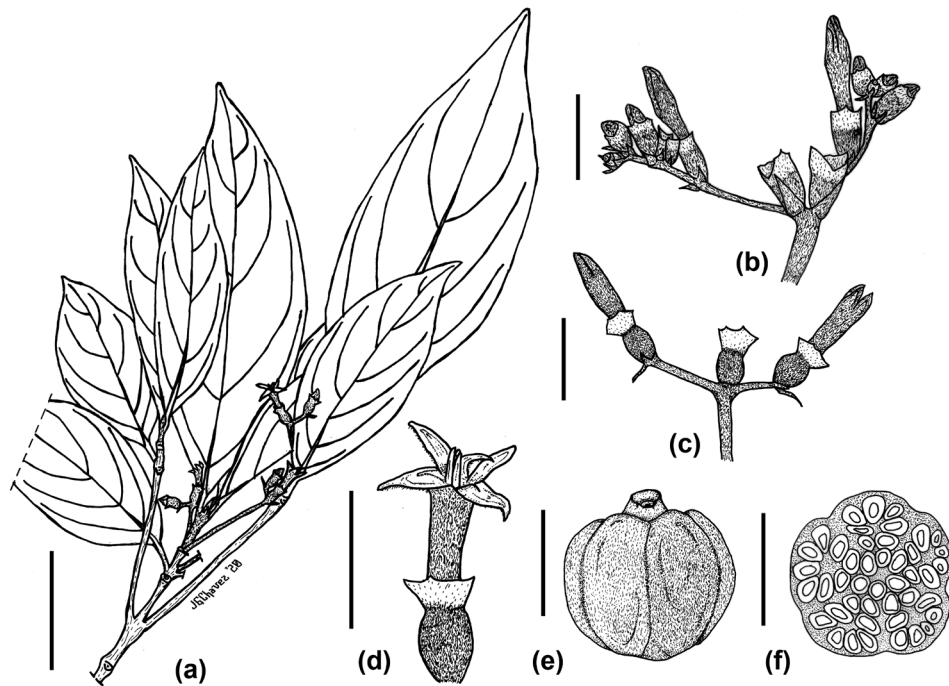


Figure 6. *Timonius stevendarwinii* sp. nov. (a) flowering pistillate branch, (b) male inflorescence, (c) pistillate inflorescence, (d) pistillate flower, (e) fruit, (f) transverse section of fruit showing pyrene arrangement. Scale bars: a = 2.5 cm, b–f = 5 mm. Based on (a, c–d) D.D. Soejarto, F. Gaerlan, E. Sagcal and O. Fernando 8360, (b) B.C. Stone, D. Madulid et al. PPI 32, (e) Pipoly, Romero et al. PPI 38130, (f) A.C. Podzorski SMHI 568.

***Timonius stevendarwinii* J.G.Chavez, sp. nov. (Fig. 6)**

A species differing from *T. abanii* Jun H.Chen by its valvate stipules (versus imbricate), pistillate flowers with 5-lobed corollas (versus 6- to 7-lobed corollas), and densely strigose fruits (versus subglabrous to sparsely pubescent fruits).

**Type:** The Philippines, Palawan Island. Brooke’s Point: Barangay Malis, Magagong settlement at the southern reaches of Mantalingajan Range, 600–700 m a.s.l., 16 Jun 1994, ♀, D.D. Soejarto, F. Gaerlan, E. Sagcal and O. Fernando 8360 (holotype: A; isotype: L 2957175).

**Etymology**

This species is named after Dr. Steven P. Darwin, Professor Emeritus at Tulane University (New Orleans, Louisiana), for his remarkable efforts in advancing the knowledge on the systematics of *Timonius*.

**Description**

Shrub to tree up to 15 m tall and 5–40 cm dbh. *Branchlets* 0.9–2.7 mm wide toward apex, densely to moderately strigose becoming sparsely strigose or glabrous when mature, with trichomes 0.08–0.50 mm long. *Stipules* valvate, triangular, 5.0–8.4 × 2.8–3.2 mm, two-ridged, with ridges converging toward apex, their outer surface densely strigose, with trichomes 0.08–0.75 mm long, their inner surface densely strigose, with trichomes 0.50–1.13 mm long. *Colleters* present on inner surface of stipules, bracts and bracteoles of both staminate

and pistillate inflorescences, and sinus between calyx teeth of pistillate flowers. *Leaves* opposite; petioles 2.4–11.75 × 0.9–2.4 mm, densely to moderately strigose, with trichomes 0.08–0.75 mm long; lamina elliptic, 4.5–14.0 × 1.3–6.9 cm, rarely obtuse, chartaceous, their upper surface moderately strigose becoming glabrous, with trichomes 0.25–1.0 mm long, their lower surface moderately strigose, with trichomes 0.13–0.50 mm long, while those along the midrib are 0.25–1.25 mm long, attenuate to acuminate at apex, attenuate to cuneate at base; secondary nerves 4–6 pairs; domatia present as tuft of trichomes or ciliate pit in axils of secondary nerves. *Staminate inflorescences* 5- to 29-flowered, seen in buds only; peduncles 7.65–32.25 × 0.6–1.0 mm, densely to moderately strigose from trichomes 0.13–0.75 mm long; bracts and bracteoles triangular to lanceolate, 0.75–2.90 × 0.25–1.25 mm, their outer surface densely strigose, with trichomes 0.13–0.4 mm long, their inner surface densely strigose, with trichomes 0.25–0.50 mm long; calyx cupuliform, occasionally ruptured at the apex by the expanding corolla, 4-toothed, its outer surface densely strigose becoming moderately strigose towards the apex, with trichomes 0.08–0.50 mm long, its inner surface densely strigose, with trichomes 0.13–0.50 mm long; calyx tube 1.75–3.0 × 1.25–1.5 mm; calyx teeth triangular, 0.1–0.3 × 0.2–0.5 mm; corolla infundibular, white, 4-lobed, corolla tube outer surface densely strigose, with trichomes 0.25–0.75 mm long, its inner surface not seen; corolla lobes lanceolate, their upper surface glabrous, their lower surface densely strigose, with trichomes 0.38–0.75 mm long; stamens not seen; pistillodia simple, densely strigose,

with trichomes 0.18–0.25 mm long. *Pistillate inflorescences* 3-flowered; peduncles 3.0–27.5 × 0.5–1.3 mm, densely to moderately strigose, with trichomes 0.08–0.50 mm long; bracts and bracteoles triangular to lanceolate, 0.4–2.5 × 0.20–0.75 mm, their outer surface densely to moderately strigose, with trichomes 0.18–0.38 mm long, their inner surface densely strigose, with trichomes 0.25–0.50 mm long; calyx cupuliform, not ruptured by the expanding corolla, 4- to 5-toothed, its outer surface moderately strigose, with trichomes 0.08–0.38 mm long, its inner surface densely strigose, with trichomes 0.13–0.38 mm long; calyx tube 0.90–1.50 × 1.50–2.25 mm; calyx teeth triangular to lanceolate, 0.10–1.75 × 0.1–0.6 mm; corolla infundibular, white, 5-lobed; corolla tube 3.50–4.65 × 1.5–1.8 mm, its outer surface densely strigose, with trichomes 0.13–0.63 mm long, its inner surface glabrous; corolla lobes lanceolate, 1.80–3.24 × 0.95–1.50 mm, its upper surface glabrous but lower surface densely strigose, with trichomes 0.13–0.50 mm long; staminodia 5, elliptic to lanceolate, 2.1–2.4 mm long, sagittate at base, with abaxial surface densely strigose, with trichomes 0.13–0.38 mm long; hypanthium globose to prolate, 2.0–2.5 × 1.7–2.9 mm, densely strigose, with trichomes 0.25–0.50 mm long. Style with 5 unequal stigmatic arms, densely strigose becoming glabrous towards the stigmatic arms, with trichomes 0.13–0.50 mm long. *Fruits* globose to sub-ellipsoid, 6.2–7.5 × 5.9–8.75 mm, 5- to 7-costate, not tuberculate, densely strigose, with trichomes 0.08–0.50 mm long, with persistent calyx 0.75–3.90 mm long; schizogenous cavity absent; pyrenes ca 44 visible in transverse section of the fruit, arranged in 5 or probably up to 7 double radiating files, ca 10 visible in longitudinal section of the fruit, oriented subvertically, cylindrical to falcoid, 4.0–5.6 × 1.0–1.6 mm.

#### **Distribution and ecology**

*Timonius stevendarwinii* is known to occur on the island of Palawan, where it grows in slopes of low to mid-elevation forests.

#### **Conservation status**

*Timonius stevendarwinii* has an EOO of 3673.1 km<sup>2</sup> (after exclusion unsuitable habitat) and an AOO of 40 km<sup>2</sup>, all are within the 'Endangered' category. On the other hand, the associated threshold for subcriterion 'a' (number of locations) was not met. Based on herbarium records, *Timonius stevendarwinii* is known from seven locations in the island of Palawan. Exploitation of forest resources and infrastructure development especially in the lowland areas of Palawan are seen as threats to *T. stevendarwinii*. Because of this information, *T. stevendarwinii* is provisionally assessed as 'Vulnerable' VU B1+2ab(i,ii,iii,iv).

#### **Notes**

*Timonius stevendarwinii* is phenotypically more closely related to the Bornean *T. abanii* than any other species of *Timonius* in the Philippines. The main differences between the two are in the stipular aestivation, the number of corolla

lobes in pistillate flowers, and the indumentum of the fruits. On the other hand, *T. stevendarwinii* is very distinct and can be easily distinguished from all other Palawan *Timonius* by its 3-flowered pistillate inflorescences.

#### **Additional specimens examined (paratypes)**

The Philippines, Palawan Island. Aborlan: Barangay Apis, 18 Feb 1992, ♀, M.A.O. Cajano and B.F. Hernaez 1538 (CAHUP). Narra: Trident Mining concession area, Apr 1987, ♀, R.S. Madulid et al. 054 (USTH). Puerto Princesa: Mt. Beaufort, north-northwest spur, east side, 550 m a.s.l., 14 Mar 1984, ♀, A.C. Podzorski SMHI 537 (L, PNH); Mt Beaufort, north spur, west side, 370 m a.s.l., 19 Mar 1984, ♂, A.C. Podzorski SMHI 568 (L); Irawan River Valley head, north side, ± 170 m a.s.l., 21 Mar 1984, ♀, C.E. Ridsdale SMHI 176 (L); Irawan River Valley, Mt Venture slopes, vicinity of Benguet Mining Compound, 400–500 m a.s.l., 4 Apr 1989, ♂, D.D. Soejarto, E. Reynoso, E. Sagcal and R. Rutz 6392 (L, US); Irawan River Valley, Tatanarom, vicinity of Benguet Mine, 500 m a.s.l., 4 Apr 1989, ♀, D.D. Soejarto, E. Reynoso, E. Sagcal and R. Rutz 6396 (U); Irawan River Valley, north slope of Mt Beaufort, ca 3 km from Irawan River crossing at Tatanarom, 9°51', 118°38'E, 650 m a.s.l., 26 Mar 1990, ♀, D.D. Soejarto, E. Reynoso, E. Sagcal and R. Edrada 7092 (L); Irawan, Tatanarom, 20 Jan 1991, ♂, B.C. Stone, D. Madulid et al. PPI 32 (BISH, BRIT, L); on ridge above camp two towards Cleopatra's Needle, 590 m a.s.l., 19 Jan 1998, ♂, G.C.G. Argent, Q. Cronk, M. Mendum, D.J. Middleton, P. Wilkie, R. Fuentes and R.V. Chavez 25367 (L). Quezon: Sumindap River, Barangay Bundog, 225 m a.s.l., 21 Aug 1996, ♀, Pipoly, Romero et al. PPI 38130 (BRIT, GH, L). Rizal: Ransang, Kumaraka, 22 Jan 1994, ♀, Gaerlan, Romero and Sagcal PPI 13204 (BRIT, GH, L).

#### **Synonymies in Philippine *Timonius***

***Timonius finlaysonianus* (Wall. ex G.Don) Hook.f. (1880, p. 127) (Fig. 7)**

**Basionym:** *Guettarda finlaysoniana* Wall. ex G.Don. (1834, p. 552).

**Based on the same type:** *Timonius jambosella* Thwaites var. *finlaysoniana* (Wall. ex G.Don) King and Gamble (1904, p. 54).

**Type:** Singapore, s.loc., s.d., ♀, N. Wallich s.n. (holotype K 000950289-6823).

**Taxonomic synonym:** *Timonius compressicaulis* (Miq.) Boerl. (1891, p. 133).

**Basionym:** *Polyphragmon compressicaule* Miq. (1857, p. 235).

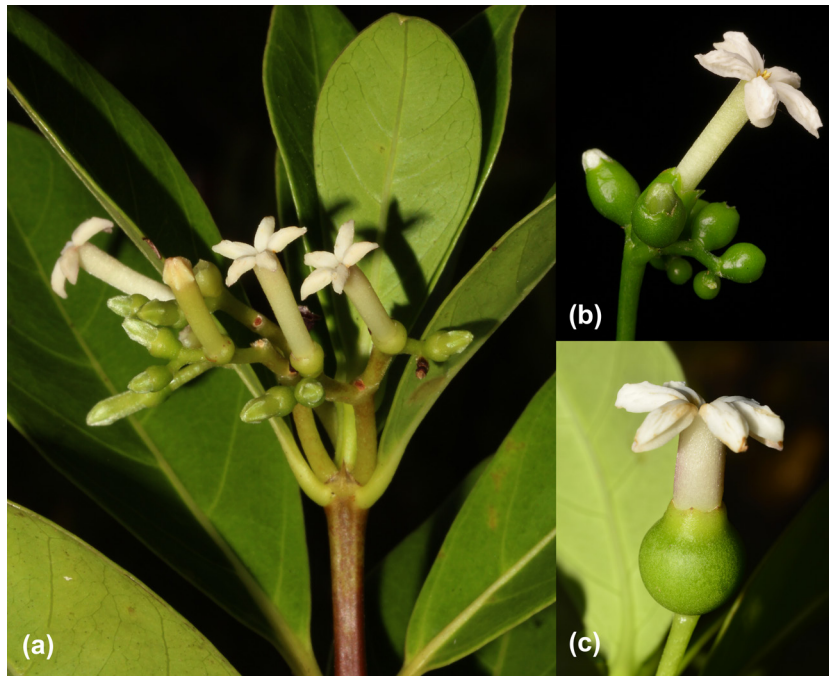


Figure 7. *Timonius finlaysonianus* (a) flowering staminate branch, (b) staminate flower, (c) pistillate flower. Based on (a, c) individuals from the type locality of *T. philippinensis*, no vouchers, (b) cultivated at University of Bayreuth, Lorenzo LL063, voucher in UBT.

**Type:** Indonesia, Sumatra. Ciboga, s.d., ♂, Teijsmann s.n. (lectotype K 000763579, first-step designated by Wong 1988, p. 514; isolectotype K 000763578, second-step designated by Wong et al. 2019, p. 312).

**Taxonomic synonym:** *Timonius philippinensis* Merr. (1903 p. 54), syn. nov.

**Type:** The Philippine, Dinagat Island. s.loc., ♂, G.P. Ahern 463 (lectotype HBG, HBG520960, designated here; isolectotypes K 000763547, NY 00133424, US 00138430).

*Timonius finlaysonianus* is a widespread species distributed in Java, Peninsular Malaysia, the Philippines, Singapore and Sumatra (Wong 1988, Wong et al. 2019). Its occurrence in the Philippines was first reported by Wong (1988) based on a staminate specimen of *T. philippinensis* from the island of Dinagat (M. Ramos and P. Convocar sub B.S. 84095). Merrill (1903) described *T. philippinensis* from two specimens collected in that same locality: Capt. G.P. Ahern 463 and 456. In the protologue (Merrill 1903, p. 54), *T. philippinensis* is distinguished from *T. compressicaulis* (then treated as distinct from *T. finlaysonianus*) by its thicker, purplish, glabrous and terete branchlets, glabrous calyx, and longer corolla. Our field and ex-situ observations, as well as examination of herbarium materials revealed that these characters are inconsistent and only reflect phenotypic variations associated with ecological conditions (e.g. soil type, canopy open or closed). Also, the floral and fruit traits of *T. philippinensis* fall within the range of *T. finlaysonianus*. Therefore, the distinctiveness of *T. philippinensis* claimed by Merrill (1903) cannot be supported and the species should be treated as a synonym.

***Timonius valetonii* Elmer (1911, p. 1012) (Fig. 8)**

**Type:** The Philippines, Sibuyan Island. Magallanes: Mt Guiting-Guiting, Apr 1910, ♀, A.D.E. Elmer 12342 (lectotype NY 00133428, designated here; isolectotypes A 00094669, GH 00094668, HBG 520958, K 000763538, L 0001478, U 0118385, US 00138438, Z 000023247).

**Taxonomic synonym:** *Timonius panayensis* Merr. (1920 publ. 1921, p. 317), syn. nov.

**Type:** The Philippines, Panay. Capiz: Libacao, May–Jun 1919, ♀, A. Martelino and G. Edaño sub B.S. 35445 (lectotype US 00138429, designated here; isolectotypes A 00312919, K 000763550, L 0006229).

Elmer (1911) based the description of *T. valetonii* on a fruiting specimen collected from Mt. Guiting–Guiting on the island of Sibuyan. In the protologue, Elmer (1911, p. 1013) mentioned two additional gatherings: A. D. E. Elmer 12292 and A. D. E. Elmer 12120. The former is a pistillate specimen which he associated with *T. arboreus*, but based on our examination, the specimen represents *T. gammillii*. A.D.E. Elmer 12120 is from a staminate plant of *T. valetonii*, from which the diagnosis of the species was derived. Later, Merrill (1920 publ. 1921) described *T. panayensis* based on specimens from Libacao on the island of Panay, a locality that is close to Sibuyan Island (ca 100 km). This species is distinguished by its variable leaf morphology, elongated staminate flowers and ellipsoid fruits that are crowned by a cylindric and elongated calyx (Merrill 1920 publ. 1921, p. 318). However, there are no significant morphological differences between *T. valetonii*

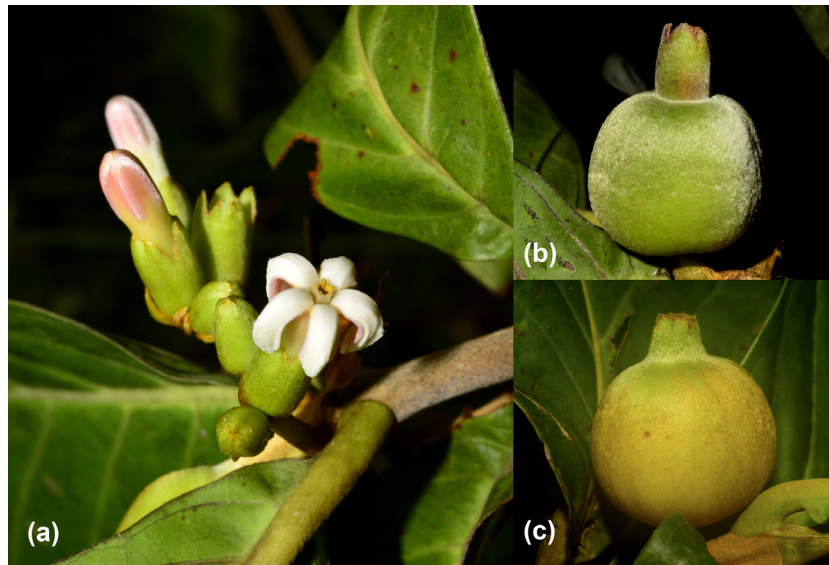


Figure 8. *Timonius valetonii* (a) flowering staminate branch, (b–c) fruits showing length variation of the persistent calyx. Based on (a) J.G. Chavez and C.I. Banag SB 055, (b–c) J.G. Chavez and C.I. Banag SB 052.

and *T. panayensis*. The features of the vegetative and staminate floral structures of *T. panayensis* are within the range of morphological variations of *T. valetonii*. Additionally, the description of fruit characteristics for both taxa provided by Elmer (1911) and Merrill (1920 publ. 1921) were based on materials at different stages of maturity. Field observations also show that the persistent calyx crown of the fruits of *T. valetonii* is elongated, but sometimes appears short and truncate (Fig. 8b–c) due to deterioration or damage caused by canopy soil or foraging insects. We therefore consider the two taxa as conspecific, and *T. valetonii* should be retained as the correct name based on priority of publication.

**New combination in *Ridsdalea* J.T. Pereira and K.M. Wong**

***Ridsdalea quadrasii* (Elmer) J.G.Chavez, Meve and Liede, comb. nov.**

**Basionym:** *Timonius quadrasii* Elmer (1906, p. 36).

**Based on the same type:** *Rothmannia quadrasii* (Elmer) J.G.Chavez, Liede and Meve (Chavez et al. 2017, p. 218).

**Type:** The Philippines, Mindanao Island. Zamboanga: Tetuan, May–June 1901, J.F. Quadras sub G.P. Ahern 245 (also numbered G.P. Ahern 545) (lectotype: US 00138432, designated by Chavez et al. (2017, p. 218)).

*Timonius quadrasii* Elmer is a singleton species that is endemic to the island of Mindanao (Merrill 1923). This hermaphroditic species shows 3:3 nodal pattern of leaves, left-contorted corolla lobes, pseudo-axillary inflorescences, bilocular ovaries and ovules with axile placentation, which prompted Chavez et al. (2017) to transfer it to *Rothmannia*

Thunb. of tribe Gardenieae without knowing of the newly described genus *Ridsdalea*. The genus *Ridsdalea* is treated as a segregate of the *Rothmannia* complex, and contains Asian species with left-contorted corolla aestivation (Wong and Pereira 2016, Khammongkol et al. 2018). The morphological features of *T. quadrasii* are within the limits of *Ridsdalea*; thus, we here formalize the transfer of this species to the genus. This taxonomic act is necessary to correct the oversight that was made (Chavez et al. 2017) on the current circumscription of *Rothmannia* and its restriction to Africa (Wong and Pereira 2016). Furthermore, the transfer of *T. quadrasii* to *Ridsdalea* makes Philippine *Timonius* a less heterogeneous assemblage.

**Occurrence of *Timonius nitidus* (Bartl. ex DC.) Fern-Vill.**

The provenance of *T. nitidus* in the Philippine flora remains dubious, due to problematic interpretations of its *locus classicus*. De Candolle (1830) originally described the species as belonging to the genus *Petesia* P. Browne (now recognized as a heterotypic synonym of *Rondeletia* L.), based on a specimen collected by Thaddeus Haenke [T.P.X. Haenke s.n., s.d., ♂ (GOET 2 sheets, HAL)] during the Malaspina expedition (1789–1794). In the protologue, de Candolle (1830, p. 395) stated that the origin of Haenke’s material is ‘*in insulis Philippicis et Marianis*’. Later, Fernandez-Villar (1880, p. 109) transferred De Candolle’s species to *Timonius* and reduced its distribution to the Philippine island of Luzon, perhaps knowing of Haenke’s route during the exploration (see Madulid 1983, 1988 for discussion). In contrast, Merrill (1919, p. 544) assumed that the Philippine locality was erroneous and that the specimens used by de Candolle may have originated from the island of Guam. He then formally excluded *T. nitidus* from the Philippines, stating that:

‘... recently collected Guam material exactly matches the type, a fragment of which is before me, while the species has not been found in the Philippines’ (Merrill 1923, p. 543). This emendation was substantiated by Fosberg et al. (1993), who provided a comprehensive morphological description of *T. nitidus* and treated it as endemic to the island of Guam. In spite of this, *T. nitidus* was re-listed as a member of the Philippine flora in the online checklists of Pelser et al. (2011) and Govaerts et al. (2019).

It is important to note that although several botanical collections from the Malaspina Expedition are accompanied by field labels with erroneous localities, *T. nitidus* is not included in the list of extra-Philippine species that were attributed to the archipelago (Merrill 1915, Madulid 1988). The confusion, however, whether to include the Philippines in the range of distribution of *T. nitidus*, is based on the indeterminate locality in Haenke’s exsiccates and the concept of Spain’s colony in the Philippines. ‘Spain’s colony in the Philippines’ (ca 16th to 19th century) includes the present-day Marianas, Guam and Caroline Islands, which justifies the locality presented by de Candolle (1830) during his time. On the other hand, to accept the interpretation of Pelser et al. (2011) and Govaerts et al. (2019), one must assume the out of date geopolitical demarcation, which is inadvisable. Furthermore, our careful morphological comparison between *T. nitidus* and available herbarium material of Philippine and Guam *Timonius*, coupled with field observations in the island of Luzon, provide clear indications that this species is not found in the Philippines, supporting the assumptions of Merrill (1919, 1923). Based on this, we (re-)exclude *T. nitidus* from the Philippine flora.

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