

A new species of *Boyania* (Melastomataceae) from Guyana

Michelangeli F.A.

The New York Botanical Garden, Bronx, New York – 10458-5126, USA
E-mail: fabian@nybg.org

Abstract: *Boyania kenwurdackii* (Melastomataceae, Sonerileae) is described from moist forests in Guyana. It is the third species in the genus and most closely resembles the other species that occurs in Guyana, *B. ayangannae*, but differs on flower merosity, indumentum, petal and anther size and morphology. The new species is illustrated and scanning electron microscopy photographs of the seeds are provided, as well as a distribution map for both species present in Guyana.

Keywords: Neotropics, Sonerileae, Taxonomy.

Introduction

Melastomataceae, with close to 5900 accepted species is an important component of most tropical floras (Ulloa Ulloa *et al.*, 2022). Our understanding of the relationships within the family have greatly changed over the past 20 years based on molecular data (*e.g.* Clausing & Renner 2001; Michelangeli *et al.*, 2011; Rocha *et al.*, 2016; Bacci *et al.*, 2019; Kartonegoro *et al.*, 2021), which recently yielded a greatly revised taxonomy at the tribal level (Penneys *et al.*, 2022). These studies have also shown that there is remarkable geographical structure across clades (Reginato *et al.*, 2020, 2022), with no genus found both in the Americas and in Asia and/or Africa (Ulloa Ulloa *et al.*, 2022). At the tribal level there is also a great amount of geographical compartmentalization, with most tribes found only in either the New or the Old World. The Astronieae, Melastomateae, and Sonerileae are exceptions to this rule (Ulloa Ulloa *et al.*, 2022).

Sonerileae are a group of 44 genera and *c.* 1100 species mostly from the Asian tropics, but with some species present in Africa and South America

(Liu *et al.*, 2022). In South America the tribe is represented by only 12 species from six genera: *Boyania* Wurdack (2 spp.), *Neblinantha* Wurdack (1 sp.), *Opisthocentra* Hook.f. (1 sp.), *Phainantha* Gleason (5 spp.), *Tateanthus* Gleason (1 sp.) and *Tryssophyton* Wurdack (2 spp.). For the three neotropical genera with more than one species *Boyania* has one present in Guyana and one in the foothills of the Andes in Colombia, *Phainantha* has four in the Guayana Shield in Guyana and Venezuela and one in southern Ecuador, and both species of *Tryssophyton* occur in Guyana (Ulloa Ulloa & Neill, 2006; Wurdack & Michelangeli, 2019; Liu *et al.*, 2022). There are three monotypic genera, two from the Guayana Highlands in Venezuela (*Neblinantha* and *Tateanthus*) and one from the lowlands in the basins of the rivers Vaupes, Rio Negro and Atabapo in Brazil, Colombia and Venezuela respectively (Berry *et al.*, 2001). While most of the neotropical species are clustered early diverging lineages of Sonerileae, different analyses have yielded slightly different results with *Boyania*, *Opisthocentra* or *Phainantha* as sister to the remaining members of the tribe (Bacci *et al.*, 2019; Wurdack & Michelangeli, 2019; Maurin *et al.*, 2021; van der Burgt *et al.*, 2022; Zhou *et al.*, 2022).

While reviewing herbarium material and some recent collections from Guyana it became obvious that the plants that had been identified as *Boyania ayangannae* Wurdack contained two different and easily identifiable species, one indeed corresponding to *B. ayangannae* and one new. The new species is described here, along with an illustration, and a distribution map to both known species of *Boyania* in Guyana. A list of specimens confirmed to belong to *B. ayangannae* is also provided.

Received: 31.11.2022; Revised & Accepted: 03.02.2023;

Published Online: 02.03.2023

Materials and Methods

Measurements for vegetative parts were taken from herbarium dried specimens, while measurements for floral parts were obtained from rehydrated or alcohol-preserved material. Seeds for scanning electron microscopy studies were mounted on aluminum stubs and coated with gold-palladium in a DSK00V-0016 sputter coater (Denton, Moorestown, NJ, USA) at 15 kv for 4.5 min. Scanning electron microscopy was performed on a SU3500-VP (Hitachi, Tokyo, Japan) and images taken with the SE detector with accelerating voltages ranging from 5 to 15 kv and working distances ranging from 6 to 12 mm.

All specimens at CAS, FLAS, K, NY, US, VEN, were seen in person; images for those at INPA and U were seen on the SpeciesLink portal (<https://splink.cria.org.br>) maintained by the Centro de Referência em Informação Ambiental, CRIA. Images for specimens at B and G were seen on the JSTOR Global Plants portal (<https://plants.jstor.org>) (acronyms follow Thiers, 2022 updated continuously).

Distribution maps were then made in ArcGIS Desktop 10.6 (ESRI 2018). The conservation status of each species was evaluated according to the Categories and Criteria of the IUCN (2012) as well as the guidelines for IUCN Standards and Petitions Committee (2022). The extent of occurrence (EOO) and area of occupancy (AOO) were calculated as recommended by the IUCN (2022) using the Geospatial Conservation Assessment Tool GeoCAT (Bachman *et al.*, 2011).

Taxonomic Treatment

Boyania kenwurdackii Michelang. sp. nov. Figs. 1 & 2

Differs from *Boyania ayangannae* Wurdack by the 4-merous (*vs.* 5-merous) flowers, hypanthia sparsely covered by minute sessile glands (*vs.* densely to sparsely glandular pubescent), smaller petals (up to 3.24 mm long *vs.* 8–13 mm long), and anthers with a bilobed ventral appendage 0.15 mm long (*vs.* a single dorsal appendage 0.6 mm long), and the larger dorsal appendage (1.4–2.2 mm *vs.* 0.8–1.2 mm long).

Type: GUYANA, Cuyuni-Marazuni, 2nd and 3rd escarpments (of four) of Kamakusa Mt., upper west-facing slopes below summit, 1330 m, N 5°52'55.2", W 60°06'34.6", 08.06.2012 (fl), K. J. Wurdack, E. A. Tripp, A. Radosavljevic &

J. Ralph 5869 (holo NY [NY04239396!]; iso K [K000370697], P [P00950851!], US [*n.v.*]).

Creeping to climbing herbs to small shrub, terrestrial or growing on fallen trunks or rocks, adventitious roots occasionally present. Stems obscurely quadrangular to flattened when young, glabrescent to pubescent, the trichomes mostly eglandular, but mixed with some glandular, 0.7–1.1 mm long, appressed, the older stems glabrescent and terete, nodes with a membranous, irregular flap *c.* 1.3 mm wide. Leaves opposite, usually isophyllous, occasionally anisophyllous, then the smaller leaf 1/3–1/5 the size of the larger one; petioles in isophyllous nodes or large leaves 3–8 cm long and up to 3.5 mm across., in smaller anisophyllous leaves 5–12 mm long, in all cases densely pubescent, trichomes simple, up to 2.5 mm long, appressed; leaf blades ovate to elliptic, 6.5–13 × 3.8–8.5 cm, chartaceous, base obtuse to broadly acute, apex acute to acuminate, margins serrulate and sparsely ciliate, the trichomes simple, up to 1 mm long; abaxial surface with sparse minute sessile glands, the primary and secondary veins pubescent, trichomes up to 0.8 mm long, appressed, mostly eglandular, but with some glandular trichomes, higher order veins with mixed minute sessile glands and simple trichomes up to 0.2 mm long; adaxial surface with sparse minute sessile glands, otherwise glabrescent or dense to sparsely strigulose with smooth trichomes up to 0.8 mm long; venation acrodromous with 2–3 pairs of secondaries basal, the outer pair considerably thinner, tertiary veins straight, spaced every 3–5 mm, higher order veins forming areolae 2–4 mm wide. Inflorescence terminal, with a 4–9 cm long peduncle, with a pair of bracts near the middle, glabrous, with 3–4 verticillate branches, each of them a scorpioid cyme; bracteoles lanceolate, 2–3 mm long, margins ciliate at the apex, persistent in flower, but late caducous; pedicels 3–4.5 mm long at anthesis, up to 13 mm long in fruit. Flowers 4-merous; hypanthium campanulate, 2.5–3 mm long, 2.1–2.3 mm wide at the torus, sparsely covered by minute sessile glands. Calyx 1.6–1.8 mm long; tube *c.* 8 mm long, lobes broadly deltoid with a blunt slightly cucullate apex, 0.8–1 mm long, the outer tooth reduced to a stubby round bump, the outer surface with glands similar to the hypanthium. Petals 3–3.2 mm

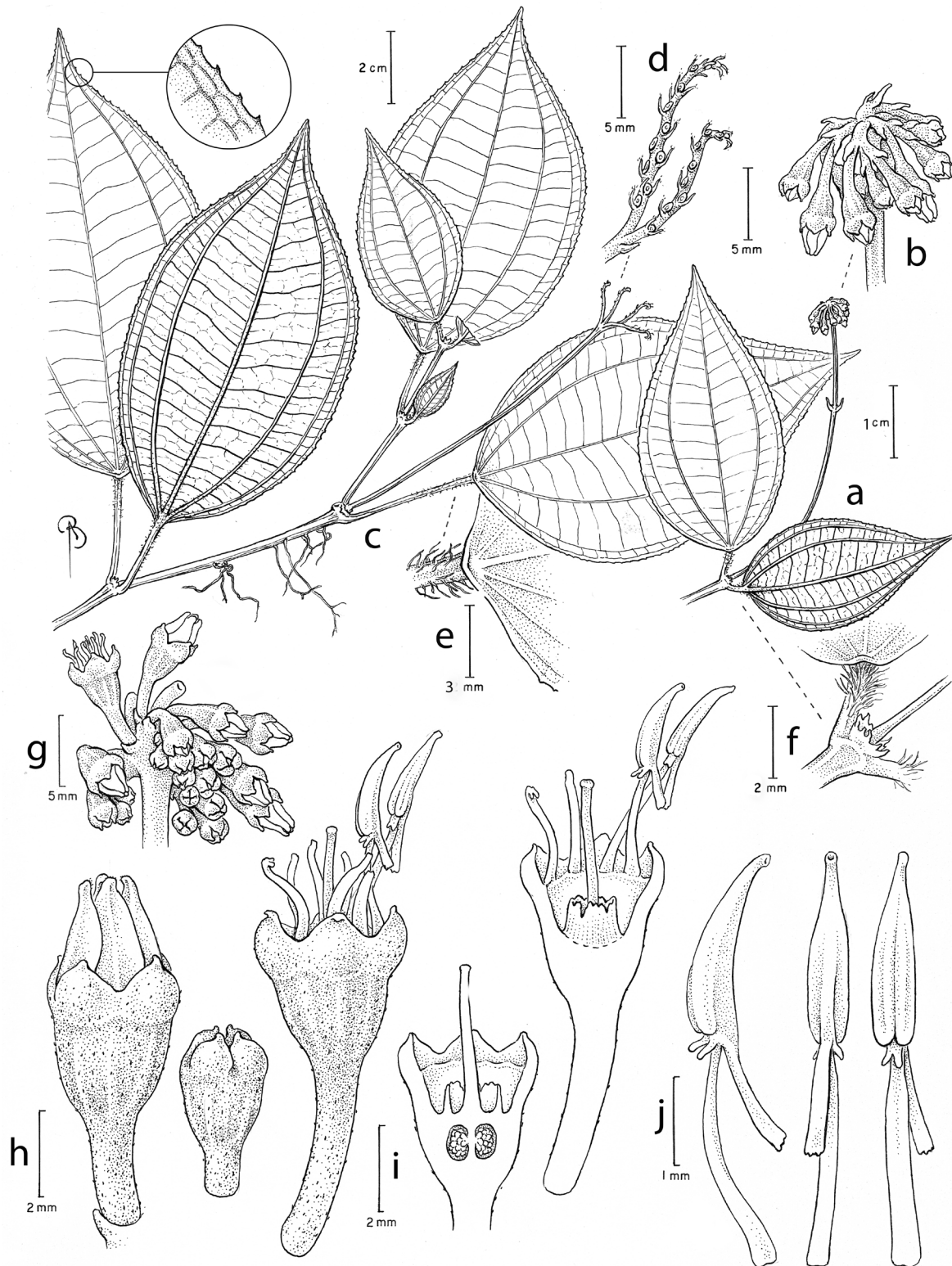


Fig. 1. *Boyania kenwurdackii* Michelang.: **a**. Flowering stem with distal leaves and inflorescences, with close up of stem node; **b**. Young inflorescence; **c**. Branch with old inflorescence remnant; **d**. Inflorescence remnant with persistent bracteoles; **e**. Petiole apex and leaf base; **f**. Stem node and flap. **g**. Young inflorescence; **h**. Flowers and bud in lateral view, mature flower (right) with petals removed; **i**. Flower in longitudinal section (left) through the ovary and with petals and stamens removed, (right) through the hypanthium with petals and some stamens removed; **j**. Antesepalous stamens in lateral (left), dorsal (middle) and frontal (right) views (**a–f** from Michelangeli 2489; **g–j** from K.J. Wurdack, E.A. Tripp, A. Radosavljevic & J. Ralph 5869; drawn by Bobbi Angell).

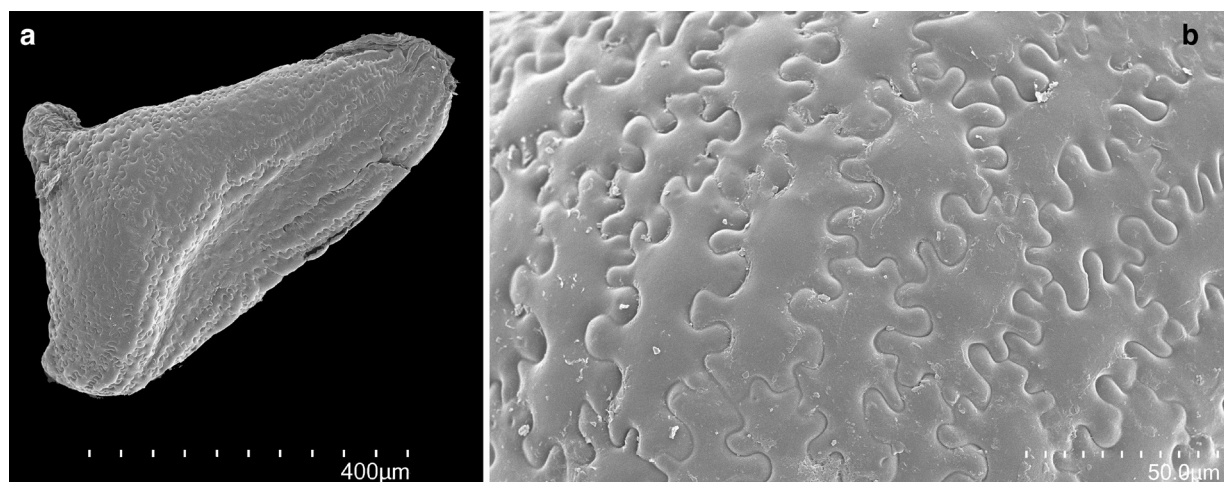


Fig. 2. Scanning electron microscopy images of seeds of *Boyania kenwurdackii* Michelang.: **a.** Entire seed; **b.** Detail of testa (both from C.E. Zartman, M.M. Pombo, Y.H. Glen & C. Perry 9387).

long, thin and translucent when dry. Stamens 8, isomorphic; filaments 2.5–2.8 mm long, glabrous; anthers subulate and slightly arcuate, 2.1–2.2 mm long, opening by a minute pore, upright to slightly dorsally oriented, connective not prolonged beyond the thecae, but with a dorsal flattened appendage 1.4–2.2 mm long, and two ventral appendages *c.* 0.15 mm long. Ovary fully to $\frac{1}{2}$ inferior, 4-locular, with a collar *c.* 0.9 mm tall around the style, glabrous; style straight, projecting 2.5–2.8 mm above the collar; stigma punctiform. Fruit capsular, terete but with 8 prominent ridges; seeds numerous (>50) per fruit, long pyramidal, 0.6–0.7 mm long, testa cells flat and with the anticlinal walls puzzle-shaped.

Flowering & fruiting: Flowering and fruiting plants have been collected in both in March and June, but there are no collections outside of these months.

Habitat: *Boyania kenwurdackii* grow in the understory of moist forests in the foothills and mid elevations of the Pakaraima mountains of the Guayana Shield in central Guyana at elevations between 225 m and 1330 m (Fig. 3).

Distribution: Endemic to Guyana.

Etymology: The specific epithet honors Ken Wurdack, Curator at the National Museum of Natural History of the Smithsonian Institution, who has collected in some of the most remote corners of Guyana, including the type of this new species.

Specimens examined: *Boyania kenwurdackii*

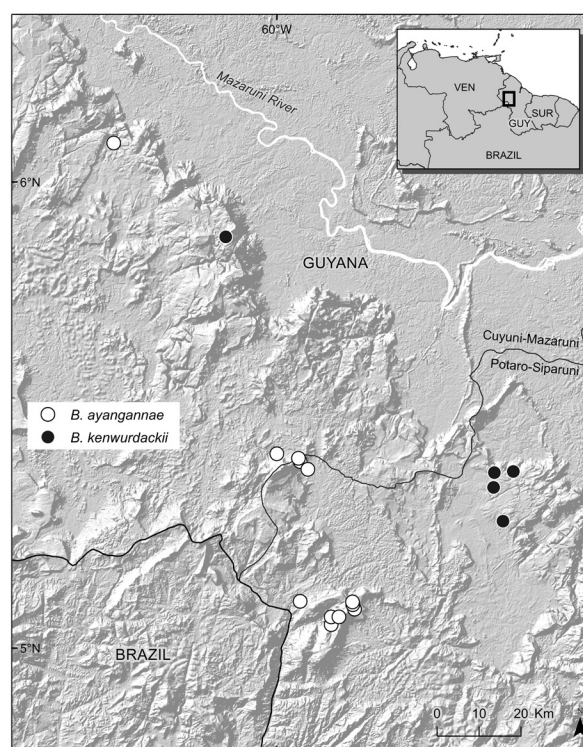


Fig. 3. Arc Gis map with distribution points of *Boyania kenwurdackii* Michelang. and *Boyania ayangannae* Wurdack in Guyana.

Michelang: GUYANA, Potaro-Siparuni. Kaieteur National Park, upper Mure Mure basin, 480–490 m, N 5°16'19.56", W 59°30'53.28", 25.03.2014 (fl.), F.A. Michelangeli & N. Zarine 2486 (BRG, NY, US); Marina Falls, 449 m, N 5°22'43.2", W 59°29'33.3", 28.03.2011 (fl.), C.E. Zartman, M.M. Pombo, Y.H. Glen & C. Perry 9356 (INPA); Amalia Falls to V4, 225 m, N 5°20'40", W 59°32'06", 30.03.2011 (veg.), C. E. Zartman, M.M.

Pombo, Y.H. Glen & C. Perry 9368 (INPA, US); *Ibid.*, 30.03.2011 (fl.), C.E. Zartman, M.M. Pombo, Y.H. Glen & C. Perry 9387 (INPA, US); V4, N 5°22'40", W 59°32'00", 31.03.2011 (fl.), C.E. Zartman, M.M. Pombo, Y.H. Glen & C. Perry 9404 (INPA, US). ***Boyania ayangannae*** Wurdack: GUYANA, Cuyuni-Mazaruni, Pakaraima Mts, ascent and transect 4 km along NE plateau of Mt. Ayanganna, 1100–1500 m, N 5°24', W 59°57', 06.11.1992 (fl buds), T.W. Henkel 147 (BRG, NY, US); Pakaraima Mountains, Kumarau Falls on Kurupung River, 0.5–1.5 km SW on forest trails, 350 m, N 6°05', W 60°21', 31.07.1992 (veg), B. Hoffman 2237 (NY, US); Pakaraima Mountains; ascent and transect 4 km along NE plateau of Mt. Ayanganna, 1100–1500 m, N 5°24'25", W 59°57'13", 06.11.1992 (fr), B. Hoffman 3236 (NY, US); Pakaraima Mountains; 1–4 km NW of Mt. Ayanganna on outer toe slopes of mountain, 800–1100 m, N 5°25', W 60°0', 09.11.1992 (fr), B. Hoffman 3308 (BRG, NY, U, US); Membaru-Kurupung Trail, Pakaraima Mts., 1000 m, 29.10–04.11.1951 (veg), B. Maguire 32405 (B, NY, US, VEN [paratypes]); Mt. Ayanganna, NE side of, upper Mazaruni River basin, 800–915 m, N 5°23', W 59°57", 14.08.1960 (fl.), S.S. Tillet 45000 (K, NY, US [paratypes]); *Ibid* 16.08.1960 (fl.), S.S. Tillet 45151 (NY [paratype]); 16.08.1960 (fl.), S.S. Tillet 45152 (G [isotype], K [isotype], NY [isotype], US [holotype]). **Potaro-Siparuni**, Wokomung, base camp & vic., upper Potaro River region, 1070–1160 m, N 5°5', W 59°50', 30.06.1989 (fl.), B.M. Boom 8993 (NY, US); Mt. Wokomung, easternmost pinnacle of massif, 1524 m, N 5°05'34.4", W 59°50'13.3", 30.06.2003 (fl.), H.D. Clarke 10344 (BRG, NY[2], US); Mt. Wokomung, NE facing slopes above second of four escarpments, 1400 m, N 5°5'56", W 59°50'16", 01.07.2003 (fl.), H.D. Clarke 10389 (NY[2], US); Pakaraima Mts, Mt. Wokomung, Wusupubaru Creek, 2 km from juncture with Suruwabaru Creek, 975–1125 m, N 5°03', W 59°53', 13.02.1993 (fr), T.W. Henkel 1340 (BRG, NY, US); Pakaraima Mts, Mt. Wokomung, W slope on sub-plateau near head of Mo-toy-mabaru Creek, 1150–1200 m, N 5°04', W 59°53', 11.11.1993 (fr), T.W. Henkel 4286 (BRG, CAS, FLAS, NY, U, US); *Ibid*, 11.11.1993 (fl bud, fr), T.W. Henkel 4291 (BRG, CAS, FLAS, INPA, NY, U, US); Pakaraima Mts-Mt. Wokomung, summit ridge of Ka-mie-wah pinnacle NE to S pinnacle, "Little Ayanganna", 1550–1650, N 5°04', W

59°52', 17.11.1993 (fl.), T.W. Henkel 4436 (BRG, CAS, FLAS, NY, US); Pakaraima Mtns; upper Ireng watershed, Sukabi River, Kurdah Falls, lower E branch, 685 m, N 5°06', W 59°97', 20.10.1994 (fl.), P.A. Mutchnick 129 (US).

Conservation status: It is known from only six collections made in the last 12 years, only one of which is inside a national park. Moreover, four of the paratypes have been collected in areas that have been identified as future dam sites for hydroelectric power. The Extent of Occurrence (EOO) is 474.3 km² and the Area of Occupancy (AOO) is 20 km² with a total of 4 locations. Based on the low number of locations, the EOO and AOO and the fact that some of the areas are likely to be developed in the near future, it is recommended that *Boyania kenwurdackii* be considered Endangered under criteria B1ab(iii)+ B2ab(iii) (IUCN, 2022).

Notes: Superficially, *Boyania kenwurdackii* closely resembles *B. ayangannae*, and indeed all the specimens assigned here to the new species had been initially determined as the latter. However, the two species differ by the number of petals, hypanthium indumentum, the size of the petals, and the size and morphology of the anther appendages (see diagnosis). Additionally, the ovary in *B. kenwurdackii* seems to range from ½ to fully inferior and it is 4-locular, while it is superior and 3-locular in *B. ayangannae*; however, these characters are based on limited dissections for both species. Furthermore, *B. kenwurdackii* is easily distinguished from *B. colombiana*, the third species in the genus, by the leaf bases (obtuse to broadly acute *vs.* cordate), and the anthers dorsal connective appendages (present *vs.* absent). Although *B. kenwurdackii* and *B. ayangannae* both grow in central Guyana, and relatively close to each other, they have not been collected in the same locality. *Boyania ayagannae* has been mostly collected around Mount Ayanganna and Mount Wokomung at 800–1400 m, and once farther west along the Kurupung River at 350 m (Fig. 4). *Boyania kenwurdackii* has been mostly collected at 225–480 m on tributaries of the Potaro River farther north of Mount Ayanganna, and once (the type), at 1300 m in Kamakusa Mountain.

When Wurdack (1964) described *Boyania* he placed it in the expanded Sonerileae and noted that among neotropical members of the tribe it most closely resembled *Diplarpea* Triana or *Monolena*

Triana ex Benth. & Hook.f. However, it is notable that he also remarked that it actually shared more characters with Old World Sonerileae. *Diplarpea* has now been synonymized under *Triolena* Naudin, and both *Triolena* and *Monolena* form the tribe Trioleneae, an exclusively neotropical group not part or sister to the Sonerileae as currently defined (Bacci *et al.*, 2020).

It should be noted that the collection cited as *B. ayangannae* in recent phylogenetic analyses (Bacci *et al.*, 2019; Wurdack & Michelangeli, 2019; Maurin *et al.*, 2021; Penneys *et al.*, 2022) is actually one of the paratypes of *B. kenwurdackii*. Moreover, when more than one species of *Boyania* have been included in phylogenetic studies the genus is not recovered as monophyletic, with both terminals close to the base of the tribe, although most of the branches in between these taxa have low or moderate support.

Acknowledgements

This research was partially supported by the National Science Foundation (DEB-2001357, DEB-2002270), the WWF-Guianas program, and Global Wildlife Conservation. I am grateful to the Curators at BRG, CAS, F, K, NY, US and VEN for access to the collections and managing herbarium loans. Liz Gjeli made the distribution map and Bobbi Angell the illustration. I also thank Ken Wurdack and Charles Zartman for providing additional details about their collections and the distribution of additional specimens and to Carol Kelloff and Sue Zmarzty for information and images of specimens at US and K respectively.

Literature Cited

- BACCI L.F., AMORIM A.M., MICHELANGELI F.A. & R. GOLDENBERG 2020. Flower morphology is correlated with distribution and phylogeny in *Bertolonia* (Melastomataceae), an herbaceous genus endemic to the Atlantic Forest. *Molecular Phylogenetics and Evolution* 149: 106844. <https://doi.org/10.1016/j.ympev.2020.106844>
- BACCIL.F., MICHELANGELI F.A. & R. GOLDENBERG 2019. Revisiting the classification of Melastomataceae: implications for habit and fruit evolution. *Botanical Journal of The Linnean Society* 190: 1–24. <https://doi.org/10.1093/botlinnean/boz006>
- BACHMAN S., MOAT J., HILL A.W., DE LA TORRE J. & B. SCOTT 2011. Supporting Red List threat assessments with GeoCAT: geospatial conservation assessment tool. *Zookeys* 150: 117–126. <https://doi.org/10.3897/zookeys.150.2109>
- BERRY P.B., GRÖGER A., HOLST B.K., MORLEY T., MICHELANGELI F.A., LUCKANA N.G., ALMEDA F., RENNER S.S., FREIRE-FIERRO A., ROBINSON O. R. & K. YATSKIEVYCH 2001. Melastomataceae. In: BERRY P.E., HOLST B.K. & K. YATSKIEVYCH (eds.), *Flora of the Venezuelan Guayana*, Volume 6. Missouri Botanical Garden, Saint Louis.
- CLAUSING G. & S.S. RENNER 2001. Molecular phylogenetics of Melastomataceae and Memecylaceae: Implications for character evolution. *American Journal of Botany* 88: 486–498. <https://doi.org/10.2307/2657114>
- ESRI 2018. ArcGIS Desktop: Release 10.6 Redlands, CA: Environmental Systems Research Institute. <http://www.esri.com>
- IUCN 2012. *IUCN Red List Categories and Criteria*: Version 3.1. Second edition. IUCN, Gland, Switzerland and Cambridge, UK.
- IUCN 2022. IUCN STANDARDS AND PETITIONS COMMITTEE. Guidelines for using the IUCN Red list Categories and Criteria. Version 15. Available from: <http://www.iucnredlist.org/documents/RedListGuidelines.pdf> (Accessed on 23.12. 2022).
- KARTONEGORO A., VERANSO-LIBALAH M.C., KADEREIT G., FRENGER A., PENNEYS D.S., DE OLIVEIRA S.M. & P.C. VAN WELZEN 2021. Molecular phylogenetics of the *Dissochaeta* alliance (Melastomataceae): redefining tribe Dissochaeteae. *Taxon* 70: 793–825. <https://doi.org/10.1002/tax.12508>
- LIU Y., VERANSO-LIBALAH M.C., KADEREIT G., ZHOU R.-C., QUAKENBUSH J.P., LIN C.-W. & J.S. WAI 2022. Systematics of the Tribe Sonerileae. In: GOLDENBERG R., MICHELANGELI F.A. & F. ALMEDA (eds.), *Systematics, Evolution, and Ecology of Melastomataceae*. Springer, Cham. pp. 321–343. https://doi.org/10.1007/978-3-030-99742-7_15
- MAURIN O., ANEST A., BELLOT S., BIFFIN E., BREWER G., CHARLES-DOMINIQUE T., COWAN R.S., DODSWORTH S., EPITAWALAGE N., GALLEGÓ B., GIARETTA A., GOLDENBERG R., GONCALVES D.J.P., GRAHAM S., HOCH P., MAZINE F., LOW Y.W., MCGINNIE C., MICHELANGELI F.A., MORRIS S., PENNEYS D.S., ESCOBAR O.A.P., PILLON Y., POKORNY L., SHIMIZU G., STAGGEMEIER V.G., THORNHILL A.H., TOMLINSON K.W., TURNER I.M., VASCONCELOS T., WILSON P.G., ZUNTINI A.R., BAKER W.J., FOREST F. & E. LUCAS 2021. A nuclear phylogenomic study of the angiosperm order Myrtales,

- exploring the potential and limitations of the universal Angiosperms353 probe set. *American Journal of Botany* 108: 1087–1111. <https://doi.org/10.1002/ajb2.1699>
- MENDOZA-CIFUENTES H. 2010. A new species of *Boyania* (Melastomataceae) in Colombia. *Novon* 20: 432–436. <https://doi.org/10.3417/2008136>
- MICHELANGELI F.A., NICOLAS A., MORALES-P M.E. & H. DAVID 2011. Phylogenetic relationships of *Allomaiaeta*, *Alloneuron*, *Cyphostyla*, and *Wurdastom* (Melastomataceae) and the resurrection of the tribe Cyphostyleae. *International Journal of Plant Sciences* 172: 1165. <https://doi.org/10.1086/662032>
- PENNEYS D.S., ALMEDA F., REGINATO M., MICHELANGELI F.A., GOLDENBERG R., FRITSCH P.W. & R.D. STONE 2022. A new Melastomataceae classification informed by molecular phylogenetics and morphology. In: GOLDENBERG R., MICHELANGELI F.A. & F. ALMEDA (eds.), *Systematics, Evolution, and Ecology of Melastomataceae*. Springer, Cham. pp. 109–165. https://doi.org/10.1007/978-3-030-99742-7_5
- REGINATO M., ALMEDA F., MICHELANGELI F.A., GOLDENBERG R., FRITSCH P.W., STONE R.D. & D.S. PENNEYS 2022. Historical biogeography of Melastomataceae. In: GOLDENBERG R., MICHELANGELI F.A. & F. ALMEDA (eds.), *Systematics, Evolution, and Ecology of Melastomataceae*. Springer, Cham. pp. 87–105. https://doi.org/10.1007/978-3-030-99742-7_4
- REGINATO M., VASCONCELOS T.N. C., KRIEBEL R. & A.O. SIMOES 2020. Is dispersal mode a driver of diversification and geographical distribution in the tropical plant family Melastomataceae?, *Molecular Phylogenetics and Evolution* 148: 106815. <https://doi.org/10.1016/j.ympev.2020.106815>
- ROCHA M.J.R., BATISTA J.A.N., GUIMARAES P.J.F. & F.A. MICHELANGELI 2016. Phylogenetic relationships in the Marcetia alliance (Melastomeae, Melastomataceae) and implications for generic circumscription. *Botanical Journal of The Linnean Society* 181: 585–609. <https://doi.org/10.1111/boj.12429>
- THIERS B. 2022 (continuously updated). *Index Herbariorum: A global directory of public herbaria and associated staff*. The New York Botanical Garden. Available from: <http://sweetgum.nybg.org/science/ih>.
- ULLOA ULLOA C., ALMEDA F., GOLDENBERG R., KADEREIT G., MICHELANGELI F.A., PENNEYS D.S., STONE R.D. & M.C. VERANSO-LIBALAH 2022. Melastomataceae: global diversity, distribution, and endemism. In: GOLDENBERG R., MICHELANGELI F.A. & F. ALMEDA (eds.), *Systematics, Evolution, and Ecology of Melastomataceae*. Springer, Cham. pp. 3–28. https://doi.org/10.1007/978-3-030-99742-7_1
- ULLOA ULLOA C. & D.A. NEILL 2006. *Phainantha shuariorum* (Melastomataceae), una Especie Nueva de la Cordillera del Cóndor, Ecuador, Disyunta de un Género Guayanés. *Novon* 16: 281–285. [https://doi.org/10.3417/1055-3177\(2006\)16\[281:PSMUEN\]2.0.CO;2](https://doi.org/10.3417/1055-3177(2006)16[281:PSMUEN]2.0.CO;2)
- VAN DERBURGT X.M., HABAP.M., MAGASSOUBAS. & M.C. VERANSO-LIBALAH 2022. *Benna alternifolia* (Melastomataceae: Sonerileae), a new herbaceous genus and species from Guinea, West Africa. *Willdenowia* 52: 25–37. <https://doi.org/10.3372/wi.52.52102>
- WURDACK J.J. 1964. Melastomataceae. In: MAGUIRE B., WURDACK J.J. & Collaborators, editors, Botany of the Guayana Highlands-Part V. *Memoirs of the New York Botanical Garden* 10: 135–186.
- WURDACK K.J. & F.A. MICHELANGELI 2019. Systematics and relationships of *Tryssophyton* (Melastomataceae), with a second species from the Pakaraima Mountains of Guyana. *PhytoKeys* 136: 1–21. <https://doi.org/10.3897/phytokeys.136.385582022>
- ZHOU Q.J., DAI J.H., LIN C.W., NG W.L., VAN DO T., WAI J.S., MICHELANGELI F.A., REGINATO M., ZHOU R.C. & Y. LIU 2022. Out of chaos: phylogenomics of Asian Sonerileae. *Molecular Phylogenetics and Evolution* 175: 107581. <https://doi.org/10.1016/j.ympev.2022.107581>