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Two new species of *Meriania* (Melastomataceae) from eastern Ecuador

DIANA M. FERNÁNDEZ-FERNÁNDEZ^{1,4*}, LOU JOST^{2,5} & AGNES S. DELLINGER^{3,6*}

¹ Instituto Nacional de Biodiversidad, Herbario Nacional del Ecuador (QCNE).

² Fundación EcoMinga, Ecuador.

³ University of Vienna, Department of Botany and Biodiversity Research, Rennweg 14, 1030 Vienna, Austria.

⁴  fernandezdiana@yahoo.com;  <https://orcid.org/0000-0001-6398-2900>

⁵  loujost@gmail.com;  <https://orcid.org/0000-0002-5850-0716>

⁶  agnes.dellinger@univie.ac.at;  <https://orcid.org/0000-0003-1394-3414>

* Corresponding author

Abstract

We describe two new species of *Meriania* (Melastomataceae), *Meriania ardyae* from Llanganates National Park and *Meriania zunacensis* from the Río Zuñac Reserve in Ecuador. *Meriania ardyae* is characterized by dark crimson petals, hypanthium and calyx with a dark purple coloration, young branches and internodes covered with a dense pubescence of violet-black hirsute trichomes and slightly dimorphic stamens. *Meriania zunacensis* is distinguished by conspicuous interpetiolar flaps, inflorescences with glomerulate flower clusters, large flowers with magenta petals, isomorphic stamens, and a fleshy, strongly curved style.

Resumen

Se describe dos nuevas especies de *Meriania* (Melastomataceae), *Meriania ardyae* del Parque Nacional Llanganates y *Meriania zunacensis* de la Reserva del Río Zuñac en Ecuador. *Meriania ardyae* es caracterizada por los pétalos de color carmesí oscuro, el hipanto y cáliz con una coloración púrpura oscuro, las ramas jóvenes y entrenudos cubiertos de una pubescencia densa de tricomas hirsutos de color negro-violáceo y los estambres ligeramente dimórficos. *Meriania zunacensis* se distingue por las faldas interpeciolares conspicuas, ramificaciones de la inflorescencia de tipo glomerular, las flores grandes con pétalos de color magenta, estambres isomorfos y el estilo fuertemente recurvado.

Keywords: Andes, Cloud forest, Merianieae, Reserva Río Zuñac

Introduction

The Melastomataceae tribe Merianieae encompasses approximately 280–300 species (Mendoza-Cifuentes & Fernández-Alonso 2012) and is distributed from southern Mexico through the tropical Andes and Caribbean islands to southeastern Brazil, with centers of diversity in Colombia and Ecuador (Almeda 1993, Renner 1993, Michelangeli *et al.* 2015). With 95–110 species, *Meriania* Swartz (1798: 823) is the most speciose genus in the tribe (Michelangeli *et al.* 2015). In Ecuador, 31 species of *Meriania* have been registered, of which 20 are considered endemic, distributed mostly in the Andes, between 1000 and 3500 m (Fernández-Fernández 2010). Calyx and stamen traits have mostly been used as systematic characters. *Meriania* is characterized by penta- to octamerous flowers, dorsal stamen connective appendages and capsular fruits with five to six locules and straight seeds (Mendoza-Cifuentes & Fernández-Alonso 2010, 2012).

Cladistic analyses of morphological characters and recent molecular phylogenetic work have shown, however, that the delimitation of *Meriania* is difficult (Mendoza-Cifuentes & Fernández-Alonso 2010, 2012, Fernández-Fernández 2010, Cotton *et al.* 2014, Dellinger *et al.* 2019a, b). In particular, relations to the genera *Adelobotrys* Candolle (1828: 127), *Axinaea* Ruiz & Pavón (1794: 68) and *Centronia* Don (1823: 314–315) need re-consideration as *Meriania*, in its current delimitation, most likely is polyphyletic (Schulman & Hyvönen 2003, Cotton *et al.* 2014, Dellinger *et al.* 2019a).

In addition, revisions of some clades in *Meriania* and additional fieldwork have led to the discovery of more than 15 new species in the last years (e.g. Ulloa-Ulloa *et al.* 2007, Ulloa & Homeier 2008, Mendoza-Cifuentes & Fernández-Alonso 2012, Mendoza-Cifuentes *et al.* 2014, Chiavagetto & Baumgratz 2015, Michelangeli *et al.* 2015, Goldenberg *et al.* 2016, Michelangeli & Goldenberg *et al.* 2018). Here, we describe two new species from Ecuador, *Meriania ardyae* D. Fernández & A. S. Dellinger, which is found in the Llanganates National Park, and *M. zunacensis* D. Fernández & A. S. Dellinger, from the Rio Zuñac Reserve, both in close vicinity of *M. aurata* Ulloa *et al.* (2007: 525–528), only described in 2007.

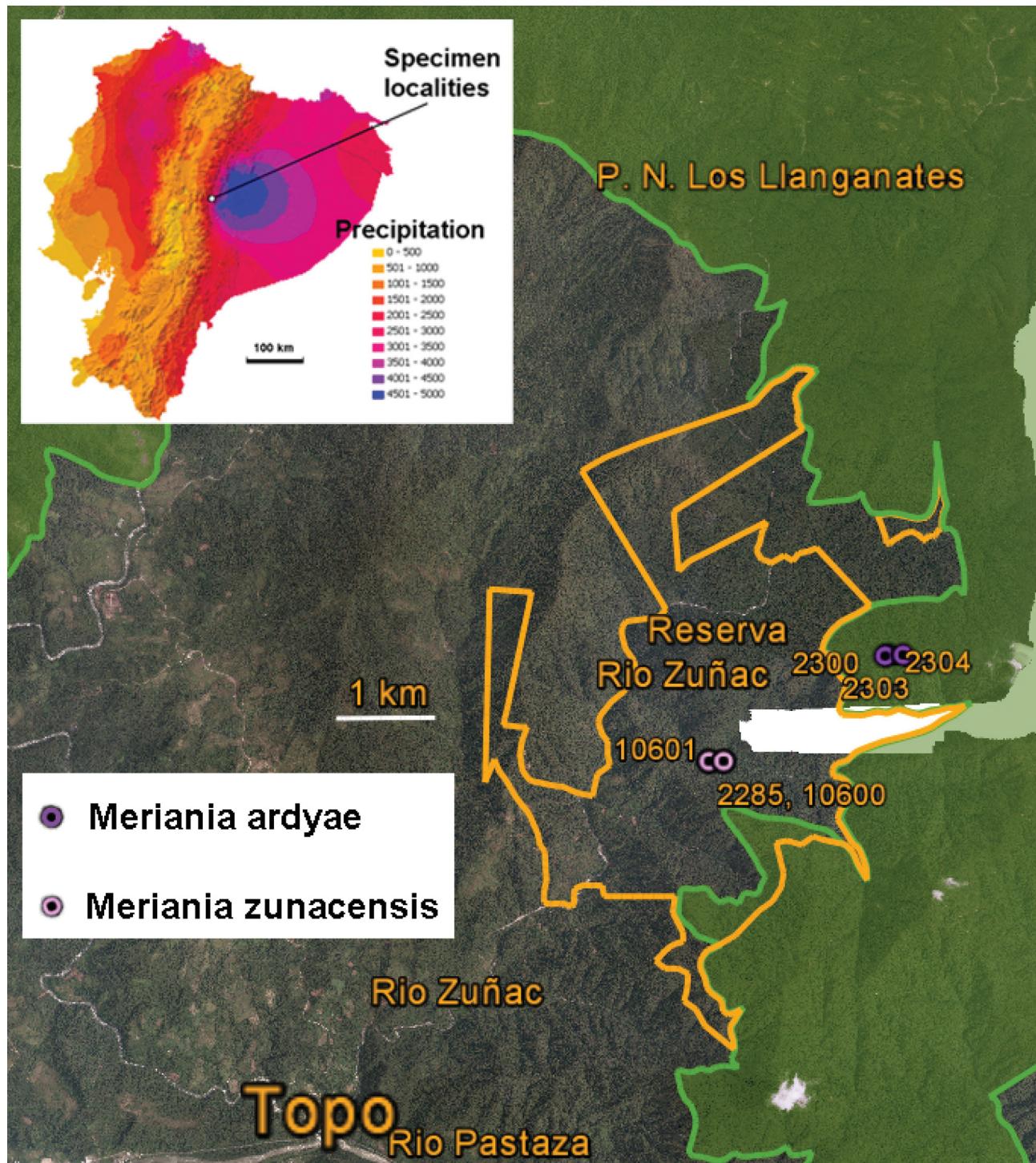


FIGURE 1. Map of Rio Zuñac Reserve and collection sites of the two new *Meriania* species; the border of the Reserve is marked in orange, the area occupied by PN Los Llanganates is shaded in green.

Material & Methods

Lou Jost, Fausto Recalde, and Luis Recalde first found and photographed these two species in flower on Sept 29–30, 2014. We then collected herbarium vouchers and flower material of the two species during field expeditions to the Rio Zuñac Reserve and Llanganates National Park in November 2016 and May 2018 (Figure 1). We compared this material to herbarium specimens in the following herbaria: COL, FMB, QCNE, W, WU; and virtual herbaria from JSTOR Plant Science types, MO, NY and US (Thiers 2016).

We took measurements on our collected herbarium specimens, and the ethanol-preserved flowers and fruits. We photographed the conspicuous trichomes both species bear on branches and leaves on mounted isotypes under scopes. Figure 4a was done by focus-stacking one thousand photos using a Nikon 50x finite objective; Figure 4b used the same method with a 10x objective. The stacks were done using Zerene software. Further, we used scanning electron microscopy (SEM) to accurately depict surface structures of stamens (Dellinger *et al.* 2019a). We dissected flowers and desiccated single stamens through an ethanol series (70% - 85% - 96%), transferred them to acetone and critical-point dried them (CP Autosamdry-815). We then mounted stamens on aluminium stubs and coated them with gold using a Sputter coater (SCD 050). We photographed stamens in a scanning electron microscope (JEOL JSM-6390) at 10 kV.

Description of the new species

Meriania ardyae D. Fernández & Dellinger, sp. nov.

Type:—Ecuador. Provincia de Tungurahua: Cantón Baños, Área límitrofe entre la Reserva Río Zuñac de la Fundación EcoMinga y el Parque Nacional Llanganates, en el sendero desde la casa de la Reserva hacia el Parque, cerca al hito de límites. Bosque de neblina montano, 1°22.009°S 78°08.228°W, 2533 m, 15 November 2016 (fl), Diana Fernández, Agnes Dellinger, Santiago Recalde 2304 (holotype: QCNE-243981!; isotypes: WU-092856!). Figures 2, 3, 4.

Diagnosis:—*Meriania ardyae* is similar to *Meriania campi* Wurdack, but distinguished from the latter by a terete hypanthium (vs. costate), truncate calyx lobes (vs. 0.7–2.5 mm long), slightly dimorphic stamens (vs. isomorphic) and an acute to slightly acuminate leaf apex (vs. emarginate).

Trees 4–7 m tall, young stems sub-quadrangular. Internodes 2–5 cm long. Young branches and internodes covered by dense scabrous pubescence, trichomes hirsute, dendritic, squamulose, violet-black, 0.7–1 mm long. Interpetiolar lines narrow, conspicuous. Leaves opposite, decussate, mature leaves similar or variable in size. Petioles terete, 1.5–3 cm long, covered with squamulose light brown and scabrous black trichomes, purple on the adaxial surface. Leaf blades sub-coriaceous, 6–12.5 × 2.5–5.3 cm, ovate to slightly elliptic; adaxial surface dark green, dull, glabrous; abaxial surface light green; apex acute to slightly acuminate; base obtuse, auriculate; auricles 1–1.5 mm long, revolute; margin entire; venation acrodromous, the primary nerve visible on the adaxial surface and prominent on the abaxial surface, with 2 to 3 pairs of secondary nerves, the two internal pairs extending to the blade apex; the secondaries basal, impressed on the adaxial surface and prominent on the abaxial surface; primary and secondary nerves on the abaxial surface sparsely covered by minute squamulose trichomes; tertiary veins nearly parallel, 2–4.5 mm apart in the widest part of the blade, impressed on the adaxial surface, slightly prominent on the abaxial surface. Inflorescence a compound dichasium, terminal, 6.5–12.5 cm long (including the peduncle), usually 9-flowered, rarely more than 9, with a basal pair of leaflike bracts, 2.5–8 × 1–3 cm, elliptic, with a small pedicel 1–1.3 cm long; bracteoles absent; peduncle 2–4 cm long. Flowers 5-merous, perigynous; pedicels terete, 1–2.5 cm long, rough, light green, tinted light purple; hypanthium terete, cupuliform, 0.8–1.5 × 1.1–1.5, rigid, glabrous, dark purple. Calyx tube 0.5–0.6 cm long, truncate, internal calyx lobes inconspicuous, external calyx teeth conical, ca. 1 mm long, with rounded apex, rough, with rigid-like knobs, dark purple, situated in the centre of each lobe. Corolla widely funnelform, petals free, reflexing with age; petals obovate, 3.7–4.5 × 2.8–3.7 cm, fleshy, glabrous, apex asymmetrically bilobed, crimson/magenta at anthesis, crimson to very dark purple in buds. Stamens 10, all arranged at one side of the flower at anthesis (hence flower zygomorphic by the androecium), slightly dimorphic, geniculate at the insertion of the filament; filament complanate, purple; thecae crimson, subulate; connective along thecae purple, white in the transition to the elbow or filament apex/base of connective junction, filament apex/base of connective junction yellow; thecae in both stamen whorls dorsally attached to the connective, thecal walls strongly corrugated, apical pore dorsally inclined, whitish

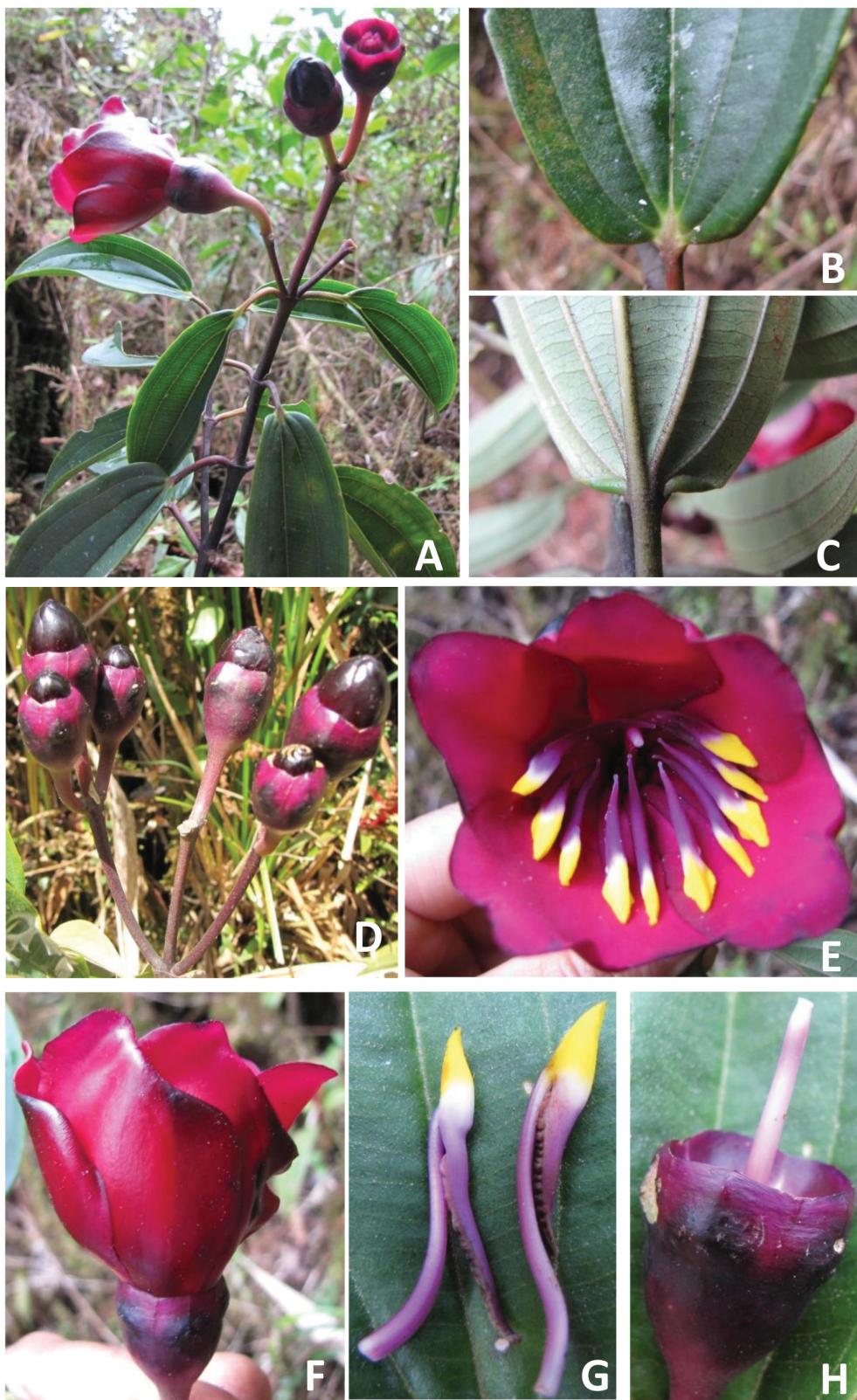


FIGURE 2. *Meriania ardyae*. A. Flowering branch. B. Base of the leaf, adaxial side. C. Base of the leaf, abaxial side with revolute auricles. D. Compound dichasial inflorescence. E. Young anthetic flower, with the zygomorphic arrangement of the androecium clearly visible, and the style located in the centre of the flower; note the prominent colour difference between the corolla and the filament/connective joint. F. Young flower from the side, just opening. G. The two slightly dimorphic stamens, on the left the antisepalous stamen with a laterally compressed filament apex/connective joint and a longer anther; on the right the antipetalous stamen the larger triangular filament apex/connective joint (laterally flattened) and the shorter anther. H. Purple hypanthium with the truncate calyx, and the style with the punctiform stigma.



FIGURE 3. *Meriania ardyae*. Images of holotype and pickled floral material. A. Branch with buds. B. Detail of adaxial leaf surface with numerous, squamulose trichomes. C. Detail of B, squamulose white trichomes. D. Detail of abaxial leaf surface with brown to violet-blackish, squamulose trichomes. E. Flower of the holotype of *M. ardyae*. F. Antepetalous stamen with short thecae and filament apex expanded laterally. G. Antesepalous stamen with longer thecae and filament apex not expanded. H. Hypophysis, calyx and stamens viewed in bud stage (petals removed). I. Longitudinal section of hypophysis, exposing the ovary and style.

rim; antisepalous stamens with filaments 2–2.2 cm long and 0.2–0.25 cm thick (at the base), thecae slightly curved to the ventral side, 1.4–2.9 cm long, filament apex/base of connective junction laterally compressed, 0.6–0.7 cm long, dorsal appendage sub-angular, conspicuous; antipetalous stamens with filaments 2.2–2.4 cm long and 0.2–0.3 cm thick (at the base), thecae slightly curved (sigmoid), 1–1.4 cm long, filament apex/base of connective junction triangular, ca. 0.8 cm long, expanded at the sides, 0.1 cm thick, dorsal appendage obtuse and inconspicuous. Ovary superior, 5–locular, oblong ovoid, 1–1.2 × 0.6–0.7 cm, ribbed; apex gabrous, with five oblong, prominent and separated lobes ca. 1.5 × 1 mm; style fuchsia, 1.5–1.7 cm long, terete, slightly incurved at the apex. Stigma punctiform, papillate. Fruits loculicidal capsules, 1.8–2 cm long; seeds numerous, triangular, 1.6–2 mm long.

Habitat, Distribution and Ecology:—*Meriania ardyae* is only known from the Andean cloud forests of the Cordillera Abitagua, part of the Eastern Cordillera (Cordillera Oriental) of Ecuador, close to the limit of the Llanganates National Park (Figure 1). Some individuals were observed along the ‘Mono chorongo’ trail leading uphill from the Río Zuñac Reserve (EcoMinga Foundation) to the Llanganates National Park. The species was collected between 2480 m and 2550 m on granitic substrate and in vicinity of another recently described *Meriania* species, *M. aurata* (Ulloa-Ulloa *et al.* 2007).

Meriania ardyae has been collected in flower and bud in November 2016, and photographed in flower in late September 2014. According to a recent publication on pollination syndromes in Merianieae, the species is most likely buzz pollinated by bees (Dellinger *et al.* 2019a).



Figure 4. *Meriania ardyae*, details of trichomes on the stem (A) and on the primary nerves on the abaxial side of the leaf (B).

Conservations status:—*Meriania ardyae* is considered as endemic to Ecuador. It is known from three collections made in a reduced area between the Rio Zuñac Reserve and the Llanganates National Park. Based on the analysis of the IUCN Red List Categories and Criteria (2019) the species should be classified as Critically Endangered (CR), because it has an Area of Occupation (AOO) of 4 km² and an Extension of Occurrence (EOO) of 0.001 km². However, since the recorded individuals are found between two protected areas and the occurrence of other populations in the region is likely, we suggest the conservation status of Endangered EN B1ab(iii,iv) + B2ab(iii,iv) for this taxon.

Etymology:—The new species is named in honor of Ardy van Ooij to commemorate the generous donations made by the Ardy van Ooij and Henri Botter to the EcoMinga Foundation to support nature conservation and research in the Rio Zuñac Reserve. Private foundations like EcoMinga, sustained by donations, are an invaluable element of modern nature protection and help complete the governmental conservation networks.

Additional specimens examined (paratypes):—Ecuador. Provincia de Tungurahua: Cantón Baños, Área limítrofe entre la Reserva del Río Zuñac de la Fundación EcoMinga y el Parque Nacional Llanganates, sendero

que parte de la Reserva hasta el Parque pasando por el hito de límites entre las dos áreas protegidas, Bosque de neblina montano, 1°22.015'S 78°08.329'W, 2486 m, 15 November 2016 (fl), *Diana Fernández et al.* 2300 (QCNE!); 1°22.009'S 78°08.311'W, 2497 m, 15 November 2016 (fl), *Diana Fernández et al.* 2303 (QCNE!, WU!).

Discussion:—*Meriania ardyae* is habitually similar to species of the paraphyletic genus *Axinaea* (Dellinger *et al.* 2019a): a slender treelet with relatively small, slightly auriculate, pulverulent leaves and few-flowered dichasias. *Meriania ardyae* is clearly differentiated from *Axinaea* by the lack of bulbous connective stamen appendages (Dellinger *et al.* 2014; connective appendages instead are pyramidal and elongated), and by corrugated thecal walls (as opposed to smooth thecal walls in *Axinaea*).

Meriania ardyae does not resemble any described species of *Meriania* given the violet-black young branches and inflorescences, conspicuous trichomes and crimson flowers, together with the slender habit and stamen dimorphism. The funnelform flower shape of *M. ardyae* is similar to flowers found in the Colombian *M. fantastica* Alvear *et al.* (2014: 26–31), but flowers of *M. fantastica* are about twice as large and bright orange. *Meriania ardyae* further differs from *M. fantastica* by lacking a scutum at the adaxial petiole apex (vs. prominent in *M. fantastica*), ovate to slightly elliptic leaves (vs. elliptic to sub-orbicular in *M. fantastica*) and the violet-black young branches (vs. green in *M. fantastica*).

Meriania ardyae resembles *M. campii* Wurdack (1967: 2) and *M. rigida* (Bentham 1844: 130) Triana (1871: 66), two endemic Ecuadorian species, in the few-flowered inflorescences with dichasial branches, but differs from *M. campii* by the obtuse, auriculate, revolute leaf base (vs. rounded base, without auricles in *M. campii*), hypanthium 8–5 mm long (vs. 4 mm long in *M. campii*), presence of an interpetiolar line (vs. absent in *M. campii*); *M. ardyae* differs from *M. rigida* by the corolla widely funnelform (vs. open and reflexed in *M. rigida*), and stamens slightly dimorphic (vs stamens isomorphic in *M. rigida*).

In a recently published molecular phylogeny (Dellinger *et al.* 2019a), *M. ardyae* is found in a clade of large, orange-flowered *Meriania* species (e.g. *M. aurata*, *M. pastazana* Wurdack 1974: 142–143, *M. hernandoi* L. Uribe 1969: 292), some of which (*M. aurata*, *M. pastazana*) occur in the same area and were observed flowering few hundred meters away from *M. ardyae*. *Meriania ardyae* differs markedly from these two species in flower colour (dark purple/magenta vs. orange in *M. aurata* and *M. pastazana*), slight stamen dimorphism (vs. mostly isomorphic in *M. aurata* and *M. pastazana*), small (1 mm), conical calyx teeth (vs. elongated, 8–14 mm in *M. aurata*), absence of a scutum at the leaf base (vs. present in *M. aurata*), acute to acuminate leaf tips (vs. obtuse to slightly acute in *M. pastazana* and obtuse, auriculate leaf base (vs. decurrent in *M. pastazana*); for further differences see Table 1.

Meriania zunacensis D. Fernández & Dellinger, sp. nov.

Type:—Ecuador. Provincia de Tungurahua: Cantón Baños, Parroquia Río Negro, Sector El Topo, Estación Científica Río Zuñac, Fundación EcoMinga, Bosque siempreverde montano bajo, sendero sin nombre a lo largo del río Zuñac, 1°22.593'S 78°09.213'W (+/- 50 m), 1568 m, 26 May 2018 (fl), *Lou Jost, Fausto Recalde y Santiago Recalde* 10600 (holotype: QCNE-243978 [1/2]!, QCNE-243977 [2/2]!; isotypes: QCNE-243976!. Figures 5, 6, 7.

Diagnosis:—*Meriania zunacensis* is similar to *M. maxima* Markgraf (1938: 461) but distinguished from the latter by the isomorphic androecium (vs. dimorphic), a fleshy, strongly curved style (vs. slender, slightly hooked at the tip) and thickened nodes with well-developed, sub-coriaceous stipuliform flaps, 9–13 mm long (vs. inconspicuous flaps, 1 mm long).

Trees ca. 18 m tall, young stems sub-quadrangular with rounded edges, ribbed. Internodes 3.3–4.5 cm long. Thickened node with a well-developed, sub-coriaceous stipuliform flap, 9–13 × 4–6 mm, persistent. Mature leaves equal or unequal in size, opposite, decussate. Petioles terete, slightly ribbed, 3–5.6 cm long, glabrous. Leaf blades coriaceous, glabrous, 16–23.5 × 10.5–17 cm, elliptic to ovate, adaxial surface glossy, abaxial surface dull, principal nerves sparsely covered by patches of minute, squamulose trichomes; apex acute, rectangular, slightly emarginate; base obtuse to slightly acute, with a small wedge-like structure on the abaxial side at the insertion of the petiole; margins entire, at the leaf base slightly revolute towards the abaxial side; venation acrodromous, the primary nerve clearly visible on the adaxial leaf surface and very prominent on the abaxial surface, with 2 to 3 pairs of secondary nerves, but only the two internal pairs extending to the blade apex and one pair converges with the primary nerve; the secondaries basal, impressed on the adaxial surface and very prominent on the abaxial surface; tertiary veins nearly parallel, 5–8 mm apart in the widest part of the blade, impressed on the adaxial surface, slightly prominent on the abaxial surface. Inflorescence a paniculate thyrsse, terminal (sometimes accompanied by two basal branches, hence appearing lateral), with partial reductions along the terminal branches, leading to agglomeration of flowers at tips of thyrsse), 20–42 cm long (including the peduncle), with approximately 57 flowers, with a pair of leaflike basal bracts, deciduous (absent at anthesis); bracteoles absent; peduncle or basal part of the rachis 5–9 cm long. Flowers 5-merous, perigynous; pedicels

terete, 0.6–1.5 cm long, thick; hypanthium campanulate, 0.9–1.2 × 1.3–1.4 cm, rigid, glabrous. Calyx tube 0.6–0.9 cm long, truncate, slightly curved outwards; interior side of tube green with light pink patterning, external side with inconspicuous, broadly flattened teeth, with a small, dark green knob in the center. Corolla in mature flowers widely open, but with the petal tips reflexed; petals obovate, 4.5–5.8 × 3–4.2 cm, fleshy, glabrous, imbricate, with the upper margin irregular, in young flowers magenta, in mature flowers faded magenta. Stamens 10, all arranged at one side of the flower (hence flower zygomorphic by the androecium), isomorphic, geniculate at the insertion of the filament; filaments dorso-ventrally compressed, slightly twisted at the base, 2.3–2.8 × 0.3–0.4 cm, with stomata on the apex; thecae subulate, 1.2–2 cm long, dorsally attached to the connective, the walls smooth, pore apical, dorsally inclined; dorsal connective (along the thecae) crimson, enlarged to a pyramidal-acuminate basal prolongation (appendix, at the elbow), light yellow, 0.7–1 cm long;. Ovary superior, 5-locular, oblong, obovate, 1.3–1.5 × 0.6–0.9 cm, costate; apex glabrous, with five prominent oblong teeth, ca. 4–5 mm above the torus. Style fleshy, strongly recurved (hook-like), 1.9–2.5 × 0.3–0.6 cm at the base, terete. Stigma punctiform. Fruits loculicidal capsules; seeds numerous, triangular, 2–4 mm long.

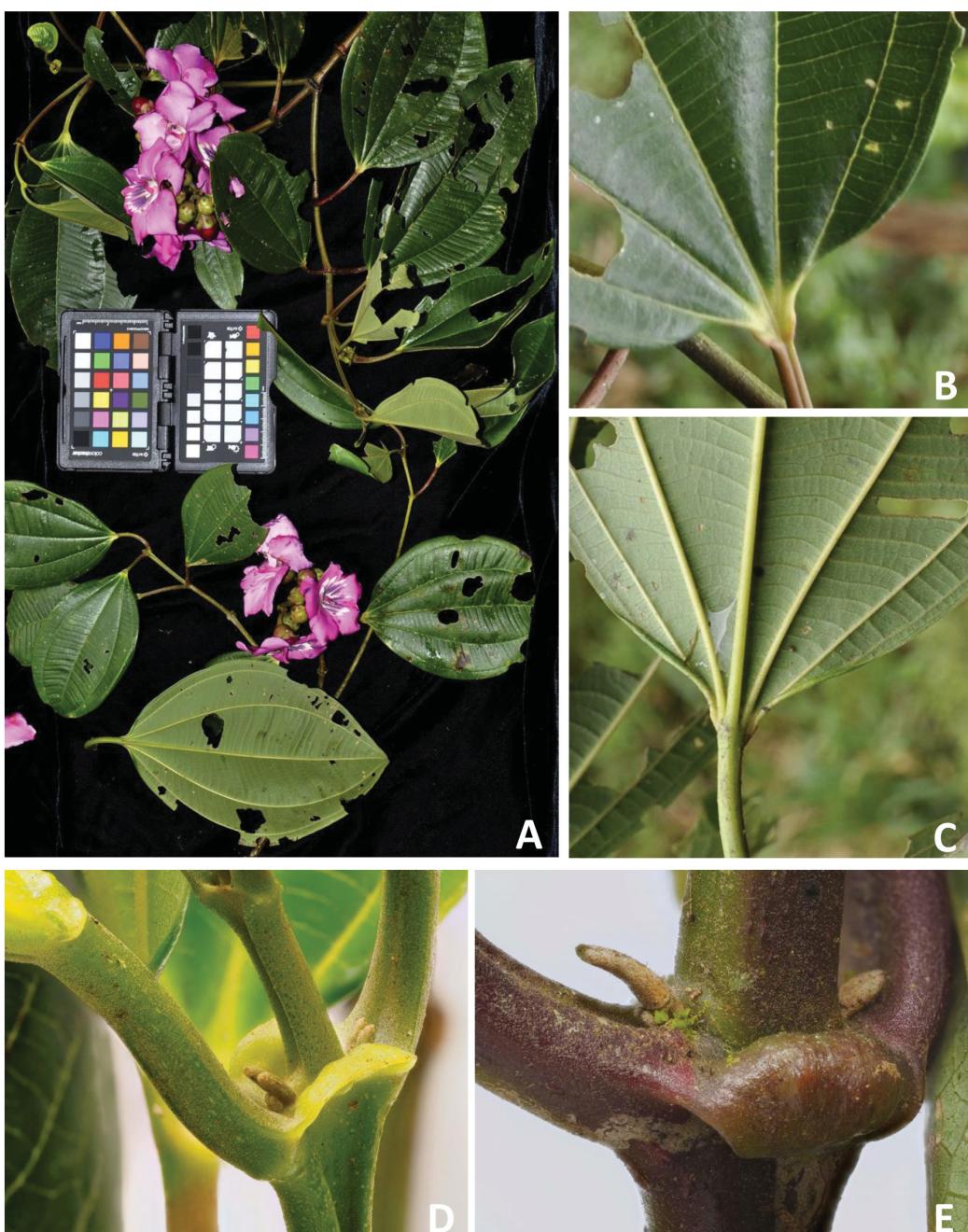


FIGURE 5. *Meriania zunacensis*. A. Branch with flowers. B. Base of the leaf, adaxial side. C. Base of the leaf, abaxial side with slightly revolute auricles. D. Young branch with thickened, membranaceous interpetiolar flap. E. Mature branch with thickened, coriaceous interpetiolar flap.

TABLE 1. Comparison of some morphological characters between *Meriania ardyae*, *M. zunacensis*, and related species.

| Characters | <i>M. almedae</i> | <i>M. ardyae</i> | <i>M. aurata</i> | <i>M. campii</i> | <i>M. drakei</i> | <i>M. hernandoi</i> | <i>M. maguirei</i> | <i>M. maxima</i> | <i>M. pastazana</i> | <i>M. rigida</i> | <i>M. sanguinea</i> | <i>M. tetragona</i> | <i>M. zunacensis</i> |
|--|---|---|---|---|---|---|---|--|--|--|--|--|--|
| Leaf base | Cordate | Obtuse, auriculate, revolute | Cordate | Rounded or obtuse | Acute or obtuse | Cordate | Acute or obtuse | Acute or obtuse | Obtuse, decurrent | Rounded or obtuse | Cordate | Cordate | Obtuse or slightly acute |
| Nº pairs of secondary nerves | 3–4 | 2–3 | 2–3 | 2 | 2–3 | 1 | 2 | 2 | 1–2 | 2–3 | 3–4 | 2–3 | 2–3 |
| Length of stipuliform flap/interpetiolar line | 3–7 mm | 0.5 mm | 2 mm | Absent | 0.5–1 mm | 1–1.5 mm | 0.2 mm | 1 mm | 0.2 mm | 0.1 mm | 5–7 mm | 5–10 mm | 9–13 mm |
| Inflorescence type | Multiflorous panicle, umbellate branches | Pauciflorous panicle, compound dichasium | Multiflorous panicle, dichasial branches | Pauciflorous panicle, dichasial branch | Multiflorous panicle, dichasial branches | Multiflorous panicle, dichasial branches | Multiflorous panicle, dichasial branches | Submultiflorous panicle, dichasial branches | Pauciflorous panicle, dichasial branches | Multiflorous panicle, umbellate branches | Multiflorous panicle, | Paniculate thyse, terminal branches | Multiflorous panicle, umbellate branches |
| Bracteoles | Absent | Absent | Absent | Absent | Present | Present | Present | Absent | Present | Present | Present | Absent | Absent |
| Type of corolla | Pseudo- campanulate | Wide funnelform | Open/bowl- shaped | Wide funnelform | Open/bowl- shaped | Open/bowl- shaped | Open/bowl- shaped | Open/bowl- shaped | Open/bowl- shaped | Pseudo- campanulate | Pseudo- campanulate | Open/bowl- shaped | Open/bowl- shaped |
| Colour of petals | Bright red | Crimson or dark purple | Orange | Magenta | Magenta | Orange | Magenta | Magenta | Orange | Magenta | Bright red | Bright red | Magenta |
| Hypothecium length | 3–5 mm | 8–15 mm | 18–25 mm | 4 mm | 6–10 mm | 7–9 mm | 8–10 mm | 10–12 mm | 5–6 mm | 5–9 mm | 2.7–3 mm | 4–5 mm | 9–12 mm |
| Calyx type | Truncate | Truncate | Truncate | Lobulate | Truncate or slightly lobed | Truncate | Calyptrate | Truncate | Truncate | Truncate | Truncate | Lobulate | Truncate |
| Petal length | 9–11 mm | 37–45 mm | 21–35 mm | 21–24 mm | 22–40 mm | 22–25 mm | 21–3.5 mm | 40–48 mm | 25–34 mm | 16–21 mm | 11–12 mm | 12–13 mm | 45–58 mm |
| Stamens | Isomorphic | Slightly dimorphic | Isomorphic | Isomorphic | Isomorphic | Isomorphic | Isomorphic | Strongly dimorphic | Isomorphic | Isomorphic | Isomorphic | Isomorphic | Isomorphic |
| Specimens examined | D. Neill, 16923 (QCNE) | D. Fernández 2304 | D. Neil 13423 | W. Camp E-4919 | D. Fernández 1539, 1549 | D. Fernández (QCNE, MO) | D. Fernández 1546 (QCNE, (QCNE, MO) | D. Fernández 1507 (QCNE, (QCNE, MO) | D. Fernández 1265 (QCNE, 2280 (QCNE) (MO) | D. Fernández 1520 (QCNE, 2225 (QCNE) (MO) | D. Fernández 1511 (QCNE, L. Jost 10600 (QCNE) | D. Fernández 1511 (QCNE, 2225 (QCNE) (MO) | D. Fernández 1511 (QCNE, L. Jost 10600 (QCNE) |



FIGURE 6. *Meriania zunacensis*. A. Inflorescence with buds and immature fruits. B. Dense, multi-flowered, agglomerate terminal inflorescence. C. Single, fully anthetic flower, note zygomorphic arrangement of the androecium, distinct colouration of the filament apex/connective joint. D. Stamens isomorphic, filaments dorsi-ventrally compressed, enlarged to a pyramidal-acuminate basal prolongation of the connective. E. Hypanthium with lateral depressions and gynoecium with ovary lobes barely separated, and prominently hooked style.

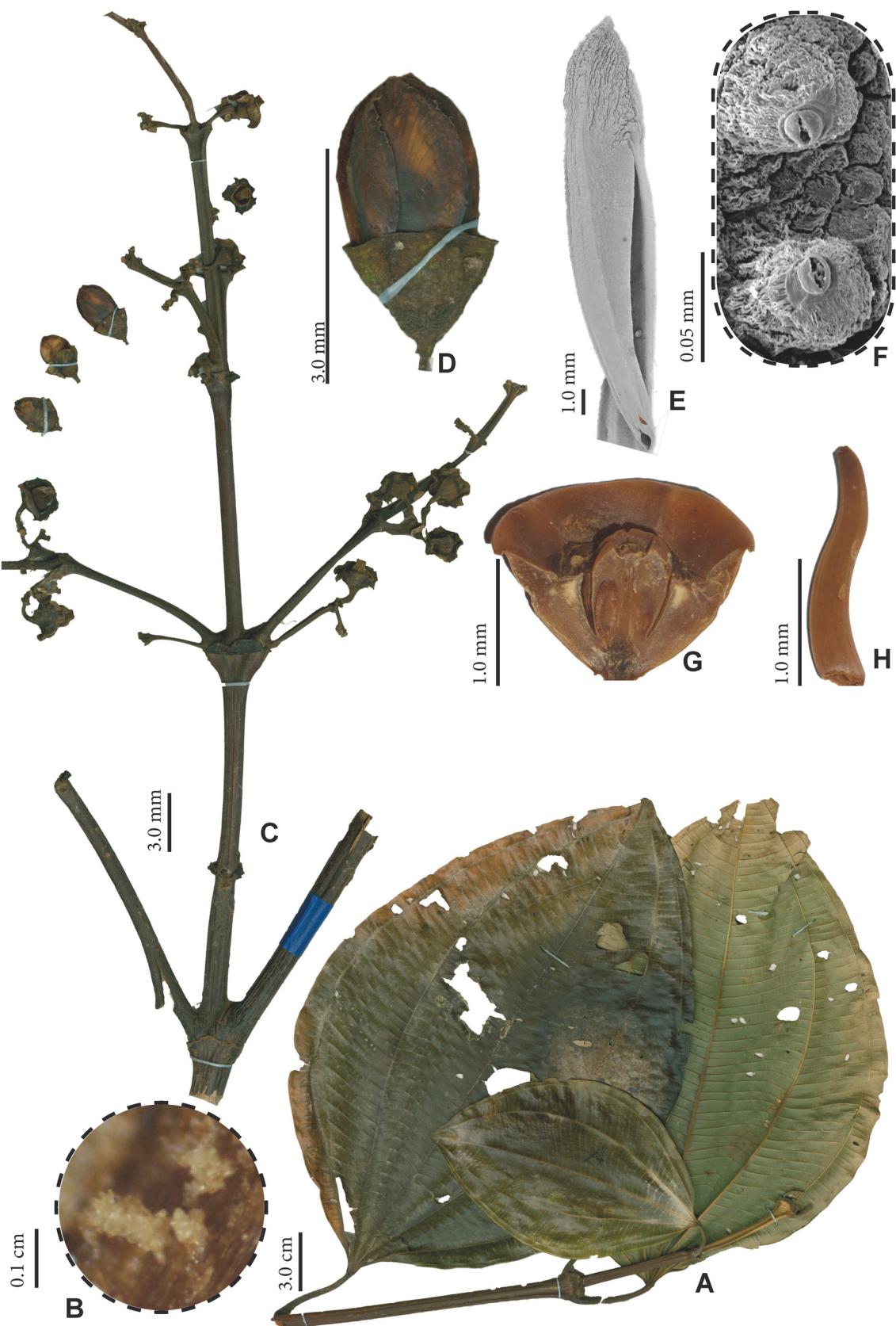


FIGURE 7. *Meriania zunacensis*. Images of holotype and pickled floral material. A. Branch with leaves. B. Detail of adaxial leaf surface with white, squamulose trichomes. C. Inflorescence of *M. zunacensis* with fruits, single buds shown as well. D. Detail of E, mature bud of *M. zunacensis*. E. Scanning-Electron Microscopy picture of stamen, note apical pore and ornamented connective joint. F. Detail of E, showing stomata on connective joint. G. Longitudinal section of hypanthium with slightly outwards-curved calyx. H. Strongly curved style.

Habitat, Distribution and Ecology:—*Meriania zunacensis* has only been collected in the low montane forests of the Cordillera Abitagua, part of the Eastern Cordillera (Cordillera Oriental) of Ecuador, in the Rio Zuñac Reserve of the EcoMinga foundation in the province of Tungurahua at around 1570 m (Figure 1). Some individuals were observed along the riverbanks of the Rio Zuñac in the riparian forest at approximately 1550 m.

Meriania zunacensis has been collected in flower and fruit in November 2016 and in May 2018, and photographed in flower in late September 2014. According to a recent publication on pollination syndromes in Merianieae, the species is most likely buzz pollinated by bees (Dellinger *et al.* 2019a). A strong, sweet scent was noted from the flowers.

Conservation status:—*Meriania zunacensis* is here considered as endemic to Ecuador (but see below). The species has been collected in a well-conserved area of lowland montane forest in the Rio Zuñac Reserve very close to the river that gave the name to this protected area. Based on the analysis of the IUCN Red List Categories and Criteria (2019), this species should be listed as Critically Endangered CR B2ab(iii, iv) with an Area of Occupancy (AOO) of 4 km². Although some individuals have been found along the Zuñac river, it is not known if they exist along riverbanks in the vicinity.

Recently, specimens very similar to *M. zunacensis* have been collected in Peru (Goldenberg, pers. com.). While these have not yet been compared systematically with our type specimen, it is possible that the Rio Zuñac specimens of *M. zunacensis* and the Peruvian specimens actually are the same species. Hence, *M. zunacensis* may not be endemic to Ecuador, but rather occur in small, isolated populations also in Peru, and potentially other little-explored parts of Ecuador.

Etymology:—The species is named after the Rio Zuñac Reserve, owned by the EcoMinga Foundation, where it was found growing near the Rio Zuñac.

Additional specimens examined (paratypes):—Ecuador. Tungurahua: Cantón Baños, Parroquia Río Negro, Sector El Topo, Reserva Río Zuñac, Fundación EcoMinga, Bosque siempreverde montano bajo, Sendero sin nombre a lo largo del río Zuñac, 1°22.593'S 78°09.250'W (+/- 50 m), 1569 m, 26 May 2018 (fl), L. Jost *et al.* 10601, QCNE!; 1°22.593'S 78°09.213'W (+/- 50 m), 1568 m, 14 November 2016, D. Fernández *et al.* 2285, QCNE!, WU-092845 [1/2]!, WU-092844 [2/2]!.

Discussion:—*Meriania zunacensis* resembles *M. maxima* in being a large tree, with many-flowered panicles, the magenta flower being large (petals 40–58 mm long) and widely open with reflexed petal tips, but it differs from *M. maxima* by an isomorphic androecium (vs. strong heteranthery in *M. maxima*), a fleshy, strongly curved style (vs. slender style, hooked only at the apex in *M. maxima*), and a conspicuous and persistent stipuliform flap (vs. small and sometimes caducous in *M. maxima*) (Table 1).

The prominent stipuliform flap is a very conspicuous feature in *Meriania zunacensis*, similar to flaps of *M. sanguinea* Wurdack (1967: 4), *M. tetragona* (Cogniaux 1908: 137) Wurdack (1964: 411) and *M. almedae* Wurdack (1979: 339–340). These species differ from *M. zunacensis* habitually (scandent shrubs, no higher than 4 m), pseudocampanulate flowers, bright red corollas and straight styles (Table 1).

In a recently published molecular phylogeny, *Meriania zunacensis* falls within the same clade as *M. ardyae* but appears to be more closely related to *M. maxima* as well as the habitually smaller species *M. maguirei* Wurdack (1967: 6) and *M. drakei* (Cogniaux 1891: 447) Wurdack (1967: 3) (Dellinger *et al.* 2019a). *Meriania zunacensis* is distinguished from *M. maguirei* by being a large tree (vs. slender treelets less than 4 m high), prominent stipuliform flaps (interptiolar lines in *M. maguirei*), multiflowered inflorescences (vs. single in *M. maguirei*) and strongly curved style (vs. hooked only at apex in *M. maguirei*). *Meriania zunacensis* differs from *M. drakei* by an inconspicuous petiole lacking a scutum at the leaf base (vs. saddle-shaped petiole with tuberculate scutum in *M. drakei*), prominent stipuliform flaps (small in *M. drakei*) and strongly curved style (vs. hooked only at apex in *M. drakei*), compare Table 1.

Conclusions

Our discovery of two new species of *Meriania* within a relatively small area yet again highlights the extremely small-scaled, localized plant diversification characteristic for Andean plant diversity. Further, the sites of discovery lie in an area that has been explored by Melastomataceae experts previously (and led to the discovery of *M. aurata* Ulloa *et al.* 2007). Only repeated explorative fieldwork (i.e. in different seasons, on different slopes) helps to gradually establish a more complete picture of clade diversity. Finally, our results demonstrate the importance of conservation through the joint action of governmental and private initiatives.

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References

- Almeda, F. (1993) An evaluation of the Mesoamerican species of *Meriania* (Melastomataceae: Merianieae). *Proceedings of the California Academy of Sciences* 48 (7): 141–152.
- Bentham, G. (1844) *Plantas Hartwegianas imprimis Mexicanas*. London, pp. 1–363.
- Candolle, A. (1828) Melastomaceae. *Prodromus Systematis Naturalis Regni Vegetabilis* 3: 127.
- Chiavegatto, B. & Baumgratz, J.F.A. (2015) A new Species of *Meriania* (Melastomataceae; Merianieae) from the Brazilian Atlantic Forest. *Systematic Botany* 40 (3): 791–795.
<https://doi.org/10.1600/036364415X689258>
- Cogniaux, A. (1891) Mélastomacées. In: Candolle, A. & C. (Eds.) *Monographiae Phanerogamarum*, Vol 7. Parisii. 1256 pp.
- Cogniaux, A. (1908) Melastomataceae peruvianaee. In: Urban, I. (Ed.) *Plantae novae andinae imprimis Weberbauerianae. Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 42: 137.
- Cotton, E., Borchsenius, F. & Balslev, H. (2014) A revision of *Axinaea* (Melastomataceae). *Sci Dan B, Biologica*, Volume 4. Det Kongelige Danske Videnskabernes Selskab. The Royal Danish Academy, 120 pp.
- Dellinger, A.S., Penneys, D., Staedler, Y.M., Fragner, L., Weckwerth, W. & Schönenberger, J. (2014) A Specialized Bird Pollination System with a Bellows Mechanism for Pollen Transfer and Staminal Food Body Rewards. *Current Biology* 24 (14): 1615–1619.
<https://doi.org/10.1016/j.cub.2014.05.056>
- Dellinger, A.S., Chartier, M., Fernández-Fernández, D., Penneys, D.S., Alvear, M., Almeda, F., Michelangeli, F.A., Staedler, Y., Armbruster, W.S. & Schönenberger, J. (2019a) Beyond buzz-pollination – departures from an adaptive plateau lead to new pollination syndromes. *New Phytologist* 221 (2): 1136–1149.
<https://doi.org/10.1111/nph.15468>
- Dellinger, A.S., Artuso, S., Pamperl, S., Michelangeli, F.A., Penneys, D.S., Fernández-Fernández, D.M., Alvear, M., Almeda, F., Armbruster, S., Staeder, Y. & Schönenberger, J. (2019b) Modularity increases rate of floral evolution and adaptive success for functionally specialized pollination systems. *Nature Communications Biology* 2: 471.
<https://doi.org/10.1038/s42003-019-0697-7>
- Don, D. (1823) An Illustration of the Natural Family of Plants called Melastomaceae. *Memoirs of the Wernerian Natural History Society* 4: 284, 314–315.
- Fernández-Fernández, D. (2010) *Análisis cladístico de las especies ecuatorianas del género Meriania (Melastomataceae) basado en caracteres morfológicos y moleculares*. Tesis Master. Universidad Internacional Menéndez Pelayo, España.
- Goldenberg, R., Michelangeli, F.A., Aona, L.Y.S. & Amorim, A.M. (2016) Angiosperms and the Linnean shortfall: three new species from three lineages of Melastomataceae at one spot at the Atlantic Forest. *PeerJ* 4: e1824.
<https://doi.org/10.7717/peerj.1824>
- Goldenberg, R., Meyer, F.S. & Michelangeli, F.A. (2020) Taxonomic notes in *Meriania* (Melastomataceae) from the Brazilian Atlantic Forest, including a new species, a resurrected one and a new synonym. *Phytotaxa* 453: 218–232.
<https://doi.org/10.11646/phytotaxa.453.3.4>
- Markgraf, F. (1938) *Notizblatt des Botanischen Gartens und Museums zu Berlin-Dahlem* 13: 461.
<https://doi.org/10.2307/3994830>

- Mendoza-Cifuentes, H. & Fernández-Alonso, J.L. (2010) Evaluación de caracteres del cáliz y de los estambres en la tribu Merianieae (Melastomataceae) y definición de homologías. *Revistas de la Academia Colombiana de Ciencias* 34: 143–172.
- Mendoza-Cifuentes, H. & Fernández-Alonso, J.L. (2012) Novedades en *Centronia* y *Meriania* (Merianieae, Melastomataceae) y revisión taxonómica de *Meriania* grupo *brachycera*. *Anales del Jardín Botánico de Madrid* 69: 259–294.
<https://doi.org/10.3989/ajbm.2317>
- Mendoza-Cifuentes, H., Almeda, F. & Alvear, M. (2014) Novelties in *Meriania* (Melastomataceae: Merianieae) from Andean rainforests of Colombia. *Phytotaxa* 178: 23–32.
<https://doi.org/10.11646/phytotaxa.178.1.2>
- Michelangeli, F.A., Carmenate-Reyes, W. & Sosa, K. (2015) A revision of *Meriania* (Melastomataceae) in the Greater Antilles with emphasis on the status of the Cuban species. *Brittonia* 67: 118–137.
<https://doi.org/10.1007/s12228-015-9366-4>
- Michelangeli, F.A. & Goldenberg, R. (2018) New and noteworthy Melastomataceae from the Yanachaga-Chemillén National Park and surrounding areas in Oxapampa, Pasco, Peru. *Phytotaxa* 374: 185–210.
<https://doi.org/10.11646/phytotaxa.374.3.1>
- Renner, S.S. (1993) Phylogeny and classification of the Melastomataceae and Memecylaceae. *Nordic Journal of Botany* 13: 519–540.
<https://doi.org/10.1111/j.1756-1051.1993.tb00096.x>
- Ruiz, H. & Pavón, J. (1794) *Florae Peruvianae, et Chilensis Prodromus*. Imprenta de Sancha, Madrid, pp. 1–153.
- Schulman, L. & Hyvönen, J. (2003) A cladistics analysis of *Adelobotrys* (Melastomataceae) based on morphology, with notes on generic limits within the tribe Merianieae. *Systematic Botany* 28: 738–756.
- Swartz, O. (1798) *Meriania. Flora Indiae Occidentalis* 2: 823.
- Thiers, B. (2016) Index Herbariorum: A Global Directory of Public Herbaria and Associated Staff. New York Botanical Garden's Virtual Herbarium. Available from: <http://sweetgum.nybg.org/science/ih/> (accessed 28 August 2020)
- Triana, J. (1871) Les Mélastomacées. In: *Transactions of the Linnean Society of London* 28 (1): 66.
<https://doi.org/10.1111/j.1096-3642.1871.tb00222.x>
- IUCN Standards and Petitions Committee. (2019) Guidelines for Using the IUCN Red List Categories and Criteria. Version 14. Prepared by the Standards and Petitions Committee. Available from: <http://www.iucnredlist.org/documents/RedListGuidelines.pdf> (accessed 28 August 2020)
- Ulloa Ulloa, C., Fernández-Fernández, D. & Neill, D.A. (2007) *Meriania aurata* (Melastomataceae), una Especie Nueva de los Llanos, Ecuador. *Novon* 17: 525–528.
[https://doi.org/10.3417/1055-3177\(2007\)17\[525:MAMUEN\]2.0.CO;2](https://doi.org/10.3417/1055-3177(2007)17[525:MAMUEN]2.0.CO;2)
- Ulloa Ulloa, C. & Homeier, J. (2008) *Meriania franciscana* (Melastomataceae), una especie nueva de los Andes del Ecuador. *Anales del Jardín Botánico de Madrid* 65: 383–387.
<https://doi.org/10.3989/ajbm.2008.v65.i2.300>
- Uribe, L. (1969) Sertula Florae Colombiae, XI. *Caldasia* 10 (48): 292.
- Wurdack, J.J. (1964) Certamen Melastomataceis VIII. *Phytologia* 9: 411.
<https://doi.org/10.2307/2804774>
- Wurdack, J.J. (1967) Plant collected in Ecuador by W. H. Camp—Melastomataceae. *Memoirs of The New York Botanical Garden* 16: 1–45.
- Wurdack, J.J. (1974) Certamen Melastomataceis XXIII. *Phytologia* 29 (2): 142–143.
- Wurdack, J.J. (1979) Certamen Melastomataceis XXX. *Phytologia* 43 (4): 339–340.