

Botanical novelties from Sierra de Maigualida, southern Venezuela. II

José R. Grande^{1*}, Jacquelyn Kallunki², María M. Arbo³, Paul E. Berry⁴, Otto Huber⁵ & Ricarda Riina^{4,6}

¹Postgrado en Botánica, Instituto de Biología Experimental, Facultad de Ciencias, Universidad Central de Venezuela, Calle Suapure, Colinas de Bello Monte, Apartado 47114, Caracas 1041-A, Distrito Capital, Venezuela; jose.r.grande@gmail.com

²Associate Director and Curator of the Herbarium, New York Botanical Garden, Bronx, NY 10458-5126, USA; jkallunki@nybg.org

³Curadora del Herbario CTES, Instituto de Botánica del Nordeste, C.C. 209-3400 Corrientes, Argentina; arbo@agr.unne.edu.ar

⁴University of Michigan Herbarium and Department of Ecology and Evolutionary Biology, 3600 Varsity Drive, Ann Arbor, MI 48108, USA; peberry@umich.edu

⁵Fundación Instituto Botánico de Venezuela "Dr. Tobias Lasser", Herbario Nacional de Venezuela, Universidad Central de Venezuela, Apartado 2156, Caracas, Distrito Capital, Venezuela; huberotto8@gmail.com

⁶Real Jardín Botánico, CSIC, Plaza de Murillo 2, E-28014 Madrid, Spain; rriina@rjb.csic.es

Abstract

Grande, J.R., Kallunki, J., Arbo, M.M., Berry, P.E., Huber, O. & Riina, R. 2012. Botanical novelties from Sierra de Maigualida, southern Venezuela. II. *Anales Jard. Bot. Madrid* 69(1): 7-19.

Four new species, *Siphocampylus acanthidiotrichus* J.R. Grande (Campanulaceae), *Phyllanthus huberi* Riina & P.E. Berry (Phyllanthaceae), *Sohnreyia maigualidensis* J.R. Grande & Kallunki (Rutaceae), and *Turnera maigualidensis* J.R. Grande & Arbo (Turneraceae) are described and illustrated from the summit areas of Sierra de Maigualida in the Guayana Highlands of southern Venezuela. To date, one genus, 32 species, one subspecies, and one variety of angiosperms are known only from the Maigualida meadows and shrublands, between 1800 m and the highest elevation areas at 2400 m. Here we describe the first iteroparous species for the genus *Sohnreyia* K. Krause, a *Turnera* L. species with apically villose, apiculate petals, and a *Siphocampylus* Pohl species with aculeiform hairs and pinnatisect leaves. The new species, *Siphocampylus acanthidiotrichus*, together with *S. tillettii* Steyerl., represents a morphologically distinct subgroup within the genus.

Keywords: Campanulaceae, Guayana Highlands, Guiana Shield, Pantepui, Phyllanthaceae, Rutaceae, taxonomy, Turneraceae.

INTRODUCTION

This is the second installment of a series of papers updating the floristic knowledge of Sierra de Maigualida, a relatively recently discovered granitic mountain range in southern Venezuela which is surrounded by several typical Guayanan sandstone table mountains (tepui). A description of the geography, geology and vegetation of this mountain range, including a detailed map, can be found in Huber & al. (1997) and in the first issue of this series (Nozawa & al., 2010). A preliminary checklist of the vascular plant species of the Sierra de Maigualida is given in Rodríguez & al. (2008), but a more detailed one, including floristic patterns, as well as the history of its botanical exploration, is in preparation (Grande & al., in prep.).

Including the results shown in the present work, 37 new species, two new subspecies and one new variety of an-

Resumen

Grande, J.R., Kallunki, J., Arbo, M.M., Berry, P.E., Huber, O. & Riina, R. 2012. Novedades botánicas de la Sierra de Maigualida, sur de Venezuela. II. *Anales Jard. Bot. Madrid* 69(1): 7-19 (en inglés).

Se describen e ilustran cuatro especies nuevas procedentes de las cumbres de la Sierra de Maigualida: *Siphocampylus acanthidiotrichus* J.R. Grande (Campanulaceae), *Phyllanthus huberi* Riina & P.E. Berry (Phyllanthaceae), *Sohnreyia maigualidensis* J.R. Grande & Kallunki (Rutaceae) y *Turnera maigualidensis* J.R. Grande & Arbo (Turneraceae). Hasta ahora un género, 32 especies, una subespecie y una variedad de angiospermas se conocen exclusivamente de la Sierra de Maigualida, y todas ellas proceden de herbazales y arbustales desarrollados entre los 1800 m y las áreas más altas, a 2400 m. Aquí, se describen por primera vez una especie iterópara del género *Sohnreyia* K. Krause (Rutaceae), una especie de *Turnera* L. con pétalos apiculados apicalmente villosos y una especie de *Siphocampylus* Pohl con pelos aculeiformes y hojas pinnatisectas. La nueva especie *Siphocampylus acanthidiotrichus* representa, junto a *S. tillettii* Steyerl., un subgrupo morfológicamente distinto dentro del género.

Palabras clave: Campanulaceae, Escudo Guayanés, Pantepui, Phyllanthaceae, Rutaceae, taxonomía, Turneraceae.

giosperms have been described so far from material from the Sierra de Maigualida; of these, 32 species, one subspecies and one variety are endemic. Species considered as endemic do not include *Tibouchina huberi* Wurdack (Melastomataceae), which is also known from Cerro Ualiapano (Wurdack, 1990). References to previously published taxa can be found in Anderson (1995), Croat & al. (2010), Frodin (1993), Holst (1993, 2002), Kirkbride (1997), Morillo (1993), Pruski (1992, 2011), and Sastre (2001) and see Nozawa & al. (2010) for the remaining 11. One genus (*Huberopappus*, Asteraceae) is endemic to Sierra de Maigualida. There are some common traits to the endemic elements from this massif. The new eudicot species described so far from the summits of Sierra de Maigualida are shrubby or suffruticose plants, which tend to have coriaceous leaves with revolute margin, clustered towards the apex of

* Corresponding author.

branchlets. This common vegetative feature makes those species relatively easy to distinguish from their closest relatives, especially the non-Pantepui taxa. In addition, most of the species described from Maigualida have their vegetative parts covered by hair-like fungal mycelia and/or bryophytes, a condition often shared with other plants from the Pantepui Province.

In the present contribution, four species belonging to four families (Campanulaceae, Phyllanthaceae, Rutaceae and Turneraceae), are described and illustrated. Some of them exhibit remarkable features within their respective genera. This is the first record of an iteroparous species for the genus *Sohnreyia* (Rutaceae), a *Turnera* species with apically villose, apiculate petals, and a *Siphocampylus* species with aculeiform hairs and pinnatisect leaves.

The continuous exploration work and new cartography generated require some corrections on the topographical nomenclature in this region. Localities referring to "Río Chajura" in previously published species [including those in *Botanical Novelties from Sierra de Maigualida, southern Venezuela. I* (Nozawa & al., 2010)] are to be changed to Río Yudi, according to the updated geographical information included in Huber (1995), and cited in Huber & al. (1997).

RESULTS AND DISCUSSION

CAMPANULACEAE

The following new species was treated as *Siphocampylus* sp. A in *Flora of the Venezuelan Guayana* (Stein, 1998), in which a brief description as well as an illustration. It was not accounted for, however, in the *Nuevo Catálogo de la Flora Vasculare de Venezuela* (Madriz, 2008).

Siphocampylus acanthidiotrichus J.R. Grande, sp. nov.

Typus: Venezuela. Bolívar: Municipio Cedeño, Sierra de Maigualida, sector nor-oriental, altiplanicie tepuyana ubicada en las cabeceras del Río Yudi ["Río Chajura" in the label], afluyente occidental del Río Erebató, aprox. 100 Km (en línea recta) al SW del campamento EntreRíos, 05°33'N, 65°13'W, ± 2100 m, 28-III-1988 (fl), O. Huber 12746 (holotypus, VEN-283600; isotypus, NY).

A reliquis Siphocampylo speciebus hactenus descriptis differt; caule, calyce ac corolla trichomatibus minutis aculeiformibus tectis.

Subfrutex geniculatus, 0.2-0.5 m altus, caule, calyce ac corolla trichomatibus minutis aculeiformibus tectis. Caulis usque 3 mm diametro, pustulatus, apicem versus glabrescens. Folia alterna, petiolo 0.45-0.7 cm longo, pustulis oblongis praedito; lamina ovata e conspicue lobulata pinnatisecta, 1.9-3.4 cm longa, 0.75-1.5 cm lata, basi attenuata, margine paulum revoluta, apice acuta, interdum pilis albis, complanatis, erectis usque 1 mm longis donata; lobulis acutis, laminae pagina pustulis rotundatis et nervis pustulis oblongis praeditis. Inflorescentiae simplices, axillares, versus apicem ramorum nascentes, erectae, 9.1-17 cm longae. Flores 3.8-4.3 cm longi, trichomatibus minutis aculeiformibus et mamillatis usque 0.15 mm longis, tecti. Calyx e sparse hispidulo gla-

brescens, hypanthio turbinato, 4.8-5.1 mm longo, 4-5, mm lato, lobulis lineari-triangularibus, apice calloso et margine integro, 5-5.2 mm longis, 1.5-1.6 mm latis. Corolla 3.2-3.9 cm longa, 0.56-0.73 cm lata, hispidula, lobulis satis dense pubescentibus, dorsalibus 5.5-7.5 mm longis, 1.8-2 mm latis, lateralibus 3.7-5.7 mm longis, 1.7-2.9 mm latis, ventrali 6-8.2 mm longo, 2.6-3.6 mm lato. Antherarum tubus 4-4.5 mm longus, 1.8-1.85 mm latus, pilis simplicibus adpressis, albis, usque 0.5 mm longis, super tres antheras dorsales in parte gibbosa apicali, et crista pilorum setosorum alborum et erectorum super duas antheras ventrales. Fructus membranosus, conicus superficie reticulatus, 4.9 mm altus, apiculo 1.3 mm longo inclusive. Semina rotundata, dorsiventraliter tenuiter complanata, ca. 1 mm longa, minute foveolata.

Geniculate subshrub, 0.2-0.5 m tall, rooting at the lower nodes. Stems fistulose, the pith reduced to a membrane attached to the inner surface, terete, up to 3 mm in diameter, conspicuously longitudinally winged, covered by oblong pustules, glabrous except near the apex, where they are glabrescent, with flattened white hairs to 0.5 mm long, rising from the apex of the pustules, and tiny aculeiform hairs. Leaves simple, alternate, petiolate, petiole with oblong pustules, terete, with winged margins, from 0.45 to 0.7 cm long, blade ovate, conspicuously lobed to pinnatisect, 1.9-3.4 × 0.75-1.5 cm, with attenuated base, margin slightly revolute, apex acute, sometimes with erect flattened white hairs up to 1 mm long, lobes acute, with a verrucose apex (a colleter?), surface of blades with rounded pustules, except in the nerves where they are oblong. Inflorescences simple, axillary, towards the apex of branches, pedicels erect, slightly curved at the apex, 9.1 to 17 cm long, bracts sinuous or revolute, glabrous or sparsely hispidulous, linear-subulate, 1 mm long, born to 0.45-3.6 cm from the base, with the apex verrucose (a colleter?). Flowers 3.8-4.3 cm long, with tiny aculeiform trichomes, slightly recurved upwards, up to 0.15 mm long, translucent; anther tube at the same level as the lobes of the corolla at anthesis. Calyx sparsely hispidulous to glabrescent, hairs 0.05-0.1(0.15) mm long, hypanthium turbinate, 4.8-5.1 × 4.5-5.2 mm, 10-costate, more conspicuously so along 5 main nerves; lobes linear-triangular, with apex verrucose (a colleter?) and the margin entire, 5-5.2 × 1.5-1.6 mm. Corolla 3.2-3.9 × 0.56-0.73 cm, constricted to 2.7-3.8 mm at 0.65-0.8 cm from the base, then abruptly widened, with pubescence as the calyx, but denser, and with nipple hairs, some thicker than others; lobes with relatively dense pubescence, dorsal lobes 5.5-7.5 × 1.8-2 mm, linear-oblong, with apex curved downwards briefly, lateral lobes slightly falcate, 3.7-5.7 × 1.7-2.9 mm, ventral lobe slightly curved downwards, 6-8.2 × 2.6-3.6 mm. Staminal tube 0.85-1 mm wide, glabrous; anther tube 4-4.5 × 1.8-1.85 mm, with simple, appressed, white hairs, up to 0.5 mm long on the gibbous (apical) portion of the three dorsal anthers, and a tuft of white, erect and setose hairs on the apex of the two ventral anthers. Fruit conical, flattened dorsiventrally, with convex sides, membranous, 4.9 × 4.8 mm including a beak of 1.3 mm long, the surface reticulate. Seeds round, slightly flattened dorsiventrally, ca. 1 mm long, minutely foveate. (Fig. 1).

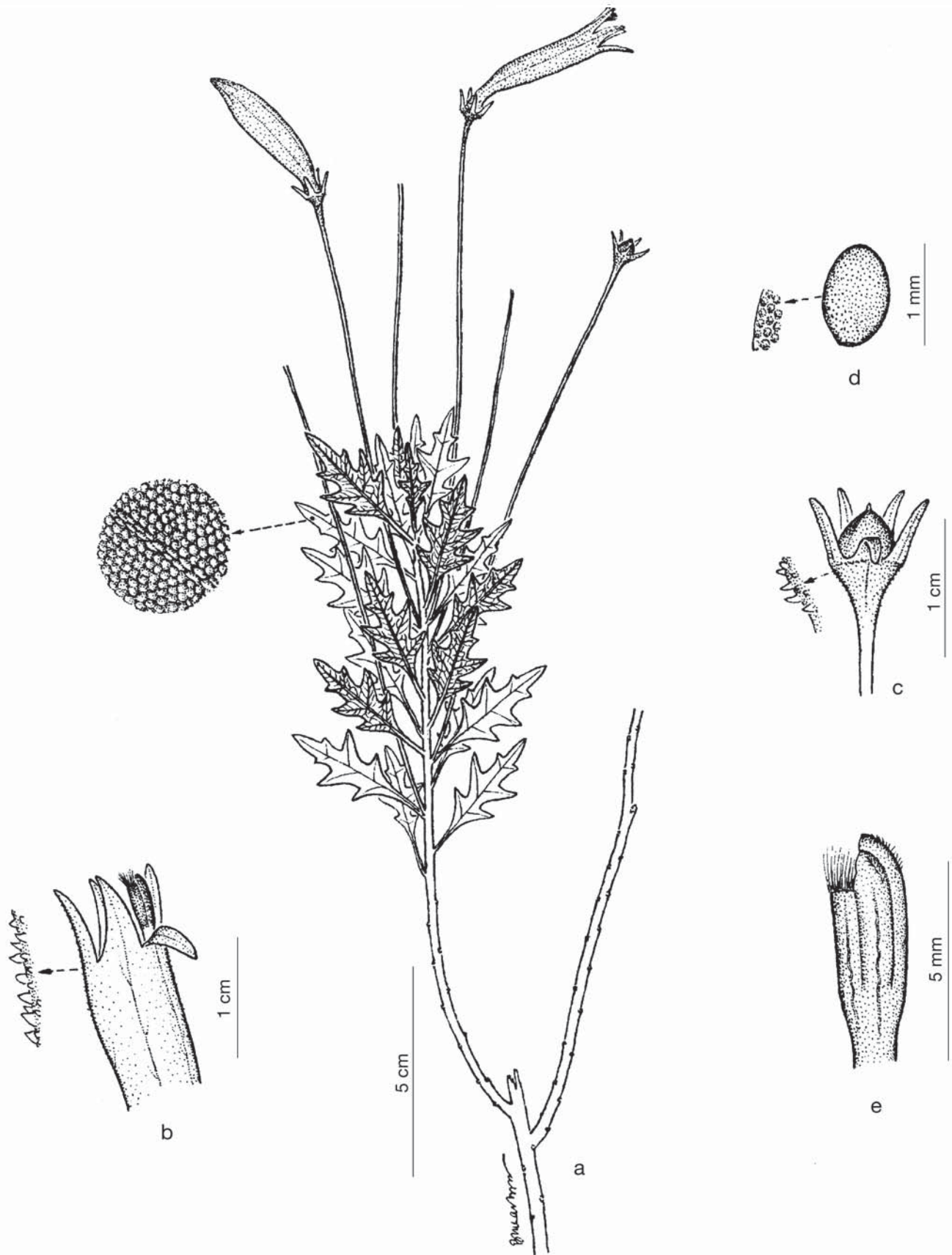


Fig. 1. *Siphocampylus acanthidiotrichus*: **a**, habit, detail of adaxial surface of leaf blade; **b**, apex of the flower, with details of pubescence abaxial side of corolla lobe; **c**, calyx, with detail of pubescence at the apex of the calyx tube; **d**, seed, extended surface, showing the tiny foveae; **e**, anther tube. (Drawn by Bruno Manara from *O. Huber* 12746 [holotype]; **a, c, f**, *O. Huber & L. Izquierdo* 12782; **b, d, e**, from *O. Huber* 13067).

Tab. 1. Morphological differences between *Siphocampylus acanthidiotrichus* and *S. tillettii*.

	<i>S. acanthidiotrichus</i>	<i>S. tillettii</i>
Trichomes	Tiny aculeiform, up to 0.15 mm long	Subulate, up to 0.25 mm long
Leaf margins	Lobed to pinnatisect, slightly revolute	Serrate
Calyx	Sparsely hispidulous to glabrescent, hairs 0.05-0.1(0.15) mm long	Hispid pubescence, subulate hairs 0.07-0.25 mm long
Calyx lobes	Entire, 5-5.2 × 1.5-1.6 mm	Serrate, 4.7-11.1 × 1.1-1.8 mm
Pedicels length (at anthesis)	9.1-17 cm	5.5-13.7 cm

Etymology

The compound epithet *acanthidiotrichus* means, in latinized Classical Greek, “with tiny spiny [or aculeiform] hairs”, and is derived from *ákanthos*, spine, *-idium*, latinised greek substantival suffix for neutral diminutives, and *thrix*, *trichos*, hair.

Diagnostic characters

Siphocampylus acanthidiotrichus is the only known species in the genus with tiny aculeiform trichomes. It is very similar to *S. tillettii* Steyer., from which it can be differentiated according to the characters listed in Table 1. Although infrageneric, and even generic divisions within subfamily Lobelioideae do not reflect the current phylogenetic hypothesis (Knox & al., 2008; Lammers, 1998), until now the most thorough classification is that of Wimmer (1953), according to which *Siphocampylus acanthidiotrichus* and *S. tillettii* are part of *Siphocampylus* sect. *Macrosiphon* subsect. *Eusiphocampylus* (A. DC.) E. Wimm. Both species can be assigned to this subsection by virtue of their corolla tubes, which are 2-5 times longer than the limb, and their filaments, which are adnate to the corolla from the base to the constriction. By virtue of their habit (geniculate, rooting at lower nodes and not exceeding 0.5 m high), surface of leaves and stems (bullate), texture and margins of leaves (coriaceous), relatively long pedicels, and corolla with reddish-orange tube and yellow lobes, they could be considered part of a small, well-delimited group restricted to the Guayana Highlands.

Distribution and habitat

Siphocampylus acanthidiotrichus is endemic to Sierra de Maigualida, where it grows in shrubby meadows at 2100-2150 m elevation, on soils developed from granitic substrate. According to the information in the collection labels it is not clear whether *S. acanthidiotrichus* grows on peatlands or on rocky exposures. *Siphocampylus tillettii*, the most similar species, is restricted to rock outcrops on Cerro Marahuaka (Stein, 1998; Steyermark, 1978), a sandstone table mountain in western Venezuelan Guayana.

Paratypes

VENEZUELA. **Amazonas:** Departamento Atures, Sierra de Maigualida, sector nor-oriental, altiplanicie disectada de granito en las cabeceras nororientales del Río Iguana, afluente del Río Ventuari, 05°40'N, 65°08'W, ± 2150 m, 24-XI-1989, (fl, fr), O. Huber 13067 (VEN-372737, MO), Cabeceras del Río Asita en la sección nororiental de la Sierra de Maigualida, grandes extensiones de turberas con herbazales arbustivos tepuyanos, 5°34'N, 65°13'W, ± 2150 m, 8-III-1996, (fl), O. Huber & R. Riina 13634 (Unicata: VEN-301116). **Bolívar:** Distrito Cedeño, Sierra

de Maigualida, sector nor-oriental, altiplanicie tepuyana disectada sobre granito en las cabeceras del Río Yudi [“Río Chajura” in the label], afluente occidental del Río Erebató, aprox. 100 km (en línea recta) al SW del Campamento EntreRíos, 05°33'N, 65°13'W, 2100 m, 18-XI-1988, (fl), O. Huber & L. Izquierdo 12782 (VEN-372722; MO, 2 sheets).

PHYLLANTHACEAE

Following current classifications based on phylogenetic hypotheses (APG III, 2009; Hoffmann & al., 2006; Stevens, 2011), the genus *Phyllanthus* L. is included within the family Phyllanthaceae, formerly considered a member of Euphorbiaceae and included as such in the Flora of the Venezuelan Guayana (Webster, 1999).

Phyllanthus huberi Riina & P.E. Berry, sp. nov.

Typus: Venezuela. Bolívar: Distrito Cedeño, Sierra de Maigualida, sector nor-oriental, altiplanicie disectada sobre granito en las cabeceras del Río Yudi [“Río Chajura” in the label], afluente occidental del Río Erebató, aprox. 100 km (en línea recta) al SW del Campamento EntreRíos, 05°33'N, 65°13'W, 2100 m, 18.xi.1988, (fl, fr), O. Huber & L. Izquierdo 12806 (holotypus, VEN; isotypi, DAV, MA, MYF, M, NY).

Phyllantho tepuicolae affinis, sed foliis petiolisque maioribus, apice foliorum retuso, marginibus valde revolutis, pedicello pistillato minori differt.

Frutices monoeci 0.2-1.5 m alti. Caules primores erecti, dense ramosi, cortice irregulariter crustaceo, e griseo nigrescente; ramis teretibus, ascendentibus, 3-9 cm longis, 1.2-2 mm diametro, 24-35 foliis praeditis. Folia laminis anguste oblanceolatis, 5-14 mm longis, 2-3 mm latis, coriaceis, glabris, eglandulosis, supra nitentibus, subtus opacis, basi cuneatis, margine integerrimis et valde revolutis; costa supra depressa, subtus suaviter prominenti, venis 4-8, arcuatis, supra obscuris, subtus suaviter prominentibus. Petiolus canaliculatus, abaxialiter teres, 1-1.5 mm longus. Stipulae persistentes, anguste triangulares, coriaceae, glabrae, 1.5-2 mm longae, 0.4-0.6 mm latae, apice ex acuto acuminatae, margine hyalinae, integerrimae, paulo undulatae vel suaviter fimbriatae. Inflorescentiae axillares, bracteis triangularibus, acutis, 0.4-0.5 mm longis. Cimulae staminatae uno alterove flore praeditae, pedicello 0.9-1.5 mm longo; sepalis 6, biserialis, late ellipticis, 1-1.3 mm longis, 0.7-0.9 mm latis, apice obtusis, margine hyalinis; disco glandulis 6, discretis, plus minusve rotundatis, 0.2-0.3 mm diametro; staminibus 3, filamentis liberis vel partialiter connatis; thecis emarginatis, horizontaliter debiscentibus. Flores pistillati praesertim solitarii, 1.5-2.5 mm longi, 1.5-2.5 mm lati, pedicello 2-3 mm longo; sepalis 6, ex elliptico late ellipticis, suaviter imbricatis,

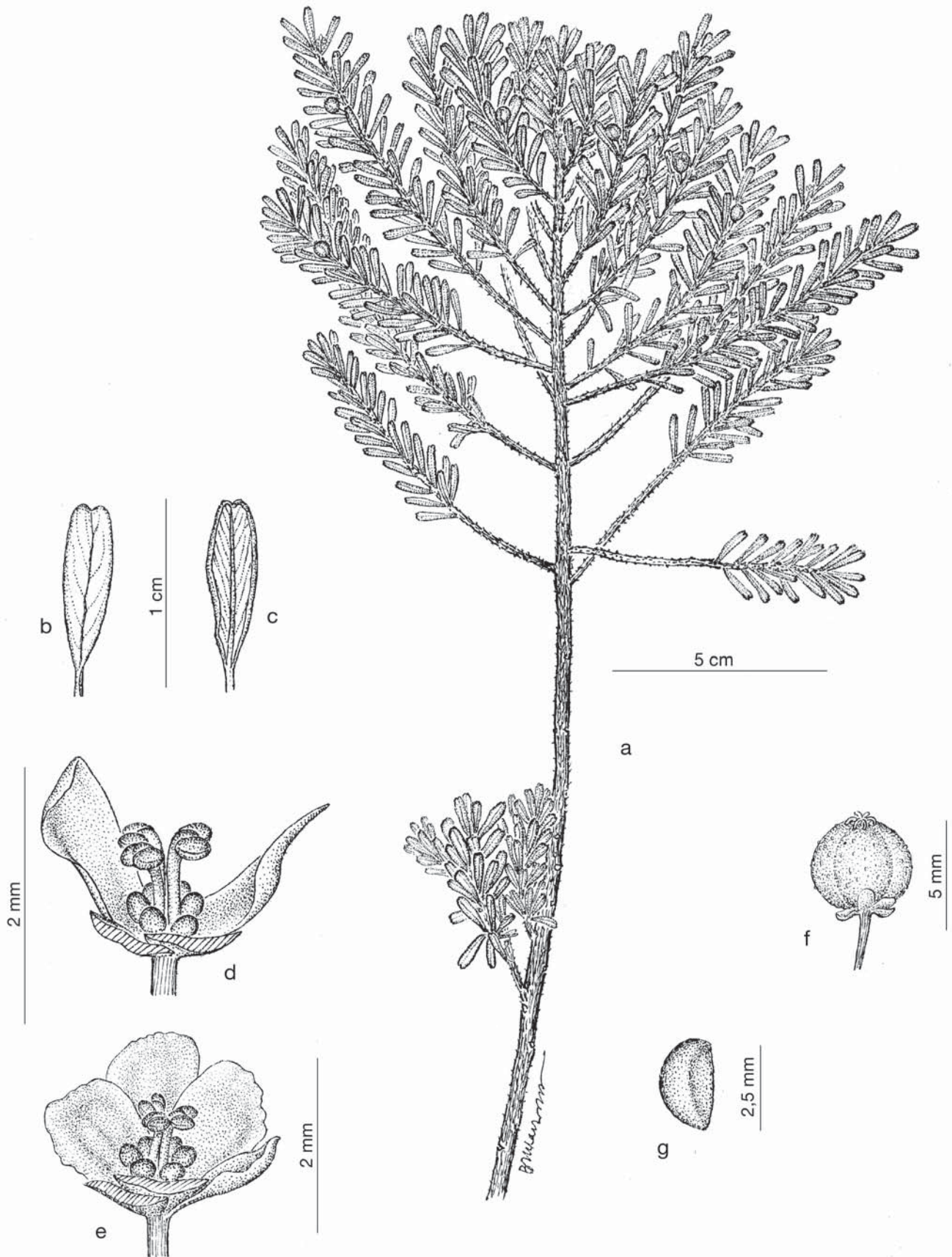


Fig. 2. *Phyllanthus huberi*: **a**, habit; **b**, abaxial side of leaf; **c**, adaxial side of leaf; **d**, staminate flower showing detail of anthers and disc glands (four sepals removed); **e**, staminate flower showing three of the six sepals in detail; **f**, fruit; **g**, seed. (Drawn by Bruno Manara from O. Huber & L. Izquierdo 12806 [holotype]).

glabris, 1.3-1.5 mm longis, 0.8-1.1 mm latis, apice rotundatis, margine hyalinis; disco segmentis 6 contiguas, margine irregulariter dissectis; ovario globoso, glabro, stylo 3, 0.4-0.5 mm longo, horizontaliter protenso, bifido, apicibus corniculatis. Capsulae depresso globosae, triloculares, suaviter sulcatae, 3-3.5 mm longae, 4-5 mm latae, extus pauca verrucosae, rubrae (in sicco e saturate brunneis nigricantes); ovulis binis in loculo; columella persistenti, 2.5 mm longa. Semina triquetra, levia, dilute brunnea, 2.2-2.5 mm longa, 1.1-1.3 mm lata.

Monoecious shrubs 0.2-1.5 m tall. Main stems erect, terete, 3-8 mm diam., densely branching from the base; bark irregularly crusty, gray to blackish; phyllanthoid branchlets terete, ascending, 3-9 cm long, 1.2-2 mm diam., with 24-35 leaves. Leaf blades narrowly oblanceolate, 5-14 × 2-3 mm, coriaceous, glabrous, eglandular, shiny above and dull beneath; base cuneate; apex emarginate; margin entire and strongly revolute; midvein depressed adaxially, raised abaxially; lateral veins 4-8 per side, arching, obscure adaxially, slightly raised abaxially. Petiole terete abaxially, canaliculate adaxially, 1-1.5 mm long. Stipules persistent, narrowly deltate, coriaceous, glabrous, 1.5-2 × 0.4-0.6 mm; apex acute to acuminate; margin hyaline, entire or sometimes undulate or slightly fimbriate. Inflorescences axillary, bracts triangular, acute, 0.4-0.5 mm long. Staminate cymes with 1-2 flowers, pedicel 0.9-1.5 mm long; sepals 6, biseriate, broadly elliptic, 1-1.3 × 0.7-0.9 mm, apex obtuse, margin hyaline; disc glands 6, distinct, ± circular, 0.2-0.3 mm diam.; stamens 3, filaments free or partially connate; thecae divergent, muticous, emarginate, aperture horizontal. Pistillate flowers usually solitary, 1.5-2.5 × 1.5-2.5 mm, pedicel 2-3 mm long; sepals 6, elliptic to broadly elliptic, slightly imbricate, glabrous, 1.3-1.5 × 0.8-1.1 mm, apex rounded, margin hyaline; disc segments 6, contiguous, more or less globose to slightly flattened (when rehydrated); ovary globose, glabrous, styles 3, 0.4-0.5 mm long, horizontally spreading, bifid, the tips corniculate. Capsules depressed-globose, trilocular, slightly sulcate, 3-3.5 × 4-5 mm, outer surface slightly verrucose, red (dark brown to blackish on drying); ovules two per locule; columella persistent, 2.5 mm long. Seeds triquetrous, smooth, light brown, dull, 2.2-2.5 × 1.1-1.3 mm. (Fig. 2).

Etymology

The species honors our friend and colleague Otto Huber, a dedicated worker on the flora and vegetation of the Guayana Region, and the first person to botanically explore the high ridges of Sierra de Maigualida.

Diagnostic characters

The only other species of *Phyllanthus* known to date from the higher altitudes of the Sierra de Maigualida is *P. obfalcatus* Lasser & Maguire. That species differs, however, in its more numerous leaves on the side branches (> 40), its narrower and more falcate leaf blades (1-2 mm wide), and in having a distinct subapical gland 0.1-0.2 mm diam. on the lower leaf surface.

Following Webster's key to *Phyllanthus* in the Flora of the Venezuelan Guayana (Webster, 1999), *P. huberi* keys out closest to *P. maguirei* Jabl. and *P. tepuicola* Steyermark., both high elevation species to which it is presumably allied phylogenetically and characterized by the lack of laminar glands, bifid styles, muticous/emarginate anthers, and the presence of six disk segments in both flower sexes. Of the two, *P. huberi* is more similar to *P. tepuicola*, which is endemic to Cerro Duida, to the southwest in Estado Amazonas. *Phyllanthus huberi* can be distinguished by its larger leaves with an emarginate apex, strongly revolute margins, longer petiole, and shorter pistillate pedicel.

Although *Phyllanthus huberi* is entirely glabrous, the stems and branchlets of the three specimens cited all have a notable blackish growth that could initially be confused with pubescence. This covering is most likely due to the presence of fungal hyphae, perhaps associated with the very humid and cool conditions at the high elevation shrublands and meadows in which the species occurs. Steyermark (1988) made reference to this same phenomenon in several species of *Ilex* L. (Aquifoliaceae) from the Guayana Highlands.

Distribution and habitat

This species is only known from the Sierra de Maigualida, in the Venezuelan Guayana Region, along the border of estado Bolívar and estado Amazonas. It occurs there on sandy soils along streams, at the edge of rock outcrops, and in herbaceous meadows, at 2100-2150 m elevation.

Paratypes

VENEZUELA. Amazonas: Depto. Atures, Sierra de Maigualida, sector nor-oriental, altiplanicie disectada de granito en las cabeceras nor-orientales del Río Iguana, afluente del Río Ventuari, 05°40'N, 65°08'W, 2150 m, 24-XI-1989, (fl, fr), O. Huber 13064 (DAV, VEN; 3 sheets to be distributed). Bolívar: Distrito Cedeño, Sierra de Maigualida, sector nor-oriental, altiplanicie tepuyana ubicada en las cabeceras del Río Yudi ["Río Chajura" in the label], afluente occidental del Río Erebató, aprox. 100 km (en línea recta) al SW del Campamento EntreRíos, 05°33'N, 65°13'W, 2100 m, 28-III-1998, (fl, fr), O. Huber 12739 (DAV, MA, VEN).

RUTACEAE

Sohnreyia K. Krause is a small genus with four species from the Amazonian-Guayan region of northern South America (Appelhans & al., 2011). As presently understood it is a member of tribe Spathelieae, subfamily Spathelioideae, together with the related *Spathelia* L. and *Dictyoloma* A. Juss. Despite some early disagreement about its taxonomic placement and circumscription, this genus is currently accepted as a member of the family Rutaceae, order Sapindales (Stern & Brizicky, 1960; Chase & al., 1999; Groppo & al., 2008; Appelhans & al., 2011; Stevens, 2011).

So far, species described in *Sohnreyia* are characterized by its apically crowded paripinnate leaves, with 7-24 pairs of leaflets, phyllothyrsiform terminal inflorescences (inflorescence terminology following Austin, 1973), and fruits 2-3-winged, wider than long. They are monopodial and semelparous, a combination present also in some monocots like *Agave* L. (Agavaceae-Asparagaceae) and *Corypha* L.

(Arecaceae) but very rare in dicots (Janzen, 1976; Bell, 1980). León & Alaín (1951), in fact, reported that plants of the related *Spathelia* die six months after flowering, once the fruits have ripened. Collections made in the late 1980's and early 1990's above 2000 m elevation in the highlands of Sierra de Maigualida (Central Venezuelan Guayana), however, have revealed the existence of individuals similar to *Sohnreyia ulei* (Engl. ex Harms) Appelhans & Kessler that are capable of producing axillary inflorescences and show an iteroparous condition, being monopodial or sometimes sympodial. These individuals, additionally, are relatively shorter and exhibit a very dense ferruginous pubescence on young organs and leaves with only 2-4(5) pairs of smaller, rugose leaflets (Kallunki, 2005). A deeper examination of the complete set of specimens revealed further differences in the type and distribution of the pubescence, as well as in the filaments, ovary, stigma, and fruit. All together, they suggest a substantial differentiation of the populations on granitic substrate at higher altitudes in Sierra de Maigualida from those that occur on sandstone within a wider altitudinal range, and convinced the authors that it merits specific recognition.

***Sohnreyia maigualidensis* J.R. Grande & Kallunki, sp. nov.**

Typus: Venezuela. Amazonas: Departamento Atures, Sierra de Maigualida, sector nor-oriental, altiplanicie disectada de granito en las cabeceras nor-orientales del Río Iguaña, afluente del Río Ventuari, 05°40'N, 65°08'W, ± 2150 m, 24-XI-1989 (fl, fr), O. Huber 13063 (holotypus, VEN-37776; isotypi, NY, 2 dupl.).

A Sohnreyia uleo, paribus foliolorum paucioribus (2-5 nec 6-20) necnon ramis foliisque junioribus trichomatibus ramosis densis sed postremo deciduis indutis differt.

Frutices 0.5-5(7) m alti, praesertim monopodiales, raro ramosi corona sparsa. Caules juniores, folia, sepala, ovaria necnon fructus, plus minus densa brevi pubescentia stellatis et simplicibus pilis constituta. Pili stellati robro-ferruginei, decidui, (4)5-8-complanato-ramosi, persistentiores in rachi, petiolis, petiolulis, foliolis subtus, inflorescentiae axi calycibusque, praesertim conglomerati in arbuscularum structuras uniformiter subtus distributas in maturis foliolis. Pili simplices hyalini, persistentes, paulo recurvati, subtus in costa foliolorum et supra secus marginem, fragiles in senectute. Caules nigricantes, conspicue cicatricosi, cortice paulo fragili. Folia coriacea, (6.5)10.2-28.5 cm longa, (3)4-7-foliolata, 2-4(5) foliolorum paribus constituta, interdum singulo foliolo in pari basali vel apicali absente, juvenilia e brunneo-ferruginea rubricante, valde obscura pubescentia induta; foliola sessilia vel brevissime petiolata, longe oblongo-ovata vel elliptica, raro elliptico-obovata, coriacea, (2.7)5-12.4 cm longa, 3.1-5.8 cm lata, basi cordata, rarius obtusa, margine suaviter revoluta, apice obtusa, breviter apiculata; supra nitida, rugosa, parum bullata. Inflorescentia terminalis vel lateralis, singulo flore vel interdum florali alabastro abortante terminata; bractee floribus subtensae paulo evolutae; bractee ramis IV et V ordinis subtensae, squamatae, anguste triangulares. Flores praesertim feminini (istius sexi tantum observati), in al-

abastro globosi, erecti, pedicellis 1,2-4 mm longis. Sepala parum coriacea, patenti-erecta, 2-2.1 mm longa, 1-1.1 mm lata, valvata, elliptico-oblonga, apice rotundata. Petala membranacea, patentia, alba (cremosa in sicco), 4.3-4.5 mm longa, 3.1-3.3 mm lata, imbricata, late elliptico-ovata, glabra, retrorsus margine ciliata, parum cucullata. Stamina filamentis subulatis, basi alata, alae 0.3-0.8 mm longa, 0.7 mm lata, pilis simplicibus, sinuosis, usque 0.9 mm longis in verticalibus seriebus secus margines costaque abaxialiter (et pilis raris variae longitudinis utrinque conspersis), caeterum glabra; antherae elliptico-ovatae, ca. 1 mm longae, 0.75 mm latae. Ovarium 3.2-3.5 mm longum, 3 mm latum, orbiculare, complanatum, bilobum, maniculatum, ferrugineum, interne glabrum; stigma dilute luteum, sessile, quam ovarium nigricantius (in sicco); gynophorum breve, puberulum. Fructus irregulares, asymmetrici, fere rhomboidales, valde dorsiventraliter compressi, margine alati, basi retusi, ferruginei, dense puberuli brevibus pilis stellatis simplicibus induti, in senectute glabrescentes, (1.34)1.6-2 cm longi, 1.6-2.1 cm lati.

Shrubs 0.5-5(7) m tall, usually monopodial, rarely branched, with a sparse crown. Young stems, leaves, sepals, ovaries, and fruits more or less covered with a dense, short pubescence composed of stellate and simple hairs. Stellate hairs reddish-ferruginous, deciduous, with (4)5-8 flattened arms, persistent for a longer period on rachises, petioles, petiolules, lower leaflet surfaces, inflorescence axes, and calyces, with tendency to agglomerate, once detached, to form arbusculiform structures evenly distributed on lower surfaces of the mature leaflets. Simple hairs hyaline, persistent, straight or slightly recurved, concentrated on the midrib of lower surfaces of the leaflets and along margins of upper surfaces, broken in senescent tissues. Stems blackened, conspicuously cicatricose, bark somewhat brittle. Leaves coriaceous, (6.5)10.2-28.5 cm long, (3)4-7 foliate, with 2-4(5) pairs of leaflets, sometimes one leaflet of basal pair or of apical pair absent, the juveniles with a brownish-ferruginous to reddish pubescence; leaflets sessile or very shortly petiolulate, long oblong-ovate to elliptic, rarely elliptico-obovate, coriaceous, (2.7)5-12.4 × (1.9)3.1-5.8 cm, the base cordate, rarely obtuse, the margins slightly revolute, the apex obtuse, slightly apiculate; upper leaflet surface lustrous, rugose, slightly bullate, with venation to the fifth order immersed, initially with a dense pubescence, then glabrescent, simple hairs more or less sparse, stellate hairs very sparse along the midrib and the secondary veins; lower leaflet surface ferruginous and opaque, with prominent nerves, decreasing in prominence from the primary to the tertiary veins (as seen with the naked eye). Inflorescence terminal or lateral, when terminal ramified to the fifth order and bearing flowers congested near the apex of the tertiary ramifications, when lateral arising directly from the stem on a short projection bearing a pair of thyrses, each ramified between the third and the fifth order and bearing flowers on the secondary ramifications, determinate, terminated by a flower or a sometimes aborted floral bud; bracts subtending flowers poorly developed; bracts subtending ramifications of fourth and fifth order scale-like, narrowly triangular. Flowers predomi-

nantly female (only that type of flower seen), globose in bud, erect, on pedicels 1.2-4 mm long. Sepals somewhat coriaceous, patent-erect, 2-2.1 × 1-1.1 mm, valvate, elliptic-oblong, apically rounded, the abaxial surface reddish-fer-

ruginous, with sparse, reddish, stellate hairs and hyaline simple hairs concentrated toward the margins and on the lower half of the midvein. Petals membranaceous, patent, white (creamy *in sicco*), 4.3-4.5 × 3.1-3.3 mm, imbricate,

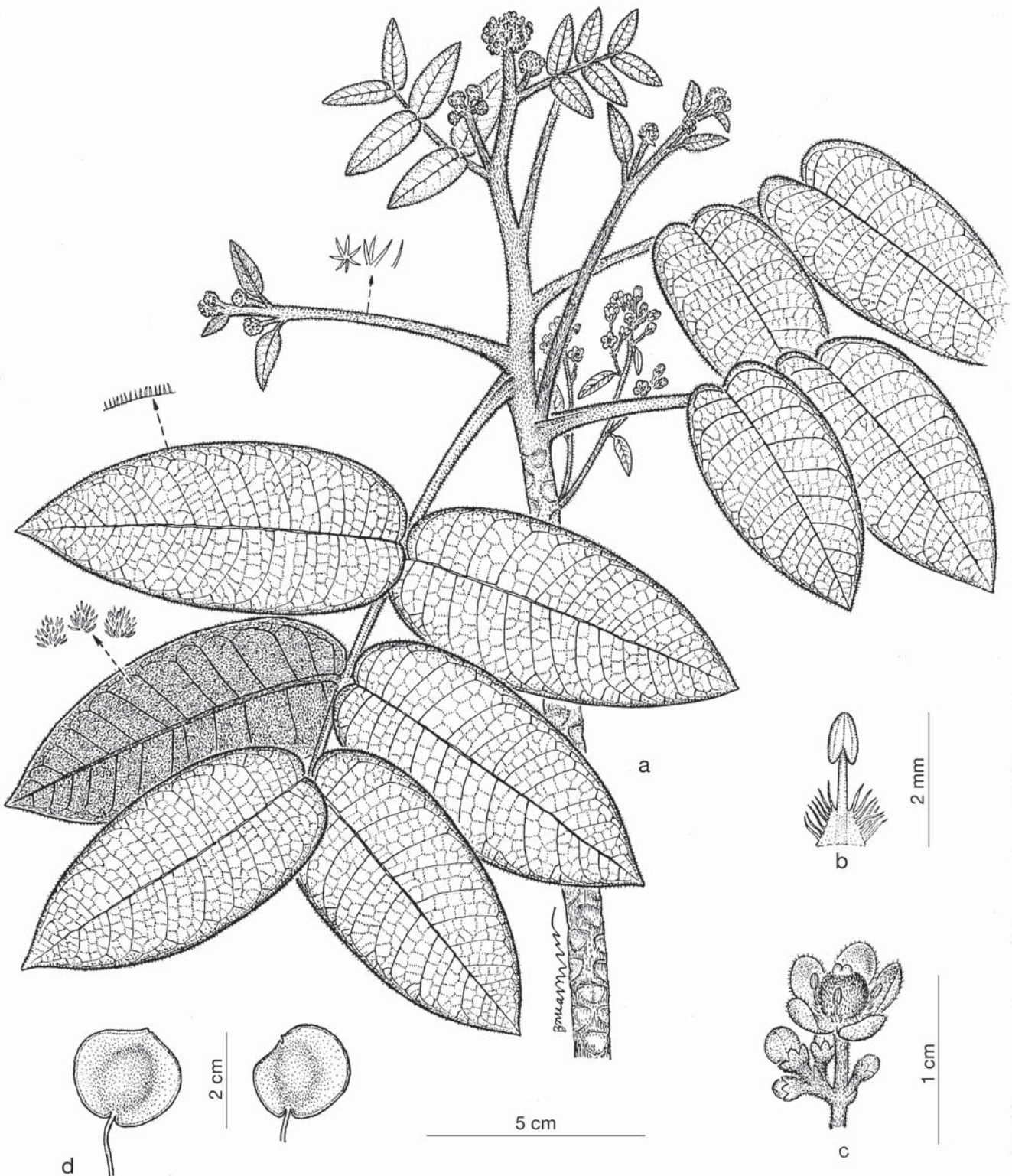


Fig. 3. *Sohneyia maigualdens*: **a**, habit, included are details of the pubescence of the adaxial and abaxial surfaces of the leaflets; **b**, stamen, internal side; **c**, apical portion of a ramification of a terminal inflorescence, showing one flower in anthesis; **d**, fruits. (Drawn by Bruno Manara; a-d from *O. Huber 13063* (holotype), except the terminal inflorescence of *a*, from *O. Huber 13097*).

broadly elliptic-ovate, glabrous, retrorsely ciliate on margin, somewhat cucullate. Stamens light green, 2.1-2.7 mm long, filaments subulate, basally winged, wings thin, 0.3-0.8 × 0.17 mm, with vertical rows of simple sinuous hairs to 0.9 mm along the margins and the midvein on the abaxial surface (plus some additional hairs of varied length, sparse on both surfaces), the rest glabrous; anthers elliptic-ovate, ca. 1 × 0.75 mm. Ovary 3.2-3.5 × 3 mm, orbicular, flattened, bilobed, adpressed-pubescent, ferruginous, internally glabrous; stigmas light yellow, sessile, darker than the ovary (*in sicco*); gynophore short, puberulous. Fruits irregular, asymmetrical, approximately rhomboidal, strongly dorsiventrally compressed, winged, retuse at base, ferruginous, densely pubescent with short stellate hairs and simple hairs, glabrescent when senescent, (1.34)1.6-2 × (1.18)1.6-2.1 mm. (Figs. 3, 4).

Etymology

The specific epithet refers to the type locality.

Diagnostic characters

Since Linné (1760) established *Spathelia sorbifolia* L., 29 species and one variety in four different genera have been described in the tribe Spathelieae. Fourteen to twenty

species are still recognized: one species from Brazil is included in *Dictyoloma*, with branched stems and semelparous habit, bipinnate leaves, capsular fruits with several ovules, and winged seeds; nine to fourteen species of *Spathelia* (including or not the variety, considered as a subspecies by Borhidi & Muñiz [1971]) are exclusive to the Caribbean islands Cuba, Jamaica and the Bahamas; the remaining four, all from northern South America, are included in *Sohnreyia* (Cowan & Brizicky, 1960; Proctor, 1982; Kallunki, 2005; Parra-Osorio, 2005; Beurton, 2008; Appelhans & al., 2011). All the species described in the past as *Spathelia* and *Sohnreyia* have unbranched stems, semelparous habit and samaroid fruits, and this was the reason for their inclusion in *Spathelia sensu lato*. But now, species assigned to *Spathelia* are distinguished by their bright red or pink petals, three or rarely two carpels without secretory cavities, elliptic to oval fruits with the bearing-seed portion generally broader than wings, leaflets often serrate or crenate, seeds with endosperm, and lanceolate embryos (formerly included in *Spathelia* L. subgen. *Spathelia*), whereas those taxa with whitish petals, two or rarely three carpels with one large secretory cavity in each locule, ovate to oblate somewhat bilobed fruits with the seed-bearing portion generally narrower than the wings, entire leaflets (except in *S. giraldiana* (Parra-Os.) Appelhans & Kessler,



Fig. 4. Venezuelan Guayana species of the genus *Sohnreyia* (Rutaceae): **a, b**, *S. maigualidensis*, Sierra de Maigualida, ca. 2000 m; **a**, habit; **b**, habitat; **c, d**, *S. ulei*, Gran Sabana, ca. 1000 m; **c**, habit; **d**, habitat. (Photos O. Huber).

which are serrate), seeds without endosperm and rounded embryos are included in *Sohnreyia* (formerly included in *Spathelia* subgen. *Sohnreyia* (K. Krause) Cowan & Brizicky and *Spathelia* subgen. *Diomma* (Engler ex Harms) Cowan & Brizicky; Cowan & Brizicky, 1960; Parra-Osorio, 2005; Appelhans & al., 2011).

The genus *Sohnreyia* comprises, besides *S. maigualidensis* (here described), *S. ulei*, an endemic of the Guayana Highlands in the Roraima Sandstone Formation, *S. giraldiana*, from a granitic outcrop in Departamento de Vichada, Colombia, *S. excelsa* K. Krause, from Central Amazonia, and *S. terminalioides* (A.H. Gentry) Appelhans & Kessler, from an ecologically similar but geographically distant area of in Western Amazonia (white sand woodlands on the Río Nanay near Iquitos, departamento de Loreto, Perú; Cowan & Brizicky, 1960; Kallunki, 2005; Parra-Osorio, 2005). *Sohnreyia ulei* and *S. giraldiana* belong to *Spathelia* subgen. *Diomma* as defined by Cowan & Brizicky (1960) whereas *S. excelsa* constitutes the monotypic *Spathelia* subgen. *Sohnreyia* (Cowan & Brizicky, 1960; Parra-Osorio, 2005); *S. terminalioides* has not yet received subgeneric assignment.

The new species can be easily differentiated from all previously described taxa within *Spathelia* and *Sohnreyia* by its paucifoliolate leaves (only 2-5 pairs of leaflets vs. 7-24 pairs in the rest of the species), densely covered by a ferruginous indumentum of mixed stellate and simple hairs and by its small inflorescences, both terminal and axillary (vs. exclusively terminal).

Distribution, habitat, and phenology

The new species seems to be restricted to small, open areas scattered in the highlands (1800-2200 m) of Sierra de Maigualida, located in the north-central part of the Guayana phytogeographic region and the Pantepui Province (Huber & al., 1997). It is a mostly monopodial or rarely ramified shrub, with a very sparse crown, which grows in large colonies of numerous individuals that are usually separated several meters from each other. The average height is between 1-3 m, but shorter (juvenile) and taller individuals (up to 7 m) have also been observed, the latter especially on rocky substrates and in the ecotone zone with the low elfin forest.

Sohnreyia maigualidensis communities appear to prefer deep, water-saturated peat soils of valley plains (see Huber & García, 2011), which are covered by a dense, unique tepui grassland dominated by *Axonopus villosus* Swallen (Poaceae), *Kunhardtia rhodantha* Maguire (Rapateaceae), and *Orectanthe sceptrum* (Oliv.) Maguire (Xyridaceae), together with numerous herbs of Eriocaulaceae, Xyridaceae, Cyperaceae, Liliaceae, and terrestrial Bromeliaceae. Among the common shrub species are *Clusia* sp. (Clusiaceae), *Phyllanthus obfalcatus* and *P. huberi* (Euphorbiaceae), and *Marcetia taxifolia* (A. St.-Hil.) DC. (Melastomataceae). Similar to *Sohnreyia ulei*, widespread in the Guayana uplands and highlands, this new species also seems to show massive synchronous flowering cycles as seen from fruiting specimens; so far, however, only a few, occasional, flowering individuals

have been observed during the eight expeditions made in March, May, November, and December, which correspond to the beginning (Nov/Dec) and the end (March/May) of the dry season, respectively.

Paratypes

VENEZUELA. Amazonas: Depto. Atures, Sierra de Maigualida, sector nor-oriental, altiplanicie disectada de granito en las cabeceras nor-orientales del Río Iguana, afluente del Río Ventuari, 05°40'N, 65°08'W, ± 2100 m, 4-V-1990, (fl), *O. Huber 13097* (unicata, VEN-377774); sector centro-norte, herbazales arbustivos sobre vertiente inclinada hacia el SE, en las cabeceras del Río Asita, 05°32' N, 65°10' W, ± 1700 m, 5-XII-1992, (fr), *O. Huber & J. Rosales 13420* (MYF, VEN); Depto. Atures, Sierra Maigualida, NW sector, small valley along an upper tributary of Caño Iguana, 05°30'N, 65°15'W, 2000 m, 3-III-1991 (sterile), *Berry & al. 4846* (NY, MO, n.v.); Mun. Atures, Sierra Uasadi, sector nor-oriental, cabeceras nor-orientales del Río Asita, pequeña planicie sobre granito con herbazales arbustivos tepuyanos, 5°22'N, 65°09'W, 1800 m, 4-XII-1992, (fl), *O. Huber 13415* (MYF, VEN, to be distributed, 5 sheets). Bolívar: Distrito Cedeño, Sierra de Maigualida, sector nor-oriental, altiplanicie tepuyana ubicada en las cabeceras del Río Yudi ["Río Chajura" in the label], afluente occidental del Río Erebató, aprox. 100 km (en línea recta) al SW del Campamento EntreRíos, 05 33' N, 65 13' W, ± 2100 m, 28 Mar 1988 (sterile), *O. Huber 12719* (VEN-377775, NY).

TURNERACEAE

Although Turneraceae could be circumscribed within Passifloraceae as subfamily Turneroideae on the basis of molecular phylogenetic evidence (APG III, 2009; Stevens, 2011), in this contribution it is retained as a distinct family.

Turnera maigualidensis J.R. Grande & Arbo, sp. nov.

Typus: Venezuela. Amazonas: Cabeceras nororientales del Río Asita en el sector nororiental de la Sierra de Maigualida, extensos herbazales sobre glaxis poco inclinado hacia el W, 5°31'50"N, 65°09'14"W, ± 1700 m, 9-III-1996 (fl), *O. Huber & R. Riina 13654* (holotypus, VEN; isotypus, CTES).

A reliquis Turnerae speciebus hactenus descriptis differt: foliis imbricatis solum in apice ramorum praesentibus, margine revolutis, singulo pari glandularum cupuliformium ad unionem laminae cum petiolo, petalisque apice apiculatis necnon pilosis.

Fruticulus pauca ramosus, usque 1.5 m altus, ramis 2-3(6)-furcatis, indumento strigoso e pilis simplicibus 0.3-0.4 mm longis, ochraceo-auratis in junioribus caulibus, foliis calyceque praesentibus. Caulis conspicue cicatricosus, stipulis persistentibus paucis centimetris sub loco abscissionis foliorum locatis. Cortex fusco-griseus, fissuris transversalibus praeditus. Folia imbricata, in apice ramorum; stipulis 1.1-1.8 mm longis, subulatis, dense pilosis, patentibus; petiolis dense strigosis, 2-3.5 mm longis; laminiis 1.5-2.6 cm longis, 2-7 mm latis, ex elliptico paulo obovatis, basi cuneatis, per petiolum breviter decurrentibus, margine revolutis, denticulatis, duobus denticulis basalibus nectariis cupuliformibus e rotundato oblongis, 0.2-0.3 mm diametro, in foliis maturis difficulter observatis, caeteris denticulis coeleteribus donatis. Inflorescentiae simplices, apicem versus congestae; pedunculo florali libero 2.7-4 mm longo, prophyllis ovato-ellipticis, laxe strigosis, margine paulo

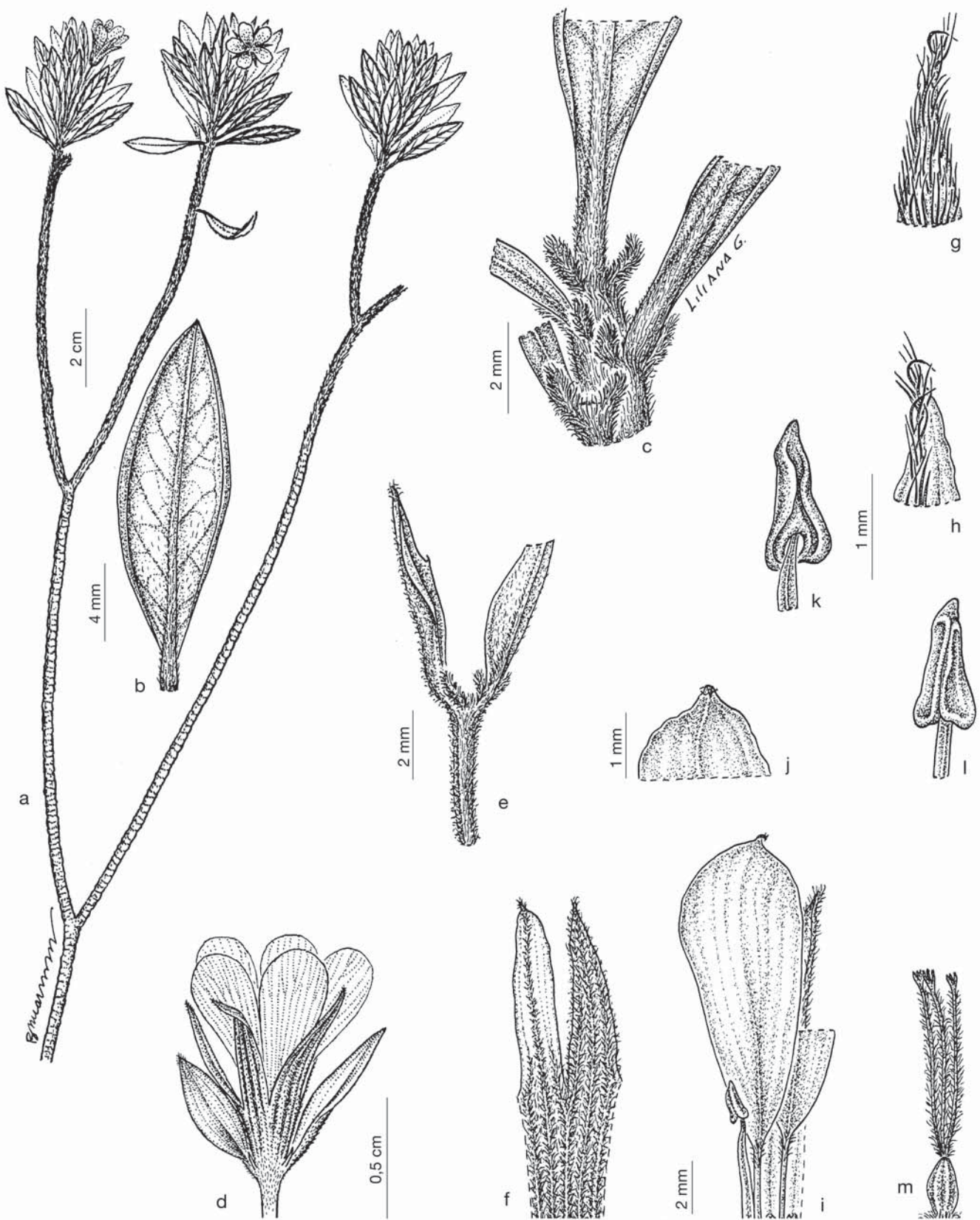


Fig. 5. *Turnera maigualidensis*: **a**, flowering branch; **b**, leaf, abaxial side; **c**, portion of branch, showing the insertion of the leaves with pilose stipules, persistent after leaf abscission; **d**, flower with prophylls; **e**, floral pedicel and prophylls with stipules; **f**, outer portion of the calyx, showing indumentum of inner and outer lobe; **g**, apex of an outer lobe; **h**, apex of an inner lobe; **i**, calyx tube portion, inside, with two petals and one stamen adnate, the scars of two stamens have been squared; **j**, apical portion of a petal; **k**, anther, dorsal view; **l**, anther, ventral view; **m**, longistylous gynoecium. (Figs. a, d, Bruno Manara; figs. b, e-m, Liliana Gómez; all figures from the type specimen).

revolutis et denticulatis, 5-7 mm longis, 1-2 mm latis, in receptaculo insertis. Calyx 7-12.5 mm longus, sepalis a basi ad 2.8-3.5 mm conniventibus. Tubus calycinus extus dense strigosus, intus glaber, lobulis anguste triangularibus, 5-9 mm longis, 1.6-1.7 mm latis, venis tribus (3) prominentibus, carinantibus. Petala 10 mm longa, 3-3.5 mm lata, dilute lutea, glabra, excepto ungue in insertione cum lamina adaxialiter, et apice apiculata, ubi villosa. Fructus seminaque incognita.

Shrubs to 1.5 m, sparsely ramified, branches 2-3(6)-forked, indument strigose, composed of 0.3-0.4 mm long golden-ochraceous short simple hairs, over leaves and calyces, as well as in young stems. Stems 2.7-3.9 mm in diameter below terminal ramifications, conspicuously cicatricose, stipules persistent several centimeters below the level of abscission of the foliage; bark grayish brown, with transverse cracks; young stems strigose, turning glabrous with age. Foliage imbricate, disposed toward the apex of branches. Leaves coriaceous, petiolate; stipules 1.1-1.8 mm long, subulate, densely pilose, patent; petioles linear to obcuneate, densely strigose, 2-3.5 mm long; leaf blades green, slightly discolorous in dried material, 15-26 × 2-7 mm, elliptic to slightly obovate, base cuneate, shortly decurrent on the petiole, margin revolute, denticulate, the basal pair of denticles with cupulliform nectaries rounded to oblong 0.2-0.3 mm in diameter, hardly distinguishable in mature leaves, remaining denticles with colleters; apex acute to slightly acuminate; upper leaf surface glabrous, except the midvein slightly sunken, with dense appressed hairs to the base and scattered hairs to the apex, secondary veins slightly prominent when dry; underside glabrous except the midrib and prominent lateral veins, with scattered appressed hairs, sometimes third-order veins also slightly prominent. Inflorescences simple, flowers axillary, possibly heterostylous (only longistylous flowers seen) towards the apex of the foliated portions of the branchlets, floral peduncle free 2.7-4 mm long, prophylls ovate-elliptic, loosely strigose, margin slightly revolute and denticulate (2.1-3)5-7 × (0.15-0.2)1-2 mm, with linear-laciniate stipules, strigose, of 0.7 to 1.2 mm long, inserted at the calyx base. Calyx 7-12.5 mm long, light brown, sepals connate from the base to 2.8-3.5 mm high, the resulting tube densely strigose abaxially, glabrous adaxially; lobes narrowly triangular, 5-9 × 1.6-1.7 mm, with 3 prominent veins, forming carinae, loosely strigose abaxially, glabrous adaxially. Petals 10 × 3-3.5 mm, spatulate, apiculate, pale yellow, glabrous except at the junction of the claw with the blade, which is villous on adaxial side, and at the apex. Stamens with complanate-subulate filaments in dry material, 3 mm long, with the lower 0.5-0.7 mm adnate to the calyx, anthers sagittate 1 × 0.6 mm, with introrse longitudinal dehiscence, base emarginate, apex apiculate, filament inserted dorsally to 0.25 mm from the base, abundant pollen, with grains ellipsoid, amber-hyaline. Gynoecium 2-4 mm longer than the stamens; ovary ovoid, glabrous, 1.2-1.5 mm long., 3 styles 4.8-6 mm long, with simple hairs more or less appressed; stigmas pennicillate, 0.5-0.6 mm long., with 4-6 branches. Fruits and seeds unknown. (Fig. 5).

Etymology

The specific epithet refers to the type locality.

Diagnostic characters

The new species differs from other described species of *Turnera* L. by the overlapping leaves, congested towards the apex, with revolute margins, a sole pair of cupuliform nectaries at the junction of the petiole, and petals with the apex apiculate and villose. *Turnera maigualdensis* belongs to series *Salicifoliae* Urb., which includes species having stipules small or rudimentary, upper leaf surface glabrous or subglabrous, solitary flowers, free flower pedicel, narrow prophylls, ovary glabrous and styles pilose. Upright long branches foliated only towards the apex, are present like in many specimens of *T. glaziovii* Urb. and *T. rupestris*, and in *T. arcuata* Urb. (series *Turnera*). Leaf base is somewhat prominent and stipules are persistent after leaf abscission as in *T. cicatricosa* Arbo, the pedicel is not developed, as in *T. venosa* Urb. The new species differs from all species in the series by presenting small imbricate leaves with revolute margins. The latter is a rare character in the genus, present in a few species of series *Leiocarpae* Urb. and series *Sessilifoliae* Arbo.

Distribution and habitat

According to the information from collection labels, this new species is a low shrub, fairly scarce in its natural habitat. It is only known from the type collection.

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