Botanical novelties from the Sierra de Maigualida, southern Venezuela III: revision and two new species of the genus *Ilex* (*Aquifoliaceae*)

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Resumen. La Sierra de Maigualida es un sistema montañoso del centro del escudo guayanés escasamente explorado, el cual presenta un alto grado de endemismo. En la presente entrega, esta área es nuevamente delimitada y mapeada, se corrige la toponimia y se revisan las especies del género *Ilex* L. que allí crecen, dos de las cuales, *I. huberi* J.R.Grande sp. nov. e *I. maigualidensis* J.R.Grande sp. nov., descritas como nuevas para la ciencia. *Ilex huberi* sp. nov. puede ser diferenciada por sus hojas fuertemente revolutas, mucronadas y con venación secundaria obscura, dicasios simples y sépalos depreso-lunados; *I. maigualidensis* sp. nov. por sus hojas opacas, flores con estilos reducidos y estigmas capitado-subcoronados. Las yemas vegetativas y los cátalos son propuestos como caracteres útiles en la delimitación de especies dentro del género *Ilex* magnifructa Edwin se ilustra por primera vez. Se incluye una clave para diferenciar todas las especies maigualídeñas de *Ilex*.

Palabras clave. Escudo Guayanés, especies nuevas, *Ilex*, Sierra de Maigualida, Venezuela.

INTRODUCTION

According to recent systematic studies, the family *Aquifoliaceae* Bercht. & J.Presl is monogeneric (Cuénoud & al. 2000; Powell & al. 2000; Loizeau & Barriera 2009; Stevens 2012). Its only genus, *Ilex* L., includes c. 500 (Galle 1997) to c. 600 (Cuénoud & al. 2000) extant species which are distributed in South America (c. 300 spp.), South and East Asia plus New Caledonia (c. 250 spp.), the northern Australia (2 spp., cf. Manen & al. 2010), North and Central America plus the Caribbean islands (c. 60 spp.), Europe and the northern Africa (4 spp., including the type species, *I. aquifolium* L.), Macaronesia (2 spp.), Africa southwards from the Sahara (1 sp.), and the Pacific islands (2 spp.). The last phylogenetic surveys show the species of *Ilex* to be grouped in four main clades, fairly related with their geographic distribution and ecological features (Cuénoud & al. 2000; Loizeau & Barriera 2009). Seventy-six species and six varieties have been reported for the Guayana Shield (Berry & al. 2007), many of them endemic (cf. Steyermark & Berry 1995). Twenty-four species have been placed under the nearly endemic *I. sect. Guayanoilex* Edwin, which includes twenty three endemic species plus *I. divaricata* Mart. ex Reissek, which is also found in the Brazilian Amazon and the southwestern Colombia.

Biodiversity prospecting has been associated with geographical exploration. The Guayana Shield is not an exception, with the discovery of several mountains and massifs in the course of botanical expeditions (v.gr., Maguire & Deery de Phelps 1951; Maguire & Wurdack 1959). Geographic and cartographic information from this area, however, has been accumulated since the last decade of the xxth century in a rather steady way, but has not been comprehensively treated to the present. The following notes summarize the geography of the study area, with relevant updatings in toponography and toponymy from the maps offered in Huber & Berry (1995), Huber (1995b),
Huber & al. (1997: 443 fig. 1), and the ‘part I’ of the series (Nozawa & al. 2010: 197 fig. 1). Additionally, two new species of the genus *Ilex*, *I. huberi* J.R.Grande sp. nov. and *I. maigualidensis* J.R.Grande sp. nov. are described.

Considering the still very preliminary exploration of Sierra de Maigualida, a surprisingly high number of endemic taxa have been described from there. As it was pointed out in Lourteig (1996), in fact, this mountain range is very promising for the study of plant evolution, since it includes unique or at least highly characteristic taxa inhabiting special and isolated ancient environments. One of the species described in the present contribution—*I. maigualidensis* sp. nov.—, for example, is the second member of the genus with conspicuous pubescence within the Guayana Shield, while the other—*I. huberi* sp. nov.—is the second species worldwide with a prostrate habit.

With the two species here established, the number of angiosperms endemic to Sierra de Maigualida reaches thirty-seven, including one genus, thirty-four species, one subspecies, and one variety. Additional species are currently studied and will be published as new in future installments.

**MATERIAL AND METHODS**

Cartography and toponymy were reviewed by means of the available pioneer maps, summarized in Salazar-Quijada (1983), and the literature cited in the text.

The dry collected material of the genus *Ilex* from Sierra de Maigualida and housed at the herbaria MYF and VEN was reviewed and identified. Measurements were performed directly on dried specimens, using a stereoscopic microscope to study the pubescence. Relevant literature was also reviewed, and the species concepts confirmed with the examination of the available type specimens at Jstor Plant Sciences (https://plants.jstor.org/) and reviewed herbaria. The following descriptions are based on the aforementioned sources, as well as from the corresponding field notes of accompanying labels.

**RESULTS AND DISCUSSION**

**Geography**

Recent advances in cartography have made available high resolution imagery for extensive areas of the Earth’s surface, freely available on the internet. The map of the fig. 1, prepared from a panoramic image from the program Google Earth (https://www.google.com/intl/es/earth/).

![Fig. 1. Map of Sierra de Maigualida and surroundings, including updated toponymy.](image-url)
Jacquemontia austinianna J.R.Grande, sp. nov.

accessed 31 Jul. 2019), shows the traditional subdivision of Cordillera de Maigualida, an oronym apparently coined by Marrero (1964). It is a crystalline mountain chain made up of a number of more or less isolated mountains, mountain ranges and massifs, uplifted after the Amazonian orogenesis (1.7–2 Gy) in the Cuchivero geological province, that shows extensive rock outcrops of granites of the ‘Santa Rosalía group’ (Rincón & Estanga 1996), and embraces, from north to south, the Serranía de Mato (NW-SE orientation and elevations never surpassing 1500 m a.s.l.), the Serranía de Nichare (NW-SE orientation and elevations rarely surpassing 1500 m a.s.l., never reaching 2000 m a.s.l.), the Serranía de Maigualida (N-S general orientation, and main faults oriented NE-SW), and the Serranía de Uasadi (mainly hilly, not surpassing 1000 m a.s.l., except for its northernmost part, where it scarcely reaches 1500 m a.s.l., and with the same general orientation of the Serranía de Nichare). This huge mountain complex, nearly 250 km long, and a roughly N-S extension, between 6°30’ and 4°40’ N, and 64°50’ and 65°50’ W, is the longest and one of the most extensive mountain systems of the Guayana Shield, the source of the rivers Caura, Erebato, Manapiare and Cuchivero rivers, as well as several of the main tributaries of the Ventuari river (Huber 1995a: 21 figs. 1–16). Its highest elevation, Cerro Yudi, is located towards the north of the Sierra de Maigualida, and reaches c. 2400 m a.s.l., the surrounding highlands lying mostly between 1600 and 2200 m a.s.l. (Nozawa & al. 2010). The name Serranía de Maigualida, by the other hand, has been used on maps only recently, probably just from the 2000s. It includes the Cerro Ualipano, floristically related to the Sierra de Maigualida, and the Cerro Corobo (“Cerro Coroba” in some recent references, as Huber & Berry 1995), besides of several actually unnamed mountains and massifs.

Sierra de Maigualida, the studied area, includes extensive mountains and dissected plateaus, with several types of ombrophilous basimontane and montane forests on its slopes, and a mosaic of saxicolous vegetation, shrublands, highland low forests and tepui broad-leaved and grass-dominated meadows over ultisols, entisols, rock exposures and organic soils, only very preliminary mapped and described (cf. Huber 1995c; Rosales & Huber 1996; Huber & Rosales 1997; Riina & Huber 2003). As it is here circumscribed, it includes only the highest and easternmost portion of Serranía de Maigualida, made up of three main blocks, which are, from north to south, the Cerro Iguna (“sector noroccidental” in previous literature and herbarium labels), the Cerro Yudi (“sector nororiental”), and the Cerro Cuyuwí (“Serranía de Uasadi”).

Description of two new species

Five species of the genus Ilex have been collected in the Sierra de Maigualida (fig. 1), above 1500 m a.s.l.: I. huberi sp. nov. (fig. 2), closely related to a species of I. sect. Vaccinifoliae Loes. from the Espinhaço range (eastern Brazil), I. maigualidensis sp. nov. (fig. 3), a species of indefinite affinities, and three species of I. sect. Guayanolex, namely I. magnifructa Edwin (fig. 4), I. marginata Edwin, and I. retusa Mart. ex Reissek, the two former ones included within I. set. Lateralior Edwin.

The following descriptions consider the types of inflorescence and stigma proposed by Edwin (1965) for the Guayanan species. Despite the fact that neither stipules, nor prophylls or prophyllate bracts have been considered of taxonomic importance (Edwin 1965), cataphylls and apical buds have some diagnostic value, at least for the species of the Sierra de Maigualida. They are described in the following paragraphs and included in the key.

Ilex huberi J.R.Grande sp. nov. Type: Venezuela, Amazonas State, “dpto. Atures [mun. Manapiare]: Sierra de Maigualida, sector nor-oriental, altiplanicie dissectada de granito en las cabeceras nor-orinentales del rio Iguna, afluente del rio Venturari”, 5°40′ N, 65°8′ W, ± 2150 m a.s.l., 24 Nov. 1989, O. Huber 13079 leg. (holo:- MYF 11255!; iso:- MO-1170816, MYF 11367!). Fig. 2.

LSID: urn:lsid:ipni.org:names:60478843-2

Species haec, inter species generis habitu prostato et folis coriaceis petiolo pilis minutis atque sparsis, laminis lustrosis conspicue revolutis acipe acuminatis acumine indurato, valde distincta.

Decumbent and prostrate shrubs with stems elongate; ramultets striate, grayish, generally subopposite or subverticillate, 1–3 each node, the apical portions pubescent, turning glabrous when mature; cataphylls c. 1 × 0.4 mm, narrowly oblong, with involute margings, acute and extrosely folded at the apex. Leaves subimbricate, grouped towards apex of ramultets, shortly petiolate; stipules similar to the cataphylls, caducous; pectoles 1.5–3 mm long, pubescent when young, turning puberulous when mature; leaf blades 1.4–1.75 × 0.4–0.55 cm, coriaceous, shiny, ochraceous to dark brown in sicco, base cuneate, margings strongly revolute, appearing oblong to long-ovate or long-obovate, apex scarcely revolute, discretely mucronate, the macro elongate, conspicuous and indurate; epiphyll blackish when young; midvein blackish on both sides when young, conspicuously impressed adaxially, prominent to carinate abaxially; secondary venation as well as that of following orders obscure. Male inflorescences 1–3-flowered, 2–3.5 cm long, axillary, the ‘type 4’ of Edwin (1965), dark brown, with in conspicuous, pubescent bracts reduced to scales; peduncles c. 1.5 mm long; pedicels 0.75–1.5 cm long. Calyx dark brown; sepals c. 0.75 × 0.85 mm, depressed-lunate. Corolla grayish-white;
Fig. 2. *Ilex huberi* J.R. Grande sp. nov., *O. Huber* 13079 leg. (MYF 11255): a, habit, including details from leaf blade apex and apical portion of a ramullet, showing a vegetative bud; b, male inflorescence.
petals c. 2 × 1.8 mm, widely ovate to subrotund. Stamens included; anthers c. 0.5 × 0.3 mm, oblong, yellowish.

Etymology.—This species in named to honour my dear friend and teacher Dr. Otto Huber, whose pioneer studies in the Guayana Shield have led to the discovery of many new plants. Curiously enough, type of I. huberi sp. nov. was collected on his birthday.

Distribution and habitat.—Ilex huberi sp. nov. is known by a single collection, consisting of three duplicates from a single male plant collected near the summit of Cerro Yudi. It was found creeping on rocks, in an exposed area under the influence of heavy winds, where it seems to be a frequent species. It may be postulated that strong winds are the cause of the prostrate habit, but populations of I. maigualidensis sp. nov., which grows very nearby, are always upright. Based on label information, it flowers in November.

Notes.—The hairs are, in this species, scarce and restricted to the young stems, inflorescences, and petioles; they are always minute, subulate, and sepalate. All the known terminal branches or ramullets are sterile, except one from the holotype. Despite being an endemic of the Guayana Shield, I. huberi sp. nov. seems to be more closely related to I. prostrata Groppo, from the 'campos rupestres' of the crystalline mountain range of Serra do Cipó, a southern portion of the Espinhaço range in the Minas Gerais state of Brazil. That species, assigned in its protologue to I. sect. Vaccinifoliiæ (Groppo & Pirani 2002), has in common with I. huberi sp. nov. the prostrate habit, reduced leaves, and single dichasia (sometimes further branched in its lateral flowers, corresponding to the 'type 4' of the inflorescence type system of Edwin 1965). The new species can be differentiated, however, by the leaf blades strongly revolute, mucronate and with an obscure secondary venation, the presence of strictly simple dichasia (vs. lateral axes further ramified), and depressed-lunate sepals (vs. widely deltoid). The habitats of these two species are similar, since I. prostrata grows also on granitic plateaus, over sandy-rocky soils or among rocks at c. 1100 m a.s.l. (Groppo & Pirani 2002). Since no species of I. sect. Guayanolex and I. sect. Vaccinifoliiæ from the Espinhaço range have been included so far in a phylogenetic analysis (Groppo 2007; Manen & al. 2010), it is difficult to ascertain whether they are closely related, as is suggested by their geographic distribution and several morphological traits of the leaves and inflorescences. Phylogenetic analyses, as well as deeper studies of relevant characters, should be conducted in order to know the true relationships of these two groups of species from ecologically similar areas.

Ilex maigualidensis J.R.Grande sp. nov. Type: Venezuela, Amazonas State, Atures [mun. Manapiare], Sierra Maigualida, NW sector, small valley along an upper tributary of Caño Iguna, 5°30′N, 65°15′W, 2000 m a.s.l., 28 Feb.–3 Mar. 1991, P.E. Berry, O. Huber and J. Rosales C. 4892 leg. (holo:- VEN 329798; iso:- MO-1173805; MYF 11238!). Fig. 3.

LSID: urn:lsid:ipni.org:names:60478844-2

Frutices plus minusue retortuqui, ramullis foliis inflorescentis floribus fruticosum tomentosum Illice maguirei adhuc confusa, sed stylo ac rostro fructus nullis differt.

Shrubs 1–3 m tall, more or less gnarled; diameter of branches that subend the terminal ramifications to 0.56 cm; young portions of ramullets angulate, tomentose, turning terete when mature, generally blackish, the apical buds pubulate and tomentose; subterminal branches cinereous-creamy, slightly suberified, scarcely cicatricose; bark conspicuously striate-reticulate, its surface rugose, not detachable, with rhomboid marks. Leaves alternate, shortly petiolate; stipules 0.6–0.8 × 0.6–0.7 mm, reduced to scales, acute, thickened towards base, more or less claw-shaped; petioles 1.5–2.5 mm long, short, tomentose; leaf blades (0.6)1.2–5.6 × (0.55)–3.6 cm, elliptic, slightly ovate, slightly obovate or subrotund, adaxially as well as abaxially tomentose, the base symmetric, obtuse to rounded, the margins revolute, discretely serrate towards apex, apex more or less asymmetric, mucronate, rounded to obtuse, rarely emarginate. Female inflorescences 2–3-flowered, 0.4–1.5 cm long (not including the flowers and fruits) tomentose, solitary or cyzome; peduncles 1–5 mm long, of similar thickness as petiole subtending it; pedicels 0.45–1.2 cm long, subtended by a triangular scale-like bract, 0.3–0.7 mm long, slightly longer than wide, glabrous or puberulent towards base and margins. Female flowers 2.2–2.5 cm long; sepals 1–1.25 × c. 1.5 mm, hirsutule to tomentose, lunate to widely triangular, the apex rotund to obtuse, margins entire, apex apiculate, the apicule indurate; petals and staminodes unknown; pistil 2–2.5 × 2.1–2.25 mm, obтурinate or more or less oblute, ovary pubescent to tomentose, style not developed, stigma conspicuous, glabrous, capitâte-subcormonate, more or less 4-lobulate, sometimes also capitâte and corenate in different ovaries from the same plant (cf. Huber and Izquierdo 12804 leg.). Fruits pubescent to tomentose, obturinate to ovoid when immature, turning globose when mature, 8.5 mm long and diameter 7 mm in sicco to 1 cm in vivo, green to grayish green, turning dark purple when mature, crowned by a 1.2–1.8 mm long conccrescent stigma, obcuritate; pedicels apparently not enlarging but clearly thickening, sepals persistent but, apparently, not conccrescent.

Etymology.—Ilex maigualidensis sp nov. is named after its type locality (Sierra de Maigualida).

Distribution and habitat.—Ilex maigualidensis sp nov. inhabits forest borders (where it is scarce and 2–3 m tall fide P.E. Berry & al. 4892 leg. and O. Huber 12804 leg.), and open places near rocks (where it is very scarce, c. 2 m tall, with rounded leaves and conspicuously globose fruits, fide O. Huber 13073 leg.) or among rocks (where it is scarce, gnarled and very short, c. 1 m tall fide O. Huber 13114 leg.). Based on the few available specimens, this species flowers in November, and bears fruits from November to March. Only female plants are known.

Notes.—In this species the pubescence is constituted, invariably, by a more or less fine and sparse tomentum, slightly rough to the touch, made up of more or less acicular setiform hairs, 0.2–0.7 mm long, which are sepalate, more or less recurved, and somewhat brittle. This is especially true for leaves, where pubescence appears broken in mature portions, leaving a rough surface. The bark is partially covered by black piliform fungi, foliose bryophytes, crustose lichens or diminute plants of the family Bromeliaceae Juss., as it is common in the Pantepui area (Steyermark 1998; Grande & al. 2012). The affinities of I. maigualidensis sp nov. are unclear, but it shares with I. maguirei Wurduck, I. chimantaensis T.R.Dudley (as I. sulcata Edwin in Steyermark & Berry 1995), and I. tepuiana Steyerm. several foliar and reproductive characters. They include petiole length (relatively short), leaf shape (more or less elliptic), and inflorescence structure (simple dichasia). Ilex chimantaensis and I. tepuiana, however, lack the characteristic indumentum of I. maguirei, the only additional species in Venezuelan Guayana with conspicuously
Fig. 3. *Ilex maigualidensis* J.R.Grande sp. nov., *P.E. Berry* & al. 4892 leg. (VEN 329798): a, habit; b, fruit, lateral view; c, fruiting stigma; d, apical portion of a ramullet, showing the perulate bud, a leaf, and stipules; e, pubescence from adaxial side of a leaf blade; f, pubescence from abaxial side of a leaf blade.
Fig. 4. *Ilex magnifructa* Edwin, O. Huber 13061 leg. (VEN): a, habit; b, fruit, lateral view; c, stigma; d, apical bud.
Key to the species of Ilex of the Sierra de Maigualida

1. Upright shrubs; young stems, leaves, inflorescences, sepals, ovaries, and fruits tomentose; stigma capitate-subcoronate ... **I. maigualidensis** J.R. Grande sp. nov.
   - Upright or prostrate shrubs; plants glabrous or, if pubescent, never tomentose; stigma different .... 2

2. Prostrate shrubs; cataphylls c. 1 × 0.4 mm, with involute margins and extrosersely folded apices; leaf blades conspicuously revolute and mucronate ....

   ----------------------------------------------- **I. huberi** J.R. Grande sp. nov.
   - Upright shrubs; leaf blades flat to only slightly revolute, retuse ........................................ 3

3. Leaf blades small, usually < 2.5 cm long, < 2 cm wide; stigma capitate; fruit pubescent ............

   ................................................ **I. retusa** Klotzsch ex Reissek
   - Leaf blades larger, usually > 3 cm long, > 2 cm wide; stigma capitate or coronate; fruit glabrous .... 4

4. Apical buds not perluate, reduced and conical-shaped; leaf blades ovoid, elliptic or suborbicular, concolorous, blackish in siccio; stigma capitate; fruit globose, smooth .................... **I. magniflora** Edwin
   - Apical buds perluate; leaf blades elliptic to obovate, obovate in siccio, discolorous, shiny; stigma coronate; fruit ovoid, slightly lobed ........ **I. marginata** Edwin

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Jacquemontia austiniana J.R.Grande, sp. nov.