

## **A critically endangered new species of *Aralia* (Araliaceae) from Cuba**

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RAMIRO CHAVES<sup>1</sup>

## A critically endangered new species of *Aralia* (*Araliaceae*) from Cuba

### Abstract

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*Aralia duplex* (*Araliaceae*) is described as a new species from Pinar del Río Province, W Cuba, based on a specimen initially mistaken for *A. rex*. Only a single individual is known in the wild, in Viñales National Park, and no reproduction has been observed there. Differential characters include the leaflet margin, numbers of umbels per inflorescence and flowers per umbel, pedicel length, numbers of floral parts and fruit shape. Illustrations and distribution maps are provided. A key is presented for the identification of *A. duplex* and *A. rex* within *A. sect. Sciadodendron*. As with *A. rex*, the conservation status of *A. duplex* is assessed as Critically Endangered (CR). Ex-situ-germinated plants are being kept in cultivation by members of the Cuban Botanical Gardens Network.

Additional key words: taxonomy, identification key, *Aralia* sect. *Sciadodendron*, *Aralia rex*, *Megalopanax*, endemic, Caribbean

### Introduction

*Aralia* L. is one of about 50 genera of *Araliaceae* and is closely related to *Panax* L., with which it forms one of the three major clades in core *Araliaceae* (Plunkett & al. 2004; Wen 2011). As recently circumscribed (Wen 2011), *Aralia* has 71 species in six sections, viz.: *A. sect. Aralia* (three North American and 11 Asian species), *A. sect. Dimorphanthus* (Miq.) Miq. (two E North American and 27 Asian species), *A. sect. Humiles* Harms (three North and Central American species), *A. sect. Nanae* Harms (one North American species), *A. sect. Pentapanax* (Seem.) J. Wen (19 Asian species) and *A. sect. Sciadodendron* (Griseb.) J. Wen (five Neotropical species).

Species of *Aralia* sect. *Sciadodendron* are unarmed, glabrous, branched trees or tall shrubs with 2–4-pinnate leaves, persistent bracts at the base of the umbels, which cluster in panicles that are usually themselves aggregat-

ed at the stem apex, 5-, 6- or 8–12-merous flowers, at least basally connate styles, and dark purple fruits (Wen 2011). This section is phylogenetically basal in *Aralia* and includes species previously placed in *Sciadodendron* Griseb., *Coudenbergia* Marchal and *Megalopanax* Ekman ex Harms (Wen 2011). One of these species was described by Harms as the sole member of the Cuban endemic genus *Megalopanax*: *M. rex* Ekman ex Harms (Harms 1924), which was later transferred to *Aralia* necessitating the combination *A. rex* (Ekman ex Harms) J. Wen (Wen 1993), which is the currently recognized only native Cuban member of the genus (Wen 2011).

*Aralia rex* is a critically endangered species (Areces Mallea 1998; Berazaín Iturralde & al. 2005). It has been considered the most endangered Cuban tree species by Cuban officials (Anonymous 1995; Álvarez Brito 1999). Until 1989, there were historical records for only six individuals in three locations (Fig. 1A). Two of them grew

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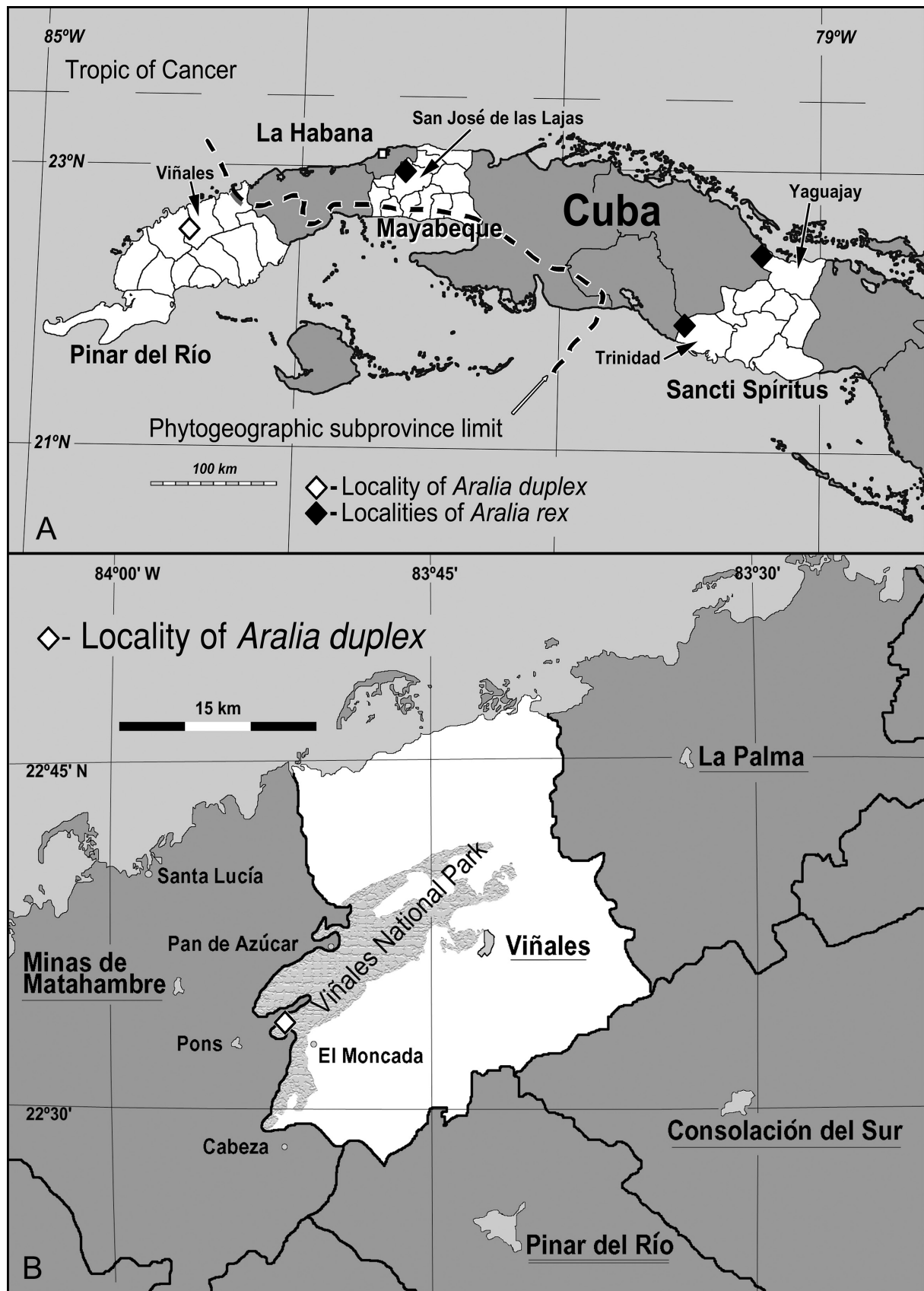


Fig. 1. Distribution of *Aralia duplex* (white rhombus) and *A. rex* (black rhombuses) – A: *A. duplex* and *A. rex* in Cuba, their municipalities (black arrows), their provinces (white with names underneath), and limit between Western and Central Cuban phytogeographical subprovinces (dashed line); B: *A. duplex* in Viñales National Park (shown in streaked pale grey) within Viñales municipality (white).

at the type locality: Lomas de Camoa, San José de Las Lajas municipality, Mayabeque province; at least one in Finca Brazo Fuerte, Yaguajay municipality, Sancti Spíritus province; and three in the Topes de Collantes Natural Park, Trinidad municipality, Sancti Spíritus province (Harms 1924; Roig y Mesa 1953; Montes & al. 1985; and herbarium specimens: *A. Fors* 16156 [1950] and *R. Sardiña* 16291 [1950] in HAC; *R. DeChamps* & *R. Carrera* 12190 [1988] in MO). Some of these location data need explanation, as they diverge from recent publications (Lazcano Lara & Areces Berazaín 2005; González-Torres & al. 2013). “Lomas de Somorrostro” has usually been reported as the type locality because it was the one recorded on isotype specimens left in Cuba, possibly mistakenly annotated by León (*E. L. Ekman* 17551 [1923] in HAC). The common name, “panza de vaca” (Roig y Mesa 1953), could imply a certain abundance or usage in Finca Brazo Fuerte, but there are no references to the number of specimens found. This property lies 13 km from Caibarién, on the N flank of Lomas Las Taseras (Anonymous 1953), and now its lands lie inside the boundary of Yaguajay municipality (Anonymous 1978). At present, only one of the six individuals mentioned has been confirmed to survive at Topes de Collantes Natural Park (González-Torres & al. 2013).

In 2004, a plant belonging to *Aralia* was found at a location in the Viñales National Park, Pinar del Río province (Fig. 1). It was initially determined as *Aralia rex* and was cited under that name as a newly discovered individual of this extremely threatened species (Lazcano Lara & Areces Berazaín 2005). While devising a conservation strategy for *A. rex*, the present author studied this plant in both the field and herbarium. Differences were found between the new individual and the descriptions of *A. rex* provided by Harms (1924) and Wen (2011), the corresponding specimens in Cuban herbaria, and images received of specimens in foreign herbaria. These differences are numerous and significant, especially as they include features of inflorescences and flowers, and appear to justify recognizing the new plant as a distinct species. The purpose of this article is to describe this new species, to assess its conservation status, and to point to the feasibility of its ex-situ propagation.

## Results

*Aralia duplex* R. Chaves, **sp. nov.** – Fig. 2–4.

Holotype: Cuba, Pinar del Río province, Viñales municipality: “Parque Nacional Viñales, Sierra de La Caoba, ladera norte hacia Cañadones”, 225 m, “sobre carso de mogote, individuo único”, 3 Aug 2011, *Ramiro Chaves* HAC43069 (HAC [with flowers]; isotypes: B, HAC, HAJB [2 sheets], JE, PAL-Greuter).

*Description* — *Trees* 14 m tall; *trunk* forming a straight shaft, 23.5 cm in diam. at 1.3 m above base; *branches*

*few*; *bark* reddish to pinkish pale brown at base of tree, to ashy pale brown or pale grey toward apex of tree. *Leaves* 3-pinnate, sometimes 4-pinnate (Fig. 3A–G), 30–100 cm long, 25–80 cm wide; *stipules* adnate to base of petiole, lanceolate, 2–4 mm long from confluence on petiole to apex, subcoriaceous, glabrous; *petiole* 7–30 cm long; *rachis* articulated at nodes; *pinnae* generally imparipinnate; *accessory pinnae or leaflets* (terminology based on Wen 2011) commonly present at point of insertion of 1st- and sometimes of 2nd-order leaf branches (could be also considered minor digitate pinnae or leaflets of a pinnate-digitate leaf in mid-transition to 3-pinnate), sometimes present even up to 5th node of rachis; *leaflets* of varying size and shape according to their position; *petiolule* proximally articulated to rachis or rachilla and usually distally articulated a little below lamina, glabrous, length variable according size and position, 1–40 mm long, those in terminal leaflets usually longest; *leaflet laminas* light green abaxially, green with some shine adaxially, generally ovate, oblong-ovate, or ovate-lanceolate, but sometimes orbicular, oblong, or lanceolate, 1.4–9.5 cm long, 0.9–5.5 cm wide, membranous, glabrous, base generally rounded or subcordate, sometimes cordate or obtuse, rarely acute, usually briefly contracted near petiolule, margin varying according to leaflet size, proximally entire, elsewhere variable from subentire to serrate (from minutely and sparsely to broadly serrate) or crenate, or crenate-serrate, depending on presence of 4–8 denticles on each side (Fig. 2P), more evident on immature leaflets (Fig. 3H), apex acuminate, frequently longish. *Inflorescence* lateral, solitary or 2 or 3 aggregated on a short leafless stem, paniculate; *main axis* light brown, 5–10 cm long, 4–6 mm wide, conspicuously lenticellate, glabrous, with 1 or 2 whorls of umbels, proximal whorl (if present) with up to 3 umbels, distal whorl with 4–8 umbels; *peduncle* predominantly greenish brown, articulated near middle, widening toward hemispherical apex, 6.5–10 cm long, 2–5 mm wide, rough, lenticellate; *bracts* subtending individual umbels, persistent, triangular, 2–3 mm long, 3–5 mm wide, coriaceous, glabrous; *bracteoles* persistent, triangular, 0.4–1.5 mm long, 0.3–1.5 mm wide; *umbels* 39–60-flowered. *Flowers* hermaphroditic, appearing after emergence of late leaves, nearly odourless; *pedicels* mostly purplish red with very thin longitudinal streaks, except light green at base and sometimes at apex, articulated to thalamus, at anthesis 15–27 mm long, c. 1 mm wide at base, c. 0.5 mm wide at middle, glabrous; *thalamus* light green, parabolic cupuliform, 2.5–3.2 mm long, c. 1 mm wide at base, 2.5–3.5 mm wide at apex; *sepals* 4 (or 5), minute triangular denticles on calyx rim, c. 0.1 mm long; *petals* (5 or)6(or 7), free, imbricate in bud, caducous, changing from light green to yellowish white before anthesis, externally sometimes irregularly purplish tinged, adaxially yellowish white at anthesis, tongue-shaped, 3.5–5 mm long, 1.5–2.2 mm wide, with a thickened medial line, basal ½ recurved, apex incurved, more internal petals with incurved apex; *stamens* (5 or)6,



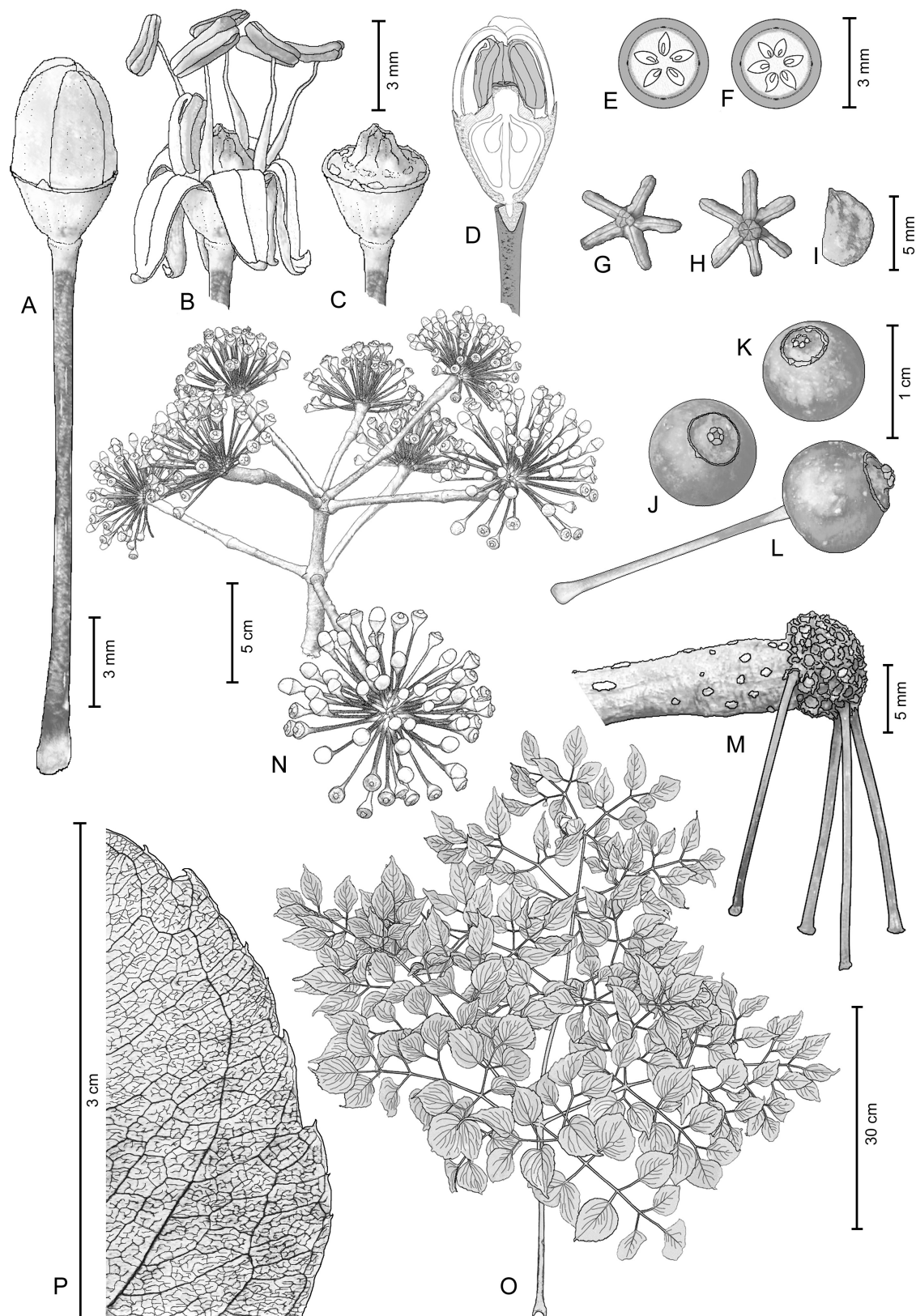


Fig. 2. *Aralia duplex* – A: flower bud; B: open flower at anthesis; C: flower after loss of petals and stamens; D: flower bud, longitudinal section; E & F: ovary transverse sections at level of insertion of ovules, basal view; G & H: seed disposition in fruits naturally deprived of pulp, apical view; I: seed; J & K: fruits, oblique apical view; L: fruit with pedicel, lateral view; M: apex of peduncle with remnant fruitless pedicels attached; N: inflorescence; O: leaf (same as in Fig. 3A); P: leaflet apical portion, abaxial view. – Drawings within groups A–F, G–I and J–L share same scale bars. – Drawings by Ramiro Chaves: A–F & N–P from HAC43069; G–M from HAC43070.

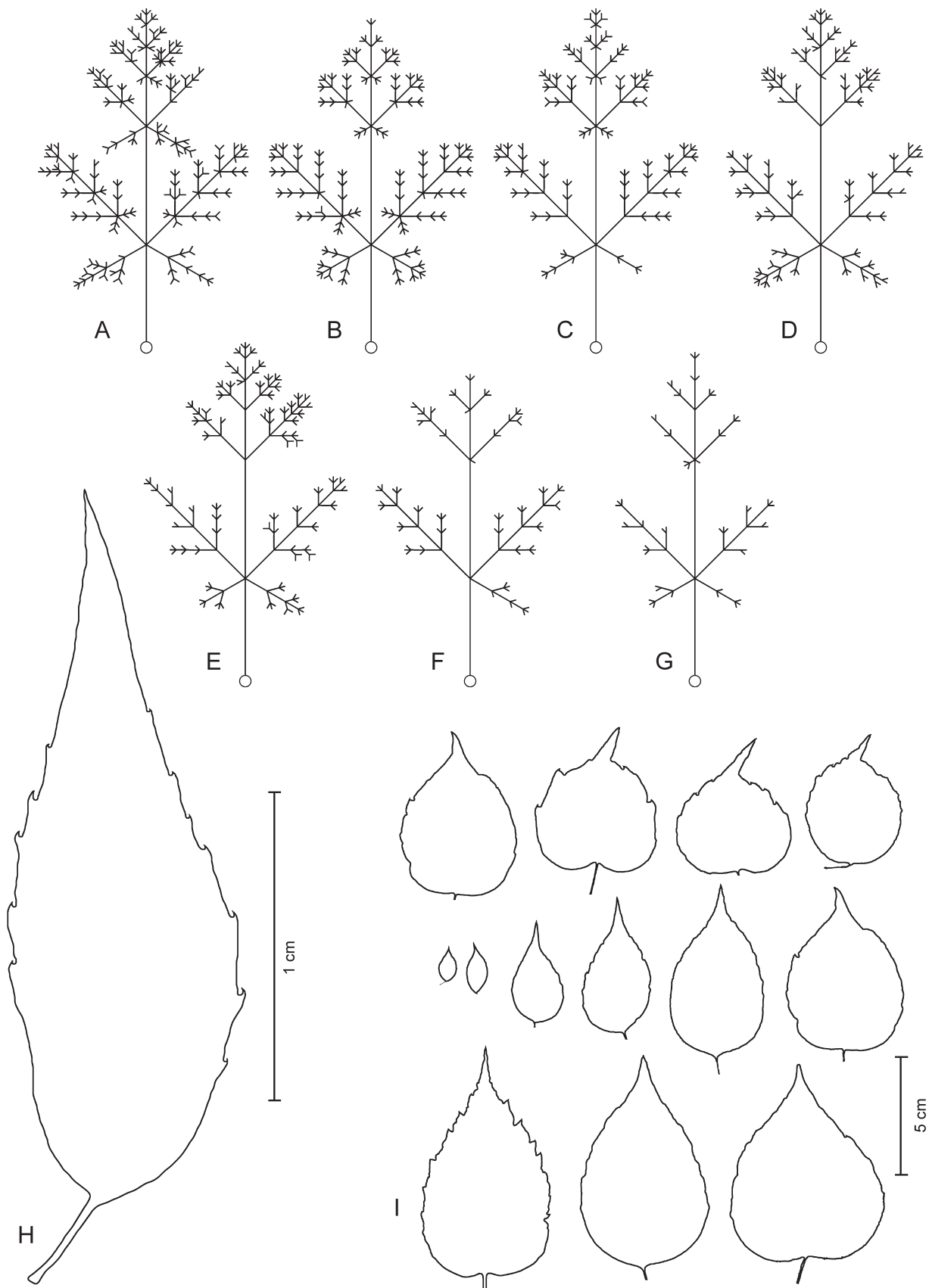


Fig. 3. *Aralia duplex* – A–G: branching diagrams of leaves, each end branch represents a leaflet; H: outline of a non-expanded leaflet; I: outlines of 13 leaflets of expanded leaves showing variation in shape. – Drawings by Ramiro Chaves: A, D–G & I from HAC43069; B & H from HAC43071; C from HFC 83079.





Fig. 4. *Aralia duplex*, the only known individual, Viñales National Park – A: with leaves in August 2010; B: without leaves in February 2011. – Photographs by Ramiro Chaves.

caducous; *filaments* narrowing toward apex, 4–5 mm long, 0.5–0.7 mm wide at base, 0.1–0.2 mm wide at apex, terminal  $\frac{1}{3}$  bent before anthesis; *anthers* oblong, 2–3 mm long, base subsagittate, divergent; *nectar disk* light yellowish green, irregularly rough; *ovary* inferior, (5 or)6-locular, c. 2.5 mm long, 1.5–2 mm in diam.; *styles* firmly connate into a thick fleshy column with a truncate apex, c. 1 mm long; *stigmas* (5 or)6, almost rudimentary, green.

*Fruit* changing at maturity from green to purplish red and finally to dark purple or almost black, globose, 7–11 mm long, 7–11 mm in diam., with 5 or 6 ribs when dry; styles stout, persistent stigmas almost circular, margins divergent toward apex, laterally usually attached. *Seeds* 6 or 5 per fruit, very light yellowish brown, flattened, almost semi-circular in outline, 5–6 mm long, 3–3.5 mm wide, 0.6–0.9 mm thick, base rounded, hilum margin almost



straight, apex acute; *testa* slightly undulate; *embryo* evident as a linear thickening 1.5–3 mm long almost from centre to apex of seed.

**Phenology** — Tree leafless from December or January to April (Fig. 4B); new leaves flushing from April or May to July; flowering from mid-July to mid-August; fruit ripening late September to late October.

**Distribution** — Endemic to Cuba, Pinar del Río province, Viñales municipality, Viñales National Park, N flank of Sierra de La Caoba facing the Cañadones valley (Fig. 1), where only one individual is known.

**Habitat** — *Aralia duplex* grows in semi-deciduous forest of the “Mogote” (karstic hill) vegetation complex, with an open canopy, on karstic limestone with a little soil present in the interstitial cavities, on a 25°–30° slope, at 225 m altitude. Neighbouring trees are up to 16 m tall and rarely exceed 25 cm in diam. at 1.3 m above the base. The surrounding vegetation has been listed by Lazcano Lara & Areces Berazaín (2005). See Fig. 4.

**Etymology** — The specific epithet, *duplex*, is a Latin adjective meaning twofold or double, chosen because the number of native Cuban *Aralia* species has been doubled by the discovery of *A. duplex*.

**Additional specimens examined (paratypes)** — CUBA, PINAR DEL RÍO PROVINCE, VIÑALES MUNICIPALITY: same locality and from same individual as holotype, 28 Oct 2004, F. Areces & J. Lazcano HFC 83079 (HAJB [5 sheets, sterile]); *ibid.*, 16 Jul 2010, Ramiro Chaves HAC43071 (HAC [2 sheets, immature leaf, sterile]); *ibid.*, 26 Oct 2010, Ramiro Chaves HAC43070 (HAC [with fruits]).

## Discussion

This new species described from a single individual cannot be considered as merely an atypical or abnormal example of *Aralia rex*. Differential characters perfectly separating the two species occur in leaves, inflorescences, flowers and fruits – differences at too many levels to represent just casual isolated deviation. All of these characters are of the same nature as those already used to differentiate species within *A. sect. Sciadodendron* and other sections. Besides, herbarium specimens of *A. rex* collected from all three of its known locations are indistinguishable from each other (see Appendix). Furthermore, *A. duplex* and *A. rex* can be distinguished by the leaflet margins in four-year-old plants under cultivation as well as in their parent wild plants. For these reasons, this single known wild individual of *A. duplex* in Viñales Park and its descendants in cultivation deserve the present treatment as a distinct species.

The morphological differences between *Aralia duplex* and *A. rex* are further supported by their occurrence in two different phytogeographical subprovinces: Western Cuba and Central Cuba, respectively (Fig. 1A), within the phytogeographical province of Cuba, subregion of West Indies, region of Caribbean, as defined by Borhidi (1996).

A DNA analysis comparing sequences between both these Cuban species would better validate *Aralia duplex* as an independent evolving population and would give an estimate of the time during which the two species have been diverging.

*Aralia duplex*, on account of being a branched, unarmed, glabrous tree with 3–4-pinnate leaves, persistent bracts at the base of the umbels, umbels clustered in panicles aggregated at the apex of a short stem, 5- or 6-merous flowers, connate styles, and dark purple fruits belongs to *A. sect. Sciadodendron* (Wen 2011). Wen's identification key to the species of this section needs to be modified as follows:

### Key to species of *Aralia* sect. *Sciadodendron*

1. Pedicels not articulated ..... 2
- Pedicels articulated ..... 3
2. Fruits subglobose, 6–7 mm long; peduncles relatively slender, 1–1.5 mm thick ..... *Aralia excelsa* (Griseb.) J. Wen
- Fruits ovoid-globose to globose, 7–8 mm long; peduncles stout, 2–3 mm thick ..... *Aralia bahiana* J. Wen
3. Inflorescences aggregated, up to 4 × branched; differentiated abortive or functionally male umbels present; ovaries 5-locular ..... *Aralia soratensis* Marchal
- Inflorescences aggregated, up to 3 × branched; differentiated abortive or functionally male umbels absent; ovaries 5–10-locular ..... 4
4. Panicles up to 5 aggregated on a short axis; peduncle of umbels 1.5–2 mm thick; umbels 25–40-flowered; pedicels 4–7 mm long at flowering ..... *Aralia warmingiana* (Marchal) J. Wen
- Panicles up to 3 aggregated on a short axis; peduncle of umbels 2–5 mm thick; umbels 39–120-flowered; pedicels ≥ 9 mm long at flowering ..... 5
5. Leaflet margin usually entire; inflorescence of 9–30 umbels; umbels 90–120-flowered; pedicels 9–13 mm at flowering; flowers 7–10-merous; fruits depressed subglobose .. *Aralia rex* (Ekman ex Harms) J. Wen
- Leaflet margin usually serrate or crenate; inflorescence of no more than 11 umbels; umbels 39–60-flowered; pedicels 15–27 mm long; flowers 5- or 6-merous; fruits globose ..... *Aralia duplex* R. Chaves

### Conservation status

*Aralia rex* was first described from a population of only two known individuals. After its first collection, 29 years



elapsed before it was collected at a second location and a further 34 years before it was collected at a third. Besides the human impacts on its population, based on its extreme rarity, *A. rex* could be supposed to be suffering a natural process of extinction. The change in climate since the last glacial period could be a cause of this process.

*Aralia duplex* could be suffering a similar process. Neighbouring inhabitants who frequently visit Sierra de La Caoba, the type locality of *A. duplex*, never knew this species before its discovery. No other individuals have yet been found, despite the frequent surveying of this location. But Cordillera de Los Órganos, to which Sierra de La Caoba belongs, extends for about 80 km of similar karstic mountain ranges with natural patchy vegetation. These very difficult-to-explore habitats may possibly be home to other individuals. However, the discovery of new localities for *A. duplex* could take decades, as was the case for *A. rex*.

The most evident fact at assessing the conservation status of *Aralia duplex* is the extremely low population size, as only one individual is known in the wild. Less evident information is the observed continuing decline in quality of habitat due to selective timber poaching in its location, as in many of the similar habitats where the species could be potentially present. This must be considered together with its being known from a single location, with both an extent of occurrence and an area of occupancy extremely small. These data are enough to classify this species as Critically Endangered under criteria CR: B1ab(iii)+2ab(iii); D of the IUCN threat categories (IUCN 2012; IUCN/SPS 2014). At its only known location, no natural reproduction has been observed. Nevertheless, seeds sown ex situ showed a 12 %–35 % germination depending on seed selection. Resultant seedlings had a mortality rate of about 40 % after four months and of about 60 % after 11 months, due to mycosis in leaves and roots. Forty young plants of three to five years old have survived to the present. Twenty-three of them were donated to be kept in ex-situ cultivation by ten members of the Cuban Botanical Gardens Network.

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### Appendix: *Aralia rex* specimens examined

CUBA: MAYABEQUE PROVINCE: San José de Las Lajas municipality, Lomas de Camoa, 1923, with flowers, *E. L. Ekman 17551* (BM, GH, HAC, K, MO, NY, S [holotype], UPS, US); *ibid.*, 1921, with fruits, *E. L. Ekman 13451* (S); *ibid.*, 1921, with fruits, *E. L. Ekman 13523* (BM, MO, S). — SANCTI SPÍRITUS PROVINCE: Yaguajay municipality, Finca Brazo Fuerte, 1950, with peduncle, *A. Fors (R. Sardiña) 9092* (HAC); *ibid.*, 1950, with seeds, *A. Fors 16156* (HAC); *ibid.*, 1950, with flowers and fruits, *R. Sardiña 16291* (HAC); Trinidad municipality, Topes de Collantes Natural Park, 1984, *L. Montes, C. Chiappy & R. Oviedo HAC-30377* (HAC); *ibid.*, 1989, *V. Moreno & R. Pérez HAJB 66443* (HAJB); *ibid.*, 2011, with under-developed fruits, *R. Chaves SV43075* (HAC).