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Populus luzae (Salicaceae), a new species of white poplar endemic to the western Transmexican Volcanic Belt, in Zapopan, Jalisco, Mexico

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Abstract

Populus luzae, a new species of white poplar from the western Transmexican Volcanic Belt, Zapopan, Jalisco, Mexico, is described and illustrated. *Populus luzae* belongs to section *Populus* and is morphologically close to *P. guzmanantlensis*, but it differs from the latter in having smaller size and soboliferous habit, narrower twigs and petioles, ovate to ovate-deltoid and chartaceous leaf blades, adaxial leaf surface with less depressed veins, abaxial surface puberulent, thrice smaller ovate male bracteoles with entire margin, twice longer female bracteoles sparsely denticulate but none lobed, smaller number of pistillate flowers, capsules pubescent, twice longer mature male inflorescence, and a lax and longer infrutescence.

Resumen

Populus luzae se describe e ilustra como una especie nueva de álamo blanco del occidente de la Faja Volcánica Transversal Mexicana, Zapopan, Jalisco, México. *Populus luzae* pertenece a la sección *Populus*; en términos de su morfología se asemeja a *P. guzmanantlensis*, pero difiere de ésta última en presentar hábito de tamaño mediano y sobolífero (frecuentemente propagado por raíz), ramillas y peciolos más angostos, láminas ovadas a ovado-deltoideas y papiráceas, haz con nervaduras menos deprimidas, envés puberulento, brácteolas masculinas tres veces más pequeñas, ovadas, con margen entero, bracteolas femeninas dos veces más largas, no lobadas, esparcidamente denticuladas, menor número de flores pistiladas, cápsulas pubescentes; inflorescencia masculina dos veces más larga e infrutescencia más larga y laxa.

Key words: "Álamo blanco", *Populus* subsect. *Tomentosae*, *Populus* subsect. *Trepidae*, "white poplar"

Introduction

The genus *Populus* Linnaeus (1753b: 1034) (Salicaceae) in Mexico consists of ten species, including the one described here, belonging to four sections: *Abaso* Eckenwalder (1977a: 194), *Aigeiros* Duby (1828: 427), *Populus* and *Tacamahaca* Spach (1841: 32) (Eckenwalder 1977a, 1977b, Rzedowski 1985, Vázquez-García & Cuevas-Guzmán 1989, Martínez-González & González-Villarreal 2002, 2005). Three species have been reported from the state of Jalisco, one belonging to section *Aigeiros* [*Populus fremontii* Watson (1875: 350) subsp. *mesetae* Eckenwalder (1977a: 201)], reported from northern Jalisco, including the Los Altos region, and two belonging to section *Populus*: *Populus guzmanantlensis* Vázquez & Cuevas (1989: 39) [subsect. *Tomentosae* Hart. (1851: 433)], endemic to the Jaliscan portion of the Sierra Madre del Sur, and *Populus tremuloides* Michaux (1803: 243) [subsection *Trepidae* Dode (1905: 176) Tamm (1971: 8)] recorded from Mezquitic, northern Jalisco (Vázquez-García & Cuevas-Guzmán 1989, Martínez-González & González-Villarreal 2002, 2005). Here we describe and illustrate a new species, *Populus luzae,* belonging to section *Populus,* subsect. *Tomentosae*, growing in gallery forest with relict cloud forest species in the western Transmexican Volcanic Belt, Zapopan, Jalisco, México.

Jalisco with 40% (4 spp.) of the Mexican species of *Populus* (10) is only second to Chihuahua with 5 spp., in terms of absolute *Populus* species richness; however, considering that the latter is nearly three times larger (247,460 km^2) in area than the former (79,080 km^2), Jalisco is relatively richer than Chihuahua (with 1 species per ca. 20,000 vs. 1 species per ca. 50,000 km^2).

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TABLE 1. Differences between *Populus luzae* and closely related taxa in terms of morphology, phenology, habitat and geography. Based on herbarium type specimens examinations, Eckenwalder (1977a, 1977b), Martínez-González & González-Villarreal (2002, 2005), Rzedowski (1975, 1985) and Vázquez & Cuevas (1989).

Traits	***P. luzae***	*P. tremuloides*	*P. guzmanantlensis*	*P. fremontii* subsp. *mesetae*	*P. simaroa*
Tree height (m)	15.0–20.0	5.0–15.0(20.0)	25.0–45.0	6.0–15.0 (–30.0)	(8.0–) 25.0–45.0
Tree dbh (m)	0.3–1.5	0.1–0.2(–0.3)	0.5–1.9	0.2–1.2	(0.3–)1.5–2.0
Bark	Evidently fissured, even the middle aged trees	Smooth to slightly fissured	Smooth when young to longitudinally sulcate	Deeply furrowed	Deeply furrowed
Leaf blade size (cm)	(9.5–)10.5–15.0 (–16.0) × (7.8–)8.8–13.4(–14.2)	2.5–8.5 × 2.0–8.0	3.0–14.0 (–16.0) × 5.0–10.0(–13.0)	(2.0–)4.0–14.0 × 2–8	8.0–23.0 × 5.0–13.0
Petiole length (cm) and pubescence	(3.7–)4.5–6.0, glabrous to pubescent, barely laterally compressed	2.0–8.0 glabrous, laterally compressed at the blade union	(2.0–)4.0–8.0 (–10.0), pubescent, cylindrical at the blade union	5.0–6.0, pubescent, transversely flattened at blade union	2.0–8.0, tomentose
Leaf shape	Widely ovate, to ovate-deltoid	Widely ovate to suborbicular	Ovate to suborbicular, occasionally rhombic or cordate	Broadly deltoid-ovate, trullate at young shoots	Ovate-deltoid to rhombic–ovate
Leaf apex	Rounded, acute to shortly apiculate	Abrupt and acutely acuminate	Apiculate 3–15 mm, obtuse or rounded	Long-acuminate	Acute to acuminate
Leaf base	Obtuse to rounded to subcordate	Rounded to subcordate	Rounded, cordate, obtuse, rarely oblique	Truncate to subcordate, cuneate at young shoots	Truncate to subcordate
Abaxial leaf surface	Puberulent, tertiary veins not very prominent	Glabrous, glaucous, tertiary veins not prominent	Pubescent, tertiary veins very prominent	Glabrous, tertiary veins not prominent	Densely pubescent, tertiary veins very prominent
Length of mature male inflorescence (mm)	(25.0–)45.0–65.0(–72.0)	38.0–60.0 (–90.0)	10.0–30.0	40.0–130.0	10.0–40.0
Number of stamens	9–13	6–18	7–15	30–70	10–18
Male bracteoles	Ovate, scarcely pubescent, margin entire, ciliated, unlobed, 0.7–1 mm long	Margin with 3–5 lanceolate lobes, ciliated, 2 mm long	Spathulate, deciduous pubescence, margin dentate to parted, ciliated, 2–3 mm long	Narrow ovate margin entire, unlobed, 2.5–3 mm long	Very variable in shape, margin entire, laciniate to lobed, irregularly ciliated, 1.5–2 mm long
Female bracteoles	With denticles and ciliated, unlobed, 2.6–3.2 mm long	Non ciliated, lobed, 3.0–5.0 mm long	Ciliated, evidently lobed, 1.2–1.5 mm long	Narrow, 6.0–8.0 mm long	Ciliated, lobed, 1.5–2.0 mm long
Length of mature female inflorescence (mm)	50.0–60.0 (–80.0)	40.0–60.0	50.0	40.0–140.0	45.0
Number of pistillate flowers	(35–)75–70(–77)	Ca. 50	70–130	(10–)–28–30	25–75
Capsule length (mm) and pubescence	2.0–2.5, pubescent	(3.0–)6.0–9.0, glabrous	2.0–3.0, glabrous	6.0–10.0, glabrous	4.0–6.0, pubescent
Deciduousness of foliage	At the beginning of autumn	Winter	Middle summer to autumn Aug–Nov	Winter	Summer
Flowering	September to November	March to May	August to October	February to April	March to June
Fruiting	October to January	April to June	October to November	March to July	June to July
Habitat	Gallery forest with relict cloud forest elements	In Jalisco: *Pinus arizonica forest*	Tropical subdeciduous forest-cloud forest ecotone	Oak forests	Cloud forest, pine-oak forests
Elevation (m)	1330–1460	2650	400–1250	1750–2300	1500–2500
Mean annual rainfall (mm)	900	Ca. 500	1450–1850	Ca. 760	Ca. 670
Geography	Central Jalisco: Zapopan, western Transmexican Volcanic Belt	Alaska, Canada, USA, northern Mexico, Mexican Plateau including northern Jalisco	Southern to southwestern Jalisco and Colima, Sierra Madre del Sur mountain range (Vázquez & Cuevas 1989)	S of New Mexico, Texas & Mexican Plateau, including northern Jalisco. (Eckenwalder 1977a, 1977b)	State of México, Guerrero & Michoacán, Sierra Madre del Sur mountain range (Rzedowski 1975, 1985)

Materials and Methods

The newly proposed taxon was first collected over four decades ago (1975) by Dra. Luz María Villarreal de Puga, at the spring of Río Atlicotle, near Copala (1460 m); however, the sterile specimen (*Villarreal 7411,* IBUG) remained misidentified as *Populus fremontii* subsp. *mesetae* by Martínez-González & González-Villarreal (2002, 2005). Several recent explorations by Antonio Vázquez & Rosa E. Martínez, near Copala, suggest that this population was extirpated from this location. Furthermore, the cited specimen was possibly misplaced and is no longer filed at IBUG. In late November 2012, the second and third authors of this manuscript, while sampling populations of *Magnolia pugana* Iltis & Vázquez (1994: 14) A.Vázquez & Carvajal (2002: 137) in Arroyo La Virgen, Zapopan, located several female trees of *Populus* (Figs. 1–6). Later, in January 2013, a close examination of the relatively long and lax infrutescence and somewhat abaxially tomentose and crenate leaves, as well as the description of the recently obtained male inflorescence (*Nieves & Padilla Lepe s.n.*) (Figs. 5 A–C) collected in October 2017, when both female and male trees were blooming, allowed us to conclude: 1) that we had rediscovered the same taxon that Dra. Villarreal de Puga had found 42 years earlier; and 2) that this population represented an undescribed taxon of section *Populus*, here described as a new species. Morphological description and illustrations were based on fresh and herbarium material. Leaf description and general shapes of reproductive structures follow Eckenwalder (2010), Dickmann & Kuzovkina (2014) and Radford *et al.* (1974). The herbarium acronyms follow Thiers (2017). Detailed herbaria type specimens examination and electronic images of type material for both *Populus guzmanantlensis* [Holotype: provided by R. Cuevas from ZEA (Fig. 7 A); isotypes: MEXU, MICH; BRIT, CAS, CHAPA, CIDIR, ENCB, F, GH, LE, MICH, MO, TEX, UAMIZ, WIS] and *P. simaroa* Rzed. (1975: 37) (Holotype: ENCB; isotypes: CAS, ENCB, G, MEXU, MICH, MO, NY, OS, P, US)*,* available at the Global Plant JSTOR website (except for the *P. guzmanantlensis* holotype), were valuable for construction of Table 1 with morphological differences among taxa. For accepted names we used Plants of the World Online, POWO (2017). Authors and names of plants follow The International Plant Name Index, IPNI (2017). The conservation status was assessed based on the criteria of IUCN (2012).

Results

Populus luzae A.Vázquez, Muñiz-Castro & Padilla-Lepe *sp. nov.* (Figs. 1–6, 8).

Diagnosis:— ***Populus luzae*** A.Vázquez, Muñiz-Castro & Padilla-Lepe is morphologically close to *P. guzmanantlensis* (Figs. 7 A–D), but it differs from the latter in having smaller habit, producing suckers, narrower twigs and petioles; leaf blades widely ovate to ovate-deltoid, chartaceous rather than ovate to suborbicular, coriaceous, with adaxially less depressed veins; male bracteoles thrice smaller, ovate, with entire margin; female bracteoles twice longer, sparsely denticulate but unlobed; smaller number of pistillate flowers; capsules pubescent; mature male inflorescence twice longer, and infrutescence lax and longer.

Type:—MEXICO. Jalisco: Zapopan, Arroyo La Virgen, 1.15 km SW from Rancho San Nicolás, 9 km WNW from Santa Lucía, along a stream with relict cloud forest elements, 20°48'53.22"N, 103°34'51.30"W, 1425 m, 30 November 2012 (young fruit), *Miguel A. Muñiz-Castro, Jesús Padilla-Lepe y Ana T. Nuño-Rubio 1150* (holotype IBUG!; isotypes IEB!, MEXU!, MO!, ZEA!,).

Description:—*Trees* 15.0–20.0 m tall, trunk 0.3–1.5 m dbh; *first branches* from 2.0 to 3.0 m height, in any direction, rarely straight; *clones* spreading by means of root-borne sucker shoots (soboliferous); *bark* smooth and grayish at sapling stage, soon becoming deeply furrowed and occasionally tessellated; *twigs* lenticellate, slender, 2.0–4.0 mm thick, glabrous except the young green twigs puberulent to pubescent. *Petioles* (3.7–)4.5–6.0 cm long, occasionally shorter in young and shaded shoots, abaxially flattened at the base, 1.5 × 1.2 mm, adaxially convex, basically cylindrical halfway its length, barely compressed laterally, (1.2 × 1.0 mm) at the blade union, glabrous to pubescent. *Leaf blades* (9.5–)10.5–15.0(–16.0) × (7.8–)8.8–13.4(–14.2) cm, widely ovate to ovate-deltoid; base obtuse to rounded to subcordate; apex rounded to acute to shortly apiculate; margins crenate-dentate, 19–20 teeth per side, each topped by a dark gland; adaxial leaf surface glabrous, with slightly depressed veins; abaxial leaf surface puberulent, tertiary veins not very prominent. *Male inflorescence* ament, (25.0–)45.0–65.0(–72.0) × 6.0–8.0(–9.5) mm, cylindrical, pendulous and curved, with densely arranged flowers, rachis 0.7–0.8(–1.0) mm thick, white to creamy, brown when it dries, sparsely ciliate; *bracteoles* ovate 0.7–1.0 mm long, reddish brown, scarcely ciliated, margin entire, ciliate. *Staminate flowers* (50–)55–77(–85), pedicellate, 1.8–2.7 mm long; *pedicels* 0.3–0.5 mm long; *floral disc* meniscoid, shallow cup, shaped to patelliform, oblique, 1.0–1.2 mm diam., creamy, when it dries: brown and yellowish; *stamens*

FIGURE 1. *Populus luzae*, Habit and bark detail. Illustrations by Daniel Barba.

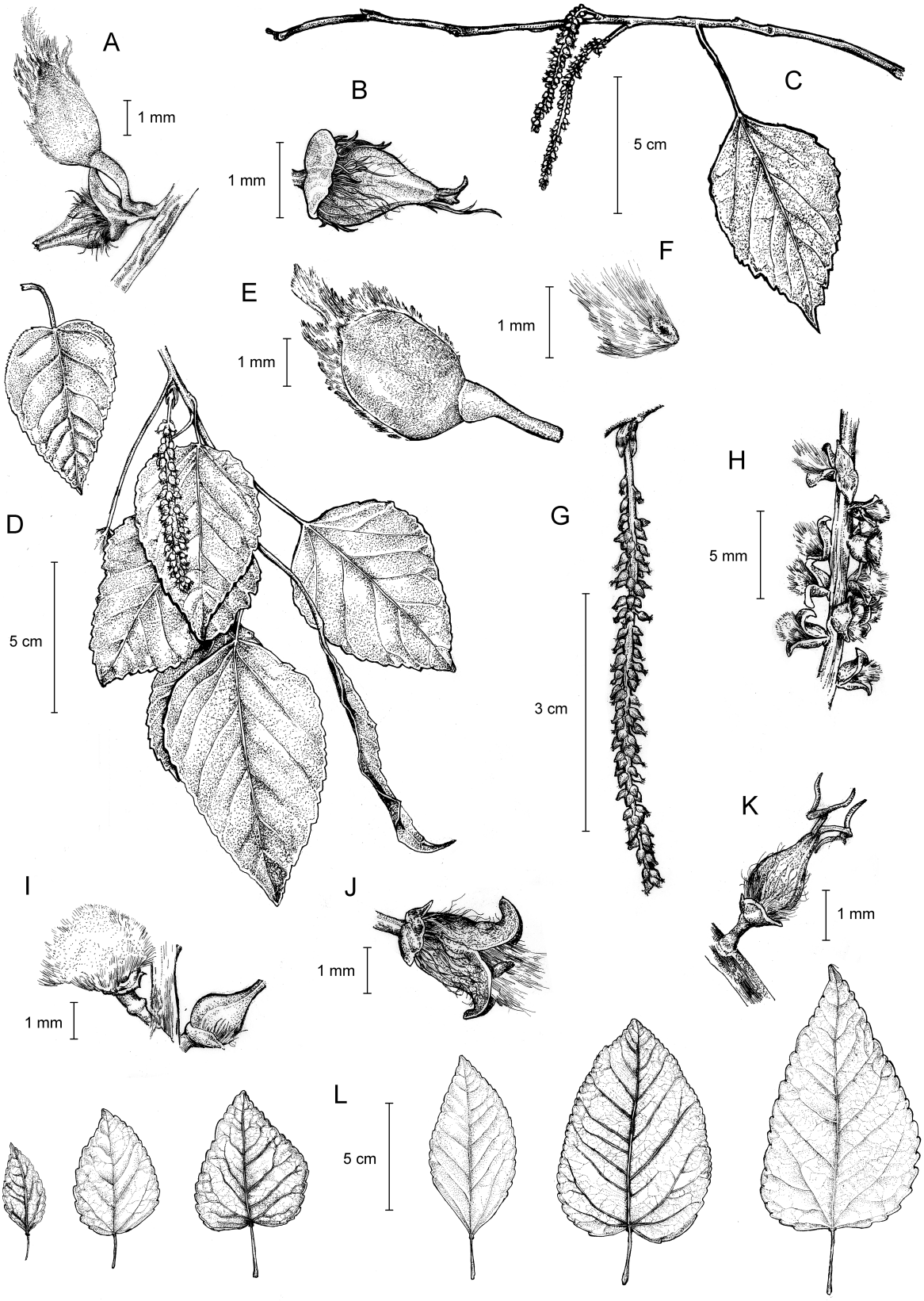

FIGURE 2. *Populus luzae.* A. Bract, floral disk and capsule. B. Capsule with floral disk. C. Twig with developing infrutescence. D. Terminal twig with infrutescense. E. bract with pedicel. F. Seed with arilate coma. G. Developing infrutescence. H. Dehiscing infrutescence. I. Closed and open capsule. J. Close up to open capsule. K. Ovary with styles s and stigmas. L. Variation of leaf shape. A–L. Illustrations by Daniel Barba, from the holotype, except for L (leaves collected from the ground).

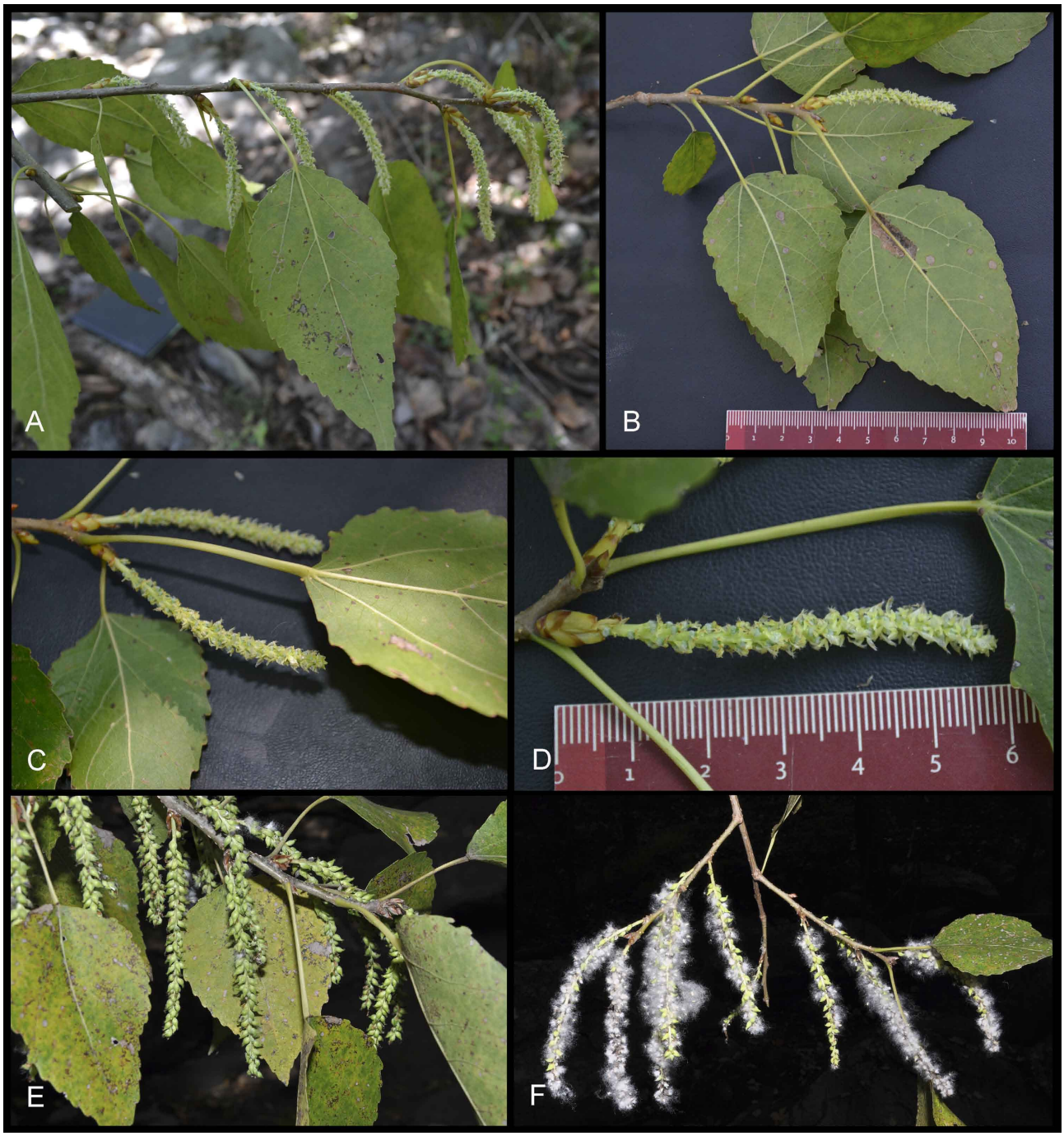

FIGURE 3. *Populus luzae.* A–D. Twigs with leaves and female inflorescences, ruler in cm. E. Twig with developing infrutescences. F. Twig with mature infrutescences with dehiscent capsules and cottony seeds getting out. Photographs A–D by Jesús Padilla-Lepe, E–F by Miguel Muñiz-Castro.

9–13, free, filaments glabrous 1.2–1.8 mm long; *anthers* basifix and oblong, 0.9–1.2 mm long, pale yellow. *Female inflorescence* ament, 50.0–60.0(–80.0) × 3.5–4.5 mm, cylindrical, lax, rachis (0.6–)0.7–0.9(–1.2) mm thick, creamy to greenish-yellow color, brown when it dries, sparsely ciliate; scales of axillar buds 6–7, 3.5–4.0 × 2.5–3.0 mm, brown reddish, glabrescent to pubescent; *pedicels* (0.1–)0.2–0.3 mm long; *bracteoles* 2.6–3.2 × 1.2–1.3 mm, narrowly ovate to elliptic to broadly spathulate, margin sparsely denticulate to entire, none lobed, ciliate, caducous, greenish-yellow at anthesis, brown-reddish when they dry; *pistillate flowers* (35–)57–70(–77), ovate acuminate to conic; *floral disc* cuplike, oblique, scarcely ciliated; *ovary* pubescent to glabrescent; *styles* 2, each branched into curved stigmas. *Infrutescences* lax 50.0–81.0 × 3.5–6.0 mm; *capsules* bivalved, 2.0–2.5 × 1.3–1.6 mm (closed), pubescent, opening at the tip. *Seeds* 4–6 per capsule, 0.2 × 0.1 mm, ovoid, reddish brown.

FIGURE 4. *Populus luzae*. A–B. Ciliated female bracteoles. C–D. Capsules and floral disks. Photographs, all from the holotype, by Miguel Muñiz-Castro.

Distribution, habitat, and phytogeography:—Apparently, *Populus luzae* is endemic to central Jalisco, in the Zapopan municipality (Fig. 8), at 1425–1430 m elev., along only two streams at the northern and eastern edges of the "Mesa de Nextipac" plateau, respectively, in gallery forest ecotones with relict cloud forest elements such as *Magnolia pugana*, *Persea liebmannii* Mez (1889: 166), *Fraxinus uhdei* Wenz. (1883: 182) Lingelsh. (1907: 221), *Prunus ferruginea* Steud. (1841: 403), and *Clethra hartwegii* Britton (1914: 6); and tropical moist forest elements such as *Salix bonplandiana* Kunth (1817: 24), *Lysiloma acapulcense* Kunth (1821: 78) Benth. (1844: 83), *Platymiscium trifoliolatum* Benth. (1860: 82), *Ficus petiolaris* Kunth (1817: 49), *Oreopanax peltatus* Linden (1859: 368) and

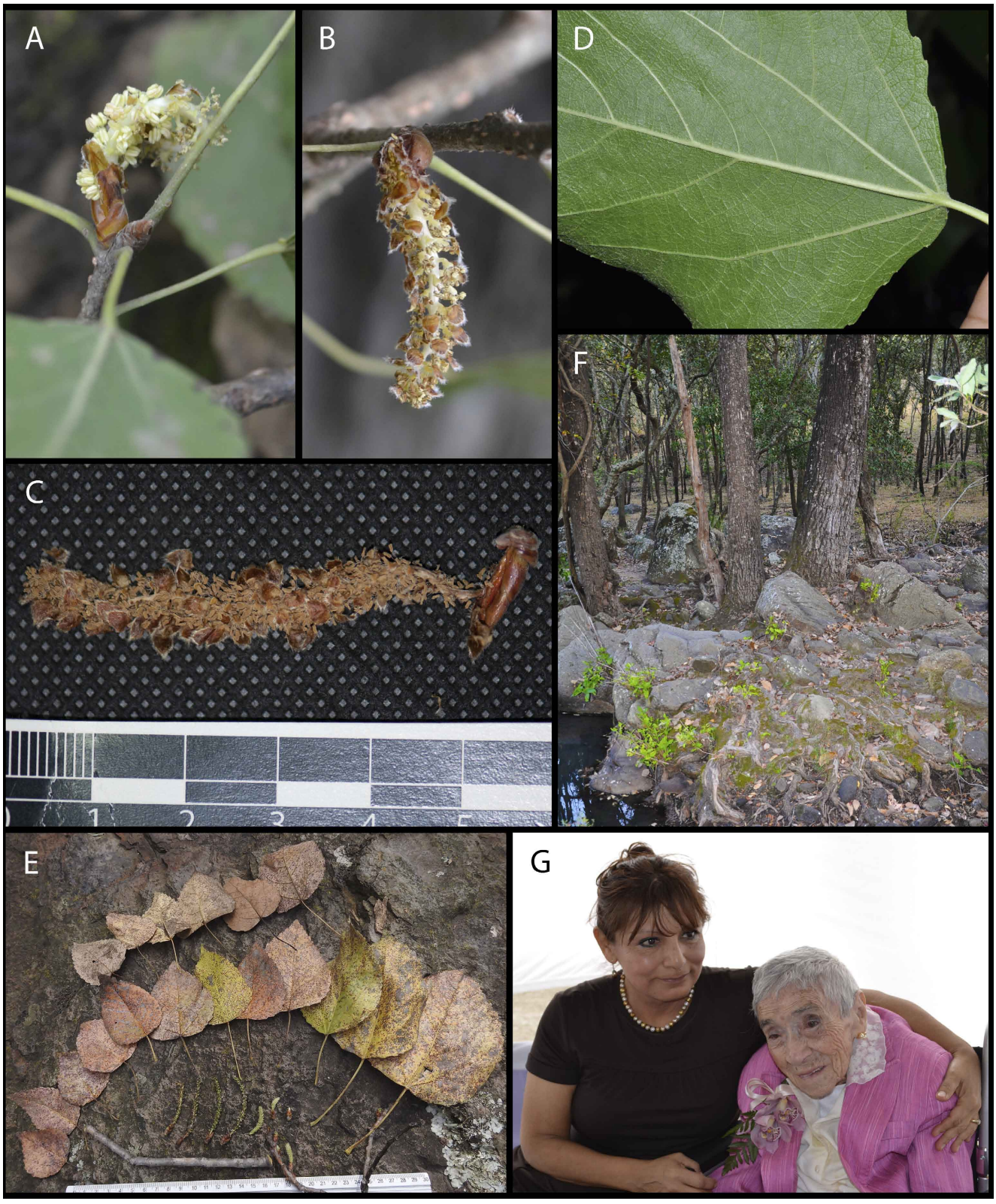

FIGURE 5. *Populus luzae*. A. Male inflorescence at anthesis, with fully developed anthers. B–C. Male inflorescence after anthesis. D. Abaxial leaf surface. E. Variation of leaf shape and size, and immature infrutescences. F. Stems form a single individual and newly root-borne shoots. G. Dr. Luz María Villarreal de Puga† and M.Sc. Luz María González Villarreal, both from Universidad de Guadalajara, México. Rulers in cm. Photographs A–B by Jesús Padilla-Lepe, C–F by Miguel Muñiz-Castro, G by Luz María González Villareal.

FIGURE 6. *Populus luzae.* Holotype, *M. A. Muñiz-Castro, J. Padilla-Lepe and A. T. Nuño-Rubio 1150* (IBUG).

Toxicodendron radicans L. (1753a: 266) Kuntze (1891: 153); the forest understory including *Osmunda regalis* L. (1753b: 1065), *Psilotum complanatum* Sw. (1801: 110), *Piper hispidum* Sw. (1788: 15)*, Chusquea circinata* Soderstr. & C.E.Calderón (1978: 156), *Rhus trilobata* Nutt. (1838: 219) and *Verbesina fastigiata* B.L.Rob. & Greenm. (1899: 558). Outside the ravine, the western slopes are heavily disturbed and dominated by *Pinus oocarpa* Schiede ex Schltdl. (1838: 491) and *Vachellia farnesiana* L. (1753a: 521) Wight & Arn. (1834: 272), while the eastern slopes are less disturbed and dominated by *Quercus resinosa* Liebm. (1854: 182). The cloud forest relicts most likely migrated from older refugia at the Sierra Madre Occidental mountain range to the more recent (late Miocene–Pliocene) Neovolcanic Plateaus supergroup (Rodríguez-Castañeda & Rodríguez-Torres 1992), where they possibly survived Pleistocene climatic fluctuations in protected ravines with perennial streams. The extensive natural and artificial hybridization reported for the genus *Populus* in China and North America (Shang *et al.* 2016, Eckenwalder 1977a) is unlikely to occur at the southern edge of its distribution in México, particularly in the canyon region of central Jalisco, where deep ravines prevent long distance dispersal and pollination flow and favor allopatric speciation.

Phenology:—The new species is found flowering from September to November, and fruiting from October to January. Deciduousness of foliage at the beginning of autumn (September).

Eponymy:—The specific epithet honors both Doctorate Honoris Causa Luz María Villarreal de Puga (1913-2013) and M.Sc. Luz María González Villarreal, two outsdanding botanists (mother and daughter) from Universidad de Guadalajara, Mexico (Fig. 5 G).

Ethnobotany:—There is no available information on the use of *Populus luzae*.

Conservation status:—*Populus luzae* is only known from two ravines: the type locality where it is found with scarce abundance (nearly twenty trees) at Arroyo La Virgen, Zapopan, and a second locality at Arroyo Pajaritos stream, a tributary of Arroyo San Lorenzo (near El Encanto hot springs), where the authors have seen only six trees. According to the IUCN Red List Criteria (IUCN 2012) used to assess the conservation status, *Populus luzae* should be categorized as Critically Endangered, because this species has a very small population size (< 250 mature individuals, criterion C), an estimated continuing decline (criterion C2) due to high deforestation rate by fires and forest conversion to pasturelands, and the number of mature individuals in each subpopulation is less than 50 (criterion C2(a)(i)). According to criterion D, *Populus luzae* is categorized as Critically Endangered too, due to its very small and restricted population with < 50 known individuals, and it also has a very restricted geographic range (an *Area of Occupance "AOO"* of less than 10 km^2, criterion B) (Fig. 8). Hence, *Populus luzae* deserves immediate protection and should be considered a Critically Endangered (CR) tree species. Fortunately, cuttings and seeds are being tried to propagate at the botanical institute of the Universidad de Guadalajara in order to study its biology and its rate of growth.

Additional specimens examined (paratypes):—MEXICO. Municipio Zapopan: Spring of Río Atlicotle, nearby Copala, 1460 m, 7 July 1975 (sterile), *Villarreal 7411* (IBUG: currently lost). Jalisco: Zapopan, Arroyo La Virgen, 1.25 km SW from Rancho San Nicolás, 9 km WNW from Santa Lucía, 20°48'52.38" N, 103°34'53.88"W, 1430 m, 11 January 2013 (sterile), *Muñiz-Castro et al. 1157* (IBUG); Zapopan, Arroyo La Virgen, 1.25 km SW from Rancho San Nicolás, 9 km WNW from Santa Lucía, 20°48'52.38" N, 103°34'53.88"W, 1430 m, 26 February 2013 (fallen fr) *Muñíz-Castro & Vázquez-García 1164.* (IBUG); Zapopan, Arroyo La Virgen, 1.25 km SW from Rancho San Nicolás, 9 km WNW from Santa Lucía, 20°48'52.38"N, 103°34'5 3.88"W, 1430 m, 6 March 2013 (sterile), *Nieves et al. s.n.* (IBUG); Zapopan, Arroyo La Virgen, 1.25 km SW from Rancho San Nicolás, 9 km WNW from Santa Lucía, 20°48'52.38"N, 103°34'5 3.88"W, 1430 m, 3 October 2017 (male infl.), *Nieves & Padilla-Lepe s.n.* (IBUG, MEXU, ZEA, WIS); Zapopan, Arroyo Pajaritos (San Lorenzo stream) (near El Encanto hot springs), 600 m NW from home of Rancho de Los Rivera (inside the ranch), 6 km W from Santa Lucía, 20°48'39.04"N, 103°33'15.48"W, 1425 m, 19 January 2013 (sterile), *Muñiz-Castro et al. 1162* (IBUG).

Discussion

Significant differences between *Populus luzae* and closely related taxa in terms of morphology, phenology, habitat and geography are presented in Table 1. *Populus luzae* is characterized by bifacial leaves, broad ciliate bracteoles; persistent, entire and oblique disk; 2 carpels; and 4–6 seeds per fruit, belonging to section *Populus*, the richest in the genus (7–13 spp.). It is part of a group consisting of white poplars with abaxially pubescent leaves (Eckenwalder 1977a, 1977b). *Populus luzae* is morphologically close to *P. guzmanantlensis* (Figs. 7 A–D) in having tomentose leaves and buds; however, it differs from the latter in having: 1) medium size habit (15–20 vs. 30–45 m tall), clonal spread by means of root-borne sucker shoots (always vs. unusual); 2) narrower twigs (2–4 vs. 5–7 mm in diameter); 3) narrower petioles at base and at union of blade (1.1–1.5 × 1–1.1 vs. 3.5–5 × 2–2.5 mm); 4) leaf blades chartaceous vs. coriaceous, widely

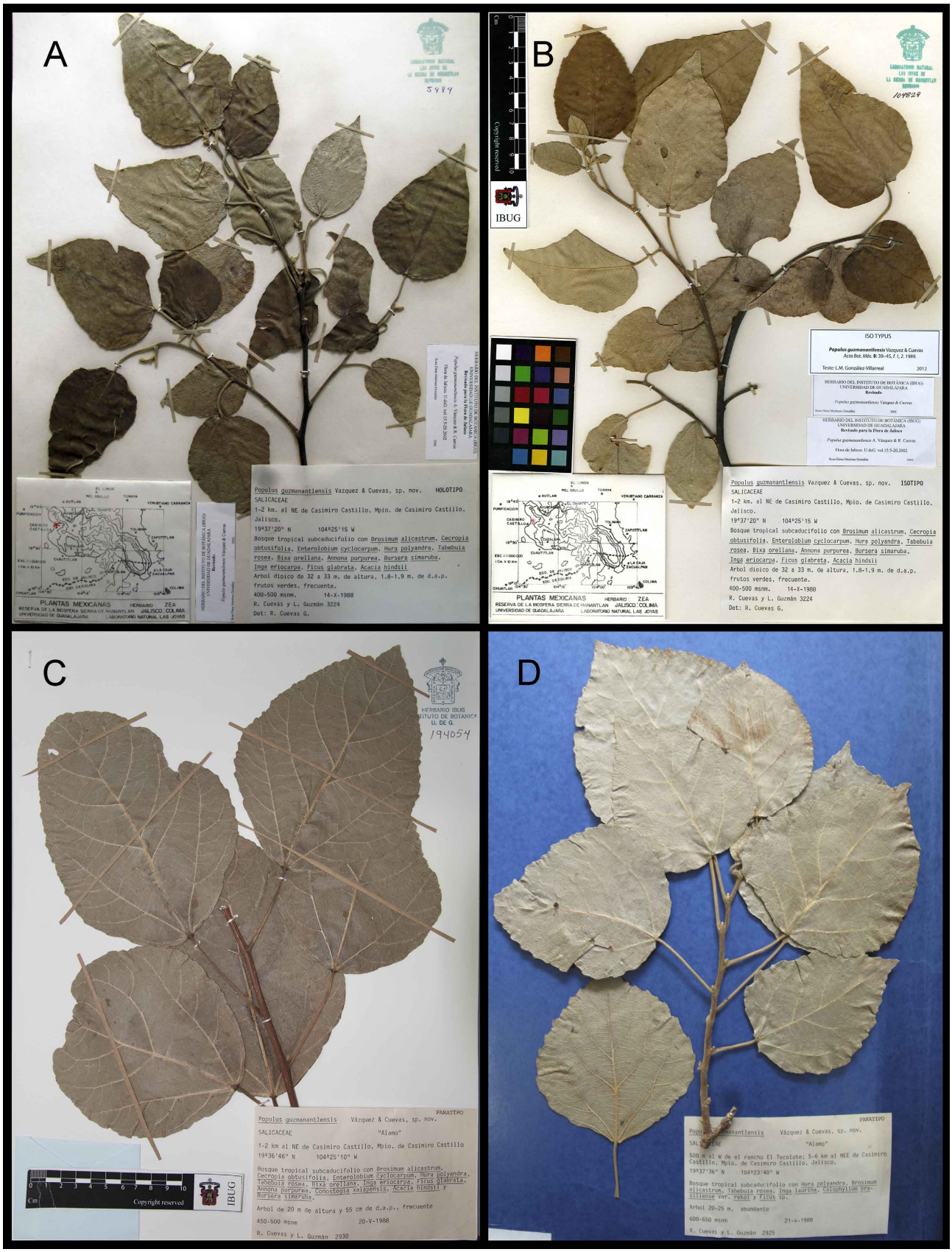

FIGURE 7. *Populus guzmanantlensis.* A. Holotype, *R. Cuevas and L. Guzmán 3224* (ZEA). B. An isotype (IBUG). C. A paratype, *Cuevas & Guzmán 2930* (IBUG). D. A paratype, *Cuevas & Guzmán 2925* (ZEA).

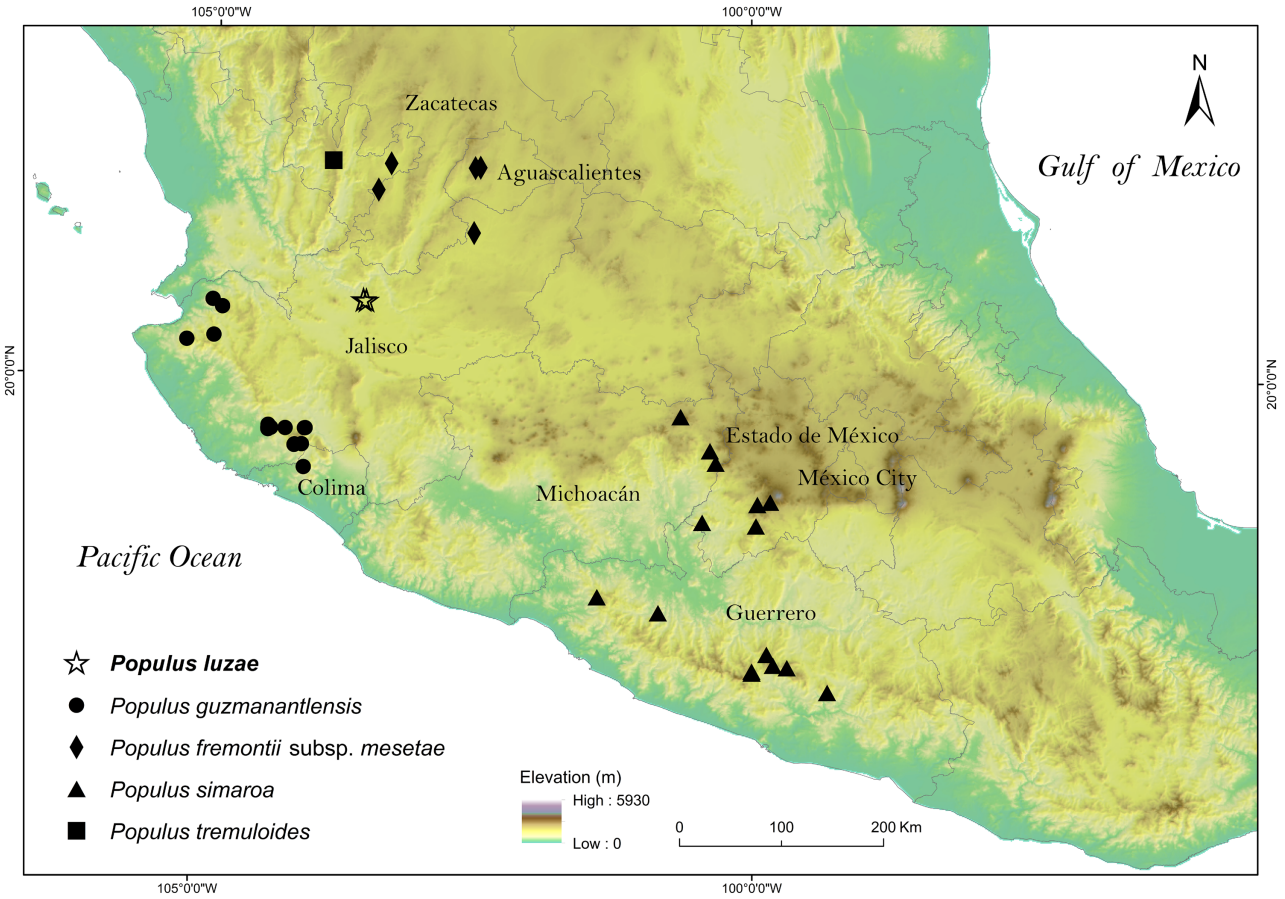

FIGURE 8. Distribution of species of *Populus* in Jalisco, México. *Populus simaroa* is added for reference since it is considered morphologically related to *P. guzmanantlensis* (Dickmann & Kuzovkina 2014).

ovate to ovate-deltoid vs. ovate to suborbicular, occasionally rhombic to cordate; 5) abaxial leaf surface puberulent with tertiary veins not very prominent vs. pubescent with tertiary veins very prominent; 6) adaxial surface with less depressed veins; 7) twice longer mature male inflorescence (ca. 45-65 vs. 10-30 mm); 8) male bracteoles 0.7–1 mm long, ovate, scarcely pubescent, margin entire, ciliate, unlobed vs. 2–3 mm long, spathulate, deciduous pubescence, margin dentate to parted, ciliate; 9) female bracteoles 2.6–3.2 mm long, none lobed and sparsely denticulate to entire vs. 1.2–1.5 mm long, deeply lobed and dentate to lacerate; 10) number of pistillate flowers (35–)75–70(–77) vs. 70–130; 11) infrutescence longer (ca. 80 vs. 50 mm) and lax vs. dense; 12) capsules pubescent vs. glabrous (Table 1). These numerous quantitative and qualitative characters warrant the status of *Populus luzae* at the species level.

Additionally, *Populus luzae* differs from *P. guzmanantlensis* in terms of: a) phenology, flowering from September to November vs. August to October and fruiting from October to January vs. October–November; b) habitat (gallery forest with relict cloud forest elements and ecotone with tropical dry forest and temperate *Quercus-Pinus* forest vs. tropical subdeciduous forest with occasionally incursion in cloud forests and ecotone with tropical *Quercus* forest); and c) mean annual rainfall of the habitat (ca. 900 vs. 1450–1850 mm).

In relation to the distribution map for *Populus guzmanantlensis* and *P. simaroa*, plate 6A of Dickmann & Kuzovkina (2014), based on the Discover Life website (Discover Life 2017), we clarify that for each of these two species one distribution record was greatly misplaced several hundreds of kilometers away, in different regions of the country: 1) For *P. guzmanantlensis* the misplaced specimen was *Vázquez et al. 4888* (MO); listed as ID_parent MO02090644 in Tropicos.org (2017a), it is shown in this map to occur in eastern México (Veracruz) (Discover Life 2017), but in fact, it is from western Mexico in the state of Jalisco, 1.5–2 km northeast of Casimiro Castillo city, in the Sierra de Manantlán (Vázquez-García & Cuevas-Guzmán 1989), together with an additional specimens from the same region (Fig. 8). Similarly, for *P. simaroa*: 2) the specimen record misplaced was *Matuda et al. 30610* (MO), listed as ID_parent MO02093383 in Tropicos.org. (2017b); it is shown in this map to occur in northern Mexico (23°N, 102°W) (Discover Life 2017), but in fact it is from south central Mexico (southern region of the state of México), at the Cerro Aguacatitlán, Almoloya de Alquisiras municipality, at *ca.* 18°52'N, 99°55'W (Rzedowski 1975), together with several

other records from the same region (Fig. 8). Addditionally, within western Mexico, the Discover Life Global Mapper website (Discover Life 2017) misplaced two other records of *P. guzmanantlensis*: 3) the specimen *Cuevas & Guzman 3224* (MO), listed as ID_parent MO1356256 in Tropicos.org (2017c) and as ID_parent/000727 GBIF727366478 in the GBIF web database (GBIF.org 2017); and 4) the specimen *Vázquez et al. 3696* (MO), listed as ID_parent MO02795702 in Tropicos.org. (2017d). The last two are referred from central Jalisco (20.3°N, 103.7°W and 20.333°N, 103.667°W, respectively) but they are rather from southern Jalisco (19.62°N, 104.42°W and 19.62°N, 104.41°W, respectively), municipio Casimiro Castillo in the Sierra de Manantlán (Vázquez-García and Cuevas-Guzmán 1989) (Fig. 8).

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