

THREE NEW SPECIES OF CLETHRA (CLETHRACEAE) FROM MEXICO

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ABSTRACT

Recent systematic studies on the Clethraceae of Mexico have resulted in the discovery of three new species in the series *Tomentellae*: *Clethra chiapensis*, *C. konzattiana*, and *C. luzmariae*. The new species, here described and illustrated, are endemic to the states of Chiapas and Oaxaca. Comments on their probable relatives, ecology, and a map of their geographic distributions is provided. This paper is gratefully dedicated to the Professor Luz María Villarreal de Puga on the occasion of her 85th birthday.

RESUMEN

Recientes estudios taxonómicos sobre Clethraceae en México dieron como resultado el descubrimiento de tres nuevas especies dentro de la serie *Tomentellae*: *Clethra chiapensis*, *C. konzattiana* y *C. luzmariae*. Las especies aquí descritas e ilustradas son endémicas de los estados de Chiapas y Oaxaca. Se incluyen comentarios sobre sus posibles afinidades, ecología y mapa de distribución geográfica. Este artículo lo dedico a la profesora Luz María Villarreal de Puga, en la celebración de sus 85 años.

The genus *Clethra* is the only member of the Clethraceae family. It was considered as a part of the Ericaceae by De Candolle (1839) until 1851, when Klotzsch raised it to a separate family on the basis of "its regular flowers with free petals, anthers with poricidal dehiscence, a 3-locular ovary, 3-loculicidal capsule, and style with 3 free stigmatic ends".

Clethra is widely distributed in both hemispheres: Asia (China, Indochina, Japan, Philippines, and the Malayan Archipelago); Canary Islands; Greater Antilles (Jamaica, Trinidad and Cuba); North America (eastern United States and Mexico); Central and South America (Bolivia, Brazil, Colombia, Ecuador, Peru and Venezuela). The number of species in the world is uncertain, for while Sleumer (1967) cited 67 species, other authors recognized as many as about 120 species.

The species of *Clethra* are shrubs and trees well-represented in the mountain systems of México, where the author has recognized 22 species, of which 15 are

endemic, including the three newly described. All belong to section *Cuellaria*, subsection *Cuellaria*, separated into three of Sleumer's series, based on differences in leaf abaxial indumentum. The series *Glabrae*, characterized by completely glabrous blades, is comprised of *C. suaveolens* Turcz., a widespread species ranging from southern Veracruz to Nicaragua. The series *Tomentellae*, containing 13 species, has minute, appressed, stellate hairs, so minute, in fact, as to appear glabrous except under high magnification (40X). The series *Tomentosae*, including 8 species, has a more complex combination of short stellate and long fasciculate trichomes. One additional series, *Ferrugineae*, is not represented in Mexico. The three new taxa here described are part of the series *Tomentellae*.

Clethra chiapensis L.M. González V. sp. nov. Figure 1.

Ramulis pallido-bruneis vel ochraceis puberulis; petiolo producto et tenui, (0.6-) 1.5-2.5 (-3) cm longo; lamina coriacea quasi concolori, elliptica vel oblanceolata aut ovato-lanceolata vel subobovata, apice acuto vel acuminato, saepe mucronato raro rotundato, basi increbre inaequilatera, attenuata seu rotundata vel truncata, perbasi leviter revolutis, marginibus maximam partem serrato-dentatis, undulatis vel integris, (2.3-) 5-10 (-15) cm longa, (0.8-) 2-3 (-6) cm lata; supra olivacea in sicco, pilis parvis stellatis dispersis pallidissimis vel rubris obtecta; subtus tristis brunneo-luteola ut videtur glabra, sed vero pilis minutis adpressis stellatis obtecta, nervo medio prominenti puberulo seu glabro; venis lateralibus utroque latere 10-13 (-18); racemis (-3) 5-7 in numero, simplicibus vel subpaniculatis laxis, (9-) 10-15 (-20) cm longis; bracteis lanceolatis, 2-3 (-4) mm longis; pedicello brevi, (1.5-) 2-3 (-4) mm longo, manifeste pendulo; filamentis comparate productis, (2-) 3-4 mm longis.

Tree or shrub, 6-15 (-20) m tall; **bark** slightly fissured, grayish; **branchlets** terete, slender, cinnamon colored or ochraceous, puberulent, the old leaf-scars inconspicuous; **petioles** long and slender, often flattened adaxially, (0.6-) 1.5-2.5 (-3) cm long, puberulent; **leaves** when young densely and minutely stellate above; **leaf blade** rigidly coriaceous, almost the same color on both sides, elliptic or oblanceolate to ovate-lanceolate or obovate, the apex acute, acuminate to long-acuminate, or rarely rounded, the base noticeably asymmetrical, attenuate, rounded or truncate, sometimes slightly infolded underneath, the margins serrate to serrulate-dentate, usually extending well below the middle to near the base or entire and undulate even on the same branchlet, (2.3-) 5-10 (-15) cm long, (0.8-) 2-3 (-6) cm wide; **adaxial** surface drying olive-green, with scattered, minute, stellate hairs, becoming nearly glabrous, sometimes punctate, the secondary veins impressed, the midvein with short stellate hairs or glabrous, the veinlets not easily discernible; **abaxial** surface dull, pale-brown, appearing glabrous but actually covered with minute and closely appressed, stellate hairs, the midvein prominent, puberulent to totally glabrous, rarely with very scattered acicular hairs;

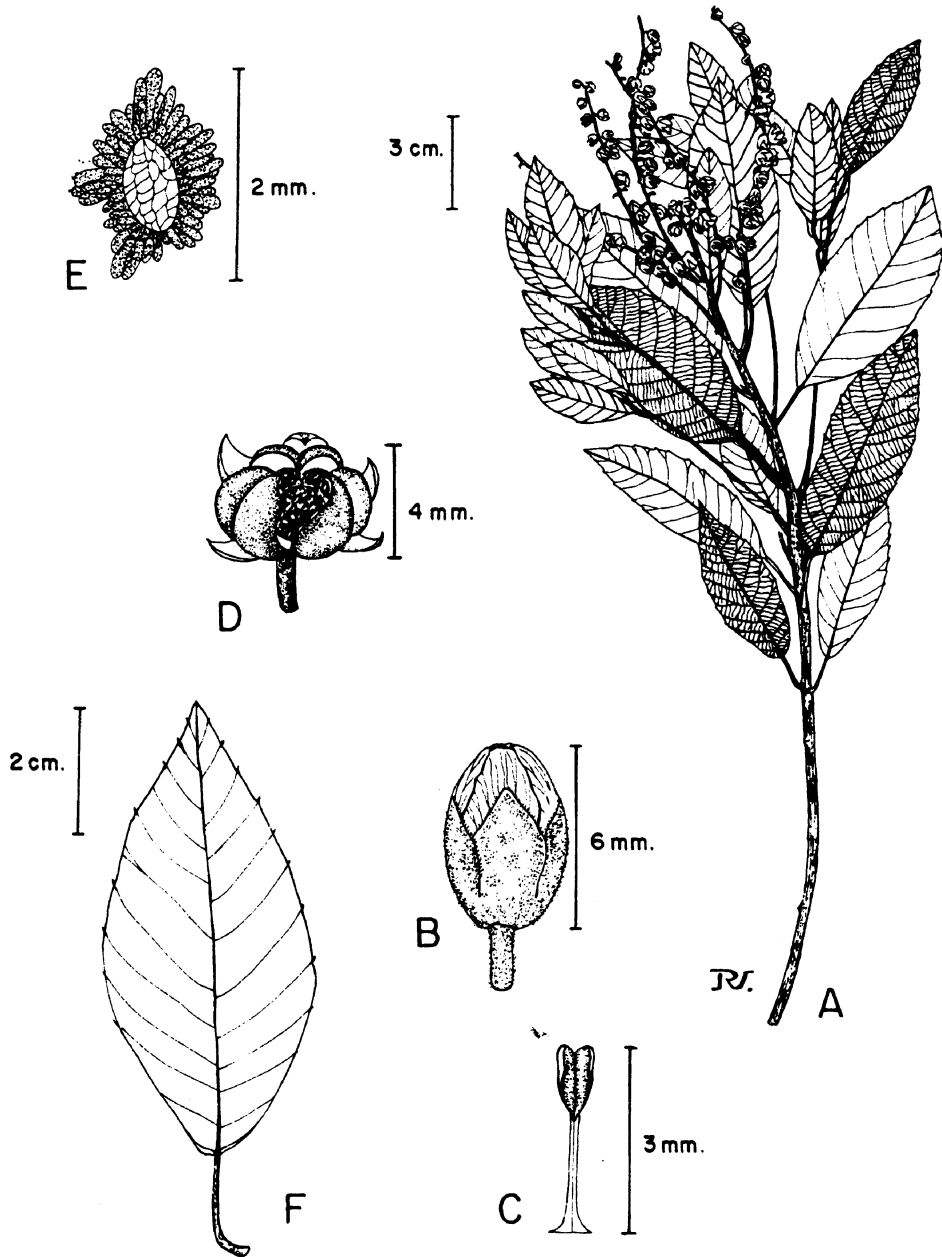


Figure 1. *Clethra chiapensis*. A, flowering branch. B, flower. C, stamen. D, fruit. E, seed. F, leaf. Based on *Shilom Ton* 621 and 908. Illustration by María del Refugio Vázquez.

secondary veins reddish-brown, in contrast to the pale surface, 10-13 (-18) on each side, almost straight or somewhat arching-ascending, much-branching and anastomosing near the margin, forming interconnecting arches or passing into the teeth, the veinlets often developing a network of very thin, flat, reddish-brown lines. **Inflorescence** paniculate, of (3-) 5-7 racemes, lax-flowered, (9-) 10-15 (-20) cm long; **rachis** slender, shortly stellate-tomentose, reddish-brown or ochraceous; **bracts** lanceolate, densely minute-tomentose, 2-3 (-4) mm long, almost as long as the flowering pedicels, very early deciduous; **pedicel** short, noticeably down-curved, minutely stellate tomentose, (1.5-) 2-3 (-4) mm long; **flowers** relatively large, in bud globose; **sepals** lanceolate-ovate, the apex acute or rounded, the margin ciliate, (3.5-) 4-5 mm long, (2-) 2.5-3 mm wide, stellate tomentose; **petals** oblong, 5-7 mm long, 3-4 (-5) mm wide, pilose within, the margin fimbriate-ciliate; **filaments** relatively elongated, (2-) 3-4 mm long; **anthers** (1-) 1.5-2 mm long; **ovary** sericeous, 2 mm in diameter; **style** elongate, (2.5-) 3-4 (-5) mm long; **capsule** large, when mature 4-5 mm high, 5-6 mm in diameter.

TYPE. Mexico. Chiapas: near paraje Banabil, Tenejapa, 2 680 m, 12-I-1982 (fl), *D.E. Breedlove et F. Almeda 57074* (holotype: CAS; isotypes: ENCB, GH, LL, MICH, NY).

ADDITIONAL SPECIMENS EXAMINED: Mexico. Chiapas: 5 mi N of Chamula Center along road to Chenalho, Chamula, 7 500 ft [2 286 m], 20-I-1965 (imm. fr), *D.E. Breedlove et H. Raven 8147* (DS, MICH, US); paraje Pahal Ton, Tenejapa, 7 500 ft [2 286 m], 1-X-1965 (bud), *D.E. Breedlove 12596* (DS, ENCB, LL, MICH, MSC, US); E base of Cerro Tres Picos near Cerro Bola, along a logging road SW of Colonia Agrónomos Mexicanos, Villa de Corzo, 1 500 m, 9-II-1972 (fl), *D.E. Breedlove 23996* (DS, ENCB); 7 Km NE of Huistan along road to Oxchuc and Ocosingo, Huistan, 2 100 m, 21-IX-1972 (fr), *D.E. Breedlove 27718* (DS, INIF, LL, MO); 5 Km N of Hwy 190 on logging road from Laguna Chamula microwave station, Comitán de Domínguez, 2 400 m, 15-X-1976 (bud), *D.E. Breedlove 40799* (DS); 16-20 Km E of Chilil along road to Chanal, San Cristóbal de las Casas, 2 380 m, 10-XI-1976 (bud), *D.E. Breedlove 41360* (DS, MO); third ride along logging road from Las Margaritas to Campo Alegre, La Independencia, 2 300 m, 27-XI-1980 (bud), *D.E. Breedlove et F. Almeda 47850* (CAS, LL); Bautista Chico, San Juan Chamula, Region Altos, 18-VI-1986 (fr), *C. Fortul 10* (MEXU); Las Ollas, camino San Cristóbal de las Casas-Tenejapa, San Cristóbal de las Casas, 2 400 m, 3-VII-1991 (fr), *L.M. González Villarreal et al. 4012* (IBUG, WIS); Santa Cruz en San Felipe, San Cristóbal de las Casas, 15-XI-1986 (imm. fr), *A. Méndez Ton et M.C. Martínez 9507* (MO); paraje Pahal Ton, Tenejapa, 8 200 ft [2 500 m], 20-I-1966 (bud, fl), *A. Shilom Ton 621* (DS, ENCB, GH, LL, US); Colonia Ach'lum, Tenejapa, 8 600 ft [2 621 m], 26-IV-1966 (fr), *A. Shilom Ton 908* (DS, LL, MSC).

PHENOLOGY: Flowering from October to January, bearing fruits mostly in April, June and September.

ETYMOLOGY: The specific epithet, *chiapensis*, is named for its occurrence in the Mexican state of Chiapas.

DISTRIBUTION AND ECOLOGY: Endemic to the Central Plateau of Chiapas, at (1 500-) 2 100 to 2 400 m where it usually occurs on mountain slopes in humid forests with pines, oaks, and *Liquidambar*. It also grows in cloud forests with *Abies*, *Magnolia*, *Olmediella*, *Photinia*, and *Podocarpus*. Sometimes, it is found along small streams and logging roads with *Agarista mexicana* var. *pinetorum*, *Alnus acuminata* ssp. *arguta*, *Arbutus glandulosa*, *Fuchsia* spp., *Quercus* spp., and *Sambucus* sp.

Clethra chiapensis is very closely related to *C. vicentina* Standl., a widespread species ranging from Jalisco to El Salvador. Both taxa share somewhat similar leaf shape and long and slender petioles, commonly 1.5-2.5 cm long. However, the new species differs in having strongly coriaceous blades with mostly serrate-toothed margins, evidently inequilateral bases, veins furrowed above and raised beneath as well as the veinlets forming an evident network. In addition, the inflorescences have shorter and down-curved pedicels (2-4 mm long versus 4-9 mm long).

The majority of *Clethra chiapensis* specimens have been misidentified as *C. macrophylla* Mart. et Gal., a tree of series *Tomentosae* commonly encountered in central Veracruz, northern Puebla and adjacent Hidalgo. Also, some few specimens have been labeled as *C. pachecoana* Standl., this, in fact, a close relative but differing from *C. chiapensis* by its entire, thinner and softer blades, and shorter petioles often 1-1.5 cm long. In addition, the inflorescences are very short, no longer than 10 cm long, bearing tiny flowers with the petals completely glabrous within. *Clethra pachecoana* grows at higher altitudes from 2 800 to 3 200 m in the Sierra Madre de Chiapas where it has been collected at Cerro Male, Cerro Boqueron, Cerro Mozotal and Volcan Tacana in the southernmost state of Chiapas, Guatemala to El Salvador.

Clethra konzattiana L.M. González V. sp. nov. Figure 2.

Ramulis puberulis vel quasi glabris; petiolo producto et tenui (1-) 1.5-3 (-5) cm longo, glabro; lamina subcoriacea, bicolori, elliptica vel elliptico-oblongata vel obovata, apice acuto vel acuminato, usque ad longo-acuminato, raro rotundato, basi plerumque cuneata vel obtusa, marginibus maximam partem serrato-dentatis, dentibus saepe curvato-adscendentibus, crasso mucrone vel aristata terminatis, nonnumquam perbasi revolutis, (4-) 6-12 (-17) cm longa, (1-) 3-5 (-9) cm lata; supra atroviridia, omnino glabra vel aliquando pilis parvis stellatis pallidis praecipue in nervo medio instructa venis bene impressis, venulis inconspicuis; subtus pallida brunnea, ut videtur glabra sed vero pilis parvis adpressis stellatis instructa, nervo medio et venis plerumque puberulentis vel pilis solitariis dispersis instructis vel glabris; venis lateralibus

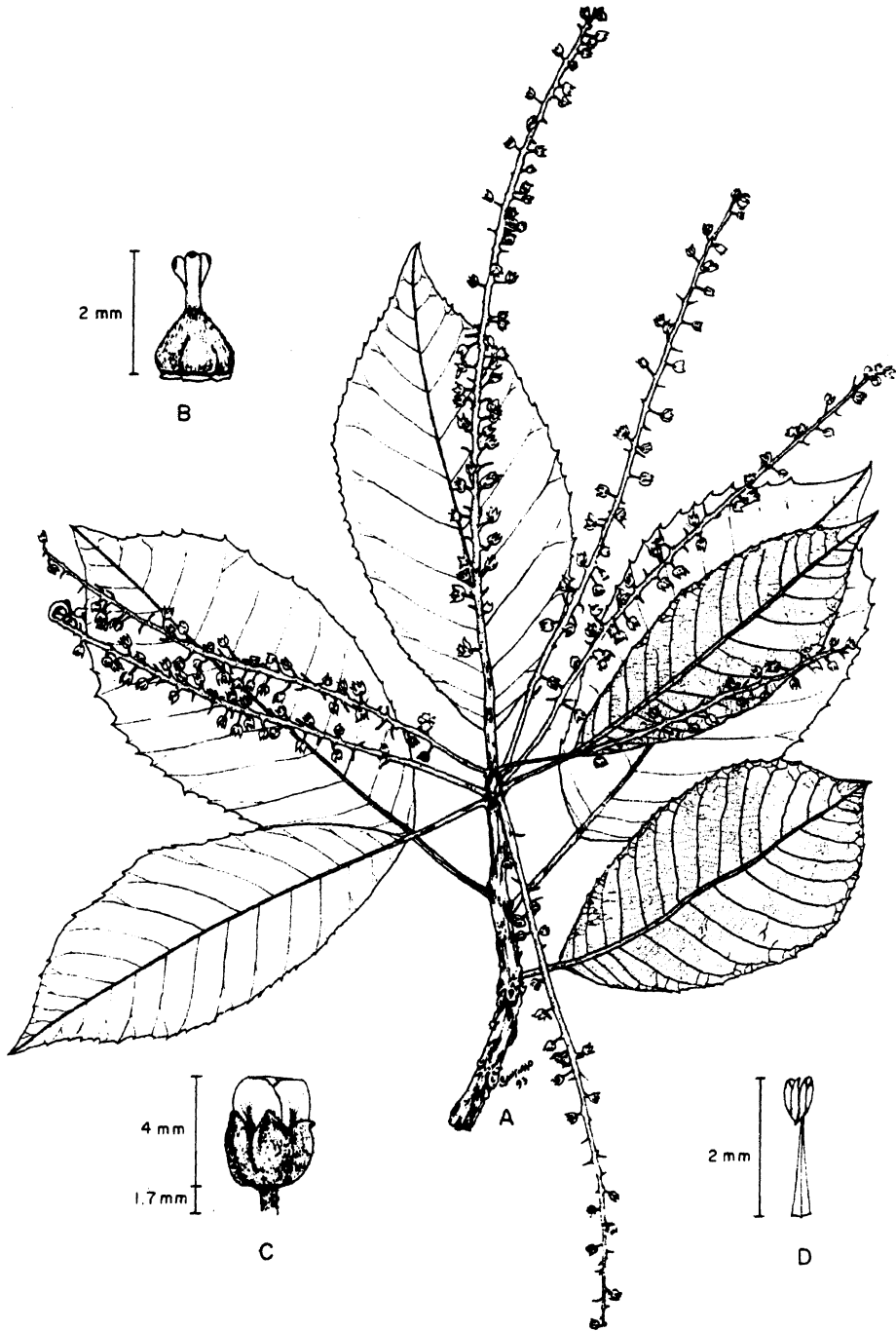


Figure 2. *Clethra konzattiana*. A, flowering branch. B, flower. C, pistil. D, stamen. Based on the type collection L.M. González Villarreal 4231. Illustration by María del Refugio Vázquez.

utroque latere (15-) 20-25; *racemis simplicibus laxis* (5-) 7-10 in numero, (5-) 13-18 (-28) cm longis; *bracteis ovatis vel ovato-lanceolatis*, (1-) 1.5-2 (-3) mm longis; *pedicello tenui*, (2-) 3-4 (-7) mm longo, *divergenti*; *filamentis* (2-) 2.5 mm longis.

Tree 10-15 (-20) m tall, 15-30 cm dbh; **bark** thin, slightly fissured, grayish; **branchlets** puberulent to almost completely glabrous, dark reddish-brown or sometimes purplish-brown, with many large and conspicuous old leaf-scars; **petioles** long and slender, (1-) 1.5-3 (-5) cm long, glabrous or with scattered stellate hairs; **leaves** when very young densely short-stellate on both sides; **leaf blades** subcoriaceous, bicolored, elliptic to elliptic-oblongate or obovate, the apex acuminate to long-acuminate, tip narrowly acute aristate, rarely rounded, the base cuneate to obtuse, the margins mostly serrate-dentate (from base to apex or at least from below the middle), the teeth often curved-ascending, tipped by a stout mucro or arista, the base sometimes slightly infolded underneath, (4-) 6-12 (-17) cm long, (1-) 3-5 (-9) cm wide; **adaxial** surface dark green, completely glabrous or sometimes with scattered small pale stellate hairs mostly on the midvein, the secondary veins well marked, the veinlets inconspicuous; **abaxial** surface noticeably paler than the upper surface, somewhat whitish or pale brownish, apparently glabrous but covered with minute, appressed-stellate hairs, the midvein and secondary veins reddish-brown, contrasting with the much paler surface, provided with scattered acicular hairs or glabrous; **secondary** veins (15-) 20-25 on each side, slender, strongly ascending or moderately arcuate, passing directly into the teeth, the veinlets often forming a reticulum discernible as very thin brown lines. **Inflorescence** of (5-) 7-10 lateral racemes, elongate, lax-flowered, (5-) 13-18 (-28) cm long; **rachis** slender, terete, pale, puberulent; **bracts** ovate-lanceolate, densely tomentose, (1-) 1.5-2 (-3) mm long, shorter than the flowering pedicels, mostly early deciduous; **pedicel** slender, (2-) 3-4 (-7) mm long, divergent; **flower buds** globose; **sepals** short, ovate to widely ovate, the apex acute to acuminate, the margin scarcely ciliate, 2-2.5 (-3) mm long, 1.5-2 (-2.5) mm wide, tomentose; **petals** spatulate to obovate, 3.5-4 (-5) mm long, 2-2.5 (-3) mm wide, densely to scattered pilose within or completely glabrous, the apex rounded to obtuse, the margin scanty fimbriate or ciliate; **filaments** (2-) 2.5 mm long; **anthers** sagittate, (0.8-) 1 mm long, 0.5 mm wide, with a small appendage at the base of each theca; **ovary** sericeous, 2-2.5 mm in diameter; **style** short, 2-3 mm long; **capsule** small, when mature 3-4 mm high, 4-5 mm in diameter, on 4-5 (-8) mm long pedicel.

TYPE: Mexico. Oaxaca: Km 102 Hwy 175 Oaxaca-Tuxtepec, 2 300 m, tree 15 m tall, bark light gray, slightly fissured, frequent, oak-pine forest with ericads, 16-VII-1991 (fl, imm. fr), *L.M. González Villarreal et al.* 4231 (holotype: IBUG; isotypes: ENCB, IBUG, IEB, MEXU, MICH, TEX, WIS, US).

ADDITIONAL MATERIAL EXAMINED: Mexico. Oaxaca: 26.1 Km W of Teotitlan del Camino, Distrito de Teotitlan, 2 160 m, 19-X-1985 (fl), *B.M. Bartholomew et al.*

3180 (CAS, GH, MEXU, NY); 2 Km E of Huautla de Jimenez on the road to Ayutla, Sierra Mazateca, Huautla de Jimenez, 18° 08'N, 95° 51'W, 1 700 m, 5-I-1984 (fl), *S.L. Solheim et S. Reisfield* 1225 (NY, WIS, XAL); Puerto de La Soledad, carretera a Huautla de Jiménez, Distrito de Teotitlán, 2 100 m, 22-XI-1977 (fl), *M. Sousa et J.A.S. Magallanes* 8874 (CAS, ENCB, MEXU); 11.4 Km N of the pass between Valle Nacional and Ixtlan de Juarez and 49.7 Km S of Valle Nacional, 2 100 m, 22-X-1985 (fr), *B.M. Bartholomew et al.* 3331 (CAS); Cerro La Raya, Cuyamescales, Distrito de Cuicatlán, 2 000 m, 24-VI-1909 (bud), *C. Conzatti* 2395 (F, NY); along Hwy 175 between Valle Nacional and Oaxaca, vicinity of Km 98, 31.2 mi NNE of Jaltianguis, 37 mi NNE Ixtlan de Juarez, 17° 37'N, 96° 22'W, 2 200 m, 22-II-1987 (fr), *T.B. Croat et D.P. Hannon* 65161 (BM); Santa Cruz Tepetotutla, San Felipe Usila, 17° 39'54"N, 95° 33'24"W, región de la Chinantla, Sierra de Juárez, 2 470 m, 21-XII-1993 (fr), *C. Gallardo* 886 (IBUG, MEXU); *ibid.*, 26-II-1994 (fr), *A. Rincón* 258 (IBUG, MEXU); *ibid.*, 17° 40'23"N, 96° 33'28"W, 2 200 m, 15-V-1994 (fl), *A. Rincón* 399 (IBUG, MEXU); Km 128 carretera Oaxaca-Tuxtepec, 21-XII-1972 (fr), *E. García M. et al.* 600 (CHAPA); Km 102 carretera No. 175 Oaxaca-Tuxtepec, 2 300 m, 16-VII-1991 (fl), *L.M. González Villarreal et al.* 4229, 4230A (IBUG, WIS); Km 123 carretera Oaxaca-Tuxtepec, al S de Ciudad Alemán, 2 370 m, 2-VI-1969 (sterile), *E. Hernández X. et P. Segalen* 327 (INIF); Rio Soyolapam Gorge Hwy 175, 7 500 ft [2 286 m], 4-VIII-1975 (imm. fr), *R.O. Lawton* 793 (CAS, F, NY); Macuiltianguis, Ixtlán de Juárez, 2 200 m, II-1984 (sterile), *L.R. Sánchez* 4 (WIS, XAL); 9.5 Km E of the Mitla to Choapam road to Zacatepec, NE slope of Cerro Zempoaltepetl, 2 130 m, 27-IX-1986 (fl), *D.E. Breedlove et F. Almeda* 64740 (CAS).

PHENOLOGY: Flowering in January, July, October and November, with mature fruit from August, October, December and February.

ETYMOLOGY: The specific epithet, *conzattiana*, honors Cassiano Conzatti (1862-1951), an Italian botanist who made significant contributions to our knowledge of the Flora of Oaxaca, and of Mexico as a whole, and was in 1909 the first collector of this species.

Conzatti apparently sent one specimen of his collection 2395 to W. H. Camp, at the time the foremost specialist of Ericaceae and related families. The specimen at NY bears Camp's annotation taken from his letter to Conzatti of Oct. 3, 1936: "Absolutely unmatched in our herbarium and I suspect it is a new species, but since it is not in flower (only buds are present) it would be unwise to describe it at the present". Thus, Camp was the first to call attention that this was an undescribed entity.

DISTRIBUTION AND ECOLOGY: *Clethra conzattiana* is known from the Sierra Mazateca and Sierra de Juarez mountain systems of northern Oaxaca, and from the

vicinity of Cerro Zempoaltepetl east of the city of Oaxaca, at elevations from 1 700 to 2 470 m. Habitats include humid forests of *Pinus-Quercus* with many ericads such as *Arbutus glandulosa*, *Comarostaphylis discolor*, *Gaultheria trichocalycina*, *Lyonia squamulosa*, and *Vaccinium* sp. It also grows in very wet and mossy pine-*Persea* forests and cloud forests where associated species include *Alnus acuminata* ssp. *arguta*, *Cornus disciflora*, *Magnolia schiedeana*, *Myrica* sp., *Rubus* sp., and *Sambucus* sp.

Clethra konzattiana is closely related to the allopatric *C. schlechtendalii* Briq. from which it is distinguished by its glabrous twigs and petioles, rarely with only a few scattered stellate hairs. The leaves have longer petioles, commonly 1.5-5 cm long, rather than 1-2.5 cm long, often extremely long-acuminate apices, very obvious toothed-aristate margins and a greater number of secondary veins (20-25 versus 14-16) on each side. In addition, *C. konzattiana* has longer inflorescences up to 28 cm long, rather than 10-16 cm long, with more elongated pedicels (3-4 (-7) mm long versus 2-3 mm long).

A misapplied name for this new taxon has been *Clethra macrophylla* Mart. et Gal., probably because of its similar leaf shape and size. However, *C. macrophylla* is a totally distinct entity, belonging to series *Tomentosae* and characterized by a combination of vestiture on the abaxial leaf surface. The indumentum consists of long, fasciculate and reddish hairs forming a moderate to dense tomentum, mixed with minute, pale, stellate trichomes obscuring the epidermis. *Clethra schlechtendalii* and *C. macrophylla* are very frequent trees in central Veracruz and adjacent states.

***Clethra luzmariae* L.M. González V. sp. nov. Figure 3.**

Frutex vel arbor parva, ubi solitaria 6-10 metralis, plerumque rhizomati repente orta, dumetis usque ad 2 m altis efferenti; ramulis bruneo-luteolis, pulvereis in juventute; petiolo brevi et tenui, (0.4-) 0.7-1 (-2) cm longo; foliis praeter nervum medium quasi glabris in juventute, lamina rigida coriacea concolori vel aliquanto bicolori, leviter conduplicata, elliptica vel elliptico-lanceolata aut oblanceolata, apice vulgo acuminato interdum mucronato vel aristato, raro rotundo, basi acuta vel attenuata, marginibus denticulato-aristatis, raro integris, leviter carnosa cartilaginea, nonnumquam perspicue revolutis, (2.5-) 4-10 (-12) cm longa, (1-) 2-3.5 (-4.5) cm lata; supra atroviridia lucida, vulgo punctata, praeter nervum medium quasi omnino glabra, nervo medio profunde sulcato, venis et venulis inconspicuis; subtus griseo diluta, ud videtur glabra sed vero pilis parvis adpressis stellatis instructa, nervo medio prominenti, puberulescentibus, venis lateralibus utroque latere 9-18; racemis densis 3-6 (-11) in numero, (5-) 7-11 (-15) cm longis; bracteis ovato-lanceolatis, (2-) 3 (-5) mm longis; pedicello tenui (2-) 3-4 (-7) mm longo; filamentis relative magnis, (2.5-) 3 (-4) mm longis.

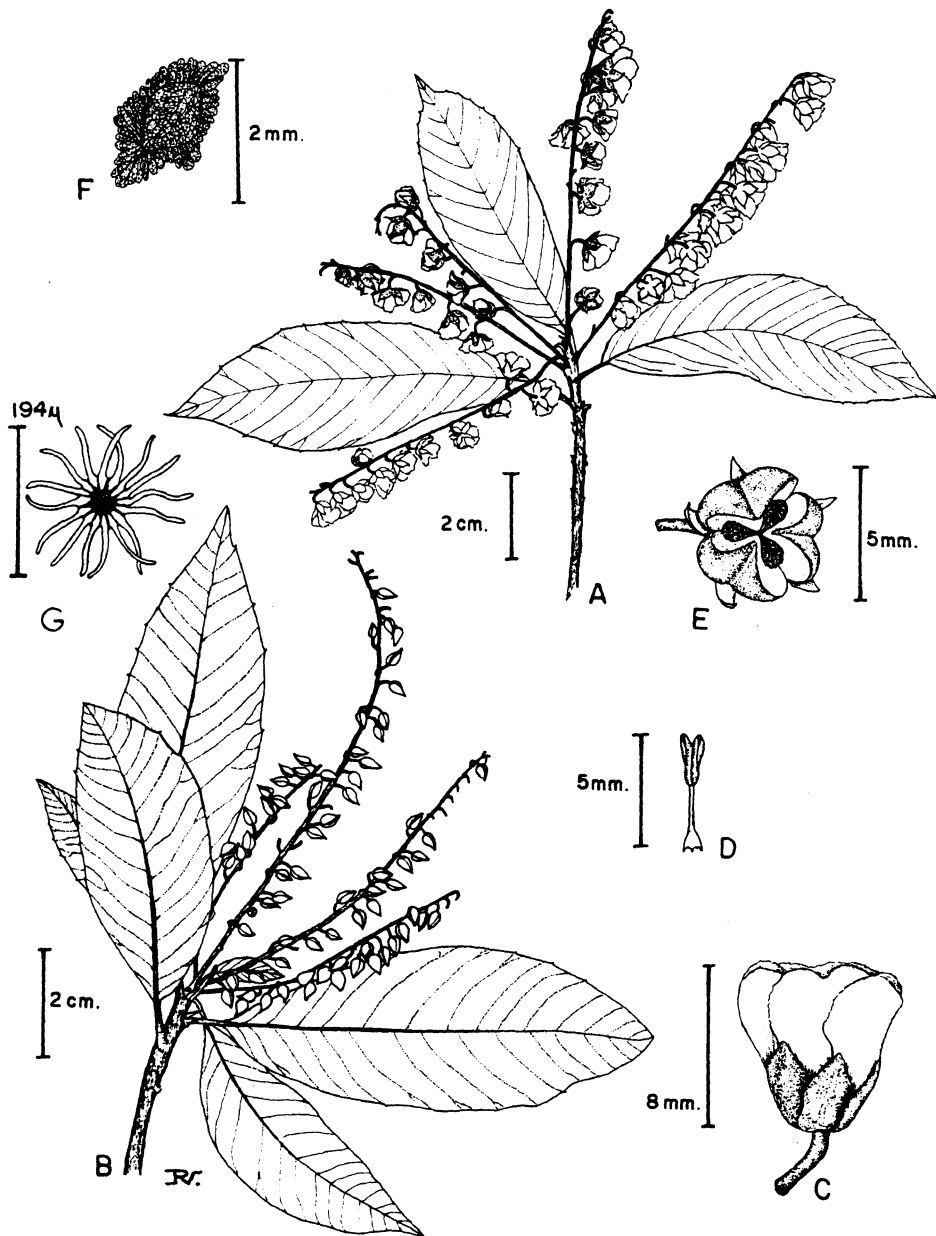


Figure 3. *Clethra luzmariae*. A, flowering branch. B, branch with buds. C, flower. D, stamen. E, fruit. F, seed. G, stellate hairs from the abaxial leaf surface. Based on R. Torres 298, J. Rzedowski 2887 and L.M. González Villarreal 4292. Illustration by María del Refugio Vázquez.

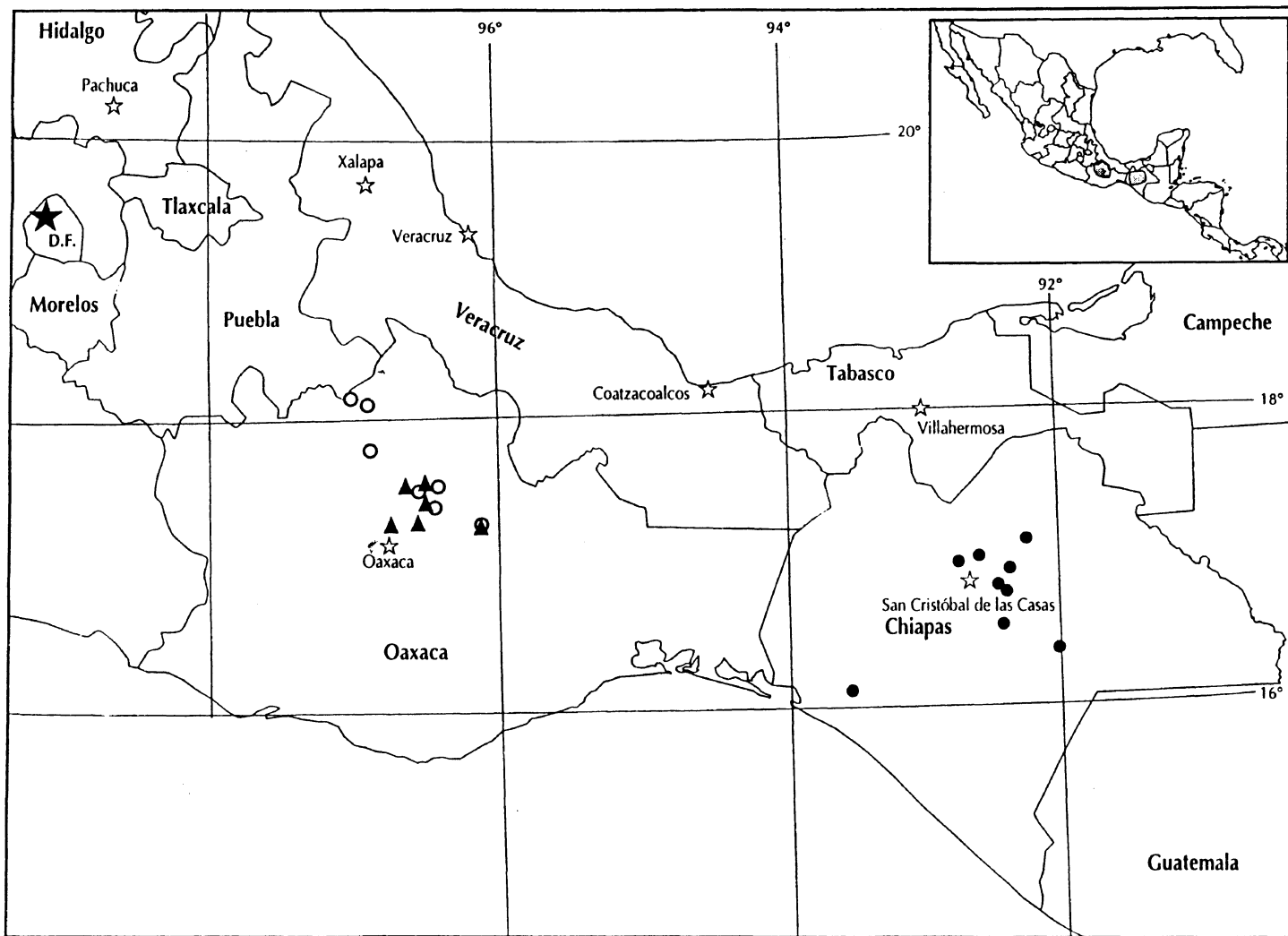
Shrub or small tree, when solitary 6-10 m tall, usually spreading out by horizontal underground rhizomes, thicket-forming shrubs reaching 2 m tall or less; **bark** thin, smooth to slightly wrinkled, pinkish-gray; **branchlets** terete, pale or yellowish-brown, powdery when young; **petioles** short and slender, flattened adaxially, (0.4-) 0.7-1 (-2) cm long, puberulent or sometimes pilose; **leaves** when young almost glabrous above except for the midvein; **leaf blades** rigidly coriaceous, concolorous or rather bicolored, somewhat conduplicate, elliptic to elliptic-lanceolate or oblanceolate, the apex mostly acuminate or acute, sometimes mucronate or aristate, rarely rounded, the base acute to attenuate, the margin aristate-toothed from the middle or below, aristae mostly 0.5-1.5 mm long, very rare completely entire, slightly cartilaginous-thickened, sometimes evidently revolute, (2.5-) 4-10 (-12) cm long, (1-) 2-3.5 (-4.5) cm wide; **adaxial** surface dark green, lustrous, often punctate, almost completely glabrous except for the deeply furrowed pilose midvein, the secondary veins and veinlets inconspicuous; **abaxial** surface pale-gray, appearing glabrous but actually covered with a dense, minute, appressed, stellate hairs, with a peltate (fused) center (40X), sometimes with very short reddish fasciculate hairs scantily intermixed, the midvein prominent, commonly puberulent, barely provided with acicular hairs; **secondary** veins 9-18 on each side, slender, pale or reddish-brown contrasting to the pale surface, arcuate, irregularly much-branched and anastomosing within the margins, or passing directly into the teeth, the veinlets inconspicuous. **Inflorescence** of 3-6 (-11) racemes, sometimes subpaniculate, dense-flowered, (5-) 7-11 (-15) cm long; **rachis** slender, pale or somewhat yellow-orange, tomentulose; **bracts** lanceolate-ovate, densely tomentose, (2-) 3 (-5) mm long, almost the same length as the flowering pedicels, early deciduous; **pedicel** slender, (2-) 3-4 (-7) mm long, commonly recurved or sometimes divergent; **flowers** relatively large, in bud evidently conic; **sepals** lanceolate-ovate, pale or yellowish, covered with small reddish-stellate hairs, the apex acute to acuminate, the margin ciliate, (3-) 4-4.5 (-5.5) mm long, 2-2.5 (-3.5) mm wide, tomentose; **petals** obovate-oblong, (5-) 6-7 (-8.5) mm long, (3.5-) 4-5 (-8) mm wide, glabrous within, the margin emarginate or ciliate; **filaments** relatively long, (2.5-) 3 (-4) mm long; **anthers** oblong, (1.2-) 1.5-2 mm long; **ovary** covered by short stellate hairs and pilose at the tip, (2-) 2.5 (-3) mm in diameter; **style** elongate, (3½) 4 (-5) mm long; **capsule** large, when mature (3-) 4-5.5 mm high, (4-) 5-6 mm in diameter.

TYPE: México. Oaxaca: 24 Km al W de Ixtlán de Juárez, carretera Oaxaca-Tuxtepec, Departamento de Ixtlán de Juárez, 2 710 m, 13-IV-1982 (fl white, fragrant), *R. Torres et D. Lorance* 278 (holotype: MO; isotypes: CAS, MEXU, NY, XAL).

ADDITIONAL SPECIMENS EXAMINED: Mexico. Oaxaca: on the Oaxaca-Valle Nacional Hwy on Cerro Pelon, 25.5 mi E of Ixtlan de Juarez, 2 950 m, 21-VII-1960 (fr), *J.H. Beaman* 3681 (GH, MSC, US); on Pacific slope of mountains 1/2 mi SW of Cerro Pelón, 9 000 ft [2 743 m], 6-V-1969 (fl), *G. Breckon et B. Christman* 615 (CAS, WIS);

2.5 mi by road SW of summit at Cerro Pelon on Hwy 175 between Ixtlan de Juarez and Valle Nacional, 17°23'N, 96°16'W, 2 550 m, 19-VII-1972 (fr), *G. Breckon et M.E. Breckon 1363* (ENCB); edge of Llano de las Flores on road between Ixtlan de Juarez and Valle Nacional, ca. 8 500 ft [2 591 m], 8-V-1969 (fl), *G. Breckon et B. Christman 633, 638* (IEB, TEX, WIS); *ibid.*, 2 640 m, 9-V-1969 (fl), *G. Breckon et B. Christman 662* (WIS); along Hwy 175 through Sierra de Juarez between Tuxtepec and Oaxaca just beyond summit on Pacific slope, 2 950 m, 20-II-1979 (bud), *T.B. Croat 48136* (BM); entre Llano de las Flores y Tuxtepec, Km 102, 25-XII-1966 (bud), *C. Delgadillo 99* (CAS, MEXU); Cerro Pelon, Santiago Comaltepec, 17°35'20"N, 96°30'55"W, 3 040 m, 2-I-1995 (bud), *C. Gallardo 1268* (IBUG, MEXU); *ibid.*, 17°35'10"N, 96°30'55"W, 2 820 m, 7-I-1995 (fr), *C. Gallardo 1279* (IBUG, MEXU); desviación a Yolox, carr. 175 Oaxaca-Tuxtepec, Comaltepec, Sierra de Juárez, 2 750 m, 16-VII-1991 (fr), *L.M. González Villarreal et al. 4283, 4284* (IBUG, WIS); Llano de las Flores, entre Ixtlán de Juárez y Valle Nacional, Atepec, 2 800 m, 16-VII-1991 (fr), *L.M. González Villarreal et al. 4292 to 4297* (IBUG, WIS); Los Tanques, San Pablo Macuiltianguis, 2 800 m, 29-I-1984 (fr), *E. Guízar 1211* (ENCB, IEB); vicinity of Cerro Zempoaltepetl, Patio de Arena, about 5 Km E of summit, ca. 2 800 m, 9-VIII-1950 (fr), *B. Hallberg 871* (ENCB, LL, MEXU, MICH,US); Km 110-111 on Hwy 175 from Tuxtepec to Oaxaca, ca. 9 000 ft [2 743 m], 22-V-1983 (fl), *W.C. Holmes 4548* (NY, TEX, WIS); Llano de las Flores, Sierra de Juarez, Ixtlan de Juarez, 2 800 m, 5-VIII-1981 (fr), *D.H. Lorence et al. 3652* (MEXU, MO); Cerro Humo Chico, Comaltepec, Ixtlan de Juarez, 6-7-IV-1967 (fl), *T. MacDougall s.n.* (US); *ibid.*, 28-III-1969 (fl), *T. MacDougall s.n.* (NY); NE of Oaxaca, 1.3 mi SW of main Ixtlan de Juarez to Tuxtepec road, 10 200 ft [3 109 m], 26-XI-1966 (bud), *L. McIntyre et R. Gaukin 190* (MEXU); cerca de Tequistlán-Llano de las Flores, 3-I-1960 (bud, imm. fr), *F. Miranda 9225* (MEXU); Llano de las Flores, Ixtlán de Juárez, 3-I-1960 (bud), *F. Miranda 9241* (MEXU); 30.5 mi N of Guelatao, 3 500 m, 24-XII-1975 (bud), *A.A. Reznicek et D.R. Gregory 327* (MICH); upper slopes of Sierra Juarez, 27 Km N of Ixtlan de Juarez at Km 85 on road to Tuxtepec, 17°30'N, 96°30'W, 16-17-IX-1965 (bud, fl), *K. Roe et E. Roe 1952* (DS, ENCB, F, MICH, WIS); Cerro Pelón, Comaltepec, Ixtlán de Juárez, 2 850 m, 26-II-1972 (bud, fl), *J. Rzedowski 28871* (CAS, ENCB, LL, MICH); Llano de las Flores, 23 Km al N de Ixtlán de Juárez, sobre el camino a Tuxtepec, 2 850 m, 26-II-1972 (fr), *J. Rzedowski 28879* (CAS, ENCB, TEX); about 29 mi N of Ixtlan de Juarez on Hwy 175, about 2 800 m, 18-VII-1976 (fr), *W.D. Stevens et al. 2463* (ENCB, MSC, WIS); Cerro Pelón, ca. 70 mi from Oaxaca by road Sierra Madre del Sur, 9 000-9 100 ft [2 743-2 774 m], 20-VI-1962 (fl, fr), *G.L. Webster et al. 11562* (MEXU, U).

PHENOLOGY: Flowering from (December) February through June, with fruits known from January, February, and June to August, these usually remaining attached for a long period of time.



Map 1. Distribution of *Clethra chiapensis*, alt. 1 500-2 380 m (●); *Clethra konzattiana*, alt. 1 700-2 470 m (○); *Clethra luzmariae*, alt. 2 400 m (▲).

ETYMOLOGY: It is with great pleasure that I dedicate this species to Luz María Villarreal de Puga, a botanical pioneer and insatiable collector who has devoted 38 years of her life to training future botanists, for her tireless efforts to protect, conserve and gain knowledge from our forests and because she is my beloved mother, of whom I am so proud.

DISTRIBUCION AND ECOLOGY: *Clethra luzmariae* is endemic to the Sierra de Juarez of northeastern Oaxaca and Cerro Zempoaltepetl east of the city of Oaxaca at elevations of 2 400 to 3 100 m. It is often an element of oak forests, growing singly, or more frequently stoloniferous and thicket-forming, intermixed with ericads such as *Comarostaphylis discolor*, *C. spinulosa*, *Gaultheria trichocalycina*, *Pernettya prostrata* and *Vaccinium* sp. It is also found in open oak-pine forests slopes as well as disturbed areas such as forest edges, trails, roadsides, and cut-over areas in the montane cloud forest zone.

Clethra luzmariae is closely related to the Central American *C. gelida* Standl. of Costa Rica and *C. oleoides* L.O. Williams of southern Chiapas, Guatemala and Honduras. These share short petioles, commonly less than 1 cm long, coriaceous somewhat conduplicate leaves, inflorescences having relatively big flowers with the petals glabrous within, down-curved pedicels, and conic buds. As characteristic of the series *Tomentellae*, they have minute, appressed, matted, stellate hairs but in addition these species show a peltate (fused) center (40X) on the abaxial leaf surface. They also have ecological preferences for high altitudes, usually above 2 500 m, and up to 3 350 m in Costa Rica. Nevertheless, *C. luzmariae* is readily separated from the two related species because its leaves have a perceptible serrulate-denticulate margins, the teeth up to 1.5 mm long, the apex acuminate to long acuminate and its adaxial surface often punctate. The most striking character that makes it unique is the often shrubby habit, with the shrubs less than 2 m tall, spreading vegetatively by horizontal underground rhizomes, always mixed with ericads. The extensive network of underground rhizomes evidently adapts it well to surviving frequent fires.

Clethra gelida and *C. oleoides* are very similar species. Actually, the only differences is the more robust branchlets and thicker blades with a more prominent secondary veins abaxially of *C. gelida*. These variations are probably a result of environmental effects at higher elevations. When Williams (1965) described *C. oleoides*, he pointed out that his new entity is closely allied to *C. gelida*, but he did not mention any distinguishing character to separate it; he solely indicated that the relative is known only from Costa Rica. His discussion mentioned that the color of the abaxial leaf surface of *C. oleoides* is due to the presence of many small punctiform glands. The close similarity of these two species was also recognized by Hamilton (1985), who stated that the only good character to differentiate them was "the leaf underside texture of *C. gelida* which is ferrugineous, whereas that of *C. oleoides* is rough and glandular

but not pubescent". However, no glands have ever been reported in the genus *Clethra*. I believe that the "punctiform glands" described by these authors could be the fused center of the stellate trichomes, as seen with x40 magnification. In reality, *C. gelida* shows the rays of the stellate hairs more or less erect rather than appressed as seen in the other two related species.

The new entity could be mistaken by *Clethra galeottiana* Briq., a tree distributed from central Guerrero to western Chiapas. In Oaxaca their geographic ranges overlap, but *C. luzmariae* apparently growing at higher elevation. Morphologically they have similar leaf size, shape, margins, relatively large flowers and big capsules. However, *C. galeottiana* from the series *Tomentellae* can be easily distinguished by its wooly reddish tomentum on branchlets, leaves and rachis of the inflorescence. Thus, the abaxial leaf surface, usually rust-colored tomentose, is due to the stipitate-fasciculate, tangled, reddish hairs of various sizes obscuring the epidermis.

The two new Oaxacan species here described overlap in their distribution. However, *Clethra konzattiana* is found in most instances at elevations from 1 700 to 2 470 m, while *C. luzmariae* grows most often at higher elevations from 2 400 to 3 100 m. Thus, in the vicinity of the Zempoaltepetl, these taxa apparently have not been found growing together since the first was collected at 2 130 m and the second at 2 800 m.

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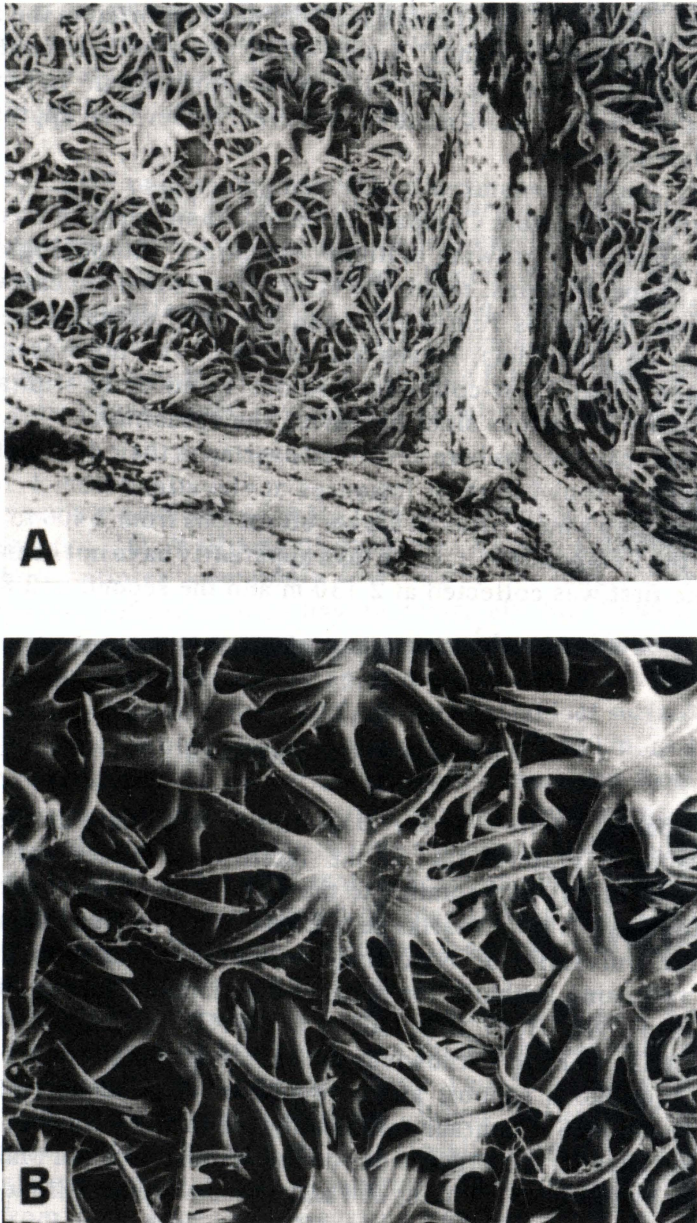


Figure 4-a. SEM photomicrographs. A,B. Abaxial leaf surface: covered by fused-stellate hairs with 8-15 rays, the midvein and secondary veins almost glabrous or with scattered stellate trichomes. *Clethra chiapensis*, x80, x250.

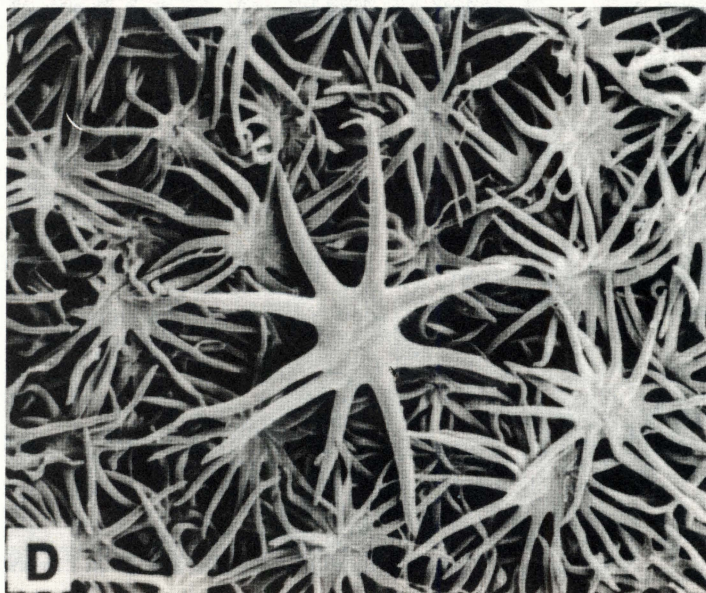


Figura 4-b. SEM photomicrographs. C,D. Abaxial leaf surface: covered by stellate hairs with 9-16 rays, the midvein and secondary veins almost glabrous or with very sparse stellate and acicular trichomes. *Clethra konzattiana*, x80, x250.

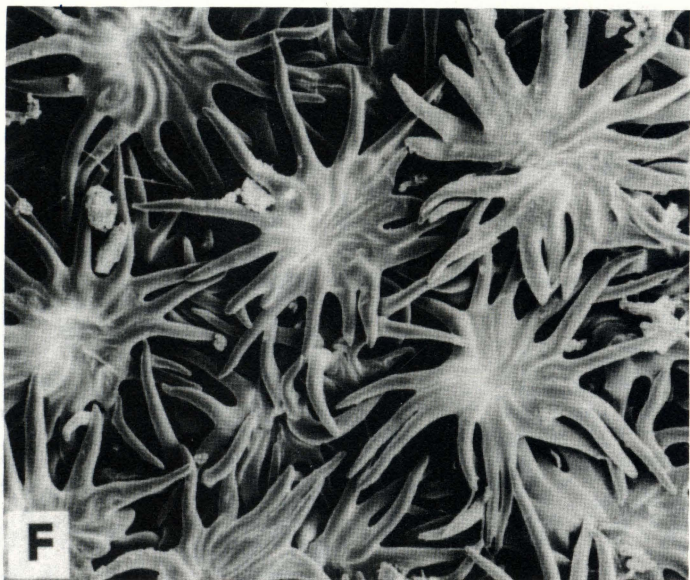
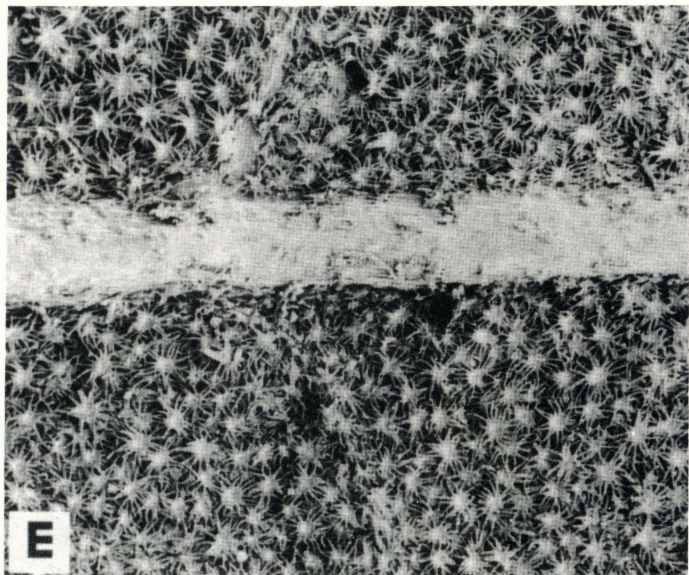


Figura 4-c. SEM photomicrographs. E,F. Abaxial leaf surface: covered by fused-stellate hairs with 8-19 rays, the midvein almost glabrous or with sparse acicular trichomes. *Clethra luzmariae*, x50, x350.

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