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SYSTEMATICS OF THE *SEDUM PARVUM* GROUP (CRASSULACEAE) IN
NORTHEASTERN MEXICO AND TEXAS

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ABSTRACT

In a systematic study of the yellow-flowered species of *Sedum* of northeastern México and Texas, those traditionally interpreted as the *S. parvum* Hemsl. group, we elevate or reinstate to species rank three taxa regarded by Clausen as subspecies of *S. parvum*: *S. catorce* stat. et nom. nov. (= *S. parvum* subsp. *dendroides* R.T. Clausen), *S. nanifolium* Frod. (*S. parvum* subsp. *nanifolium* [Frod.] R.T. Clausen), and *S. diminutum* stat. et comb. nov. (= *S. parvum* subsp. *diminutum* R.T. Clausen). In addition, three new species are proposed: *S. dulcinomen* Nesom, *S. papillicaulum* Nesom, and *S. macdonaldii* Nesom.

KEY WORDS: Crassulaceae, *Sedum*, México, systematics

This study was begun as a consequence of the observation by McDonald (1991) that two separate species of *Sedum* occur on the tops of the high peaks of southeastern Coahuila. Robert Clausen had earlier identified and annotated nearly all of the yellow-flowered species of *Sedum* in the Sierra Madre of Coahuila and Nuevo León as *S. parvum* Hemsl. subsp. *nanifolium* (Frod.) R.T. Clausen, although many of the collections cited in the present study have been made since his death. With further study, it became apparent that only one of these high elevation taxa could be identified as subsp. *nanifolium*. Several other entities related to *S. parvum*, at high and lower elevations in the Sierra Madre and adjacent areas, represent undescribed species. Further, based on a more restricted species concept than Clausen's, we believe that a group of taxa described by him as subspecies of *S. parvum* are better treated at specific rank. Clausen espoused, theoretically and practically, a very broad species concept (1984, p. 9): "The concept of species is best reserved for a level of differentiation that is major, involves many genetic characters, and is especially distinguished by impressive biological discontinuity where two or more species occur together." The

subspecies of this group, however, are allopatric non-intergrading taxa of northeastern México and the morphological distinctions among them are equivalent to those of accepted species in many genera of various other families.

Distinctive features of the *Sedum parvum* group are yellow, erect petals, yellow anthers and ovaries, and relatively small, elongate leaves drying with a flat to slightly concave adaxial surface (see below). Two other Mexican species clearly are members of the same group, *Sedum reptans* R.T. Clausen of San Luis Potosí and Querétaro, and *S. tamaulipense* Nesom of Tamaulipas. These taxa are distinctive in their spreading petals and fully terete leaves, but in their completely prostrate habit they are perhaps closely related to *S. parvum*. *Sedum nuttallianum* Raf., an erect annual common in Texas and the south-central United States, also appears to be very closely related (Nesom 1988). Clausen (1975) included the latter as the most divergent member of subgenus *Sedum* sect. *Lanceolata*, in which he otherwise included only species from north of México, but he noted that it is related to *S. parvum* "on the basis of morphology and geography." Finally, *S. greggii* Hemsl. and *S. grandipetalum* Frod. of the Trans-Mexican Volcanic Range, and perhaps *S. humifusum* Rose and *S. cupressoides* Hemsl., also appear to belong with this assemblage of taxa. According to Praeger (1921), these would be members of sect. "Seda Genuina Koch" (= sect. *Sedum*).

Other yellow-flowered species of *Sedum* in México may constitute more than one natural group apart from the *S. parvum* group. All, however, have flat (fresh) leaves, mostly 6-20 mm wide (much wider than the taxa treated in the present paper) and 15-40 mm long, and the inflorescences tend to be elevated well above the normally developed cauline leaves. Only one of them, *S. palmeri*, occurs in northeastern México.

Variation in leaf shape and arrangement

Clausen (1978) referred to *Sedum greggii* and *S. grandipetalum* as "heterophyllous," in reference to the "leaves of the elongate floriferous stems [which] are markedly different from those of the vegetative shoots or compact rosettes." Species treated in the present study also present a type of heterophylly, although it may not be homologous with that of those noted above. These produce short, vegetative, lateral branches with spreading, imbricately arranged leaves so densely packed that the stem surface is not evident. Sometimes, however, the floriferous branches of these also produce densely packed leaves resembling those of the lateral branches. In any case, five essentially prostrate species covered in this study (in the key below) do not produce this type of leaf arrangement vegetatively or otherwise but rather the leaves are evenly and well-spaced, leaving the stem surface in view. Such species without a marked dimorphism in leaf morphology Clausen called "homophyllous."

In Clausen's key to the species of the Mexican Cordilleran Plateau (1984), an early couplet distinguished "leaves flat, 2 or more times broader than thick" (*Sedum greggii*) from "leaves terete, subterete, or at least not 2 or 3 times broader than thick" (*S. parvum* and *S. reptans*). These choices were in reference to living material, which Clausen expected users of his key to have on hand (or else field notes describing the original morphology), but the leaves of *Sedum* shrink radically upon drying and it

becomes difficult to surmise the original shape. The relative position of the midvein in dried leaves does provide a clue to the original shape. The key below presents choices based on dried material, and notes on the morphology of fresh material are provided in the species descriptions where this information is available. The leaves of the *S. parvum* group have a strong tendency to markedly flatten when dried, even to the point of displaying two, sharply acute, lateral margins. The leaves of *S. nanifolium* Fröd. and *S. macdonaldii* Nesom usually dry with a relatively flat adaxial surface and convex abaxial one with rounded, poorly defined margins. These are referred to as "half-terete" in the descriptions below. Although the leaf shape (in cross-section) is constant within a species, it does not appear to be of critical importance in indicating phylogenetic relationships, if our supposition is correct that *S. nanifolium* is most closely related to *S. chrysicaulum* J.A. McDonald, which has markedly flattened leaves with strongly differentiated margins.

Variation in stem and leaf surface texture

Three basic types of stem morphology in the *Sedum parvum* group can be identified: 1) smooth, non-shiny, without visible cellular structure; 2) smooth, shiny, with elongated cells evident; and 3) papillate, non-shiny, with quadrate cells evident. The following groups of species correspond to the three stem types: 1) *S. reptans*, *S. nuttallianum*, *S. tamaulipense*; 2) *S. parvum*, *S. diminutum* (R.T. Clausen) Nesom, *S. nanifolium*, *S. chrysicaulum*; and 3) *S. papillicaulum* Nesom, *S. macdonaldii*, *S. catorce* Nesom, *S. dulcinomen* Nesom. These three morphologies are so distinctly different that we believe that the three species groups may represent separate phyletic lineages, each including species both of erect and prostrate habit. It is surprising that Clausen did not recognize the usefulness of this character among the species treated in the present study, because he used the same character in several key couplets (Clausen 1984) to delimit groups of species unrelated to the *S. parvum* group.

Description of the *Sedum parvum* group

Unless otherwise noted, the descriptions and measurements below are taken from dried, pressed specimens. Elaboration is found in the paragraphs above.

Erect or prostrate-decumbent perennials, annual in one species, somewhat woody in the lower portions, completely herbaceous in one species. Stems glabrous, smooth or papillate. Homophyllous or heterophyllous, the leaves glabrous, small, 3-10 mm long, drying flat to half-terete. Flowers in congested, terminal cincinni, more diffusely arranged in one species. Petals yellow, sometimes with short, red, longitudinal stripes, separate, each usually with a thick, raised, medial keel widened at the apex, erect to spreading or reflexed. Stamens 10, those opposite the petals adnate to the petal base; anthers yellow, red in one species. Carpels yellow, erect, the follicles erect to spreading, free or sometimes basally connate, baso-ventrally gibbous, each with numerous seeds. Seeds brown, minutely papillate, echinate in one species. Chromosome numbers, $n=10$ and 26 (known from only 2 species, see below).

KEY TO THE SPECIES OF THE *SEDUM PARVUM* GROUP IN
NORTHEASTERN MEXICO AND TEXAS

1. Stems minutely papillate to papillate-glandular, without a sheen.....(2)
2. Plants prostrate-decumbent from horizontal rhizomes.9. *S. dulcinomen*
2. Plants erect, without stolons or creeping rhizomes.....(3)
3. Stems 10-25 cm high or long, somewhat glaucous; leaves with prominent, wide, white margins of different texture than the blade; petals often spreading or reflexing.8. *S. catorce*
3. Plants mostly 4-14 cm high, not glaucous; leaf margins sometimes slightly lighter colored than the blade but then very narrow and not of different texture; petals erect.....(4)
4. Stems densely and minutely papillate, appearing somewhat stipitate-papillate, the cellular structure not clearly perceptible; leaves flattened or slightly convex above and beneath, the cellular structure evident only in the striate, elongated cells at the abaxial base, the margins sharply flattened and translucent-papillate 11. *S. papillicaulum*
4. Stems not distinctly columnar- or stipitate-papillate but with quadrate cells clearly perceptible; leaves half-terete, not strongly papillate but both surfaces with clearly perceptible quadrate cells, the margins rounded and not at all papillate.....12. *S. macdonaldii*
1. Stems smooth, not at all papillate or glandular-appearing, with or without a sheen.(5)
5. Plants prostrate-decumbent from horizontal rhizomes; leaves and petals without prominent red markings.(6)
6. Stems with a prominent sheen on the lower part, the cells elongate; petals erect, 3-5 mm long.....(7)
7. Rhizomes completely herbaceous; leaves 4-8 mm long, 2-4 mm wide; flowers in compact, terminal cincinni; petals 4-5 mm long; anthers yellow 1. *S. parvum*
7. Rhizomes thin but noticeably woody; leaves 3.5-5.3 mm long, 1.3-1.8 mm wide; flowers arranged relatively diffusely along upper branches; petals 3.0-3.5 mm long; anthers red.2. *S. diminutum*
6. Stems without a prominent sheen, the cellular structure not readily apparent, petals spreading, either ca. 2.5 or 6.5-8.5 mm long.....(8)
8. Petals ca. 2.5 mm long; leaves 2.5-7.0 mm long, 0.8-1.0 mm wide.4. *S. tamaulipense*
8. Petals 6-8 mm long; leaves 6.5-8.5 mm long, 2.5-3.5 mm wide.3. *S. reptans*
5. Plants erect, without rhizomes; leaves and petals with or without prominent red markings.....(9)
9. Annual; stems without a sheen; leaves and petals without red markings.5. *S. nuttallianum*
9. Perennial; stems with a prominent sheen at least on the lower part; leaves and petals with prominent red markings.(10)
10. Lower part of stems reddish-shiny; leaves 2.5-3.5 mm long, even in length; petals 4.0-5.1 mm long.6. *S. nanifolium*
10. Lower part of stems golden-shiny; leaves of lower stems 5-6 mm long, 7-10 mm long near the inflorescence; petals 5.0-7.5 mm long7. *S. chrysicaulum*

1. *SEDUM PARVUM* Hemsl.

Sedum parvum Hemsl., *Diagn. Pl. Nov. Mex.* 50. 1880. *Altamiranoa parva* (Hemsl.) Rose ex Britt. & Rose, *Bull. New York Bot. Gard.* 3:32. 1903. *Villadia parva* (Hemsl.) Jacobsen, *Natl. Cactus Succ. J.* 13:76. 1958. TYPE: MEXICO. San Luis Potosí: In regione San Luis Potosí, 6000-8000 ft, 1878, *Parry & Palmer 234* (HOLOTYPE: K; Isotype: GH!). *Sedum posoepalum* Frod., *Acta Horti Gotob.* 10, App.: 66. 1936. TYPE: MEXICO. San Luis Potosí: Alvarez, 13-23 Jul 1904, *Palmer 251* (HOLOTYPE: US; Isotype: GH!).

Prostrate-decumbent, completely herbaceous perennials from creeping rhizomes, producing fibrous, adventitious roots. Stems green, smooth, with a noticeable reddish sheen below, the cells elongated. Leaves evenly sized and spaced, green, usually drying translucent, very flat, narrowly elliptic-oblong to narrowly oblanceolate-oblong, 4-8 mm long, 2-4 mm wide. Petals erect, yellow, 4-5 mm long. Seeds echinate.

San Luis Potosí; rock outcrops or ledges in pinyon pine, pine-oak, pine-fir woods; 2000-2700 m; June-October.

In its prostrate habit, shiny stems, and "homophyllous" leaves, *Sedum parvum* is most similar to *S. diminutum*. *Sedum reptans*, which also occurs in San Luis Potosí, can be distinguished by its non-shiny stems, longer petals, and papillate seeds.

2. *SEDUM DIMINUTUM* (R.T. Clausen) Nesom, *comb. et stat. nov.* BASIONYM: *Sedum parvum* Hemsl. subsp. *diminutum* R.T. Clausen, *Bull. Torrey Bot. Club* 106:215. 1979. TYPE: MEXICO. Coahuila: Cañada La Hacienda, Sierra de la Madera, NW of Cuatro Ciénegas, crevices of limestone in shade of *Quercus*, slope on E side of Cañada, 1860 m, 22 Jul 1978, *R.T. Clausen 78-7* (HOLOTYPE: BH!; Isotypes: BH-3 sheets!).

Prostrate-decumbent perennials from slightly woody rhizomes, producing adventitious, fibrous roots. Stems green, smooth, with a noticeably golden sheen below, the cells elongated. Leaves evenly sized and spaced, green, very flat, narrowly elliptic-oblong to narrowly oblanceolate-oblong, 3.7-5.5 mm long, 1.3-1.8 mm wide. Flowers arranged rather diffusely along upper branches, not in congested cincinni. Petals erect, yellow, 3.0-3.5 mm long. Anthers red.

Known only from the type collection. See comments following *Sedum parvum*.

3. *SEDUM REPTANS* R.T. Clausen

Sedum reptans R.T. Clausen, *Bull. Torrey Bot. Club* 105:222. 1978. TYPE: MEXICO. San Luis Potosí: Sierra de San Luis Potosí, northern slope of Cerro El Ajugon, 21° 40' 45" N, 100° 03' 20" W, 1720 m, 7 Sep 1977, *R.T. Clausen 772,036* (HOLOTYPE: BH!).

Sedum reptans R.T. Clausen var. *carinatifolium* R.T. Clausen, *Variation Spec. Sedum* 15, 1981. TYPE: MEXICO. Querétaro: 1 km W of Lazaro Vega, 8 km NE of Vizarron des Montes, 20° 53' 25" N, 99° 39' 40" W, in depressions in limestone exposed to SE, 2250 m, 14 Apr 1980, R.T. Clausen 80-29 (HOLOTYPE: BH!; Isotype: BH!).

Completely herbaceous perennials with prostrate, creeping stems producing fibrous adventitious roots and short, erect or decumbent, leafy stems. Cells of stems quadrate, noticeably papillate in the youngest portions. Leaves terete to subterete to carinate above (fresh), drying [somewhat flattened], 6.5-8.5 mm long, 1.5-2.5 mm wide. Petals spreading, 6-8 mm long. Follicles widely spreading, ventrally gibbous, basally connate for ca. 1/4 their length.

Eastern San Luis Potosí to northeastern Querétaro; limestone rocks; 1700-2250 m; April-September.

In its habit, leaf shape, and morphology of its stems and follicles, *Sedum reptans* is similar to *S. tamaulipense*. Clausen (1981) described subsp. *carinatum* as different from subsp. *reptans* "in the length (8.5 versus 6.7 mm) and length-width ratios (4 versus 2.4 of the leaves" and dorsally carinate leaves. These putative differences (we find overlap in the leaf length) do not appear to us to justify formal nomenclature.

4. *SEDUM TAMAULIPENSE* Nesom

Sedum tamaulipense Nesom, *Sida* 13:22. 1988. TYPE: MEXICO. Tamaulipas: Mpio. San Carlos, Sierra de San Carlos, ca. 5 mi S of San Carlos, N side of Bufa El Diente, 18 Jun 1987, G. Nesom 6166 (HOLOTYPE: TEX!; Isotypes: BH!, MEXU!, UAT!, WTU!).

Perennial, prostrate herbs with numerous adventitious roots, forming mats, the stems smooth, without a sheen. Leaves narrowly oblong, terete (fresh), drying flattened, 2.5-7.0 mm long, 0.8-1.0 mm wide. Petals ca. 2.5 mm long, yellow, spreading. Follicles spreading, ventrally gibbous, basally connate for 1/2-3/5 their length.

Known only from the Sierra de San Carlos of central Tamaulipas; top of rocks and large boulders with bryophytes, in oak woods with scattered *Carya* and *Abies*; 1100-1250 m; May-August.

5. *SEDUM NUTTALLIANUM* Raf.

Sedum nuttallianum Raf., *Atl. J.* 1:146. 1832. TYPE: UNITED STATES. [Oklahoma]: drainage of the Red River, Arkansas, 1819, *Nuttall s.n.* (NY). See Clausen (1975) for notes on typification and synonymy.

Erect annual herbs 5-8 cm tall, from a very slender taproot, the stems smooth, without a sheen. Leaves narrowly elliptic-oblong, mostly 3-5 mm long, terete (fresh), drying more or less terete, all more or less similar in size and distribution. Petals yellow, spreading, 2-4 mm long. Follicles widely spreading, ventrally gibbous. Chromosome number, $n=10$ pairs.

Texas, Oklahoma, Arkansas, Missouri; open areas in shallow soil, commonly over granite or sandstone, usually in the area of oak or oak-juniper woods; April-July.

Probably most closely related to *Sedum tamaulipense*, sharing with it distinctively small petals and spreading, ventrally gibbous follicles.

6. *SEDUM NANIFOLIUM* Frod.

Sedum nanifolium Frod., Acta Horti Gotob. 10, App. 196. 1936. *Sedum parvum* Hemsl. subsp. *nanifolium* (Frod.) R.T. Clausen, Bull. Torrey Bot. Club 105:223. 1978. TYPE: MEXICO. Coahuila: Chojo Grande, 27 mi SE of Saltillo, 16 Jul 1905, Palmer 722 (HOLOTYPE: UC; Isotype: GH!).

Erect perennials to 20 cm high, homophyllous or rarely producing densely leafy shoots. Stems smooth, prominently reddish-shiny on the lower portions, cells elongated. Leaves widely obovate to obovate-oblong, half-terete (flat adaxially), green with prominent red dots, sometimes waxy, 2.5-3.5(-4.0) (-5.0 in Texas) mm long, 2.0-2.5 mm wide, even in length on upper and lower portions of the stem, cells quadrate. Petals erect, 4.0-5.1 mm long, yellow with prominent, short, red, longitudinal stripes. Chromosome number, $n=26$ pairs.

Widespread in eastern Chihuahua, Coahuila, central Nuevo León, and apparently rare in Brewster Co., Texas; limestone gravel, ledges, or crevices, in matorral, chaparral, or pinyon pine woods with juniper, oak, or agave; (1200-)1600-2300 (-2700) m; June-November.

Additional collections examined: MEXICO. Chihuahua: NW end of the Sierra del Diablo, ca. 27° 20' N, 29 Jul 1941, Stewart 981 (GH). Coahuila: W of El Chorro and ESE of Saltillo, 22 Jun 1978, Clausen 78.3 (BH-2 sheets); W of Chorro Grande, 25° 23' N, 100° 48' W, 23 Apr 1949, Clausen 7607 (BH-2 sheets, GH); 17 mi S of Arteaga, 18 Aug 1948, Kenoyer & Crum 2771 (GH); Del Carmen Mts., 2 Sep 1936, Marsh 862 (TEX); Sierra de Santa Rosa, NW of Muzquiz, 25 Jul 1938, Marsh 1476 (GH,TEX); 3 mi N of Puerto Flores, 8 Nov 1957, Moran 6309 (BH); Sierra de la Encantada, 10 km NW of Rancho Buena Vista, 5 Sep 1941, Stewart 1428 (GH, TEX); near Lirios, SE of Saltillo, Strauss s.n. (BH); Cañon de la Barrica, Sierra de la Madera, 20 Aug 1975, Wendt 1218 (TEX); Sierra del Carmen, E of Pico de Cerda, 11 Aug 1974, Wendt 563A (LL); Sierra del Carmen, 7.9 mi N of Rancho El Jardín on road to Mina El Popo, 22 Sep 1973, Wendt et al. 63 (LL). Nuevo León: Cañada Zacatosa, 6 km N of La Escondida, 24° 09' N, 99° 55' W, 30 Aug 1977, Clausen 77.32 (BH-2 sheets); Hwy 51 between Dr. Arroyo and Galeana, 34 km S of jct with Hwy 58 at Puerto de Pastores, 28 Jun 1978, Cochran et al. 8459 (BH); 2 mi S of Pablillo, 20 Jul 1958, Correll & Johnston 19889 (LL); Hwy 68, 17.7 mi S of jct of Hwy 60 and 1.6 mi N of Puerto de Cieneguillos, 24 Sep 1973, Reveal 3409 (BH); Hacienda Pablillo, Galeana, 8 Aug 1936, Taylor 103 (TEX).

UNITED STATES. Texas: Brewster Co.: on limestone hills in valley at the S end of Del Nortes, Hinckley 4114 (BH); Doubtful Canyon, Del Norte Mts., Gage Estate, 25 mi S of Alpine, 18 Sep 1947, Warnock & Hinckley 7521 (SRSC); Cox

Ranch, 15 mi SE of Alpine, 21 Aug 1960, *Warnock 18644* (SRSC); Doubtful Canyon, Del Norte Mts., 25 Sep 1967, *Warnock 21320* (SRSC).

7. *SEDUM CHRYSICAULUM* J.A. McDonald

Sedum chryseicaulum J.A. McDonald, *Sida* 14:315. 1991. TYPE: MEXICO. Nuevo León: Mpio. Rayones, summit of Sierra La Marta, ca. 3600 m, 24 Aug 1980, *J. A. McDonald & M. Mayfield 2556* (HOLOTYPE: TEX!).

Erect perennials 5-9 cm high. Stems smooth, prominently golden-shiny on the lower portions, cells elongated. Leaves narrowly oblanceolate-oblong, flat, green with prominent red dots, 2.0-2.5 mm wide, 5-6 mm long on lower stem, 7-10 mm long on the upper portions. Petals erect, 5.0-7.5 mm long, yellow with prominent, short longitudinal, red stripes.

Southeastern Coahuila (Sierra La Viga) and central Nuevo León (Sierra La Marta, Cerro Potosí, Sierra Peña Nevada); grassy subalpine to alpine meadows, often with *Pinus hartwegii* and *P. culminicola*; 3400-3800 m; August-October (November).

Additional collections examined: MEXICO. Coahuila: Mpio. Arteaga, summit of Sierra La Viga, ca. 3600 m, 24 Oct 1984, *McDonald & Gomez 1157* (TEX); Sierra La Viga, 3700 m, 22 Aug 1986, *McDonald 2099* (TEX); Sierra La Marta, 22 Aug 1986, *McDonald 2136* (TEX). Nuevo León: Mpio. Aramberri, Cerro Viejo, 3400 m, 20 Nov 1993, *Hinton et al. 23971* (TEX); Mpio. Doctor Arroyo, Sierra de Peña Nevada, N of Picacho de San Onofre, ca. 3400 m, 30 Nov 1984, *McDonald & Gomez 1298* (TEX); Mpio. Galeana, summit or near summit of Sierra La Marta, 3600 m, 31 Aug 1980, *Hinton et al. 17977* (TEX), Sierra La Marta, 3680 m, 4 Aug 1980, *Hinton et al. 17919* (TEX); 25 Oct 1984, *McDonald & Gomez 1242* (TEX); 22 Aug 1986, *McDonald 2136* (TEX); summit or near summit of Cerro Potosí, 23 Aug 1984, *Lavin 4787* (TEX); Cerro El Potosí, 3810 m, 14 Oct 1970, *Hinton et al. 17303* (TEX).

This is the most widespread of the high-elevation *Sedum* species of northeastern México. It is most closely related to *S. nanifolium*, with which it shares an erect habit, shiny stems with elongated cells, and the distinctive red markings in the leaves and petals.

8. *SEDUM CATORCE* Nesom, *nom. et stat. nov.*

Sedum parvum Hemsl. subsp. *dendroides* R.T. Clausen, *Bull. Torrey Bot. Club* 105:223. 1978. TYPE: MEXICO. San Luis Potosí: 0.5 km W of Real de Catorce, 23° 41' 24" N, 100° 53' 32" W, cliff of quartzite exposed to southwest, N side of canyon, 2620 m, 23 Aug 1977, *R.T. Clausen 772.028*--pressed from greenhouse-grown plants (HOLOTYPE: BH!; Isotype: BH!). Non *Sedum dendroideum* DC.

Erect to semi-erect, slightly glaucous perennials 10-25 cm high, roots said to be tuberos. Stems strongly woody, sometimes somewhat pendant from cliff sides, reddish, minutely papillate, not at all shiny, cells quadrate. Leaves homophyllous, lanceolate-oblong, flat but from a swollen base, (3.0-)3.5-5.0 mm long, 1.3-2.0 mm

wide, dark green with prominent white margins, venation usually clearly discernible. Petals erect to spreading or reflexed, 6-7 mm long, yellow.

Known only from cited collections.

9. ***SEDUM DULCINOMEN*** Nesom, *spec. nov.* TYPE: MEXICO. Nuevo León: [Mpio. Zaragoza], 2 mi E of Dulces Nombres, succulent on limestone outcrops, 1850 m, 28 Jun 1948, *F.G. Meyer & D.J. Rogers* 2699 (HOLOTYPE: BH!).

Sedo catorce Nesom, *S. papillicaulo* Nesom, et *S. macdonaldii* Nesom caulibus papillatis similis sed distinctus habitu prostrati-decumbenti caulibus ex rhizomatibus horizontalibus radicibus adventitiis orientibus; *Sedo catorce* similis caulibus ac foliis glaucis.

Prostrate-decumbent perennials from horizontal, slightly woody rhizomes, producing fibrous, adventitious roots, stems and leaves heavily glaucous (less so in cultivation). Stems green, becoming reddish-tinted, but without discrete dots of red pigment, minutely papillate with quadrate cells, arching upward or erect and arising from the rhizomes. Leaves heterophyllous, green, heavily glaucous (less so in cultivation), flat, elliptic-oblong, 1.5-2.0 mm wide, 2.5-4.5 mm long. Petals erect, yellow, 4.5-6.0 mm long.

Nuevo León, on the Tamaulipas border near Dulces Nombres; limestone ledges and outcrops in pine woods; 1750-2000 m; February-June.

Additional collections examined: MEXICO. Nuevo León: Mpio. Zaragoza: ca. 16 km E of mine in District of Dulces Nombres, Feb 1950, *J.L. Edwards s.n.*--pressed from greenhouse cultivar (BH); ca. 3 km SE of Santa Teresa, "39" Jan 1980. *Clausen U2724*--pressed from greenhouse cultivar (BH).

The three collections studied of *Sedum dulcinomen* are very similar among themselves. The specimen collected from nature (the type), is strongly glaucous, but the greenhouse-grown plants show clear traces of a waxy surface. Among the other species treated in this study, only *S. catorce* produces a glaucous covering.

10. ***SEDUM PAPILLICAULUM*** Nesom, *spec. nov.* TYPE: MEXICO. Nuevo León: Mpio. Zaragoza, Sierra de Peña Nevada, Picacho San Onofre, fir and pine forest, 3000 m, 18 Jun 1979, *Hinton et al.* 17551 (HOLOTYPE: TEX!).

Sedo catorce Nesom et *S. macdonaldii* Nesom habitu erecto et caulibus papillatis similis sed distinctus paginis non glaucis, foliis planis, et papillis caulinis columnaribus structuram cellulosaam perspicuam carentibus.

Erect, fibrous-rooted perennials 6-25 cm high. Stems suffruticose, prominently minutely and densely papillate, the papillae columnar and sometimes appearing stipitate-glandular, the cellular structure not readily apparent. Leaves oblong-elliptic to lanceolate-oblong, flat, 3-4 mm long, even in length on the upper and lower portions

of the stems, 1.5-2.2 mm wide, the cells quadrate in the distal portions, elongate in the swollen basal portion. Petals erect, yellow, rarely with a reddish tinge, 5-7 mm long.

Nuevo León; subalpine and alpine meadows of Sierra Peña Nevada and vicinity, usually with *Pinus hartwegii* or pine-fir, sometimes in oak-agave woodland; (2700-) 3000-3600 m; June-August.

Additional collections examined: MEXICO. Nuevo León: Mpio. Doctor Arroyo: ridge and E side of Peña Nevada, 5 Jul 1985, *McDonald 1642* (TEX); trail from Cañon La Tinaja to La Encantada, 4 Jul 1988, *Patterson 5837* (TEX); N and NW slope of Picacho Onofre, 10-15 Jul 1977, *Wells & Nesom 369* (TEX). Mpio. Zaragoza: Cerro El Viego, 1800 m, 7 Jul 1992, *Hinton et al. 22125* (TEX); Cerro El Viego, 3360 m, 6 Oct 1992, *Hinton et al. 22147* (TEX); 9 km N of La Encantada, 2700 m, 25 May 1992, *Hernández et al. 2284* (TEX); 2 m NE Cerro Peña Nevada, 2690 m, 23 Aug 1989, *Nesom 7121* (TEX). Tamaulipas: 15 km NW Estanque de los Walle, 2000 m, 25 Oct 1989, *Hernández S. 2063* (TEX).

A distinctive species restricted to the Peña Nevada area of southeastern Nuevo León but closely similar to *Sedum macdonaldii*, which appears to be its northern vicariad.

11. ***SEDUM MACDONALDII*** Nesom *spec. nov.* TYPE: MEXICO. Nuevo León: Mpio. Galeana, Sierra La Marta, S and SE sides at the top, alpine and subalpine zone, 22 Aug 1986, *Andrew McDonald 2135* (HOLOTYPE: TEX!); Isotypes: MEXU, BH).

Sedo catorce Nesom et *S. papillicaulo* Nesom habitu erecto et caulibus papillatis similis sed distinctus paginis non glaucis, foliis semi teretibus et cellulisquadratis in lineis papillas caulinas formantibus.

Erect fibrous-rooted perennials 4-7 cm high. Stems mostly obscured by the leaves but the surfaces low-papillate with quadrate cells in lines. Leaves half-terete, flat above with a medial sulcus, both surfaces with quadrate cells from tip to base, minutely striate-papillate, the cellular structure clearly perceptible. Petals yellow, erect, 6-7 mm long.

Coahuila (Sierra Coahuilón, Sierra La Viga), Nuevo León (Cerro Potosí and Sierra La Marta); subalpine and alpine zones, often with *Pinus hartwegii*, *Pinus culminicola*, or *Pseudotsuga*; 2850-3600 m; July-October.

Additional collections examined: MEXICO. Coahuila: Mpio. Arteaga, ridge and SE side of Sierra Coahuilón, 22 Jul 1985, *McDonald 1762* (TEX); summit of Sierra La Viga, 24 Oct 1984, *McDonald & Gomez 1158* (TEX). Nuevo León: Mpio. Galeana: Sierra La Marta, near top, 5 Jul 1981, *Hinton et al. 18310* (TEX); SE side of Cerro Potosí, 25 Jun 1960, *Beaman 3321* (GH); near top of Cerro Potosí, 3500 m, 23 May 1988, *Westlund 23* (TEX).

Sedum macdonaldii apparently is most closely related to *S. papillicaulum*, which differs in its flat (dried) leaves with a basal area of elongated cells and its strongly stipitate-papillate stems, the cellular structure of which is not at all discernible.

INCERTAE SEDIS

Sedum robertsonianum E.J. Alexander, Bull. Torrey Bot. Club 63:201. 1936. *Sedum parvum* Hemsl. subsp. *robertsonianum* (E.J. Alexander) R.T. Clausen, *Variation Spec. Sedum* 16. 1981. TYPE: UNITED STATES. Texas: Brewster Co., mountain top in shallow calcareous soil, 4000 ft, A.R. Davis s.n. (HOLOTYPE: NY, from cultivar of Davis collection.)

Clausen (1981) could not find the type at NY and made the following comment: "Because no type is at the New York Botanical Garden, a part of the type material, made available by Mr. Alexander and cultivated and pressed at Cornell University on July 22, 1937, may serve as the lectotype. The specimen is in the herbarium at Cornell University."

[It] "combines features of the other subspecies: longer leaves (8.6 mm) as in ssp. *diminutum*, wider leaves (3.7 mm) as in ssp. *nanifolium*, longer anthers (1.1 mm) as in ssp. *dendroides*, narrower nectaries (0.4 mm) as in ssp. *diminutum*, and later flowering (Aug.-Sept.) as in ssp. *parvum*. It is the most herbaceous of the five subspecies. Otherwise, it is similar to the other subspecies in having cymes of 1-2 cincinni, yellow flowers, gibbous follicles, and fuscous, papillose seeds." Clausen (ms), in his forthcoming treatment of *Sedum* for the Flora of the Chihuahuan Desert (Henrickson, in prep.), places *S. robertsonianum* in synonymy under *S. parvum* Hemsl.

Erect, fibrous-rooted perennials. Stems [papillate?], both stems and leaves "red-streaked and spotted." Heterophyllous, the leaves 5-8 mm long, 3-4 mm wide, subterete (fresh), papillate, the cells quadrate. Petals yellow, 4 mm long, spreading-reflexed. Carpels erect, the follicles spreading, baso-ventrally gibbous.

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LITERATURE CITED

- Berger, A. 1930. Crassulaceae. In: A. Engler & K. Prantl, *Nat. Pflanzenfam.* ed. 2. 18a:352-483.
Britton, N.L. & J.N. Rose. 1950. *Sedum* in N. Amer. Fl. 22:7-74.
Clausen, R.T. 1959. *Sedum* of the trans-Mexican volcanic belt: an exposition of taxonomic methods. 380 pp. Ithaca, New York.
_____. 1975. *Sedum* of North America north of the Mexican Plateau. 742 pp. Ithaca, New York.

- _____. 1978. *Sedum*--seven Mexican perennial species. Bull. Torrey Bot. Club 105:214-223.
- _____. 1979. *Sedum* in six areas of the Mexican Cordilleran Plateau. Bull. Torrey Bot. Club 106:216.
- _____. 1981. Variation of species of *Sedum* of the Mexican Cordilleran Plateau. Arnold Printing Corp., Ithaca, New York.
- _____. 1984. *Sedum* (Crassulaceae) of the Mexican Cordilleran Plateau. Gentes Herb. 12:8-48.
- Froderstrom, H. The genus *Sedum* L., a systematic essay. Part I. Acta Horti Gotob. 5 Appendix: 1-75. 1930; Part II, Ibid 6 (Appendix): 1-111. 1931; Part III. Ibid 7 (Appendix): 1-126. 1932; Part IV. Ibid 10 (Appendix): 1-262. 1935.
- McDonald, J.A. 1991. Plantae alpinae novae Mexicanae: *Sedum chrysicaulum* (Crassulaceae). Sida 14:315-319.
- Nesom, G.L. 1988. New species of Crassulaceae from northeastern México. Sida 13:21-24.
- Praeger, R.L. 1921. An account of the genus *Sedum* as found in cultivation. J. Royal Hort. Soc. 46:1-314.

THE GENUS *TETRANEMA* (SCROPHULARIACEAE) IN COSTA RICA, WITH TWO NEW SPECIES

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ABSTRACT

Two new species of *Tetranema* (Scrophulariaceae) are described from Costa Rica: *T. gamboanum* Grayum & Hammel, known from wet forests on both slopes, and *T. floribundum* Hammel & Grayum, endemic to Cerro Turrubares in the mid-Pacific region. Both are unusual in having a long-stemmed growth habit and red, tubular corollas presumably adapted for pollination by hummingbirds. The new species are most similar, at least in floral morphology, to the Mexican endemic *Tetranema megaphyllum* (Brandege) L.O. Williams. These are the first records of the genus from south of Honduras, and increase the total number of species from four to six.

KEY WORDS: Costa Rica, Scrophulariaceae, *Tetranema*, systematics

A wealth of botanical material gathered during the exploration of a remote region on the Atlantic slope of Costa Rica's Cordillera de Talamanca in April, 1989, included one particularly remarkable collection made by Costa Rican botanist Gerardo Herrera. This collection was remarkable in representing a conspicuous, terrestrial herb—an asterid dicot with bright red, tubular corollas ca. 5 cm long—that we were unable to identify even to the generic level. Though its flowers superficially resembled those of some Acanthaceae known from the region [*Odontonema tubaeforme* (Bertol.) Kuntze, *Razisea spicata* Oerst.], the Herrera collection was soon identified as belonging to Scrophulariaceae. However, the combination of a caulescent, subshrubby growth habit and axillary, long-pedunculate, bracteolate, cymose inflorescences seemed incompatible with any known genus; indeed, we entertained the notion of establishing a new genus to accommodate this collection and other, similar material that has subsequently emerged from Costa Rica.

With respect to their shrublike habit, axillary, cymose inflorescences and red, tubular corollas, the abovementioned Costa Rican collections suggest the genus *Russelia* Jacq., of the monotypic tribe Russeliae. *Russelia* differs, however, in having septicidal capsules densely packed with hairs. The Costa Rican material better concords with tribe Cheloneae *sensu* Thieret (1954), characterized by bracteolate,

cymose or racemose inflorescences and sterile posterior stamen filaments. The only members of this group occurring naturally in the Mesoamerican region are the large genus *Penstemon* Schmidel and the oligotypic *Tetranema* Benth. ex Lindl. and *Uroskinnera* Lindl. (though none of these have been recorded from south of Honduras). Each of these three genera includes at least one species with red, tubular, presumably hummingbird-pollinated flowers (see, e.g., Daniel & Breedlove 1992).

Tetranema differs from *Penstemon* and *Uroskinnera* in having axillary and cymose (rather than terminal and racemose or thyrsoïd) inflorescences and much reduced sterile stamens (staminodes); it further differs from *Uroskinnera* in having distinct sepals, and from *Penstemon* in having loculicidal capsules. In all of these critical details, the Costa Rican material accords perfectly with *Tetranema*. Moreover, the seeds of the one Costa Rican collection examined in this regard (Figure 2) are a very convincing match for those of *Tetranema roseum* (M. Martens & Galeotti) Standl. & Steyerl., as illustrated by Beaufort-Murphy (1983: Pl. 4G) (who, unfortunately, did not study *Uroskinnera* or *Penstemon*).

Our initial attempts to identify the Costa Rican *Tetranema* collections to genus level were thwarted by our reliance on Standley & Williams's (1973) *Flora of Guatemala* Scrophulariaceae treatment. In their generic key (p. 321), the leads are inverted in the couplet purporting to separate *Tetranema* from *Uroskinnera* and *Penstemon* (as pointed out by Daniel & Breedlove 1992). Furthermore, the three *Tetranema* species attributed to Guatemala are all quite unlike the Costa Rican material in being acaulescent or short-stemmed herbs with campanulate, white or purple (*vide* Standley & Williams) corollas.

Tetranema has heretofore been considered a genus of four species, ranging from southern México (Puebla) to Honduras (Méndez-Larios & Villaseñor 1995). *Tetranema roseum*, the most wide-ranging species, is of modest horticultural repute as a glasshouse plant, with at least two cultivars available commercially under the name "Mexican foxglove" (Morrison 1981).

The Costa Rican material of *Tetranema* is here treated as comprising two species new to science, bringing the generic total to six. *Tetranema gamboanum* Grayum & Hammel is represented by the Herrera collection from the Atlantic slope and several subsequent collections from wet-forest sites on the Pacific slope, while *T. floribundum* Hammel & Grayum is known only by three collections from Cerro Turrubares, an isolated peak in the central Pacific region.

TETRANEMA GAMBOANUM Grayum & Hammel, *spec. nov.* TYPE: COSTA RICA. Puntarenas: Cantón de Osa, Fila Costeña, cabeceras del Río Piedras Blancas, Cerro Anguciana, 8° 49' 12" N, 83° 11' 15" W, 900 m, 7 Dec 1993 (fl., fr.), Aguilar *et al.* 2700 (HOLOTYPE: INB!; Isotypes: BM!, CAS!, CR!, FI!, MEXU!, MO!, NY!, US!). Figures 1-2.

Species cum *Tetranemata megaphyllo* (Brandege) L.O. Williams optime congruens sed differt foliis apice longiacuminatis bracteis inflorescentia brevioribus corolla longiore lobis corollae multo longioribus.

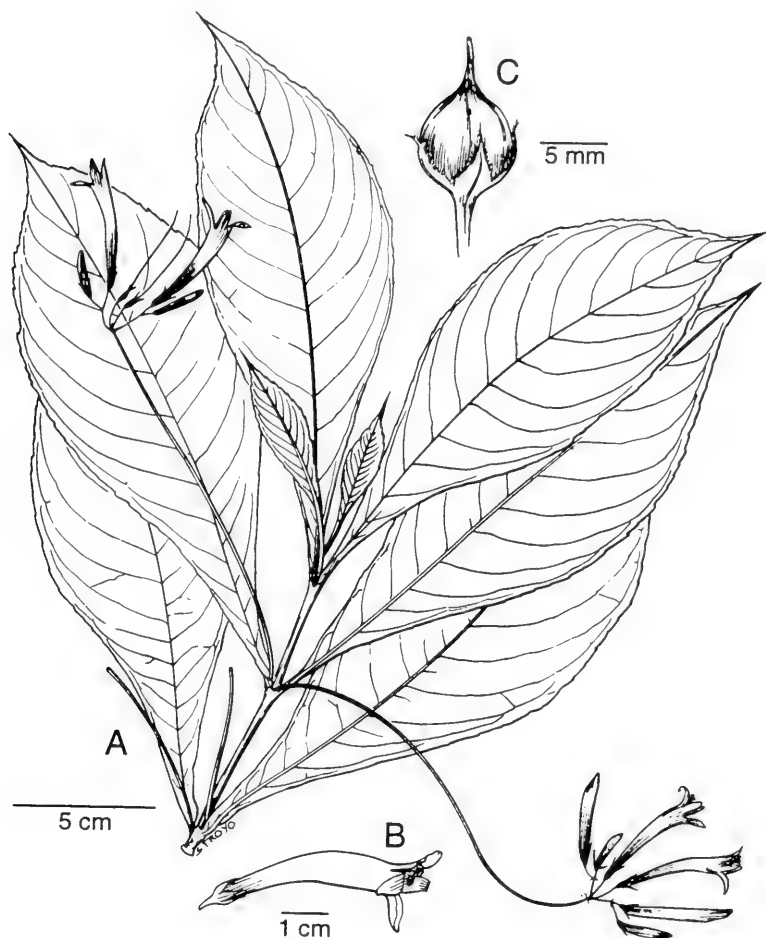


Figure 1. *Tetranema gamboanum*. A. flowering shoot (Aguilar et al. 2700); B. flower (Aguilar et al. 2700); C. fruit (Hammel et al. 19429).

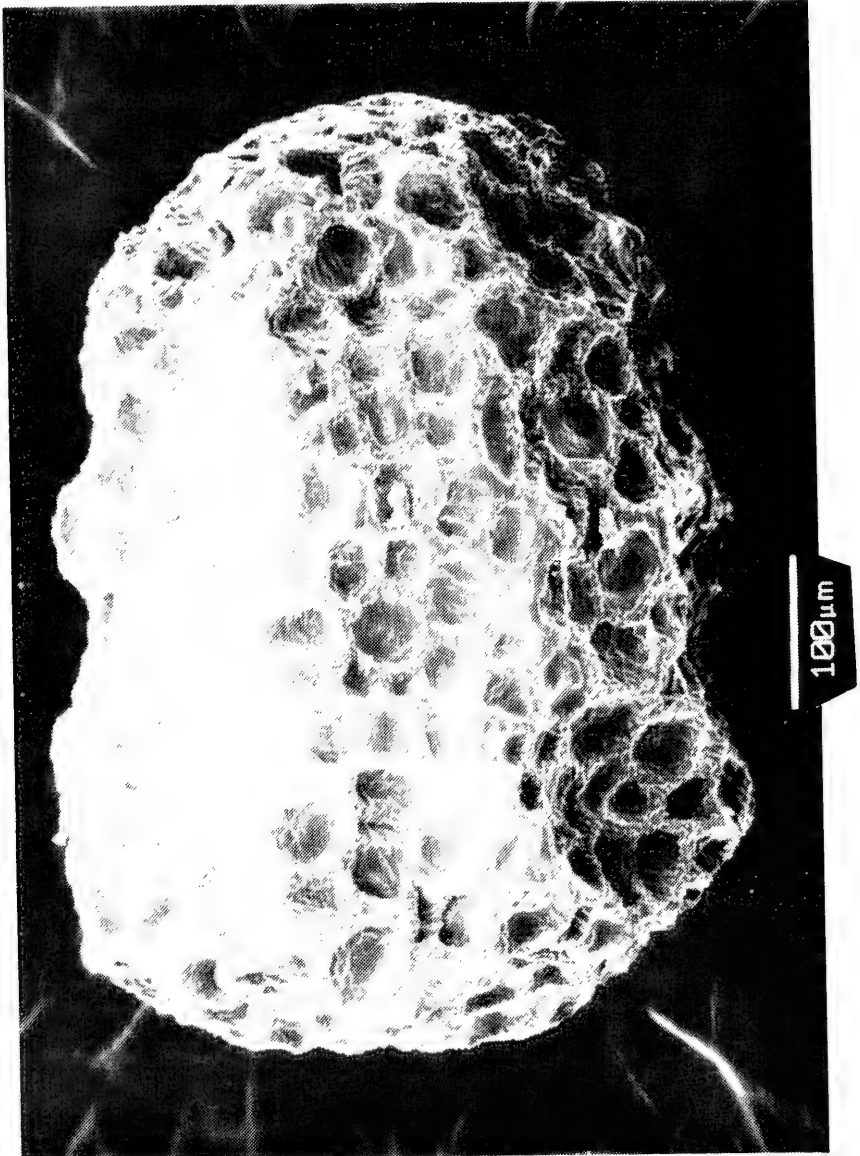


Figure 2. *Tetranema gamboanum* (Hammel et al. 19542), seed; $\times 150$ (photo by Betty Strack).

Erect, decumbent-based herbs 1-2+ m tall. Internodes to at least 11 cm long, strigulose when young. Petioles obsolete to ca. 1 cm long, strigulose, canaliculate above, the margins ciliate proximally, the hairs extending in a line across the node. Leaves 14-31 × 5-11 cm, elliptical to oblanceolate or spatulate, long-acuminate at apex, attenuate to the base (where decurrent onto the petiole), the margins ± coarsely serrate, glabrous above or with few, distant hairs along the midrib and major veins (especially proximally), pubescent along the veins below, midrib often falcate, primary lateral veins ca. 9-13 per side, prominulous on both sides when dry. Inflorescences axillary, cymose; peduncle 9-24 cm long, divergent, green, quadrangular with the angles narrowly winged. Flowers ca. 2-12 per inflorescence, bracteate, the bracts 0.5-2.0 mm long, subulate to narrowly triangular, ciliate on margins; pedicels ca. 9-11 mm long at anthesis, to ca. 20 mm in fruit, glabrous; calyx 5-merous, divided nearly to base, the lobes ca. 3-5 mm long at anthesis (to ca. 6 mm in fruit), ± narrowly to broadly ovate, imbricate, ± cornute apically, ciliate on margins; corolla ca. 4.9-5.5 cm long, scarlet, tubular, slightly curved (convexly) upward and gradually expanded distally, glabrous throughout or (*Herrera & Chacón 2644*) with flat hairs at the mouth and onto the lower lobes, the lobes 4, 11-13 × 3.0-3.5 mm, imbricate, lanceolate, the 3 lower ones obtuse to rounded apically and spreading-reflexed, the upper one emarginate and slightly wider; fertile stamens 4, exserted from the throat (but not exceeding the upper corolla lobe); filaments attached at base of corolla tube, glabrous, ± dilated toward base; anther sacs 0.8-1.0 mm long, confluent apically and becoming divergent, glabrous; staminode ca. 1.5-2.0 mm long; ovary 3-4 mm long, narrowly ovoid, glabrous; style exserted, glabrous; stigma clavate to funnelform, hollow, the rim papillose; fruit a loculicidal capsule, ca. 6-9 mm long, subglobose-apiculate; seeds ca. 0.6-0.7 × 0.45 mm, oblong, amber to black, densely foveolate.

Additional specimens examined: COSTA RICA. Limón: Cordillera de Talamanca, entre Cerro Muchilla y Cerro Avioneta, cabeceras de Río Suruy, Fila Matama, 9° 47' 25" N, 83° 06' 30" W, 550 m, 17 Apr 1989 (fl.), *Herrera & Chacón 2644* (BM,CR,INB,MEXU,MO,USJ). Puntarenas: Cantón de Osa, upper head waters of Río Piedras Blancas, W slopes of Cerro Anguciana, Fila Cruces, 8° 49' 12" N, 83° 11' 09" W, 950-1,150 m, 10 Dec 1993 (fl.), *Grayum 10663* (CAS,BM,CR,F,INB,MEXU,MO); same locality, 7 Dec 1993 (fl., fr.), *Hammel et al. 19200* (CR,INB,F,MO). San José: Cantón de Pérez Zeledón, Fila Costeña, Fila Tinamastes, por la carretera entre Dominical y San Isidro, 9° 18' 43" N, 83° 46' 19" W, 950 m, 3 Feb 1994 (fl., fr.), *Hammel et al. 19429* (COL,CR,INB,MICH,MO,TEX); same locality, 28 Mar 1994 (fl., fr.), *Hammel et al. 19542* (CR,INB,MO; live at MO).

Tetranema gamboanum is endemic to Costa Rica, where it is known by a single collection from the Atlantic slope of the Cordillera de Talamanca (Fila de Matama) at 550 m elevation, and from two widely separated sites in the Pacific Fila Costeña at ca. 900-1,000 m (Figure 3). All of these stations appear to lie in the Premontane Rain Forest Life Zone of the Holdridge system (*cf.* Tosi 1969). Flowering material of *T. gamboanum* has been collected from December through April.

As mentioned previously, Costa Rican material of *Tetranema* does not concord with any of the three species treated in the *Flora of Guatemala* (Standley & Williams

1973). It does, however, compare reasonably well with the Chiapan endemic *T. megaphyllum* (Brandegee) L.O. Williams, at least in terms of gross floral morphology. The original description of *Allophyton megaphyllum* Brandegee (1914) specified tubular, red corollas ("Corollae tubus cylindraceus . . . Corollae coccineae") that "resemble those of *Russelia*," and subsequent descriptions agree on this point. This is the only *Tetranema* species from north of Costa Rica that has tubular corollas, though those of *T. evolutum* Donn. Sm. may be red (*fide* Méndez-Larios & Villaseñor 1995; Standley & Williams described them as "bright purple").

Tetranema gamboanum would seem to differ from *T. megaphyllum* in comprising taller (1-2+ m), coarser plants. Although the specimens of the latter species studied by Brandegee (1914) were "not complete enough to give the size of the plant," the leaves were said to be "crowded," suggesting that the plants may have been short-stemmed. Pennell (1925), the first to ally the "most remarkable" *Allophyton megaphyllum* with *Tetranema* (using the name *Allophyton* Brandegee for the entire group), stated that "all the species of *Allophyton* have short stems," more specifically, "1 dm long or less." Pennell cited three duplicates of a topotype collection (*Purpus* 7921) not cited by Brandegee. Méndez-Larios & Villaseñor (1995), citing three additional collections not seen by previous authors, characterize *T. megaphyllum* as "la especie con desarrollo vegetativo más vigoroso"; nevertheless, they describe it as having "tallos muy reducidos," 25-40 cm tall.

Although we have been unable to obtain the holotype of *Tetranema megaphyllum* on loan, we have studied an isotype (*Purpus* 6855 [NY]), as well as the NY duplicate of the topotype cited by Pennell (1925). While neither of these specimens bears label data indicating either the habit of the plants or the color of the corollas, the following differences from *T. gamboanum* are manifest: *T. megaphyllum* has inflorescence bracts to ca. 10 mm long and corollas ca. 2.5-3.6 cm long with rounded, apparently forward-directed lobes ca. 2-4 mm long; *T. gamboanum*, on the other hand, has inflorescence bracts to ca. 2 mm long and corollas ca. 5 cm or more long with elongate, spreading-reflexed lobes ca. 11-13 mm long. These observations are corroborated by Méndez-Larios & Villaseñor's (1995) description of *T. megaphyllum*.

The occurrence of *Tetranema gamboanum* on both the Atlantic and Pacific slopes has innumerable precedents in the Costa Rican flora. The lone collection from the Atlantic slope (*Herrera & Chacón* 2644) is essentially a perfect match for the Pacific material, except for the unusual corolla hairs noted in the description. Whether or not these hairs are characteristic of Atlantic populations, and thus potentially indicative of infraspecific rank, cannot be decided without additional material.

Tetranema gamboanum is probably more widespread in Costa Rica than our scattered records indicate; it may also yet be found in Panamá. Although it is locally more or less abundant, none of the three known stations lies within a protected area. This appears to be a species of relatively undisturbed habitats.

We take great pleasure in dedicating this new species to William Gamboa Elizondo (1958-) of Las Mellizas de Coto Brus, Costa Rica, who has participated enthusiastically in virtually every major botanical expedition into the Cordillera de Talamanca since 1983 as cook, porter, scout, negotiator, and occasional collector.

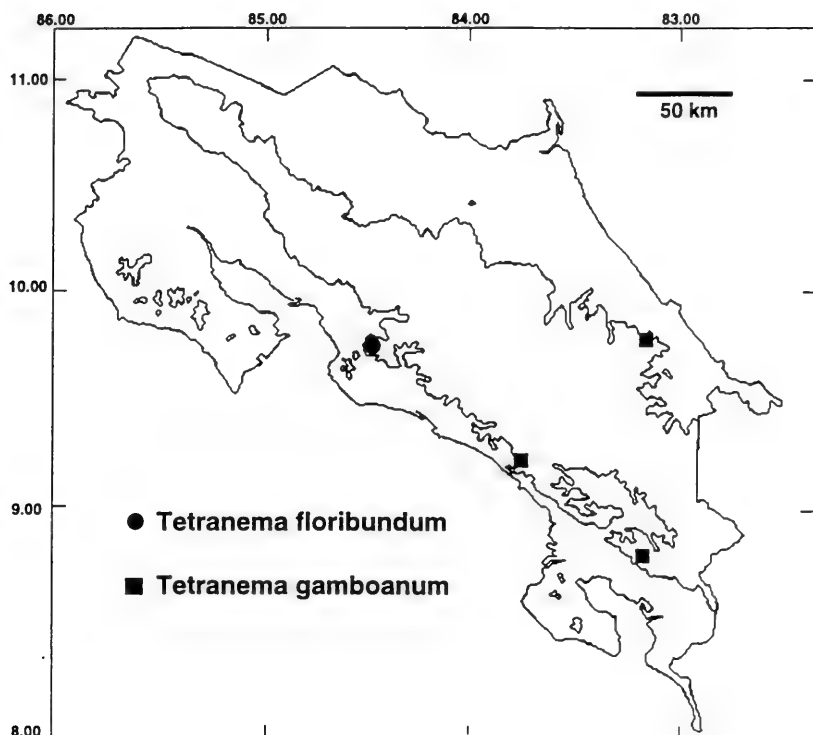


Figure 3. Distribution of *Tetranema* in Costa Rica (500 m contour is indicated).

TETRANEMA FLORIBUNDUM Hammel & Grayum, *spec. nov.* TYPE: COSTA RICA. San José: lado N de Cerro Turrubares, al S de San Rafael por Quebrada Pital, 9° 48' 05" N, 84° 27' 52" W, 1,200-1,300 m, 5 Jan 1996 (fl., fr.), Hammel, Jiménez, & Morales 20068 (HOLOTYPE: INB!; Isotypes: BM!, CR!, F!, MO!). Figure 4.

Species ex affinitate *Tetranematis megaphylli* (Brandege) L.O. Williams et *T. gamboani* Grayum & Hammel, ab utroque inflorescentiis omnibus (8-)14-30-floris tubo corollae intus ventraliter in longitudinem pubescenti distincta.

Erect, decumbent-based herbs (0.35-)0.80-2.00 m tall, often rooting at decumbent nodes. Internodes to at least 5 cm long, densely matted-, arachnoid-, or woolly-pubescent when young. Petioles essentially obsolete, the often undulate margin of the leaf blade reaching nearly to the node. Leaves 21.0-23.5 × 9-13 cm, broadly elliptic to oblanceolate or spatulate, rounded, abruptly acute or short-acuminate at apex, acute to mostly concavely and abruptly attenuate to the base, the margins coarsely serrate to undulate-toothed, glabrous above except on the midrib at the very base, strigulose on the midrib and main veins below and minutely scaly (and thus shiny, when dry) throughout the abaxial leaf surface, midrib occasionally falcate, primary lateral veins 8-10(-11) per side, prominent below. Inflorescences axillary, cymose; peduncle 13-23 cm long, purple, quadrangular with the angles narrowly winged. Flowers ca. (8-)14-30 per inflorescence, bracteate, the bracts 1-5 mm long, narrowly triangular, ciliate (often only at base) on margin; pedicels ca. 10 mm long at anthesis, to ca. 20 mm in fruit, glabrous; calyx 5-merous, divided nearly to base, the lobes 2-3 mm long at anthesis (to 4 mm in fruit), broadly ovate, ± connate apically, ciliate on margins; corolla 2.6-3.5 cm long, red, tubular, gradually slightly curved (convexly) upward and expanded distally, glabrous externally, internally pubescent with a narrow band of flat, yellow hairs (to ca. 1 mm long) on the ventral surface of the tube from near the base to the mouth and often all along the median lower lobe, the lobes 4, ca. 13 × 2.5-5.5 mm, ± lanceolate, the 3 lower ones rounded apically and spreading-reflexed, the upper one emarginate and slightly wider; fertile stamens 4, exserted from the throat (but held just below the upper corolla lobe and not exceeding it); filaments attached at the base of the corolla tube; anther sacs 0.8-0.9 mm long, confluent apically (where attached to the filament), divergent at dehiscence (full length) and then broadly elliptic, glabrous; staminode ca. 0.5 mm long; ovary ca. 3.5 mm long, narrowly ovoid, glabrous; style exserted (with the stamens), glabrous; stigma clavate, hollow; fruit to ca. 8 mm (immature), ovoid.

Additional specimens examined: COSTA RICA. San José: Cantón de Turrubares, Z. P. Cerros de Turrubares, Potenciana arriba, cerca del Cerro Turrubares, 9° 48' 00" N, 84° 27' 10" W, 1,600 m, 4 Mar 1993 (fl., fr.), Jiménez et al. 1155 (BM, CR, INB, MO); Z. P. Cerros de Turrubares, Cerros de Puriscal, sector San Rafael, Sitio Cerro Pelón, 09° 49' 00" N, 84° 28' 50" W, 1,200 m, 6 Dec 1991 (fl.), Zúñiga 599 (INB).

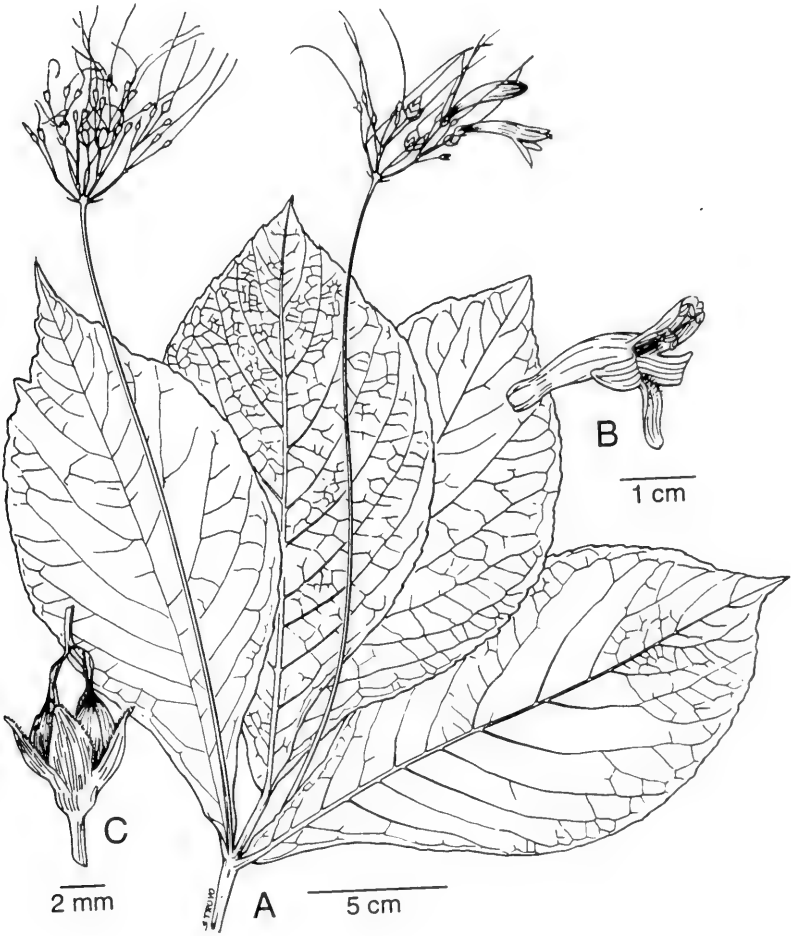


Figure 4. *Tetranema floribundum*. A. flowering shoot (Jiménez et al. 1155); B. corolla (Hammel et al. 20068); C. fruit (Jiménez et al. 1155).

Tetranema floribundum is endemic to Costa Rica, where it is known only from Cerro Turrubares, an isolated peak in the central Pacific region, at 1,200-1,600 m elevation (Figure 3). This region apparently corresponds to the Lower Montane Rain Forest Life Zone of the Holdridge system (*cf.* Tosi 1969). The three flowering collections of *T. floribundum* are from December, January, and March.

The specific epithet of *Tetranema floribundum* reflects the fact that it has more flowers (ca. 14-30) per inflorescence, on average, than any other known *Tetranema* species (*T. roseum* may have as many as 20). It differs additionally from *T. gamboanum* and *T. megaphyllum*, the only other species with red, tubular corollas, in having the corolla tube internally pubescent along the ventral surface. The corollar pubescence of the sole Atlantic slope collection of *T. gamboanum*, discussed previously, does not extend into the tube. *Tetranema floribundum* is further distinguished from *T. gamboanum* in having (as *T. megaphyllum*) merely acute to short-acuminate (rather than long-acuminate) leaf apices and smaller corollas, and from *T. megaphyllum* in having (as *T. gamboanum*) longer stems and generally larger corollas with relatively and absolutely much longer, spreading-reflexed lobes.

It may seem unusual that *Tetranema* populations on Cerro Turrubares, in the central Pacific region of Costa Rica, should differ specifically from populations in the southern Pacific region, while the latter populations should be conspecific with material from the Atlantic slope (as discussed under *T. gamboanum*). Cerro Turrubares, however, is relatively high and quite isolated, and is known to harbor other endemic plant species (*cf.* Burger & Jiménez 1994). *Tetranema floribundum* occurs at slightly higher elevations and, ostensibly, in a different life zone than *T. gamboanum*.

Tetranema floribundum should presently be considered an endangered species, since it is known from just a few populations in a site that has already been seriously degraded by human activity. Two of the three collections were made within a protected area (Zona Protectora Cerro de Turrubares), but from a region dominated by pastures.

Both of the new Costa Rican *Tetranema* species described herein will come out to *T. megaphyllum* in the key of Méndez-Larios & Villaseñor (1995). The distinguishing characteristics of these three species may be summarized as follows:

1. Corolla lobes ca. 2-4 mm long, < 1/5 the total corolla length, apparently directed forward; floral bracts ca. 6-10 mm long; stems ca. 0.25-0.40 m tall; leaf apex acute to short-acuminate; inflorescence 3-10-flowered; corolla ca. 2.5-3.6 cm long, glabrous throughout; Chiapas. *T. megaphyllum*.
- 1' Corolla lobes ca. 11-13 mm long, > 1/5 the total corolla length, spreading-reflexed; floral bracts 0.5-5.0 mm long; stems (0.35-)0.80-2.00 m tall; Costa Rica. (2)
2. Inflorescence many- (14-30-) flowered, the peduncle purple; corolla 2.6-3.5 cm long, pubescent within in a band of flat, yellow hairs along the entire ventral surface and onto the lower lobe; leaf apex rounded to short-acuminate; Cerro Turrubares. *T. floribundum*

- 2' Inflorescence few- (2-12-) flowered, the peduncle green; corolla ca. 4.9-5.5 cm long, glabrous throughout or (rarely) pubescent on lower lobe and at mouth; leaf apex long-acuminate; Fila Costeña and Atlantic slope of Cordillera de Talamanca. *T. gamboanum*

The recent discovery of *Tetranema* in Costa Rica is surprising, especially since both species comprise shrubby, understory plants with large, vividly scarlet corollas. Though the distribution of the genus in Costa Rica appears spotty, *T. gamboanum*, at least, may be locally abundant. At the Tinamastes site, a sizeable population occurs right at the roadside along a moderately well-botanized route (San Isidro de El General to Dominical).

It is likely that earlier Costa Rican collections of *Tetranema*, not seen by us, will yet be discovered filed as undetermined, or misdetermined, in some of the many scattered herbaria housing Costa Rican material. As in the case of *Ticodendron* (Ticodendraceae), another conspicuous Central American plant described only recently, the belated recognition of *Tetranema* in Costa Rica is "perhaps explainable by the fact that although it looks very much like something well known [e.g., an Acanthaceae, *Scutellaria*, or *Russelia*], it really is something different" (Hammel & Burger 1991: 92).

ACKNOWLEDGMENTS

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LITERATURE CITED

- Beaufort-Murphy, H.T. 1983. The seed surface morphology of the Gesneriaceae utilizing the scanning electron microscope and a new system for diagnosing seed morphology. *Selbyana* 6:220-422.
- Brandegge, T.S. 1914. *Plantae mexicanae purpusianae*, VI. Univ. Calif. Publ. Bot. 6:51-77.
- Burger, W. & Q. Jiménez. 1994. A new species of *Psychotria* subgenus *Psychotria* (Rubiaceae) from Costa Rica. *Novon* 4:206-208.
- Daniel, T.F. & D.E. Breedlove. 1992. A new species of *Uroskimmera* (Scrophulariaceae) from southern Mexico. *Madroño* 39:131-136.

- Hammel, B. & W.C. Burger. 1991. Neither oak nor alder, but nearly: the history of Tico dendraceae. *Ann. Missouri Bot. Gard.* 78:89-95.
- Méndez-Larios, I. & J.L. Villaseñor. 1995. Revisión taxonómica del género *Tetranema* (Scrophulariaceae). *Acta Bot. Mex.* 32:53-68.
- Morrison, P. 1981. *Tetranema roseum* (Mexican Foxglove) formerly *Allophyton mexicanum*. *Light Gard.* 18:180-181.
- Pennell, F.W. 1925. The genus *Allophyton* of southern Mexico and Guatemala. *Proc. Acad. Nat. Sci. Philadelphia* 77:269-272.
- Standley, P.C. & L.O. Williams. 1973. Scrophulariaceae. In, P.C. Standley, L.O. Williams, & D.N. Gibson (editors), *Flora of Guatemala*. *Fieldiana, Bot.* 24(9):319-416.
- Thieret, J.W. 1954. The tribes and genera of Central American Scrophulariaceae. *Ceiba* 4:164-184.
- Tosi, J.A., Jr. 1969. *Mapa ecológico, República de Costa Rica: Según la clasificación de zonas de vida del mundo de L. R. Holdridge*. San José, Costa Rica: Centro Científico Tropical.

KEY TO THE AMERICAN GENERA OF ASTERINAE (ASTERACEAE)

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ABSTRACT

An artificial key is provided for identification of *Aster* sensu stricto and the fourteen genera that have been recently proposed to encompass the ca. 180 New World species segregated from *Aster*: *Almutaster*, *Ampelaster*, *Canadanthus*, *Chloracantha*, *Doellingeria*, *Eucephalus*, *Eurybia*, *Ionactis*, *Oclemena*, *Oreostemma*, *Psilactis*, *Sericocarpus*, *Symphyotrichum*, and *Tonestus*. *Aster* sensu stricto is represented by only a single species native to the New World, *A. alpinus*. Also included in the key are *Aster tataricus*, naturalized in eastern North America, and the distinct genus *Boltonia*, which is often associated with a group of Old World *Aster*.

KEY WORDS: *Aster*, Asteraceae, Asterinae, New World, systematics

In a systematic review of the genus *Aster* as it has been broadly conceived in recent treatments, it was proposed that the ca. 180 American species of this alliance be divided among a number of segregates (Nesom 1994). In this view, only a single species of *Aster* sensu stricto occurs natively outside of the Old World: *A. alpinus* grows in northern Eurasia and across Beringia into Alaska and southward along the Rocky Mountain cordillera as far as Colorado. *Aster tataricus*, which is native to northeast Asia, is naturalized in the eastern United States; as noted in the review, this species probably should be placed in a genus separate from *Aster* sensu stricto. Only *Doellingeria* among the American segregate genera also has species in the Old World.

Several of the genera included here (particularly *Tonestus*, *Ionactis*, *Boltonia*, and *Chloracantha*) are ambiguous in their relative positions among other potentially related genera (Nesom 1994). *Tonestus kingii* is the only species of that genus that has been treated within *Aster*, and *Tonestus* may be more closely related to the Solidagininae than to genera it is associated with among segregates of *Aster*. *Ionactis* has been hypothesized to be related to *Eucephalus* and to the goldenasters, but it differs from both in a number of critical morphological features. *Boltonia* is isolated among American genera associated with *Aster*; it has long been considered to be closely related to the Asian genus *Kalimeris* (an *Aster* segregate), but morphological features

in the key below suggest that it may be closer to the South American subtribe *Brachycominae*. *Chloracantha* also appears to be phyletically isolated although it is similar to *Boltonia* in some features, particularly habit. Other North American species previously treated within *Aster* have recently been repositioned in *Erigeron* and *Machaeranthera*, and several South American species of *Aster sensu lato* have recently been dispersed among phyletically diverse genera.

The recognition of the genera segregated from *Aster* apportions the morphological variation into reasonably discrete entities, but apparent parallelisms create practical difficulties in the definition of some genera. The generic placement of certain species (particularly within *Eurybia*) will be problematic because of distinctive morphological specializations. These problems are discussed in detail elsewhere (Nesom 1994) and reflected in the artificial key provided here. In any case, the key should serve at least as a starting point for those who elect to use this taxonomic system or something similar to it. Construction of keys and the identification of genera and species groups will be considerably easier on a regional basis, just as it has been for *Aster sensu lato*. Detailed descriptions of these genera, species groups, and problematic species are found in the *Aster* review (Nesom 1994), as are authorities for all names used in the present report.

In previous keys and discussions, I have used the terms "ligule" and "achene" in reference to the expanded portion of the pistillate corollas and the fruit of *Astereae*. Those terms are replaced here by "lamina" and "cypsela," in acknowledgment of their more technical correctness and their ineluctable fate in forthcoming application.

KEY TO THE AMERICAN GENERA OF ASTERINAE

1. Cypselas strongly flattened with lateral wings; pappus of two lateral awns (or thickened bristles) and a series of short, highly reduced, awns or scales; disc corollas with tube 0.2-0.5 mm long and abruptly expanded into the limb, the veins accompanied by orange resin ducts. *Boltonia*
1. Cypselas flat to terete, without wings; pappus of barbellate bristles disc corollas with a longer tube, abruptly or gradually opening into the limb, the veins without orange resin ducts (except in *Chloracantha*). (2)
 2. Stems suffrutescent, usually sparsely to densely thorny, sometimes unarmed in var. *spinosa*; leaves deciduous by anthesis; heads terminal on wiry, green stems, arranged in a diffuse capitulescence; resting axillary buds with bud scales. *Chloracantha*
 2. Stems usually herbaceous, suffrutescent in a few species, never thorny; at least the cauline leaves persistent and present at flowering (the stems of *Oreostemma* scapose); heads variously arranged but not on wiry green stems in a diffuse capitulescence; resting buds not formed. (3)
3. Plants arising from long or short rhizomes and fibrous roots, not strongly woody at the base. (9)
3. Plants arising from a distinct taproot or thick, woody, mostly erect caudex branches. (4)

4. Plants perennial, usually arising from a thick taproot or thick caudex branches. (7)
4. Plants annual, usually arising from a slender taproot. (5)
5. Heads and upper stems stipitate-glandular; ray cypselas epappose. *Psilactis*, in part
5. Plants completely eglandular; ray cypselas pappose (*Symphyotrichum*, in part). (6)
6. Phyllaries evenly herbaceous and of subequal length; pistillate flowers in 2-4 series in a broad outer zone, the lamina absent or rudimentary to filiform and short; disc (staminate) flowers fewer than the pistillate; pappus bristles in 2 series, all of equal length. *Symphyotrichum* sect. *Conyzopsis*
6. Phyllaries with a green, rhombic apical patch, basally indurate, graduated in length (imbricate); pistillate flowers in 1(-2) series, the lamina prominent or strongly reduced; disc flowers more numerous than the ray; pappus bristles of equal length and in a single series. *Symphyotrichum* sect. *Oxytripolium*, in part
7. Stems scapose, eglandular or minutely granular-glandular near the apex; heads solitary; plants arising from a thick taproot or sometimes a short rhizome. *Oreostemma*
7. Stems with well-developed cauline leaves, eglandular or densely glandular; heads solitary or few and loosely associated in a corymbiform capitulescence; plants arising from a thick taproot or thick, woody caudex branches. (8)
8. Stems and leaves eglandular or with short-stipitate glands; leaves 1-nerved, congested on the stems; phyllaries stiff, evidently indurate-thickened, distinctly keeled; rays mostly blue to purple; disc cypselas commonly 2-nerved, ray cypselas usually 3-4 nerved; carpodium oblique; pappus with an outer series of bristles much shorter than the inner. *Ionactis*
8. Stems and leaves usually with long-stipitate glands (eglandular in some species); leaves with at least the secondary veins evident, not crowded on the stems; outer phyllaries loose, foliaceous; rays yellow, white, or absent; cypselas mostly 5-8-nerved; carpodium a symmetrical ring at right angles to the long axis of the cypselas; pappus of (1-)2 series of bristles of equal length, rarely with a shorter outer series. *Tonestus*
9. Phyllaries without a green apical patch. (14)
9. Phyllaries with a distinct, green apical patch or zone, the lower portion of the phyllary indurate. (10)
10. Capitulescence diffuse or the heads terminally clustered but not in a distinctly corymboid association; apical patch of phyllaries rhombic, sharply delimited at the base and basally acute or attenuate, basally truncate in some species; pappus bristles apically attenuate, in a single series. (12)
10. Capitulescence corymboid or reduced to glomerate clusters; apical patch of phyllaries basally truncate, sometimes not sharply delimited; pappus bristles apically dilated, in (1-)2-3 series of equal or subequal length. (11)
11. Heads pedicellate, mostly distinct (subsessile in *Eurybia compacta*); leaves stipitate-glandular in a few species, otherwise eglandular; disc corollas yellowish; style branch appendages spreading hairy from base to tip (closely papillate in a few species); rays blue and strongly coiling, or white and non-coiling in sect. *Biotia*; cypselas narrowly cylindric, glabrous to moderately strigose. *Eurybia*
11. Heads sessile or subsessile in glomerate clusters; leaves sessile- or punctate-glandular; disc corollas white; style branch appendages closely papillate; rays white, not coiling; cypselas turbinate, strigose-sericeous. *Sericocarpus*

12. Ray cypselas epappose. *Psilactis*, in part
12. Ray cypselas pappose. (13)
13. Plants trailing or climbing (not twining) vines. *Ampelaster*
13. Plants mostly erect, sometimes leaning but never trailing or even subscandent.
..... *Symphyotrichum*, in part
14. Leaves all cauline, glabrous, linear with 3 parallel veins; pappus of a single
series of equal-length, apically attenuate bristles; involucre glandular.
..... *Almutaster*
14. Leaves various but not as above; pappus bristles in (1-)2-3 series of equal
length, apically dilated or attenuate; involucre glandular or eglandular. (15)
15. Plants monocephalous; phyllaries evenly herbaceous, in 2(-3) series of subequal
length; cypselas obovate, 2-nerved and flattened, usually sessile-glandular near the
apex; pappus often with an evident short, outer series. *Aster alpinus*
15. Plants with two or usually more heads, or if monocephalous then without the
above combination of features. (16)
16. Leaves neither clasping nor subclasping; phyllaries usually strongly graduated
in length, not foliaceous; stems, leaves, and phyllaries eglandular or sometimes
sessile-glandular but without stipitate glands. (18)
16. Leaves clasping or subclasping; phyllaries subequal in length, at least those of
the outer series foliaceous; stems, leaves, and phyllaries with stipitate glands. .
..... (17)
17. Outer phyllaries foliaceous, the inner usually with a green apical patch or zone;
basal leaves usually the largest, persistent; cypselas cylindric; pappus bristles
usually dilated at the apex. *Eurybia* sect. *Herrickia*
17. Outer phyllaries similar to the inner, herbaceous from base to apex; lowermost
cauline leaves greatly reduced in size (scale-like) and not persistent; cypselas
flattened; pappus bristles apically attenuate. *Canadanthus*
18. Phyllaries herbaceous, 1-nerved, with a green band along the midvein from
base to tip, often purple-margined; basal leaves the largest, persistent; cypselas
terete. *Aster tataricus*
18. Phyllaries usually somewhat indurate at least near the base, with 1 or more
nerves, never with a medial green band; lowermost cauline leaves greatly
reduced in size (scale-like); cypselas terete to flattened. (19)
19. Heads mostly solitary or sometimes few and in a loosely corymboid
capitulescence; leaves thickened and stiff, 1-nerved, congested on the stems
(internodes abbreviated); disc cypselas commonly 2-nerved, ray cypselas usually
3-4-nerved; carpopodium oblique. *Ionactis*
19. Heads in a distinctly corymboid capitulescence; leaves relatively thin and
flexuous, spaced along the stem with internodes prominent, venation with at least
the secondary nerves evident; all cypselas 4-9 nerved; carpopodium at right angles
to the long axis of the cypselas. (20)
20. Leaves usually sessile-glandular on the lower surface; collecting appendages
of the disc style branches spreading-hairy from base to tip; cypselas densely
sessile-glandular; pappus bristles apically attenuate or (in *Oclemena reticulata*)
slightly dilated at the apex. *Oclemena*
20. Leaves not sessile-glandular, rarely short-stipitate glandular; collecting
appendages of the disc style branches closely papillate at least in the distal
portion; cypselas eglandular; pappus bristles usually prominently dilated at the
apex. (21)

- 21. Cypselas terete or subterete, with (4-)5-9 evenly spaced, orange-resinous nerves, at maturity about the same length as the phyllaries; phyllaries oblong, not keeled, each with a midvein and 1-2 lateral pairs of nerves; eastern North America and southeastern Asia.*Doellingeria*
- 21. Cypselas distinctly flattened, with a pair of lateral nerves and sometimes 1-2 whitish, subepidermal nerves on each face, shorter than the phyllaries at maturity; phyllaries ovate to ovate-oblong, keeled, 1-nerved; western North America.*Eucephalus*

LITERATURE CITED

Nesom, G.L. 1994. Taxonomic overview of *Aster* sensu lato (Asteraceae: Astereae), emphasizing the New World species. *Phytologia* 77:141-297.

**TRIDAX YECORANA (ASTERACEAE, HELIANTHEAE) A NEW SPECIES
FROM SONORA, MEXICO**

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ABSTRACT

Tridax yecorana B.L. Turner, *spec. nov.*, is described and illustrated. It is an annual herb known only from type material collected near Yecora, Sonora, and is related to *T. erecta*. It differs from the latter in numerous characters which are discussed in the text.

KEY WORDS: Asteraceae, Heliantheae, *Tridax*, México, Sonora, systematics

Routine identification of Mexican Asteraceae has revealed the following novelty.

TRIDAX YECORANA B.L. Turner, *spec. nov.*, Figure 1. TYPE: MEXICO. Sonora: Arroyo El Otro Lado, Mesa El Otro Lado, 1-2 km NNE of Yecora on old road to Maycoba, pine-oak forest, 28° 23' 49" N, 108° 54' 48" W, 1520 m, 7 Sep 1995, T.R. Van Devender 95-836 (with A.L. Reina G., D.A. Yetman, and M.E. Fishbein) (HOLOTYPE: TEX).

Similis *T. erectae* A. Gray sed foliis linearibus-lanceolatis (vice foliorum ovatorum), glaberis aut sparsim glanduliferis-pubescentibus (vice hispidissimorum), involucris campanulatis (vice urceolatorum) glaberisque (vice pubescentium), acheniis rigide pubescentibus (vice molliter pubescentium), et pappis 1-2 mm longis (vice 2.5-5.0 mm).

Annual herbs 7-20 cm high. Stems mostly unbranched, sparsely pubescent with glandular trichomes 0.5-1.0 mm long. Leaves linear-lanceolate, mostly 1-2 mm wide. Heads single on peduncles, 4-15 cm long, pubescent like the stems. Involucres campanulate, 4-6 mm high, 4-9 mm wide (pressed); bracts 3-4 seriate, broadly elliptical to oblanceolate, glabrous, the apices broadly rounded, scarious. Receptacles conical, 2-3 mm across, 2.0-2.5 mm high; bracts scarious, persistent, oblanceolate to linear-oblanceolate, variously 2-3 cleft at their apices. Ray florets pistillate, fertile;

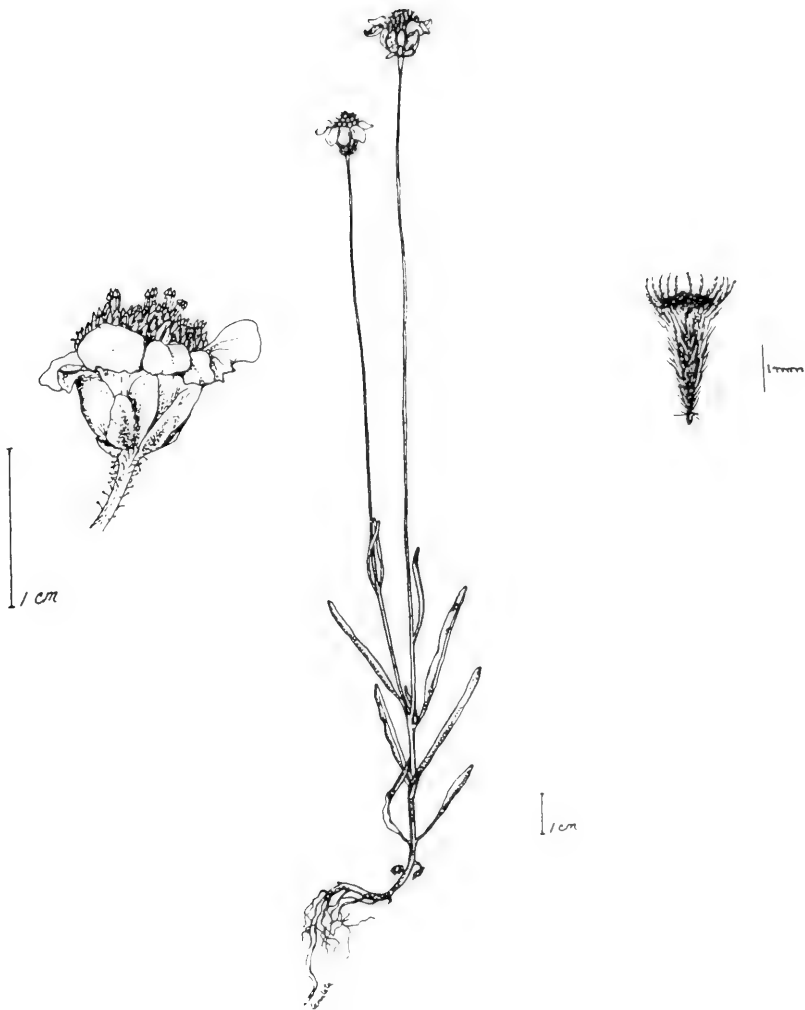


Figure 1. *Tridax yecorana*, from holotype; left, a single head; right, a disk achene.

corollas yellow; tube ca. 2 mm long, densely pilose; ligules mostly 4-5 mm long, 3-4 mm wide. Disk florets 10-25; corollas yellow, ca. 3 mm long, the tubes ca. 0.8 mm long, densely pilose; throat ca. 2 mm long, gradually amplate upwards, the 5 lobes markedly nervate. Anthers yellow, their apices trianguloid, keeled inwardly. Achenes of disk and ray florets similar, obpyramidal, ca. 2 mm long, 0.8 mm wide, densely pubescent with stiff ascending hairs 0.5-1.0 mm long; pappus of 20 or more short plumose scales 1-2 mm long.

Tridax yecorana, in habit, superficially resembles *T. coronopifolia* H.B.K. but is clearly most closely related to *T. erecta* A. Gray, differing from the latter in having linear, nearly glabrous leaves, campanulate completely glabrous involucre, ray florets with densely villous tubes, and achenes with stiffer hairs and shorter pappus scales.

Tridax erecta (including the recently described *T. durangensis* A. Garcia Arévalo, which appears to be but a form of that species) has ovate, coarsely pubescent leaves, involucre urceolate with loose outer bracts and coarsely pubescent inner bracts, and more softly pubescent achenes with longer pappus scales.

According to label data on the type sheet, *Tridax yecorana* is a "Locally very common annual."

ACKNOWLEDGMENTS

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**SALVIA BOOLEANA (LAMIACEAE), A NEW SPECIES FROM
NORTHEASTERN MEXICO**

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ABSTRACT

Salvia booleana B.L. Turner *spec. nov.*, is described and illustrated. It belongs to the sect. *Fulgentes*, a small group with about eight species, all having large red flowers (corollas mostly 3-5 cm long), where it relates to *S. fulgens* Cav. It is distinguished from the latter by numerous characters including habit, leaf shape, bract size, vestiture and distribution.

KEY WORDS: Lamiaceae, *Salvia*, sect. *Fulgentes*, México, Nuevo León, San Luis Potosí, systematics

Routine identification of Mexican plants has revealed the following novelty.

SALVIA BOOLEANA B.L. Turner, *spec. nov.* Figure 1. TYPE: MEXICO. San Luis Potosí: Mpio. Charcas, Charcas, "on wetbank of Arroyo", Jul-Aug 1934, C.L. Lundell 5470 (HOLOTYPE: LL!, Isotype: TEX!).

Similis *Salviae fulgenti* Cav. (*Salvia fulgens*) sed differt laminis foliorum subdeltatis, basibus foliorum plerumque cordatis, et caulibus valde glandulosis-pubescentibus, indumento 0.6-1.0 mm alto.

Perennial herbs 60-100 cm high. Stems densely glandular-hirsute, the vestiture 0.6-1.0 mm high. Midstem leaves 4-7 cm long, 2.5-4.0 cm wide; petioles 1.5-3.0 cm long; blades cordate-deltoid to subdeltoid, about as wide as long, mostly subcordate at base, pubescent like the stems, margins crenulodentate, the apices mostly obtuse. Floral bracts ovate, soon deciduous, the upper immature bracts 8-10 mm long, 2-4 mm wide, the apices gradually acuminate. Flowers (2-)4-6 to a node. Calyces mostly 11-15 mm long, glandular-pubescent; upper lobes 3-4 mm long, 9-ribbed. Corollas red to orangish-red, 3.0-4.2 cm long; upper lips 12-15 mm long; lower lips 10-12 mm long. Stamens attached near the orifice, the anthers mostly loosely exerted somewhat beyond the upper lip, rarely not, ca. 2 mm long, attached near the base (1/4 the anthers' length). Styles pubescent, the upper branches 2-3 times as long as the lower. Nutlets linear-ovoid, ca. 4 mm long, 1.5 mm wide, veinous, glabrous.



ADDITIONAL SPECIMENS EXAMINED: MEXICO. Nuevo León: Mpio. Aramberri, N of Aramberri, 995 m, 16 Jun 1990, *Hinton et al.* 20340 (TEX); N of Aramberri, 970 m, 1 Sep 1990, *Hinton et al.* 25019 (TEX); Sierra Vieja, 12.2 mi along dirt road turnoff to Ejido Capadero, just N of Dr. Arroyo, 6900 ft., "In dry stream bed", 20 Oct 1984, *Saunders-Scherrer* 13476 (TEX).

Salvia booleana belongs to the sect. *Fulgentes* of *Salvia*, sensu Epling (1939). The nomenclatural history of this section is discussed in some detail by Ramamoorthy (1987), but no recent taxonomic study of the taxon is available, in spite of its array of attractive large red-flowered species.

Epling (1939) recognized (and keyed) six species as occurring in the section, adding an additional species with the description of *Salvia sharpii* Epling & Mathias in 1957, which is probably a weakly differentiated populational element of *S. microphylla* H.B.K. The present addition brings this total to eight, and additional species are certain to follow as Mexico becomes more thoroughly collected.

Type material of *Salvia booleana* was apparently included by Epling (1939) in his concept of *S. fulgens*, but with the comment, "Lundell's specimen from Charcas, while similar in flowers to the southern forms is markedly glandular with short-deltoid leaves." Which is certainly true; indeed, all of the specimens cited above possess such leaves and, combined with their relatively small calyces and much-reduced floral bracts, mark the plants concerned as very distinctive, certainly deserving of specific rank as morphologically defined by Epling and yet others.

Salvia booleana reportedly occurs along dry washes in relative xeric habitats from 800 to 2000 m; *S. fulgens* is a taller plant with much larger leaves occurring in mostly moist montane habitats above 2000 m (distributed from southern San Luis Potosí southwards to the states of Puebla and Morelos).

It is a pleasure to name this taxon for George Boole Hinton (great grandson of the late renown Mexican collector, George Boole Hinton), frequent companion on field forays with Jaime and Jorge Hinton, son and grandson, respectively of the primal sire, G.B. Hinton. A photograph of this young Hinton can be found in Turner (1996). My principal reason for selection of the epithet concerned is to establish a familial record of sorts: five names from a male lineage representing four generations, all included in the same genus. These include:

1. *Salvia hintonii* Epling - named for G.B. Hinton, the father.
2. *Salvia jacobii* Epling - for James Hinton, the son (pers. comm., James Hinton)
3. *Salvia jaimehintoniana* Ramamoorthy - honoring James Hinton, the son.
4. *Salvia jorgehintoniana* Ramamoorthy - honoring George Hinton, the grandson.
5. *Salvia booleana* B.L. Turner - honoring George Boole Hinton, the great grandson.

And this does not include *Salvia leninae* Epling, named for a remarkable pack animal of the Hinton's, a mule named Lenina. *Salvia*, with 500 or more species, can comfortably ingest such effrontery. What I like about the eponyms concerned is that most of the species (all except *S. jacobii* and *S. hintonii*) occur in the state of Nuevo León, and the surviving kin of G.B. Hinton, all residing in Nuevo León on their

Rancho Aguililla, are now surrounded by floristic "headstones" that will extend far beyond their natural lives. I like that kind of perpetuity for such dedicated workers!

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Piero Delprete for reviewing the manuscript.

LITERATURE CITED

- Epling, C. 1939. A revision of *Salvia*, subgenus *Calosphace*, Fedde Repert. Sp. Nov. Beih. 110:1-388.
Ramamoorthy, T.P. 1987. Typifications in *Salvia* (Lamiaceae). Taxon 33:322-324.
Turner, B.L. 1996. *Sedum booleanium* (Crassulaceae), a new red-flowered species from Nuevo León, México. Phytologia 79:31-34.

A NEW SPECIES OF *LOBELIA* (CAMPANULACEAE) FROM OAXACA,
MEXICO

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ABSTRACT

Lobelia hintoniorum B.L. Turner, *spec. nov.* from Distrito Miahuatlán, Oaxaca, is described and illustrated. It belongs to the sect. *Hemipogon*, subsect. *Leiospermae*, where it relates to *L. occidentalis* McVaugh. It differs from the latter in possessing very large dark blue corollas and nonhispidulous anthers.

KEY WORDS: Campanulaceae, *Lobelia*, México, Oaxaca, systematics

Routine identification of Mexican lobelioids has revealed the following novelty.

LOBELIA HINTONIORUM B.L. Turner, *spec. nov.* Figure 1. TYPE: MEXICO. Oaxaca: Distrito Miahuatlán, S side of Cerro Quiexobra, 1-3 km NE of La Cieneguilla on road to summit, in damp ravines below understory of pine-oak forests, 2900 m, 2 Oct 1990, *Andrew McDonald* 2982 (HOLOTYPE: TEX).

Similis *L. occidentali* McVaugh & Huft sed foliis midcaulis majoribus, ([6-]12-15 cm longis vice 4-10 cm longis), pedunculis valde majoribus (5-6 cm longis vice 2.5-4.0 cm longis), tubis corollarum longioribus (12-15 mm longis vice 7-9 mm longis), et sacculis superis antherarum glabris (vice sacculorum hispidorum).

Weakly ascending or procumbent herbs to 60 cm high arising from slender rhizomes, forming colonies. Midstems 1-3 mm across, glabrous. Midstem leaves glabrous, mostly linear to linear-lanceolate, gradually reduced upwards, (5-)6-15 cm long, 0.3-0.7 cm wide, remotely denticulate. Inflorescence of (2-)5-25 flowers, when numerous the latter disposed in a secund fashion. Bracts linear, mostly 1/2 as long as the pedicels, or more. Pedicels of mature flowers mostly upwardly arcuate, 2-6 cm long. Ovary ca. 1/3 to 1/2 inferior, the calyx cup ca. 2 mm high, glabrous, the lobes



Figure 1. *Lobelia hintoniorum*, from holotype.

linear-lanceolate, 4-6 mm long, reflexing with age. Corollas dark blue, the tubes 12-16 mm long, not fenestrate, the dorsal slit 9-11 mm deep; upper two lobes linear-lanceolate, 6-8 mm long; lower 3 lobes neatly elliptical, 7-10 mm long, 2.5-4.0 mm wide. Filaments ca. 10 mm long, united for ca. 4 mm apically; anthers 3-4 mm long, the lower 2 tufted, otherwise glabrous. Fruits not available.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Oaxaca: Distrito Miahuatlán, Quiexobra, 2920 m, 14 Oct 1995, *Hinton et al.* 26104 (TEX); Siete Ocotes, 2950 m, 20 Oct 1995, *Hinton et al.* 26256 (TEX); Siete Ocotes, 2880 m, *Hinton et al.* 26265 (TEX).

Lobelia hintoniorum clearly belongs to the sect. *Hemipogon* subsect. *Leiospermae* (sensu Wimmer 1953) where it relates to *L. occidentalis* McVaugh and *L. dielsiana* Wimmer. McVaugh (1975) provided a detailed key to both of these taxa. In this, *L. hintoniorum*, because of its very large corollas, will key to *L. sublibera* S. Wats., a very distinctive species confined to northeastern México (Nuevo León and Tamaulipas). *Lobelia hintoniorum* has the habit, leaves, and general inflorescence of *L. occidentalis*, but differs in the characters called to the fore in my diagnosis.

It is a pleasure to name this taxon for the Hinton family, who collected three of the only four collections known to me. Label data on the Hinton material report the species to form scattered but common procumbent plants or colonies to 60 cm high. *Hinton 26104* is a depauperate plant with relatively small leaves, but its flowers are typical of the taxon concerned.

The type of *Lobelia hintoniorum* was obtained by Andrew McDonald in 1990 (from among whose many collections I named *Lobelia macdonaldii* B.L. Turner), but this collection remained unnamed awaiting additional material. The several Hinton specimens cited above leave little doubt that the taxon is quite distinct and undescribed.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Ted Delevoryas for reviewing the manuscript. Ms. Maria Thompson provided the illustration.

LITERATURE CITED

- McVaugh, M. & M.J. Huft. 1975. Rediscovery of *Lobelia dielsiana* Wimmer, and a related species new to science. *Contr. Univ. Mich. Herb.* 11:65-68.
Turner, B.L. 1992. A new species of *Lobelia* (Campanulaceae) from Oaxaca, México. *Phytologia* 72:34-36.
Wimmer, F.E. 1953. *Lobelia*, in *Pflanzenreich* IV. 276b (Heft 107): 408-695.

A NEW SPECIES OF *VERBESINA* (ASTERACEAE) FROM OAXACA, MEXICO

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ABSTRACT

Verbesina miahuatlana B.L. Turner *spec. nov.*, is described and illustrated from Distrito Miahuatlán, Oaxaca. It is known only from two collections, both obtained in pine-oak forests between 2700-2825 m. It belongs to the *Verbesina virgata* complex (ca. eight species) but can be distinguished from all of these by its much larger coarsely serrate leaves and loosely corymbose paniculate capitulescence.

KEY WORDS: Asteraceae, *Verbesina*, México, Oaxaca, systematics

Routine identification of Mexican Asteraceae has revealed the following novelty.

VERBESINA MIAHUATLANA B.L. Turner, *spec. nov.* TYPE: MEXICO. Oaxaca: Distrito Miahuatlán, Xianaguilla, 2700 m, oak and pine forests, 21 Oct 1995, *Hinton et al.* 26294 (HOLOTYPE: TEX).

Similis *V. virgatae* sed foliis latioribus (3-9 cm latis vice 1.5-2.5 cm latis), cum marginibus valde serratis, et capitulis parvioribus, dispositis in paniculis rotundatis et corymbosis, pedunculis ultimis gracilibus et flexuosis (vice crassorum et rigide erectorum).

Shrub to 2.5 m high. Stems sparsely strigose, narrowly corky winged for 1-3 cm below each node. Larger leaves alternate, 9-24 cm long, 3-8 cm wide; petioles 5-20 mm long; blades pinnately nervate, broadly ovate to elliptic, gradually tapering upon the petioles, sparsely strigose above and below, especially along the major veins, the margins irregularly serrate. Heads numerous, arranged in terminal corymbose panicles, scarcely exceeding the leaves, the ultimate peduncles mostly 5-15 mm long. Involucres broadly campanulate, 4-5 mm high, 6-8 mm wide (pressed); bracts 2-4 seriate, narrowly ovate, subgraduate, black, the apices acute. Receptacle ca. 2 mm across, 1 mm high, the chaff shorter than the subtended florets, their apices abruptly acute. Ray florets 5-8, pistillate fertile; ligules yellow, 6-9 mm long, 2-3 mm wide, 4-6 nervate, their apices with 2-3 shallow lobes; tubes ca. 1.5 mm long, pubescent.

Disk florets 30-40 (est.); corollas yellow, ca. 3 mm long, the tube ca. 0.75 mm long, pubescent; lobes glabrous, ca. 0.7 mm long. Anthers brown. Achenes ca. 2 mm long, the faces sparsely strigose, the margins ciliate; pappus of 2 subequal persistent awns ca. 2 mm long.

ADDITIONAL SPECIMEN EXAMINED: MEXICO. Oaxaca. Distrito Miahuatlán, Siete Ocotes to Xianaguilla, 2825 m, 21 Oct 1995, *Hinton et al.* 26277 (TEX).

The present novelty is closely related to a group of species centering about the widespread *Verbesina virgata*. The distribution of this complex is shown in more detail by Turner (1992). *Verbesina miahuatlana* differs from these in possessing broader leaves, more numerous heads arranged in rounded corymbose panicles, and having black, broadly campanulate involucre, among yet other characters.

The holotype represents a lush collection with very large leaves, while the additional collection has much smaller, less serrate leaves, but in all other characters the two plants are alike and unquestionably belong to the same species.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Justin Williams for reviewing the paper.

LITERATURE CITED

- Turner, B.L. 1992. Two new species of *Verbesina* (Asteraceae) from southern México. *Phytologia* 72:109-114.

A NEW SPECIES OF *MENTZELIA* (LOASACEAE) FROM NUEVO LEON,
MEXICO

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ABSTRACT

Mentzelia hintoniorum B.L. Turner & Hempel, *spec. nov.*, is described and illustrated. It is known only from gypseous soils near San Roberto, Mpio. Galeana, Nuevo León. The taxon belongs to the sect. *Bartonia* and is seemingly most closely related to *M. mexicana* but is distinguished from that species by numerous features including habit, vestiture, and flower size.

KEY WORDS: Loasaceae, *Mentzelia*, México, Nuevo León, systematics

Routine identification of Mexican plants has revealed the following novelty.

MENTZELIA HINTONIORUM B.L. Turner & Hempel, *spec. nov.* Figure 1.
TYPE: MEXICO. Nuevo León: Mpio. Galeana, San Roberto to "Y," (24° 41' 55" N, 100° 10' 34" W) 2015 m, gypsum hillside, 5 Sep 1995, *Hinton et al.* 25495 (HOLOTYPE: TEX).

Similis *M. mexicanae* M.J. Thompson et Zavort. sed caulibus rectis, non ramosis infra, em corona radicum lignearum exorientibus, et floribus majoribus, petalis plerumque 20-22 mm longis (vice 10-15 mm longis), staminibus exterioribus ca. 13 mm longis (vice ca. 9 mm longis).

Simple-stemmed (or sparsely branched following injury) perennial herbs ca. 30 cm high, arising from the crown of woody roots. Stems straight, not at all fractiflex, ca. 3 mm across at midstem, moderately pubescent with stiff, multiseptate, glochidiate hairs, forming a vestiture ca. 0.5 mm high. Leaves linear-oblongate, not clearly petiolate, gradually reduced upwards, those at midstem mostly 3-4 cm long, 4-7 mm wide, pubescent like the stems, but sparsely so, and the surfaces mostly glabrous, the margins with 3-7 shallow lobes. Flowers 1-3, terminal. Calyx cup at anthesis 3-5 mm high; lobes lanceolate, ca. 12 mm long, 2.5 mm wide at base, fused below for

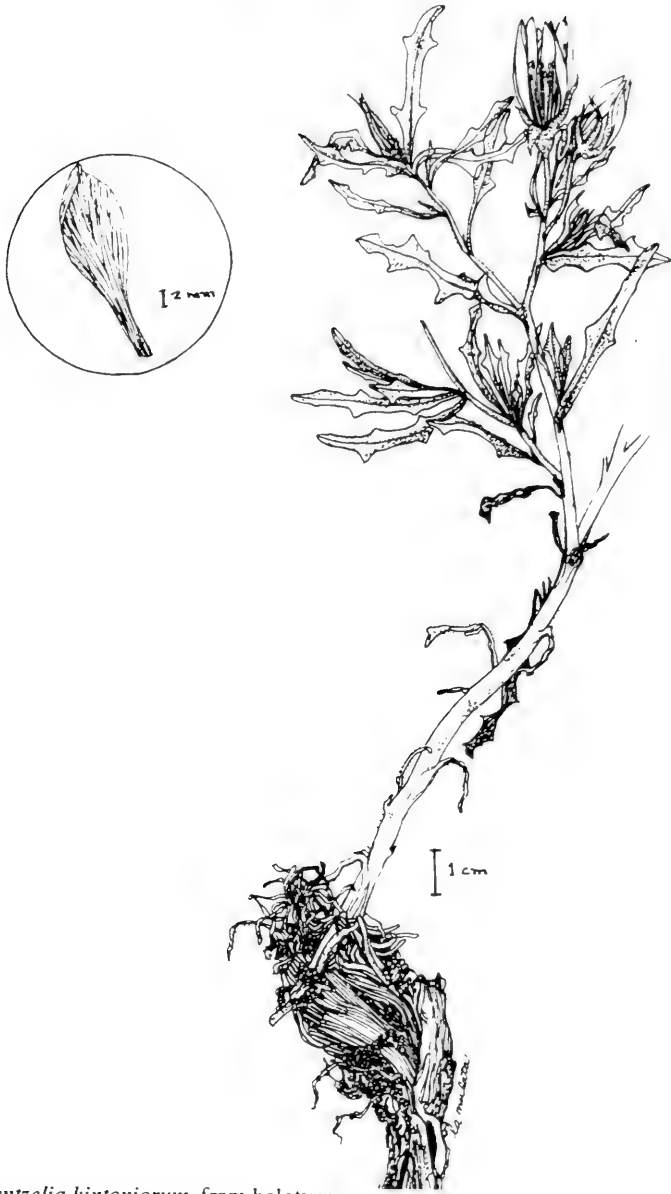


Figure 1. *Mentzelia hintoniorum*, from holotype

1.5-2.0 mm, pubescent like the stems. Petals 10, yellow, 20-22 mm long, ca. 5 mm wide, gradually tapered from above into a narrow claw ca. 8 mm long. Stamens numerous, 10-13 mm long, the outermost anthers borne on narrow filaments. Capsules 20-25 mm long, 8-10 mm wide (pressed); lobes 4-6 mm long. Seeds white, smooth, 2.5-3.0 mm long, ca. 2 mm wide; wings ca. 0.5 mm wide.

Mentzelia hintoniorum is closely related to *M. mexicana* Thompson & Zabort. of the sect. *Bartonia* (cf. Thompson & Powell 1981). It is readily distinguished from *M. mexicana* by its unbranched straight stems which arise from the crown of woody tap roots (vs. much-branched stems from tough but scarcely woody tap roots), more prominent stem-hairs, the vestiture ca. 0.5 mm high, lacking an understory of minute hairs (vs. vestiture ca. 0.25 mm high and minutely pubescent beneath), and much larger petals (20-22 mm long vs. 10-15 mm long).

Thompson & Powell (1981) provided a detailed account of *Mentzelia mexicana* and closely related taxa, mapping the distribution of each taxon. None of these was shown to occur in Nuevo León. *Mentzelia hintoniorum* occurs in a region of Nuevo León (near San Roberto) where numerous gypseous endemics occur, the present apparently being yet another.

It is a pleasure to honor the remarkable Hinton clan with this rare novelty, the collectors noting the taxon to be represented by only "a few plants." at the locality concerned, which is very near the type locality of the localized *Arenaria hintoniorum* B.L. Turner.

ACKNOWLEDGMENTS

We are grateful to Gayle Turner for the Latin diagnosis, and to her and Ted Delevoryas for reviewing the paper. Maria Thompson provided the illustration.

LITERATURE CITED

- Thompson, H.J. & A.M. Powell. 1981. Loasaceae of the Chihuahuan Desert Region. *Phytologia* 49:16-32.

A NEW SPECIES OF *STEVIA* (ASTERACEAE) FROM CERRO QUIEXOBRA,
OAXACA, MEXICO

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ABSTRACT

Stevia quiexobra B.L. Turner, *spec. nov.* is described from Cerro Quiexobra, Oaxaca, México, where it occurs in pine-fir forests at ca. 3400 m.

KEY WORDS: Asteraceae, *Stevia*, México, Oaxaca, systematics

Stevia is represented in México by numerous species, most of these treated by Grashoff (1972). Since the latter's treatment, numerous additional species have been added, the most recent being those of Turner (1995) and Yahara & Soejima (1995). I add here a newly discovered taxon from Cerro Quiexobra, Oaxaca.

STEVIA QUIEXOBRA B.L. Turner *spec. nov.* TYPE: MEXICO. Oaxaca: Distrito Miahuatlán, Cerro Quiexobra, 3385 m, "steep fir and pine woods", 15 Oct 1995, *Hinton et al.* 26141 (TEX).

Similis *S. perfoliatae* Cronq. sed foliis non perfoliatis et achenibus exaristatis.

Perennial rhizomatous herbs 20-30 cm high. Stems with a dense vestiture of glandular-capitate trichomes about 0.5 m high. Leaves mostly opposite (except for 3-5 uppermost leaves), gradually reduced upwards. Midstem leaves ovate to ovate-elliptic, sessile or nearly so, widest at or about the middle, 3-4 cm long, 1.0-1.8 cm wide, with 3 principal nerves arising from above the base, glandular-punctate on both surfaces, glandular pubescent like the stems, the margins weakly crenate. Heads arranged in bracteate congested glomerules ca. 1.5 cm high, 1.5 cm across. Subtending bracts glandular pubescent, similar to the involucre bracts. Involucres ca. 7 mm high, sparsely glandular pubescent to glabrous. Corolla tubes ca. 5 mm long, sparsely pubescent; lobes 1.5-2.0 mm long, sparsely pubescent on the outer surfaces. Achenes (immature) all alike, ca. 4.5 mm long, glabrous except for a few hispid hairs near the apices; pappus a crown of short scales ca. 0.75 mm high.

This taxon is known only by the type; label data note it to occur as "thin colonies 0.3 m high." Because of its broad sessile glandular pubescent leaves, *S. quixobra* is readily distinguished from most other Mexican taxa. It is seemingly most closely related to *S. perfoliata* Cronq., but lacks the perfoliate leaves and aristate achenes of that species.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Ted Delevoryas for reviewing the paper.

LITERATURE CITED

- Grashoff, J.L. 1972. A systematic study of the North and Central American species of *Stevia*. Doctoral Dissertation. The University of Texas, Austin, Texas.
- Turner, B.L. 1995. *Stevia calzadana* (Asteraceae) a new species from Oaxaca, México. *Phytologia* 79:5-7.
- Yahara, T. & A. Soejima. 1995. A new species of *Stevia* from México. *Phytologia* 79:35-37.

**STELLARIA MIAHUATLANA (CARYOPHYLLACEAE), A NEW SPECIES
FROM OAXACA, MEXICO**

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ABSTRACT

Stellaria miahuatlana B.L. Turner, *spec. nov.*, is described from Distrito Miahuatlán, Oaxaca, México. It is closely related to *S. irazuensis* but differs in its 5-parted calyx, larger corollas and much larger leaves.

KEY WORDS: Caryophyllaceae, *Stellaria*, México, Oaxaca, systematics

Routine identification of Mexican plants has revealed the following novelty.

STELLARIA MIAHUATLANA B.L. Turner, *spec. nov.* Figure 1. TYPE: MEXICO. Oaxaca: Distrito Miahuatlán, above Xianaguilla, 2510 m, "mixed woods of oak, pine, arbutus...Common", 24 Oct 1995, *Hinton et al.* 26426 (TEX).

Similis *S. irazuensis* Donn. Sm. sed calycibus cum 5 lobis (vice 4), corollis majoribus, ca. 9 mm longis (vice 3-6 mm longis), et foliis majoribus cum laminis 30-40 mm latis (vice 10-20 mm).

Sprawling perennial (?) herbs to 0.4 m high. Younger stems mostly pilose; older stems glabrate and shiny, the internodes mostly 2-3 times as long as the leaves. Stipules absent. Midstem leaves (4-)5-6 cm long; petioles 1.0-2.5 cm long, pilose; blades cordate, 3.0-4.5 cm long, 3.0-3.5 cm wide, more or less glabrous on both surfaces, the margins and veins sparsely pilose. Flowers 5-10, mostly axillary in bracteate dichasial cymes, rarely solitary. Pedicels mostly 1.5-2.0 cm long, densely glandular-pilose. Sepals 5, ovate-lanceolate, 4-5 mm long, ca. 1.5 mm wide, sparsely pilose below, the margins white-scarious. Petals 5, white, ca. 9 mm long, deeply cleft for 4-5 mm, the lobes linear to linear-oblancoelate, weakly nervate, if at all. Stamens 10, ca. 4 mm long, the anthers white. Style branches 3, ca. 4 mm long, free to the base. Capsules (immature) ca. 4.5 mm long, the young seeds numerous and peripherally ornate with bulging cells.

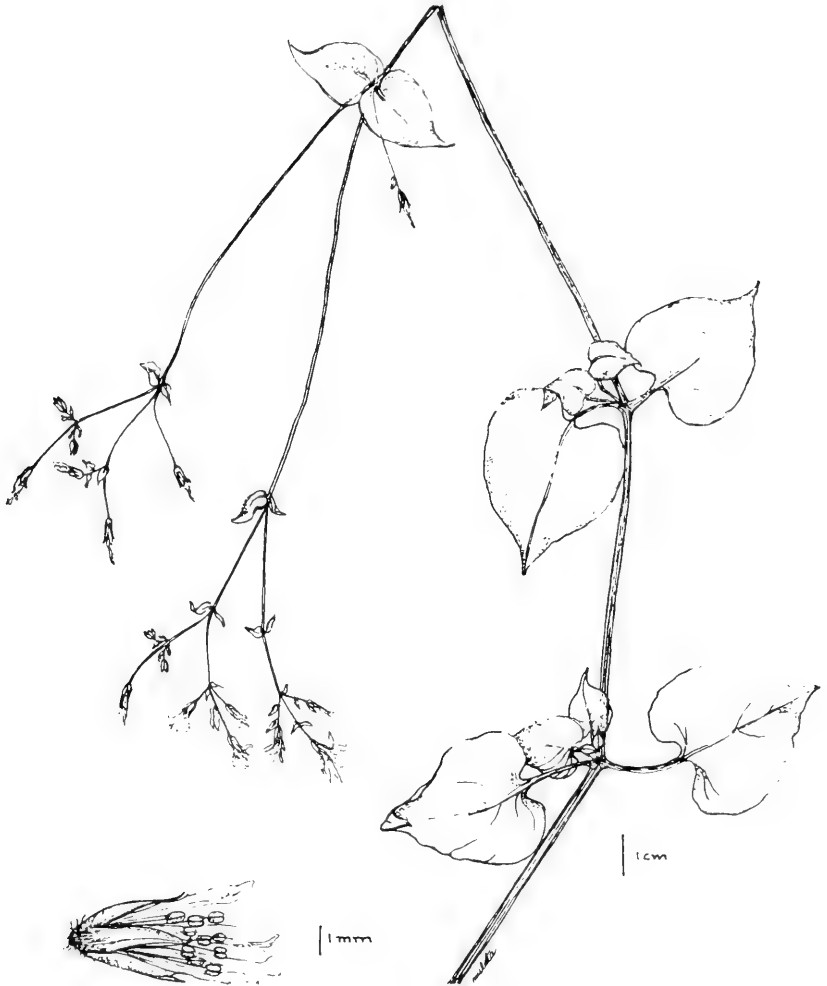


Figure 1. *Stellaria miahuatlana*, from holotype.

This taxon, because of its inflorescence, glandular-villous pedicels and markedly cordate leaves, appears to be closely related to *Stellaria irazuensis* Donn. Sm. a species of Central America (Guatemala to Panamá), nicely illustrated by Duke (1961) in his treatment of *Stellaria* for Panamá. *Stellaria miahuatlana* is readily distinguished from *S. irazuensis* in having larger more broadly cordate blades (30-35 mm wide vs. 5-15 mm wide) mostly 5 sepals (vs. 4 sepals), and larger petals.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Ted Delevoryas for reviewing the manuscript.

LITERATURE CITED

- Duke, J.A. 1961. *Stellaria*, in Flora of Panama. Ann. Missouri Bot. Gard. 48:438-442.

A NEW SPECIES OF *CYNOGLOSSUM* (BORAGINACEAE) FROM OAXACA, MEXICO

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ABSTRACT

Cynoglossum hintoniorum B.L. Turner, *spec. nov.*, is described and illustrated from high elevational regions on and about Cerro Quiexobra, Oaxaca. It is closely related to *C. amabile*, but differs markedly from that species in possessing mericarps with relatively few smooth elongate spines, otherwise they appear very similar.

KEY WORDS: Boraginaceae, *Cynoglossum*, México, Oaxaca, systematics

Identifications of collections from Cerro Quiexobra, Oaxaca, and immediate environs has revealed the following novelty.

CYNOGLOSSUM HINTONIORUM B.L. Turner, *spec. nov.* TYPE: MEXICO. Oaxaca: Distrito Miahuatlán, Cerro Quiexobra, 3145 m, 19 Oct 1995, *Hinton et al.* 26206 (HOLOTYPE: TEX).

Similis *C. amabili* Stapf & Drumm. sed mericarpis cum solum 10-15 spinis elongatis laevibusque (vice spinarum multarum, brevium, et muricatarum).

Erect perennial herbs 20-60 cm high, arising from stout ligneous taproots. Basal leaves mostly 10-18 cm long, 1.5-3.0 cm wide; petioles 3-6 cm long; blades narrowly elliptic, widest at or near the middle, pinnately veined, moderately pilose above and below, strigose along the major veins, the surfaces minutely atomiferous-glandular, the margins entire. Midstem leaves 5-10 cm long, 1-3 cm wide, the petioles winged throughout, tapered upon by the blades. Flowers terminal, arranged in scorpioid-racemic inflorescences 10-20 cm long, the pedicels 2-5 mm long, recurved in fruit. Sepals ovate-lanceolate, ca. 3 mm long, strigose externally, free to the base or nearly so. Corollas blue, 8-10 mm across, the throat nearly closed by hispidulous bilobate appendages. Stamens 5, nearly sessile, the anthers ca. 1 mm long, not excurrent.

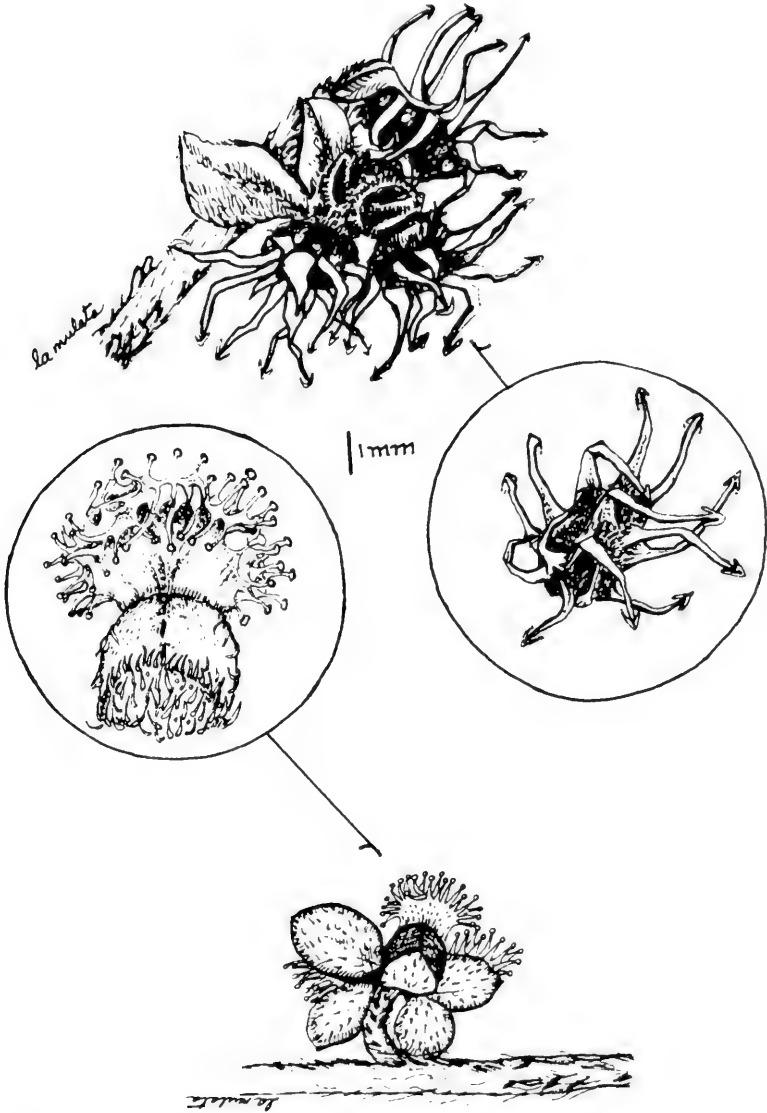


Figure 1. Mericarps of *Cynoglossum anabile* (lower left, Webster 11327 [TEX]) and *C. hintoniorum* (upper right, from holotype).

Style ca. 3 mm long, the stigmatic surface more or less peltate. Mericarps (3 of them), each with 10-15 long flattened smooth spines, 3-4 mm long, their apices with 2-4 hooked hairs, 1 of the mericarps tending to abort, nearly rugose, not at all spinose or very weakly so.

ADDITIONAL SPECIMEN EXAMINED: MEXICO. Oaxaca: Distrito Miahuatlán, Xianaguilla, 2715 m, oak and pine forest, 13 Oct 1995, *Hinton et al.* 26063 (TEX).

This taxon has most of the characters of *Cynoglossum amabile* Stapf & Drumm., except for the markedly different fruits, as shown in Figure 1. Examination of 30 or more sheets of *C. amabile* (LL, TEX) from both México and Central America revealed no fruits remotely approaching those of *C. hintoniorum*.

Mexico is now known to have four species of *Cynoglossum*: *C. amabile*, *C. henricksonii* Higgins (= *C. erectum* Higgins 1976, not *C. erectum* Sweigg ex Schrank 1822), *C. hintoniorum*, and *C. pringlei* Greenm. *Cynoglossum amabile* is said to be native to China, being introduced into México and elsewhere in Central and South America (cf. Nash & Moreno 1981, who provided an excellent illustration). Brand (1921), however, does not note a New World distribution in his treatment. Apparently *C. amabile* is used as a folk medicinal, having largely spread throughout the tropical and subtropical regions of the New World over the past 50 years (it was not described as new to science until 1906). Gibson (1970) thought the plant to be largely cultivated for ornamental purposes in Guatemala, the very adherent seeds readily dispersed by mammals, including man. Finally, it should be noted that *C. hintoniorum* may be a stabilized or populational fruit-form of *C. amabile*; if so, it is a remarkable populational variant, especially since it occurs at two distant locales in Miahuatlán at very high elevations (2715-3145 m) in regions relatively remote from human population centers.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Ted Delevoryas for reviewing the manuscript. Marcia Thompson provided the illustration.

LITERATURE CITED

- Brand, A. 1921. *Cynoglossum*, in Pflanzenreich IV (252):114-153.
Gibson, D. 1970. *Cynoglossum*, in Flora of Guatemala. Fieldiana: Bot. 24:133-134.
Nash, L. & N. Moreno. 1981. *Cynoglossum*, in Flora de Veracruz. 18:52-55.

TWO NEW SPECIES OF *AGERATINA* (ASTERACEAE) FROM MEXICO

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ABSTRACT

Two new species of *Ageratina* are described from México: *A. ayerscottiana* B.L. Turner, from the vicinity of Basaseachi, Chihuahua; and *A. miahuatlana* from Oaxaca. The former belongs to the subgenus *Neogreenella* and relates to *A. petiolaris*; the latter belongs to the subgenus *Ageratina* and relates to *A. viscosissima*. A map showing the distribution of *A. ayerscottiana* and *A. petiolaris* is provided.

KEY WORDS: Asteraceae, Eupatorieae, *Ageratina*, Mexico, Chihuahua, Oaxaca, systematics

The genus *Ageratina* is a segregate from *Eupatorium* (s.l.). It is a large highly variable complex in Mexico, 110 or more species currently recognized (*cf.* Turner & Nesom 1993). The present account, along with others described since the 1993 survey, adds two additional species, bringing to ca. 125 the number currently recognized for México (Turner 1996).

AGERATINA AYERSCOTTIANA B.L. Turner, *spec. nov.* TYPE: MEXICO. Chihuahua: 1 mi N. of Maguarachi, ca. 22 mi S of junction with Basaseachi-San Juanito road, "steep S-facing cliff in drainage," ca. 6000 ft, May 1984, *T.J. Ayers 399*, with *R. Scott* (HOLOTYPE: TEX!)

Similis *A. petiolaris* (DC.) R.M. King & H. Rob. sed foliis parvioribus cum venatione valde elevata et sine trichomatibus glandulosus.

Suffruticose herbs or shrublets. Young stems densely hirsute with white eglandular hairs. Leaves opposite throughout; uppermost leaves thick and strongly venose beneath; petioles 10-15 mm long; blades neatly cordate, 2-3 cm long, 2-3 cm wide, 3-5 nervate from the base, densely hirsute above and below with eglandular hairs, the surfaces densely atomiferous-glandular, the margins crenulate. Heads terminal, arranged 30-100 in rounded corymbose capitulescences, the ultimate peduncles mostly 5-15 mm long. Involucres campanulate, 5-6 mm high, ca. 10 mm

wide (pressed); bracts linear-lanceolate in ca. 2 series, pubescent with eglandular hairs, the surfaces atomiferous-glandular. Receptacles convex, ca. 4 mm across, 1.5 mm high, glabrous. Disk florets 50 or more (est.); corollas white, 4-5 mm long, glabrous; tubes ca. 2 mm long; lobes ca. 0.5 mm long, atomiferous-glandular, but without hairs. Achenes ca. 3 mm long, hispidulous; the pappus of ca. 20 barbellate bristles 5 mm long in a single series.

ADDITIONAL SPECIMEN EXAMINED: MEXICO. Chihuahua: just E of Maguarachi on road between Basaseachi and San Juanito, headwaters of the Río Oteros, "steep sided mountain slopes in narrow arroyo," 17 May 1984, *Lavin 5427* (TEX), with *R. Scott et al.*

This taxon belongs to the subgenus *Neogreenella* (*sensu* King & Robinson 1987), superficially resembling *Ageratina petiolaris* (DC.) King & H. Rob. It is amply distinct from the latter by a number of characters, most notably through the absence of glandular trichomes, and by the seemingly smaller, thicker more venous leaves. I retained such plants under my concept of *A. petiolaris* for several years, but closer inspection has suggested that these are deserving of specific status. The distributional relationship of *A. ayerscottiana* and *A. petiolaris* is shown in Figure 1.

It is a pleasure to name this isolated species in honor of Dr. Tina Ayers and her husband Dr. Randy Scott, both having participated in the collection of the only two specimens known to me. Tina and Randy obtained their doctorates under my direction, and are currently located at Northern Arizona University, Flagstaff, Arizona. Their wedded name also appears on one other Mexican species, *Wedelia ayerscottiana* B.L. Turner.

AGERATINA MIAHUATLANA B.L. Turner, *spec. nov.* TYPE: MEXICO. Oaxaca: Distrito Miahuatlán, Quiexobra, 3050 m, 22 Oct 1995, *Hinton et al.* 26304 (HOLOTYPE: TEX!).

Similis *A. viscosissimae* (Rolfe) R.M. King & H. Rob. sed involucris majoribus (10-12 mm altis vice 6-8 mm altis) et setis papporum pluribus (ca. 30 vice 10-15).

Suffruticose herbs or shrublets 0.5-1.2 m high. Midstems 3-5 mm across, densely pubescent with a vestiture of glandular trichomes ca. 0.25 mm high. Leaves opposite throughout, but occasionally the uppermost alternate; those at midstem mostly cordate; petioles 2-3 cm long; blades 5-7 cm long, 4-7 cm wide, thin, 3-nervate from the base, moderately to sparsely pubescent above and below, the margins crenulodentate. Heads arranged in relatively loose terminal cymes, the ultimate peduncles mostly 1-3 cm long, pubescent like the stems. Involucres campanulate, 11-12 mm high; bracts linear-lanceolate, 2-3 seriate, subequal, glandular-pubescent, the apices narrowly acute. Florets 20-30 per head (est.); corollas white, 6-7 mm long, glabrous except for the sparsely pilose lobes. Achenes (immature) ca. 3 mm long, hispidulous; pappus of ca. 30 readily deciduous white bristles ca. 6 mm long.

ADDITIONAL COLLECTIONS EXAMINED: MEXICO. Oaxaca: Distrito Miahuatlán, Xianaguilla, 2715 m, 13 Oct 1995, *Hinton et al.* 26062 (TEX); Siete Ocotes, 2950 m, 20 Oct 1995, *Hinton et al.* 26258 (TEX).

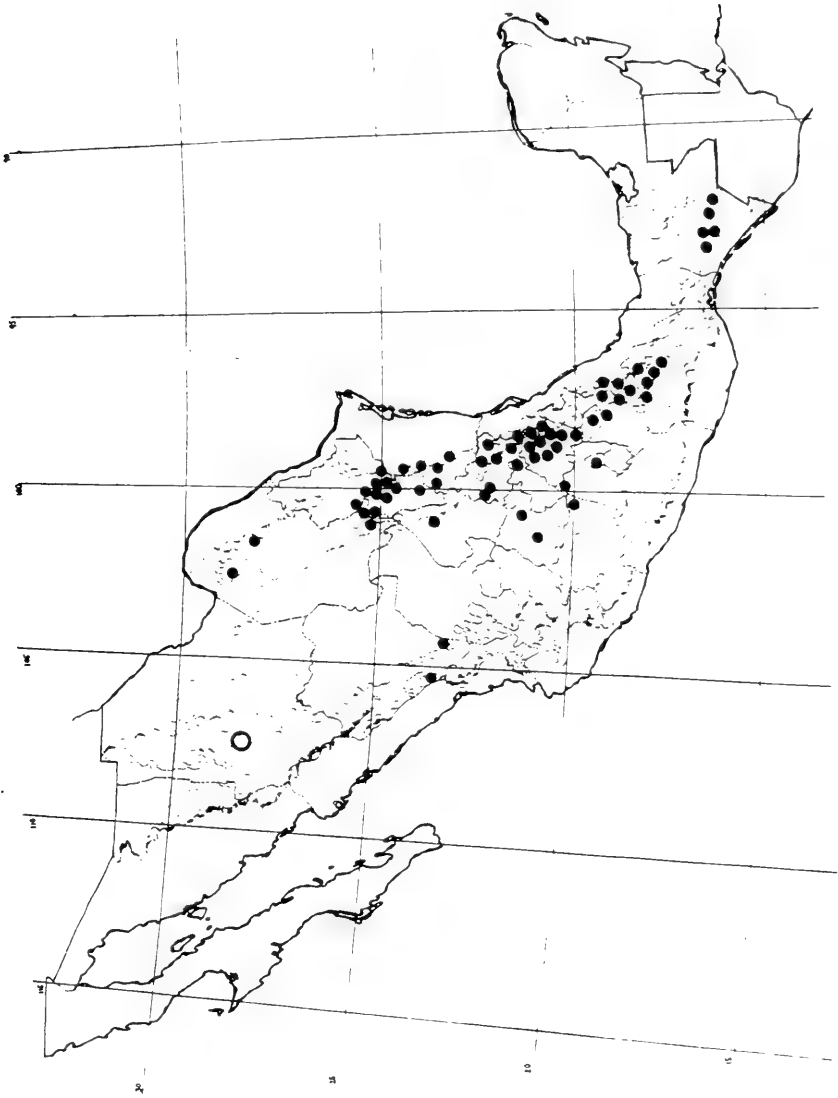


Figure 1. Distribution of *Ageratina petiolaris* (closed circles) and *A. ayerscottiana* (open circle). Based upon specimens at LL, TEX.

Ageratina miahuatlana relates to a group of species with large heads and glandular-pubescent foliage centering about *A. viscosissima* (Rolfe) King & H. Rob. The latter occurs in northwestern México and belongs to the subgenus *Ageratina* (sensu King & Robinson 1987). It differs from the latter in having leaves with shorter petioles and larger heads, the involucre 10-12 mm long (vs. 6-8 mm long), and pappus of more numerous bristles (ca. 30 vs. 10-15).

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnoses, and to her and Justin Williams for reviewing the paper.

LITERATURE CITED

- King, R.M. & H. Robinson. 1987. The genera of the Eupatorieae (Asteraceae). Monographs Syst. Bot. Missouri Bot. Gard. 22:1-581.
- Turner, B.L. 1996. Asteraceae of Mexico vol. 1 (of a contemplated 10 vol. account): in prep.
- Turner, B.L. & G. Nesom. 1993. Biogeography diversity, and endangered or threatened status of Mexican Asteraceae, in *Biological Diversity of Mexico* [T.P. Ramamoorthy *et al.*, eds.] Oxford Univ. Press, Oxford.

A NEW SPECIES OF *BOCCONIA* (PAPAVERACEAE) FROM OAXACA,
MEXICO

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ABSTRACT

Bocconia hintoniorum B.L. Turner, *spec. nov.*, is described and illustrated from Cerro Quiexobra, Distrito Miahuatlán, Oaxaca. It is a small tree 3-5 m high having undivided, thick coriaceous leaves, and flowers with 7-8 anthers. It is closely related to the more southern *B. gracilis*, differing from the latter in having smaller, thicker leaves with minutely crenulodentate margins and fewer anthers.

KEY WORDS: Papaveraceae, *Bocconia*, México, Oaxaca, systematics

Routine identification of Mexican plants has revealed the following novelty.

BOCCONIA HINTONIORUM B.L. Turner, *spec. nov.* Figures 1-2. TYPE: MEXICO. Oaxaca: Distrito Miahuatlán, Cerro Quiexobra, 3070 m, 19 Oct 1995, *Hinton et al.* 26227 (HOLOTYPE: TEX).

Similis *Bocconiae gracili* Hutch. sed foliis crassioribus glabrisque, marginibus uniformiter minuteque crenulatis-dentatis, et antheris 7-8 (vice ca. 12).

Small tree 3-5 m high. Young stems densely hirsute. Leaves 12-13 cm long, 2-3 cm wide, pubescent at the base like the stem, often winged throughout by the gradually tapering blades, the latter narrowly elliptic to elliptic-oblongate, pinnately nervate, the margins minutely crenulodentate for about 2/3 of their length. Flowers arranged in terminal panicles ca. 30 cm long, 10 cm across, the pedicels mostly 4-10 mm long, glabrous. Sepals 9-11 mm long, 2.5-3.0 mm wide, the apices abruptly constricted forming a lanceolate extension ca. 2 mm long. Petals absent. Stamens 7 or 8. Fruits on recurved pedicels at maturity, glaucous-black, glabrous. Seeds ovoid, ca. 4 mm long, 3 mm across, the caruncle broadly conical, ca. 2 mm long.

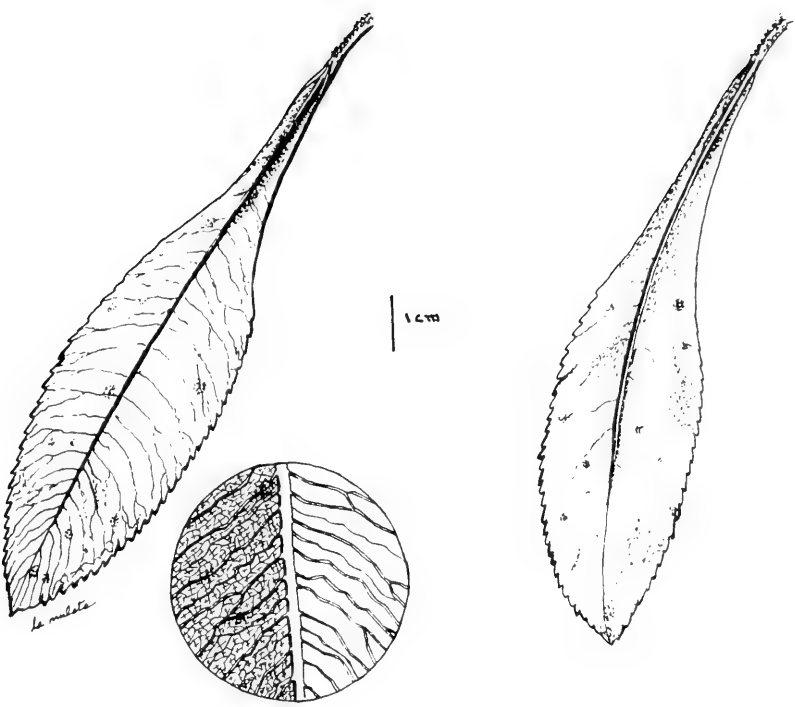


Figure 1. Leaves of *Bocconia hintoniorum*: left side (lower surface); right side (upper surface); circular inset (undersurface, showing detail); from holotype.

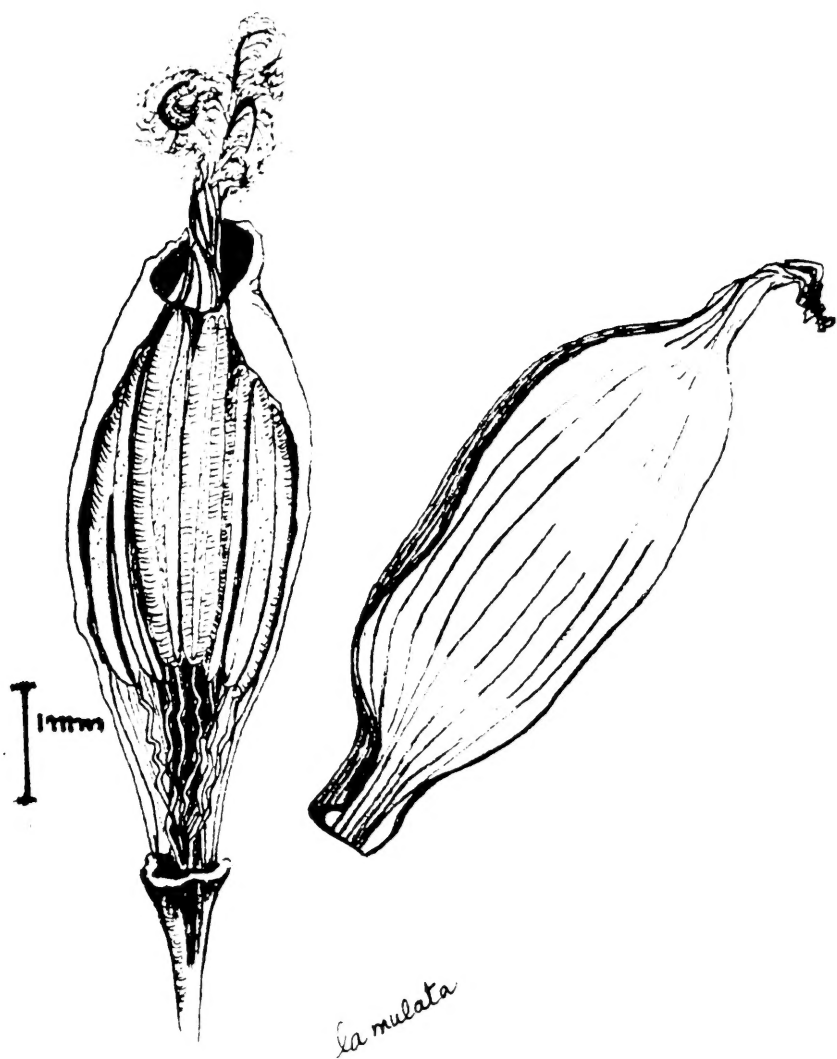


Figure 2. Flower of *Bocconia hintoniorum* with one of the two sepals removed (from holotype).

This newly described taxon first came to my attention in the fall of 1980 while on a *Bocconia* collecting expedition with Ms. Joan Johnson (accompanied by Dr. David Northington and Dr. Wayne Elisens). Ms. Johnson was in the early stages of a doctoral systematic study of *Bocconia*, having borrowed a wide range of material from various institutions so as to prepare herself for the field trip concerned. We collected the commonly occurring bocconias throughout most of México (mainly *B. frutescens* L., including *B. latispala* S. Wats.), but were startled to find small populations of the presently described species along highway 175 in the vicinity of Miahuatlán, Oaxaca. Unfortunately, Ms. Johnson abandoned her doctoral program and failed to preserve the various collections made during this sojourn. She also left me, her major professor, with a large set of *Bocconia* specimens to annotate and return to various institutions, none of these representing the species described herein. Thus my delight to find among Hinton's numerous collections from Cerro Quiexobra, newly assembled specimens that might serve as type material for this long-remembered but unnamed taxon.

Bocconia hintoniorum will key to *B. integrifolia* Kunth in Standley's (1922) *Trees and Shrubs of Mexico*. The latter, however, is typified by Peruvian material and, as noted by Hutchinson (1920) in his account of the genus, is restricted to South America. Although the material of *B. hintoniorum* will key to *B. integrifolia* in the treatment of Hutchinson, it is seemingly more closely related to the Central American *B. gracilis* Hutch., with which it is compared here.

It is a pleasure to name this attractive new species for the Hinton family, whose collections in México are becoming increasingly legendary.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Ted Delevoryas for reviewing the manuscript.

LITERATURE CITED

- Hutchinson, J. 1920. *Bocconia* and *Macleaya*. Kew Bull. 1920:275-282.
Standley, P.C. 1922. *Bocconia*, in *Trees and Shrubs of Mexico*. Contr. U.S. Natl. Herb. 23:299-301.

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