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A NEW SPECIES OF *VERBENA* (VERBENACEAE) FROM NORTHEASTERN MEXICO AND AN OVERVIEW OF THE *VERBENA OFFICINALIS* GROUP

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ABSTRACT

Verbena madrensis Nesom sp. nov., is described from Coahuila, Nuevo León, and Tamaulipas in northeastern Mexico. It is most similar to *V. menthifolia* and apparently also closely related to *V. officinalis* and *V. supina*. Seven South American species and three from Africa and Australia also are hypothesized to be closely related to *V. officinalis*. The closest relationship of *V. halei* has sometimes been hypothesized to be with *V. officinalis*, but it apparently is closer to other species native to North America. A key to the five species known either as waifs or naturalized in North America is provided and typification, a description, and commentary is given for each.

KEY WORDS: *Verbenaceae*, *Verbena madrensis* sp. nov., *V. menthifolia*, *V. halei*, *Verbena officinalis*, *V. supina*, taxonomy, USA, Mexico, South America, Galapagos, Australia

In review of the taxonomy of North American *Verbena* toward preparation of the treatment for the Flora of North America volumes, attention has been given to the delimitation of *V. officinalis* L. and its apparent close relatives, including *V. menthifolia* Benth. and *V. supina* L. These species, along with others from Africa, Australia, and South America, are treated by Nesom (2010) within *Verbena* sect. *Verbena* ser. *Verbena*. *Verbena halei* Small has been hypothesized in earlier literature to be most closely related to *V. officinalis* but has been placed in a different series (Nesom 2010). In North America, *V. menthifolia* and *V. halei* are native and *V. officinalis* is naturalized; *V. supina* has been recorded as a waif but does not appear to be naturalized. A previously undescribed species from northeastern Mexico also belongs in ser. *Verbena*.

VERBENA MADRENSIS Nesom, sp. nov. Figs. 1, 2. Type: **MEXICO. Nuevo León**. [Mpio.] Galeana, Hacienda Pablillo, 3 Aug 1936, *M.E. Taylor 49* (holotype: TEX!; isotype: MO!)

Verbenae menthifoliae Benth. similis vestimento plerumque strigilloso, spicis laxis elongatis, et nuculis parvis superficiebus commissuralibus apicem attengentibus sed differt rhachidibus dense persistente glandulosis, foliis incrassatis regulatim grosse serratis marginibus revolutis, bracteis floralibus hispido-hirsutis glandulosis, et corollis majoribus.

Plants perennial herbs, taprooted, sometimes producing basal offsets or basal branches layering (*Hinton 24412*). **Stems** mostly 1 from the base, erect to ascending-erect, 25–60(–120) cm, very sparsely hirsute-strigose, eglandular or sparsely stipitate-glandular. **Leaves** mostly on proximal half of stems, ovate to lanceolate or oblong-lanceolate in outline, lower and midstem 2.5–4(–5) cm x 5–17(–25) mm, margins strongly revolute, coarsely serrate with 3–6 teeth per side, sometimes 3-lobed or pinnatifid, lobes acute, veins slightly impressed adaxially, hispid-strigose adaxially, hispid-hirsute abaxially mostly along the veins, eglandular. **Fruiting spikes** 1 or 3–7 from distal branches, open-elongate or sometimes denser with overlapping fruits, 6–20 cm, rachis densely and persistently stipitate-glandular; floral bracts ovate to ovate-lanceolate, slightly shorter than the calyces, hispid-hirsute, stipitate-glandular, margins ciliate. **Calyces** 2.2–3 mm, hirsute to hirsutulous, densely minutely stipitate-glandular, lobes acuminate-filiform, hispid, not connivent. **Corollas** blue to

purplish pink, tubes (3–)3.5–4.5 mm, 2 mm longer than the calyces, limbs 5–9 mm in diam. **Nutlets** (1.3–)1.5–1.8 mm, longitudinally ridged, commissural faces reaching very tip, minutely papillate to papillate-bullate, rarely bare.

Flowering May–Aug(–Oct). Thorn forest, oak, pine, oak-pine, and oak-fir woods, rocky slopes, dry stream beds, roadsides; 500–2400 m; Mexico (Coahuila, Nuevo León, Tamaulipas).

Additional collections examined. **MEXICO**. **Nuevo León**. Chipinque, pine woodland, 1 Jul 1947, *Barkley et al. 7150* (TEX); Mpio. Linares, Rio Iturbide, IRF Iturbide, 900 m, 30 Sep 1979, *Hinton et al. 17695* (HINTON); Mpio. Aramberri, N of Aramberri, IRF Lampacitos, 995 m, 16 Jun 1990, *Hinton 20329* (TEX); Mpio. Montemorelos, El Pastor, oak woods, 460 m, 19 May 1994, *Hinton 24216* (TEX); Mpio. Santiago. La Nogalera, glade in oak woods, 1005 m, 16 Jun 1994, *Hinton 24412* (TEX-2 sheets); Mpio. Santiago, Blanquillo, bushy hillside, 540 m, 22 Jun 1994, *Hinton 24440* (TEX); Mpio. Galeana, Hacienda Cieneguillas on Cerro Potosí, open, dry, rocky slopes in chaparral, 8000 ft, 11 Aug 1938, *Mexican Biol. Exped. Univ. of Illinois 992* (ARIZ); Sierra Madre Mts, Monterrey, 18 Jul 1933, *Mueller 157* (TEX); Mpio. Villa Santiago, Canon Denuncio, common in less dense oak wood of upper canyon, 22 Jun 1935, *Mueller 2010* (MO); Montemorelos, 3 Apr 1902, *Nelson 6096* (MO); 5 mi SE of Monterrey on Hwy 85 and 2 mi W of Valle Alto, thorn forest and dry stream bed, limestone and shale, 14 Jul 1971, *Parker 424* (TEX); Chipinque Mesa, 1900 ft, 2 Aug 1970, *Roberts 57* (TEX); Linares, 4 Jun 1971, *Seigler and Becker OS-3149* (MO, TEX); 1 mi down road from Chipinque, Monterrey, Apr 1961, *Smith 476* (TEX); Hacienda Vista Hermosa, 35 mi S of Monterrey, ca. 2200 ft, 27 Jun 1939, *White 1577* (ARIZ). **Tamaulipas**. Sierra de San Carlos, Cerro del Diente, 17 km S de San Carlos, 1100 m, bosque mesofilo de montana con *Abies*, *Quercus*, *Staphylea*, etc, 22 May 1988, *Hernandez 2246* (TEX); Sierra de San Carlos, ca 5 mi S of San Carlos, near top of slope, igneous bedrock, open woods of scattered oaks and pines, ca. 1200 m, 18 Jun 1987, *Nesom 6141* (TEX).

Verbena madrensis is recognized by its single-stemmed habit, glabrate stems with sharp, strongly nerved angles, widely spaced and elongate leaves with coarsely serrate, revolute margins, loose, elongate spikes in panicles at the apices of the stems and branches, persistently and densely stipitate-glandular rachises, hirsute to hirsutulous and stipitate-glandular floral bracts and calyces, short corolla tubes, and nutlets with commissural faces reaching the tip. The oblong-lanceolate cauline leaves with sharp, slightly recurving teeth are reminiscent of those of *V. canescens*, but the nutlet comissural faces in *V. madrensis* reach all the way to the nutlet tip, like those of *V. officinalis* and *V. menthifolia*.

Among North American species, *Verbena madrensis* is closely similar to *V. menthifolia* Benth. Moldenke (1964) cited *Mueller 157*, *Mueller 2010*, and *Taylor 49* (above, as *V. madrensis*) among plants he identified as *V. menthifolia*. The geographic range of *V. madrensis* lies at the northeastern corner of that of *V. menthifolia*, essentially allopatric with it, and is much smaller in comparison. From Nuevo León, in the region where *V. madrensis* is common, I have seen only a single collection of *V. menthifolia*: 32 mi S of San Roberto, along Hwy 57, near small pond, 6000 ft, 11 Jul 1963, *McGregor et al. 492* (SMU). Two collections from southeastern Coahuila are *V. menthifolia*: Sierra de la Concordia, 6 km NE del Ejido La Casita, 25º 14' 05" N 101º 25' 25" W, bosque de *Pinus cembroides*, *Quercus laeta*, *Q. saltillensis*, *Arbutus xalapensis*, y *Garrya wrightii*, canyones y ladera media de exposicion oeste, 2100–2300 m, 10 Oct 1996, *Encina 288* (TEX). Mpio. Arteaga. Los Lirios→El Cercado, roadside in pine and oak woods, 1 m tall, 2405 m, 29 Jul 1995, *Hinton et al. 25422* (HINTON-digital image!). I have not seen a collection of *V. menthifolia* from Tamaulipas.

The two species are distinguished by the following contrasts.

1. Leaf margins regularly, coarsely serrate, revolute; inflorescence rachis densely and persistently stipitate-glandular; floral bracts hispid-hirsute, stipitate-glandular; corolla tubes (3–)3.5–4.5 mm, 2 mm longer than the calyces, limbs 5–9 mm in diam. ..... **Verbena madrensis**
1. Leaf margins deeply and irregularly toothed to lobed, not revolute or only slightly so; inflorescence rachis eglandular or rarely sparsely stipitate-glandular and quickly becoming eglandular; floral bracts glabrous to sparsely strigillose, eglandular to sparsely stipitate-glandular; corolla tubes 2.5–3 mm, 0.5–1 mm longer than the calyx, limbs 1.5–3(–5) mm in diam. ..... **Verbena menthifolia**

Features in common between *Verbena madrensis* and *V. menthifolia* are a mostly strigillose vestiture, elongate, slender spikes of remote flowers and fruits (not overlapping each other on the spikes), relatively small corollas, and small nutlets with commissural faces reaching the nutlet tip. The European native *V. officinalis* also is closely similar. A close relationship between *V. menthifolia* and *V. officinalis* was hypothesized by Perry (1933), who also included *V. halei* as a member of this group. She noted that distinctions of *V. menthifolia* are "perhaps … differences only of degree and may be merely variations of *V. officinalis*; nevertheless, for the present it seems prefereable to retain the name *V. menthaefolia* for the American representative" (p. 265). The present study confirms their distinction. These species, along with another that is newly described in this manuscript, can be distinguished by the following contrasts.

1. Stems mostly prostrate to decumbent-ascending; mid-cauline leaves triangular to deltate or ovate-cuneate in outline ..... **Verbena supina**
1. Stems mostly erect; mid-cauline leaves ovate to lanceolate or oblong-lanceolate in outline.

2. Leaves mostly basal and lower cauline, distal cauline become linear and entire; leaf margins revolute; commissural faces ending below the nutlet tips ..... **Verbena halei**
2. Leaves evenly distributed along stems, often largest at midstem, proximal and distal cauline similar in morphology; leaf margins not revolute or only slightly so; commissural faces reaching the nutlet tips.

3. Rachis eglandular or nearly so. ..... **Verbena menthifolia**
3. Rachis persistently stipitate-glandular.

4. Corolla tubes 2.5–3 mm, 0.5–1 mm longer than the calyces, limbs 2–3 mm in diam; leaf margins coarsely and unevenly crenate to incised-crenate or crenate-serrate, not revolute or only slightly so ..... **Verbena officinalis**
4. Corolla tubes (3–)3.5–4.5 mm, 2 mm longer than the calyces, limbs 5–9 mm in diam; leaf margins regularly coarsely serrate, narrowly revolute ..... **Verbena madrensis**

VERBENA MENTHIFOLIA Benth., Pl. Hartw., 21. 1839. **TYPE**: **Mexico**. [Guanajuato]. Leon, 1839, [no other collection information], *Hartweg 175* (holotype: K, photo-MO!; isotype: NY, digital image!). The protologue: "175. VERBENA (Euverbena) *menthaefolia*, sp. n., caule erecto ramoso pilosiusculo, foliis obovato-cuneatis subincisis laciniis acutiusculis grosse dentatis, spicis elongatis gracilibus paniculatis, bracteis parvis, corollis calyce triplo longioribus, fructibus remotis."

Verbena hintonii Moldenke, Phytologia 1: 439. 1940. **TYPE**: **Mexico**. Michoacan. Distr. Zitacuaro, Zitacuaro–Bosque, grassy bank, 28 Jun 1938, *Hinton et al. 11991* (holotype: NY-digital image!; isotypes: F-digital image!, GH, HINTON-digital image!, MICH, TEX!, US-digital image!, WTU).

Verbena setosa Mart. & Gal., Bull. Acad. Roy. Sci. Bruxelles 11: 321. 1844. **TYPE**: **Mexico**. Hidalgo. "Dans les forêts de Moran, près de Real del Monte, et del Sabino, près d'Izmiquilpan, au nord de Mexico, de 6000–7500 ft," fl. lilas, Août 1840, *H.G. Galeotti 778* (holotype: BR, photo-LL!, photo-MO!). The type of *V. setosa* is not currently listed in the online account of BR types.

Verbena carolina forma *albiflora* Moldenke, Phytologia 7: 430. 1961. **TYPE**: **Mexico**. Sonora. Region of the Rio de Bavispe, Cañón de El Temblor, 19 Aug 1940, *S.S. White 3379* (holotype: MICH digital image!). O'Leary et al. (2010) treat this as a synonym of *V. carolina*.

Verbena comonduensis Moldenke, Phytologia 18: 343. 1969. *Verbena menthifolia* var. *comonduensis* (Moldenke) Moldenke**,** Phytologia 46: 155. 1980. **TYPE**: **Mexico**. Baja California. Comundu, common roadside weed for 10 miles in either direction, 19 Mar 1969, *A.F. and A.R. Moldenke 2922* (holotype: LL!). Topotype: Comondu, moist sandy depressions on flats along roadside, 21 Apr 1971, *Moldenke and Moldenke 25407* (LL, TEX).

Plants perennial herbs, usually taprooted (rarely with basal offsets, *Encina 288*, TEX). **Stems** mostly 1–3 from the base, erect, (30–)40–70 cm, sparsely strigose to hirsute-strigose along the ridges with appressed to ascending hairs, eglandular. **Leaves** relatively evenly distributed, on stems, even-sized or sometimes largest at midstem, ovate to broadly lanceolate in outline, midstem blades 2.5–4.5(–8) cm x 15–25(–40) mm, strigose-hirsute to hirsute-strigose abaxially, strigillose to hirsute-strigose adaxially, eglandular, margins not revolute or only slightly so, deeply toothed to pinnately lobed, sometimes evidently 3-lobed through a pair of large proximal divisions, divisions ovate-oblong to triangular, subpetiolate. **Fruiting** s**pikes** (1–)3–12 in panicles, elongate and slender, 10–20(–30) cm, rachis eglandular to sparsely stipitate-glandular; floral bracts ovate-lanceolate, 1.5–2 mm, shorter than the calyces, glabrous to sparsely strigillose, eglandular, margins ciliate. **Calyces** 2.3–3 mm, closely to loosely strigillose with even-length hairs, eglandular to very sparsely stipitate-glandular (moderately sessile-glandular in Sonora and D.F.), lobes deltate to triangular, not connivent to subconnivent. **Corollas** blue to purple, tubes 2.5–3 mm, 0.5–1 mm longer than the calyx, limbs 1.5–3(–5) mm in diam. **Nutlets** separating at maturity, 1.4–1.8(–2) mm, commissural faces extending completely to the nutlet tips, minutely acicular-papillate.

Flowering Apr–Jun. Canyon bottoms, around springs and tanks, river and canal banks, wet places in arid habitats (USA); 50–1200 m; Arizona, California, New Mexico, Texas; Mexico (Aguascalientes, Baja California, Baja California Sur, Chihuahua, Coahuila, Distrito Federal, Durango, Guanajuato, Hidalgo, Jalisco, México, Michoacan, Morelos, Nuevo León, Oaxaca, Querétaro, Puebla, San Luis Potosí, Sinaloa, Sonora, Veracruz, Zacatecas); introduced in Europe. Attributions of *V. menthifolia* to Chiapas and Guatemala are based on collections discussed under *V. officinalis*.

Verbena menthifolia is known to me from Texas by only a single collection. **Texas**. Brewster Co.: Black Gap Refuge, Horse Canyon, 100 mi S of Alpine, infrequent perennial around old dirt tank, limestone soil, 2000 ft, 24 Jun 1950, *Warnock & Hinkley BG-108* (SMU). Moldenke (1964a) cited two other collections: [Bexar Co.?]: between Kerrville and San Antonio, *Jones 28294* (POM); Uvalde Co.: W of Uvalde, 26 Apr 1931, *Jones s.n.* (POM)—I have not seen these but it is improbable that they are *V. menthifolia*.

Peterson and David (1998, p. 23) recorded the occurrence of *Verbena menthifolia* in Chaves Co., New Mexico, as "Occasional in lowlands and arroyos and on roadsides" in Bitter Lake National Wildlife Refuge, northwest of Roswell. This report has been the basis for citation of *V. menthifolia* as an element of the New Mexico flora in various accounts (Martin & Hutchins 1981; Allred 2009; USDA, NRCS 2010; Kartesz 2010). A voucher for this, however, has not been located in the present study, and a New Mexico collection of *V. menthifolia* is not found in NMC, UNM, or SJNM. That species would be considerably out-of-range and out-of-habitat in Chaves County, and I speculate that

the plants observed there by Peterson and David probably were *V. halei* at the northwestern corner of its range.

On the other hand, a collection from New Mexico cited by Moldenke (1963) and repeated in various other accounts as *Verbena halei* proves instead to be *V. menthifolia*. Otero Co.: sand dunes west of Alamogordo, 3 May 1930, *M.E. Jones 26229* (DS-digital image!). The distalmost leaves on this plant are linear and entire (as characteristic of *V. halei*), but the stem is strictly erect and sparsely strigose, the basal leaves are deciduous, the cauline narrowly elongate and narrowly lobed, and the spikes are relatively short and few-flowered compared to typical *V. halei*.

Verbena menthifolia has been collected abundantly in California (at least from San Bernadino, San Diego, Los Angeles, and Riverside counties) and Arizona (Pima, Pinal, and Yuma counties) and in Mexico (states as cited above).

Verbena menthifolia from Hidalgo, Edo. Mexico, and Distrito Federal sometimes has stems, leaves, and calyces with vestiture variable toward strigose-hirsute with uneven length hairs, but like other plants of the species over the rest of its range, they are essentially eglandular and produce small corollas. An Arizona plant identified and studied by Yuan and Olmstead (2008) as *Verbena menthifolia* was heterozygous at both the PHOT1 and PHOT2 nuclear gene loci, and the gene trees indicated that the individual was of hybrid origin, with *V. halei* as one of the putative parental species. I have not been able to study a voucher for this record, but at least it is clear that *V. halei* does not presently occur sympatrically with *V. menthifolia*.

VERBENA SUPINA L., Sp. Pl. 1: 21. 1753. **TYPE**: "Habitat in Hispania." **LECTOTYPE** (Moldenke 1965, p. 255): "Hispania," *Loefling 16* (S9.1, Linnaean Herbarium Stockholm digital image!). See detailed comments by Munir (2002).

Verbena supina L. forma *erecta* Moldenke, Phytologia 11: 259. 1965. *Verbena supina* L. var. *erecta* (Moldenke) Munir, J. Adelaide Bot. Gard. 20: 62. 2002. **TYPE**: **Spain**. Lieux incultes, Algeciras, 24 Jun 1887, *E. Reverchon 81* (holotype: GB, photo-NY fide Moldenke 1965, photo-TEX!; isotypes: BR, S).

Plants annual or weakly perennial herbs, taprooted, sometimes with adventitious roots on the proximal, procumbent portions of the stems. **Stems** branching profusely from crown, procumbent to decumbent-ascending, less commonly erect to erect-ascending, (10–)15–35(–50) cm, sparsely to moderately hirsute-strigose to hirsute, hairs sometimes slightly deflexed, eglandular to sparsely stipitate-glandular. **Leaves** evenly distributed and relatively even-sized, triangular to deltate or ovate-cuneate in outline, midstem blades 2–4 cm x 1.5–2.5 cm, strigose to hirsute-strigose or hirsute, eglandular to stipitate-glandular, margins revolute, coarsely toothed with ovate to oblong-ovate or obovate teeth or divisions to 1–2-pinnatisect, often 3(–5)-lobed, margins veins impressed adaxially; petioles 5–12 mm. **Fruiting spikes** 1 or 1–3, initially dense but elongating and fruits becoming looser and remote, 1.5–3(–5) cm; rachis strigillose, minutely sessile- to short-stipitate-glandular; floral bracts linear-lanceolate to oblong, 1–1.5 mm, shorter than the calyces. **Calyces** 1.8–2 mm, hirsutulous-hirtellous to hirsutulous-strigose, minutely stipitate-glandular, lobes subulate, not connivent. **Corollas** blue to purplish or lilac, tubes 2–2.5 mm, 0.5–1 mm longer than the calyces, limbs 1.5–2.5 mm in diam. Nutlets separating at maturity, 1.8–2.2 mm, commissural faces extending fully to nutlet tips, bare. $2n = 14$.

Flowering mostly spring–summer. Dry and wet places, grasslands, disturbed sites, at a wide range of elevation; Mediterannean Europe, Asia, Africa; naturalized in northern Europe and Eurasia, Asia, Africa, Atlantic Islands (Canary Islands), Pacific Islands (New Zealand), Australia.

Verbena supina was recorded from Alabama by Moldenke (1965), based on waifs collected from along Mobile Bay in 1892 and 1893. The species has not been recorded since that time from anywhere in the USA and is not considered part of the naturalized flora of North America. Alabama. [Mobile Co.]: Hunter's Wharf, 5 Sep 1892, *Mohr s.n.* (US-2 sheets); Mobile, Jul 1893, *Mohr s.n.* (NY)—both Mohr collections as cited by Moldenke.

Common names for *Verbena supina* are trailing vervain and carpet vervain, reflecting its characteristically prostrate habit. Other distinctive and diagnostic features are the deltate to ovate (in outline) and relatively small leaves, relatively short spikes, loosening proximally but remaining compact in the distal 1/3–2/3, short floral bracts, small corollas, fruits with comissural faces extending fully to the nutlet tips, and characteristic stipitate-glandularity, at least sparsely. Munir (2002) observed that in *Verbena supina* in Australia, the commissural faces of the nutlets always are smooth and the vegetative parts are eglandular, while in other parts of the native and naturalized range, plants sometimes are stipitate-glandular and the commissural faces papillate.

The distinctiveness of *Verbena supina* var. *erecta*, was emphasized by Munir, who noted (p. 64) that "the possibility of mistaking this taxon with the typical form would be minimal." And (p. 62 and 64) "The var. *erecta* is closely related to the typical variety in having almost similar shaped leaves, inflorescence, calyx, corolla and mericarps … [but] … differs from the typical form of the species in having its stems usually erect or suberect from the beginning, usually robust and purplish, almost glabrous and shiny or very sparsely puberulous. Leaves usually glabrous adaxially, puberulous on the veins abaxially, lobes obtuse or rounded at the apex." Munir also noted that var. *erecta* is known to occur in several countries of Eastern Europe, North Africa, and the Middle East. In context of Munir's account as summarized here, it appears that var. *erecta* would be appropriately treated at specific rank. Without commenting on patterns of variability, O'Leary et al. (2010) noted only that "El análisis del ejemplar tipo permitió determinar que este taxón es un sinónimo de *V. supina*."

VERBENA OFFICINALIS L., Sp. Pl. 1: 20. 1753. **TYPE**: "Habitat in Europae Mediterraneae ruderatis," probably from central Europe (see Michael 1997). **LECTOTYPE** (Verdcourt in Jarvis et al., Regnum Veg. 127: 98. 1993): Herb. Clifford: 11, Verbena 6, sheet 6 (BM).

Verbena officinalis L. var. *prostrata* Gren. & Godr., Fl. France 2: 718. 1853. **TYPE**: **France**. Sables des environs de Bayonne, bords des chemins et décombres, Jun-Oct, no collector or date specified. Described in the protologue simply as "Tige étalée-couchée."

Verbena spuria L., Sp. Pl. 1: 20. 1753. *Verbena officinalis* L. var. *spuria* (L.) Hook., Companion Bot. Mag. 1: 176. 1836. **TYPE**: O'Leary et al. (2010) designated (from photos) "*Muhlenberg 68*," "PH 3073 no visto" as the neotype. Typification of *V. spuria* is under further study by Nesom (in manuscript).

Verbena riparia Raf. ex Small & Heller, Mem. Torrey Bot. Club 3: 12. 1892. *Verbena urticifolia* var. *riparia* (Raf. ex Small & Heller) Britton, Mem. Torrey Bot. Club 5: 276. 1894. **LECTOTYPE**: (Moldenke 1964, p. 101): **USA**. North Carolina. Caldwell Co: Along the John's River near Globe, 3 Jul 1891, *J.K. Small s.n.* with A.A. Heller (NY-digital image!; isolectotype: MO!). O'Leary et al. (2010) designated a lectotype for this, not realizing that it had been done previously.

Verbena domingensis Urb., Symb. Antill. 5: 484. 1908. **LECTOTYPE** (O'Leary et al. 2010): **Hispaniola**. Dominican Republic. Ad Angostura del Rio Yaqui, "in rupibus calcareis, ad ripam fluminis," 210 m, 8 May 1887, *H.F.A. von Eggers 1828* (NY-digital image!). Placed by O'Leary et al. (2010) as a synonym of *V. menthifolia*.

Verbena russellii Moldenke, Phytologia 2: 55. 1941. **TYPE**: **Mexico**. Sinaloa. Vicinity of Culiacan, moist field, 21 Apr 1910, *J.N. Rose 14850* (holotype: NY digital image!; isotypes: US digital

image!). O'Leary et al. (2010) placed *V. russellii* as a synonym of *V. neomexicana* var. *neomexicana*.

Verbena domingensis Urb. var. *cubensis* Moldenke, Phytologia 50: 309. 1982. **TYPE**: **Cuba**. Campo Florido, 13 Mar 1905, *A.H. Curtiss 677* (holotype: NY-digital image!; isotype: F-digital image!). Placed by O'Leary et al. (2010) as a synonym of *V. menthifolia*.

Verbena domingensis Urb. forma *foliosa* Moldenke, Phytologia 34: 19. 1976. **TYPE**: **Hispaniola**. Dominican Republic. [Prov.] Pedernales. Near Canote, ca. 5 mi W of Aceitillar, Baoruco Mts., in thickets at the bottom of the gorge, ravine on limestone, 1400 m, 9 Nov 1969, *A.H. Liogier 16846* (holotype: NY-digital image!). Placed by O'Leary et al. (2010) as a synonym of *V. menthifolia*.

Plants annual or weakly perennial herbs, taprooted. **Stems** mostly 1 from the base, erect, 30–140 cm, glabrous to scabrous to sparsely hispid-strigose or hirsute-strigose along the angles, eglandular, becoming sparsely stipitate-glandular distally into the inflorescence. **Leaves** relatively evenly distributed on stems, narrowly obovate to oblanceolate or lanceolate in outline, midstem blades 2–7 cm x 8–40 mm, even-sized or sometimes largest at midstem, hirsute-strigose abaxially and adaxially, eglandular at maturity but stipitate-glandular abaxially when young, margins coarsely and unevenly crenate to incised-crenate or crenate-serrate, basal often 3-lobed or rarely pinnately lobed, not revolute or only slightly so; petioles 5–15(–20) mm, narrowly or broadly winged. **Fruiting s**pikes (3–)5–15 in panicles, elongate and slender, 3–15 cm, rachis sparsely stipitate-glandular; floral bracts ovate-acuminate to triangular, 1.5–2 mm, shorter than the calyces. **Calyces** 2–2.2 mm, hirsute to hispid-strigose, minutely stipitate-glandular, lobes shallowly deltate, not connivent. **Corollas** blue to purplish, rarely pink, tubes 2.5–3 mm, 0.5–1 mm longer than the calyces, limbs 2–3 mm in diam. **Nutlets** separating at maturity, 1.4–2 mm, commissural faces reaching the nutlet tips, acicular-papillate, rarely bare. $2n = 14$.

Flowering Jun–Aug. River banks, dunes, roadsides, ballast; 5–700 m; introduced; Alabama, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Mississippi, New Jersey, New Mexico, New York, North Carolina, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Virginia, Washington, West Virginia, Wisconsin; Europe, Asia; introduced also in West Indies, Bermuda, South America (Chile), Asia (Bhutan, China, India, Japan, Pakistan, Thailand), Africa (Canary Islands, Natal, South Africa), Atlantic Islands (Azores), Pacific Islands (New Zealand), Australia. Records from Colorado, Mississippi, New Mexico, Oregon, and Wisconsin (as reported by PLANTS Database) have not been confirmed in the present study.

Some plants in New York state are identified by the PLANTS Database as *Verbena officinalis* var. *prostrata*, perhaps based on the record in House (1924, p. 589), but House identified the New York plants as *V. officinalis*, citing "*V. spuria* L.; Torr. Fl. N.Y. 2: 52. 1843" only as a synonym.

Verbena officinalis is not common in the USA outside of cultivation. At least some collections perhaps reflect plants that are persistent from cultivation and not clearly naturalized. Plants and populations along river banks in montane North Carolina, Tennessee, Virginia, and West Virginia, however, apparently have long been established, apparently naturalized, and often identified as *V. riparia*. It seems unusual that they would already have been well-established in these habitats by the time that Rafinesque observed them (in the 1820s or 1830s), but they appear to be similar to *V. officinalis* in all features. On the other hand, a number of collections identified as *V. officinalis* were made in the same regions in the 1840s through the 1890s—from Alabama, Delaware, Georgia, New Jersey, New York, North Carolina, Pennsylvania, Tennessee, Virginia, and others— suggesting that this species perhaps was cultivated at that time for its medicinal properties and commonly escaped to become more abundant then than it is now.

Additional collections identified as "*Verbena riparia*" (if not with exclamation, then as cited by Small and Vail 1893; Perry 1933; Moldenke 1964c). **North Carolina**. Stanly Co.: near falls of Yadkin, 18 Aug, 1891, *Small and Heller s.n.* (F). **Virginia**. [Isle of Wight County]: Ragged Island, [date], *Fernald and Long 12453* (NY). Smyth Co.: banks of Staley Creek at Marion, valley of Middle Fork of Holston River, 2200 ft, 16-? May 1892, *Small and Vail s.n.* (NY); banks of Cedar Creek, valley of Middle Fork of Holston River, 1900 ft, 16-? May 1892, *Small and Vail s.n.* (NY); bluffs of Middle Fork Holston River, near Marion, 2100 ft, 22 Jun 1892, *Small s.n.* (NY, OKL, TEX!, UC); Middle Fork, Holston River, 2100 ft, 1 Jul 1892, *Small s.n.* (BH-3 sheets, CAS, CINC, CM, DUKE, FLAS, NCU, NY, P, PENN, POM, US, WVA); Marion, 2100 ft, 6 Jul 1892, *Small s.n.* (ARIZ, GH, MO); Middle Fork Holston River, 6 Jul 1892, *Small s.n.* (CAN, CS, ISC, MO, NY-2 sheets, NYS, OC, US); about Marion, 2100 ft, 20 Jul 1892, *Small s.n.* (MO); Marion, Middle Fork Holston River, 6 Jul 1922, 2100 ft, *Small s.n.* (MO, SMU).

These collections, also from riverbanks and clearly the same species as those cited above as "*Verbena riparia*," were identified as *V. officinalis*: **Tennessee**. Carter Co.: banks of Doe River, 16-17 Jul 1891, *Small and Heller 84* (SMU), *Small and Heller 484* (MO); Knox Co.: Knoxville, roadside, Jul 1893, *Ruth s.n.* (MO). **Virginia**. Marion, 2100 ft, 29 Jun 1892, *Small s.n.* (MO)

In the protologue of *Verbena domingensis*, Urban (1908) noted that *V. officinalis* differs from *V. domingensis* in its more branching stems, smaller, mostly toothed (vs. pinnatifid or pinnately parted) leaves, and smaller flowers. Perry (1933) treated *V. domingensis* as a synonym of *V. officinalis*, but it was maintained as distinct by Moldenke (1964) and by Liogier (1957, 1994). The type collections of *V. domingensis* var. *cubensis* and *V. domingensis* forma *foliosa* appear to be of plants typical of *V. officinalis* in leaf morphology, suggesting that the smaller-leaved plants probably are populational variants of naturalized *V. officinalis*.

Early reports of *Verbena officinalis* from the Valley of Mexico confused its identification with *V. menthifolia* (fide Rzedowski & Rzedowski 1985). Moldenke (1964) cited as *V. officinalis* only a single collection from Mexico: Nuevo León, *Pennell 16880*, PH, MEXU, US); I have not seen this collection but the plants are probably *V. madrensis* or *V. menthifolia*. Most other collections from western states (e.g., Chihuahua, Durango, Sonora) originally determined as *V. officinalis* have proved to be *V. menthifolia*.

Verbena russellii Moldenke (cited above) from Sinaloa is unequivocally is *V. officinalis* sensu stricto. The only other representative of *V. officinalis* I have seen from Mexico was collected from the same immediate area as the type of *V. russellii*: Sinaloa. Maraton, 12 mi W of Culican, heavy clay of coastal plain, thorn forest, 100 ft, common annual, 14 Mar 1944, *Gentry 7011* (ARIZ).

A collection from Guatemala was cited as *Verbena menthifolia* by Moldenke (1964a) and Gibson (1970): Huehuetenango, between Nenton and Las Palmas, *Steyermark 51655* (US; cited by O'Leary et al. 2010 as *V. menthifolia*). I have not seen the Guatemala specimen, but distinctive plants (CAS-DS, TEX-LL, MO) from adjacent southeastern Chiapas, e.g., Amatenango del Valle, Comitán de Domínguez, Frontera Comalapa, Venustiano Carranza, near Trinitaria, near Cuahtémoc, and others, probably represent the same entity, definitely not *V. menthifolia*. These plants have relatively few spikes in a panicle, the fruits becoming remote proximally, and glandular rachises, but the leaves are uncharacteristically elongate (oblong-lanceolate) and the teeth and lobes are sharp-pointed. They are remarkably similar to the Australian native *V. officinalis* var. *gaudichaudii* Briq., recognized by Michael (1997) at specific rank. If not that same entity, they will be justifiably treated as a distinct species, previously undescribed.

Michael (1997) segregated at specific rank three native Australian taxa often identified as infraspecific taxa of *Verbena officinalis*: *V. macrostachya* F. Muell. (= *V. officinalis* var. *macrostachya* (F. Muell.) Benth.), *V. gaudichaudii* (Briq.) P.W. Michael (= *V. officinalis* var. *gaudichaudii* Briq.), and *V. africana* (Fernand. & Verdc.) P.W. Michael (= *V. officinalis* subsp. *africana* Fernand. & Verdc.). These taxa differ in vestiture, leaf shape, and corolla size, their treatment as species correlative with Michael's observation only that they are "sufficiently distinct" from *V. officinalis* sensu stricto, which is naturalized in Australia. Munir (2002), however, treated these three at varietal rank within *V. officinalis*, adding *V. officinalis* var. *monticola* Munir (native), *V. officinalis* var. *eremicola* Munir (native), and *V. officinalis* var *halei* (introduced) as inhabitants of Australia. Munir's explicit rationale also was minimal — he noted (p. 80) that "the present author believes that the above-named infraspecific taxa do not merit the status of species because they differ from the typical form chiefly by the size of their spikes and flower parts and dentation of leaf blades. These characters are very variable and there are intermediates between these taxa."

In review of the Australian taxonomic pattern, and to use Munir's ranks, vars. *gaudichaudii* and *africana* occur over broad ranges and are mostly sympatric with each other; each of vars. *eremicola*, *monticola*, and *macrostachya* has a narrowly restricted range and is allopatric with the other two, but all three occur within the broader ranges of vars. *gaudichaudii* and *africana*; var. *officinalis* and var. *halei* are each known from scattered collections over a broad area, essentially sympatric with vars. *gaudichaudii* and *africana*. Verdcourt (1992) observed that two entities—*V. officinalis* sensu stricto and *V. africana* sensu Michael—with "quite marked" differences occur together in South Africa. If morphology supports distinct recognition of the five Australian endemics, then each of them probably is appropriately treated at specific rank. *Verbena halei* clearly should be treated so.

In addition to those discussed above, a group of South American species also is hypothesized to be closely related to *Verbena officinalis*: *V. caniuensis* Moldenke, *V. demissa* Moldenke, *V. filicaulis* Schauer, *V. gracilescens* (Chamisso) Herter, *V. grisea* Rob. & Greenm., *V. swiftiana* Moldenke, and *V. townsendii* Svenson. These species are discussed in relation to the formal delimitation of series *Verbena* (Nesom 2010).

VERBENA HALEI Small, Bull. Torrey Bot. Club 25: 617. 1898. *Verbena officinalis* L. subsp. *halei* (Small) S. C. Barber, Syst. Bot. 7: 454. 1982. *Verbena officinalis* L. var. *halei* (Small) Munir, J. Adelaide Bot. Gard. 20: 93. 2002. **LECTOTYPE (**Moldenke 1963, p. 162**): USA**. Louisiana. No other collection information, *Dr. J. Hale 245* (NY-digital image!). Small cited "Hale 245," but the last digit of the collection number on the type label is somewhat ambiguous (either "5" or "3").

Verbena leucanthemifolia Greene, Pittonia 5: 135. 1903. **TYPE**. **USA**. Texas. Taylor Co.: Abilene, 19 May 1902, *S.M. Tracy 7996* (holotype: ND-G 43312; isotypes: GH, MO!, MSC, NY-digital image!, TEX! digital image!, US-digital image!). The ND-G sheet has the annotation of "type" in Greene's hand, fide Barbara Hellenthal.

Plants short-lived perennial to annual, taprooted. **Stems** mostly 1–3 from the base, erect, (25–)40–80 cm, glabrate to scabrous, or sparsely hirsute-strigose with upturned hairs on the ridges, eglandular. **Leaves** (basal and lower cauline) spatulate to ovate or oblong-obovate, margins coarsely toothed to incised, revolute, cauline reduced in size and narrower, 1–2-pinnatifid, upper cauline commonly bracteate, linear and entire, veins impressed adaxially, basal and proximal blades 2–6 cm x 7–25(–30) mm, strigose to strigillose adaxially, hirsute to hispid-hirsute abaxially, eglandular; petioles 10–60 mm. **Fruiting spikes** (3–)5–15 in panicles, elongate and slender, 8–25 cm, rachis eglandular; floral bracts ovate-lanceolate, 1.6–2.5 mm, shorter than the calyces. **Calyces** 2.2–3.2 mm, strigillose, eglandular, lobes deltate to triangular, not connivent. **Corollas** bluish to lavender-blue or purple,

rarely white, tubes 3–4 mm, 0.8–1 mm longer than the calyx, limbs 4–5(–7) mm in diam. **Nutlets** separating at maturity, 1.6–2 mm, commissural faces ending below the nutlet tips, with bullate to papillate plates. 2n = 14.

Flowering Mar–Jun(–Oct). Rocky hillsides, prairies, pastures, fields, beaches, dunes, shell banks, post oak, pine, cedar glades, oak-mesquite, mesquite, roadsides, disturbed sites; 5–200(–800) m; Alabama, Arkansas, Florida, Georgia, Louisiana, Missouri, Mississippi, North Carolina, Oklahoma, South Carolina, Texas; Mexico (Coahuila, Nuevo León, Tamaulipas, Sonora, Veracruz); introduced in Australia.

Verbena halei is a distinctive North American species. With *V. officinalis* it shares closely strigillose calyces, small corollas, and mostly glabrate to sparsely hirsute-strigose stems, but the two taxa are continentally disjunct in native range and discontinuous in morphology. *Verbena halei* is completely eglandular, it produces more numerous spikes often in congested panicles, and the leaves are primarily basal and proximal and thicker with revolute margins and veins impressed adaxially.

Barber's submergence of *Verbena halei* into *V. officinalis* (1982) was based on her encounter of specimens of the former misidentified as the latter. "These misidentifications were often justified because the plants would really fit neither taxon because of some intermediate character exhibited by the specimen. The problem of deciding which species a specimen belongs to would be solved with the merger …" (p. 452). In contrast to Barber's assessment, and in agreement with Perry (as noted above), *V. officinalis* is as similar or more to *V. menthifolia* than to *V. halei* (though probably not most closely related to each other (see Nesom 2010). And because of the rarity of *V. officinalis* (naturalized or otherwise) within the geographic range of *V. halei*, the two rarely if ever have the opportunity even to hybridize, much less to intergrade. They can be separated by these contrasts.

1. Basal and lower cauline leaves persistent, relatively thick, large and spatulate, margins revolute, cauline leaves quickly reduced in size distally and becoming linear-entire; rachis and calyces eglandular ..... **Verbena halei**
1. Basal leaves usually deciduous, relatively thin, margins not revolute, cauline leaves relatively even-sized upwards or largest near midstem; rachis and calyces stipitate-glandular ..... **Verbena officinalis**

Moldenke (1963) cited collections of *Verbena halei* from Durango (*Waterfall & Wallis 13371*, TEX, = *V. menthifolia*!), Querétaro (*Arsene 10242*, MO! = *V. menthifolia*!), Sinaloa (*Gentry 7011*, ARIZ, = *V. officinalis*!, see comments above), and Chihuahua (*Pringle s.n.*, 11 Apr 1887, not seen). All other collections that I have seen from Chihuahua, Durango, Sinaloa, and Sonora identified as *Verbena halei* by Barber and by Moldenke have instead been *V. menthifolia*. Collections identified as *V. halei* from Arizona (SEINET 2009; Kearney & Peebles 1960; Moldenke 1963) either have proved to be or apparently are *V. menthifolia*. I have not seen evidence that *V. halei* occurs further west in the USA than Texas. The single collection upon which attribution of *V. halei* to the New Mexico flora has been based (Otero Co., *Jones 26229*) is identified here as *V. menthifolia* (see comments above). A collection from southeastern New Mexico previously identified as *V. menthifolia* (Chaves Co., as cited by Peterson and David 1998, see comments above under *V. menthifolia*) instead probably is *V. halei*, but I have not seen a voucher.

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Figure 1. Holotype of *Verbena madrensis* Nesom.

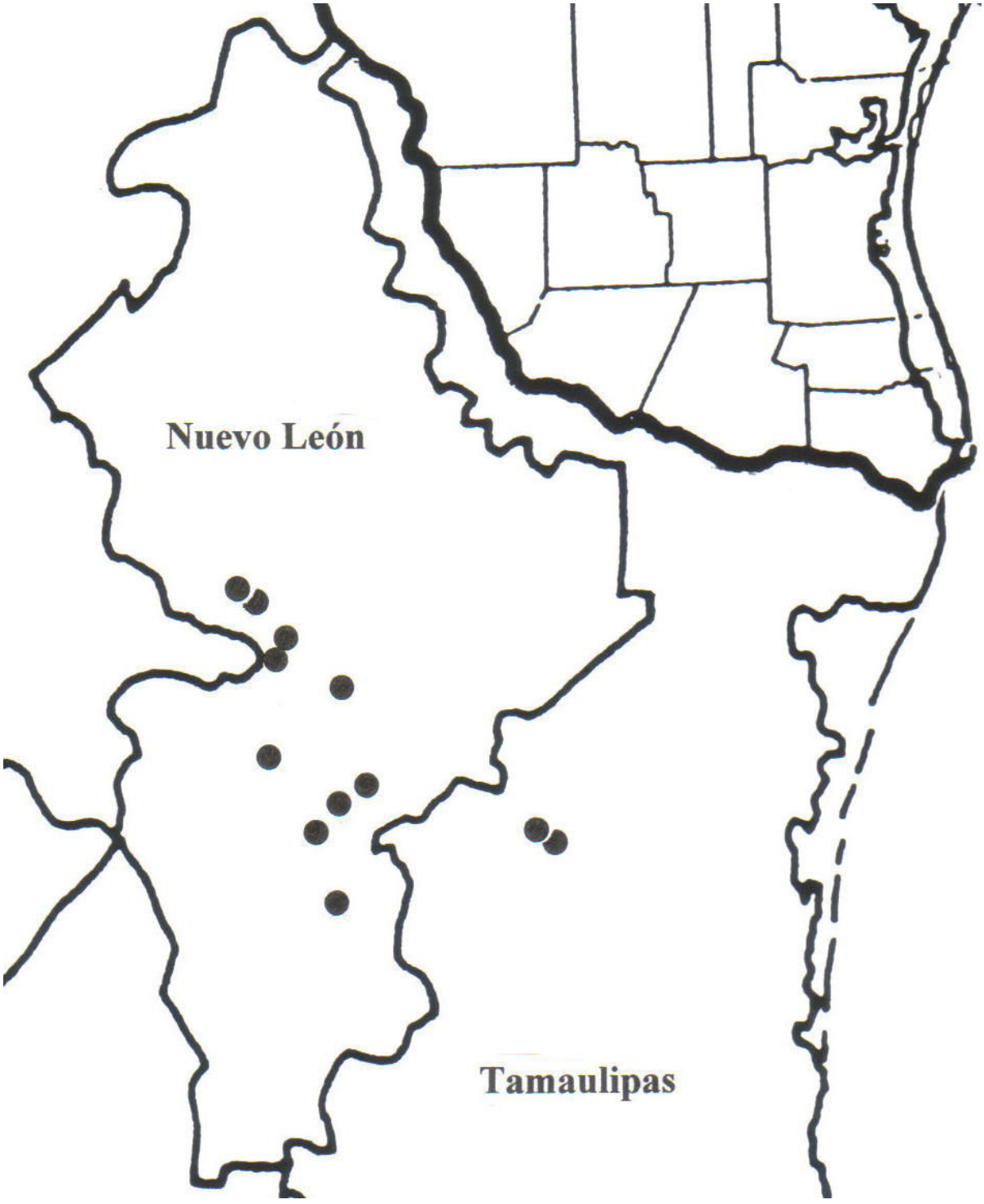

Figure 2. Geographic distribution of *Verbena madrensis* Nesom.