

H747
V. 78
#6

PHYTOLOGIA

An international journal to expedite plant systematic, phytogeographical
and ecological publication

Vol. 78

June 1995

No. 6

CONTENTS

TURNER, B.L., A new species and new combination in Mexican <i>Sedum</i> (Crassulaceae).....	405
HURTER, P.J.H., Two newly described cycads from Africa.....	409
REEDER, C.G. & J.R. REEDER, The resurrection of a species; <i>Muhlenbergia straminea</i> (Gramineae).....	417
ENQUIST, M. & B. CROZIER, <i>Anemone tuberosa</i> (Ranunculaceae) in Texas.....	428
TURNER, B.L., <i>Paronychia virginica</i> (Caryophyllaceae), a first report of its occurrence in México.....	446
TURNER, B.L., Synoptical study of <i>Rhododon</i> (Lamiaceae).....	448
Index to authors, volume 78.....	452
Index to taxa, volume 78.....	453
Back issues available.....	510
Index to reviewers, volume 78.....	511

LIBRARY

DEC 11 1995

NEW YORK
BOTANICAL GARDEN

PHYTOLOGIA (ISSN 00319430) is published monthly with two volumes per year by Michael J. Warnock, 185 Westridge Drive, Huntsville, TX 77340. Second Class postage paid at Huntsville, TX. © 1995 by PHYTOLOGIA. Annual domestic individual subscription (12 issues): \$40.00. Annual domestic institutional subscription (12 issues): \$44.00. Foreign and/or airmail postage extra. Single copy sales: current issue and back issues volume 72 to present: \$4.00; back issues (previous to volume 72): \$3.00; add \$0.75 per copy postage and handling US [\$1.50 per copy foreign]). Back issue sales by volume: \$17.00 per volume 42-71 (not all available as complete volumes); \$21.00 per volume 72-present; add \$3.00 per volume postage US (\$6.00 per volume foreign). POSTMASTER: Send address changes to Phytologia, 185 Westridge Drive, Huntsville, TX 77340-8916.

A NEW SPECIES AND NEW COMBINATION IN MEXICAN *SEDUM*
(CRASSULACEAE)

B.L. Turner

Department of Botany, University of Texas, Austin, Texas 78713 U.S.A.

ABSTRACT

A new species of *Sedum*, *S. hintoniorum* B.L. Turner, is described from southern Nuevo León and closely adjacent Tamaulipas, and *S. rhodocarpum* subsp. *edwardsii* R.T. Clausen is elevated to specific rank as *S. edwardsii* (R.T. Clausen) B.L. Turner, *comb nov.* An account of their relationships to closely related taxa is given, and a map showing their distributions is presented.

KEY WORDS: Crassulaceae, *Sedum*, México, Nuevo León, Tamaulipas

Routine identification of plants from northeastern México has revealed the following novelty.

SEDUM HINTONIORUM B.L. Turner, *spec. nov.* TYPE: MEXICO. Nuevo León: Mpio. Zaragoza, Cerro Viejo, 2085 m, 1 Oct 1993, *Hinton et al.* 23797 (HOLOTYPE: TEX!; Isotypes: GH!, MEXU!).

Sedo caduco R.T. Clausen *similis sed differt caulibus non sigillatim papilloso, foliis viridibus (vs. rubescentibus), petalis lanceolatis (vs. cucullatis ad apicem), et antheris purpurascensibus (vs. flavidis).*

Ascending to recumbent perennial herbs 15-20 cm high. Roots forming fusiform tubers 1-2 cm long, 0.2-0.5 cm across. Lower stems suffruticose, glabrous, the epidermal cells elongate but bulging; upper stems and branches of inflorescence similar to the lower but upon drying seemingly winged, the uppermost portions appearing subpapillose. Leaves alternate, oblanceolate, those at midstem ca. 2 cm long, 0.4 cm wide, glabrous, smooth. Flowers arranged in terminal, relatively open, paniculate cymes 3-5 cm across and about as wide, or else arranged in leafy 1-sided flowering branches. Sepals 5, unequal, free, ovate-lanceolate to oblanceolate, 2-4 mm long. Petals 5(-4), 4-6 mm long, 1-2 mm wide, broadly lanceolate, the upper portion often with a green or rosy mid-rib, the apices decidedly acute, reflexing at maturity.

Nectaries much-reduced, reniform, white. Stamens ca. 5 mm long, the anthers purple or purplish. Pistils 4-5 mm long, erect to somewhat spreading at maturity, the beak ca. 1.5 mm long. Seeds ovoid, ca. 0.7 mm long, brown, minutely papillose.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Nuevo León: Mpio. Aramberri, Cerro Viejo, 2485 m, 20 Nov 1993, *Hinton et al.* 23981 (TEX). Mpio. Galeana, Agua Blanca to San Miguel, 1985 m, 28 Aug 1991, *Hinton et al.* 21297 (TEX). Mpio. Zaragoza, Cerro Viejo, 1935 m, 6 Oct 1992, *Hinton et al.* 22455 (TEX). Tamaulipas: Mpio. Hidalgo, Arroyo Oscuro, 2 rd. mi NE of Paraje Los Caballos, 1800 m, 23 Sep 1994, *Nesom 7500* (TEX).

Sedum hintoniorum occurs in pine-oak woodlands from 1800-2100 m where, according to label data, it forms colonies on bare boulders or exposed rocky places. The specimen from Tamaulipas (growing in humid woods with *Carya* spp., *Cornus*, *Carpinus*, and *Dirca*) differs somewhat in possessing smaller flowers (these obviously immature).

In Clausen's 1984 account of *Sedum* for the Mexican Cordillera, flowering specimens of *S. hintoniorum* will key to or near *S. caducum* R.T. Clausen, a white-flowered species known only from type material collected in Tamaulipas, México, near Ciudad Victoria at 610 m. His description of the habit (stiffly erect), stems (papillose), leaves ("prominently speckled with red and appearing reddish"), inflorescence (2-3 parted cymes with 2-7 flowers), petals hooded at apex, basal fusion of petals (0.8 mm), anther color ("pale yellow to pale carmine"), differs markedly from the species described here.

It is a pleasure to name this distinctive species for the remarkable G.B. Hinton (and his extended family), the latter having assembled most of the specimens cited herein. I am well aware that there already exists a *Sedum* with the name *S. hintonii* R.T. Clausen, named for the late G.B. Hinton (1882-1943), fount of this clan and father of Jaime and grandfather of George (collectors of the present taxon). But such an extraordinary lineage, in my opinion, is fully deserving of the appellations concerned, as well documented in Hinton & Hinton (1995) showing their collecting activities in northeastern México.

SEDUM EDWARDSII (R.T. Clausen) B.L. Turner, *comb. & stat. nov.*
BASIONYM: *Sedum rhodocarpum* Rose subsp. *edwardsii* R.T. Clausen, *Sedum Mexic. Cordill.*, Plat. 7. 1981.

As noted by Clausen, who treated the taxon as a subspecies of *Sedum rhodocarpum*, *S. edwardsii* is closely related to *S. rhodocarpum* but differs in numerous characters, including leaf shape and vestiture; the latter character is especially diagnostic, all of the collections listed below possessing pilose stems and foliage, while *S. rhodocarpum* is completely glabrous.

The following collections of *Sedum edwardsii* have come to the fore since Clausen's description of the taxon. MEXICO. Tamaulipas: Mpio. Hidalgo, Los Caballos, 1705 m, 21 Sep 1994, *Hinton et al.* 25143 (TEX); El Mirador, 895 m, *Hinton et al.* 25147; 11.4 mi E of Dulces Nombres, 0.3 road mi W of Paraje de Los Caballos, 1840 m, 21 Sep 1994, *Nesom 7456* (TEX).

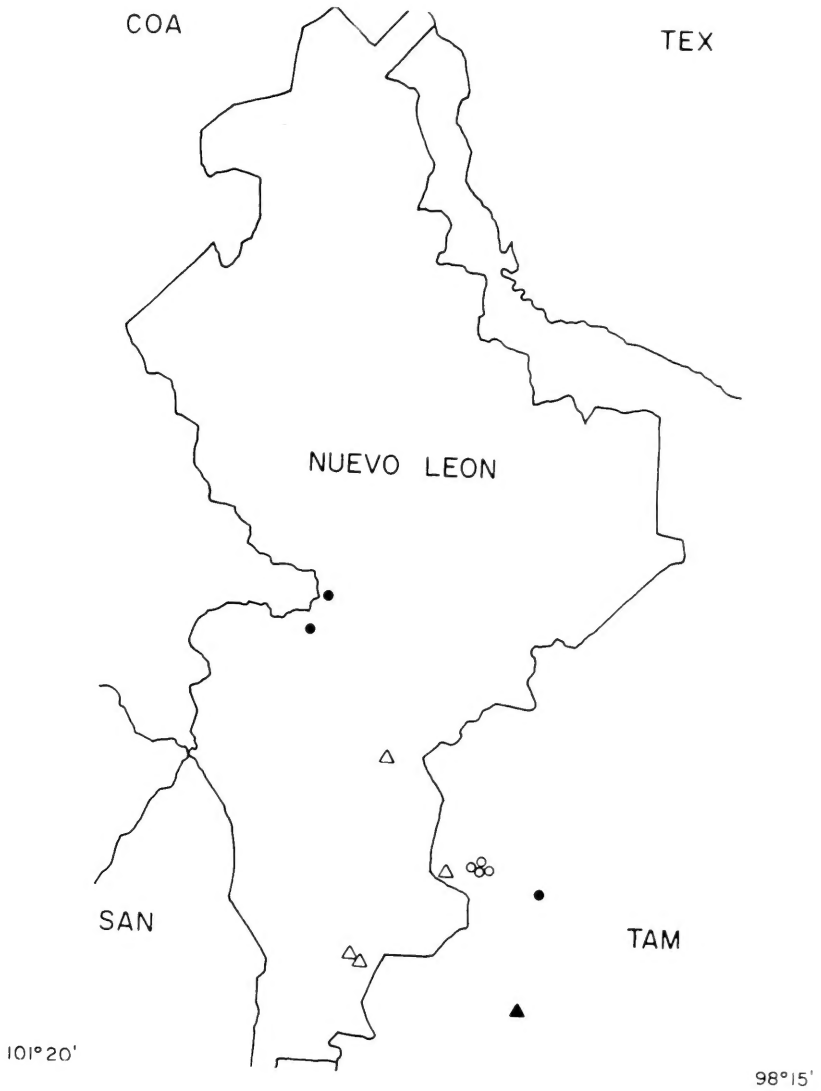


Figure 1 Distribution of *Sedum* spp: *S. caducum* (solid triangle); *S. hintoniiorum* (open triangles); *S. edwardsii* (open circles); *S. rhodocarpum* (closed circles).

None of these collections contained material referable to *Sedum rhodocarpum*, however, Hinton's collection 25147 (from 857 m) differs from the other specimens listed in reportedly having green petals. Only two plants of the latter were observed at the locality concerned, according to the collectors.

ACKNOWLEDGMENTS

I am grateful to Guy Nesom for the Latin diagnosis, and to him and Mark Mayfield for reviewing the manuscript.

LITERATURE CITED

- Clausen, R.T. 1984. *Sedum* (Crassulaceae) of the Mexican Cordilleran Plateau. *Gentes Herb.* 12:8-48.
- Hinton, J. & G.S. Hinton. 1995. Checklist of Hinton's collections of the flora of south-central Nuevo León and adjacent Coahuila. *Acta Bot. Mex.* 30:41-112.

TWO NEWLY DESCRIBED CYCADS FROM AFRICA

P. J. H. Hurter

Lowveld National Botanical Garden, P. O. Box 1024, NELSPRUIT, 1200, Republic of South Africa.

ABSTRACT

Recent intensive field study of *Encephalartos* in Uganda and South Africa reveal two overlooked species. The nature of these entities, their distribution, and conservation status is discussed.

KEY WORDS: *Encephalartos*, new species, Zamiaceae

Encephalartos nubimontanus P.J.H. Hurter, *spec. nov.* TYPE: SOUTH AFRICA. Northern Province: 1,000 m alt., (leaf and male cone). 27 March 1995, P.J.H. Hurter 95R/1. (HOLOTYPE: PRE). (Figure 1).

E. cupidus R.A. Dyer frondes rigidae, pungentes, glaucas similis sed plantae arborescentes; frondes recurvae et sessilibus; foliola falcata; microsporophylla demissa; bullae labiatae.

Plant arborescent, suckering from the base. Trunk often decumbent, up to 2.5 m long, 350-400 mm diameter. Leaf bases persistent, crown slightly tomentose. Cataphylls velvety white, becoming sub-glabrous with age. Leaves numerous in a dense crown, apically recurved, rigid, glaucous, 1.1-2.0 (1.4) m long, pinnac ascendant. Petiole apparent, slightly trigonous, basally bulbous, 230 mm long, slightly tomentose with a reddish brown collar at maturity. Rachis glabrous, round in cross-section, becoming yellow with age. Pinnac dentate or entire, veins not raised abaxially, margins slightly thickened, inflexed, directed toward the frond apex at an angle of circa 45° to the rachis, opposing leaflets inflexed, set at an angle of circa 70° to each other, oriented incubously towards each other; proximal leaflets gradually reduced to a series of spines; median leaflets 180-250 mm long, 15-25 mm wide, outer lamina edge falcate, narrowly elliptic, gradually acuminate apically, pungent, basally sessile to the rachis, apices somewhat turned toward the frond apex. Strobili seriate, dimorphous, glabrous; scale facets smooth, light green. Microsporangiate strobili 1-5 per trunk, subconical, 250-400 mm long, 50-90 mm in diameter, stalked on a peduncle 30-45 mm long. Median microsporophylls slightly descending, lamina

oblong, tapering to the base, 11-24 mm wide, 20-30 mm long, 5-10 mm high, margins contracted to the pedicel, bulla with two trapezoidal lateral facets, without median facet but well defined hump-like sagittal ridge; terminal facet a drooping lip-like structure, often slightly crenulate. Megasporengiate strobili 1-3 per trunk, ovoid, 360-400 mm long, 180-200 mm in diameter, with peduncle 360-400 mm long, 180-200 mm in diameter, with peduncle up to 150-310 mm long. Terminal sterile megasporophyll bullae drawn out into ascending lip-like structures. Median megasporophylls rhombic, 40-60 mm wide, 50-60 mm long, and 350-360 mm high. Bulla with two smooth or slightly verrucose trapezoidal lateral facets and a single smooth or slightly verrucose oblong median facet, terminal facet smooth, slightly concave, 3-5 mm deep, lateral ridges slightly drawn out, sagittal crest verrucose, drooping below the pedicel, seminal ridges smooth or slightly sagittate. Seed circa 200 per cone, sarcotesta orange-red, sclerotesta 35-38 mm long, 23-30 mm in diameter, ellipsoidal, round and smooth.

Plants of *Encephalartos nubimontanus* superficially resemble those of *Encephalartos cupidus* R.A. Dyer (Dyer 1971) by their stiff, pungent, glaucous fronds. However, *E. nubimontanus* can at first glance be distinguished from that species by its arborescent habit, robust nature, and long recurved leaves. Vegetatively, *E. nubimontanus* is easily distinguished from *E. cupidus* by its longer, often nearly sessile fronds. In *E. cupidus* the median pinnae are oblong lanceolate, unlike the normally falcate, often marginally dentate pinnae of *E. nubimontanus* (an ecotype that has thus far been observed only in cultivation and not in habitat, produces a lamina dentate to nearly lobed on both sides and is thus not falcate). Cones are also distinctive. The female cones of *E. nubimontanus* have sterile terminal megasporophyll bullae that are drawn out into ascending lip like structures, which is not the case in *E. cupidus*. In the male cones of *E. nubimontanus* the median microsporophylls are slightly descending with bullae drawn out into lip-like structures, while the median microsporophylls of *E. cupidus* are spreading with bullae not drawn out.

Distribution and Habitat: At present this species is known only from one small area in the Northern Province, at an altitude of 1000 m. Plants grow scattered in mixed deciduous woodland, especially on cliff faces.

Material Studied: To protect plants from poachers, precise localities are not given, and grid references are restricted to a 1:250,000 scale. 2430 Pilgrim's Rest: *P.J.H. Hurter 95R/1* (leaf and male cone, PRE, holotype), *95R/2* (leaf and female cone, PRE), *95R/3* (leaf), *95R/4* (leaf), *95R/5* (leaf and male cone), *95R/6* (leaf), *95R/7* (leaf and male cone), *95R/8* (leaf and male cone).

Encephalartos whitelockii P.J.H. Hurter, *spec. nov.* TYPE: UGANDA: Mpanga River Falls, 1,200 m alt. 27 October 1994, *P.J.H. Hurter 94U/3a* (leaf and median section of microstrobilus [HOLOTYPE: PRE]). (Figure 3).

E. hildebrandtii A. Br. & Bouché propter folia rigidi, dentati, pungentia similis sed frondes planae, leviter recurvatae; foliola effusa nonsuperposita ad apicem frondes apicem versus; microstrobilis laxus; microsporophylla patentia; megasporophylla demissa.

Plant arborescent, suckering from the base. Trunk up to 3.5 m long (rarely to 4.2 m), 350-400 mm in diameter. Leaf bases persistent. Leaves numerous in a dense crown, apically recurved, rigid, subsessile, green, 3.1-3.4(-4.1) m long. Petiole basally bulbous, to 130 mm long, glabrous. Rachis tomentose, becoming glabrous with age. Pinnae dentate, veins not raised abaxially, margins slightly revolute, spreading, opposing leaflets set at an angle of about 160° to each other, not overlapping, but succubously oriented, proximal leaflets gradually reduced to a distinct series of spines. Median leaflets 230-300 mm long and 20-28 mm wide, narrowly elliptic and falcate, gradually acuminate apically, pungent and subsessile basally, apically somewhat turned towards the frond apex. Strobili seriate, dimorphous, glabrous with smooth scale facets, light green becoming yellow with age. Microsporangiate strobili up to 5 per trunk, narrowly ovoid, 500 mm long and 90 mm in diameter, stalked on a peduncle to 320 mm long. Median microsporophylls rhombic, about 29 mm wide, 32 mm long, and 14 mm high, distinctly with two lateral facets and one median facet, the central facet flat or slightly concave. Megasporangiate strobili 1-3 per trunk, ovoid, 450 mm long, 350 mm in diameter, appearing sessile but with peduncle to 100 mm long, cloaked by cataphylls in the trunk crown. Median megasporophylls descending in appearance, rhombic, with two lateral facets and one central facet, slightly drawn out, seminal fringe slightly verrucose, about 55 mm wide, 40 mm long, and 30 mm high with central facet a third of the horizontal diameter of the bulla. Seed about 400 per cone, sarcotesta orange-red; sclerotesta 30-35 mm long and 25-30 mm in diameter, ellipsoidal, round and smooth.

Diagnostic features and affinities: *Encephalartos whitelockii* superficially resembles *E. hildebrandtii* A. Br. & Bouché (Melville 1957, 1958) because of its stiff dentate and pungent green leaves. However, even vegetatively it is easily distinguished from this species. In *Encephalartos hildebrandtii* the pinnae are ascending, succubously overlapping and falcate with the apices directed toward the base of the leaf. In *E. whitelockii* the pinnae are spreading, not overlapping, and falcate with the apices directed toward the apex of the leaf. Profound differences are also observable between the strobili. Microstrobili of *E. whitelockii* are pendulous at maturity while those of *E. hildebrandtii* are erect. The microsporophylls of *E. whitelockii* are spreading while those of *E. hildebrandtii* are strongly ascending. The megasporophylls of *E. hildebrandtii* are spreading and the bullae are not drawn into descending structures as with those of *E. whitelockii*.

Distribution: At present this species is known only from one area along the Mpanga River, Western Uganda (Figure 4).

Material Studied: UGANDA: Mpanga River falls, 2 km west of Lake George, P.J.H. Hurter 94U/5, 94U/3a.

This species is named for Loran M. Whitelock, horticulturist and cycadologist, who has made most of my recent exploration of central and east Africa possible and who has devoted a life time to cycads.

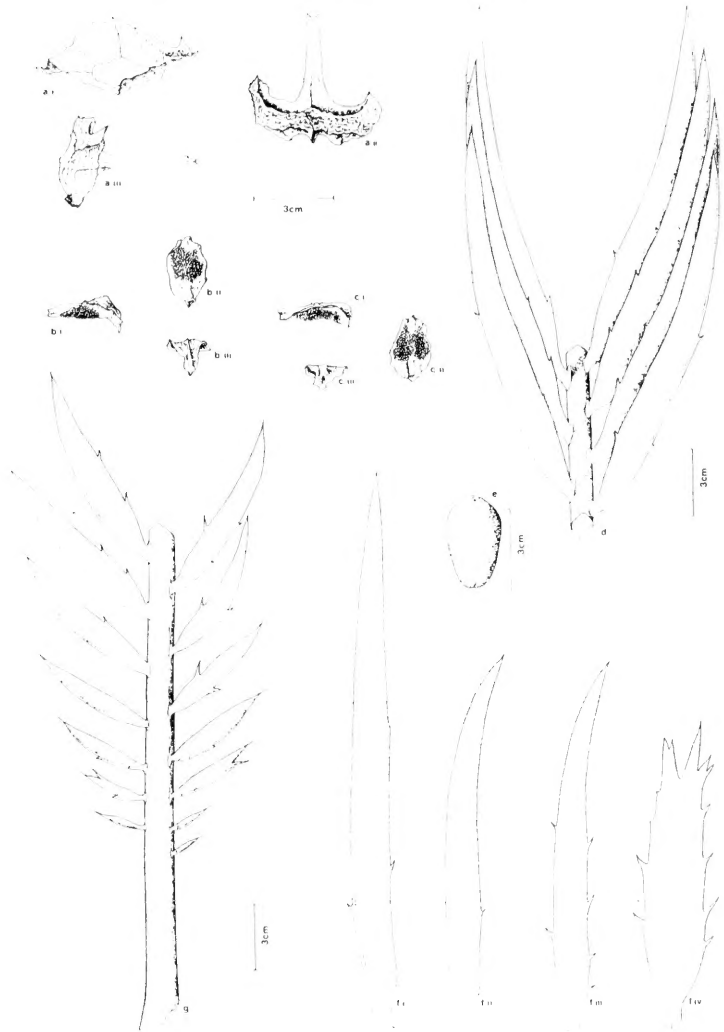


Figure 1. *Encephalartos nubimontanus*: (a) median megasporophyll (*P.J.H. Hurter 95R/2*), (i) frontal view, (ii) adaxial view, (iii) side view; (b) median microsporophylls (*P.J.H. Hurter 95R/5*), (i) side view, (ii) abaxial view, (iii) frontal view; (c) median microsporophylls (*P.J.H. Hurter 95R/8*), (i) side view, (ii) abaxial view, (iii) frontal view; (d) median pinnae (*P.J.H. Hurter 95R/1*); (e) seed (*P.J.H. Hurter 95R/2*); (f. i-iv) a range of pinnae shapes observed within the new species; (g) petiole and proximal pinnae (*P.J.H. Hurter 95R/1*). (del. S. Burrows).

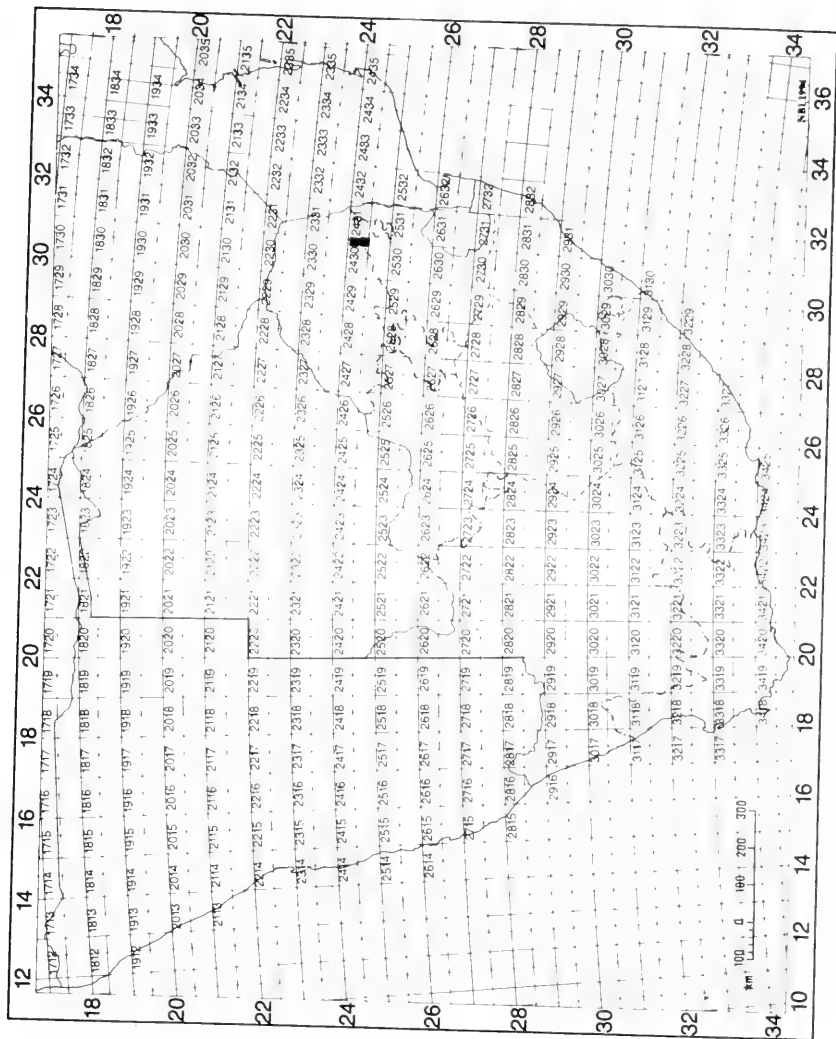


Figure 2. *Encephalartos nubimontanus*: known distribution in South Africa.

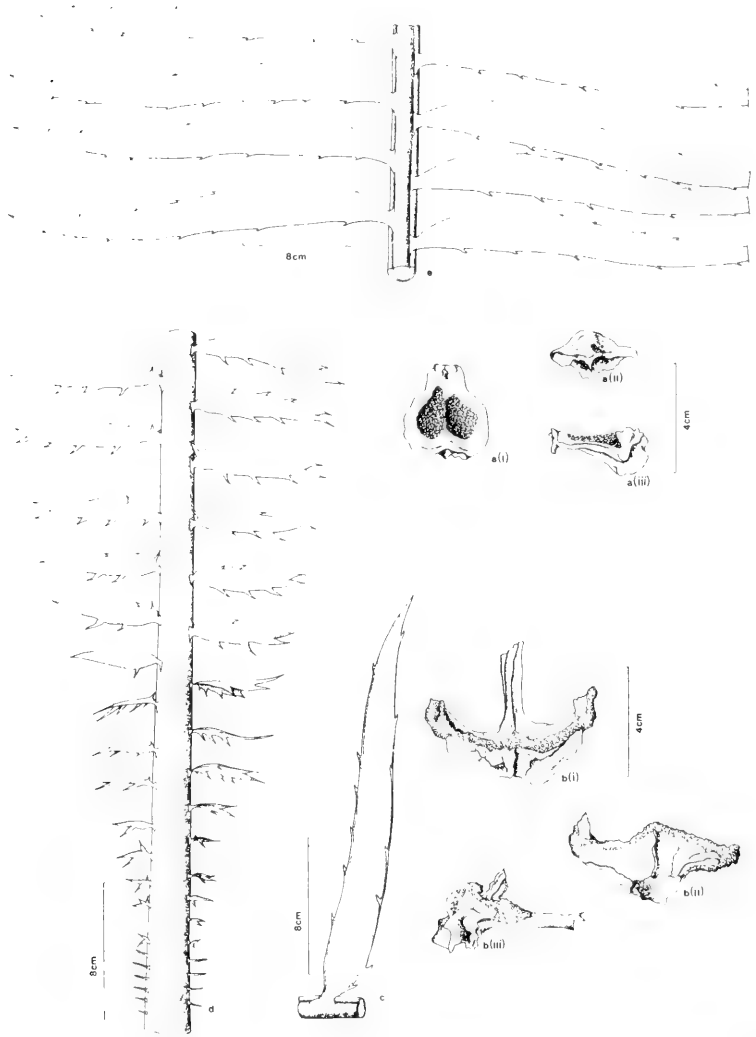


Figure 3. *Encephalartos whitelockii* (a) median microsporophyll (P.J.H. Hurter 94U/3a), (i) abaxial view, (ii) frontal view, (iii) side view; (b) median megasporophyll (P.J.H. Hurter 94U/5) (i) adaxial view, (ii) frontal view, (iii) side view; (c) median pinna; (d) petiole and proximal pinnae (P.J.H. Hurter 94U/3a).

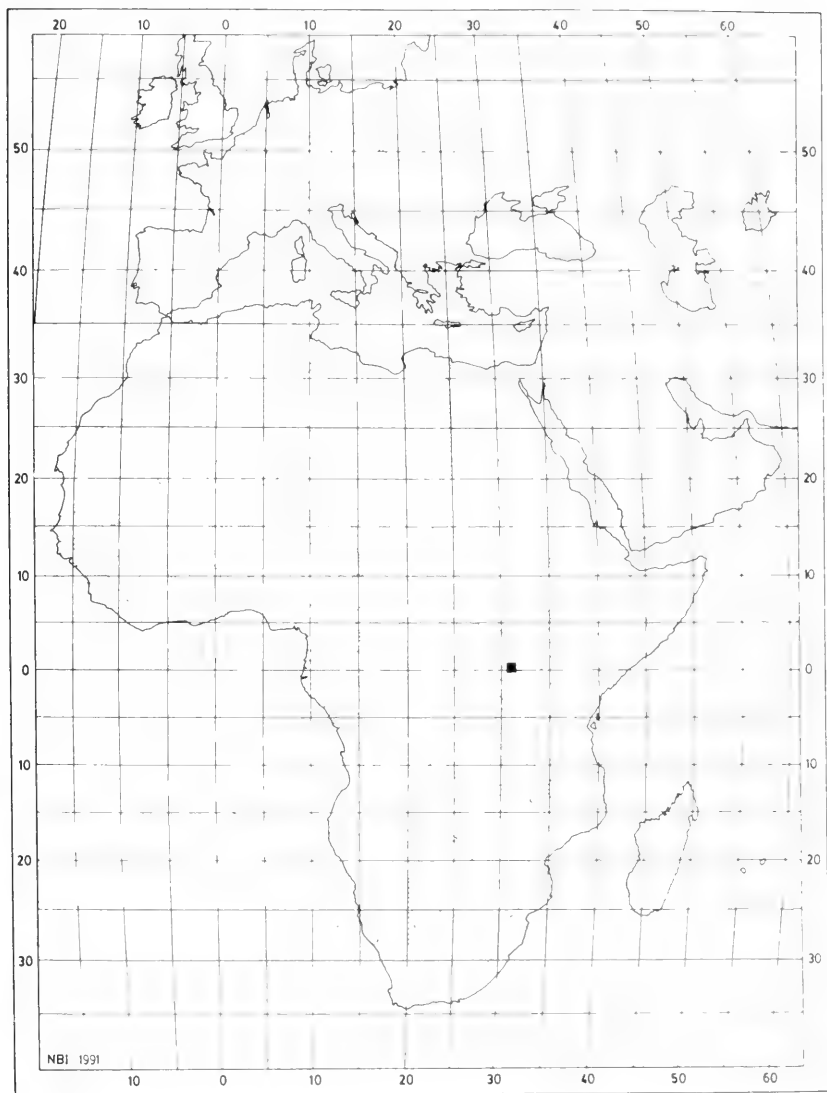


Figure 4. *Encephalartos whitelockii*: known distribution in Uganda.

ACKNOWLEDGMENTS

Research in South Africa and Uganda was supported by the National Botanical Institute and Loran M. Whitelock. Sandie Burrows is thanked for the art work in Figures 1 and 3.

REFERENCES

- Dyer, R.A. 1971. A further new species of cycad from the Transvaal. *Bothalia* 10:370-383.
- Melville, R. 1957. *Encephalartos* in Central Africa. *Kew Bull.* 12:237-257.
- Melville, R. 1958. Gymnospermae. in *Flora of Tropical East Africa*. pp 3-10. Crown Agents, London, Great Britain.

THE RESURRECTION OF A SPECIES; *MUHLENBERGIA STRAMINEA* (GRAMINEAE)

Charlotte G. Reeder & John R. Reeder

Herbarium (ARIZ), 113 Shantz Building, University of Arizona, Tucson, Arizona
85721 USA

ABSTRACT

Muhlenbergia straminea, described by Hitchcock (1913), was recognized as a distinct species until 1935 when he relegated it to synonymy under *M. virescens* (H.B.K.) Kunth, a disposition that has been followed by all subsequent authors. The present study, based on morphology, distribution, and time of flowering presents strong evidence for the recognition of *M. straminea* as a species distinct from *M. virescens*. Although quite unexpected, we believe it is highly significant that meiosis occurs in the anthers of *M. straminea* in the autumn preceding flowering the following spring.

KEY WORDS: Gramineae, *Muhlenbergia straminea*, *M. virescens*, *M. curvula*, *M. quadridentata*, México, southwestern U.S.A.

Continuing field and herbarium studies, along with examination of type specimens, have revealed the need to re-evaluate certain members of the *Muhlenbergia montana* complex. This group includes species most easily recognized by the 3-nerved (often 3-toothed and/or 3-awned) second glume and lower sheaths which become flat, somewhat papery, and no longer invest the culm. A number of species, most of which occur in México, make up this taxonomically puzzling assemblage of both annual and perennial grasses. Of immediate concern is the perennial *M. virescens*, a taxon said to range from Central México to Arizona and New Mexico, U.S.A. The species is based on *Podosaemum virescens* H.B.K. (1816), which was described from a plant collected by Humboldt & Bonpland in 1803 in the state of Guanajuato, México: "Crescit locis asperis, excelsis regni Mexicani prope Santa Rosa de la Sierra et Puerto de Varietos, alt. 1350 hexap. [ca. 2400 m]. Floret Septembr." The type specimen (P!) is fragmentary, consisting of a segment of culm with an inflorescence partially included in the upper sheath, another short section of culm with leaf attached, and a separate leaf. Written on the sheet is the locality, "S. Rosa." The description is quite ample, and along with the type specimen, gives an adequate conception of the species. Numerous specimens (including our own) collected in the mountains of Guanajuato can be determined as this species with little difficulty. The

transfer to *Muhlenbergia* was made by Trinius (1824), some five years before Kunth (1829) as cited by Hitchcock (1913, 1935, 1935a, 1951). Prior to 1913, Trinius was given as the authority for this transfer. It is noteworthy that Kunth (1833) recognized the Trinius combinations.

There has been, and continues to be, confusion regarding the range of *Muhlenbergia virescens*. Roemer & Schultes (1817), Hemsley (1885), and Fournier (1886) repeat the distribution as given in H.B.K. (1816), which suggests that the species is confined to Central México. Fournier often cited other collections but here listed only the type number. Hemsley's work, based largely on Fournier, included no additional information.

Meanwhile Scribner (1882) published a detailed list of grasses collected by C.G. Pringle in Arizona and California during the summer of 1881. Included (p. 88, 89) is: "32. *Muhlenbergia virescens*, Trin., *Unifl.*, 193; Kunth, *Enum. Pl.* i, 202, et *Suppl.* 160; *Podosaemum virescens*, H B K., *Nov. Gen.*, i, 132; *Trichochloa virescens*, R. & S., *Syst.*, ii, 389." One finds (p. 88, 89) a rather lengthy description of a plant collected on "Summits of the Santa Rita Mts., Arizona. . . . This species resembles *M. gracilis* Trin., in habit, but is distinguished at once by its very long involute leaves and light colored, more loosely flowered panicle." [*M. gracilis* sensu Amer. auct. is considered to be *M. montana* (Nutt.) Hitchc. True *M. gracilis* (H.B.K.) Trinius is not a synonym of *M. montana* but a related species.] Lastly this comment (p. 89): "This is a Mexican grass, not before observed in the distributed collections made within the limits of the United States, and perhaps now found for the first time within our limits. It should be added that identification of Pringle's specimens with *M. virescens* Trin., is based upon descriptions of that plant only."

This report by Scribner (1882) of the occurrence of *Muhlenbergia virescens* in the Southwestern United States appears to account for Vasey (1883, 1892), Beal (1896), and subsequent authors having added Arizona and New Mexico to its range. Vasey (1892) included a detailed description of *M. virescens* stating (p. 67): ". . . New Mexico, Arizona, and Mexico." Hitchcock (1913), in *Mexican Grasses*, indicated that the range of *M. virescens* extended from central México into New Mexico and Arizona. Two years later Wootton & Standley (1915), in their *Flora of New Mexico* cited (p. 72) "18. *Muhlenbergia virescens* (H.B.K.) Kunth" [obviously following Hitchcock 1913], quoting the type locality from H.B.K. The range is given as "Arizona and New Mexico to Mexico." There is no description; however two collections are cited: *Palmer* from northwestern New Mexico, and a *Bigelow* gathering from Ben More (sic!) [a peak near Santa Rita, in eastern Grant County]. A specimen (at US) collected by Edward Palmer *s.n.* [no date] gives only "State of New Mexico."

Hitchcock (1913, p. 301) listed *Muhlenbergia virescens* (H.B.K.) Kunth, *Rév. Gram.* 1:64. 1829. He indicated that it is based on *Podosaemum virescens* H.B.K., and quoted the type locality from the original description. The range, however, includes New Mexico and Arizona. Three collections from México are listed: *Rose* 3527 from Sierra Madre, Zacatecas, and two *Parry & Palmer* numbers (920 and 928 in 1878), both from San Luis Potosí.

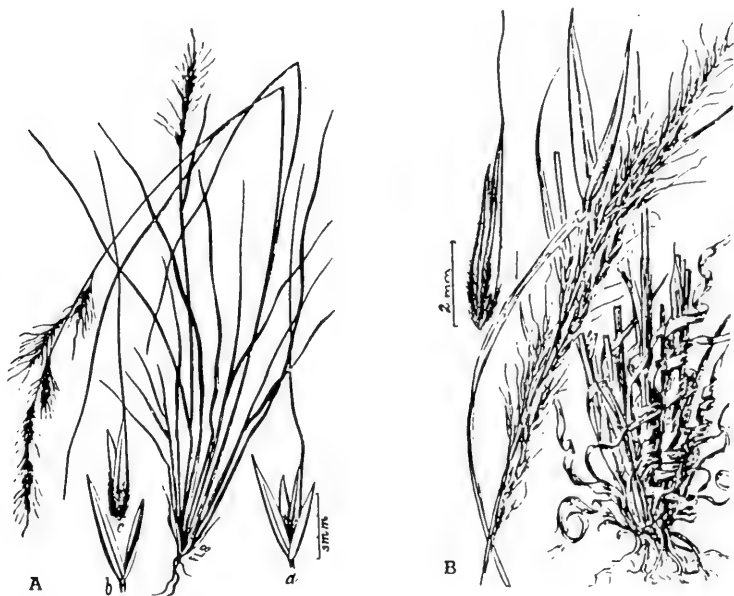


Fig. 1. Habits and spikelet details. A, *Muhlenbergia virescens*, from Scribner (1897); B, *M. straminea*, from Hitchcock (1951).

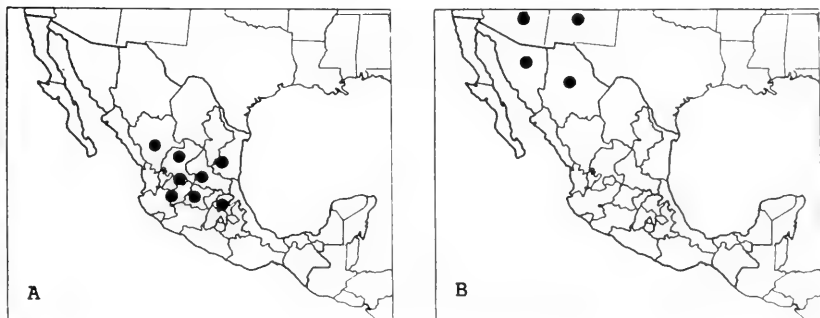


Fig. 2. Distributions of A, *Muhlenbergia virescens* and B, *M. straminea*.

TABLE I

Chromosome Numbers for *Muhlenbergia straminea* and *M. virescens* (All collections are Reeder & Reeder, with vouchers deposited at ARIZ.)

<i>Muhlenbergia straminea</i>		
Collection	2n	Locality
6903	21	AZ: Cochise Co., Chiricahua Mts., Rustler's Park Campground. 2530 m 16 Oct. 1977.
6906	22	AZ: Pima Co., Santa Catalina Mts., near Loma Linda Picnic area. 2440 m 18 Oct. 1977.
6907	22	AZ: Pima Co., Santa Catalina Mts., above Geology View Point. 2165 m 18 Oct. 1977.
6908	20	AZ: Graham Co., Graham [Pinaleno] Mts., near Shannon Campground. 2774 m 19 Oct. 1977.
6909	21	AZ: Graham Co., Graham [Pinaleno] Mts., Turkey Flat. 2316 m 19 Oct. 1977.
6910	20	AZ: Cochise Co., Huachuca Mts., Carr Canyon. 2195 m 21 Oct. 1977.
6911	20	AZ: Cochise Co., Huachuca Mts., Carr Canyon. 2255 m 21 Oct. 1977.
6914	22, 24	NM: Grant Co., Cherry Creek Campground, N of Pinos Altos. 2103 m 26 Oct. 1977.
6918	20, 21	NM: Catron Co., S of Luna. 2440 m 27 Oct. 1977.
6922	20, 24	AZ: Navajo Co., N of Indian Pines. 2250 m 27 Oct. 1977.
6924	20	AZ: Coconino Co., San Francisco Mts., on Snow Bowl Road. 2440 m 28 Oct. 1977.
6926	20	AZ: Gila Co., along Old Mogollon Rim Road. 2225 m 28 Oct. 1977.
6928	20	AZ: Gila Co., along Old Mogollon Rim Road. 2440 m 3 Nov. 1977.
6929	20	AZ: Apache Co., SE of Big Lake Campground. 2680 m 4 Nov. 1977.

Muhlenbergia virescens

Collection	2n	Locality
4750	20	MEX: Guanajuato, 9.5 km NE of Ciudad Guanajuato. 2450 m. 19 Oct. 1966.
4751	20+1	MEX: Guanajuato, 27.5 km NE of Ciudad Guanajuato. 2400 m 19 Oct. 1966.
4965	40	MEX: San Luis Potosí, 19.5 km SW of Ciudad San Luis Potosí. 2250 m, 15 Sept. 1967.

TABLE II

Comparison of morphological features between *Muhlenbergia virescens*, *M. curvula*, and *M. straminea*.

	<i>M. virescens</i>	<i>M. curvula</i>	<i>M. straminea</i>
Basal sheaths and blades	straight	straight	curling, like wood shavings
Blades	involute	involute	flat, becoming involute at tip
Blade width	ca. 1.5 mm	ca. 1.5 mm	2.5--3.5 mm
Blade surface	scabrous below, hispid above	scabrous below, hispid above	scabrous below, with tiny spicules between the ribs above
Inflorescence color	green or dark green	dark green	yellowish or pale green
Glume I	(1.5) 2.0--3.0 (3.5) mm	(2.4) 2.5--3.0 mm	(3.0--3.5) 4.5--5.0 mm
Glume II	(3.0--3.5) 4.0--4.5 (5.0) mm	4.0--4.5 (5.0) mm	(4.0) 4.5--5.5 (6.0-7.0) mm
Glume surface	glabrous, shiny, translucent	glabrous, translucent	dull, minutely scaberulous
Lemma	(3.0) 3.5--4.0 mm	3.5--4.0 mm	4-5 (6) mm
Lemma surface	pubescent on lower 1/2--2/3	pubescent lower 2/3	pubescent on midrib at base and on margins on lower 1/2
Stamens	2.0--2.5 (3.0) mm	ca. 2 mm	(2.0) 2.5--3.0 mm
Flowering time	Sept.--Oct.	Sept.--Oct.	March--April (May)

Recent authors, e.g. McVaugh (1983), Beetle (1987), and Allred (1993) have continued to include the southwestern United States within the range of *Muhlenbergia virescens*. McVaugh (p. 263) states "Open dry grassy places in sparse oak or oak-pine forest, 1600--2700 m on the Central Plateau and the ranges to the west, flowering Oct--Nov." He includes "S w U.S." as well as various central and western states of México. Beetle (1987) cites "New Mexico and Arizona, south to Michoacán and Mexico." Allred (1993) gives only the distribution within New Mexico.

Hitchcock (1913, p. 302) described as new *Muhlenbergia straminea*, the type collection, R. Endlich 1210, 10 April, 1906, from pine and oak woods, Tecorichu, western Sierra Madre, Chihuahua, elev. 2200 m. Two other gatherings from the same general area are cited: Endlich 1226 and 1210a, from Tierra Colorada, dated April, 1906. [Hitchcock indicated that the specimens at US are from material sent him by Dr. I. Urban, Berlin Botanical Garden.] There is a rather lengthy description, followed by (p. 302): "This species is distinguished by the stramineous appearance of the glumes and foliage and by the flat, ribbon-like lower sheaths, which withdraw from the culms and become spirally twisted or curled like shavings. The long, papery glumes indicate an affinity with *Trinichloa* but it is distinguished from that genus by the terminal awn of the lemma. It appears to be most nearly allied to *M. longiglumis* [Vasey, G., Contrib. U.S. Natl. Herb. 1:283. 1893]."

Muhlenbergia straminea may somewhat resemble *Trinichloa*, however careful examination reveals that the members of the latter genus are characterized by closed sheaths, and lodicules which are often fused and lack vascular traces. Also the leaf anatomy is pooid; in *Muhlenbergia* it is eragrostoid (chloroid). *Trinichloa* is clearly related to *Melica* and *Schizachne*. [See J.R. Reeder Systematic position of the genus *Trinichloa* (Gramineae). Amer. J. Bot. 55:735. 1968 (abstract).]

Muhlenbergia longiglumis is an attractive Mexican species with compressed-keeled sheaths, and long glumes which may be aristate. Soderstrom (1967) included it as a member of § *Epicampes*. *Muhlenbergia straminea* belongs within the § *Podosaemum* as outlined by Soderstrom, and is related to the *M. montana* group of species. In fact when Hitchcock treated the genus in the North American Flora (1935a), he placed *M. straminea* as a synonym of *M. virescens*, but gave no reason for this change. Since the original material of *M. virescens* was collected in central México, and the type specimen of *M. straminea* came from the mountains of northern Chihuahua, it seemed prudent to re-examine these two taxa with respect to the plants which are to be found in Arizona and New Mexico.

Perhaps one of the most striking differences to be noted from the protologues of these taxa is that the original material of *Muhlenbergia virescens* was collected in September; that of *M. straminea* in early April. Anyone familiar with "*M. virescens*" in the mountains of New Mexico and Arizona is aware that it blooms very early in the spring. Another characteristic, perhaps known only to us, is that the flowers are actually initiated in late autumn, at which time meiosis in the microsporocytes occurs. We tried unsuccessfully for several years in early spring to collect young inflorescences for cytological examination. Even though panicles had not yet emerged from the sheath, the anthers were already fully formed and contained mature pollen grains. At this time also, anthers have their characteristic reddish purple color, which is retained in the fixative and in 70% alcohol in which they are stored. Eventually we discovered that good cytological material can be collected in late September to early

November. Numerous good chromosome counts were obtained from collections made in late autumn in various localities in Arizona and New Mexico. The possibility that meiosis might occur in the autumn of the previous year occurred to us when we found plants partially covered with snow in March, many of which had inflorescences exposed, some well exerted from their sheaths! In contrast, we have observed *M. virescens* in full flower from August to October, and at that time have collected young inflorescences in satisfactory condition for cytological examination. Although, as can be seen in Table I, collections for chromosome counts for both *M. virescens* and *M. straminea* were made in the month of October, there is an important difference with respect to the time involved for the completion of flowering. As mentioned above, the initiation of meiosis within the anthers of *M. straminea* takes place in late autumn, and the plants remain dormant during the winter, blooming in early spring of the following year. In the case of *M. virescens*, meiosis occurs in late summer or autumn, and the plants bloom soon after in the same season.

In 1951 little was known regarding the flowering habits of this southwestern grass. In Gould (1951), C. Reeder (p. 211) made the following comment: "... flowering March to June and occasionally again in the summer and fall. New Mexico and Arizona to central Mexico. An interesting forest bunchgrass, closely related to the widespread and variable *Muhlenbergia montana* complex but rather unique in its spring-flowering habit and conspicuous with its peculiarly coiled leaves [and sheaths] and strikingly colored anthers." Obviously the idea that it may flower in late summer or fall arose from the early emergence of next-year's panicles. ARIZ has at least one such specimen, *L.N. Goodding M-314* (ARIZ-55284) from the Huachuca Mts., Cochise Co., Arizona, 5 Nov 1937. It is worth noting that specimens of this southwestern species collected after late April ordinarily consist of empty glumes with few or no florets. Even at this stage, the plants can usually be identified by their characteristic glumes and curling foliage.

It is true that *Muhlenbergia virescens* and *M. straminea* share certain characteristics, *e.g.*, both are commonly to be found in oak or pine-oak forests in the higher mountainous areas of México and southwestern USA (mostly between 1900 and 2800 m); a fragile hyaline ligule commonly 10 to 20 mm long; subequal long acute or acuminate glumes, the first 1-nerved, the second 3-nerved; and narrow somewhat contracted panicle. There are, however, a number of morphological differences which serve to distinguish these species even on herbarium sheets (Table II).

Swallen (1950) described as new *Muhlenbergia curvula*, which he appears to have compared to *M. virescens* based on the northern element (*M. straminea*). This is not surprising since the descriptions of *M. virescens* in North American Flora (1935a) and Hitchcock's *Manual* (1935, 1951), as well as the illustration in the latter work, are based on the northern plants. In the *Manual* the figure of this species (1935, fig. 785; 1951, fig. 566) is drawn from *Palmer 565* in 1890 collected at Willow Springs, Navajo Co., Arizona. The type specimen of *M. curvula* came from México: Guanajuato: "12 miles from [Cd.] Guanajuato on road to Santa Rosa," Sept. 30, 1946 *H.E. Moore Jr. 1353* (US-1963089!). Since the Moore specimen fits well within *M. virescens*, we consider *M. curvula* Swallen and *M. virescens* (H.B.K.) Trinius to be synonyms. Further justification for this change is the fact that the type collections of both species came from essentially the same area in Guanajuato, México.

Of particular interest is *Parry & Palmer 920* in 1878 (US-995807) from San Luis Potosí area, México, elevation 6,000-8,000 ft., on which one finds in Mrs. Agnes Chase's script: "Like HBK type of *Pod. [Podosaemum] virescens*." This specimen does, indeed, resemble the type of the Humboldt & Bonpland collection (P!), but in no way resembles *M. virescens* as illustrated in Hitchcock's *Manual* (1935, 1951). (fig. 1,B). Scribner (1897, fig. 110, p. 128) in *American Grasses-Illustrated* has a sketch of *M. virescens* which is quite consistent with the type, although his comment below the figure gives: "At an altitude of 1800 to 2400 m on the mountains of Arizona and New Mexico. Mexico. May, June." (fig. 1,A). Although the figure fits our concept of *M. virescens*, the range given for the species includes *M. straminea*, but he has noted the early flowering of the southwestern material. In 1891 Vasey reported on grasses collected by Dr. Edward Palmer in western México and Arizona. On p. 114 one finds "*Muhlenbergia virescens* Trin." from "Near the summit of the mountain Alamos." March 26 to Apr. 8. 1890. US has four sheets of this number; all prove to be *Muhlenbergia straminea*. This species has been collected more recently from about the same locality in Sonora, México, by V.W. Steinman & M. Baker 9373 on March 11, 1993 (ARIZ). Other collections from the mountainous areas of Sonora and Chihuahua have appeared within recent years. For the distribution of these two species see Figure 2.

Of the new species recently described by Y. Herrera (1987, 1992) from México only one appears to pose any problem of separation from *Muhlenbergia straminea*. The type of *M. durangensis* came from Mpio. Mezquital, state of Durango, and like *M. straminea* flowers early in the spring. However, it may be distinguished by its very short truncate ligule (0.7--1.0 mm long) which has short acute projections from the sheath on either side. Further, the spikelets tend to be larger (5.0--6.5--7.0 mm long), and anthers mostly 3.0--3.5 mm long. The other species (*Muhlenbergia cualensis* and *M. michisensis*) differ in having only one nerve in the second glume. In both *Muhlenbergia virescens* and *M. straminea* the second glume is distinctly 3-nerved.

In a recent paper, Herrera & Grant (1993) consider the correlation of morphological and flavonoid data within the *Muhlenbergia montana* complex as generated by the DELTA system. The discussion does not instill great confidence, e.g. one finds the repetition of three separate collections under two different species. Further, the inclusion of *M. argentea* Vasey within this complex is puzzling. Even though Vasey (1886) in the original description of *M. argentea* stated that the upper "empty glume" is "three-toothed at the apex," Beal (1896, p. 232) described the glumes of *M. argentea* as "subequal, linear-lanceolate, the apex more or less 2-toothed, 1-nerved." Hitchcock (1935a, p. 465) described the same species in some detail, basing his description on the type material, which was all that was available at the time. The glumes are said to be "about equal, thin, oblong or somewhat notched, the midnerve extending into a mucro or short awn, the summit minutely pubescent or ciliolate." The glumes in specimens of *M. argentea* we have examined fit this description. Whereas the second glume in *M. argentea* may be 3-toothed in some plants, other characteristics do not suggest a relationship with the *M. montana* complex. The sheaths invest the culms and are slightly compressed-keeled; the glumes are 1-nerved; the lemma is deeply bifid; and of special note is the fact that the caryopsis is conspicuously flattened. *Muhlenbergia argentea* clearly is not a member of the *M. montana* complex.

In summary, *Muhlenbergia straminea* Hitchc. is shown to be a species worthy of recognition, and is not conspecific with *M. virescens* (H.B.K.) Trinius. *Muhlenbergia curvula* Swallen is reduced to synonymy with *M. virescens*. To our knowledge, the occurrence of meiosis in *M. straminea* in late autumn, preceding flowering the following spring, is unique among members of the *M. montana* complex.

ACKNOWLEDGMENTS

Our special thanks to Dra. Alicia Lourtieg of the Paris Herbarium for assistance in making the Humboldt & Bonpland collections available for our study. Curators of the following herbaria facilitated use of their specimens: ARIZ, ENCB, F, MO, P, RM, TAES, and US. Thanks also to Philip Jenkins and James Rominger who reviewed the manuscript.

LITERATURE CITED

- Allred, K.W. 1993. *A Field Guide to the Grasses of New Mexico*. Dept. Agric. Communications, New Mexico State Univ., Las Cruces, New Mexico. 258 pp.
- Beal, W.J. 1896. *Grasses of North America*. Vol. 2. New York, New York. i-viii, 1-706.
- Beetle, A.A. 1987. Noteworthy grasses from Mexico. XIII. *Phytologia* 63(4):209-291.
- Fournier, E.P.N. 1886. *Mexicanas Plantas. Pars Secunda, Gramineae*. Paris, France. pp. i-xix, 1-160.
- Gould, F.W. 1951. *Grasses of Southwestern United States*. Univ. Arizona Biol. Sci. Bull. 7. pp. 1-342.
- Hemsley, W.B. 1885. Botany. In: *Biologia Centrali-Americana*. Vol. 3. London, Great Britain. (Gramineae, pp. 474-588.)
- Herrera Arrieta, Yolanda. 1987. Una nueva especie de *Muhlenbergia* (Gramineae) del Estado de Durango. *Phytologia* 63:457-460.
- Herrera Arrieta, Yolanda & P.M. Peterson. 1992. *Muhlenbergia cualensis* and *M. michisensis* (Poaceae: Eragrostideae): two new species from Mexico. *Novon* 2:114-118.
- Herrera Arrieta, Yolanda & W.F. Grant. 1993. Correlation between generated morphological character data and flavonoid content of species in the *Muhlenbergia montana* complex. *Canad. J. Bot.* 71:816-826.
- Hitchcock, A.S. 1913. Mexican Grasses in the United States National Herbarium. *Contr. U. S. Natl. Herb.* 17:181-389.
- Hitchcock, A.S. 1935a. Poaceae. *North American Flora* 17(6):419-482.
- Hitchcock, A.S. 1935. *Manual of Grasses of the United States*. U.S. Dept. Agric. Misc. Publ. 200. 1040 pp.
- Hitchcock, A.S. 1951. *Manual of Grasses of the United States*. Second Edition, revised by Agnes Chase. U.S. Dept. Agric. Misc. Publ. 200. 1051 pp.

- Humboldt, A., A. Bonpland, & C.S. Kunth. 1816. *Nova Genera et Species Plantarum*. Vol. 1. Paris, France. (Gramineae, pp. 84-201.).
- Kunth, C.S. 1829-1834. *Révision des Graminées*. Paris, France. pp. 1-666.
- Kunth, C.S. 1833. *Enumeratio Plantarum*. Vol. 1. Agrostographia Synoptica. Stuttgart & Tübingen, Germany. 606 pp.
- Kunth, C.S. 1835. *Enumeratio Plantarum*. Supplementum Tomi Primi. Stuttgart & Tübingen, Germany. 436 pp.
- McDonald, J.A. 1990. The alpine-subalpine flora of northeastern Mexico. *Sida* 124(1):21-28.
- McVaugh, R. 1983. *Flora Novo-Galiciana*. Vol. 14. Gramineae. Univ. Michigan Press, Ann Arbor, Michigan. 436 pp.
- Reeder, J.R. 1967. Notes on Mexican grasses. VI. Miscellaneous chromosome numbers. *Bull. Torrey Bot. Club* 94:1-17.
- Reeder, J.R. 1968. Notes on Mexican grasses, VIII. Miscellaneous chromosome numbers-2. *Bull. Torrey Bot. Club* 95:69-86.
- Roemer, J.J. & J.A. Schultes 1817. *Systema Vegetabilium*. Vol. 1. Stuttgart, Germany. pp i-viii, 1-642.
- Scribner, F.L. 1882. A list of grasses collected by Mr. C.G. Pringle in Arizona and California during the summer of 1881, with descriptions of those species not already described in American publications. *Bull. Torrey Bot. Club* 9:74-77, 86-89, 103-105, 145-149.
- Scribner, F.L. 1897. *American Grasses (Illustrated)*. U.S. Dept. Agric. Div. Agrost. Bull. 7. 331 pp. [cf. fig. 110].
- Soderstrom, T.R. 1967. Taxonomic study of subgenus *Podosemum* and section *Epicampes* of *Muhlenbergia* (Gramineae). *Contr. U.S. Natl. Herb.* 34(4):75-189.
- Swallen, J.R. 1950. New Grasses from Mexico, Central America, and Surinam. *Contr. U.S. Natl. Herb.* 29(9):395-428.
- Trinius, C.B. 1824. *De Graminibus Unifloris et Sesquifloris*. Petropoli, Russia. 319 pp. + 5 pl.
- Vasey, G. 1883. *The Grasses of the United States: Being a Synopsis of the Tribes and Genera with Descriptions of the Genera and a List of the Species*. U. S. Dept. Agric. Special Report 63. 47 pp. [published 30 Aug 1883].
- Vasey, G. 1886. New species of Mexican grasses. Collected by Dr. Ed. Palmer, in S.W. Chihuahua, in 1885. *Bull. Torrey Bot. Club* 13:229-232.
- Vasey, G.R. 1892. *Monograph of the Grasses of the United States and British America*. *Contr. U.S. Natl. Herb.* 3(1):1-89. [published 25 Feb 1892].
- Wootton, E.O. & P.C. Standley. 1915. *Flora of New Mexico*. *Contr. U.S. Natl. Herb.* 19:1-794. [published 24 Jun 1915]. Reprinted 1972. (Poaceae, pp. 43-109.).

Note: The chromosome number of *Reeder 4965* from San Luis Potosí was determined to be $2n = 40$. It is of interest that in this instance meiosis is somewhat irregular with 4 or 5 quadrivalents clearly visible, suggesting that it may be an autotetraploid.

A better understanding of specific features, and the separation of *Muhlenbergia straminea*, reveal that three of our collections for which chromosome counts were reported earlier as *M. virescens* in fact represent the closely related *M. quadridentata* (H.B.K.) Trinius. The specific collections are 4664 and 4475 from Durango (Reeder

1967) and 4703 from Zacatecas (Reeder 1968). *Muhlenbergia quadridentata* may be distinguished by its shorter ligule which tends to be firmer near the base, frequently with vascular traces evident; blades, which are flat becoming involute, are strongly ribbed with tiny spicules on the ribs; and glumes that are dull (scaberulous and may have a few hairs at the base).

A few reports of *Muhlenbergia virescens* in the literature need to be clarified as well. McVaugh (1983) cited Reeder & Reeder 6437 from Monte Escobida, Zacatecas, as *M. virescens*. Re-examination of the specimen reveals it to be *M. quadridentata*, the lemma of which is pubescent on the lower 1/2 to 2/3. This type of pubescence is the principal character used by H.B.K. (1816) to segregate *Podosaemum gracilis* H.B.K. There is little else to distinguish these plants from their close relative, *M. quadridentata*.

McDonald (1990) listed *Muhlenbergia virescens* in an enumeration of species from alpine-subalpine mountains of northeastern México. He indicated that the grasses were identified by us. Another check, along with the separation of *M. straminea* and *M. virescens*, shows that indeed McDonald 2045 from the Peña Nevada, Tamaulipas, is true *M. virescens*, whereas McDonald 2100 from Sierra La Vega, Coahuila, is *M. quadridentata*.

ANEMONE TUBEROSA (RANUNCULACEAE) IN TEXAS

Marshall Enquist

11511 Metric Blvd. #1033, Austin, Texas 78758 U.S.A.

&

Bonnie Crozier

3411 Spanish Oak Drive, Austin, Texas 78731 U.S.A.

ABSTRACT

Four species of *Anemone*, all with tuberous rootstocks, occur in Texas: *Anemone caroliniana* Walter; *A. berlandieri* Pritzl; *A. edwardsiana* Tharp; and *A. tuberosa* Rydberg. The recently described species *A. okennonii* Keener & Dutton is treated as within *A. tuberosa* where it is described anew as var. ***texana*** Enquist & Crozier, var. nov. A key and distribution maps are provided for the Texas taxa of *Anemone*.

KEY WORDS: Ranunculaceae, *Anemone*, Texas

INTRODUCTION

Anemone okennonii Keener & Dutton (1994) was recently described as a new species endemic to central Texas. Its authors noted (p. 192) it is "taxonomically closest to *A. edwardsiana*" but added the caveat that "whether these two species are closest phylogenetically remains in question." They observed that the geographic range of the new species overlaps with *A. berlandieri* Pritzl but appears to lie isolated between *A. edwardsiana* Tharp and *A. tuberosa* Rydberg. Based on our own field and herbarium experience, however, we believe that the relationship of *A. okennonii* lies with *A. tuberosa*. Earlier botanists, including Donovan Correll, Cyrus L. Lundell, Marshall Johnston, Billie Turner, and Barton Warnock, correctly identified material referable to *A. okennonii* as belonging to *A. tuberosa* (s.l.). In addition, we find several misidentified collections that were later correctly annotated as *A. tuberosa* by Marshall Johnston and Lloyd Shinnors. In this paper we have attempted to assess the status of *A. okennonii*, especially as regards its relationship to *A. tuberosa* and *A. edwardsiana*. This was accomplished by the examination of numerous populations in

the field as well as a review of herbarium material so as to determine the biological status of each.

MATERIALS AND METHODS

The authors examined fifteen populations of *Anemone tuberosa* in Crockett, Edwards, Kimble, Sutton, and Val Verde counties, from which more than 300 individuals from seven populations (see Table 1) were studied by Crozier for characters of the sepals and achenes. Including our own collections, we studied approximately 140 sheets of *A. tuberosa* from México, Arizona, New Mexico, and Texas.

DISCUSSION

Keener & Dutton (1994), relying upon Joseph & Heimberger (1966), assert that the range of *Anemone tuberosa* extends only into "extreme western Texas (El Paso Co.)". However, since the Joseph & Heimberger paper there has been a gradual published acknowledgment that *A. tuberosa* extends much farther east. Warnock (1970) identified *A. tuberosa* as present in Big Bend National Park in Brewster County, Texas. Correll & Johnston (1970) did not originally include *A. tuberosa* in the flora of Texas, but by 1976 Marshall Johnston had annotated numerous sheets in the University of Texas collection as *A. tuberosa* (Warnock T205; Warnock 442; Smith M338; Correll, Correll, & Benson 30844; Correll & Correll 30884; McVaugh 7729; Tharp 1800; Correll & Flyr 38359; Rose-Innes & Warnock 565; Warnock 5199; Turner & Warnock 273; Lundell & Lundell 10176; and Worthington 4229). Johnston (1988 & 1990), in reference to *A. tuberosa*, stated, "The occurrence of this species in Western Texas has been confirmed, including the occurrence in Big Bend National Park and other southern trans-Pecos areas east to the Pecos River." This located the species in Texas as far east as Pecos, Terrell, and Val Verde counties.

Dr. James Henrickson has placed a rough draft of the unpublished "Chihuahuan Desert Flora" in the University of Texas herbarium for corrections and annotations. In its present form, the draft gives the following range information for *A. tuberosa* . . . "Very local in trans-Pecos Texas. (El Paso, Culberson, Brewster, Pecos, Val Verde Cos.); rare in Coah. (Tule Canyon near the Rio Grande), mostly below 1000 meters; Baja C., Calif., Son., Ariz., N.M., Tex., Coah., N.L., early spring, Feb.-Mar."

Recent collections by the authors, in 1995, indicate that *Anemone tuberosa* Rydb. is not limited to trans-Pecos Texas (which is considered to be that part of Texas west of the Pecos River) but also occurs widely in the Edwards Plateau east of the Pecos River in Crockett, Val Verde, Sutton, Kimble, Edwards, and Uvalde counties (see Map 4).

In large part, Keener & Dutton differentiate *Anemone okennonii* by contrasting it with *A. edwardsiana*. We believe that such a comparison is irrelevant. Many

characters of *A. okennonii* that constitute "differences" when compared to *A. edwardsiana* become similarities when compared to *A. tuberosa* (see Keener & Dutton 1994, Table 1, p. 194-195). Of the "differences" that remain, most are the result of incomplete or inaccurate information regarding one or both of the subject species.

Keener & Dutton provided a chart (p. 201) summarizing eleven differences "between *A. okennonii* and other Texas species of *Anemone* with tuberous rootstocks. . . ." Four of the eleven contrasted characters, including leaf division, number of flowers per stem, time of flowering of central and lateral flowers, and sepal number were admitted to be like *A. tuberosa*. One other character, the linear divisions of the bracts, was said to be like *A. berlandieri*, but this would apply also to *A. edwardsiana* or the eastern elements of *A. tuberosa*. This leaves six characters that were said to be unlike those of the other Texas species of *Anemone*. Of these six, we find two, flower size and sepal shape, to be of little use due to the broadly overlapping ranges of these characters in the Texas species. Reddish-glandular leaf margins and tips are not distinctive, but are common to all the Texas species of *Anemone*, particularly in the colder months. Likewise, yellow anthers are common to all the Texas species. We believe that attempts to distinguish subtle shades of yellow are too subjective to be of any value. The two remaining characters, style color and leaf dissection, are also problematic. The lavender-tinted styles of *A. okennonii* were said to be distinctive, but elsewhere in their paper (p. 196) Keener & Dutton stated that the styles of *A. tuberosa* are lavender. Additionally, Keener & Dutton reported that the styles of *A. caroliniana* and *A. berlandieri* are greenish with lavender tips. We believe the last remaining "distinctive" character of *A. okennonii*, the "typically 3-ternate" character of its leaves, results from a misinterpretation of leaf morphology. Despite the assertion that the leaves of *A. okennonii* are "typically 3-ternate", we find no instance in which this is the case, that is, thrice-ternate leaves for this taxon are not only not typical, but are also apparently non-existent. The leaves of *A. tuberosa* in Texas are typically once to twice-ternate (see Figure 1), as are the leaves of *A. tuberosa* in New Mexico, Arizona, Utah, and California. We carefully searched our collections for any leaf that might be considered 3-ternate. The most extreme example of leaf dissection we could find was from a depauperate population infected with black rust found 1.35 miles south of the Llano River on highway 385 in Kimble County. This leaf is illustrated with a line drawing in Figure 1 - H. Close examination of the actual leaf reveals that the margins of the central subleaflet of the central leaflet are continuous, *i.e.*, there is no formation of the petiolules that would be necessary to describe this as a further ternate division. The leaf is smaller than normal, with a reduced surface area, and is probably more deeply incised than normal due to disease stress. None of the other populations we found, which were all healthy, displayed central subleaflets so deeply incised.

Alternatively, we note that the leaves of *Anemone tuberosa* often have lateral leaflets that are asymmetrically ternately divided (see Figure 1, A-G). The two leaves shown in the type drawing of *A. okennonii* (Keener & Dutton 1994, p. 199) apparently are drawn from a collection in which the positions of the central leaflet and a lateral leaflet are transposed, that is, the apparent central leaflets are actually lateral leaflets. This may have contributed to the confusion over the number of ternate divisions.

TABLE 1 — VARIATION OF SEPAL AND ACHENE CHARACTERS WITHIN AND BETWEEN POPULATIONS OF ANEMONE TUBEROSA VAR. TEXANA.

Population	sepal number	sepal length (mm)	sepal width (mm)	achene length (mm)	achene width (mm)	style length (mm)
Edwards Co. [Hwy. 377 NE of Carta Valley]				(N=31)		
average	-	-	-	2.7	2.4	1.0
std	-	-	-	0.3	0.3	0.1
range	-	-	-	2.0-3.1	2.0-3.0	0.7-1.2
Val Verde Co. [Hwy. 189 NE of Juno]				(N=35)		
average	8.0	14.4	4.3	2.9	2.8	1.0
std	0.5	2.2	0.9	0.2	0.5	0.1
range	7-9	10.0-19.5	3.0-6.0	2.5-3.1	2.0-3.2	1.0-1.1
Val Verde Co. [Hwy. 277 N of Del Rio]				(N=23)		
average	-	-	-	3.2	3.1	1.1
std	-	-	-	0.3	0.2	0.1
range	-	-	-	3.0-4.0	2.8-3.8	0.9-1.3
Crockett Co. [Hwy. 2083 28.7 miles N of Pandale]				(N=39)		
average	8.5	12.3	3.7	3.0	3.0	1.0
std	1.3	2.4	1.0	0.1	0.1	0.1
range	7-12	5.0-18.0	2.5-6.5	2.7-3.2	2.5-3.2	0.9-1.2
Crockett Co. [Hwy. 2083 18.2 miles N of Pandale]				(N=40)		
average	-	-	-	2.8	2.3	1.0
std	-	-	-	0.3	0.9	0.1
range	-	-	-	2.1-3.3	2.1-3.1	0.9-1.2
Kimble Co. [Hwy. 385 1.3 miles S of Llano R.]				(N=37)		
average	-	-	-	2.7	2.5	1.0
std	-	-	-	0.3	0.5	0.1
range	-	-	-	2.0-3.0	1.8-3.2	0.7-1.2
Kimble Co. [Hwy. 385 3.2 miles S of Llano R.]				(N=21)		
average	-	-	-	3.0	3.0	1.1
std	-	-	-	0.1	0.2	0.3
range	-	-	-	2.8-3.2	2.5-3.4	0.9-2.2

TABLE 2 -- COMPARISON OF ANEMONE TUBEROSA AND ANEMONE EDWARDSIANA.

	<i>A. tuberosa</i> <i>var. tuberosa</i>	<i>A. tuberosa</i> <i>var. texana</i>	<i>A. edwardsiana</i>
TUBEROUS ROOTSTOCKS			
length	1.5-2 cm	1-3 cm	1-1.5(2) cm
width	1.0 cm	(0.7)1(1.2) cm	0.5-1(1.2) cm
BASAL LEAVES			
dissection	1-2 ternate	1-2 ternate	ternate
petiole length	4-10 cm	(3)4-12(16) cm	(3)4-12(20) cm
HEIGHT AT ANTHESIS			
	1-3 dm	1-3(4) dm	1-4(4.5) dm
PEDUNCLE			
pubescence below bracts	glabrous to glabrescent	glabrous to glabrescent	glabrous to glabrescent
number of flowers	1-3	1-3	1-3
time of flowering	central before lateral	central before lateral	central before lateral
BRACT			
shape	similar to basal leaves but shorter petiole & longer lobes and teeth	linear lobes	linear lobes
SEPALS			
number	6-13	6-12	7-13
color	white to pink	white to pink	white
shape	linear-oblong	linear-oblong or oblanceolate	linear-oblong or oblanceolate
length x width	20.0 x 3.0 mm	5.0-19.5 x 2.0-6.5 mm	5.0-22.0 x 1.5-6.2 mm
FRUITING HEAD			
shape	cylindrical to ellipsoidal	cylindrical to ellipsoidal	cylindrical to ellipsoidal
length	1.5-3.0 cm	1.5-3.5(4) cm	1-1.5 cm
width	1.0-1.5 cm	0.8-1.0(1.2) cm	0.4-0.9 cm
ACHENE			
pubescence	villous	villous	sparse with hairs on margin and base
width	2.1-4.0 mm	2.2-3.5 mm	2.2-3.0 mm
STYLE			
color	violet	violet	yellow-green to green
length	1.5 mm	0.8-1.6 mm	0.5-1.4 mm
HABITAT			
	high dry rocky slopes	rocky slopes and grassy flats	shaded canyons to open, rocky slopes

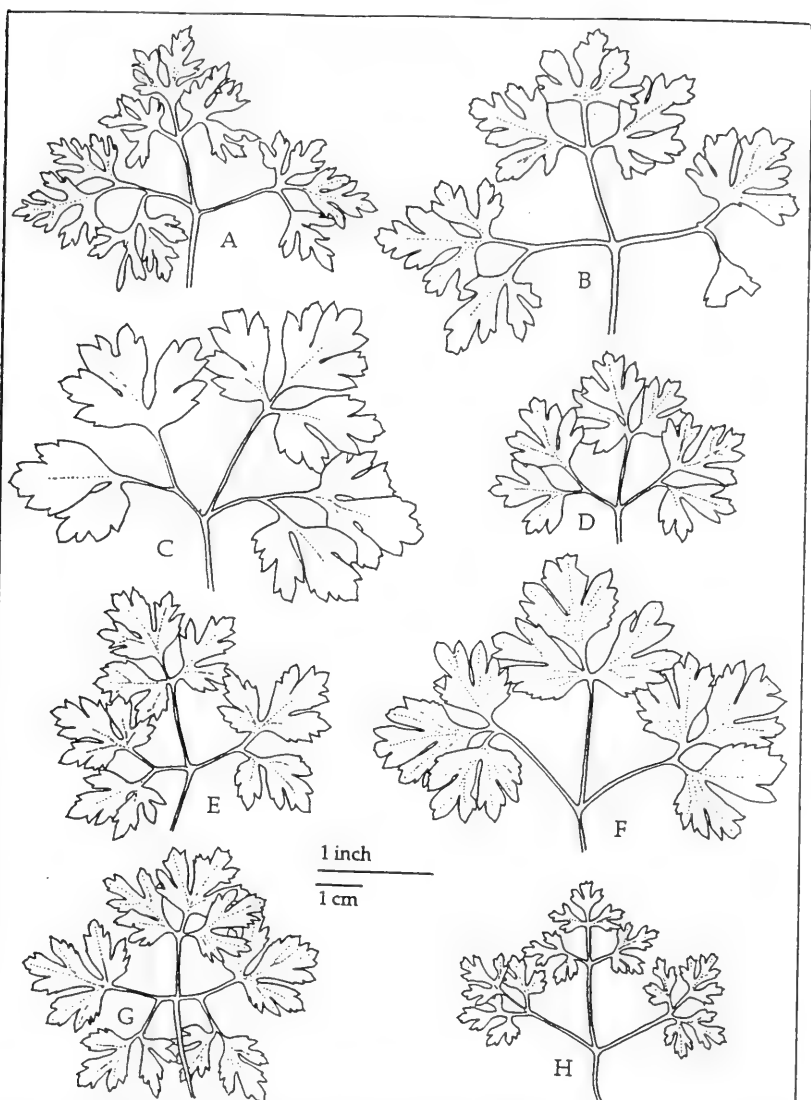


FIG. 1 — LEAF VARIATION IN ANEMONE TUBEROSA. A. New Mexico, Luna Co., Florida Mts, 7 Mar 1897, C.L. Herrick 309 (NMU). B. Texas, Brewster Co., Alpine, 20 Mar 1937, Barton Warnock T205 (TEX-LL). C. Texas, Crockett Co., Ft. Lancaster, 26 Feb 1995, M. Enquist 2710 (TEX-LL). D. Texas, Val Verde Co., Near int. of 277 & 377, 17 Apr 1995, M. Enquist, B. Crozier, & B.L. Turner (TEX-LL). E. Texas, Val Verde Co., 0.8 mi. S of Buckley Crossing on 189, 19 Mar 1995, M. Enquist & B. Crozier 2747 (TEX-LL). F. Texas, Kimble Co., S of Junction, 2 Apr 1995, M. Enquist 2780 (TEX-LL). G. Texas, Kimble Co., On 385, 1.35 mi. S of Llano River, 2 Apr 1995, M. Enquist 2776 (TEX-LL). H. Texas, Kimble Co., On 385, 1.35 mi. S of Llano River, heavily infected with Black Rust, 2 Apr 1995, M. Enquist 2776 (TEX-LL).

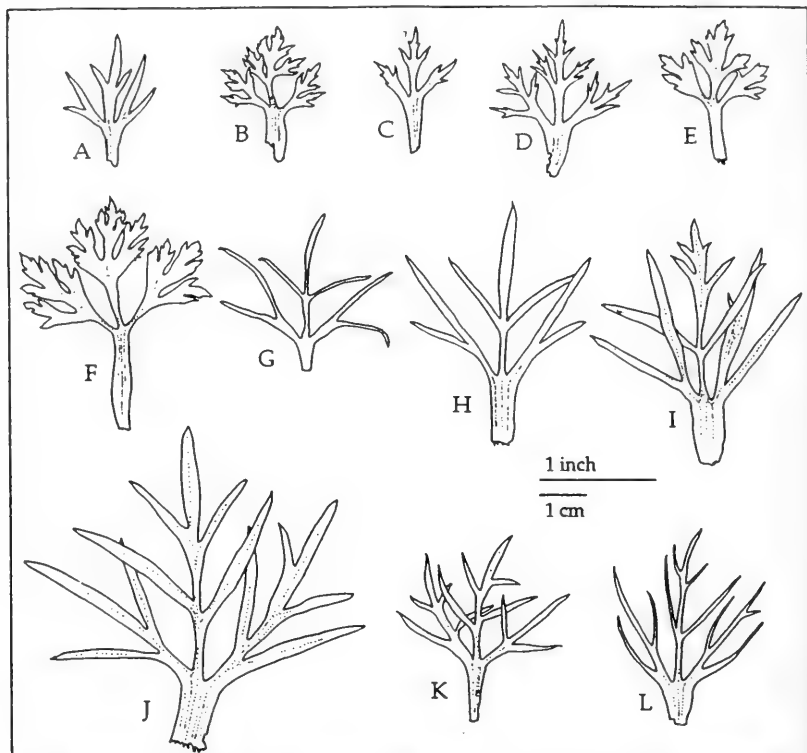
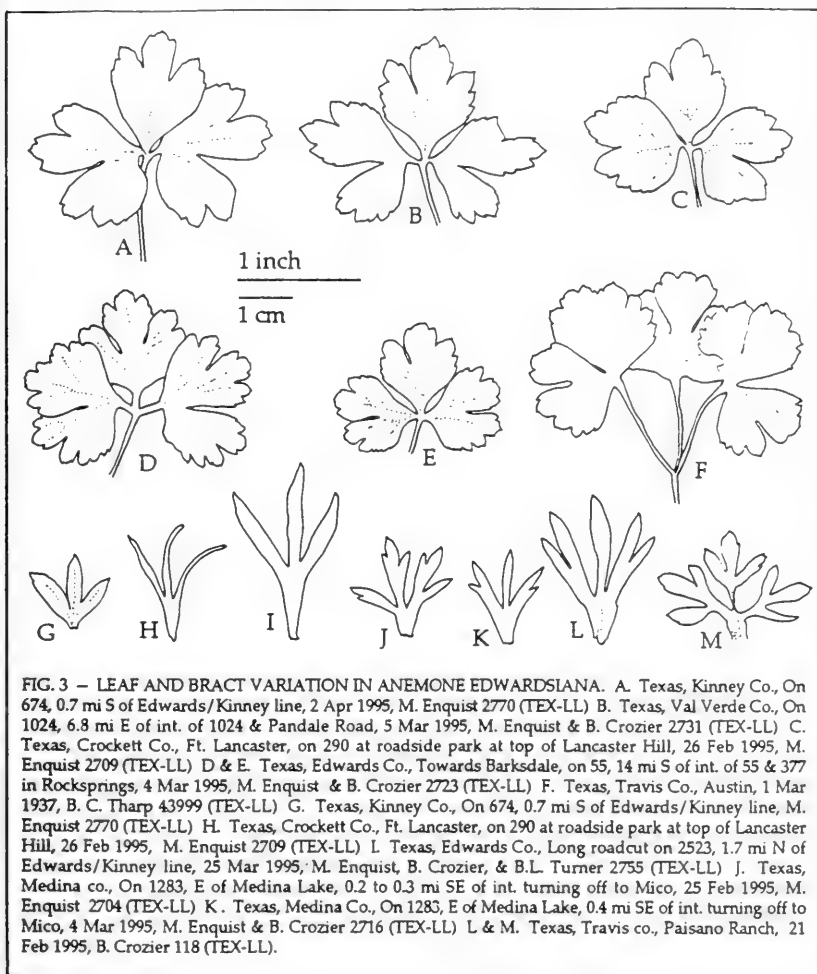
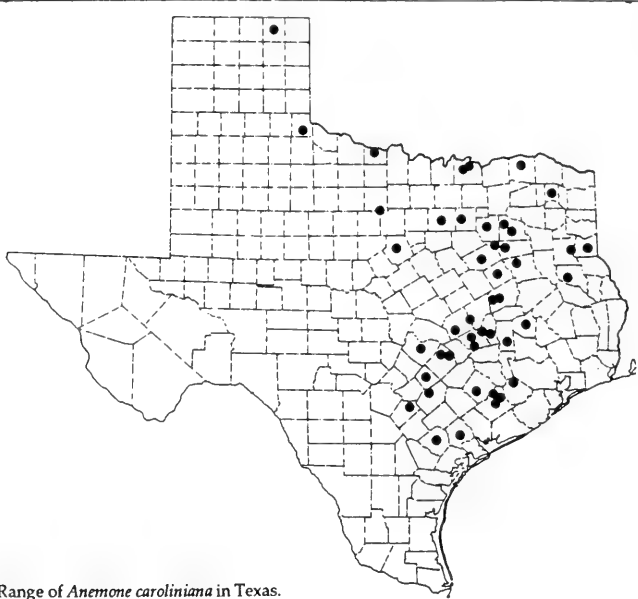
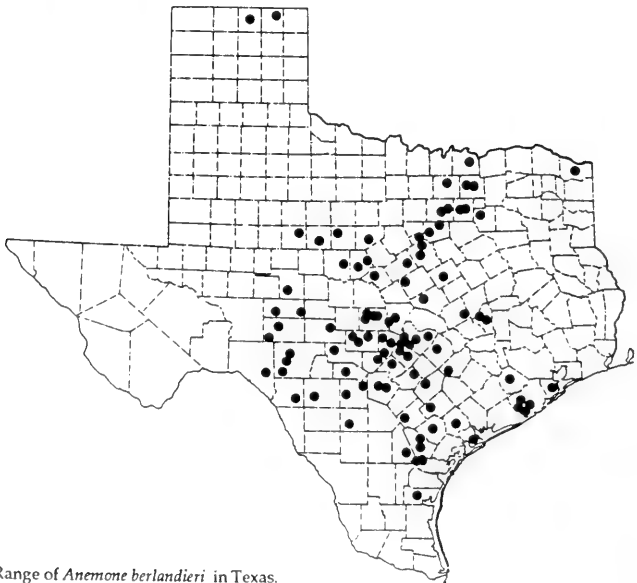


FIG. 2— BRACT VARIATION IN ANEMONE TUBEROSA. A. Mexico, Nuevo Leon, Villaldama, 15 Mar 1983, Cowan & Nixon 3809 (TEX-LL) B. Arizona, Pinal Co., 1 Mar 1968, Keil, Pinkava, & Lahto 10790 (TEX-LL) C. Arizona, Pima Co., Ajo Mts., 4 Apr 1948, Fouts 368 (NMU) D. Arizona, Santa Cruz Co., 1 Mar 1986, Ferguson S.N. (TEX-LL) E. New Mexico, Dona Ana Co., Las Cruces, ridge N of Bishop's Cap, 16 Apr 1995, M. Enquist & B Crozier 2799 (TEX-LL) F. Texas, El Paso Co., Franklin Mts., 1 Apr 1979, Worthington 4229 (TEX-LL) G. Texas, Pecos Co., NE of Ft. Stockton, 15 Apr 1941, Lundell 10176 (TEX-LL) H. Texas, Crockett Co, 24 mi N of Pandale, 12 Mar 1995, M. Enquist & B. Crozier 2734 (TEX-LL) I & J. Texas, Val Verde Co., On 277, 1.1 mi S of int of 277 & 377, 17 Apr 1995, M. Enquist & B. Crozier 2802 (TEX-LL) K. Texas, Kimble Co., 3.2 mi. S of Llano River on 385, 17 Apr 1995, M. Enquist & B. Crozier 2804 (TEX-LL) L. Texas, Kimble Co., On 385, 1.35 mi. S of Llano River, 9 Apr 1995, Enquist 2790 (TEX-LL).

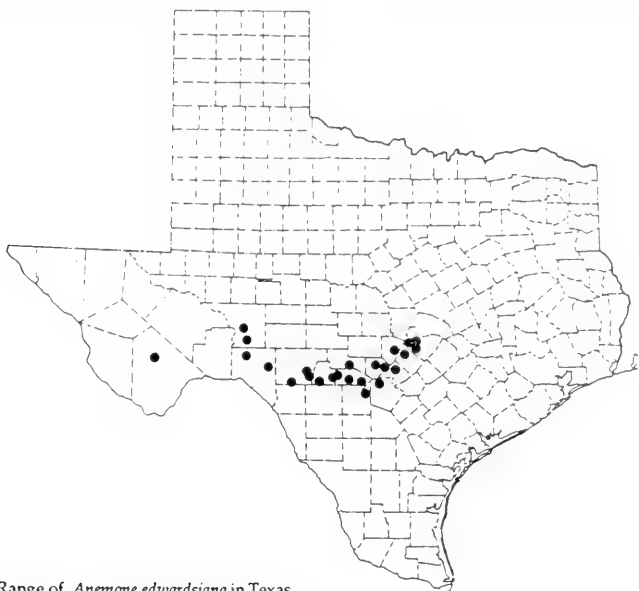




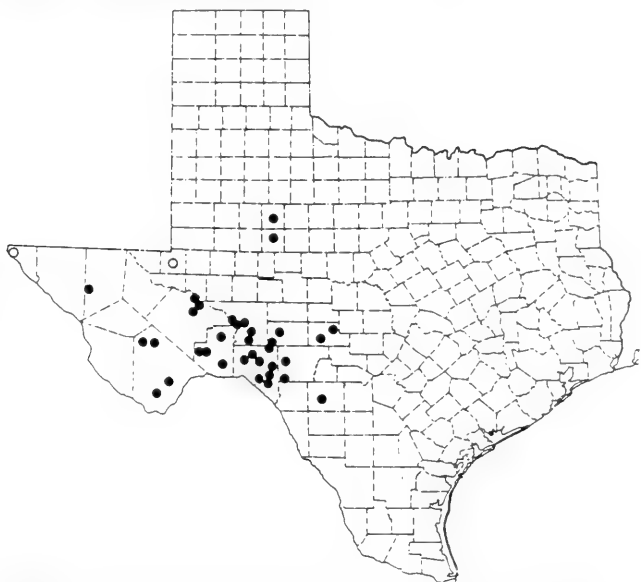
MAP 1 - Range of *Anemone caroliniana* in Texas.



MAP 2 - Range of *Anemone berlandieri* in Texas.



MAP 3 - Range of *Anemone edwardsiana* in Texas.



MAP 4 - Range of *Anemone tuberosa* in Texas. Solid dots = *A. tuberosa* var. *texana*. Open circles = *A. tuberosa* var. *tuberosa*.

We believe that once these putative "differences" are discounted, a comparison of leaf characters, achene size and pubescence, and style color indicates that the type of *Anemone okennonii* clearly fits within *A. tuberosa* (see Table 2).

The obvious differences between *Anemone tuberosa* and *A. edwardsiana* (compare Figure 1 & Figure 2 with Figure 3) may be easily contrasted in the field, where the two are often found in either closely adjacent or intermingled populations. We found the two species growing together in two populations in Val Verde County and two populations in Crockett County. Our collections indicate *A. edwardsiana* ranges from the eastern edge of the Edwards Plateau west to the valley of the Pecos River (see Map 3). We have seen one sheet that appears to be a mixed collection of *A. tuberosa* and *A. edwardsiana* from Brewster County. Although we consider it likely that *A. edwardsiana* is also continuously distributed from the Pecos River west to Brewster County, we were not able to confirm its range west of the Pecos because that area, roughly to Sierra Blanca, was suffering a severe four year drought at the time we made our collections.

Of the nine collections of *Anemone okennonii* cited in the protologue, we interpret seven of them, all made in the 1940's, as typical *A. tuberosa*. The remaining two collections were made by Mr. O'Kennon in 1992 and 1993. Since the type description and illustration of *A. okennonii* do not match the appearance of *A. tuberosa*, we tried to visit the O'Kennon collection sites to determine if these populations were somehow different. The type collection (as published) is said to be from Gillespie County, "high on a shallow roadcut in sandy loam, FM 783, 2 mi S of Doss, 22 Apr 1993". At the stated locality, a closely grazed hillside, we found an abundance of *A. berlandieri* but nothing resembling *A. okennonii* or *A. tuberosa*. The other collection (as published) is said to be from Kimble County, "Hwy 385, 2.5 mi S of Llano River, 9 Mar 1992". At this locality, a gently rolling plain in red sandy loam, we again found an abundance of *A. berlandieri*, but nothing resembling *A. okennonii* or *A. tuberosa*. Repeat visits and careful searches of these localities on an almost weekly basis from mid February through mid April yielded only *A. berlandieri*.

Examination of the holotype (BRIT) and the Kimble County collection (BRIT) offered little additional information about the exact locality of *Anemone okennonii*, but we did note that the type specimen we were shown was heavily infected with black rust. The label for the type locality reads. . . "Gillespie Co.: high on shallow roadcut in sandy loam, along FM 783 at Edwards Creek, 2 miles S of Doss, Robert J. O'Kennon 11390, 22 Apr 1993." We found such a roadcut 2.3 miles south of Doss at Edwards Creek but again found nothing resembling *A. tuberosa* or the plant described as *A. okennonii*.

The specimen label for the only other cited collection was similarly brief, reading: "Kimble Co., Hwy 385 2.5 miles So. Llano River. High on shallow roadcut in rocky limestone, Robert J. O'Kennon 8813, 9 March 1992." The label data is ambiguous. Although there is a South Llano River, Highway 385 does not cross it. The North and South forks of the Llano River unite in Junction, with the river then flowing northeast towards Highway 385. We conclude that the label intends to indicate a locality 2.5 miles south of the Llano River on Highway 385, as stated in Keener & Dutton (1994). As we have said, this location is a gently rolling plain of red sandy loam, with no roadcut in sight. Here, we did find *Ferocactus setispinus* Engelm., which was listed

as a plant associate of *Anemone okennonii*, but we found no evidence of the latter species. Searching for roadcuts in limestone, we found one at 1.35 miles south of the Llano River with a small population of *A. tuberosa*. About 80% of the plants in this population were heavily infected with black rust, as was the type specimen said to be from Gillespie County. We also found an uninfected population of *A. tuberosa* at another roadcut 3.2 miles south of the Llano River.

We find the label data for the O'Kennon localities, including the type locality, to be inaccurate, confused, and incorrect as to mileages. We also believe there is a strong possibility that the locality of the diseased Gillespie County type specimen is actually the same as that of the diseased population 1.35 miles south of the Llano River in Kimble County.

In this paper, we treat *Anemone okennonii* as a synonym of *A. tuberosa*, but because plants resembling *A. okennonii* cannot be found at the type locality as stated in the label by Mr. O'Kennon for this taxon, and because the infected plants of the type collection seem likely to have been collected in Kimble County rather than Gillespie County, the problematic and ambiguous typification of this taxon cannot serve to establish its identity.

Because we regard *Anemone okennonii* as within *A. tuberosa* but as a distinctive easternmost segment of it, we treat the former at varietal rank. Recognition that *A. tuberosa* extends from El Paso County to central Texas amounts to a 400 mile range extension eastward for the species. The plants of the new variety differ slightly from typical *A. tuberosa*, and we have modified the description of the species to reflect their inclusion.

ANEMONE TUBEROSA Rydberg, Bull. Torrey Bot. Club 29:151-152. 1902.

Anemone sphenophylla sensu Britton, Ann. New York Acad. Sci. 6:220. 1891.
(but see discussion)

Robust, apically villous herbs; stems simple below, usually branched above involucre, 1-4 dm tall at anthesis, from brownish, oblong-obovate tuberous rootstocks 1-3 cm long and 1 cm thick. Radical leaves several, 1-2 ternate; petioles 4-12 cm long. Leaflets 1-2 cm wide, subglabrous, variously parted or cleft, with cuneate obovate segments having acute tips, sessile to petiolulate. Involucral bracts 3, similar to radical leaves in dissection or dissimilar with elongate lobes, reduced, short-petiolate, thinly pilose, positioned above middle of scape at anthesis; secondary branches one or more, 2-bracteate. Flowers 1-several per scape; lateral flowering branches maturing later than central flower; scape villous above involucre, subglabrous below. Sepals 6-13, white to pink, linear-oblong, 5-19 mm long, 2.5-6.5 mm wide, pubescent on the outer side; anthers yellowish-brown, ca. 1 mm long. Fruiting heads cylindrical to ellipsoidal, 1.5-4.0 cm long and 1.0-1.5 cm broad; achenes flat, orbicular, 2-4 mm wide, densely villous; styles reddish-purple to lavender, + or - erect, filiform, 1/3 to 1/2 length of achenes; $2n = 16$ (Joseph & Heimberger 1966).

February to May. High dry rocky slopes and grassy flats, southeastern California, southern Nevada, and southwestern Utah, southeastward through Arizona and New

Mexico to central Texas; south into Baja California, Coahuila, and Nuevo León in México. [description adapted from Keener & Dutton 1994].

ANEMONE TUBEROSA Rydberg var. *TUBEROSA*

Specimens examined:

MEXICO. Baja California: On bare rocky E slope of Cerro Matomi, 4 May 1973, *R. Moran 20797* (TEX-LL).

U.S.A. Arizona: Gila Co., Beside Beeline hwy, 14 mi S of Payson, 2 Apr 1960, *N.H. Russell 11352* (BRIT). Maricopa Co., Desert slopes by Apache Trail, 2 mi W of Canyon Lake, 28 Feb 1960, *N.H. Russell 11123* (BRIT); E side of Canyon Lake, 28 Feb 1960, *N.H. Russell 11159* (BRIT); Lake Pleasant Regional Park, 6 Apr 1966, *Moore, Pinkava, & Keil 152* (TEX-LL). Pima Co., Ajo Mts., 4 Apr 1948, *Fouts 368* (NMC); Hills W of Tucson, 17 Feb 1935, *F. Shreve 13163* (BRIT); Rocky hillside near Colossal Cave, Rincon Mountains, 25 Mar 1946, *C. Van Cleve 5* (TEX-LL). Pinal Co., 1 mi N of Peppersauce Canyon, 1 Mar 1968, *Keil, Pinkava, & Lahto 10790* (TEX-LL). Santa Cruz Co., Summit of Fraguita Peak, Cobre Ridge, Coronado Natl Forest, 1 Mar 1986, *G.M. Ferguson s.n.* (TEX-LL). New Mexico: Dona Ana Co., Bishop's Cap, 23 Mar 1935, *Hershey s.n.* (NMC); Tortugas Mts., 14 Mar 1941, *No collector, s.n.* (NMC); West of Organ Mts, 21 Mar 1941, *No collector, s.n.* (NMC); Little Mt., mesa west of Organ Mts., 7 Mar 1900, *E.O. Wooton s.n.* (NMC); Ridge on N side of Bishop's Cap, SE of Las Cruces, 16 Apr 1995, *M. Enquist & B. Crozier 2799* (TEX-LL,TAES). Luna Co., Florida Mts., 7 Mar 1897, *C.L. Herrick 309* (NMC); Hermanas, 18 Mar 1940, *A.L. Hershey s.n.* (NMC). Sierra Co., 1 mi W of Hillsboro, 30 Apr 1904, *O.B. Metcalfe 1558* (NMC). Texas: El Paso Co., E lower slopes of Mt. Franklin, 19 Apr 1952, *Barton Warnock 10409* (SRSC); E slopes of Fusselman Canyon, Franklin Mts., 25 Apr 1973, *Barton Warnock 23688* (SRSC); Slopes below Cottonwood Spring above Tom Mays Memorial Park, W side of Franklin Mts., 6 Apr 1970, *D.S. Correll & D. Flyr 38359* (BRIT,TEX-LL); Franklin Mts. along Trans-Mountain Road near Fusselman Canyon flood control dam, 1 Apr 1979, *R.D. Worthington 4229* (TEX-LL). Winkler Co., 5 mi E of Kermit, 24 Apr 1975, *Barton Warnock 23875* (SRSC).

Since the 1930's, many collections of *Anemone tuberosa* have been made in the western half of Texas. Its variation has not gone unnoticed. As a result, identifications have largely been divided between *A. tuberosa* and *A. sphenophylla* Poepp. We believe taxonomists have divided their identifications between these two names due to the character of the involucre bracts in most of the Texas plants.

Rydberg (1902) described the leaves and involucre bracts of *Anemone tuberosa* as follows ". . . basal leaves with petioles about 5 cm. long, twice ternate; divisions rhombic-cuneate in outline, ternately cleft and toothed; teeth oblong-ovate: . . . involucre leaves similar to the basal ones, but short-petioled and with longer lobes and teeth . . .". He cited specimens from Arizona, New Mexico, Utah, and California which presumably fit his description of a "leafy-bracted" *Anemone*.

Although specimens with involucre bracts fitting the typical elements of *Anemone tuberosa* can be found in extreme West Texas (El Paso County), other plants from

there east to Edwards County have involucre bracts unlike the type description. These plants have bracts with elongate, linear lobes and segments, usually with entire margins but sometimes few-toothed (see Figure 2).

Faced with this variation from the typical elements, many taxonomists in Texas have relied on the interpretation of Britton (1891), who expanded the name *Anemone sphenophylla* to include this taxon of the southwestern U.S. Britton described the leaves and involucre bracts of *A. sphenophylla* as follows: "Radical leaves slender-petioled ternately divided, the divisions obovate, obtuse, cuneate at the base, variously lobed and cleft; leaves of the involucre short-petioled or sessile by a narrowed base, palmatifid into linear or oblong acute segments . . ." This description would seem to better describe the linear-lobed bracts common to *A. tuberosa* in Texas and is the probable reason for the numerous label and annotation identifications of this taxon as *A. sphenophylla*. (We have seen no specimens of *A. sphenophylla* from Chile and do not address the question of whether this name has priority over the name *A. tuberosa*. We note the disjunct occurrence of *A. multifida* Poir. in Chile [Lourteig 1951] and would not be surprised at the disjunct occurrence there of the taxon under discussion in this paper).

Rydberg's description of the bracts of *Anemone tuberosa* was brief and somewhat ambiguous, describing the involucre leaves as similar to the basal ones "but short-petioled and with longer lobes and teeth . . .". When Rydberg described the bracts as being similar to the radical leaves, he may have had in mind bracts such as those in Figure 2 B, E, & F, as well as those with "longer lobes and teeth" exemplified by Figure 2 C & D. We believe the bracts illustrated in Figure 2 C & D represent an intermediate morphology between the western and eastern elements of *A. tuberosa*. In a comparison of specific individual plants, the difference between Figure 2 D (Santa Cruz Co., Arizona) and Figure 2 K (Kimble Co., Texas) is one of degree only.

We feel it is useful to contrast the western and eastern populations of *Anemone tuberosa*; those in Arizona are predominantly "leafy bracted" while those in most of the Texas range have bracts that are not "leafy bracted" but instead are predominantly elongately lobed. We propose that the name *Anemone tuberosa* var. *texana* be applied to those plants with elongately lobed bracts that are dissimilar to the radical leaves.

ANEMONE TUBEROSA Rydberg var. **TEXANA** Enquist & Crozier, var. nov.

TYPE: U.S.A. Texas: Val Verde Co., On Highway 277 north of Del Rio, 1.1 miles south of intersection of 277 & 377, abundant in bar ditch on east side of road, 25 Mar 1995, M. Enquist, B. Crozier, & B.L. Turner 2757 (HOLOTYPE: TEX-LL; Isotypes: TAES, BRIT)

Anemone okennonii Keener & Dutton, Sida 16(1):191-202. 1994.

Anemone tuberosae Rydb. var. *tuberosae* similis sed segmentis ultimis bractorum involucre linearibus integribusque differt.

Slender perennial herb, 4-30 cm tall at anthesis, from oblong or clavate tuberous rootstocks; radical leaves petiolate, 1-2 ternate, acute-tipped, 2-4 cleft, cuneate at the base; peduncle typically branched above the involucre bracts, appressed pubescent above the bracts and glabrate below; involucre bracts sessile, palmatifid into linear or oblong acute segments; flowers (1) 2 (3) per peduncle, the first peduncle naked,

subsequent ones involuclate; sepals 6-12, oblong-oval obtuse, often with retuse tips; pink, white, or white with pink streaks on the outer side, 0.5-1.9 cm long, pubescent on the outer side; fruiting head ovoid to cylindrical, 1.5-3.5 cm long; achenes tomentose, styles violet-purple, filiform, about 1/3 the length of the achene.

February to April. Rocky slopes to grassy flats, predominantly over limestone. In Texas, from El Paso County east to Kimble County; also in northern México.

Specimens examined:

MEXICO. Coahuila: Rio Grande, Tule Canyon, on Coahuila side above Upper Madison Falls, 10 Apr 1973, *M.C. Johnston, T.L. Wendt, & F. Chiang C. 10614* (TEX-LL). Nuevo León: Monterrey, 9 Mar 1923, *B.C. Tharp 1800* (TEX-LL); On "M" ridge side above San Pedro, Monterrey, 5 Feb 1961, *R. F. Smith M338* (TEX-LL); Rocky hillside 3.7 mi W of Bustamante, 4 Feb 1983, *C. Cowan 3782* (TEX-LL); Villaldama, Mountains E of state highway 34, 1.4 km N of junction to Bustamante, 15 Mar 1983, *C. Cowan 3809* (TEX-LL)

U.S.A. New Mexico: Eddy Co., Carlsbad Caverns Natl. Park, 19 Apr 1977, *T.L. Burgess 4476* (TEX-LL). Texas: Brewster Co., E slope of Pulliam above Moss Well at Big Bend National Park, 21 Mar 1967, *Barton Warnock 21142* (SRSC); Glass Mts., hills in back of Jim Nichols ranch house, 9 Mar 1947, *Barton Warnock 47007* (SRSC); Alpine, 20 Mar 1937, *Barton Warnock T205* (SRSC, TEX-LL); Pine Mt., about 12 mi E of Alpine, 19 Mar 1938, *B. Peyton & Barton Warnock T439* (SRSC); Dog Canyon, Big Bend Natl Park, 8 Apr 1958, *Barton Warnock & M. Johnston 15986* (SRSC); Lowest foothill slopes, Glass Mts., 21 Mar 1941, *Reg. Rose-Innes & Barton Warnock 565* (BRIT, TEX-LL); Chisos Mts., 15 Mar 1941, *Barton Warnock 442* (TEX-LL). Crockett Co., 14.8 mi W of Ozona, 14 Mar 1949, *B.L. Turner & Barton Warnock 273* (SRSC, BRIT, TEX-LL); Hwy 290, 1 mi E of Pecos River bridge, 9 Apr 1964, *J. Read 572* (SRSC); On 290, at roadside park at top of Lancaster Hill, Ft. Lancaster, 26 Feb 1995, 50 to 500 yds S of park under top of west-facing rim, 26 Feb 1995, *M. Enquist 2710* (TEX-LL, BRIT, TAES); On 290, at roadside park at top of Lancaster Hill, Ft. Lancaster, 5 Mar 1995, *M. Enquist & B. Crozier 2733* (TEX-LL); W side of Pandale Road, 24.4 mi N of int. of 1024 & Pandale Road, 12 Mar 1995, *M. Enquist & B. Crozier 2734* (TEX-LL, BRIT, TAES, MO, SRSC). Culberson Co., Victorio Canyon, E margin of Sierra Diablo, 18 Apr 1973, *M.C. Johnston, T.L. Wendt, & F. Chiang 10686* (TEX-LL). Edwards Co., Rock knob 14.2 mi NE of int. of 277 & 377, 4 Mar 1995, *M. Enquist & B. Crozier 2724* (TEX-LL, BRIT, TAES, MO, SRSC, NMC); On 2523, 1.7 mi N of Edwards/Kinney Co. line at long roadcut, 25 Mar 1995, *M. Enquist, B. Crozier, & B.L. Turner 2750* (TEX-LL, BRIT, TAES). Kimble Co., On 385, 1.35 mi S of Llano River, E side of road on low roadcut through nodular limestone, 2 Apr 1995, *M. Enquist 2776* (TEX-LL, BRIT, TAES, MO, SRSC, NMC); On 385, E side of road on low roadcut through nodular limestone, plants heavily attacked by black rust, 9 Apr 1995, *M. Enquist 2790* (TEX-LL, BRIT, TAES, MO, SRSC, NMC); On 385, low roadcut to drainage, 3.2 mi S of Llano River, 17 Apr 1995, *M. Enquist & B. Crozier 2804* (TEX-LL, BRIT, TAES, MO, SRSC, NMC); On 377, S of Junction, 0.3 - 0.4 mi N of first crossing of the Llano River, W side of curve, 2 Apr 1995, *M. Enquist 2780* (TEX-LL, BRIT, TAES, MO, SRSC, NMC). Pecos Co., Along Sanderson hwy 10-18 mi out of Ft. Stockton, 5 Apr 1953, *J. Scuddy 133* (SRSC); Along hwy 20 mi NE of Ft. Stockton toward McCamey, 27 Apr 1947, *Barton Warnock 5199* (SRSC, BRIT,

TEX-LL); N side of Sierra Madera range, 24 mi S of Ft. Stockton, 12 Apr 1947, *Barton Warnock 5064* (SRSC); 13.5 mi E of Ft. Stockton along hwy 290, 17 Apr 1965, *D.S. Correll & H. B. Correll 30884* (TEX-LL); On mesa N of Tunis Spring, about 19 mi E of Ft. Stockton, 5 Apr 1965, *D.S. Correll, H. B. Correll, & L. Benson 30844* (TEX-LL); Off US 67, E of Ft. Stockton, 15 Apr 1941, *C.L. Lundell & A.A. Lundell 10176* (TEX-LL). Sutton Co., on 189, SW corner of county, 0.8 mi NE of int. of 189 & Co. Rd. 410, 12 Mar 1995, *M. Enquist & B. Crozier 2741* (TEX-LL, BRIT, TAES); On 277, 4.3 mi S of int. of 277 & Loop 476 in Sonora, 19 Mar 1995, *M. Enquist & B. Crozier 2746* (TEX-LL, BRIT, TAES). Terrell Co., 13 mi W of Sanderson, 28 Feb 1947, *Barton Warnock 47083* (SRSC); 4.2 mi W of Sanderson, 14 Mar 1949, *B.L. Turner & Barton Warnock 319* (SRSC, BRIT); 31 mi S of Sheffield, 14 Mar 1949, *B.L. Turner & Barton Warnock 307* (SRSC, BRIT); 5 mi E of Dryden on US 90, 30 Mar 1950, *H.L. Surrat 179* (SR); 8 mi E of Dryden, 28 Mar 1947, *Barton Warnock 47107* (SRSC). Uvalde Co., Uvalde, common on sandy hills and prairies, 28 Feb 1919, *H.C. Hanson s.n.* (TEX-LL). Val Verde Co., 20 mi N of Langtry, 30 Mar 1947, *Barton Warnock & G.W. Brown 47301* (SRSC); Hills above dam at foot of Devils Lake, about 20 mi NNW of Del Rio, 31 Mar 1947, *R. McVaugh 7729* (BRIT, TEX-LL); 1.1 mi S of int. of 277 & 377, 25 Mar 1995, *M. Enquist, B. Crozier, & B.L. Turner 2757* (TEX-LL, BRIT, TAES, MO); 1.1 mi S of int. of 277 & 377, 17 Apr 1995, *M. Enquist & B. Crozier 2802* (TEX-LL, BRIT, TAES); Low, curving roadcut on 1024, 6.8 mi E of int. of 1024 and Pandale Rd in Pandale, 5 Mar 1995, *M. Enquist & B. Crozier 2730* (TEX-LL, BRIT, TAES, MO, SRSC, NMC); County road to Juno at its int. with 1024, 12 Mar 1995, *M. Enquist & B. Crozier 2738* (TEX-LL); Loma Alta, 0.2 - 0.3 mi N of Loma Alta on E side of 277, 4 Mar 1995, *M. Enquist & B. Crozier 2727* (TEX-LL, BRIT, TAES, SRSC, NMC); E side of Pandale Road, 4.8 mi S of Pecos River crossing in narrow strip of grass along road, 12 Mar 1995, *M. Enquist & B. Crozier 2737* (TEX-LL); On 189, 0.8 mi S of Buckley's Crossing, 19 Mar 1995, *M. Enquist & B. Crozier 2747* (TEX-LL, BRIT, TAES, MO, SRSC, NMC); On 1024 to Pandale ca. 3 mi N of Junction with US 90 in Comstock, 14 Mar 1985, *B. Ertter & K.A. Bear 5601* (TEX-LL).

KEY TO TEXAS SPECIES OF *ANEMONE*

(adapted from Keener & Dutton 1994)

1. Plant spreading by rhizomes or stolons, involucre below middle of scape at anthesis; scape nearly glabrous below involucre; involucre bracts similar to at least some of the radical leaves; styles as long or longer than the ovoid achenes.1. *A. caroliniana*
1. Plant without rhizomes or stolons, involucre above middle of scape at anthesis; scape glabrous to pubescent below involucre, involucre bracts dissimilar or similar to radical leaves; styles less than half as long as the orbicular, flat achenes.(2)
 2. Scape simple, bearing one flower; involucre bracts distinctly dissimilar to radical leaves; scape densely pubescent below involucre.2. *A. berlandieri*
 2. Scape usually branched, bearing two or more flowers per stem; involucre bracts similar or dissimilar to radical leaves; scape nearly glabrous to glabrous below involucre.(3)

3. Leaves 1 (-2) ternate; flowers white; translucent styles colorless to yellow-green.3. *A. edwardsiana*
 3. Leaves (1-) 2 ternate; flowers white to pink; translucent styles pale lavender to purplish-red.4. *A. tuberosa*

CONCLUSION

We conclude that the label data on type material of the O'Kennon collections are inaccurate and probably reflect confusion as to where the type specimens of *Anemone okennonii* were actually collected. Because of this, and because we recognize the taxon at a lower rank, we here redescribe it with a different name and better typification. Although we are aware that the *International Code of Botanical Nomenclature* recommends the retention of any name which might be replaced in a change of rank, we believe the broader systematic community is better served by the nomenclature provided here as to the geography to which it is largely confined, its inextricable relationship with *A. tuberosa*, and by the precise typification.

ACKNOWLEDGMENTS

We would like to thank Mike Powell and Sharon Yarborough of SRSC, Barney Lipscomb and Fiona Norris of BRIT, and Richard Spellenberg of NMC.

We thank Sara Hoot, to whom we have forwarded material for DNA work, for her comments.

We also thank Guy Nesom for the Latin diagnosis.

LITERATURE CITED

- Britton, N.L. 1891. The American species of the genus *Anemone* and the genera which have been referred to it. *Ann. New York Acad. Sci.* 6:215-238.
 Correll, D.S. & M.C. Johnston. 1970. *Manual of the Vascular Plants of Texas*. Texas Research Foundation, Renner, Texas.
 Hoot, S.B., A.A. Reznicek, & J. Palmer. 1994. Phylogenetic relationships in *Anemone* (Ranunculaceae) based on morphology and chloroplast DNA. *Syst. Bot.* 19:169-200.
 Johnston, M.C. 1990. *The Vascular Plants of Texas: A List Updating the Manual of the Vascular Plants of Texas*. published by the author, Austin, Texas.
 Henrickson, J. & M.C. Johnston. A flora of the Chihuahuan desert region. Unpublished manuscript.

- Joseph, C. & M. Heimberger. 1966. Cytotaxonomic studies on New World species of *Anemone* (Section *Eriocephalus*) with tuberous rootstocks. *Canad. J. Bot.* 44:899-928.
- Keener, C.S. & B.E. Dutton. 1994. A new species of *Anemone* (Ranunculaceae) from central Texas, *Sida* 16(1):191-202.
- Lourteig, A. 1951. Ranunculaceas de Sudamerica templada. *Darwiniana* 9:397-608.
- Rydberg, P.A. 1902. Studies on the Rocky Mountain flora -- VII. *Bull. Torrey Bot. Club* 29:145-160.
- Warnock, B.H. 1970. *Wildflowers of the Big Bend Country, Texas*. Sul Ross State University, Alpine, Texas.

PARONYCHIA VIRGINICA (CARYOPHYLLACEAE), A FIRST REPORT OF ITS OCCURRENCE IN MEXICO

B.L. Turner

Department of Botany, University of Texas, Austin, Texas 78713 U.S.A.

ABSTRACT

Paronychia virginica Spreng. is widespread in the eastern U.S.A. but has not previously been reported for México, although it is relatively common in central Texas. Recent collections by D.H. Riskind from the Serranias del Burro, Mpio. Villa Acuña, Coahuila, México has extended its distribution about 300 kilometers southwestwards from its previously known range. A map showing its distributions in Texas and México is provided.

KEY WORDS: Caryophyllaceae, *Paronychia*, Texas, México

Routine identification of plants from northern México has revealed the occurrence of *Paronychia virginica* Spreng. in México, where it has not heretofore been reported. All of the collections (3 sheets) were made by Mr. David H. Riskind, in the Serranias del Burro, Mpio. de Villa Acuña, Rancho el Bonito (ca. 29° 01' 30" N, 102° 07' 30" W), as follows:

1. Canyon El Toro, 18 Sep 1977, R. 2142 (TEX).
2. Head of Canyon El Bonito, plateau of open pine-oak woodland, 2300 m, 20 Sep 1977, R. 2263 (TEX).
3. Open slope between canyons El Bonito and Pantera, 20 Sep 1977, R. 2286 (TEX).

Figure 1 shows the distribution of *Paronychia virginica* in Texas and México. This is based upon collections from Texas as reported in Turner (1983. *Phytologia* 54:9-23.) and upon collections assembled at LL, TEX since that time.

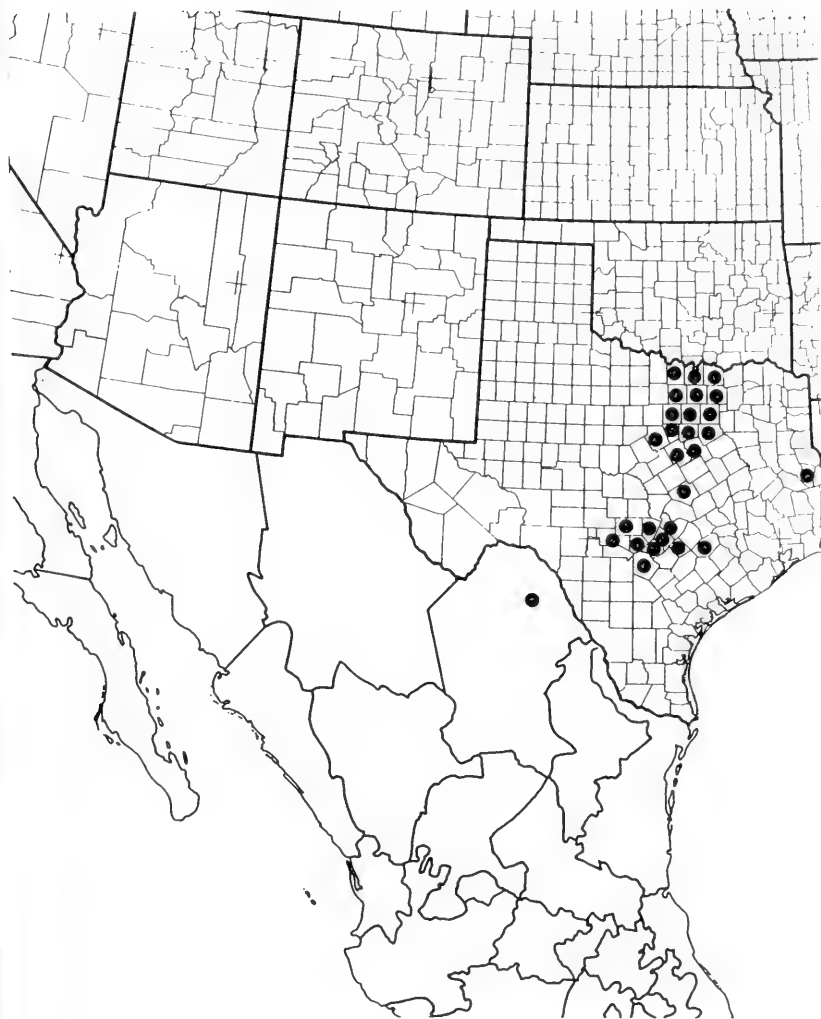


Fig. 1. Distribution of *Paronychia virginica* in Texas and Mexico.

SYNOPTICAL STUDY OF *RHODODON* (LAMIACEAE)

B.L. Turner

Department of Botany, University of Texas, Austin, Texas 78713 U.S.A.

ABSTRACT

Rhododon, endemic to Texas, is treated as having two species: *R. ciliatus* (Benth.) Epling, and *R. angulatus* (Tharp) B.L. Turner, *comb. nov.* The latter taxon was originally positioned in the genus *Stachydeoma* by Tharp in 1945 after the erection of *Rhododon* by Epling in 1939. Tharp was unaware of Epling's establishment of *Rhododon*, typical elements of which had previously resided in *Stachydeoma*. A key to the two species of *Rhododon* is provided, along with complete synonymies and maps showing the distribution of each.

KEY WORDS: Lamiaceae, *Rhododon*, *Stachydeoma*, *Hedeoma*, Texas

Rhododon was established as a monotypic genus by Epling in 1939. The type species, *R. ciliatus* (Benth.) Epling, was originally described by Bentham as *Keithia ciliata* Benth., based upon material collected in Texas by Berlandier in 1828. Bentham (Nov. 1848) subsequently transferred the species to *Hedeoma* where it was retained as *H. ciliata* (Benth.) Benth. ex DC., in spite of the existence of *H. ciliata* Nutt. (Apr. 1848), which occasioned the replacement name, *H. texana* Cory, in 1936. Earlier, however, Small in 1903 had transferred *Keithia ciliata* into his newly erected *Stachydeoma*, which apparently contained two disparate elements, neither of which was selected by Small to typify his genus. Epling (1939) corrected this oversight with the erection of *Rhododon*, typifying *Stachydeoma* with *S. graveolens* (Chapm.) Small, a Floridean endemic.

Tharp (1945), when undertaking his study of *Stachydeoma* for Texas, was unaware of Epling's *Rhododon* and maintained three taxa within *Stachydeoma*, *S. ciliata* and two newly described species, *S. angulata* Tharp and *S. duvalii* Tharp. Subsequent workers have more or less ignored *Rhododon*, although Irving (1980) excluded *R. ciliata* from his concept of *Hedeoma*, in effect accepting Epling's *Rhododon*, but treating this as monotypic, in spite of Tharp's two newly described species, both of which Irving thought synonymous with *R. ciliatus*.

I have gone over the *Rhododon* problem in some detail, studying specimens of the genus both in herbaria and in the field. My treatment recognizes *Rhododon* as distinct from *Stachydeoma*, accepting two species, *R. ciliatus* (including *S. duvalii*) and *R. angulatus*, the former occupying deep sandy soils in east central Texas, the latter occurring in coastal relic dunes in southern Texas, as shown in Figure 1.

A key to the species follows, along with brief descriptions and complete synonymies.

1. Midstem leaves broadly ovate to ovate-elliptic, mostly 1.5-2.0 times as long as wide; calyx lobes merely ciliate, their surfaces essentially glabrous, the marginal hairs mostly 0.5 mm long or less; flowers arranged in interrupted spikes; coastal relic dunes in southernmost Texas. *R. angulatus*
1. Midstem leaves elliptic to oblanceolate, mostly 2.0-3.5 times as long as wide; calyx lobes pubescent both along their margin and upon their surfaces, the hairs, at least some or most of them 1-2 mm long; flowers usually arranged in dense spikes, rarely interrupted; east-central Texas. *R. ciliatus*

RHODODON ANGULATUS (Tharp) B.L. Turner, *comb. nov.* BASIONYM: *Stachydeoma angulata* Tharp, *Brittonia* 5:304. 1945. TYPE: U.S.A. Texas: Aransas Co., Rockport, 2 Jul 1939, *B.C. Tharp 43991* (HOLOTYPE: TEX!).

Tharp (1945) provided an adequate description of this species, along with a photograph of the holotype. He also constructed a key to the several taxa recognized, but emphasized in this several characters which I have not drawn upon.

Rhododon angulatus is a rarely encountered taxon. I visited the type locality in May of 1994 to ascertain its relative commonness in the area concerned. As indicated in the specimens cited below, I first collected the species in June of 1964, 5 miles north of Aransas Pass, growing upon large stabilized sand dunes along the east side of state highway 35. At that time I encountered only two plants in the immediate vicinity, both growing upon the dunes concerned. My revisit to this site in 1994 was most disappointing, for all of the prominent dunes along the roadway had been leveled for highway expansion and commercial development.

I did, however, locate *Rhododon angulatus* in similar dune sands along the roadway that circles the Aransas County airport, about 1 km west of the earlier site. None of the plants was in flower at the time, but I counted several hundred or more over an acre or less, nearly all in deep sandy soils among and upon seemingly stabilized dune sands. Since the relic dunes in this region harbor a number of interesting plants, especially *Rhododon angulatus*, some effort should be made by conservancy agencies to protect at least a few such areas.

ADDITIONAL SPECIMENS EXAMINED: U.S.A. Texas: Aransas Co., "On sandy bank south of Aransas County Airport," 8 Jul 1957, *Correll & Johnston 17613* (LL); 5 mi N of Aransas Pass, roadside, growing in live oak mott, 16 Jun 1964, *Turner 5030* (TEX).

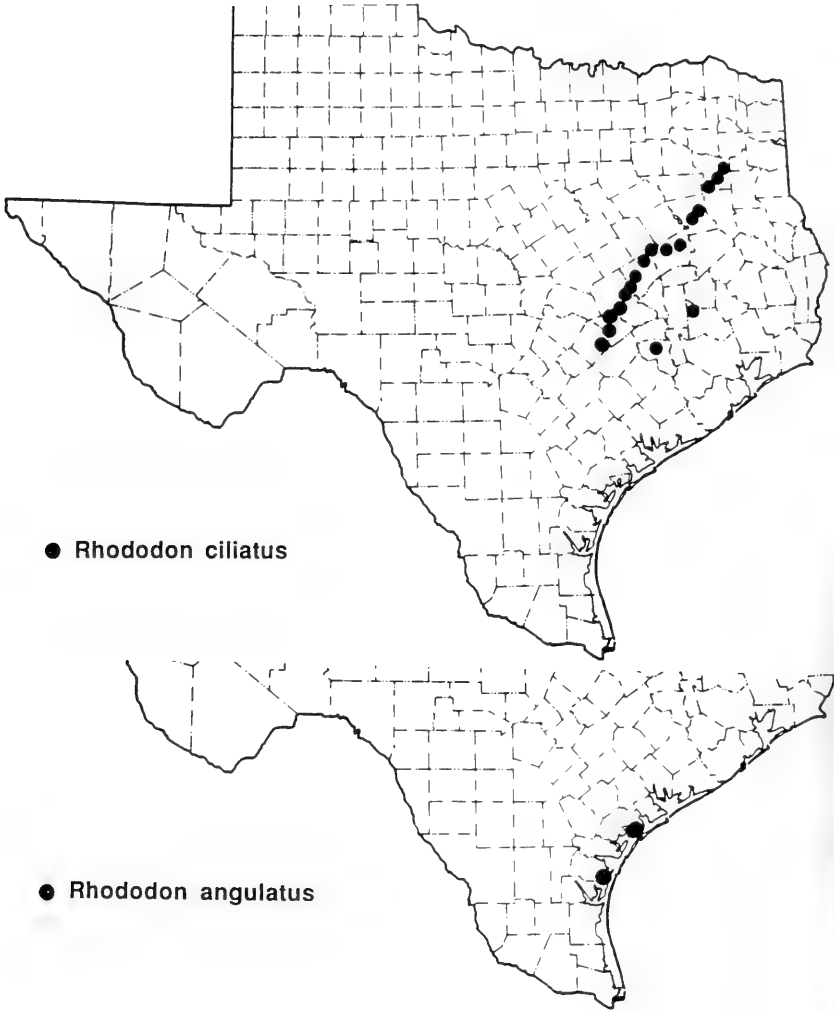


Fig. 1. Distribution of *Rhododon* spp. Upper map, *R. ciliatus*; lower map, *R. angulatus* (based upon records at BRIT, LL, TEX).

RHODODON CILIATIS (Benth.) Epling, Rep. Spec. Nov. Beih. 115:14. 1939.
= *Hedeoma ciliata* (Benth.) Benth. in DC., *Prodr.* 12:245. Nov 1848. [not *H.*
ciliata Nutt.]. = *Stachydeoma ciliata* (Benth.) Small, *Fl. S.E. U.S.* 1041. 1903,
1937. = *Hedeoma texana* Cory, *Rhodora* 38:405. 1936. TYPE: U.S.A. Texas:
w/o county, 1828, *Berlandier s.n.* (HOLOTYPE: K).
Stachydeoma duvalii Tharp, *Brittonia* 5:306. 1945. TYPE: U.S.A. Texas:
Austin Co., 4 mi NW of Bellville, 22 Jun 1923, *B.C. Tharp 43992*
(HOLOTYPE: TEX!).

This taxon has been adequately described by Tharp (1945). He separated from this, however, material collected in Austin County having interrupted spikes (the latter character approaching that of *Rhododon angulatus*), calling this *Stachydeoma duvalii*. Except for the interrupted spikes, nearly all of the characters of the latter are those of *Rhododon ciliatus* and I have little hesitancy in treating these as synonymous.

Rhododon ciliatus is linearly widespread and abundant in eastcentral Texas, where it is largely restricted to the deep white sandy soils of the Carrizo formation (*cf.*, McBryde 1933), although occasional populations occur elsewhere, as shown in Figure 1.

LITERATURE CITED

- Irving, R. 1980. The systematics of *Hedeoma* (Labiatae). *Sida* 8:218-304.
Tharp, B. 1945. Noteworthy plants of Texas - III. *Stachydeoma* as represented in Texas. *Brittonia* 5:304-307.
McBryde, J. 1933. The vegetation and habitat factors of the Carrizo sands. *Ecol. Monographs* 3:247-297.

INDEX TO AUTHORS, VOLUME 78

- Adams, R.P. 134
Anderson, L.C. 246
Affolter, J.M. 127
Aruna, V. 357
Babu, G.J. 357
Baird, G.I. 61
Benítez de Rojas, C. 353
Bridges, E.L. 246
Constance, L. 127
Crozier, B. 428
Debreczy, Z. 217
Douglas, P.P. 249
Egger, M. 256
Enquist, M. 428
Gandhi, K.N. 1
Grant, J.R. 119
Hays, J. 264
He, Ping 277, 282
Hurter, P.J.H. 409
Jones, S.D. 244
Kartesz, J.T. 1
King, R.M. 124, 381
Klackenberg, J. 189
Kumar, K.V. 260
Laferrière, J.E. 214
Landry, P. 287
Li, Hong 277
de la Luz Arreguin-Sánchez, A. 361
MacRoberts, B.R. 18, 291, 402
MacRoberts, M.H. 18, 291, 402
Martínez, M. 353
Meagher, W.L. 317
Morales, J.F. 192, 195, 197
Naidu, K.C. 357
Nesom, G.L. 61, 131, 153
Orzell, S.L. 246
Palacios-Chávez, R. 361
Pushpalatha, V. 357
Quiróz-García, D.L. 361
Rácz, I. 217
Rao, B.H. 260
Reeder, C.G. 417
Reeder, J.R. 417
Robinson, H. 124, 381, 384
Shaw, R.B. 249
Turner, B.L. 28, 36, 39, 199, 204,
209, 211, 285, 400, 405, 446,
448
Warnock, M.J. 73, 102
Wipff, J.K. 244

INDEX TO TAXA, VOLUME 78

New taxa described in this volume are indicated by bold face type.

A

- Abies* 113, 217-220, 222-229, 231,
232, 242
bracteata 218
concolor 217-219, 224, 232
var. *lowiana* 219, 232
durangensis 218, 224, 225, 228
var. *coahuilensis* 218
firma 218
grandis 219, 224, 232
guatemalensis 217-219, 222,
226, 227, 229, 231
var. *longibracteata* 218,
219, **227**, 229, 231
var. *tacanensis* 218, 219,
231
hickelii 218, 226, 227
hidalgensis 218-**220**, 228,
229

Abies (cont.)

- lowiana* 217-219, 224, 231, 232
var. *viridula* 218, **231**,
232
magnifica 218
neodurangensis 218, 219,
223, 228, 229
oaxacana 218
religiosa 222, 231
vejarii 218, 222
var. *mexicana* 218
zapotekensis 218, 219, **225**,
228, 229
Abutilon 328, 331, 347
simulans 328, 331, 347
Acacia 237, 326, 328-332, 335,
346, 351, 358
arabica 358
farnesiana 328-332, 346
leucophloea 358

Acacia (cont.)*schaffneri* 326, 328, 330, 332,

335, 346, 351

sundra 358*Acalypha* 331

Acanthaceae 21, 268, 336, 343

Acer 233, 247*glabrum* 233*rubrum* 247*Aceretes* 296*angustifolia* 296*Adenostemma* 125

Adiantaceae 268, 342, 343

Adiantum 241*Adina* 359*cordifolia* 359*Aegle* 359*marmelos* 359*Aeonium* 1, 5, 6, 13, 16*haworthii* 1, 5, 6, 13*Agalinis* 23, 273*fasciculata* 23*skinneriana* 23*tenuifolia* 273*Agarista* 247*Agarista* (cont.)*populifolia* 247*Agave* 34, 165, 203, 337, 350*filifera* 350*lechugilla* 203

Agavaceae 21

Ageratella 204-208*microphylla* 204-208var. *microphylla* 204-208var. *palmeri* 204-207var. *seemannii* 204, 205var. *sonorana* 204-206,

207

palmeri 206*Ageratina* 131*Ageratum* 204, 205, 328, 332, 333,
343*corymbosum* 328, 332, 333,

343

microphyllum 204, 205*Agrostis* 10, 11, 244, 274*aspera* 10, 11, 244*clandestina* 244*composita* 10, 11, 244*elliottiana* 274

- Agrostis* (cont.)
 hyemalis 274
 var. *hyemalis* 274
 perennans 274
- Albizzia* 358
 lebbeck 358
 odoratissima 358
- Alcantarea* 119, 120, 122, 123
 brasiliana 120
 duarteana 120
 extensa 120
 farneyi 120
 geniculata 120
 imperialis 120
 nahoumii 120
 odorata 120
 regina 120
 vinicolor 120
- Aletris* 402
 aurea 402
- Alismataceae 123
- Allium* 274
 canadense 274
 var. *canadense* 274
 var. *mobile* 274
- Allomiinae 124, 125
- Alnus* 223, 225, 227
 firmifolia 223, 225
 glabrata 227
- Alomiinae 381
- Alopecurus* 265, 274
 carolinianus 265, 274
- Alstonia* 192-194
 longifolia 192-194
 macrantha 192, 193
 pittieri 192, 194
- Amaranthaceae 341, 343
- Amaranthus* 330, 331, 341, 343
 hybridus 330, 331, 341, 343
- Ambrosia* 21, 269, 332, 343
 artemisiifolia 21, 269
 bidentata 269
 cordifolia 332, 343
- Amsonia* 295, 311
 ludoviciana 295, 311
- Anacardiaceae 21, 269, 343, 357
- Anacardium* 357
 occidentale 357
- Andropogon* 22, 274, 350
 gerardii 22, 274

Andropogon gerardii (cont.)var. *gerardii* 274*glomeratus* 22*tenarius* 22*virginicus* 22*Anemone* 23, 428-441, 443, 444,
445*berlandieri* 428, 430, 434, 438,
443*caroliniana* 23, 428, 430, 434,
443*edwardsiana* 428-430, 433,
435, 437, 438, 444sect. *Eriocephalus* 445*multifida* 441*okennonii* 428-430, 438, 439,
441, 444*sphenophylla* 439-441*tuberosa* 428-432, 435-441, 444
var. *texana* 428, 435, 436,**441**var. *tuberosa* 435, 440, 441*Angelica* 127

Angiospermae 343, 380

Anisacanthus 328, 334, 343*Anisacanthus* (cont.)*quadrididus* 328, 334, 343

Annonaceae 358

Anoda 335, 347*cristata* 335, 347*Anogeissus* 358*acuminata* 358*latifolia* 358*Antennaria* 269*plantaginifolia* 269*Aphanactis* 131

Apiaceae 21, 127

Apioideae 127

Apocyanaceae 21, 192, 195, 197,
311, 336, 343, 358

Apocynoideae 197

Apocynales 191

Apocynum 21*cannabinum* 21

Aquifoliaceae 21

Arbutus 227, 233, 235, 241*arizonica* 235*glandulosa* 233, 235*xalapensis* 227, 241*Archibaccharis* 131

- Arecaceae* 358
- Arenaria* 270
- serpyllifolia* 270
- Argemone* 342, 348
- ochroleuca* 342, 348
- Aristida* 22, 268, 274
- dichotoma* 274
- var. *dichotoma* 274
- longespica* 274
- var. *longespica* 274
- oligantha* 22
- purpurascens* 274
- Artemisia* 65
- Artocarpus* 359
- integrifolia* 359
- Asanthus* 125, 126
- Asclepiadaceae* 21, 189, 191, 343
- Asclepiadeae* 190
- Asclepias* 21, 296, 308, 329, 330, 343
- hirtella* 308
- linaria* 329, 330, 343
- longifolia* 308
- stenophylla* 296
- viridiflora* 21, 296
- Asclepias* (cont.)
- viridis* 21
- Aspidium* 1, 6, 7
- alpestre* 1, 6, 7
- Asplenium* 268
- platyneuron* 268
- var. *platyneuron* 268
- Aster* 21, 265, 269, 275, 331, 343
- dumosus* 21
- linariifolius* 269
- forma *linariifolius* 269
- var. *linariifolius* 269
- oolentangiensis* 21
- patens* 21
- pilosus* 269
- sericeus* 21, 269
- var. *microphyllus* 21
- forma *sericeus* 269
- subulatus* 343
- Asteraceae* 1, 2, 21, 26, 36, 39, 61, 65, 124-126, 153, 187, 188, 204, 208, 211, 246, 248, 267, 269, 310, 313, 318, 320, 336, 337, 340-345, 352, 381, 383, 384, 399-401

Asteraceae 61, 63, 65, 341

Astragalus 296

crassicaarpus 296

var. *trichocalyx* 296

Atasites 187

Athenaea 354

peruviana 354

Athyrium 1, 6, 7

alpestre 1, 6, 7

distentifolium 6

felix-femina 6

Avicenniaceae 72, 152, 316, 404

Ayapana 125

Azadirachta 358

indica 358

B

Baccharis 328, 331, 334, 335, 343

multiflora 328, 343

salicifolia 328, 331, 334, 335,

343

Bacopa 340, 349

procumbens 340, 349

Bahia 343

schaffneri 343

Bambusa 350

Baptisia 270

alba 270

Barroetia 124-126

brevipes 124

glutinosa 124, 126

laxiflora 125

setosa 125

***sonorana* 125**

subuligera 125

Bartonia 312

texana 312

Bassia 359

latifolia 359

Bauhinia 358

purpurea 358

racemosa 358

Berberidaceae 214-216

Berberis 214, 215, 387

chochoco 214, 215

tinctoria 215

Berchemia 23, 24

scandens 23, 24

Bidens 331, 341, 343, 344

angustissima 343

- Bidens* (cont.)
- ferulifolia* 343
 - odorata* 341, 343
 - pilosa* 341, 344
- Bignoniaceae 336, 345, 358
- Boehmeria* 247
- cylindrica* 247
- Boerhavia* 348
- coccinea* 348
- Bombacaceae 358
- Bombax* 358
- malabaricum* 358
- Boraginaceae 39, 58, 60, 260
- Boraginoideae 60
- Borassus* 358
- flabellifer* 358
- Borreria* 349, 361-364, 368, 369, 378, 379
- laevis* 361-364, 368, 369
 - verticillata* 349, 361-364, 368, 369
- Boswellia* 358
- serrata* 358
- Botrychium* 1, 9
- pumicola* 1, 9
- Bouchea* 331, 342, 349
- prismatica* 331, 342, 349
 - var. *brevirostra* 342, 349
- Bouteloua* 350
- curtipendula* 350
 - gracilis* 350
 - repens* 350
- Bouvardia* 328, 330, 333, 349, 361-365, 368, 370, 371, 378, 379
- subgen. *Bouvardia* 379
 - subgen. *Bouvardiastrum* 379
 - subgen. *Bouvardioides* 379
 - longiflora* 361, 362, 364, 368, 370, 379
 - multiflora* 328, 349, 361, 362, 364, 368, 370, 379
 - obovata* 361-364, 368, 379
 - terniflora* 361, 362
 - ternifolia* 328, 333, 349, 365, 368, 371, 379
- Brachiaria* 341, 350
- meziana* 341, 350
- Brachyactis* 275
- Brassicaceae 1, 3, 254, 269, 341, 342, 345

Braya 1, 3, 14

glabella 1, 3

var. *glabella* 3

var. *purpurescens* 3

purpurascens 1, 3

Brickellia 124-126, 328-330, 332-

334, 344, 381

subgen. *Phanerostylis* 124, 126

problematica 124

secundiflora 328, 334, 344

sonorana 124-126

veroniciflora 329, 330, 332,

333, 344

Brickelliastrum 124-126

fendleri 125

nesomii 125

villarrealii 125, 126

Bridelia 358

retusa 358

Bromeliaceae 119, 120, 123, 350

Bromus 331, 350

Buchanania 357

lanzas 357

Buddleia 223, 328, 331, 345

cordata 223, 328, 331, 345

Buddleiaceae 336, 345

Bulbostylis 273

capillaris 273

Bumelia 272

lanuginosa 272

Burmannia 296

biflora 296

Bursera 328, 333, 345

fagaroides 328, 333, 345

var. *fagaroides* 328, 333,

345

Burseraceae 336, 345, 358

Butea 358

frandosa 358

C

Cacalia 21, 169, 246

plantaginea 21

spathulata 169

suaveolens 246

Cactaceae 269, 337, 345

Caesalpinaceae 269, 358

Caesalpinioideae 340

Calliandra 328, 346

grandiflora 328, 346

- Callicarpa* 23
 americana 23
- Callitrichaceae 269
- Callitriche* 269
 heterophylla 269
 var. *heterophylla* 269
- Calopogon* 296, 306
 barbatus 296, 306
 pallidus 296
- Camassia* 274, 296
 scilloides 274, 296
 forma *scilloides* 274
- Campanulaceae 21, 336, 346
- Canthium* 359
 dicoccum 359
- Capparaceae 336, 346
- Caprifoliaceae 21, 269
- Cardamine* 1, 3-5, 16, 269
 californica 1, 3-5
 var. *californica* 4
 var. *integrifolia* 4, 5
 concatenata 269
 integrifolia 1, 3-5
 parviflora 269
 var. *arenicola* 269
- Cardiospermum* 331, 349
 halicacabum 331, 349
- Carex* 358
 arborea 358
- Carex* 21, 247, 249-252, 254, 255,
 273, 297, 313
 bushii 273
 chapmanii 247
 cherokeensis 21
 flaccosperma 21, 273
 var. *glaucodea* 273
 hyalina 297, 313
 inversa 249-252, 254
 sect. *Inversa* 249
 leptalea 247
 meadii 21, 297
 microdonta 297
 tenax 297
 subgen. *Vignea* 249
 wahuensis 250
 subsp. *rubiginosa* 250
 subsp. *wahuensis* 250
- Carpinus* 247, 406
 caroliniana 247
- Carya* 271, 328, 347, 406

Carya (cont.)*illinoensis* 328, 347*texana* 271

Caryophyllaceae 199, 270, 346,

446

Caryota 358*urens* 358*Casearia* 358*elliptica* 358*Cassia* 22, 358*fasciculata* 22*fistula* 358*siamea* 358*Castilleja* 70, 131-133, 256-259,

286, 329, 330, 333, 349

altorum 258sect. *Castilleja* 131, 133, 256,

258, 259

subgen. *Castilleja* 258, 259*conzattii* 132, 133*ctenodonta* 256, 258sect. *Euchroma* 131, 133, 258*filiflora* 258*integrifolia* 131*macrostigma* 258*Castilleja* (cont.)*nervata* 131, 132***nivibractea*** 131, **132**, 133*ornata* 258*pallescens* 70var. *inverta* 70*parviflora* 70var. *albida* 70var. *oreopota* 70***quiexobrensis*** **131**, 132*scorzonerifolia* 131-133*spiranthoides* 256-258*tenuiflora* 133, 259, 329, 330,

333, 349

tolucensis 131, 133*zempoaltepetlensis* 131, 133

Castillejinae 259

Ceanothus 1, 11, 23, 297*americanus* 23*greggi* 1, 11subsp. ***franklinii*** **1, 11**var. *franklinii* 11*herbacea* 297*Ceiba* 358*pentandra* 358

- Celtis* 273
 tenuifolia 273
 var. *tenuifolia* 273
- Centrosema* 22
 virginianum 22
- Cephalanthus* 272
 occidentalis 272
- Cerastium* 270
 brachypetalum 270
- Cercis* 269
 canadensis 269
- Cestrum* 223, 233
 fasciculatum 223
 nocturnum 233
 purpureum 223
- Chamaelirium* 297
 luteum 297
- Chamaesyce* 22
 cordifolia 22
- Chaptalia* 153-188
 albicans 154, 156, 157, 167,
 174, 185, 188
 sect. *Archichaptalia* 155
 carduacea 163
 sect. *Chaptalia* 153, 155, 159,
 169
- Chaptalia* (cont.)
 crispula 167
 dentata 161, 188
 diversifolia 163
 erosa 163
 estribensis 153, 155-157,
 160, 161, 171, 178
 exscapa 154
 fallax 167
 graminifolia 168
 hintonii 155-157, 161, 171, 179
 hololeuca 156, 157, 164, 166,
 174, 184
 integrifolia 157, 187
 leiocarpa 167
 leonina 164
 sect. *Leria* 154-156
 sect. *Lieberkuhnia* 154-156
 sect. *Loxodon* 154, 156
 lyrata 153, 169, 187
 lyratifolia 155-157, 159-161,
 171, 177
 madrensis 153, 155, 157,
 158, 159, 166, 170, 176
 majuscula 163

Chaptalia (cont.)

- sect. *Microchaptalia* 155, 156
nutans 153, 154, 156, 157,
161, 162, 164-167, 169,
173, 181, 187
var. *leiocarpa* 167
var. *texana* 163, 164
obovata 167
petrophila 153, 154, 164, 165,
169, 182, 187
piloselloides 154
pringlei 153, 161, 171, 180
sect. *Pseudotrachelocline* 155
runcinata 154, 156, 167, 168,
172, 186
var. *graminifolia* 168
var. *runcinata* 168
semifloscularis 158
spathulata 153, 154, 165, 169,
173
subcordata 163
texana 154, 156, 157, 159, 161,
163-166, 169, 173, 182
tomentosa 153, 155, 157-159,
167, 170, 175

Chaptalia (cont.)

- transiliensis* 156, 157, 165, 166,
172, 183
Chasmanthium 22
sessiliflorum 22
Cheilanthes 268, 297, 333, 338,
342, 343
beitelii 342
bonariensis 342
incana 342
lanosa 268, 297
lendigera 342
myriophylla 333, 343
sinuata 343
Chiranthodendron 231
pentadactylon 231
Chloraxylon 359
swietenia 359
Chloris 313, 341, 350
subdolichostachya 313
virgata 341, 350
Chresta 384
***pinnatifida* 384**
Chrysodendron 214, 215
tinctorium 214, 215

- Chrysodendron tinctorium* (cont.)
 var. *latifolium* 214, 215
 var. *longifolium* 214, 215
 var. *oblongifolium* 214, 215
- Chrysothamnus* 61-65
albidus 63
consimilis 64
eremobius 63, 65
 sect. **Graminei** 63
gramineus 63
 sect. *Nauseosi* 61, 62, 64
nauseosus 64
 var. *artus* 64
 var. *oreophilus* 64
oreophilus 64
 var. *artus* 64
 var. *oreophilus* 64
 sect. *Punctati* 61, 62, 64
spathulata 63
vaseyi 63
- Cinchoneae 378
 Cinchoninae 378
 Cinchonoideae
Cirsium 247
muticum 247
- Citharexylum* 328, 330, 349
lycioides 328, 330, 349
- Cleistanthus* 358
collinus 358
patulus 358
- Clethra* 227
mexicana 227
- Clusia* 387
 Clusiaceae 21, 270
 Coffeoidaeae 378
- Comarostaphylis* 227, 241
arguta 227, 241
conzattii 227, 241
- Combretaceae 358
Commelina 313, 350
benghalensis 313
dianthifolia 350
erecta 350
- Commelinaceae 273, 311, 337, 350
 Compositae 38, 65, 124, 187, 188,
 277, 399
Condylopodium 381-383
fuliginosum 381
killipii 381, 382
- Coniferae 217

- Convolvulaceae 342, 346
- Conyza* 334, 341, 344, 385
divaricata 385
sophiifolia 334, 341, 344
- Cordia* 260-263
alba 260-263
dichotoma 260-263
domestica 260-263
evolutior 260-263
macleodii 260-263
monoica 260-263
sebestena 260-263
wallichii 260-263
- Coreopsis* 21
lanceolata 21
- Cornaceae 21, 270
- Cornus* 19, 21, 24, 225, 227, 233,
247, 270, 301, 406
disciflora 225, 227
drummondii 19, 21, 24
florida 21, 270, 301
foemina 247
sericea 233
- Coryphantha* 339, 345
elephantidens 345
- Cosmos* 344
bipinnatus 344
- Crassula* 241, 249, 254
sieberiana 249, 254
- Crassulaceae 1, 5, 16, 254, 337,
346, 405, 408
- Crataegus* 19, 23, 24
crus-galli 23
marshallii 23
spathulata 23
- Critoniopsis* 384, 386-390
choquetangensis 386, 387
gynoxiifolia 387
jaramilloi 388
lindenii 390
oolepis 389
peruviana 387
thomasii 388
zarucchii 389, 390
- Crossothamnus* 381-383
gentryi 381, 382, 383
killipii 381, 382, 383
pascoanus 381-383
weberbaueri 381, 383
- Crotalaria* 341, 346

Croton (cont.)*pumila* 341, 346*Croton* 270, 328, 346*adpersus* 328, 346*capitatus* 270var. *capitatus* 270*Crotonopsis* 267, 270*elliptica* 267, 270*grandiflora* 267

Cruciferae 14, 16

Crusea 227, 361-363, 365, 368,

371-373, 378, 379

coccinea 227, 361-363, 365,

368, 371

diversifolia 361, 362, 365, 368,

372

longiflora 361, 362, 365, 368,

372, 373

Cucurbitaceae 336, 346

Cuphea 271, 332, 347*viscosissima* 271*wrightii* 332, 347

Cupressaceae 21, 134, 149, 150,

268

Cupressus 222, 231, 240*Cupressus* (cont.)*arizonica* 240*lusitanica* 222, 231*Cyclanthera* 335, 346*dissecta* 335, 346

Cyperaceae 21, 123, 249, 255, 273,

310, 350

Cyperus 265, 273, 298, 310, 334,

335, 338, 350

acuminatus 265, 273*aristatus* 273*calderoniae* 350*esculentus* 335, 350*grayioides* 298, 310*niger* 334, 335, 350*retroflexus* 310*spectabilis* 350*virens* 334, 335, 350*Cypripedium* 298*kentuckiense* 298*Cystopteris* 268*tennesseensis* 268

D

Dahlia 231

Dahlia (cont.)*excelsa* 231*Dalbergia* 358*latifolia* 358*Dalea* 22, 328-330, 340, 346, 347*bicolor* 328, 330, 346var. *bicolor* 346*candida* 22*lutea* 329, 347*prostrata* 340, 347*purpurea* 22*Danthonia* 250, 254, 274*gracilis* 250*pilosa* 254*spicata* 274var. *spicata* 274*unarede* 250*Dasyanthina* 397*Dasyilirion* 34, 241*lucidum* 241*Datura* 341, 349*stramonium* 341, 349*Decachaeta* 205*seemannii* 205*Delonix* 358*Delonix* (cont.)*regia* 358*Delphinastrum* 95, 99*leucophaeum* 99*menziesii* 95*Delphinium* 23, 73-118*alabamicum* 93, 102*alpestre* 79*andersonii* 83, 103*andesicola* 79, 80, 103*antoninum* 88*azureum* 105*bakeri* 93*barbeyi* 79, 103***basalticum* 88, 91***bicolor* 87-91, 112subsp. *bicolor* 89-91subsp. *calcicola* 89, **90**,

91

forma *devriesii* 89forma *helleri* 112forma *montanense* 89var. *montanense* 89, 90var. *nuttallii* 98sect. *Bicoloria* 87

Delphinium (cont.)

- species group *Bicoloria* 87
 subsect. *Bicoloria* 75, 77, 87,
 88, 92
bicornutum 80, 103
 subsp. *bicornutum* 103
 subsp. *oaxacanum* 103
brachycentrum 79, 104
calcar-equitis 80, 104
californicum 79, 80, 104
 subsp. *californicum* 104
cardinale 80, 81, 104, 118
 species group *Caroliniana* 85
 subsect. *Caroliniana* 85
carolinianum 23, 85, 86, 104,
 106, 107, 118
 subsp. *carolinianum* 104
 subsp. *penardii* 108
 subsp. *vimineum* 85, 106,
 107
 subsp. *virescens* 108
chilliwacense 95
columbianum 98
cyanoreios 108, 112
 forma *multiplex* 112

Delphinium (cont.)

- decorum* 88, 93, 108, 110
 subsp. *tracyi* 108
 sect. *Delphinastrum* 73
 subgen. *Delphinium* 73
 subsect. ***Depauperata*** 76, 84
depauperatum 84, 85, 88, 108
distichum 84, 108
 subsect. *Echinata* 77, 85-87
 series *Echinatae* 86, 100
 subsect. *Elata* 73, 76, 78
elatum 78, 104, 109
 subsect. *Exaltata* 76, 77-81
exaltatum 78, 79, 98, 109
 nutallii 98
flexuosum 116
geraniifolium 81, 109
geyeri 78, 81, 91, 109, 110
glareosum 88, 90, 91
glaucescens 80
glaucum 79, 80, 110
gracilentum 94, 113
 sect. *Grumosa* 92
 subsect. ***Grumosa*** 75, 77, 88,

Delphinium (cont.)

- gypsophilum* 83, 110, 118
 subsp. *gypsophilum* 110
 subsp. *parviflorum* 110
hansenii 86, 87, 110, 111
 subsp. *ewanianum* 110
 subsp. *hansenii* 111
 subsp. *kernense* 111
hesperium 87, 111
 subsp. *cuyamaca* 111
 var. *cuyamaca* 111
 subsp. *hesperium* 111
 forma *pallescens* 111
 subsp. *pallescens* 87, 111
hutchinsoniae 87
inopinum 82, 113
leucophaeum 99
lineapetalum 83
luteum 88, 111, 117
madrense 86
menziesii 92-98, 111, 112
 var. *levicaule* 112
 subsp. *menziesii* 95, 96,
 111
 var. *menziesii* 111

Delphinium menziesii (cont.)

- var. *ochroleucum* 98
 subsp. *pallidum* 95, 96,
 111
 var. *pavonaceum* 111
 subsp. *pyramidalis* 95
 var. *pyramidale* 95
multiplex 81, 82, 112
 subject. **Multiplex** 76, 78, 81,
 82, 84
nelsonii 112
newtonianum 93
novomexicanum 79, 80, 112
nudicaule 88, 93, 112
nuttallianum 89, 93, 94, 97,
 112, 115
 var. *pilosa* 89
nuttallii 92, 93, 95-99, 112
 var. *leucophaeum* 99
 subsp. *nuttallii* 98, 99, 112
 subsp. *ochroleucum* 98,
 99, 112
 var. *ochroleucum* 112
 × *occidentale* 79, 110
oreganum 95

Delphinium (cont.)

- parishii* 82, 83, 113
 subsp. *pallidum* 113
 subsp. *parishii* 113
parryi 82, 83, 113
 subsp. *blochmaniae* 113
 var. *blochmanae* 113
 subsp. *maritimum* 113
 subsp. *parryi* 113
 subsp. *purpureum* 113
patens 88, 93, 94, 113
 subsp. *hepaticoideum* 113
 subsp. *patens* 113
pauperculum 95
 × *pavonaceum* 92, 96
pedatisectum 80, 113
 series *Pelligerae* 100
penardii 85, 108
polycladon 82, 114
purpusii 82, 83, 114
ramosum 79, 80, 114
recurvatum 83, 114
robustum 79, 80
sapellonis 79
scaposum 82, 83, 114

Delphinium (cont.)

- scopulorum* 80, 81, 115
stachydeum 81
subscandens 80, 115
 subsect. *Subscaposa* 75, 77, 78,
 82, 83, 100
 “tribus” *Subscaposa* 82
sutherlandii 93, 94, 97, 115
tenuisectum 80
treleasei 94, 115
tricornis 93-95, 116
 subsp. *menziesii* 95
 var. *menziesii* 95
trolliifolium 88, 91-93, 96, 116
tuberosum 95
uliginosum 84
umbraculorum 83, 116
valens 79
variegatum 87, 116
 subsp. *variegatum* 116
virescens 85, 108
 subsect. *Virescens* 75, 77, 84,
 85, 86
viride 80
viridescens 82

Delphinium (cont.)*willametense* 99

subsect. *Wislizenana* 75, 78,
80, 81

wislizeni 80, 116, 117*wootoni* 86, 117*xantholeucum* 83, 117*Dentaria* 1, 3-5, 14*californica* 3-5var. *integrifolia* 4, 5*integrifolia* 3-5var. *californica* 4, 5*Deprea* 354*Desmanthus* 22*illinoensis* 22*Desmodium* 22, 328, 330-332*Deutzia* 277-283subsect. *Cymosae* 277sect. *Deutzia* 277*discolor* 282, 283var. *bicruristylis* 282, 283var. *discolor* 282*multiradiata* 277-281series *Multiradiatae* 277*Dichantheium* 22*Dichantheium* (cont.)*aciculare* 22*acuminatum* 22*dichotomum* 22*Dichelachne* 250*crinita* 250*Dichondra* 330, 333, 334, 346*argentea* 330, 333, 334, 346*Dicliptera* 343*peduncularis* 343

Dicotyledonae 336, 343

Dicrastylidaceae 72, 172, 316, 404

Didymaea 361, 362, 365, 366, 368,
373, 378

alsinoides 361, 362, 365, 368,
373

floribunda 361, 362, 366, 368,
373

Digitaria 274*cognata* 274var. *cognata* 274*Diodia* 267, 272*teres* 267, 272*Diospyros* 19, 21, 24, 270, 358*melanoxydon* 358

Diospyros (cont.)*montana* 358*sylvatica* 358*virginiana* 19, 21, 24, 270forma *platycarpa* 270var. *platycarpa* 270*Dipladenia* 197*boliviensis* 197

Dipterocarpaceae 358

Dirca 406*Dodecatheon* 298*meadia* 298*Dodonaea* 249, 254*Draba* 269, 298*brachycarpa* 269*cuneifolia* 298*Drosera* 402*capillaris* 402*Drynaria* 199-203, 330, 333, 338,

346

arenarioides 346ser. *Arenarioides* 199, 201, 203*axillaris* 199, 201*barkleyi* 203*coahuilana* 199, 200-202*Drymaria* (cont.)*elata* 201*laxiflora* 333, 346*lyropetala* 199-202var. *coahuilana* 199, 200var. *lyropetala* 199-201ser. *Lyropetala* 199, 201*pattersonii* 199, 201, 203*pratheri* 199, 200-202*subumbellata* 201*suffruticosa* 201*xerophylla* 330, 346

Dryopteridaceae 1, 6, 268

Dryopteris 247, 268*ludoviciana* 247*marginalis* 268*Dyschoriste* 343*Dyscritogyne* 125, 126*Dyssodia* 213, 344*papposa* 344*porophylla* 344var. *cancellata* 344

E

Ebenaceae 21, 270, 358

Echeandia 350*mexicana* 350*Echinocactus* 318, 345*grusonii* 318, 345*Echinochloa* 341, 350*Ehrharta* 254*stipoides* 254*Elaphoglossum* 241*Eleocharis* 335, 350*macrostachya* 335, 350*montevidensis* 335, 350*Encephalartos* 409-416*cupidus* 409, 410*hildebrandtii* 410, 411*nubimontanus* 409, 410,

412, 413

whitelockii 410, 411, 414,

415

Eragrostideae 425

Eragrostis 22, 254*brownei* 254*spectabilis* 22*Eremanthus* 384, 390*hatschbachii* 390*pinnatifidus* 384*Eremanthus* (cont.)*rondoniensis* 390

Ericaceae 270

Ericameria 61-65sect. *Asiris* 62*crispa* 64sect. *Ericameria* 61, 62*lignumviridis* 61, 64sect. *Macronema* 61, 62, 64*nauseosa* 61-64var. *arta* 64var. *mohavensis* 63var. *oreophila* 61, 64*paniculata* 61, 62*parryi* 61*teretifolia* 61, 62*Erigeron* 21, 131, 233*strigosus* 21*tenuis* 21

Eriocaulaceae 72, 172, 311, 316,

404

Eriocaulon 298, 398, 402*decanulare* 402*texense* 298*Eriochloa* 335, 350

- Eriochloa* (cont.)
acuminata 335, 350
- Eriogonum* 299
longifolium 299
multiflorum 299
- Erodium* 335, 347
cicutarium 335, 347
- Eruca* 341, 345
sativa 341, 345
- Eryngium* 21
yuccifolium 21
- Erythrina* 328
coralloides 328
- Erythronium* 299
rostratum 299
- Eulophia* 304
ecristata 304
- Eucalyptus* 250
- Eulophia* 312
crisata 312
- Enterolobium* 358
samman 358
- Eucalyptus* 359
glabulus 359
- Eupatoriaceae 124-126, 204, 340,
341, 381, 383
- Eupatorium* 21, 124, 125, 328,
329, 333, 334, 338, 344
collinum 328, 344
espinosarum 329, 333, 344
var. *espinosarum* 344
pycnocephalum 328, 334, 344
serotinum 21
- Euphorbia* 22, 233, 270, 299, 330-
332, 335, 338, 340, 341, 346
bicolor 299
corollata 22, 270
dentata 332, 346
graminea 335, 346
heterophylla 331, 335, 346
indivisa 340, 341, 346
maculata 346
- Euphorbiaceae 22, 270, 341, 346,
358
- Eutetras* 329, 333, 344
pringlei 329, 333, 344
- Evolvulus* 299, 342, 346
alsinoides 342, 346
sericeus 299
- Eysenhardtia* 328, 347
polystachya 328, 347

F

Fabaceae 1, 7, 17, 22, 270, 337,
340-342, 346, 347, 358

Fagaceae 270

Ferocactus 320, 332, 333, 339,
345, 438

histris 333, 345

latispinus 332, 345

setispinus 438

Feronia 359

elephantum 359

Festuca 250

novae-zealandiae 250

Ficus 359

bengalensis 359

religiosa 359

Fimbristylis 273

autumnalis 273

Flacourtiaceae 358

Flaveria 400, 401

angustifolia 400, 401

kochiana 400, 401

Flaveriinae 401

Florestina 331, 341, 344

pedata 331, 341, 344

Flyriella 124

Forestiera 328, 330, 331, 348

durangensis 328, 330, 331, 348

Forsteronia 195, 196

floribunda 196

monteverdensis 195, 196

peninsularis 196

Fouquieria 200, 203

splendens 203

Fragaria 233

Fraxinus 271, 328, 333, 348

americana 271

uhdei 328, 333, 348

G

Galactia 22, 347

brachystachys 347

volubilis 22

Galieae 378

Galinsoga 332, 341, 344

parviflora 332, 341, 344

Galium 23, 233, 331, 333, 349,

361-363, 366-368, 374, 375,

378, 379

Galium (cont.)

- aschenbornii* 361-363, 365,
368, 374, 378
- mexicanum* 331, 333, 349, 361,
362, 366, 368, 374
- subsp. *mexicanum* 361,
362, 366, 374
- pilosum* 23
- praetermisum* 363
- seatonii* 361-363, 366, 368, 374
- sphagnophilum* 361-363, 366,
368, 375
- var. *mazocarpum* 361, 362,
366
- trifidum* 361, 362, 365, 368,
375
- var. *pacificum* 361, 362,
365, 375
- uncinulatum* 361, 362, 367,
368, 375
- Gardenia* 359
- latifolia* 359
- resinifera* 359
- Garrya* 225
- laurifolia* 225

Garuga 358*pinnata* 358*Gaudichaudia* 347*cynanchoides* 347*Gaultheria* 227, 241*acuminata* 227*hirtiflora* 227, 241*Gaura* 22, 334, 348*coccinea* 334, 348*Gelsemium* 22*sempervirens* 22

Gentianaceae 22

Geraniaceae 22, 336, 347

Geranium 22*carolinianum* 22*Gerbera* 153, 155, 157, 158, 162,

167-169, 188

albicans 167*bicolor* 168*leiocarpa* 167*lyrata* 169*nutans* 162*spathulata* 169*tomentosa* 157*walteri* 157

Glandularia 23*canadensis* 23*Gnaphaliothamnus* 131*Gnaphalium* 21, 233, 331, 333, 344*arizonicum* 344*obtusifolium* 21*Gomphrena* 330, 332, 339, 341,

343

decumbens 330, 332, 339, 341,

343

Gonolobus 343*uniflorus* 343

Gramineae 16, 245, 417, 425, 426

Gratiola 265, 273*neglecta* 265, 273*Grewia* 359*disperina* 359*flavescens* 359*tiliaefolia* 359*Grosvenoria* 125*Guilleminea* 340, 343*densa* 340, 343

Gymnospermae 242, 380, 416

Gymnosperma 344*glutinosum* 344

H

Habenaria 311*integra* 311*Halimodendron* 1, 7*halodendron* 1, 7*Haplopappus* 62-65sect. *Asiris* 65*lignumviridis* 64sect. *Macronema* 65*Hardwickia* 358*binata* 358*Hasteola* 246-248*robertiorum* 246-248*suaveolens* 246, 248*Hastingia* 312*Hedeoma* 448, 451*ciliata* 448, 451*texana* 448, 451

Hedyotideae 378

Hedyotis 23, 272, 300, 361-363,

367, 368, 375, 378

cervantesii 361-363, 367, 368,

375

crassifolia 272*nigricans* 23

Hedyotis (cont.)*purpurea* 300*Heimia* 347*salicifolia* 347

Heleniaceae 400

Helenium 335, 344*mexicanum* 335, 344

Heliantheae 38, 208, 310, 313,

340, 341

Helianthus 21*hirsutus* 21*Heliopsis* 269, 344*annua* 344*helianthoides* 269var. *occidentalis* 269*Heliotropium* 299*tenellum* 299*Hesperodoria* 62, 63*Heteropogon* 350*contortus* 350*Heterosperma* 330, 332, 341, 344*pinnatum* 330, 332, 341, 344*Heterotheca* 344*inuloides* 344*Heuchera* 241, 265, 273*Heuchera* (cont.)× *hirsuticaulis* 265, 273*Hexalectris* 299*spicata* 299*Hieracium* 131, 161, 169, 187, 269*gronovii* 269*pusillum* 161*stipatum* 169, 187

Hinterhuberineae 62

Holarrhena 358*antidysenterica* 358*Hololepis* 384, 390, 391*hatschbachii* 390*pedunculata* 391*Holopetalea* 359*integrifolia* 359*Houstonia* 300*purpurea* 300*Huperzia* 1, 8*occidentalis* 1, 8*Hydrangea* 225*seemannii* 225

Hydrangeaceae 277, 280-282

Hydrodysodia 211, 213*stevensii* 213

Hydropectis 211-213

aquatica 211-213

estradii 211-213

stevensii 211-213

Hymenoxys 1, 2

acaulis 2

var. *epunctata* 2

var. *nana* 2

Hypericum 21, 267, 270

gentianoides 267, 270

hypericoides 21

punctatum 270

Hypoxis 274

hirsuta 274

forma *vilosissima* 274

I

Ilex 21, 24

decidua 21, 24

vomitaria 21

Indigofera 347

miniata 347

Inuleae 341

Ioichroma 354

suffruticosa 354

Ipomoea 330, 331, 335, 340, 346

longifolia 330, 340, 346

painteri 335, 346

pubescens 330, 331, 346

purpurea 346

Iridaceae 22, 273, 350

Iresine 328, 343

cassiniaeformis 328, 343

J

Jatropha 329, 330, 332, 346

dioica 329, 330, 332, 346

Juglandaceae 271, 336, 347

Juncaceae 274

Juncus 274

interior 274

Juniperus 21, 24, 102, 115, 117,

134-139, 141-150, 233, 267,
268

australis 145

barbadensis 134-136, 138, 139,

141, 144, 145, 147-149

var. *barbadensis* 142, 144

var. *lucayana* 134, 142,

144, **145**, 147, 148

Juniperus barbadensis (cont.)

- var. *urbaniana* 144
- bermudiana* 134-136, 138, 139,
141-143, 147-149
- blancoi* 146
- sect. *Caryocedrus* 134
- chinensis* 142
- comitana* 146, 149
- communis* 146
- davurica* 142
- deppeana* 233
- var. *robusta* 233
- ekmanii* 134-139, 141, 144
- gamboana* 146, 149
- gracilior* 134-139, 142-144,
147, 148
- var. *ekmanii* 134, 142,
144, 147, 148
- var. *gracilior* 143, 147
- var. *urbaniana* 134, 142,
144, 147, 148
- horizontalis* 146
- sect. *Juniperus* 134, 146
- lucayana* 134-136, 138, 139,
141, 145, 148, 149

Juniperus (cont.)

- oppositifolia* 143
- phoenicea* 146
- sabina* 146
- sect. *Sabina* 134, 135, 142,
146, 150
- saxicola* 134-136, 138, 139,
141, 142, 147-149
- scopulorum* 146, 149
- silicicola* 135, 149
- squamata* 142
- standleyi* 146, 149
- urbaniana* 134-139, 141, 144
- virginiana* 21, 24, 134-136,
138, 139, 141, 143-146,
148-150, 267, 268
- var. *australis* 145
- var. *barbadensis* 144
- var. *bermudiana* 143
- var. *humilis* 145
- var. *montana* 146
- var. *prostrata* 146
- var. *scopulorum* 146
- var. *silicicola* 135, 136,
138, 139, 146, 148

Juniperus virginiana (cont.)

var. *virginiana* 136, 139,
268

Justicia 343

furcata 343

K

Keithia 448

ciliata 448

Kigelia 358

pinnata 358

Koeleria 300

macrantha 300

Krigia 269

dandelion 269

virginica 269

Kydia 358

calycina 358

L

Labiatae 451

Lachnocaulon 300, 311

digynum 300

Lactuceae 341

Lamiaceae 22, 39, 209, 210, 347,
352, 448

Lamourouxia 330, 349

rhinanthifolia 330, 349

Lansea 357

coramandelica 357

Lantana 328, 331, 349

camara 328, 331, 349

Larnax 353-356

hawkesii 354

***hunzikeriana* 353, 355**

peruviana 354, 356

sachapapa 354

steyrmarkii 354

subtriflora 354

suffruticosa 354

Larrea 200, 203

tridentata 203

Lasiarrhenum 39, 40, 60

Lauraceae 14, 336, 347

Lecythidaceae 358

Leersia 265, 274

oryzoides 265, 274

virginica 274

Leguminosae 39

- Lieberkuhna* 154, 169
bracteata 154
spathulata 169
- Leibnitzia* 153, 154, 156, 168, 169, 188
anandrina 169
lyrata 153, 169
seemannii 153
- Leonotis* 333, 334, 347
nepitifolia 333, 334, 347
- Leontodon* 167
tomentosum 167
- Lepidaploa* 384, 385, 391-397
almasensis 385
araujoa 391
bahiana 392
beckii 394, 395, 397
chiriquiensis 385
davidsmithii 392, 393
juruenensis 393
krukovii 394
lewisii 394, 395
muricata 396
nitens 394
pseudaurea 385
- Lepidaploa* (cont.)
pseudomuricata 395, 396
sanmartinensis 396, 397
- Lepidium* 249, 254, 341, 345
hyssopifolium 249, 254
virginicum 341, 345
- Leria* 154, 162, 167, 169
albicans 167
leiocarpa 167
lyrata 162
nutans 154, 162, 167
var. *leiocarpa* 167
spathulata 169
- Lespedeza* 22
- Lessingianthus* 384, 385, 397
hatschbachii 397
- Leucospora* 273
multifida 273
- Leucothoe* 247
racemosa 247
- Liatris* 21, 300
pycnostachya 21
squarrosa 21
squarrulosa 21
tenuis 300

Liliaceae 274, 337, 350

Liliopsida 273

Lilium 300

michauxii 300

Linaceae 271

Linum 271

medium 271

var. *texanum* 271

Lipocarpha 273

micrantha 273

Lithospermeae 60

Lithospermum 40, 51, 57, 60, 300

caroliniense 300

molle 51

virginianum 57

Litsea 225, 241

glaucescens 225, 241

Loasaceae 336, 347

Lobelia 21, 346

appendiculata 21, 346

fenestralis 346

Loeselia 328, 330-331, 333, 348

mexicana 328, 330-331, 333,

348

Loganiaceae 22, 358

Lonicera 233, 269

flava 269

involutrata 233

pilosa 233

Loranthaceae 336, 347

Loxodon 154, 167

brevipes 154

longipes 167

Ludwigia 271, 334, 335, 340, 348

alternifolia 271

peploides 334, 335, 340, 348

Lupinus 132, 233

Luzula 233, 274

bulbosa 274

Lycopodiaceae 1, 8, 402, 403

Lycopodiella 300, 402

appressa 402

cernua 300, 402

Lycopodiophyta 317, 336

Lycopodium 8, 300, 313, 402, 403

cernuum 300, 313, 402, 403

lucidulum 8

forma *occidentale* 8

Lyonia 301

mariana 301

Lythraceae 271, 347

Lythrum 265, 271

alatum 265, 271

M

Machaeranthera 341, 344

gymnocephala 344

pinnatifida 341, 344

Macromeria 39, 40, 60

Macroptilium 347

atropurpureum 347

gibbosifolium 347

Magnolia 247

virginiana 247

Magnoliophyta 268, 317

Magnoliopsida 268

Mahonia 214-216, 231, 233

chochoco 214, 215

eutriphylla 233

lanceolata 231

repens 233

var. *pumila* 233

tinctoria 214, 215

Maianthemum 301

racemosum 301

Malaxis 301

unifolia 301

Malpighiaceae 336, 347

Malvaceae 340, 341, 347, 348,
351, 358

Malvastrum 347

coromandelianum 347

Mammillaria 320, 338, 339, 345

magnimamma 339, 345

rettigiana 339, 345

uncinata 339, 345

wildii 339, 345

zephyranthoides 339, 345

Mandevilla 197, 343

boliviensis 197

cereola 197

foliosa 343

pittieri 197

Manfreda 21

virginica 21

Mangifera 357

indica 357

Marsilea 334, 335, 343

mollis 334, 335, 343

Marsileaceae 336, 343

Martyniaceae 336, 342, 348

Maurandya 349

barclaiana 349

Mayaca 301

aubletii 301

fluviatilis 301

Melampodium 332, 335, 341, 344

glabrum 335, 344

longifolium 332, 344

sericeum 341, 344

Melastomaceae 358

Melia 358

azadirach 358

Meliaceae 358

Melica 422

Melilotus 335, 341, 347

officinalis 335, 341, 347

Memecylon 358

umbellatum 358

Menabea 189-191

venenata 189-191

Mentzelia 330, 331, 347

hirsuta 347

hispida 330, 331, 347

Metrosideros 249, 254

Miconia 387

Mikania 247

cordifolia 247

Milla 350

biflora 350

Millingtonia 358

hortensis 358

Mimosa 318, 328-330, 347

aculeaticarpa 318, 328-330, 347

var. *biuncifera* 318, 328-

330, 347

monancistra 328, 347

Mimosaceae 271, 358

Mimosoideae 340

Mimulus 334, 340, 349

glabratus 334, 340, 349

Mimusops 359

hexandra 359

Minasia 384, 397, 398

splettae 397

Mirabilis 342, 348

jalapa 348

nyctaginea 342, 348

Mitragyna 359

parvifolia 359

- Monocotyledonae 336, 350
- Monotropa* 301
- hypopithys* 301
- Montanoa* 328-331, 333, 344
- leucantha* 328, 329, 344
- var. *arborescens* 328, 329,
 344
- tomentosa* 328, 330, 331, 333,
 344
- Moraceae 336, 348, 359
- Morinda* 359
- tinctoria* 359
- Morus* 328, 333, 348
- celtidifolia* 328, 333, 348
- Muhlenbergia* 22, 244, 274, 350,
417-427
- argentea* 424
- capillaris* 22
- clandestina* 244
- cuatensis* 424, 425
- curvula* 417, 421, 423, 425
- durangensis* 424
- sect. *Epicampes* 422, 426
- gracilis* 418
- longiglumis* 422
- Muhlenbergia* (cont.)
- mexicana* 274
- michisensis* 424, 425
- montana* 417, 418, 422-425
- sect. *Podosaemum* 422
- subgen. *Podosemum* 426
- quadridentata* 417, 426, 427
- robusta* 350
- straminea* 417, 419-427
- virescens* 417-427
- Murraya* 359
- exotica* 359
- Mutisieae 153, 187, 188, 341
- Myoporum* 254
- Myrica* 22, 247
- cerifera* 22, 247
- Myricaceae 22
- Myrtaceae 359
- Myrtillocactus* 320, 330-333, 339,
345
- geometrizzans* 320, 330-333, 345
- N
- Nama* 131
- Nemastylis* 350

Nemastylis (cont.)*tenuis* 350*Neptunia* 22*lutea* 22*Nicotiana* 328, 341, 349*glauca* 328, 341, 349*tabacum* 349*Nothoscordum* 274*bivalve* 274*Nuttallanthus* 273*canadensis* 273

Nyctaginaceae 342, 348

Nyctanthaceae 72, 152, 316, 404

Nyctocereus 320, 339, 345*serpentinus* 320, 345

O

Obolaria 301*virginica* 301*Ochna* 359*squarrosa* 359

Ochnaceae 359

Oenothera 271, 348*linifolia* 271*rosea* 348

Oleaceae 271, 348

Onagraceae 22, 271, 348

Onosmodium 39-60*alabamense* 57*bejariense* 39-47, 49, 51-53, 55,

56, 58

var. *bejariense* 39, 41-44,

46, 47, 49, 52

var. *hispidissimum* 39-

42, 44, 45-47, 49,

52, 53

subsp. *occidentale* 43var. *occidentale* 39, 41-

44, 46, 47, 49, 52

subsp. *subsetosum* 41var. *subsetosum* 39, 42,

44, 47, 49, 52, 55

carolinianum 46, 51, 52var. *molle* 46var. *mollis* 51*doдрantale* 39, 40, 47, 50, 53,

56

floridanum 57*helleri* 39, 40, 48, 51, 54*hispidum* 57

Onosmodium (cont.)

- hispidissimum* 43, 45, 52
 var. *macrospermum* 45
longistylum 57
molle 39, 40, 42, 43, 51-53,
 55, 58, 60
 subsp. *bejariense* 43
 var. *bejariense* 43, 51
 subsp. *hispidissimum* 45
 var. *hispidissimum* 45
 subsp. *occidentale* 46
 var. *occidentale* 46
 subsp. *subsetosum* 47
 var. *subsetosum* 47, 51
oaxacanum 39, 40, 50, 53
occidentale 43, 46, 52
subsetosum 47
unicum 39, 40, 50, 56
virginianum 39, 40, 46, 52, 57-
 59
 var. *hirsutum* 46, 57, 58

Ophioglossaceae 1, 9

Ophioglossum 1, 9

- azoricum* 1, 9

Opiliaceae 261

Oplismenus 247

- setarius* 247

Opuntia 200, 269, 320, 330-333,

- 338, 339, 345, 351

amarilla 345*cochinera* 345*durangensis* 320, 345*fuliginosa* 320, 345*humifusa* 269*hyptiacantha* 345*imbricata* 320, 330-333, 345*incarnadilla* 320, 345*joconostle* 345*lasiacantha* 345*leucotricha* 320, 345*lindheimeri* 345

- var. *cuija* 345

matudae 345

pachona 320, 345subgen. *Platyopuntia* 331*robusta* 320, 330, 332, 345

- var. *robusta* 320

stenopetala 320, 345*streptacantha* 320, 345*tomentosa* 320, 345

Orchidaceae 1, 9, 14, 274, 311, 312

Oreopanax 231

xalapense 231

Orobanche 301

uniflora 301

Oroxylum 358

indicum 358

Osmunda 247, 402

cinnamomea 247

regalis 402

Oxalidaceae 22, 271, 342, 348

Oxalis 22, 271, 330, 331, 342, 348

corniculata 22, 330, 331, 342,
348

decaphylla 348

lunulata 348

violacea 271

Oxydon 154, 167, 168

bicolor 154, 167, 168

P

Palhinaea 402, 403

cernua 402, 403

Panicum 22, 247, 265, 274, 275,

302

Panicum (cont.)

acuminatum 274

var. *acuminatum* 274

anceps 22

commutatum 247

depauperatum 274

flexile 274, 302

philadelphicum 274

var. *philadelphicum* 274

virgatum 274

Papaveraceae 336, 342, 348

Papilionoideae 340

Paronychia 270, 302, 446, 447

drummondii 302

fastigiata 270

var. *paleacea* 270

virginica 446, 447

Parthenium 341, 344

bipinnatifidum 341, 344

Parthenocissus 334, 349

quinquefolia 334, 349

Paspalum 22

Passiflora 22

lutea 22

Passifloraceae 22

- Pectis* 340, 341, 344
 prostrata 340, 341, 344
 Pedicularaceae 259
Pediomelum 302
 hypogaeum 302
Pellaea 343
 ternifolia 343
Pennellia 341, 345
 longifolia 341, 345
Penstemon 23, 132, 273, 302
 murrayanus 302
 pallidus 273
 tubaeflorus 23
Peperomia 334, 348
 campylotropa 334, 348
Perdium 154, 157, 158, 169, 187
 lyratum 169
 piloselloides 154
 semiflosculare 157, 158, 187
Pericalia 334, 344
 sessilifolia 334, 344
 Periplocaceae 190, 191
 Periplocoideae 190
Perittostema 40
Pernettya 241
 Pernettya (cont.)
 ciliata 241
Pervillea 189-191
 decaryi 190, 191
 tomentosa 190
 venenata 191
Petasites 154
 hybridus 154
Petradoria 62, 63, 65
 discoidea 63
Phacelia 302
 strictiflora 302
Phanerostylis 124
 glutinosa 124
Philadelphus 231
 mexicanus 231
Phlebodium 333, 340, 343
 areolatum 333, 340, 343
Phlox 23, 271
 pilosa 23, 271
 subsp. *ozarkana* 271
Phoebe 328, 334, 347
 arsenei 328, 334, 347
Phoenix 358
 sylvestris 358

Phyla 349*nodiflora* 349*Phyllanthus* 358*emblica* 358*Physalis* 354*subtriflora* 354*Phytolacca* 348*icosandra* 348

Phytolaccaceae 336, 348

Picea 220*engelmannii* 220*pungens* 220

Pinaceae 22, 242, 287

Pinaropappus 344*roseus* 344

Pinophyta 268

Pinus 22, 103, 104, 114, 116, 117,

209, 217-219, 223, 230, 233,

235-239, 241-243, 287-290

albicaulis 288*apulcensis* 223, 235*attenuata* 237*ayacahuite* 233var. *brachyptera* 233subgen. *Balfouria* 288*Pinus* (cont.)*balfouriana* 288sect. *Cembra* 290*coulteri* 288*durangensis* 233, 235, 236*echinata* 22*engelmannii* 235, 236*estevezii* 217, 235subgen. *Gerardia* 287, 288*gerardiana* 288*herrerae* 235, 236*lawsonii* 217-219, 230, 237-

239, 242

var. *gracilis* 218, 219,230, **238***leiophylla* 235-237, 288var. *chihuahuana* 235, 236sect. *Leiophylla* 290*lumholtzii* 235, 236*maximinoi* 235, 236*michoacana* 217, 235, 237*montezumae* 219*Montezumae* group 217, 219*nelsonii* 288*nubicola* 217, 235

Pinus (cont.)

- oaxacana* 217-219, 230, 237,
241, 243
var. *diversiformis* 218,
230, **237**
oocarpa 209, 236
sect. *Parrya* 287, 290
patula 223
pinea 288
sect. *Pinea* 290
subgen. *Pinea* 287, 288
subgen. *Pinus* 288
pseudostrobus 223, 241, 243
var. *apulcensis* 223
var. *megacarpa* 241
var. *oaxacana* 243
Pseudostrobus group 217, 219
sect. *Quinquefoliis* 290
subgen. *Sabinia* 288
sabiniana 288, 289
strobis 288
subgen. *Strobis* 288
sylvestris 288
subgen. *Tamaulipasa* 287, 288
teocote 223, 239, 241

Pinus (cont.)

- torreyana* 287, 288
yecorensis 218, 219, 230,
233, 235, 236
var. *sinaloensis* 218, **236**
Piperaceae 336, 348
Piqueria 329, 330, 334, 341, 344
trinervia 329, 330, 334, 341,
344
Pisoniella 329, 348
arborescens 329, 348
Pithecelobium 358
dulce 358
Plantaginaceae 271
Plantago 233, 271
aristata 271
pusilla 271
var. *pusilla* 271
virginica 271
Platanthera 1, 9, 10, 14, 302, 311
blephariglottis 302
grandiflora 9
incana 302
integra 311
× *keenanii* 1, 9, 10

Platanthera (cont.)*lacera* 9, 14*zothecina* 1, 10*Platypetalum* 1, 3*purpurascens* 1, 3*Plectrornis* 89*bicolor* 89var. *montanense* 89*Poa* 233, 250*caespitosa* 250

Poaceae 1, 10, 22, 244, 267, 274,

275, 277, 336, 341, 342, 350,

351, 425

Podocarpus 218sect. *Eupodocarpus* 218*rostratus* 218*Podosaemum* 417, 418, 424, 427*gracilis* 427*virescens* 417, 418, 424*Polanisia* 303, 346*erosa* 303*uniglandulosa* 346

Polemoniaceae 23, 271, 336, 348

Polyalthia 357*cerasoides* 357*Polygala* 23, 272, 303*sanguinea* 272forma *sanguinea* 272*verticillata* 23, 303

Polygalaceae 23, 272

Polygonaceae 272, 341, 348

Polygonella 303, 311*americana* 303*polygama* 303, 311*Polygonum* 272, 334, 335, 341,

348

lapathifolium 334, 335, 341,

348

mexicanum 335, 348*tenue* 272

Polypodiaceae 336, 343

Polypodiophyta 317, 336

Polypodium 6, 233*rhaetium* 6*Polytaenia* 303*nutallii* 303*Polytrichum* 241*Pongamia* 358*glabra* 358*Populus* 233

- Populus* (cont.)
tremuloides 233
- Portulaca* 272, 349
oleracea 272
- Portulacaceae 271, 337, 349
- Potentilla* 233, 285, 286
heterosepala 286
macdonaldii **285**, 286
sect. *Multifidae* 286
sect. *Multijugae* 285, 286
richardii 285, 286
- Prenanthes* 303
barbata 303
- Prionosciadium* 127-129
acuminatum 128
madrense 127
mexicanum 127
pringlei 127
thapsoides 127
turneri 127, **128**, 129
- Priva* 349
grandiflora 349
- Proboscidea* 342, 348
louisianica 342, 348
subsp. *fragrans* 342, 348
- Prosopis* 1, 7, 8, 108, 328, 330-332, 347
glandulosa 8
var. *torreyana* 8
laevigata 328, 330-332, 347
odorata 1, 7, 8
- Prunella* 22
vulgaris 22
- Prunus* 19, 23, 235, 241, 272, 329, 330, 349
hortulana 272
mexicana 272
microphylla 329, 330, 349
serotina 235, 241
subsp. *capuli* 235, 241
umbellata 23
- Pseudotsuga* 217, 218, 220, 233, 239-241
brevifolia 240
flahaultii 220, 241
guinieri 220, 241
macrolepis 220, 241
menziesii 218, 220, 233, 239-241
var. *oaxacana* 218, **239**

Pseudotsuga (cont.)*rehderi* 220, 241*wilsoniana* 240*Psidium* 359*guajava* 359*Psittacanthus* 335, 347*calyculatus* 335, 347

Psychotriinae 378

Ptelea 223, 328, 349*trifoliata* 223, 328, 349

Pteridophyta 268, 380

Pterocarpus 358*marsupium* 358*Pteroglossaspis* 304*ecristata* 304*Purshia* 51*mollis* 51*Pycnanthemum* 22*albescens* 22*Pyrrhopappus* 21*carolinianus* 21

Q

Quechualia 397*fulva* 397*Quercus* 34, 103, 104, 114, 115,

117, 160, 223, 225, 227, 231,

233, 235-237, 241, 247, 264,

265, 267, 270

alba 270*calophylla* 241*candicans* 233, 235, 241*castanea* 241*coccolobaefolia* 235*crassifolia* 227, 241*laurifolia* 247*laurina* 223, 227, 241*magnoliifolia* 225, 235, 236*marilandica* 265, 270*stellata* 270var. *stellata* 270

R

- Ranunculaceae 23, 73, 100-102,
117, 118, 272, 310, 428, 444,
445
- Ranunculus* 233, 272
fascicularis 272
harveyi 272
 forma *harveyi* 272
- Ratibida* 21
pinnata 21
- Rauvolfia* 192-194
longifolia 192, 193
stenophylla 194
- Relbunium* 361-363, 367, 368,
376, 378, 379
microphyllum 361-363, 367,
368, 376
- Rhamnaceae 1, 11, 14, 23, 272,
359
- Rhamnus* 235, 272
betulaefolia 235
caroliniana 272
- Rhapidophyllum* 247
hystrix 247
- Rhododon* 448-451
- Rhodon* (cont.)
angulatus 448, 449-451
ciliatus 448-451
- Rhus* 19, 21, 269
copallina 19, 21, 269
glabra 269
- Rhynchelytrum* 318, 330-333, 336,
341, 351
repens 318, 330-333, 336, 341,
351
- Rhynchosia* 22
- Rhynchospora* 247, 273, 304, 402
globularis 273
 var. *recognita* 273
miliacea 247
oligantha 304, 402
- Ribes* 233
madrensis 233
- Richardia* 361-363, 367, 368, 376-
378
scabra 361-363, 367, 368, 376
tricoeca 361, 362, 367, 368,
377
 subsp. *tetracoeca* 361, 362,
367, 368, 377

Ricinus 329, 341, 346

communis 329, 341, 346

Robinia 7

halodendron 7

Rosa 272

carolina 272

setigera 272

forma *setigera* 272

var. *setigera* 272

var. *tomentosa* 272

Rosaceae 23, 272, 285, 336, 349

Rotala 265, 271

ramosior 265, 271

Rubiaceae 23, 272, 349, 359, 361-

363, 378-380

Rubieae 378

Rubioideae 378

Rubus 23, 233, 272

flagellaris 272

invisus 272

Rudbeckia 21, 269, 304, 309, 310

hirta 21

laciniata 304

missouriensis 269

scabrifolia 304, 309

Ruellia 21, 268

humilis 268

pedunculata 21

Rumex 272, 335, 341, 348

acetosella 272

crispus 335, 341, 348

Rutaceae 336, 349, 359

S

Sabal 247

palmetto 247

Sabatia 22, 304

campestris 22

macrophylla 304

Sabazia 131

Sabina 143, 144

barbadensis 144

bermudiana 143

Saccopetalum 358

tomentosum 358

Salicaceae 15, 336, 349

Salix 70, 233, 247, 320, 328, 334,

335, 349

bonplandiana 320, 328, 334,

335, 349

Salix (cont.)

- floridana* 247
- gooddingii* 233
- serissima* 70

Salvia 22, 329, 330, 331, 347

- azurea* 22
- hirsuta* 330, 347
- lyrata* 22
- nana* 347
- polystachya* 330, 331, 347
- reflexa* 347

Sambucus 223

- mexicana* 223

Sanvitalia 330, 332, 340, 341, 344

- procumbens* 330, 332, 340,
341, 344

Sapindaceae 349, 359

Sapindus 359

- emarginatus* 359

Sapotaceae 272, 359

Sarracenia 1, 12, 13, 16, 17, 402

- alata* 402
- gibbosa* 12, 13
- heterophylla* 13
- purpurea* 1, 12, 16, 17

Sarracenia purpurea (cont.)

- var. *burkii* 13, 16
- subsp. *gibbosa* 12
- var. *heterophylla* 13
- subsp. *purpurea* 12, 13
- var. *purpurea* 13
- var. *ripicola* 13
- var. *stolonifera* 13
- var. *terrae-novae* 12, 13
- subsp. *venosa* 12, 13, 16
- venosa* 12, 13

Sarraceniaceae 1, 12, 16, 17

Saxifragaceae 15, 273

Schinus 320, 328, 330-335, 343

- molle* 320, 328, 330-335, 343

Schizachne 422*Schizachyrium* 22, 267, 274

- scoparium* 22, 267, 274
- tenerum* 22

Schkuhria 335, 344

- pinnata* 335, 344
- var. *virgata* 335, 344

Schleichera 359

- oleosa* 359

Schoenolirion 305, 312

Schoenolirion (cont.)*croceum* 305*wrightii* 305, 312*Schrankia* 22, 271*microphylla* 22*nuttallii* 271*Scleria* 21*oligantha* 21

Scrophulariaceae 23, 28, 35, 131,

133, 256, 259, 273, 286, 313,
349*Scutellaria* 22*elliptica* 22*Secamone* 189-191

Secamoneae 189, 190

Secamonoideae 191

Sedum 241, 333, 334, 346, 405-

408

caducum 405-407*ebracteatum* 333, 334, 346*edwardsii* 405, **406**, 407*hintonii* 406*hintoniorum* **405**-407*rhodocarpum* 405-408subsp. *edwardsii* 405, 306*Selaginella* 305, 319, 333, 342*arenicola* 305subsp. *riddellii* 305*lepidophylla* 319, 333, 342

Selaginellaceae 336, 342

Semecarpus 357*anacardium* 357*Sempervivum* 1, 5, 6*haworthii* 1, 5, 6*Senecio* 1, 2, 131, 227, 233, 241*andrieuxii* 227*angularis* 241*barba-johannis* 241*bicolor* 2subsp. *cineraria* 2*cineraria* 1, 2

Senecioneae 341

Senna 328, 347*polyantha* 328, 347*Setaria* 22, 331, 341, 351*geniculata* 22, 331, 341, 351*grisebachii* 351*Seymeria* 28-35*bipinnatisecta* 30*coahuilana* 30

Seymeria (cont.)

- cualana* 28-30, 31
decurva 29
deflexa 28-31
falcata 28, 29, 32
 var. *falcata* 32
gypsophila 28, 29, 32-35
integrifolia 28, 29, 31, 33, 34
laciniata 29, 34
pailana 28, 29, 33
pennellii 28-30, 34
scabra 30
sinaloana 30
tamaulipana 28, 29, 31-35
virgata 29

Sherardia 361, 362, 368, 377, 378

- arvensis* 361, 362, 368, 377,
 378

Shorea 358

- talura* 358

Sida 341, 348

- abutifolia* 341, 348

Silene 267, 269

- regia* 267, 269

Silphium 21*Silphium* (cont.)

- integrifolium* 21

- laciniatum* 21

Simsia 341, 344

- amplexicaulis* 341, 344

Sisymbrieae 16

Sisyrinchium 22, 273, 350

- campestre* 273

- forma *campestre* 273

- langloisii* 22

- tenuifolium* 350

Smilacina 301

- racemosa* 301

Solanaceae 341, 342, 349, 353, 356

Solanoideae 353

Solanum 231, 330, 331, 338, 341,

- 349

- cervantesii* 231

- dulcamaroides* 341, 349

- eleagnifolium* 341, 349

- nigrescens* 331, 341, 349

- rostratum* 349

Solidaginineae 62

Solidago 21, 269, 305

- auriculata* 305

Solidago (cont.)*nemoralis* 269*nitida* 21*radula* 21*ulmifolia* 269*Sonchus* 341, 344*oleraceus* 341, 344*Soymida* 358*febrifuga* 358

Spermacoceae 378

Sphaeralcea 330, 331, 340, 341,
348*angustifolia* 330, 331, 341, 348*hastulata* 340, 348*Sphagnum* 402*Sphenopholis* 22, 274*obtusata* 22, 274*Spiranthes* 274*tuberosa* 274*Spirolobium* 1, 7, 8*odoratum* 1, 7, 8*Sporobolus* 1, 10, 11, 16, 244,

245, 267, 268, 274, 275, 305

asper 244, 245, 274var. *canovirens* 244*Sporobolus asper* (cont.)var. *clandestinus* 244*aspera* 1, 10, 11, 16var. *aspera* 10var. *drummondii* 1, 11var. *macer* 1, 11*canovirens* 244*clandestinus* 244, 274var. *canovirens* 244*compositus* 1, 10, 11, 244var. *clandestinus* 244var. *drummondii* 1, 11var. *macer* 1, 11*drummondii* 11*macer* 11*ozarkanus* 267, 274, 305*vaginiflorus* 274, 275*Stachydeoma* 448, 449, 451*angulata* 448, 449*ciliata* 448, 451*duvalii* 448, 449, 451*graveolens* 448*Stachys* 209, 210*coccinea* 209, 210*manantlanensis* 209, 210

- Stachys* (cont.)
 pacifica 209, 210
- Stenanthium* 305
 gramineum 305
- Stenocactus* 320, 339, 345
- Stenocereus* 320, 339, 345
 dumortieri 320, 345
- Stenotus* 62, 63
- Sterculia* 359
 urens 359
- Sterculiaceae 359
- Stevia* 206, 328, 330, 333, 334,
 344
 bisecta 206
 micrantha 330, 334, 344
 ovata 334, 344
 serrata 328, 330, 333, 344
 var. *serrata* 328, 333, 344
- Steviopsis* 124-126
 nesomii 124, 125
- Stilbaceae 72, 152, 316, 404
- Stilpnopappus* 384, 398, 399
 pantanalensis 398, 399
 trichospiroides 399
- Strebulus* 359
- Strebulus* (cont.)
 aspera 359
- Streptanthus* 306
 hyacinthoides 306
- Strychnos* 358
 nux-vomica 358
 potatorum 358
- Stylisma* 306
 aquatica 306
- Stylosanthes* 270
 biflora 270
- Styphelia* 249, 254
- Symphoremaceae 72, 152, 316, 404
- Symphoricarpos* 233, 269
 orbiculatus 269
 rotundifolius 233
- Syngonium* 223
 podophyllum 223
- Syzygium* 359
 cumini 359
- T
- Taenidia* 306
 integerrima 306
- Tageteae 211, 213, 341

- Tagetes* 213, 330, 332, 333, 335,
341, 344
lunulata 330, 332, 333, 335,
341, 344
- Talinopsis* 349
frutescens 349
- Talinum* 272, 305, 306, 349
calycinum 272
napiforme 349
paniculatum 349
parviflorum 305, 306
- Tamarindus* 358
indica 358
- Taraxacum* 331, 344
officinale 331, 344
- Tecoma* 329, 345
stans 329, 345
- Tectona* 359
grandis 359
- Tephrosia* 22, 270
virginiana 22, 270
- Terminalia* 358
arjuna 358
bellerica 358
catappa 358
- Terminalia* (cont.)
chebula 358
tomentosa 358
- Ternstroemia* 223
pringlei 223
- Tetragonotheca* 306, 313
ludoviciana 306
- Tetramerium* 331, 343
nervosum 331, 343
- Tetraneuris* 1, 2
acaulis 1, 2
var. *epunctata* 1, 2
var. *nana* 1, 2
epunctata 2
- Thalictrum* 233
- Thecophyllum* 122
werckleanum 122
- Thelypteris* 247
palustris 247
- Thespesia* 358
populnea 358
- Thrysanthemum* 350
macrophyllum 350
- Thuidium* 241
- Thyrsanthema* 154, 155, 158, 162,
167-169, 187

Thyrsanthema (cont.)

- hybrida* 155
- lyrata* 169
- nutans* 154, 162
- runcinata* 168
- semifloscularis* 158
- spathulata* 169
- tomentosa* 167

Tilia 247

- caroliniana* 247

Tiliaceae 359

Tillandsia 331, 333, 350

- recurvata* 331, 333, 350
- usneoides* 350

Tillandsioideae 119

Tithonia 341, 344

- tubiformis* 341, 344

Tonduzia 192-194

- longifolia* 192, 193
- longipedunculata* 194
- macrantha* 192, 193
- parvifolia* 194
- pittieri* 192, 194
- stenophylla* 194

Toxicodendron (cont.)

- radicans* 334, 335, 343

Toxocarpus 189-191

- decaryi* 189-191
- kleinii* 189
- tomentosus* 189, 190

Tradescantia 273, 306, 311, 350

- crassifolia* 350
- ohiensis* 273
- reverchonii* 306

Tragia 270, 346

- betonicifolia* 270
- nepetifolia* 346

Trichochloa 418

- virescens* 418

Trichocline 153, 188*Tridax* 332, 344

- coronopifolia* 332, 344
- palmeri* 344

Tridens 22, 274

- flavus* 22, 274
- var. *flavus* 274

Trifolium 267, 270

- reflexum* 267, 270
- var. *reflexum* 267, 270

Trigonospermum 36-38*annuum* 36-38*hintoniorum* 36-38*stevensii* 36-38*Triniochloa* 422*Triphora* 307*trianthophora* 307*Tripsacum* 351*Trixis* 328, 329, 333, 334, 344*mexicana* 328, 329, 333, 334,
344var. *auriculata* 329, 333,
334, 344var. *mexicana* 333, 344*Tussilago* 154, 157, 162, 167, 169*albicans* 167*bicolor* 167*exscapa* 154*hybridus* 154*integrifolia* 157*lyrata* 162, 169*nutans* 154, 162*tomentosum* 167*vaccina* 162

U

Ulmaceae 273, 359

Ulmus 273*rubra* 273

Umbelliferae 130

Utricularia 307*juncea* 307*purpurea* 307*Uvularia* 307*sessilifolia* 307

V

Vaccinium 241, 265, 267, 270*arboreum* 265, 267, 270*confertum* 241*Valeriana* 233*Vancklevea* 63, 65*Veratrum* 233*Verbena* 23, 330, 332, 342, 349*bipinnatifida* 332, 342, 349*carolina* 330, 349*halei* 23

Verbenaceae 23, 72, 152, 316, 342,

349, 359, 404

- Verbesina* 131, 237, 328, 334, 344
serrata 328, 344
sphaerocephala 334, 344
 var. *sphaerocephala* 344
- Vernonanthura* 384-386
diffusa 385
divaricata 385
lindbergii 385
lipoensis 385
nebularum 385
pseudonudiflora 385
schulziana 386
vinhae 386
- Vernonia* 237, 385, 386, 389, 399
almasensis 385
chiriquiensis 385
 sect. *Eremosis* 389, 399
lindbergii 385
lipoensis 385
nebularum 385
pseudaurea 385
pseudo-nudiflora 385
schulziana 386
vinhae 386
- Vernonieae 384, 399
- Viburnum* 19, 21, 269
dentatum 19, 21
rufidulum 269
- Viguiera* 331-333, 341, 344, 345
dentata 341, 344
 var. *canescens* 344
linearis 331-333, 345
- Vilfa* 10, 11, 244
aspera 10, 11
clandestina 244
drummondii 11
macra 11
- Villadia* 346
parviflora 346
- Viola* 23, 233, 273, 306
lanceolata 306
pedata 273
 forma *pedata* 273
rafinesquii 273
walteri 23
- Violaceae 23, 273
- Vitaceae 23, 336, 349
- Vitis* 23
mustangensis 23
- Vriesea* 119-123

Vriesea (cont.)

- breedloveana* 119, 121, 122
burgeri 119, 121
chiapensis 119, 121
cornus-cervii 119, 121, 122
dodsonii 121
greenbergii 121
macrantha 119, 121
macrochlamys 121
nutans 121
ovandensis 119, 121, 122
patzeltii 119, 121
 subsp. *panamaensis* 119,
 121
 var. *panamaensis* 121
pectinata 121
pycnantha 122
rugosa 121
subgen. *Vriesea* 120
werckleana 122
sect. *Xiphion* 120, 122

- Vulpia* 267, 274
 octoflora 267, 274
 var. *glauca* 274

W

- Wedelia* 208
Weinmannia 387
Werauhia 119-123
 breedloveana 122
 burgeri 119, 121
 chiapensis 121
 cornus-cervii 122
 greenbergii 119, 121
 sect. *Jutleya* 120
 macrantha 119, 121
 nephrolepis 122
 ovandensis 122
 patzeltii 121
 subsp. *panamaensis* 121
 pectinata 119, 121

Werauhia (cont.)*pycnantha* 119, 121, **122**sect. *Werauhia* 120*werckleana* 119, 121, 122*Wrightia* 358*tincotoria* 358

X

Xanthium 341, 345*strumarium* 341, 345*Xanthorhiza* 307, 310*simplicissima* 307, 310*Xylea* 358*xylocarpa* 358*Xyris* 307-309, 402*drummondii* 307, 309*scabrifolia* 307*stricta* 308

Y

Yucca 34, 200

Z

Zaluzania 328, 330-332, 345*augusta* 328, 330-332, 345

Zamiaceae 409

Zephyranthes 350*Zigadenus* 308*densus* 308*Zinnia* 330-332, 341, 345*peruviana* 330-332, 341, 345*Zornia* 308, 340, 347*bracteata* 308*thymifolia* 340, 347*Zyzyphus* 359*trinervi* 359

AVAILABILITY OF BACK ISSUES OF PHYTOLOGIA

The following back issues of PHYTOLOGIA are available:

37(3)	September 1977	\$3.00
41(2,3,6,7)	December 1978-March 1979	\$3.00 each
42(1)	April 1979	\$3.00
43(1-3)	May-August 1979	\$3.00 each
44(2,4-7)	August-December 1979	\$3.00 each
45(1,3-6)	February-June 1980	\$3.00 each
46(1,6-7)	June-October 1980	\$3.00 each
47(1,2,4,6)	November 1980-March 1981	\$3.00 each
48(1,3-6)	April-August 1981	\$3.00 each
49(1-5)	September-November 1981	\$3.00 each
50(1-7)	December 1981-May 1982	\$3.00/issue or \$17.00 for complete volume
51(1-7)	May-September 1982	\$3.00/issue or \$17.00 for complete volume
52(1-7)	September 1982-March 1983	\$3.00/issue or \$17.00 for complete volume
53(1-7)	March-August 1983	\$3.00/issue or \$17.00 for complete volume
54(1-7)	September 1983-January 1984	\$3.00/issue or \$17.00 for complete volume
55(1-7)	February-June 1984	\$3.00/issue or \$17.00 for complete volume
56(1-7)	July 1984-January 1985	\$3.00/issue or \$17.00 for complete volume
57(1-7)	February-August 1985	\$3.00/issue or \$17.00 for complete volume
58(1-7)	August-December 1985	\$3.00/issue or \$17.00 for complete volume
59(1-7)	December 1985-April 1986	\$3.00/issue or \$17.00 for complete volume
60(1-4,6,7)	May-September 1986	\$3.00/issue or \$17.00 for those available
61(1-7)	September 1986-January 1987	\$3.00/issue or \$17.00 for complete volume
62(1-6)	February-May 1987	\$3.00/issue or \$17.00 for complete volume
63(1-6)	May-November 1987	\$3.00/issue or \$17.00 for complete volume
64(1-6)	December 1987-June 1988	\$3.00/issue or \$17.00 for complete volume
65(1-6)	June 1988-February 1989	\$3.00/issue or \$17.00 for complete volume
66(1-6)	April-July 1989	\$3.00/issue or \$17.00 for complete volume
67(1-6)	August-December 1989	\$3.00/issue or \$17.00 for complete volume
68(1-6)	January-June 1990	\$3.00/issue or \$17.00 for complete volume
69(1-6)	July-December 1990	\$3.00/issue or \$17.00 for complete volume
70(1-6)	January-June 1991	\$3.00/issue or \$17.00 for complete volume
71(1-6)	July-December 1991	\$3.00/issue or \$17.00 for complete volume
72(1-6)	January-June 1992	\$3.00/issue or \$21.00 for complete volume
73(1-6)	July-December 1992	\$3.00/issue or \$21.00 for complete volume
74(1-6)	January-June 1993	\$3.00/issue or \$21.00 for complete volume
75(1-6)	July-December 1993	\$3.00/issue or \$21.00 for complete volume
76(1-6)	January-June 1994	\$3.00/issue or \$21.00 for complete volume
77(1-6)	July-December 1994	\$3.00/issue or \$21.00 for complete volume

Postage: \$.75 per issue domestic, \$3.00 per volume domestic; \$1.50 per issue foreign, \$6.00 per volume foreign.

Payable in U.S. dollars free of any bank charges to: PHYTOLOGIA, 185 Westridge Drive, Huntsville, TX 77340-8916 U.S.A.

Telephone: 409 295-5410; FAX: 409 291-0009; Federal EIN: 76-0274455.

Inquire on discounts for large orders (more than five volumes)

SPECIAL DISCOUNT: Complete set of all available back issues priced at \$420.00 postpaid domestic; \$420.00 + \$75.00 postage foreign)

All back issues subject to prior sale.

INDEX TO REVIEWERS, VOLUME 78

The editor expresses his most sincere appreciation to the following individuals. These are persons who have reviewed papers that were submitted for publication in volume 78 of *Phytologia*. Without the willingness and diligence of these reviewers, the task of the editor would be much more difficult, and the quality of the papers would be lessened. To each of you, I offer my most sincere thanks.

Michael J. Warnock, Editor.

- | | |
|------------------|------------------|
| Almeda, F. | Holmes, W.C. |
| Anderson, C. | Hu, L.C. |
| Ashton, P.S. | Hyatt, P. |
| Barkley, T.M. | Jenkins, P. |
| Brown, L.E. | Karis, P.O. |
| Carr, B. | Kral, R. |
| Cayouette, J. | Jihua, Xiong |
| Chiang, F. | Jiménez, Q. |
| Cody, W.J. | Jones, G.D. |
| Dávila, P.D. | Jones, S. |
| Delavoryas, T. | Larke, J. |
| Delprete, P. | Laven, R.D. |
| Doolittle, W. | Lellinger, D.B. |
| Ertter, B. | Lelong, M.G. |
| Fernández N., R. | Lowrey, T. |
| Folsom, J. | MacRoberts, D.T. |
| Fox, W.E. | Marroquin, J.S. |
| Funk, V. | Mason, C. |
| Grayum, M. | Mayfield, M. |
| Hammel, B. | Moore, M.O. |
| Herbst, D. | Nesom, G.L. |
| Hedenäs, L. | Prather, A. |

Pruski, J.

Rao, K.G. Raja

Rao, P.N.

Reveal, J.L.

Reznicek, A.A.

Rodríguez J., C.

Rominger, J.

Rundell, J.R.

Rzedowski, J.

Smith, L.

Stevens, P.

Stewart, R.

Strother, J.

Thomas, R.D.

Turner, B.L.

Wetherwax, M.

Whitelock, L.M.

Xiong, J.H.

Yatskievych, G.C.

Zamora, N.

New York Botanical Garden Library



3 5185 00288 4607

Information for Authors

Articles from botanical systematics and ecology, including biographical sketches, critical reviews, and summaries of literature will be considered for publication in PHYTOLOGIA. Manuscripts may be submitted either on computer diskette, or as clean typescript. Diskettes will be returned to authors after action has been taken on the manuscript. Diskettes may be 5.25" or 3.5" and may be written in any IBM or Macintosh compatible format. Typescript manuscripts should be single spaced and will be read into the computer using a scanner. The scanner will read standard type fonts but will not read dot matrix print. Manuscripts submitted in dot matrix print cannot be accepted. Use underscore (not italics) for scientific names. Language of manuscripts may be either English or Spanish. Figures will be reduced to fit within limits of text pages. Therefore, figures should be submitted with internal scales. Legends for figures should be included in figures whenever possible. Each manuscript should have an abstract and key word list. Specimen citations should be consistent throughout the manuscript. Serial titles should be cited with standard abbreviations. References cited only as part of nomenclatural summaries should not appear in Literature Cited. Nomenclatural work should include one paragraph per basionym and must provide proper (as defined by the current *International Code of Botanical Nomenclature*) citation of sources of epithets and combinations.

Authors should arrange for two workers in the appropriate field to review the manuscript before submission. Copies of reviews should be forwarded to the editor with the manuscript. Manuscripts will not be published without review.

Cost of publication is currently \$13.00 US per page for publication without reprints. Publication with 100 reprints is provided for \$18.00 US per page, 200 reprints for \$21.50 US per page. Page charges are due with manuscript and no paper will be published before payment is received in full. Reprints must be ordered and paid for in advance. Page charges will be determined on the basis of a typeset page. Title page should include title, author(s) name(s), and address(es). No extra charge is made for line drawings provided they conform to limitations of size and proportion for normal text. Halftones require an extra charge of \$14.00 US per page at 100%. Enlargement or reductions cost an additional \$6.00 per page.