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NEW NAMES AND COMBINATIONS, PRINCIPALLY IN THE ROCKY  
MOUNTAIN FLORA--IX

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The eighth paper in this series was published in Phytologia 70:231-233. 1991.

ABSTRACT

New combinations are proposed in *Azaleastrum*, *Boechea*, *Oreobatus*, and *Picradenia*. Validations are provided for previously published new combinations in *Coriflora*.

KEY WORDS: *Azaleastrum*, *Boechea*, *Coriflora*, *Oreobatus*, *Picradenia*, Rocky Mountains

*Azaleastrum albiflorum* Rydb. subsp. *warrenii* (A. Nelson) W.A. Weber, *comb. nov.* Based on *Azaleastrum warrenii* A. Nelson, Bot. Gaz. (Crawfordsville) 56:67. 1913.

*Boechea pallidifolia* (Rollins) W.A. Weber, *comb. nov.* Based on *Arabis pallidifolia* Rollins, *Cruciferae of Continental North America*, p. 181. 1993.

*Oreobatus deliciosus* (James ex Torrey) Rydb. subsp. *neomexicanus* (A. Gray) W.A. Weber, *comb. nov.* Based on *Rubus neomexicanus* A. Gray, *Pl. Wrightianae* 2:55. 1853. Synonyms: *Oreobatus neomexicanus* (A. Gray) Rydb., *Rubus deliciosus* James ex Torrey var. *neomexicanus* Kearney. This subspecies replaces the Coloradan race, *Oreobatus deliciosus* subsp. *deliciosus* in the southern edge of eastern Colorado and ranges south through New Mexico into southeastern Arizona. Subsp. *neomexicanus* has more distinctly lobed, larger, leaves which are soft-pubescent on both surfaces. Gray was under the misapprehension that *R. deliciosus* had purple flowers, and his major distinction appears to be that in *neomexicanus* the petals are white.

*Picradenia richardsonii* subsp. *floribunda* (A. Gray) W.A. Weber, *comb. nov.* Based on *Actinella richardsonii* (Hook.) Nutt. var. *floribunda* A. Gray, Mem. Amer. Acad. Arts Sci., Ser. 2, 4:101. 1849 (*Plantae Fendlerianae*).

Validation of the generic name *Coriflora* (Ranunculaceae)

*Coriflora* W.A. Weber, *Phytologia* 51:372-374. 1982, was invalidly published as a result of the omission of certain information, rectified here.

*Coriflora* W.A. Weber, *nom. nov.* ■ *Viorna* Spach, *Hist. Nat. Végétaux: Phanérogames* 7:268. 1839, type *Clematis viorna* L., *Sp. Pl.* 543. 1753 (*Viorna urnigera* Spach), *nom. illeg., non Viorna* (Pers.) Reichenbach, *Handb.* 277. 1837, *nom. illeg., superfl. renaming of Muralta* Adams. 1763, *nom. rej.*

*Clematis cirrhosa* L. is the type of (Pers.) Reichbach's name; this type was explicitly excluded by Spach by citation (l.c. p. 261) as a synonym of *Cheiroopsis elegans* Spach. According to Article 48, *ICBN*, Spach's name is a validly published later homonym for which I am providing a replacement name. While irrelevant to this transaction, according to Pfeiffer, *Nomenclator Botanicus* 1588. 1874, *Clematis*, section *Viorna* antedates Gray, *Syn. Fl. N. Amer.* 1:5. 1895. Formal transfer of the species is effected below.

- Coriflora addisonii* (Britt. ex Vail) W.A. Weber, *comb. nov.* BASIONYM: *Clematis addisonii* Britt. ex Vail, *Mem. Torrey Bot. Club* 2:28, footnote and pl. 3. 1890.
- Coriflora albicoma* (Wherry) W.A. Weber, *comb. nov.* BASIONYM: *Clematis albicoma* Wherry, *J. Wash. Acad. Sci.* 21:198, fig. 1. 1931.
- Coriflora baldwinii* (Torrey & A. Gray) W.A. Weber, *comb. nov.* BASIONYM: *Clematis baldwinii* Torrey & A. Gray, *Fl. N. Am.* 1:8. 1838.
- Coriflora beadlei* (Small) W.A. Weber, *comb. nov.* BASIONYM: *Viorna beadlei* Small, *Man. Southeast. Fl.* 527, 1504. 1933.
- Coriflora bigelovii* (Torrey) W.A. Weber, *comb. nov.* BASIONYM: *Clematis bigelovii* Torrey, *Pacific Railroad Rep.* 4:61. 1857.
- Coriflora crispa* (L.) W.A. Weber, *comb. nov.* BASIONYM: *Clematis crispa* L., *Sp. Pl.* 543. 1753.
- Coriflora fremontii* (James) W.A. Weber, *comb. nov.* BASIONYM: *Clematis ochroleuca* Ait. var. *fremontii* James, *J. Cincinnati Soc. Nat. Hist.* 6:120. 1883.
- Coriflora gattingeri* (Small) W.A. Weber, *comb. nov.* BASIONYM: *Clematis gattingeri* Small, *Bull. Torrey Bot. Club* 24:209. 1897.
- Coriflora glaucophylla* (Small) W.A. Weber, *comb. nov.* BASIONYM: *Clematis glaucophylla* Small, *Bull. Torrey Bot. Club* 24:337. 1897.
- Coriflora hirsutissima* (Pursh) W.A. Weber, *comb. nov.* BASIONYM: *Clematis hirsutissima* Pursh, *Fl. Amer. Sept.* 2:385. 1814.
- Coriflora integrifolia* (L.) W.A. Weber, *comb. nov.* BASIONYM: *Clematis integrifolia* L., *Sp. Pl.* 544. 1753.
- Coriflora morefieldii* (Kral) W.A. Weber, *comb. nov.* BASIONYM: *Clematis morefieldii* Kral, *Ann. Missouri Bot. Gard.* 74:665. 1987.
- Coriflora ochroleuca* (Ait.) W.A. Weber, *comb. nov.* BASIONYM: *Clematis ochroleuca* Ait., *Hort. Kew.* 2:260. 1789.
- Coriflora palmeri* (Rose) W.A. Weber, *comb. nov.* BASIONYM: *Clematis palmeri* Rose, *Contr. U.S. Natl. Herb.* 1:118. 1891.

- Coriflora pitcheri* (Torrey & A Gray) W.A. Weber, *comb. nov.* BASIONYM: *Clematis pitcheri* Torrey & A. Gray, *Fl. N. Am.* 1:10. 1838.
- Coriflora reticulata* (Walt.) W.A. Weber, *comb. nov.* BASIONYM: *Clematis reticulata* Walt., *Fl. Carol.* 156. 1788.
- Coriflora scottii* (Porter) W.A. Weber, *comb. nov.* BASIONYM: *Clematis scottii* Porter, *Synops. Fl. Colorado*, p. 1. 1874.
- Coriflora texensis* (Buckl.) W.A. Weber, *comb. nov.* BASIONYM: *Clematis texensis* Buckl., *Proc. Acad. Nat. Sci. Philadelphia.* 13:448. 1862.
- Coriflora versicolor* (Small ex Britt.) W.A. Weber, *comb. nov.* BASIONYM: *Clematis versicolor* Small ex Britt., *Man. Fl. Northern States and Canada.* 421. 1901.
- Coriflora viorna* (L.) W.A. Weber, *comb. nov.* BASIONYM: *Clematis viorna* L., *Sp. Pl.* 543. 1753.
- Coriflora viticaulis* (Steele) W.A. Weber, *comb. nov.* BASIONYM: *Clematis viticaulis* Steele, *Contr. U. S. Natl. Herb.* 13:364. 1911.

## ACKNOWLEDGMENTS

I am indebted to Dan Nicolson for his advice on the *Coriflora* problem.

## NEWLY REQUIRED SUPRAGENERIC NAMES IN VASCULAR PLANTS

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### ABSTRACT

Several supra-ordinal names in current use in textbooks and the more technical literature are not validly published. The following are now established: *Cycadidae*, *Cycadophytina*, *Ephedridae*, *Ephedropsida*, *Equisetidae*, *Equisetophytina*, *Ginkgoidae*, *Ginkgoophyta*, *Ginkgoophytina*, *Gnetidae*, *Gnetophyta*, *Gnetophytina*, *Isoetidae*, *Lycopodiophytina*, *Magnoliophyta*, *Magnoliophytina*, *Ophioglossidae*, *Pinophyta*, *Pinophytina*, *Polypodiophytina*, *Psilotidae*, *Psilotophyta*, *Psilotophytina*, *Salviniidae*, *Taxidae*, and *Welwitschiidae*. My own failures in 1992 require formal validation of the superorders *Cornanae*, *Cyclanthanae*, *Loasanae*, *Nepenthanae*, *Primulanae*, *Rafflesianae*, *Sarracenianae*, and *Trochodendranae*. Several ordinal names attributed to G.T. Burnett are invalid as they were proposed at the misplaced rank of section. The following names now in current use are validated: *Acorales*, *Araliales*, *Aspleniales*, *Buxales*, *Calycerales*, *Connarales*, *Hippuridales*, *Nelumbonales*, and *Vitales*. *Cyphocarpaceae*, a provisional family name proposed by Miers in 1848 is in current use; it is now validated. The revelation that *Scrophulariaceae* is polyphyletic requires the acceptance of *Rhinanthaceae* Juss. and recognition of *Schlegeliaceae*.

KEY WORDS: nomenclature, Magnoliophyta

When the three great workers on higher plant phylogeny and nomenclature, Cronquist, Takhtajan, and Zimmermann (1966), joined forces to promote a new system of classification for plants and the use of generic stems throughout all ranks above that of genus, they established a new era of botanical nomenclature for these oft used but rarely fully evaluated names. It was therefore a surprise to discover that several of their, and others (*e.g.*, Tippe 1942; Bold 1957; Ehrendorfer 1971) now commonly used names were not validly published. In all instances noted here, the authors failed to provide a full and direct reference to a Latin description or diagnosis (Art. 36.1; Greuter *et al.* 1994). Many of the names proposed as new by the three were validated earlier by others, most notably Bessey (1907, 1910) and Boivin

(1956); of course, several of the names proposed in 1966 are valid. Nonetheless, the following require validation:

**Cycadidae** Reveal, *subclass nov.*, validated by a reference to the Latin diagnosis of a J.R.B. Boivin (Bull. Soc. Bot. France 103:493. Dec 1956) isonym of class Cycadopsida A.T. Brongniart (*Enum. Pl. Mus. Paris* xxxii, 136. 12 Aug 1843, as Cycadoideae, validated by a diagnosis in French).

**Cycadophytina** Cronquist, Takht., & Zimmerm. *ex* Reveal, *subdiv. nov.*, validated by a reference to the Latin diagnosis of a later J.R.B. Boivin (Bull. Soc. Bot. France 103:493. Dec 1956) isonym of Class Cycadopsida A.T. Brongniart (*Enum. Pl. Mus. Paris* xxxii, 136. 12 Aug 1843, as Cycadoideae, validated by a diagnosis in French).

**Ephedridae** Cronquist, Takht., & Zimmerm. *ex* Reveal, *subclass nov.*, validated by a reference to a H.G.L. Reichenbach (*Fl. Germ. Excurs.* 1(2):156. Jan-Apr 1831, as Tribe Ephedreae) name with a diagnosis in Latin.

**Ephedropsida** Reveal, *class nov.*, validated by a reference to a H.G.L. Reichenbach (*Fl. Germ. Excurs.* 1(2):156. Jan-Apr 1831, as Tribe Ephedreae) name with a diagnosis in Latin.

**Equisetidae** Reveal, *subclass nov.*, validated by a reference to a J.R.B. Boivin (Bull. Soc. Bot. France 103:493. Dec 1956, as Division Equisetophyta ["Equisophyta"]) name with a diagnosis in Latin.

**Equisetophytina** Reveal, *subdiv. nov.*, validated by a reference to a J.R.B. Boivin (Bull. Soc. Bot. France 103:493. Dec 1956, as Division Equisetophyta ["Equisophyta"]) name with a diagnosis in Latin.

**Ginkgoophyta** Bold *ex* Reveal, *div. nov.*, validated by a reference to a J.R.B. Boivin (Bull. Soc. Bot. France 103:493. Dec 1956, as Class Ginkgoopsida) name with a diagnosis in Latin.

**Ginkgoophytina** Cronquist, Takht., & Zimmerm. *ex* Reveal, *subdiv. nov.*, validated by a reference to a J.R.B. Boivin (Bull. Soc. Bot. France 103:493. Dec 1956, as Class Ginkgoopsida) name with a diagnosis in Latin.

**Gnetidae** Cronquist, Takht., & Zimmerm. *ex* Reveal, *subclass nov.*, validated by a reference to a J.R.B. Boivin (Bull. Soc. Bot. France 103:494. Dec 1956, as Class Gnetopsida) name with a diagnosis in Latin.

**Gnetophyta** Bold *ex* Reveal, *div. nov.*, validated by a reference to a J.R.B. Boivin (Bull. Soc. Bot. France 103:494. Dec 1956, as Class Gnetopsida) name with a diagnosis in Latin.

**Gnetophytina** Cronquist, Takht., & Zimmerm. *ex* Reveal, *subdiv. nov.*, validated by a reference to the Latin diagnosis of a later J.R.B. Boivin (Bull. Soc. Bot. France 103:494. Dec 1956) isonym of Class Gnetopsida H.G.A. Engler (*Nat. Pflanzenfam.*, II, 1:2. 26 Mar 1887, as Gnetales, validated by a diagnosis in German).

**Isoetidae** Reveal, *subclass nov.*, validated by a reference to a Latin diagnosis associated with a later J.R.B. Boivin (Bull. Soc. Bot. France 103:493. Dec 1956, as *Isopsida*) isonym of Class *Isoetopsida* H.G.A. Engler (in H.G.A. Engler & K.A.E. Prantl, *Die Pflanzenfam. Nachtr.*: 5. July 1897 with a diagnosis in German).

**Lycopodiophytina** O. Tippe *ex* Reveal, *subdiv. nov.*, validated by a reference to a F.G. Bartling (*Ord. Nat. Pl.*: 14, 19. Sep 1830, as Class *Lycopodiopsida* ["*Lycopineae*"]) name with a description in Latin.

**Magnoliophyta** Cronquist, Takht., & Zimmerm. *ex* Reveal, *div. nov.*, validated by a reference to a C.A. Agardh (Classes Pl. [2:] 13. 1825, as Class *Polycarpellae*) name with a description in Latin.

**Magnoliophytina** D. Frohne & U. Jensen *ex* Reveal, *subdiv. nov.*, validated by a reference to a C.A. Agardh (Classes Pl. [2:] 13. 1825, as Class *Polycarpellae*) name with a description in Latin.

**Ophioglossidae** Takht. *ex* Reveal, *subclass nov.*, validated by a reference to a rankless R. Brown (*Prodr.*: 136. 27 Mar 1810, as *Ophioglosseae*) name with a diagnosis in Latin.

**Pinophyta** Cronquist, Takht., & Zimmerm. *ex* Reveal, *div. nov.*, validated by a reference to a F.G. Bartling (*Ord. Nat. Pl.*: 90, 92. Sep 1830, as Class *Coniferae*) name with a description in Latin.

**Pinophytina** Cronquist, Takht., & Zimmerm. *ex* Reveal, *subdiv. nov.*, validated by a reference to a F.G. Bartling (*Ord. Nat. Pl.*: 90, 92. Sep 1830, as Class *Coniferae*) name with a description in Latin.

**Polypodiophytina** Reveal, *subdiv. nov.*, validated by a reference to a J.R.B. Boivin (Bull. Soc. Bot. France 103:494. Dec 1956, as *Subdiv. Pteridophytina* ["*Pterophytina*"]) name with a diagnosis in Latin.

**Psilotidae** Reveal, *subclass nov.*, validated by a reference to the Latin description of a later T. Nakai (*Chosakuronbun Mokuroku* [*Ord. Fam. Trib. Nov.*]: 206. 20 Jul 1943) isonym of Order *Psilotales* H.G.A. Engler (in H.G.A. Engler & K.A.E. Prantl, *Nat. Pflanzenfam. Nachtr.* 1:5. Jul 1897 with a diagnosis in German).

**Psilotophyta** B. Boivin *ex* Reveal, *div. nov.*, validated by a reference to the Latin description of a later T. Nakai (*Chosakuronbun Mokuroku* [*Ord. Fam. Trib. Nov.*]: 206. 20 Jul 1943) isonym of Order *Psilotales* H.G.A. Engler (in H.G.A. Engler & K.A.E. Prantl, *Nat. Pflanzenfam. Nachtr.* 1:5. Jul 1897 with a diagnosis in German).

**Psilotophytina** O. Tippe *ex* Reveal, *subdiv. nov.*, validated by a reference to the Latin description of a later T. Nakai (*Chosakuronbun Mokuroku* [*Ord. Fam. Trib. Nov.*]: 206. 20 Jul 1943) isonym of Order *Psilotales* H.G.A. Engler (in H.G.A. Engler & K.A.E. Prantl, *Nat. Pflanzenfam. Nachtr.* 1:5. Jul 1897 with a diagnosis in German).

**Salviniidae** Pic. Serm. *ex* Cronquist, Takht., & Zimmerm. *ex* Reveal, *subclass nov.*, validated by a reference to the Latin description associated with the type genus by M. Adanson (*Gen. Pl.* 2:15. Jul-Aug 1764).

**Taxidae** F. Ehrendorfer *ex* Reveal, *subclass nov.*, validated by a reference to the Latin description of the type genus given by S.L. Endlicher (*Syn. Conif.*: 242. Mai-Jun 1847).

**Welwitschiidae** Cronquist, Takht., & Zimmerm. *ex* Reveal, *subclass nov.*, validated by a reference to a J.R.B. Boivin (*Bull. Soc. Bot. France* 103:494. Dec 1956, as Class Welwitschiopsida ["Welwopsidia"]) name with a diagnosis in Latin.

My own failure (Reveal 1992) to provide a reference to a validating Latin description or diagnosis means that several superordinal names are not available.

**Cornanae** Thorne *ex* Reveal, *superord. nov.*, validated by a reference to a S.L. Endlicher (*Gen. Pl. Suppl.* 5:17. 1850, as Subfam. Cornoideae ["Corneae"]) name with a diagnosis in Latin.

**Cyclanthanae** Thorne *ex* Reveal, *superord. nov.*, validated by a reference to a F.G. Bartling (*Ord. Nat. Pl.*: 67. Sep 1830, as Tribe Cyclantheae ["Cyclanthea"]) name with a diagnosis in Latin.

**Loasanae** R. Dahlgren *ex* Reveal, *superord. nov.*, validated by a reference to a P.F. Horaninow (*Char. Ess. Fam.*: 147. 1847, as Tribe Loaseae) name with a description in Latin.

**Nepenthanae** Takht. *ex* Reveal, *superord. nov.*, validated by a reference to a J.H.F. Link (*Handbuch* 1:369. Jan-Aug 1829, as Subfam. Nepenthoideae ["Nepenthinae"]) name with a diagnosis in Latin.

**Primulanae** R. Dahlgren *ex* Reveal, *superord. nov.*, validated by a reference to a A.J.G.C. Batsch (*Tab. Regni Veg.*: 206. 2 Mai 1802, as Order Cyathinae) name with a description in Latin.

**Rafflesianae** Thorne *ex* Reveal, *superord. nov.*, validated by a reference to a description in Latin for the Tribe Rafflesieae H.W. Schott & S.L. Endlicher *ex* E. Spach (*Hist. Nat. Vég.* 10:551. 20 Mar 1841, as "Rafflesiaceae") given by R. Brown (*Trans. Linn. Soc. London* 19:242. 6 Nov 1844).

**Sarracenianae** Thorne *ex* Reveal, *superord. nov.*, validated by a reference to the Latin description of Sarraceniaceae given by G. Bentham & J.D. Hooker (*Gen. Pl.* 1:48. 7 Aug 1862).

**Trochodendranae** Takht. *ex* Reveal, *superord. nov.*, validated by a reference to an A.L. Takhtajan *ex* A.J. Cronquist (*Integr. Syst. Class. Fl. Pl.*: 157. 10 Aug 1981, as Order Trochodendrales) name with a description in Latin.

In reviewing other suprageneric names of vascular plants I discovered that several names proposed by G.T. Burnett in 1835 and previously considered to have been validly published at the rank of order (Cronquist 1981; Reveal 1993), are invalid as they were proposed at the misplaced rank of section (Art. 33.5; Greuter *et al.* 1994). The following names, now in current use, are validated.

**Acorales** Reveal, *ord. nov.*, validated by a reference to a J.H.F. Link (*Handb.* 1:144. Jan-Aug 1829, as Subfam. Acoroideae ["Acorinae"]) name with a description in Latin.

**Araliales** Hutch. *ex* Reveal, *ord. nov.*, validated by a reference to an A.L. de Jussieu (*Gen. Pl.*: 217. 4 Aug 1789, as Fam. Araliaceae ["Araliae"]) name with a description in Latin.

**Aspleniales** Pic. Serm. *ex* Reveal, *ord. nov.*, validated by a reference to a C.B. Presl (*Abh. Königl. Böhm. Ges. Wiss.*, ser. 4, 5:91. 2 Dec 1836, as Tribe Aspleniaceae ["Aspleniaceae"]) name with a description in Latin.

**Buxales** Takht. *ex* Reveal, *ord. nov.*, validated by a reference to the Latin diagnosis given by F.G. Bartling (*Ord. Nat. Pl.*: 370. Sep 1830, as "Buxea") for the Tribe Buxeeae Dumort. (*Comment. Bot.* xx. 1822).

**Calycerales** Takht. *ex* Reveal, *ord. nov.*, validated by a reference to a R. Brown *ex* L.C.M. Richard (*Mém. Mus. Hist. Nat.* 6:74. Nov 1820, as Fam. Calyceraceae ("Calycereae")) name with a description in Latin.

**Connarales** Takht. *ex* Reveal, *ord. nov.*, validated by a reference to an A.P. de Candolle (*Prodr.* 2:84. mid Nov 1825, as Tribe Connareae) name with a description in Latin.

**Hippuridales** Pulle *ex* Reveal, *ord. nov.*, validated by a reference to a J.H.F. Link (*Enum. Hort. Berol. Alt.* 1:5. 16 Mar-30 Jun 1821, as Fam. Hippuridaceae ["Hippurideae"]) name with a description in Latin.

**Nelumbonales** Nakai *ex* Reveal, *ord. nov.*, validated by a reference to an A.P. de Candolle (*Syst. Nat.* 2:43. late Mai 1821, as Tribe Nelumboneae) name with a description in Latin.

**Vitales** Takht. *ex* Reveal, *ord. nov.*, validated by a reference to an A.L. de Jussieu (*Gen. Pl.*: 267. 4 Aug 1789, as Fam. Vitaceae ["Vites"]) name with a description in Latin.

In preparing the list of family names for consideration under the rubric "NCU" (Hoogland & Reveal 1993), we failed to note that Cyphocarpaceae was a provisional name and thus not validly published (Art. 34.1[b]; Greuter *et al.* 1994). In order that this name may continue in use, as was our intent in 1993, it is validated here.

**Cyphocarpaceae** (Miers) Reveal & Hoogland, *stat nov.*, based on Subfam. Cyphocarpoideae Miers, *London J. Bot.* 7:61. 1848, as Cyphocarpaceae.

One goal of systematics is to recognize monophyletic taxa. The recent discovery (Olmstead & Reeves 1995) that Scrophulariaceae, as defined by most modern workers, is polyphyletic requires a redefinition of that family. Two approaches can be taken, the reduction of numerous commonly accepted families to synonymy under a single, broadly defined Scrophulariaceae, or a fragmentation of the family into smaller groups reminiscent of the family treatments proposed by Jussieu (1789) and subsequent early nineteenth century authors. In reviewing the options, I have decided to take the latter course and propose the following linear sequence within a broadly defined Scrophulariales:

Scrophulariales Lindl. (1833)

- Acanthales Lindl. (1833)
- Bignoniales Lindl. (1833)
- Gesneriales Dumort. (1829)
- Globulariales Dumort. (1829)
- Lentibulariales Lindl. (1833)
- Pinguiculariales Dumort. (1829)
- Plantaginales Lindl. (1833)
- Rhinanthales Dumort. (1829)
- Veratrales Dumort. (1829)
- 1. Buddlejaceae K. Wilh. (1910)
- 2. Retziaceae Bartl. (1830)
- 3. Stilbaceae Kunth, *nom. cons.* (1831)
- 4. Bignoniaceae Juss., *nom. cons.* (1789)
  - Crescentiaceae Dumort. (1829)
- 5. Paulowniaceae Nakai (1949)
- 6. Schlegeliaceae Reveal (1996)
- 7. Verbasaceae Raf. (1821)
- 8. Scrophulariaceae Juss., *nom. cons.* (1789)
  - Antirrhinaceae Pers. (1807)
  - Caprariaceae Martinov (1820)
  - Chelonaceae Martinov (1820)
  - Gratiolaceae Martinov (1820)
  - Limosellaceae J. Agardh (1858)
  - Linariaceae Martinov (1820)
  - Oxycladaceae (Miers) Schnizl. (1843-1870)
- 9. Rhinanthaceae Vent., *nom. cons. prop.* (1799)
  - Aragoaceae D. Don (1835)
  - Buchneraceae (Benth.) Lilja (1870)
  - Digitalidaceae Martinov (1820)
  - Erinaceae Duvau *ex* Pfeiff. (1873)
  - Euphrasiaceae Martinov (1820)
  - Melampyraceae Rich. *ex* Hook. & Lindl. (1821)
  - Pedicularidaceae Juss. (1789)
  - Sibthorpiaceae D. Don (1835)
  - Veronicaceae Durande (1782)
- 10. Oftiaceae Takht. & Reveal (1993)
  - Spielmanniaceae J. Agardh, *nom. illég.* (1858)
- 11. Ellisiophyllaceae Honda (1930)
- 12. Orobanchaceae Vent., *nom. cons.* (1799)

- Aeginetiaceae Livera (1927)  
 Phelypaeaceae Horan. (1834)  
 13. Selaginaceae Choisy, *nom. cons.* (1823)  
     Hebenstretiaceae Horan. (1834)  
 14. Globulariaceae DC., *nom. cons.* (1805)  
 15. Gesneriaceae Dumort., *nom. cons.* (1822)  
     Belloniaceae Martinov (1820)  
     Besleriaceae Raf. (1838)  
     Cyrtandraceae Jack (1823)  
     Didymocarpaceae D. Don (1822)  
     Ramondaceae Godr. (1850)  
 16. Plantaginaceae Juss., *nom. cons.* (1789)  
     Littorellaceae Gray (1821)  
     Psylliaceae Horan. (1834)  
 17. Pedaliaceae R. Br., *nom. cons.* (1810)  
     Sesamaceae R. Br. *ex Bercht. & J. Presl* (1820)  
 18. Martyniaceae Stapf, *nom. cons.* (1895)  
 19. Trapellaceae Honda & Sakisaka (1930)  
 20. Myoporaceae R. Br., *nom. cons.* (1810)  
     Bontiaceae Horan. (1834)  
 21. Acanthaceae Juss., *nom. cons.* (1789)  
     Justiciaceae Raf. (1838)  
     Mendonciaceae Bremek. (1954)  
     Meyeniaceae Sreem. (1977)  
     Nelsoniaceae (Nees) Sreem. (1977)  
     Thomandersiaceae Sreem. (1977)  
     Thunbergiaceae (Dumort.) Lilja (1870)  
 22. Lentibulariaceae Rich., *nom. cons.* (1808)  
     Pinguiculaceae Dumort. (1829)  
     Utriculariaceae Hoffmanns. & Link, *nom. cons.* (1809)

All names necessary for the proposed revision of Scrophulariales are available except for the following:

**Schlegeliaceae** (Gentry) Reveal, *fam. & stat. nov.*, based on Tribe Schlegelieae Gentry, Fl. Neotrop. Monogr. 25:48. 19 Sep 1980.

The problematic relationship of *Schlegelia*, *Gibsoniothamnus*, and *Synopsis* with Bignoniaceae and Scrophulariaceae is well known (Monachino 1949; Williams 1970; Gentry 1980; Armstrong 1985). With the discovery of a fourth genus, *Exarata* (Gentry 1992), the distinctiveness of the taxon has become clear, and its nearness to Bignoniaceae confirmed. The fragmentation of Scrophulariaceae, the mandatory recognition of Paulowniaceae, and the unique position of the genera related to *Schlegelia* in the data presented by Olmstead & Reeves (1995) requires the recognition of Schlegeliaceae as a distinct family. Failure to fragment the traditional Scrophulariaceae into smaller families would mean that recognition of Oftiaceae, Ellisiophyllaceae, Orobanchaceae, Selaginaceae, and Globulariaceae is impossible, Bignoniaceae becomes doubtful, and the continued recognition of Pedaliaceae, Martyniaceae, Trapellaceae, Myoporaceae, and even Plantaginaceae dubious. Even the

continued acceptance of Gesneriaceae renders a broadly defined Scrophulariaceae paraphyletic.

The family name Rhinanthaceae (1799) will be proposed for conservation against the earlier Veronicaceae (1782) as the former was widely accepted in the early literature and its generic stem is the basis for Subfam. Rhinanthoideae Link.

#### ACKNOWLEDGMENTS

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## TWO NEW MEXICAN SPECIES OF *SENECIO* (ASTERACEAE)

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### ABSTRACT

Two new species of *Senecio* are described from México: *S. ozolotepecanus* B.L. Turner, from western Oaxaca, and *S. viejoanus* B.L. Turner from southern Nuevo León and closely adjacent Tamaulipas. The former is closely related to *S. picridis* Schauer of the *Triangularis* species-group and the latter is closely related to *S. loratifolius* Greenm. of the *Lugentes* species-group (*sensu* Barkley 1985).

KEY WORDS: Asteraceae, *Senecio*, México, systematics

Routine identification of Mexican comps has brought to fore the following novelties in *Senecio*.

***SENECIO OZOLOTEPECANUS*** B.L. Turner, *spec. nov.* TYPE: MEXICO. Oaxaca: "Dirt road between La Cienegilla and San Gregorio Ozolotepec. Pine forest or cloud forest dominated by *Clethra*, *Pinus* and *Quercus*" 2500-3000 m, 12 Dec 1989, Andrew McDonald 2970 (HOLOTYPE: TEX!; Isotype: MEXU).

*Senecioni picridi* Schauer similis sed differt foliis numerosioribus majoribus angustioribus tenuioribusque, bracteis involucri ut videtur multiseriatis, calyculo longitudine bracteas interiores paene aequanti.

Suffruticose shrubs ca. 1 m high. Stems tomentose at first but soon glabrate. Leaves numerous and much overlapping, gradually reduced upwards and extending into the capitulescence. Midstem leaves sessile, briefly clasping, linear to linear-lanceolate, mostly 10-15 cm long, 0.5-1.0 cm wide, markedly white-tomentose beneath, less so or glabrate above, minutely denticulate to entire, the apices narrowly acute. Heads 30 or more arranged in open very leafy corymbose panicles, the ultimate peduncles tomentose, mostly 1-4 cm long. Involucres narrowly campanulate, 11-14 mm high, ca. 10 mm wide (pressed), the outermost bracts (calyculus) nearly as long as the inner, shaggy-white tomentose, the innermost pubescent at the apices with coarse hairs. Ray florets 8; ligules yellow, 8-10 mm long, ca. 3 mm wide. Dis-

florets ca. 40 (est.), 8-9 mm long, glabrous throughout; tube ca. 3.5 mm long; lobes triangular, ca. 1 mm long. Achenes (immature) columnar, ca. 2 mm long, pubescent throughout with appressed hairs; pappus of numerous white fragile slender bristles ca. 8 mm long.

This species belong to the ser. *Fruticosa* of *Senecio* (*sensu* Barkley 1985) and is seemingly most closely related to *S. picridis* Schauer, having most of the features of that species, except that the leaves are longer, thinner, more numerous, and markedly overlapping. Additionally, the involucrel bracts (including the outermost) are nearly all of the same length and very loosely tomentose throughout, giving the involucre a multiseriate appearance.

*Senecio ozolotepecanus* might also be mistaken for *S. stoechadiformis*, the latter readily distinguished by its thicker, fewer, entire leaves, naked capitulescence, and well-developed calyculus, the outermost bracts half as long as the inner or less.

**SENECIO VIEJOANUS** B.L. Turner, *spec. nov.* TYPE: MEXICO. Nuevo León: Mpio. Aramberri, Cerro Viejo, 3400 m, pine woods, 20 Nov 1993, *Hinton et al.* 23969 (HOLOTYPE: TEX!; Isotypes: GH, NY).

*Senecioni loratifolio* Greenm. similis sed capitulis majoribus (involucris plerumque 9-11 mm altis vs. 6-8 mm altis) dispositis plerumque in capitulescentia racemoidea et foliis anguste linearibus (3-6 mm latis) non amplexicaulibus differt.

Simple-stemmed perennials 30-40 cm high from thick woody rhizomes, leaves linear, mostly basal, exauriculate, 0.3-0.6 cm wide, 10-20 cm long, tomentose above and below, with age the upper surface often glabrate. Heads 5-20, arranged in terminal raceme-like corymbs, the ultimate peduncles mostly tomentose, 1-3 cm long. Involucres broadly campanulate, 9-11 mm high, 10-12 mm wide (pressed); bracts ca. 23, linear-lanceolate, apically tufted; calyculus a series of loose bracts which grade into the inner series. Ray florets 13-32, the ligules yellow, 10-20 mm long, 2-4 mm wide. Disk florets numerous (80+), the corollas yellow, glabrous, 6-8 mm long, the tube 2.5-3.5 mm long with lobes ca. 0.8 mm long, somewhat warty on the outer surfaces. Achenes columnar, ca. 3 mm long, pubescent in lines; pappus of numerous white fragile capillary bristles 8-10 mm long.

ADDITIONAL COLLECTIONS EXAMINED: MEXICO. Nuevo León: Peña Nevada, west side of Picacho Onofre, 3230 m, 4 Jul 1959, *Beaman* 2687 (TEX); Mpio. Zaragoza, Cerro Viejo, 3310 m, 5 Oct 1992, *Hinton et al.* 22394 (TEX); summit of Peña Nevada, 2700-2900 m, "abundant in fir zone", 5 Aug 1983, *Nesom* 4805 (TEX). Tamaulipas: Mpio. Miquihuana, 5 km N of Aserradero, ca. 2500 m, 25 Oct 1986, *Hernández S.* 2078 (TEX); E side of Peña Nevada, 3500-3600 m, 5 Jul 1985, *McDonald* 1614 (TEX); Cerro Peña Nevada, 1 Jun 1975, *Patterson* 1523 (TEX); Peña Nevada, 19 Jul 1949, *Stanford et al.* 2591 (TEX).

This species is obviously a sister-taxon of *Senecio loratifolius*, differing from the latter in having larger heads which are mostly arranged in raceme-like corymbs, and by the very linear-leaved foliage throughout, those along the stem not at all clasping. *Senecio loratifolius*, so far as known, is confined to the higher peaks of central Nuevo

Leon (Cerro Potosí and closely adjacent peaks in Coahuila) while *S. viejoanus* is restricted to the higher peaks of southern Nuevo León (Cerro Peña Nevada and Cerro Viejo).

#### ACKNOWLEDGMENTS

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A NEW SPECIES OF *SALVIA* (LAMIACEAE) FROM NUEVO LEON, MEXICO

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ABSTRACT

*Salvia jorgehintoniana* Ramamoorthy, *spec. nov.* is described and illustrated from southern Nuevo León. It belongs to the sect. *Curtiflorae* of *Salvia*, where it relates to *S. longistyla*, a wide spread, variable species of western and south central México. It differs from the latter in having much larger corollas and smaller, abruptly acuminate calyx lobes.

KEY WORDS: Lamiaceae, *Salvia*, México, Nuevo León, systematics

Routine identification of Mexican plants has revealed the following novelty. To judge from notes and annotations accompanying type material, Dr. T.P. Ramamoorthy, in an earlier independent study, came to the same conclusion. Because of this I have credited him with the name and authorship, although the description and views as to its sectional relationship are those of my own.

**SALVIA JORGEHINTONIANA** Ramamoorthy, *spec. nov.* Figure 1. TYPE: MEXICO. Nuevo León: Mpio. Galeana, along road from Agua Blanca to San Miguel, 2020 m, "mixed forest of pine and oak", 28 Aug 1991, *Hinton et al.* 23148 (HOLOTYPE: TEX!)

*S. longistyla* Benth. similis sed corollis 40-50 mm longis (vice corollae 25-40 mm longae), lobis calycum 5-6 mm longis (vice lobi 6-12 mm longi), apicibus abrupte acutatis (vice apicum gradatim acuminatorum).



Figure 1. *Salvia jorgehintoniana* (Hinton 22456).

Perennial herbs 0.8-1.0 m high. Midstems sparsely puberulous with mostly down-curved eglandular hairs. Leaves 10-25 cm long, 5-13 cm wide; petioles 4.5-9.0 cm long; blades broadly ovate to subdeltooid, pinnately nervate, sparsely to moderately pubescent above and below, especially along the veins, the margins serrate. Flowers in terminal racemes 20-30 cm long, arranged 4-6 to a node, the pedicels mostly 10-15 mm long, densely pubescent with spreading hairs 0.3-0.5 mm long, mostly eglandular but at least some with weakly developed terminal viscid glands. Calyces 2.1-2.5 cm long, sparsely to moderately pubescent with spreading, mostly glandular hairs to 1 mm long; lobes 5-6 mm long, deltoid, abruptly acute, the upper lobes 3-ribbed. Corollas red, 40-55 mm long; upper lobes 8-10 mm long; lower lobes 5-6 mm long. Stamens exerted for 5-10 mm beyond the apex of the upper lobes; anthers purple, ca. 2 mm long. Style glabrous, extending somewhat beyond the stamens. Seeds ovoid, ca. 3 mm long, 1.5 mm wide, pale yellow, glabrous.

ADDITIONAL SPECIMEN EXAMINED: MEXICO. Nuevo León: Mpio. Zaragoza, Cerro El Viejo, 1935 m, 6 Oct 1992, *Hinton et al.* 22456 (TEX).

According to label data, the type was collected from a "large colony". The species is quite spectacular, with very large crimson corollas (up to 55 mm long, not counting the extended stamens and style branches). It belongs to the subgenus *Calosphace*, sect. *Curtiflorae*, where it relates to *Salvia longistyla* Benth., having the general habit, large leaves, and inflorescence of that species, but it differs markedly in having much larger corollas (40-55 mm long vs. 25-40 mm long) and shorter calyx lobes (5-6 mm long vs. 6-12 mm long) with abruptly acuminate apices (vs. gradually narrowing apices). In addition, the vestiture is less glandular-viscid and the styles are glabrous throughout, or nearly so.

*Salvia jorgehintoniana* is apparently endemic to southern Nuevo León, while *S. longistyla* is fairly widespread, occurring from Durango to Guerrero and across the trans-volcanic belt to Veracruz.

The appellation honors George Hinton, son of James Hinton, and grandson of the late G.B. Hinton, who, in conjunction with his father, has collected many extraordinary plants from the state of Nuevo León.

#### ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Piero Delprete for reviewing the paper. Marcia Thompson provided the illustration.

TAXONOMY OF THE *HEDYOTIS ACEROSA* (RUBIACEAE) COMPLEX

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ABSTRACT

*Hedyotis acerosa*, a species of the southcentral U.S.A. and northern México, is treated as having four morphogeographical varieties: var. *acerosa*, a widespread very common stiffly erect, fasciculate plant occurring mostly in Texas and Coahuila, México; var. *polypremoides*, an erect nonfasciculate plant of New Mexico, western trans-Pecos Texas and Chihuahua and westernmost Coahuila, México; var. *potosina* B.L. Turner, var. nov., a low, mat-forming taxon with elongate corollas, occurring from southernmost Coahuila to San Luis Potosí, México; and var. *tamaulipana* B.L. Turner, var. nov., an open, much-branched, wirey-stemmed plant with relatively small flowers occurring in westcentral Tamaulipas, México. A key to these taxa is provided along with maps showing their distribution.

KEY WORDS: Rubiaceae, *Hedyotis*, *Houstonia*, Texas, México, systematics

Attempts to classify Mexican collections of *Hedyotis acerosa* assembled at LL, TEX has prompted the present study. Terrell (1991) provided a brief overview of this complex, which he included in his concept of the genus *Houstonia*. While not pretending to understand fully the taxonomic limits of these two closely related genera, my taxonomic intuition, after comparing representative species of the groups concerned, is that they are best treated as but a single genus, *Hedyotis* having priority.

Distributional maps are based upon specimens on file at LL, TEX, all of these annotated accordingly.

KEY TO THE *HEDYOTIS ACEROSA* COMPLEX IN U.S.A.

- 1. Stems with leaves decidedly fasciculate; flowers mostly on pedicels 0.3-1.5 mm long; vestiture of stems various, but not uniformly minutely pubescent with down curved hairs; Culberson Co., Texas and eastwards. .... var. *acerosa*
- 1. Stems with leaves not fasciculate, or very weakly so; flowers, at least some of them, on pedicels 2.0-20.0 mm long; vestiture of stems uniformly minutely pubescent with down-curved hairs ..... var. *polypremoides*

KEY TO THE *HEDYOTIS ACEROSA* COMPLEX IN MEXICO

1. Stems with internodes much-shortened, forming low pulvinate mat-like plants mostly 2-5 cm high; corolla tubes mostly 8-10 mm long; southernmost Coahuila and southwards to San Luis Potosí.....var. *potosina*
1. Stems not as described in the above, mostly 5-15 cm high, forming well-defined rather naked stems; corolla tubes mostly 3-7 mm long.....(2)
2. Leaves markedly fasciculate; pedicels 0.3-1.5 mm long (rarely not so on lanky new growth of secondary shoots); vestiture various, but not minutely pubescent with down-curved hairs; common in Coahuila and closely adjacent central Nuevo León. .... var. *fasciculata*
2. Leaves weakly fasciculate, if at all; pedicels mostly 2-20 mm long; vestiture uniformly minutely pubescent with mostly down-curved hairs (rarely subglabrous in var. *tamaulipana*); Chihuahua, Coahuila and Tamaulipas. ....(3)
3. Corolla tubes mostly 3-4 mm long; calyx lobes 1.5-2.0 mm long; Tamaulipas. .... var. *tamaulipana*
3. Corolla tubes mostly (4-)5-6(-7) mm long; calyx lobes 3-4 mm long; Chihuahua, Coahuila..... var. *polypremoides*

*HEDYOTIS ACEROSA* A. Gray, *Pl. Wright.* 1:81. 1850.

*Houstonia acerosa* (A. Gray) Benth. & Hook. *f.* (for additional synonymy *cf.* Terrell 1991).

*HEDYOTIS ACEROSA* A. Gray var. *ACEROSA*

As described by Gray, this is a rigidly erect, fasciculate, sparingly branched plant ca. 15 cm high. Type material was collected by C. Wright in late June of 1849, presumably in present day Kinney or Val Verde County, Texas where Wright would have first encountered the taxon. Wright, in his protologue, also cited a specimen from near Buena Vista, Coahuila, collected by Gregg, among others alluded to; clearly lectotypification is needed, but from the description there is little doubt as to the application of the name.

This variety, in habit, is relatively uniform throughout its range, but its vestiture varies considerably as shown in Figure 2. In the latter illustration, specimens with a mixture of both long and very short, mostly straight hairs are depicted as open circles; those with  $\pm$  uniformly small straight hairs, and/or  $\pm$  glabrous are shown as closed circles; specimens intermediate to these extremes shown as half circles. At least a few of the specimens here accepted as var. *acerosa* were annotated by Terrell as subsp. *polypremoides* (e.g., Ector Co., Tex; Rowell 5605 [LL]).

*HEDYOTIS ACEROSA* A. Gray var. *POLYPREMOIDES* (A. Gray) W.H. Lewis, *Ann. Missouri Bot. Gard.* 55:397. 1969.

*Hedyotis acerosa* A. Gray var. *bigelovii* (Greenm.) W.H. Lewis

*Hedyotis polypremoides* (A. Gray) Shinnors

*Houstonia acerosa* A. Gray subsp. *polypremoides* (A. Gray) Terrell

*Houstonia polypremoides* A. Gray

*Houstonia polypremoides* A. Gray var. *bigelovii* Greenm.

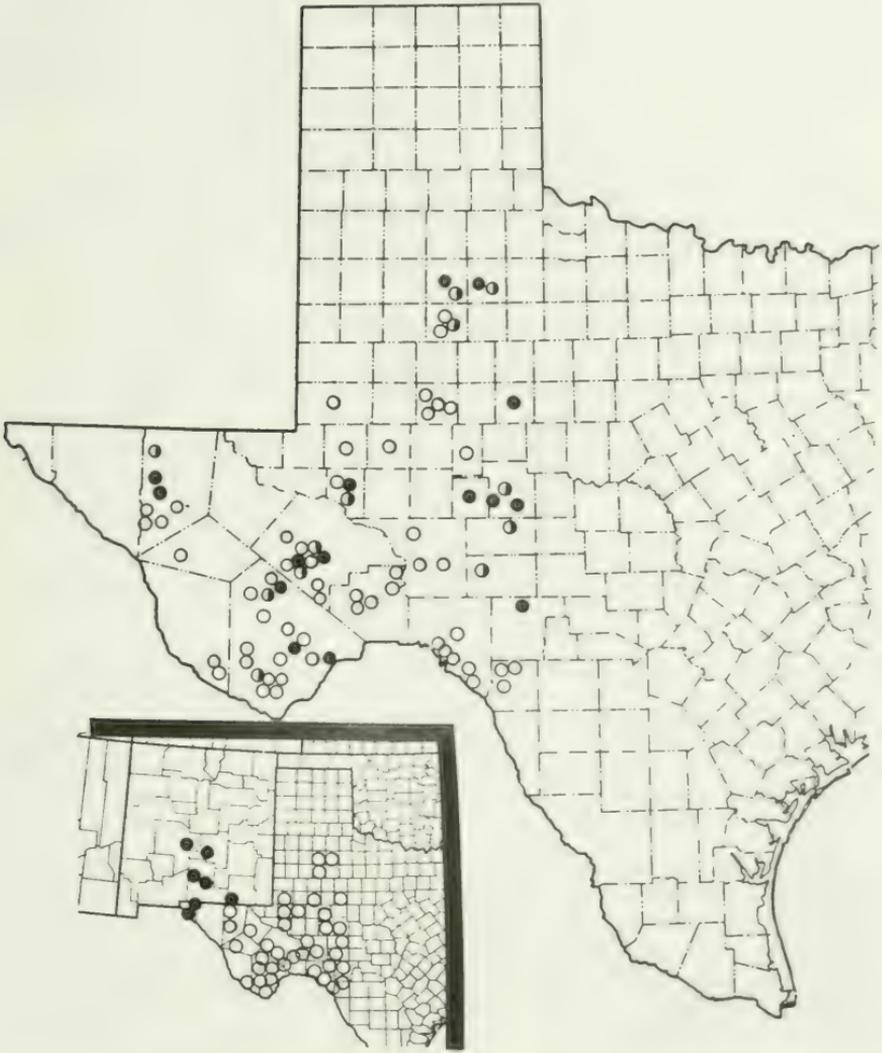


Figure 1. Distribution of *Hedyotis acerosa* var. *acerosa* in Texas: plants with both long and short hairs along the stem, the typical form (open circles); plants with rather uniformly minute straight hairs along the stem, or variously subglabrate (closed circles); plants with intermediate vestiture (half circles). Inset: Distribution of *Hedyotis acerosa* in the U.S.A.: var. *acerosa* (open circles); var. *polypremoides* (closed circles). Intermediates occur in regions of near contact.



Figure 2. Distribution of *Hedyotis acerosa* in México: var. *acerosa* (open circles); var. *polypremoides* (closed triangles); plants  $\pm$  intermediate to var. *acerosa* but tending to var. *polypremoides* (half solid triangle); var. *potosina* (closed circle); var. *tamaulipana* (open square).

Lewis (1968) lectotypified this taxon by *Pringle 356* (GH), collected in the Santa Eulalia Mts., Chihuahua (ca. 28° 35' N, 105° 53' W). Shinnars (1949) accepted this taxon as a good species, but Lewis (1968, 1969) recognized it as but varietally distinct, although Terrell (1991) recognized it as a subspecies. Lewis (1969) took up the name *Hedyotis acerosa* var. *bigelovii* for this taxon, but the current code mandates the varietal name *polypremoides* as correct, much as inadvertently supplied by Lewis.

I accept its varietal status because the taxon clearly grades into the var. *acerosa* in the trans-Pecos region of Texas (e.g., *Whitehouse s.n.* [TEX]; *Young s.n.* [TEX] both from the Guadalupe Mts.) and in México (e.g., western Coahuila, *Johnston 389* [LL]; etc.), mostly along the western periphery of var. *acerosa*, as noted by Terrell (1979).

Occasional plants of var. *acerosa*, either aberrant late-flowering, or cut-back shoots showing new growth, are apt to be mistaken for var. *polypremoides* but individuals of the former can be readily sorted out by their pubescence, as noted in my key.

**HEDYOTIS ACEROSA** A. Gray var. **POTOSINA** B.L. Turner, var. nov.  
TYPE: MEXICO. San Luis Potosí: Charcas, Jul-Aug 1934, *C.L. Lundell 5048* (HOLOTYPE: LL!).

*H. acerosa* A. Gray var. *acerosa* similis sed plantae 2-4 cm altae (vice 5-15 cm), breves, ramosissimae e basi sunt, tubis corollarum plerumque 8-10 mm longis (vice 4-6 mm).

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Coahuila: mouth of San Lorenzo Canyon, SE of Saltillo, 6200 ft, 2 Aug 1975, *Engard 690* (LL); 4 mi S of Saltillo, 6000 ft, 18 Nov 1958, *Rollins 58125* (LL). Nuevo León: 18 mi E of Matehuala, road to Dr. Arroyo, 5 Aug 1970, *Flyr 1536* (TEX). San Luis Potosí: 16 mi N of Matehuala, 11 Feb 1960, *Johnston 5088A* (TEX); 70 mi S of Matehuala, 2 Sep 1975, *Simpson 7036* (TEX). Tamaulipas: Mpio. Bustamante, 38.8 km N of Tula, 2 Jun 1983, *Barnett 83071* (TEX).

All of the above cited plants, including the type, were annotated by Terrell as subsp. *acerosa*. But, as indicated by label data on *Simpson 7036*, var. *potosina* is a mat-forming plant, having a very different growth habit than found in var. *acerosa*, additionally, the corolla tubes are nearly twice the length of those of the latter, and it occupies a decidedly different geographical region. While treated at the varietal level, it might ultimately prove to be specifically distinct, at least no clear intermediates were found linking var. *potosina* to var. *acerosa*, although the two taxa come in close proximity in the region about Saltillo, Coahuila.

**HEDYOTIS ACEROSA** A. Gray var. **TAMAULIPANA** B.L. Turner, var. nov.  
TYPE: MEXICO. Tamaulipas: Mpio. Villagran, 1 mi E of Ejido de San Lazaro (ca. 24° 35' N × 99° 13' W), ca. 1500 ft, 11 Oct 1959, *M.C. Johnston* (with *J. Graham*) 4281k (HOLOTYPE: TEX!).

*H. acerosa* A. Gray var. *polypremoides* (A. Gray) W.H. Lewis similis, sed plantae laxe divaricateque ramosae sunt, lobis calycum brevioribus (plerumque 1-2 mm longis vice 3-4 mm), et tubis corollarum brevioribus (plerumque 2-4 mm longis vice 4-6 mm).

ADDITIONAL PLANTS EXAMINED: MEXICO. Tamaulipas: Mpio. San Carlos, 6 mi S of San Carlos on the road to Padilla, 1600 ft, calcareous terraces of Arroyo de San Carlos, 13 Dec 1959, *Johnston 5007A* (TEX); Mpio. Casas, "5 mi E of Casas on the new Victorio-Soto la Marina highway", 28 Sep 1960, *Johnston 5784B* (TEX).

This taxon resembles *Hedyotis acerosa* var. *polypremoides* but the plants are loosely divaricately branched, the calyx lobes shorter (mostly 1-2 mm long vs. 3-4 mm long), and have shorter corolla tubes (mostly 2-4 mm long vs. 4-6 mm long).

Terrell annotated all of the material cited above, including the type, as *Houstonia acerosa* subsp. *polypremoides*. Considering the differences between the latter and var. *tamaulipana*, as outlined in the above, and the disjunct nature of the populations concerned, varietal status for the latter seems justified.

#### ACKNOWLEDGMENTS

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TAXONOMIC STUDY OF *HEDYOTIS PALMERI* (RUBIACEAE)

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ABSTRACT

*Hedyotis palmeri* (A. Gray) W.H. Lewis (= *Houstonia palmeri* A. Gray) is a species of northcentral México occurring in mostly shallow soils from 1000-2200 m. Two morphogeographical infraspecific categories are recognized: var. *palmeri* (including *H. longipes* S. Wats.), occurring in southeastern Coahuila and most of Nuevo León from 1600-2200 m; and var. *muquizana* B.L. Turner, var. *nov.*, occurring in northcentral Coahuila mostly at 1000-1600 m. The latter differs from the former in being a taller plant with larger corollas and longer pedicels. A map showing the distributions of the two taxa is included. Lectotypification for *H. longipes* and *H. palmeri* is provided.

KEY WORDS: Rubiaceae, *Hedyotis*, *Houstonia*, México, systematics

Terrell (1991) provided an overview of the genera *Hedyotis*, *Houstonia*, and *Oldenlandia* for North America. In this, *Hedyotis palmeri* (A. Gray) W.H. Lewis was positioned in the genus *Houstonia*, subgenus *Ericotis* Terrell. This subgenus includes *Hedyotis acerosa* A. Gray which I have recently studied (Turner, 1996), concluding that it is seemingly adequately treated as an element of *Hedyotis*. In working over that complex I became interested in the regional variation displayed by *H. palmeri*, hence the present paper.

Terrell did not recognize infraspecific categories under *Hedyotis palmeri*, but a sorting of the specimens available to me, most of these annotated by him, showed that there was a series of populations in northcentral Coahuila made up of larger wirier plants, with larger corollas on more elongate pedicels than occurs in typical populational elements of *H. palmeri*. The two series of populations apparently do not coexist, and while clear intermediates between these are not known, their close relationship is so obvious that I have described the new taxon as but varietally distinct.

A key to these two varieties follow, along with a map showing their distribution (Figure 1), based upon material on file at GH, LL, SRSC, TEX.

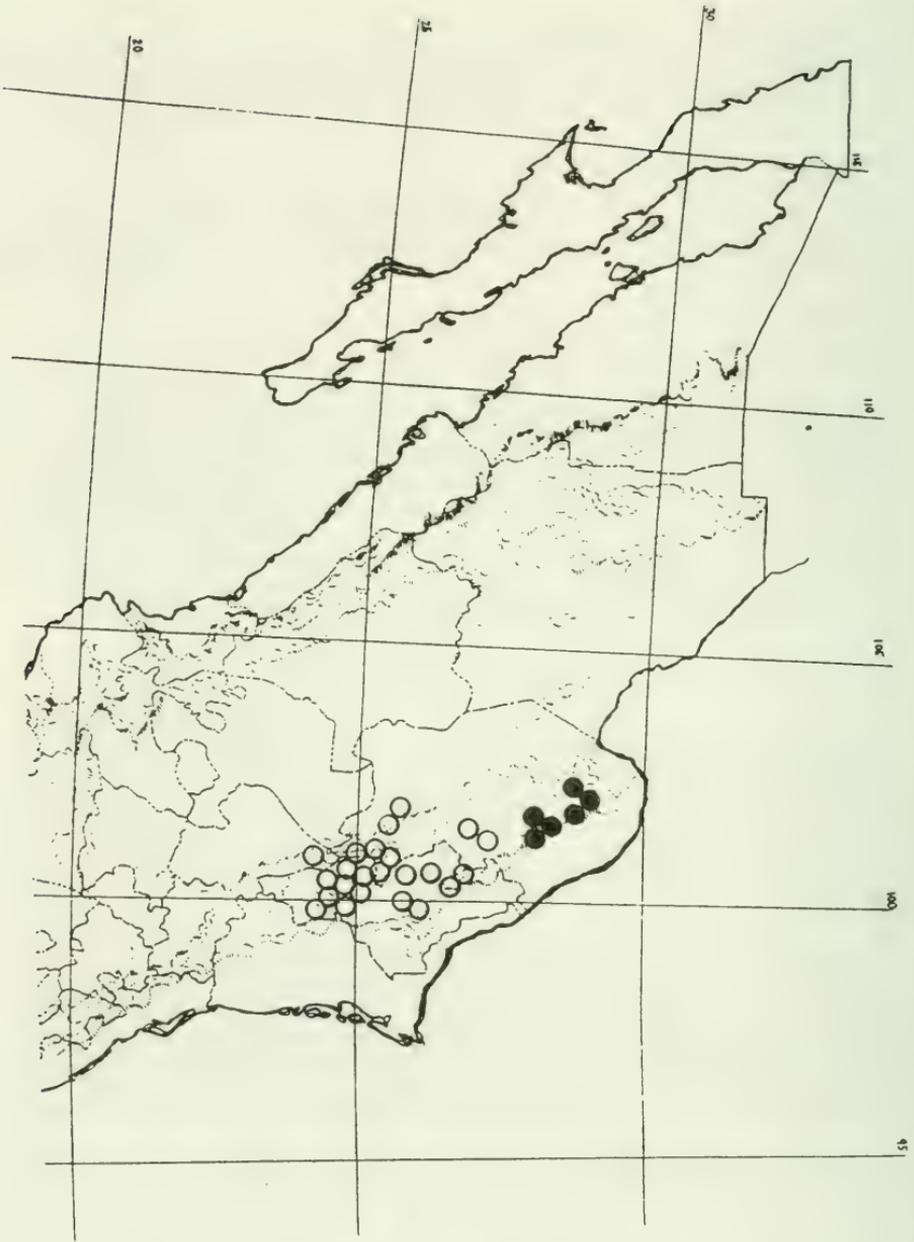


Figure 1. Distribution of *Hedyotis palmeri*: var. *muzquizana* (open circles); var. *palmeri* (closed circles).

Key to varieties of *Hedyotis palmeri*

- Mature corolla tubes mostly (6-)8-10 mm long; pedicels mostly 20-30 mm long; n Coahuila.....var. *muzquizana*  
 Mature corolla tubes mostly 4-5(-8) mm long; pedicels mostly 5-20 mm long; s Coahuila, Nuevo León.....var. *palmeri*

**HEDYOTIS PALMERI** (A. Gray) W.H. Lewis var. *PALMERI*, *Rhodora* 63:222. 1961. BASIONYM: *Houstonia palmeri* A. Gray, Proc. Amer. Acad. Arts 17:202. 1882. TYPE: MEXICO. Coahuila: "Lerios, 45 mi E of Saltillo", Jul 1880, *Edward Palmer* 397 (LECTOTYPE [here selected]: GH!). The lectotype is mounted on the same sheet with two other collections, all of these cited in the protologue: *Palmer* 398, Jul 1880, from "40 mi S of Saltillo", and *Palmer* 2117, Jul 1880, from "6 mi E of Saltillo". The several specimens are very similar but the collection selected as the lectotype is better developed as to flowering and fruiting material.

*Houstonia longipes* S. Wats., Proc. Amer. Acad. Arts 18:97. 1883. *Hedyotis longipes* (S. Wats.) W.H. Lewis, *Rhodora* 63:222. 1961. TYPE: MEXICO. Nuevo León: Monterrey, Feb 1880, *Edward Palmer* 395 (LECTOTYPE [here selected]: GH!). The lectotype is mounted on the same sheet with two other collections: *E. Palmer* 394, Sep 1880, from Monclova, Coahuila, and *Gregg s.n.*, 29 May 1847, from "Cerralbo", Coahuila (?). All of these are very similar and all were cited in the protologue. The Gregg specimens are the only ones having both flowers and fruits, the corolla tubes being ca. 4 mm long. Corollas are absent on the remaining collections.

This is the commonly collected widespread variety of the species and is known to me only by collections obtained from the south and east of var. *muzquizana* (Figure 1).

**HEDYOTIS PALMERI** (A. Gray) W.H. Lewis var. **MUZQUIZANA** B.L. Turner, var. nov. TYPE: MEXICO. Coahuila: Mpio. M. Muzquiz, ca. 130 road km NW of Muzquiz on Hwy 2A, "midslope of Sa. La Encantada along road up to tunnel entrance to La Encantada basin and mining area. Steep NW - facing slope, . . . common but scattered, mostly in moister microsites", 28° 30' 40" N × 102° 19' 30" W, 3 Jun 1992, *Guy Nesom* 7380 (with M. Mayfield) (HOLOTYPE: TEX!; Isotype: MEXU).

Similis *H. palmeri* (A. Gray) W.H. Lewis var. *palmeri* sed differt tubis corollarum plerumque 8-10 mm longis (vice tuborum plerumque 4-6 mm longorum) et pedicellis plerumque 20-30 mm longis (vice 5-20 mm longis).

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Coahuila: Mpio. M. Muzquiz, Cuesta del Plomo, 1000 m, 7 Jun 1972, *M.C. Johnston et al.* 7550p (TEX); Muzquiz, spring 1935, *Marsh* 330 (GH,SRSC,TEX); Santa Rosa Mts., 8 Jul 1938, *Marsh* 1251 (GH,TEX); 15 air km NW of La Babia, 18 May 1992, *Mayfield* 1426

(TEX); SW margin of Serranias del Burro, 1400-2100 m, 23 Jun 1991, Ruiz 47 (TEX); Rancho Agua Dulce, 1 Jul 1936, Wynd & Mueller 400 (GH).

Nearly all of the specimens cited above have the characters alluded to in the diagnosis, and it is clear that these represent populational units distinct from var. *palmeri*. Additionally, the plants concerned, in general, appear to be taller, wirier, with a less branched inflorescence than occurs in var. *palmeri*.

Terrell annotated several or more of the above sheets as *Hedyotis palmeri* without comment. In spite of numerous collections of var. *palmeri* on file at LL, TEX (40 sheets), I have not detected any clear intermediates between these allopatric entities except for a single collection from "Alamar", Pabillo, SE of Galeana, Nuevo León (*Pennell 17191* [GH]), having corolla tubes 6-8 mm long, otherwise it is similar to var. *palmeri*. Late-flowering specimens of var. *muzquizana*, however, occasionally produce small flowers (e.g., *Wynd & Muller 400*).

It is possible that future field workers will elevate var. *muzquizana* to specific rank, typical specimens differing markedly from var. *palmeri*.

#### ACKNOWLEDGMENTS

I am grateful to GH and SRSC for the loan of materials. Gayle Turner provided the Latin diagnosis, and she and Piero Delprete reviewed the article.

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**HEDYOTIS POOLEANA** (RUBIACEAE), A NEW SPECIES FROM THE DEAD HORSE MOUNTAINS, TRANS-PECOS TEXAS

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ABSTRACT

A new mat-forming species, *Hedyotis pooleana* B.L. Turner, is described and photographed from the Dead Horse Mts. of trans-Pecos Texas (Brewster Co.). It is closely related to the Mexican species *H. mullerae* Fosberg but differs from the latter in having lanceolate, markedly thickened leaves with glabrous surfaces and apiculate apices.

KEY WORDS: Rubiaceae, *Hedyotis*, Texas, systematics

Routine identification of Texas (and Mexican) plants has revealed the following novelty.

**HEDYOTIS POOLEANA** B.L. Turner, *spec. nov.* Figure 1. TYPE: U.S.A. Texas: Brewster Co., Brushy Canyon Preserve (The Nature Conservancy of Texas) Dead Horse Mts. (Sierra del Caballo Muerto); ca. 0.7 mi SW of adobe house on Brugh Canyon divide (29° 27' N, 102° 58' W), 4900 ft., North - to East-facing, vertical, limestone cliff face, 1 May 1987, Jackie Poole 2942 (HOLOTYPE: TEX!).

Similis *Hedyotis mullerae* Fosberg sed differt foliis valde crassis, lanceolatis, glabris utrinque, costatissimis infra, apicibus apiculatis.



Figure 1. Photograph of *Hedyotis pooleana* at the type locality (courtesy J. Poole).

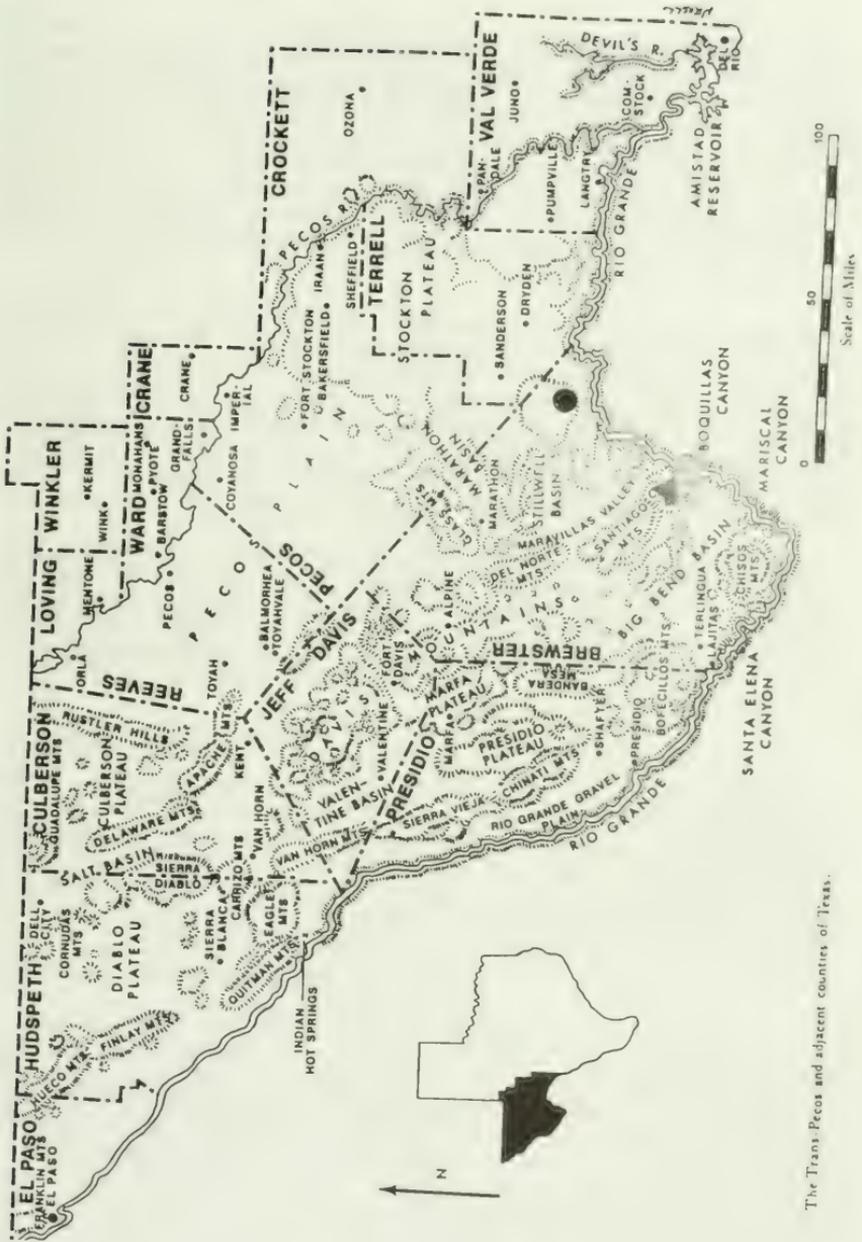


Figure 2. Map showing locations of the localized endemics, *Hedyotis butterwickiae* (circle) and *H. pooleana* (triangle).

Mat-forming perennial herbs 2-3 cm high. Stems glabrous and much-branched from the base, the internodes mostly 1-3 mm long. Stipules lanceolate, 1-2 mm long. Midstem leaves thick, lanceolate, 5-7 mm long, 1.0-1.4 mm wide, strongly 1-nerved, glabrous except for minutely hispidulous margins, the apices decidedly apiculate. Flowering branches not much extending beyond the leaves, if at all. Pedicels 0.1-0.4 mm long. Calyces ca. 2 mm long, the 4 lobes lanceolate, ca. 1 mm long. Corollas 2.5-3.0 mm long, white, the 4 lobes lanceolate, ca. 2 mm long, hispidulous externally at the apices, moderately pilose within. Anthers included within the tube. Styles excurrent for ca. 2 mm. Capsules orbicular ca. 1 mm high, dehiscent loculicidally across the disk. Seeds not available.

*Hedyotis pooleana* much resembles *H. mullerae* Fosberg of northcentral México but the leaves are markedly different, as noted in the above diagnosis. When first collected Ms. Jackie Poole (conservation biologist and one-time curator at LL, TEX) thought the plant might be *H. mullerae*, which it superficially resembles. Comparisons of her material with ten or more collections of the latter at LL, TEX has shown the distinctiveness of the taxon proposed here. Terrell (1991: *Phytologia* 71:212-243.) provided an overview of the North American species of *Hedyotis* and related genera, but did not have material of the present species.

Jackie Poole collected the species again at the type locality on 25 May 1985 (*Poole* 2527 [SRSC,TEX]). She also informed me that she observed the species on 27 Nov 1987 along the same ridge at about 4840 ft elevation within the boundary of the Big Bend National Park, about a mile or so from the type locality. The Dead Horse Mountains is an extension of the loftier Sierra del Carmen range across the Rio Grande in Coahuila, México. Wells (1965: *Southwestern Naturalist* 10:256-260.) has provided a vegetational account of this Texas extension.

Northcentral México and closely adjacent trans-Pecos Texas harbor a large array of endemic taxa. This is especially so for *Hedyotis* for the present novelty is apparently restricted to the Dead Horse Mountains, not too far removed from the recently described *Hedyotis butterwickiae* Terrell, the two occurring in close proximity (Figure 2). I can't help but add that both of the individuals for which these two taxa were named, obtained advanced degrees under my direction years ago now, and both are still ardent field workers. Bless such students!

#### ACKNOWLEDGMENTS

I am grateful to Jackie Poole for calling the novelty to my attention, to Gayle Turner for the Latin diagnosis, and to her and Piero Delprete for reviewing the manuscript.

**A NEW SPECIES OF SALVIA (LAMIACEAE) FROM NORTHERN MEXICO**

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**ABSTRACT**

*Salvia jaimehintoniana* Ramamoorthy *spec. nov.* is described and illustrated. It occurs in Durango, Hidalgo, Nuevo León, and Tamaulipas, and belongs to the sect. *Farinaceae* sensu Epling. It has previously been described as *S. azurea* var. *mexicana* Epling. When elevated to specific status it must take on another epithet, the name *S. mexicana* L. having priority at the species level. Because of this, the new name, *S. jaimehintoniana*, with new typification is proposed. The distinctions between *S. azurea* and *S. jaimehintoniana* are discussed, and a map showing their distributions in Texas and México is provided.

**KEY WORDS:** Lamiaceae, *Salvia*, México, *Salvia azurea*, systematics

Routine identification of Mexican salvias has prompted the present study.

**SALVIA JAIMEHINTONIANA** Ramamoorthy, *spec. nov.* Figure 1. TYPE: MEXICO. Nuevo León: Mpio. Zaragoza, 4.3 road mi. S of Zaragoza on the road to Aserradero la Encantada, 20 May 1988, *Burford L. Westlund 24* (HOLOTYPE: TEX!).

Similis *S. azurea* Lam. sed differt lobis superis (conjunctis) calycum acutis (vice lorum obtusorum), bracteis floralibus late ovatis et persistentibus (vice bractearum lanceolarum et mox deciduarum).

Perennial herbs 30-50 cm high, forming fascicles of tuberous roots. Stems stiffly erect, relatively unbranched or remotely branched, minutely hispidulous to subglabrate, the nodes pilose with hairs 0.6-1.0 mm long. Midstem leaves elliptical, lance-elliptical to lance-obovate, pinnately nervate; petioles 3-15 mm long; blades mostly 4-10 cm long, 1.2-3.5 cm wide, subglabrous or pubescent along the major veins, undersurfaces markedly glandular-punctate, the margins crenulodentate to nearly entire. Flowers 4-8 to a node, arranged in terminal interrupted spikes. Bracts ovate, persistent, 6-10 mm long, 3-5 mm wide, appressed-pubescent dorsally, the margins ciliate. Calyces 6-8 mm long, flaring upwards, 3-5 mm wide at orifice (pressed); upper lip ca. 2 mm long with 7 well-defined hispidulous ribs. Corollas

blue, 15-18 mm long; tubes 2-3 mm long; throats abruptly bulging below, 4-6 mm long (tube and throat 6-10 mm long); lower lip, 3-lobed, 6-9 mm long; upper lip densely puberulous, 3-4 mm long; tubes and throat not papillose within, or but weakly so. Anthers included within the upper lip, attached near the orifice of the throat. Styles pubescent above, the upper style branches ca. 3 mm long, the lower branches ca. 1 mm long. Fruits ovoid, smooth, ca. 2 mm long, 1.5 mm wide.

REPRESENTATIVE SPECIMENS EXAMINED: MEXICO. Durango: Mpio. de Tepehuanes, El Tarahumar, 2720 m, 27 Aug 1983, *Tenorio 4200* (TEX). Hidalgo: 6.5 air km ENE of Jacala, 1700 m, 13 Jul 1991, *Mayfield et al. 820* (TEX). Nuevo León: Mpio. Galeana, above El Carrizo, 1900 m, 16 Oct 1983, *Hinton et al. 18615* (TEX); along road from Agua Blanca to San Miguel, pine-oak forests, 2030 m, 28 Aug 1991, *Hinton et al. 21276* (Hinton herbarium); above Agua Blanca, oakwoods, 2305 m, 4 Jul 1992, *Hinton et al. 22285* (Hinton herbarium); ca. 30 mi S of Monterrey, 13 Aug 1934, *C.H. & M.T. Mueller 1335* (TEX); area of Cerro Peña Nevada, ca. 12 km NE of San Antonio Peña Nevada, N and NW slopes of mt. known locally as Picacho Onofre, Jul 1977, *Wells & Nesom 345, 374, 440* (TEX). Tamaulipas: ca. 6 km NW of Rancho El Cielo, ca. 12 km NW of Gómez Farías, 1900 m, 12 Aug 1991, *Iltis 30724* (TEX).

This species is represented at LL, TEX by twenty or more collections and is presumably the same as *Salvia azurea* subsp. *mexicana* Epling, the latter typified by collections from near Galeana, Nuevo León (Photoisotypes: TEX!; Paratype: *Mueller 1335* [TEX!]). I have given the plants concerned a new specific name with new typification since the name *S. mexicana* L. is preoccupied, precluding the elevation of Epling's subspecific epithet.

*Salvia jaimehintoniana* belongs to the sect. *Farinaceae* as circumscribed by Epling (1939, 1940), having the perennial habit, interrupted inflorescence with persistent bracts, upper lip of the calyx with 5-7 ribs, and corolla features of species belonging to that difficult complex.

The specimen cited from Hidalgo differs from the other collections in having spreading pilose hairs, the vestiture along the stems mostly 0.5-1.0 mm high; in all other characters, however, it is like the type material. The rather isolated specimen from Durango has all of the features of typical forms of *Salvia jaimehintoniana* except for its somewhat larger corollas and smaller floral bracts.

*Salvia jaimehintoniana* differs from *S. azurea* in having calyces with the upper fused lobes acute (vs. obtuse) and floral bracts broadly ovate and persistent (vs. lanceolate and early deciduous). The former is confined to México; the latter to the U.S.A. (Figure 1).

Ramamoorthy (by annotation) first called attention to this specific novelty, and I have retained the name which he proposed. He did not, however, recognize its affinities nor provide information as to its sectional affiliation; these are my own. The epithet honors Jaime Hinton, son of the late George Hinton, renown collector of Mexican plants.



Figure 1. *Salvia jaimehintoniana*, from holotype.



Figure 2. Distribution of *Salvia azurea* (open circles, in Texas; it is absent in México); and *S. jaimehintoniana*. Based upon specimens at LL, TEX.

## ACKNOWLEDGMENTS

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

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A NEW SPECIES OF *LUPINUS* (FABACEAE) FROM OAXACA, MEXICO: A SHRUB OR TREE MOSTLY THREE TO EIGHT METERS HIGH

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ABSTRACT

A new species, *Lupinus jaimehintoniana* B.L. Turner is described and photographed from near timberline on Cerro Quiexobra, Oaxaca, where it is a subdominant shrub or small tree up to 8 m high, the lower trunks markedly woody and up to 30 cm across. It appears to be closely related to *Lupinus montanus*, having most of the characters of that species, except for its woody habit, much-reduced leaves and stipules, silvery pubescence, and longer floral bracts.

KEY WORDS: Fabaceae, *Lupinus*, México, Oaxaca, systematics

Identification of Mexican plants has revealed the following novelty.

**LUPINUS JAIMEHINTONIANA** B.L. Turner, *spec. nov.* Figures 1, 2.  
TYPE: MEXICO. Oaxaca: Mpio. Miahuatlán, Cerro Quiexobra, 3575 m, 15 Oct 1995, *Hinton et al.* 26160 (HOLOTYPE: TEX!; Isotype: TEX!).

Similis *Lupino montano* H.B.K. sed frutex vel arbor est, 8 m alto, foliis calium superiorum 5-7 foliola habentibus, stipulis 2-10 mm secus petiolos connatis, indumento pilorum curtorum et argenteorum sursum appresso.

Shrubs or trees mostly (1-)3-8 m high, the lower trunks up to 30 cm across. Flowering stems (of new growth) nodose, the vestiture of short silvery, upwardly appressed hairs ca. 0.2 mm long. Leaves at 2-4 nodes below the inflorescence having 5-7 leaflets; stipules 2-3 cm long, fused at the base to the petioles for 2-10 mm; petioles 4-7 cm long; leaflets narrowly elliptic, 3-6 cm long, 0.6-1.2 cm wide, moderately silky appressed-pubescent on both surfaces, the apices acute. Inflorescence a terminal spike 15-30 cm long, ca. 5 cm across. Bracts linear-lanceolate, much exceeding the flowers, markedly pubescent with appressed hairs above and below, the apices mostly narrowly acuminate. Pedicels mostly 7-8 mm



Figure 1. *Lupinus jaimehintoniana* on Cerro Quiexobra, Sr. Anacleto Lugo, long time field assistant of Jaime Hinton, stands beside the species.



Figure 2. Same tree as depicted in figure 1, but at a closer distance.

long, pubescent like the stems. Calyx with lower sepals lanceolate ca. 9 mm long (including the short tube), upper (united) lobes broadly ovate, ca. 6 mm long. Corollas reportedly purple; wing petals with claws ca. 3 mm long; blades broadly oval, glabrous, ca. 13 mm long, 9 mm wide, the upper 1/3 corrugate near its base; banner glabrous throughout, sessile or nearly so, ca. 12 mm long and as wide; keel petals glabrous with claws ca. 4 mm long, their blades ca. 7 mm long as measured along the basal axis, then sharply arcuate upwards, the apical axis nearly at right angle to that of the basal axis, the apices acute. Lower stamens with anthers ca. 2 mm long. Pods (immature) ca. 4 cm long, 0.8 cm wide, densely tomentose with contorted subtawny hairs. Mature seeds not available.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Oaxaca: Mpio. Miahuatlán, Quiexobra, 3070 m, 19 Oct 1995, *Hinton et al.* 26228 (TEX); 35 km ESE of Miahuatlán, 5 km NE of Santo Domingo Ozolotepec, Cerro Quiexobra, "Timberline vegetation in open glades along ridges and in mountain saddles", 3650-3800 m, 10 Dec 1989, *McDonald* 2923 (TEX).

When first collected by Dr. Andrew McDonald (collection cited above), perhaps the first botanist to collect on Cerro Quiexobra, I was too busy with other projects to pursue its identification. Had I known its remarkable habit (as shown in figures 1 and 2) I most certainly would have sought its identity, although McDonald did describe or label the collection as being "Common subarborescent shrubs often forming dense stands along ridges, 1-3 m tall."

*Lupinus jaimehintoniana* appears to belong to the *L. montanus* Cerv. *ex* Lag. species complex, which was treated in some detail by Dunn & Harmon (1977). These authors recognized five species in the complex, one of these *L. montanus* having five infraspecific categories. Most of these taxa are confined to México and Guatemala and most were originally accepted as "good" species by yet earlier well known mavens of the genus in North America, mainly, C.P. Smith. As species are defined by most current workers in *Lupinus*, the various segregates from *L. montanus* (s.l.) rendered by Dunn & Harmon are about as distinct as yet other species in this or that complex. Nevertheless, were it not for the extraordinary habit of *L. jaimehintoniana* I would probably have followed Dunn & Harmon in recognizing it as but another infraspecific category of *L. montanus*, although having stipules quite different from the latter. In their treatment (1977) *L. jaimehintoniana* will key to *L. montanus* var. *nelsonii* (Rose) C.P. Smith, a taxon known only from eastern Oaxaca, mainly in the pine-fir forests in the sierras to the east of Cd. Oaxaca. In addition to its small stipules, it differs from *L. montanus* in having a silvery upturned vestiture on its stems (vs. tawny and down-curved or glabrous), and mostly longer floral bracts with somewhat contorted apices. *Lupinus montanus* is consistently described as a coarse herb or shrub 1-2 m high, the stems fistulose.

According to Dunn (1984), the largest lupine known to him at that time was a collection of *Lupinus* (the species not named) from Perú, said to be about 4.5 m high and possessing pendant flowering branches. As shown in figures 1 and 2, *Lupinus jaimehintoniana* can develop into relatively large trees, the inflorescences clearly borne terminal and erect.

As communicated by Jaime Hinton (nearly 80 years of age at the time of his ascent of Cerro Quiexobra, accompanied by his faithful friend and colleague, Anacleto Lugo):

. . . we trailed McDonald's [Dr. Andrew McDonald, currently Research Associate at Harvard University, who made the first extensive collections from Cerro Quiexobra in 1990] redoubtable footsteps over Quiexobra and up to the top of La Sirena (where, two years ago, a great fire reduced the four summits to tall grass and a few trees) . . . [I found myself] staring in "wild surmise" at the Lupine trees, as astonishing to the density of my ignorance as sudden fire to the human skin. (One badly burned and dying old Lupine graciously balanced its thirty feet of height on a real wooden trunk twelve inches across.)

Never in Quiexobra could I grow used to the miraculous blue Lupines held with such accomplished and heart-wringing majesty so high up in the air, as if, by God, who could ever have doubted that a Lupine could even more easily become a magnificent tree than a lovely herb? And I gazed with undying wonder at the beige-colored trunks of dead Lupines burning in the huge fires we built against the icen winds that drove us to bed, only a bit after sundown, as they mercilessly swept up at us from those Oaxacan sierras that by daylight appear tossed like the most gorgeous heaps of pale blue jewels across the whole wide northern world.

I reckon, Billie, Quiexobra does show the mightiest pines and firs still standing in Mexico. And I must admit my wonder at how well the Zapotec's earthen superstition has protected those mossy sprawling giants (*Chirathrodendron pentadactylon*, famed and held in awe for its flowers shaped like little human hands, richly yellow on one side and richly scarlet on the other) from the last few hundred years of mindless ax and fire.

Alas, the enterprising marihuaneros of to-day are no more able to control the rampage of the fires they themselves set to burn the forest for their secret and forbidden plantations, than their fabled stone gods were able to control the marauding rampage of the fiery Iberians.

Judging from its local abundance on Cerro Quiexobra, its resistance to fire and its adaptation to near timberline climates in México, it is likely that the species will prove hardy in the more temperate regions. At least it should prove interesting to ascertain through DNA analysis, *etc.*, what genes might be involved that permit its development into such a bizarre woody member of this otherwise mostly herbaceous genus.

It seems fitting that this remarkable lupine should bear the name of James Hinton, for he has collected with his father numerous lupine species, many of which are types and some of which already bear their names, including *Lupinus hintonii* C.P. Smith (for G.B. Hinton, the elder) and *L. hintoniorum* B.L. Turner (for the extended family).

## ACKNOWLEDGMENTS

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

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NOTES ON COSTA RICAN *PEPEROMIA* (PIPERACEAE), INCLUDING FOUR  
NEW SPECIES

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ABSTRACT

Four new, ostensibly endemic, Costa Rican species of *Peperomia* are described: *Peperomia hammelii* Grayum, *P. saintpauliella* Grayum, and *P. trichomanoides* Grayum are all terrestrial or epilithic species restricted to the southern Pacific slope, mainly in limestone habitats. *Peperomia ursina* Grayum comprises epilithic or epiphytic plants from the lower Atlantic slope of the Cordillera de Talamanca. *Peperomia tenuifolia* C. DC., heretofore considered a synonym of *P. lignescens* C. DC., is reinterpreted as an older name for the species heretofore called *P. killipii* Trel. Revised synonymies are provided for *P. lignescens* and *P. tenuifolia*.

KEY WORDS: Costa Rica, *Peperomia*, Piperaceae, systematics

The Costa Rican members of the huge, pantropical genus *Peperomia* (Piperaceae) were most recently treated by Burger (1971), who accounted for 66 species. Since that time, intensive collecting efforts in previously underexplored regions of the country (particularly the Cordillera de Talamanca) have resulted in the addition of at least fifteen species to this total. Most of these additions have involved species already described from other countries, but a few appear to represent new taxonomic entities. Four new Costa Rican species of *Peperomia* are described hereunder, and a fifth additional species is freed from synonymy under a name accepted by Burger.

**PEPEROMIA HAMMELII** Grayum, *spec. nov.* TYPE: COSTA RICA. Puntarenas: Cantón de Osa, Fila Costeña, Fila Cruces, cabeceras del Río Piedras Blancas, Cerro Anguciana, faldas al oeste, bosque en roca de cal, 8° 48' 56" N, 83° 10' 37" W, 1,400-1,600 m, 10 Dec 1993, *Hammel 19274* (HOLOTYPE: INB!; Isotypes: BM!, COL!, CR!, F!, MO!).

*P. lignescens* C. DC. affinis, a que imprimis differt caule trichomatibus multiseriatis vesicariis vestito petiolis in longitudinem late alatis laminis foliorum hirsutis pedunculis longioribus.

Plants terrestrial or epilithic. Stems erect, to ca. 23 × 0.2-0.5 cm, densely clothed with stout, multiseriate, inflated hairs to ca. 1 mm long. Leaves alternate. Petiole 1.2-4.6 cm, broadly alate throughout its length, ca. 2-6 mm wide, hirsute on both sides. Lamina 5.5-11.0 × 2.5-7.2 cm, ovate to broadly elliptic, impeltate, broadly cuneate to rounded or subcordate at base, subacute to subacuminate apically, pinnately nerved with ca. 5-6 primary lateral veins per side, dark-gland-dotted and hirsute on both surfaces. Inflorescences solitary at stem apex. Peduncle 2.7-3.8 cm, to ca. 1 mm wide, glabrous or with few scattered hairs toward base. Spike 1.7-8.5 × 0.2-0.4 cm, white. Flowers moderately separated; rachis glabrous; bracts 0.5-0.6 mm wide, suborbicular, densely glandular-punctate; anthers broadly elliptic to oblong, ca. 0.25 mm. Fruits unknown.

*Peperomia hammelii* is known only from the type locality, on the western slope of Cerro Anguciana, the highest peak in the Fila Costeña in the southern Pacific region of Costa Rica. Here, it grows on or near limestone cliffs or outcrops at 1,400-1,600 m elevation.

*Peperomia hammelii* is an unusually well-marked species in uniquely combining two features which, even by themselves, are anomalous within the genus: an indument of odd, inflated hairs, and broadly and extensively alate petioles. In its terrestrial or epilithic habitat, erect, caulescent habit, alternate, pinnately veined leaves and dark, sessile laminar glands it most closely resembles *P. lignescens* C. DC. and allies, to which it is perhaps intimately related. *Peperomia lignescens*, which is parapatric and at least conceivably syntopic with *P. hammelii*, differs from the latter in having generally puberulent or glabrescent (rather than hirsute) foliage and shorter peduncles (in addition to the characters mentioned previously).

I take great pleasure in dedicating this new species to its discoverer, Dr. Barry E. Hammel of the Missouri Botanical Garden, a long-time student of the Neotropical flora and my colleague on the "Manual to the Plants of Costa Rica" project.

Numerous Costa Rican collections have accrued in recent years of yet another *Peperomia* species that agrees in a general way with the description of *P. lignescens*, but which differs in having consistently palmate leaf venation. These collections are all from the humid Pacific lowlands (0-1,600 m), south from the Río Grande de Tárcos. They key out easily to *Peperomia killipii* Trel. in Yuncker's (1950) *Flora of Panama* treatment, and are an excellent overall match for the holotypes of *P. killipii* and its synonym (*vide* Yuncker) *P. hymenodes* Trel.

*Peperomia lignescens* was not treated by Yuncker (1950), while *P. killipii* was only briefly mentioned by Burger (1971: 65) in comparison with *P. pseudodependens* C. DC. (= *P. asarifolia* Schldl. & Cham.), a somewhat similar species that also has palmate venation. Due to the venation difference, *P. killipii* will not key out anywhere near *P. lignescens* in Burger's (1971) treatment. Nevertheless, type material of both *Peperomia aguacatensis* C. DC. and *P. tenuifolia* C. DC., two of the five heterotypic names listed in synonymy under *P. lignescens* by Burger (1971), agrees in all critical

details with that of *P. killipii*. As both *P. aguacatensis* and *P. tenuifolia* substantially predate *P. killipii*, the last-mentioned name must fall into synonymy.

The following paragraphs provide what I presently consider to be complete synonymies for the two species I propose be called *Peperomia lignescens* C. DC. and *P. tenuifolia* C. DC. This is necessary not only to clarify the confusion detailed above, but also to establish precedent in two cases of equal priority.

*PEPEROMIA LIGNESCENS* C. DC., J. Bot. 4:137. 1866.

*Peperomia carlosiana* C. DC., J. Bot. 4:140. 1866.

*Peperomia carthaginensis* C. DC., Linnaea 37:377. 1872. *Peperomia lignescens* C. DC. var. *carthaginensis* (C. DC.) Trel., Contr. U.S. Natl. Herb. 26:193. 1929.

*Peperomia lignescens* C. DC. var. *subcuneilimba* Trel., Contr. U.S. Natl. Herb. 26:193. 1929.

*Peperomia jilotepequeana* Trel. & Standl. in Standl. & Steyerl., Fieldiana, Bot. 24(3):254. 1952.

*PEPEROMIA TENUIFOLIA* C. DC., Linnaea 37:371. 1872.

*Peperomia aguacatensis* C. DC., Linnaea 37:376. 1872.

*Peperomia killipii* Trel., Bot. Gaz. 73:143. 1922.

*Peperomia hymenodes* Trel., Contr. U.S. Natl. Herb. 26:43. 1927.

*Peperomia tenuifolia* differs from *P. lignescens* not only in its palmate leaf venation, but also in its usually epiphytic habit (it may occasionally be epilithic), absence of conspicuous dark, sessile laminar glands, and minutely papillate inflorescence rachis. Furthermore, it is a species of generally lower elevations (though there is considerable overlap). I select the names *P. lignescens* and *P. tenuifolia* because they have already been more widely applied in herbaria than their alternatives, and because both *P. carlosiana* and *P. aguacatensis* are inappropriate toponyms.

*PEPEROMIA SAINTPAULIELLA* Grayum, *spec. nov.* TYPE: COSTA RICA. Puntarenas: along short-cut road to Golfito from Villa Briceño on Interamerican Hwy., W side of Fila Gamba, ca. 6 km from Golfito airport, 8° 41' 30" N, 83° 12' W, < 100 m, 6 Mar 1985, Croat & Grayum 59911 (HOLOTYPE: CR!; Isotypes: BM!, MO!).

*P. insueta* Trel. affinis, sed differt laminis foliorum (1.7-)2.0-3.9 cm longis ovatis vel suborbicularis pedunculis 1.6-3.7 cm longis spicis 7.3-16.1 cm × 0.4-1.0 mm.

Plants terrestrial or epilithic. Stems erect to ± decumbent, 0.8-1.3 × 0.2-0.3 cm. Leaves alternate in basal rosette. Petiole 1.3-7.4 cm, spreading-hirsute with uniseriate hairs. Lamina (1.7-)2.0-3.9 × 1.80-4.65 cm, broadly ovate to orbicular (or rarely obovate), impeltate, cordate or (rarely) subsagittate at base with sinus to 0.7 cm deep and posterior lobes rounded to subtruncate or (rarely) obtuse, nearly truncate or

rounded to obtuse apically, palmately (5-)7(-9)-nerved, pellucid-gland-dotted on both surfaces, sparsely to moderately hirsute on both sides (especially along major veins abaxially). Inflorescences solitary, basal. Peduncle 1.6-3.7 cm, with hairs like petiole. Spike 7.3-16.1 cm × 0.4-1.0 mm, pinkish. Flowers ± crowded at first, becoming distant; rachis virtually glabrous; bracts 0.4-0.5 mm wide, ± peltate, elliptic, covered with orange, sessile glands; anthers broadly elliptic, ca. 0.2 mm. Fruits ca. 0.5-0.6 × 0.4-0.5 mm, ± globose-bodied, broadly narrowed to substipitate base, beakless; stigma apical.

Additional specimens examined. COSTA RICA. Puntarenas: Cantón de Osa, forest along Quebrada Benjamín, near crossing of trail from Palmar Norte to Jalisco, 8° 58' N, 83° 28' W, ca. 160 m, 14 Dec 1989, *Grayum & Hammel* 9543 (BM, INB, MO); Cantón de Osa/Buenos Aires, western part of main ridge of Fila Retinto, along and near trail (not on current maps) from Palmar Norte to Jalisco, 8° 59' 30" N, 83° 28' W, ca. 780-960 m, 9 Dec 1988, *Grayum & Herrera* 9150 (MO).

*Peperomia saintpauliella* is apparently confined to a small area to the north and east of Golfo Dulce in Puntarenas Province, from near Palmar Norte to the vicinity of Golfito. Here, it grows near forest creeks, often on vertical rock (usually specified as limestone) faces, at ca. 50-800 m elevation.

*Peperomia saintpauliella* comprises smallish, acaulescent plants with impeltate, suborbicular leaves and solitary, basal inflorescences. As the specific epithet implies, living specimens bear a strong vegetative resemblance to smaller forms of the cultivated African violet (*Saintpaulia ionantha* H. Wendl.), and have a similarly compact, ornamental appearance. Living material of *P. saintpauliella* is in cultivation at the Missouri Botanical Garden, and plants have been put on display in the Climatron.

Other *Peperomia* species most resembling *P. saintpauliella* are the Colombian *P. macrotricha* C. DC. and the Panamanian *P. unbrigauidens* Yunck. and, especially, *P. insueta* Trel. The last-mentioned species differs from *P. saintpauliella* in having longer (4.0-7.5 cm), narrowly elliptic to ± ovate leaf blades, absolutely and relatively much longer peduncles (about as long as the spikes), and generally shorter and thicker spikes (6-12 cm × 1.0-1.5 mm).

**PEPEROMIA TRICHOMANOIDES** Grayum, *spec. nov.* TYPE: COSTA RICA. Puntarenas: Cantón de Osa, Fila Costeña, Fila Cruces, cabeceras del Río Piedras Blancas, Cerro Anguciana, faldas al Oeste, bosque en roca de cal, 9° 48' 56" N, 83° 10' 37" W, 1,400-1,600 m, 10 Dec 1993, *Hammel* 19273 (HOLOTYPE: INB!; Isotypes: BM!, CR!, MO!).

Differt a *P. saintpauliella* Grayum dimensionibus uniformiter parvioribus pedunculis relative longioribus rhachidi inflorescentiae dense pubescenti; a *P. tuerckheimii* C. DC. laminis foliorum impeltatis basi cordatis relative latioribus venis primariis basalibus plerumque 7.

Plants epilithic, the leaves and spikes flattened against rock. Stems short and thick, subcormose, ca. 0.2-0.8 × 0.15-0.25 cm. Leaves apparently alternate, in basal rosette. Petiole 0.3-1.9 cm, spreading-hirsute with uniseriate hairs. Lamina 0.5-1.8 × 0.5-1.8 cm, broadly ovate to suborbicular or subreniform, impeltate or scarcely peltate, cordulate or cordate at base with sinus to 0.25 cm deep and posterior lobes rounded to subtruncate, broadly rounded to subacute apically, palmately 3-5-nerved, pellucid-gland-dotted at least above, appressed-hirsute on both sides (more sparsely so above). Inflorescences solitary, basal. Peduncle ca. 1.3-4.1 cm, pubescent as petiole. Spike 2.7-7.0 cm × 0.2-0.9 mm. Flowers becoming distant; rachis ± densely spreading-pubescent; bracts 0.3-0.4 mm wide, ± peltate, suborbicular, densely dark-pellucid-punctate; anthers broadly elliptic-oblong to suborbicular, ca. 0.25-0.30 mm. Fruits ca. 0.5-0.6 × 0.3-0.4 mm, ellipsoidal to subglobose, narrowed to substipitate base, beakless; stigma apical.

This species is known only from the type locality, at 1,400-1,600 m elevation on the steep limestone ramparts of Cerro Anguciana, the highest peak in the Fila Costeña of southern Pacific Costa Rica.

*Peperomia trichomanoides* is so named because its habitat (epilithic and growing among mosses), appressed habit, and small size recall some species of the fern genus *Trichomanes* L. (Hymenophyllaceae). Plants of this species resemble, in general aspect, miniature versions of *P. saintpauliella* (described above), from which they differ not only in their uniformly smaller dimensions, but also in having proportionately longer (relative to the spike) peduncles and densely pubescent (rather than essentially glabrous) inflorescence rachises. In the latter respect, *P. trichomanoides* approaches some specimens of *P. tuerckheimii* C. DC. (including *P. hispidorhachis* Yunck. and *P. tecticola* C. DC.), another small calciphile that occurs in the same vicinity; however, *P. tuerckheimii* has clearly peltate, non-cordate, more elongate leaf-blades with generally 7 (rather than 5) primary basal veins.

**PEPEROMIA URSINA** Grayum, *spec. nov.* TYPE: COSTA RICA. Limón: Cordillera de Talamanca, along ridge descending to main fork of Quebrada Cañabral from divide between basin of Río Madre de Dios and that of Río Barbilla, 10° 02' N, 83° 25' W, 280-400 m, 6 Sep 1988, Grayum, Herrera, & Robles 8842 (HOLOTYPE: INB!; Isotypes: BM!, COL!, F!, MO!).

Differt a *P. alata* Ruiz & Pav. pubescentia dense uniformiterque hirsuta; a *P. tuisana* C. DC. atque *P. montecristana* Trel. petiolis brevioribus inflorescentiis multo brevioribus.

Appressed-climbing trunk epiphytes or epilithic, stoloniferous. Stems erect to ± decumbent, ca. 2-8 × 0.10-0.15 cm, spreading-hirsute with uniseriate hairs. Leaves alternate. Petiole 0.1-0.3 cm, pubescent as stems. Lower leaves ± reduced; medial and distal laminae 1.0-3.6 × 0.5-1.5 cm, narrowly elliptic to rhombic, impeltate, acute at base, subacute to subacuminate at apex, ± obscurely 3-nerved from base, hirsute on both surfaces. Inflorescences solitary at stem apex. Peduncle 0.1-1.0 cm, spreading-

hirsute. Spike 1.3-5.0 cm  $\times$  0.7-1.5 mm, yellow-green. Flowers moderately separated; rachis glabrous; bracts 0.3-0.4 mm wide, suborbicular, densely glandular-punctate; anthers broadly elliptic, 0.15-0.25 mm. Fruits ca. 0.5-0.6  $\times$  0.5-0.6 mm, globose-bodied, rounded at base, exerted on triangular stipe ca. 0.5-0.6 mm, papillate, with stout, conical beak to ca. 0.15 mm.

Additional specimens examined. COSTA RICA. Limón: Reserva Indígena Talamanca, camino a Soki entre la Quebrada Amubri, margen izquierda de Río Lari, 9° 29' 40" N, 82° 59' 40" W, 200 m, 28 Jun 1989, A. Chacón 20 (BM,CR,MO).

As far as is presently known, *Peperomia ursina* is restricted to the Atlantic slope of the Costa Rican Cordillera de Talamanca from ca. 200-400 m. According to collectors' notes, the plants may be either epilithic or epiphytic on trunks.

*Peperomia ursina* is most similar and perhaps most closely related to *P. alata* Ruiz & Pav. and allied species characterized by alternate, distichous leaves with thin, palmately veined blades, and solitary inflorescences. It differs sharply from most species in this group in its dense, uniform hirsute pubescence, reflected in the specific epithet. This species will key to the vicinity of *P. tuisana* C. DC. and *P. montecristana* Trel. in Burger's (1971) treatment of Costa Rican Piperaceae, but differs from both in its shorter petioles and much shorter inflorescences.

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NEW ADDITIONS TO THE GENUS *PINGUICULA* (LENTIBULARIACEAE)  
OF MEXICO

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ABSTRACT

Two new species of *Pinguicula* from México are described and illustrated: *P. stolonifera* (subgen. *Pinguicula*) from the state of Oaxaca, and *P. laxifolia* (subgen. *Pinguicula*) from the state of Tamaulipas. *Pinguicula stolonifera* belongs to the section *Orcheosanthus*, and subsect. *Caudatopsis*. A new section (*Orchidioides*) is proposed to include *P. laxifolia*. The taxonomic status of *P. jorgehintonii* B.L. Turner, *P. hintoniorum* B.L. Turner, and *P. reticulata* Schlauer is discussed. They are considered to be synonymous with previously described species.

KEY WORDS: Lentibulariaceae, *Pinguicula*, Flora of México, systematics

Research on the extensive herbarium collections of the genus *Pinguicula*, from the University of Texas, has revealed the following results.

*Pinguicula stolonifera* Luhrs, *spec. nov.* (Figure 1). TYPE: MEXICO. Oaxaca: ca. 3 km. se. of Ixtlán de Juárez, on steep banks in pine and oak woods, ca. 2300-2400 m, 14 Aug. 1966, R.W. Cruden 1177 (HOLOTYPE: TEX! 271238); sub nomine *P. oblongiloba* DC. Det.: S. Zamudio 1989.

Herba perennis, stolonifera; stolones flagelliformis, cerasini, usque ad 8 cm longis. Rhizoma simplex brevis, radicibus adventitiis numerosis funiformibus. Folia radicalia rosulata, biformia; rosula "hiemis" numerosa - 36, crassa, ovata vel lanceolata, acuta, 4-7(-12) mm longa, 1-3 mm lata, facie concava; rosula "aestatis" 4-7, distincte petiolata, petiolo erecto, 11-18 mm longo, 2-3 mm lato, margine ciliato, lamina lanceolata vel anguste oblongo-ovata, acuta, basin versus angustata, margine provunde involuta, superne glandulis sessilibus et glandulis stipitatis dense vestita, 18-33 mm longa, 6-12 mm lata. Hibernacula nulla; gemmatae. Pedicelli 1-3 erecti, cerasini, apicem versus glandulis stipitatis disperse obsiti, 105-164 mm alti, uniflori. Flores 39-51 mm longi (calcaribus inclusis). Calyx bilabiatus, extus glandulis stipitatis

obtusit; labium superum trilobum, lobis anguste ovatis, 3 mm longis, 2 mm latis; labium inferum usque ad dimidium longitudinis bilobum, lobis ovatis, 2.5 mm longis, 1 mm latis. Corolla ringens, profunde bilabiata, magentea, labio infero ad basi striata alba ornato, extus glandulis stipitatis vestita; labium superum bilobum, lobis oblongo-ovatis, 10-14 mm longis, 5-9 mm latis; labium inferum profunde tripartitum, lobis lateralibus oblongo-lanceolatis, apicem versus angustatis, 11-16 mm longis, 4-7 mm latis, lobo internedio paulo major 15-19 mm longo, 4-5 mm lato. Tubus brevissimus infundibuliformis, 3-4 mm longus, intus pilosus, pilis cylindrico-subulatis, sine palato. Calcar cylindrico-acuminatum, sinuatum, 18-26 mm longum, cerasinum. Ovarium subglobosum, glandulis stipitatis obsitum. Stigma bilabiatum, purpureum, labio infero maximo, suborbiculato, fimbriato. Capsula ovoidea,  $\pm$  4 mm longa, glandulis stipitatis parum obsita. Florescentia VIII-IX.

Perennial herb, stoloniferous; stolons whip-like, cherry-red, up to 8 cm long, bearing up to 4 non glandular leaves (2-4[-6] mm long) along its length. Stem short, with numerous adventitious fibrous roots. Leaves rosulate, dimorphic; the leaves of the winter rosette numerous -36, thick, ovate or lanceolate, acute, 4-7(-12) mm long, 1-3 mm wide, concave; the leaves of the summer rosette 4-7, with a distinct petiole, erect, 11-18 mm long, 2-3 mm wide, margin ciliate, lamina lanceolate or narrowly oblong-ovate, acute, narrowing towards the base, margin deeply involute, the upper surface densely covered with sessile and stipitate glands, 18-33 mm long, 6-12 mm wide. Hibernaculum absent; provided with gemma-like buds. Scapes 1-3, erect, cherry-red, the upper part dispersedly stipitate glandular, 105-164 mm tall, 1-flowered. Flowers 39-51 mm long, including the spur. Calyx bilabiate, stipitate glandular; upper lip 3-lobed, the lobes narrowly ovate, 3 mm long, 2 mm wide; lower lip divided to the middle into 2 lobes, the lobes ovate, 2.5 mm long, 1 mm wide. Corolla deeply bilabiate, red-purple, the base of the lower lip marked with a white vertical streak, the outer surface stipitate glandular; upper lip 2-lobed, the lobes oblong-ovate, 10-14 mm long, 5-9 mm wide; lower lip deeply 3-lobed, the lateral lobes oblong-lanceolate, narrowing towards the apex, 11-16 mm long, 4-7 mm wide, the middle lobe slightly larger, 15-19 mm long, 4-5 mm wide. Tube extremely short, funnel-shaped, 3-4 mm long, with cylindrical-subulate hairs inside, palate absent. Spur cylindrical-acuminate, 18-26 mm long, cherry-red. Ovary subglobular, stipitate glandular. Stigma bilabiate, purple, the lower lip much larger, suborbiculate, margin fimbriate. Capsule ovoid,  $\pm$  4 mm long, slightly stipitate glandular. Florescence August-September.

ADDITIONAL MATERIAL EXAMINED: MEXICO. Oaxaca: Distr. Ixtlán, Sierra de Juárez, ne. of C. Pelón, on a steep loamy bank,  $\pm$  2700 m, 29 Sep. 1991, *Luhrs et al.* 9105 (Herb. Luhrs); In umbrosis Totontepeque, *Hartweg* 509 (L).

*Pinguicula stolonifera* belongs to the section *Orcheosanthus* because of the deeply bilabiate corolla, the extremely short funnel-shaped tube, and the very large spur. Within this it is placed in the subsect. *Caudatopsis*, together with *P. macrophylla* H.B.K. and *P. oblongiloba* DC., because of the lanceolate or broadly ovate, acute or acuminate winter leaves, and long petiolate summer leaves as defined in Casper's monograph of the genus *Pinguicula* (1966a). It shows some affinity with *P.*

*oblongiloba*, especially on behalf of the corolla lobes (Hinton et al. 14504 [TEX]). Although it has been identified with *P. oblongiloba* by S. Zamudio, it differs from the latter by having much shorter, narrower, and deeply involute summer leaves, and by forming gemma-like buds, putting forth long whip-like runners, budding at the end of its tip, a feature which is unique in the Mexican pinguiculas and is known (in a much shorter stolon-like manner in *P. calyptata* H.B.K. from Ecuador, and *P. vallisneriifolia* Webb from Spain. Unfortunately these differences are not easily observed when the plants are dried, resulting in difficult identification of the herbarium material, especially when plants are poorly pressed. However, field study confirms such identification, as both species have been observed by the author in their natural habitats. Other characteristics are:

	<i>P. stolonifera</i>	<i>P. oblongiloba</i>
Winter leaf	ovate or lanceolate, acute, 4-7(-12) mm L./ 1-3 mm W.	lanceolate, acute, 8-12 (-15) mm L./ 2-3(-5) mm W.
Lamina of the summer leaf	lanceolate or narrow, ovate-oblong, acute, 18-33 mm L./ 6-12 mm W.	oblong or spatulate-rotundate, 23-65 mm L./ 10-42 mm W.
Petiole	11-18 mm L.	12-23 mm L.
Scape	apex dispersedly stipitate glandular, 105-164 mm L.	densely stipitate glandular, (60-)80-130(-154) mm L.
Corolla	red-purple	purple-violet
Inferior lobes	oblong-lanceolate 11-19 mm L./ 4-7 mm W.	oblong-lanceolate or oblong-obovate, 9-13 mm L./5-8 mm W.
Spur	sinuate, 18-26 mm L.	incurved, (13-)18-23(-26) mm L.

*Pinguicula stolonifera* is known from the southern slopes of the Sierra de Juárez, Oaxaca, where it inhabits cool and moist banks in mixed oak and pine woods at altitudes between 2300 and 2700 m.

*Pinguicula laxifolia* Luhrs, *spec. nov.* (Figure 2). TYPE: MEXICO. Tamaulipas: Distr. Gómez Farías, Rancho del Cielo, between La Perra and Agua Linda, small plants with pink flowers, 31 Mar 1969, A. Richardson 1211 (HOLOTYPE: TEX!).

Herba perennis. Rhizoma simplex brevis, radicibus adventitiis filiformibus numerosis. Folia radicalia rosulata, biformia; rosula "hiemis" numerosa -17, obovato-spathulata, subpetiolata, 10-17 mm longa, 1.5-3.5(-5.0) mm lata; rosula "aestatis" semierecta, erecto-patens dissimilia, elliptica vel oblanceolata, basin versus in longe petiolum ad  $\pm 1/3$  longitudinis angustata, apicem versus margine parum involuta, superne glandulis sessilibus et

glandulis stipitatis dense vestita, (32-)40-68 mm longa, (4-)6-12 mm lata. Hibernacula nulla. Pedicelli 1-3 (vel plures?) erecti, glandulis stipitatis obsiti, 60-93 mm alti, uniflori. Flores 30-39 mm longi (calcar incluso). Calyx bilabiatus, extus glandulis stipitatis obsitus; labium superum trilobum, lobis oblongis,  $\pm 2$  mm longis, 1.5 mm latis; labium inferum bilobum, lobis elliptico-oblongis,  $\pm 1$  mm longis, 1 mm latis. Corolla bilabiata, rosea vel pallide violacea, in fauce albida, stria et macula violacea; labium superum bilobum, lobis late obovato-cuneatis, 8-9 mm longis, 6-8 mm latis; labium inferum trilobum, basi pilosis luteus, pilis longis cylindricis disperse vestitis, lobis lateralibus obovatis vel obovato-rotundatis, 9-10 mm longis, 7-9 mm latis, lobo intermedio obovato vel suborbiculato, usque ad 13 mm longo et 11 mm lato. Tubus brevis, late infundibuliformis, 6-8 mm longus, 4-5 mm latus, sine palato, intus pilosus, pilis longis cylindricis disperse vestitus. Calcar cylindricum-acuminatum, subrectum, 10-14(-17) mm longum, cum tubo angulum subrectum formans. Capsula subglobosa,  $\pm 3$  mm longa. Florescentia (II)-III(-?).

Perennial herb. Stem short, with numerous adventitious thread-like roots. Leaves rosulate, dimorphic; the leaves of the winter rosette numerous -17, obovate-spatulate, subpetiolate, 10-17 mm long, 1.5-3.5(-5.0) mm wide; the leaves of the summer rosette semi-erect, spreading at different angles, elliptic or oblanceolate, narrowing towards the base into a long petiole about 1/3 of its length, the margin towards the apex lightly involute, the upper surface densely covered with sessile and stipitate glands, (32-)40-68 mm long, (4-)6-12 mm wide. Hibernaculum absent. Scapes 1-3 (or more?), erect, stipitate glandular, 60-93 mm tall, 1-flowered. Flowers 30-39 mm long, including the spur. Calyx bilabiate, stipitate glandular; upper lip 3-lobed, the lobes oblong,  $\pm 2$  mm long, 1.5 mm wide; lower lip 2-lobed, the lobes elliptic-oblong,  $\pm 1$  mm long, 1 mm wide. Corolla bilabiate, pink or pale violet, the throat white, with darker violet markings; upper lip 2-lobed, the lobes broadly obovate-cuneate, 8-9 mm long, 6-8 mm wide; lower lip 3-lobed, the base dispersedly scattered with long cylindrical hairs, being yellow in the center of the throat, the lateral lobes obovate or obovate-rotundate, 9-10 mm long, 7-9 mm wide, the middle lobe obovate or suborbiculate, up to 13 mm long and 11 mm wide. Tube short, broadly funnel-shaped, 6-8 mm long, 4-5 mm wide, palate absent, the inside scattered with long cylindrical hairs. Spur cylindrical-acuminate, more or less straight, 10-14(-17) mm long, forming an almost straight angle with the tube. Capsule subglobular,  $\pm 3$  mm long. Florescence (February)-March(-?)

This species occurs between 6300 and 6800 ft. in the high mountains of the Gómez Farfías area. Although the distribution of this plant appears to be very restricted, further details of habitat and geographical range are unknown.

*Pinguicula laxifolia* clearly belongs to the subgen. *Pinguicula* because of its bilabiate corolla, distinct funnel-shaped tube, and the spur which is longer than the tube without being contracted from it. Within this it is closely related to the sections *Orcheosanthus* and *Pinguicula*. From the latter it is distinguished because of the dimorphic leaves, the absence of a hibernaculum, and the somewhat larger tube. From the section *Orcheosanthus* it is distinguished because of the bilabiate corolla, the

lobes being almost twice as long as the tube, and the spur formed in an almost straight angle with the tube about twice its length.

The existence of this new species, which cannot satisfactorily be placed in either of the sections mentioned above, necessitates the erection of a new section within the subgen. *Pinguicula*, named after the likeness with members of the Orchid family, and close relationship to the section *Orcheosanthus*.

*Pinguicula* sectio *Orchidioides* Luhrs, sect. nov.

Folia biformia, hibernaculis nullis; corolla bilabiata, lobis tubum  $\pm$  duplo superantibus; tubus brevis, late infundibuliformis; calcar longiusculum, tubum  $\pm$  duplo superans.

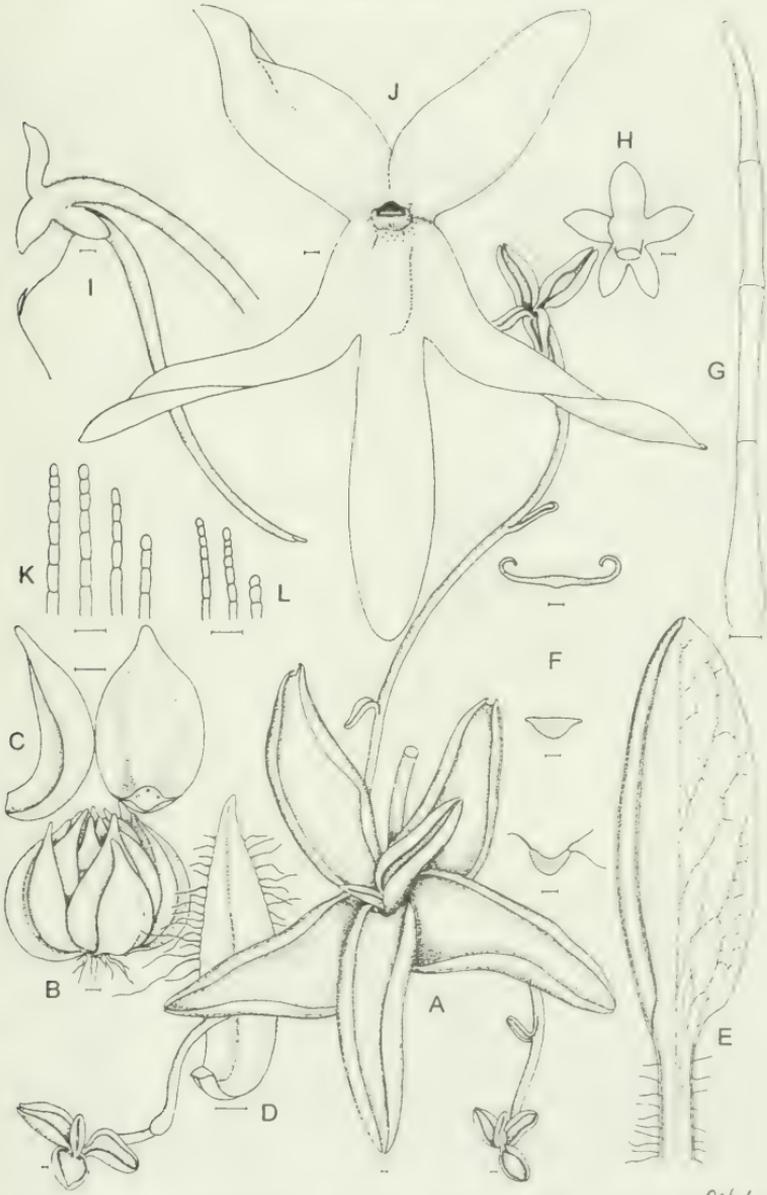
Leaves dimorphic, without hibernaculum; corolla bilabiate, the lobes about twice the length of the tube; tube short, broadly funnel-shaped; spur moderately long, about twice the length of the tube.

Type species: *Pinguicula laxifolia* Luhrs.

In view of the fact that most species of *Pinguicula* show a degree of variation in size, figure, and color of the floral parts, the following species, due to their close resemblance to previously described taxa, are considered to be synonymous.

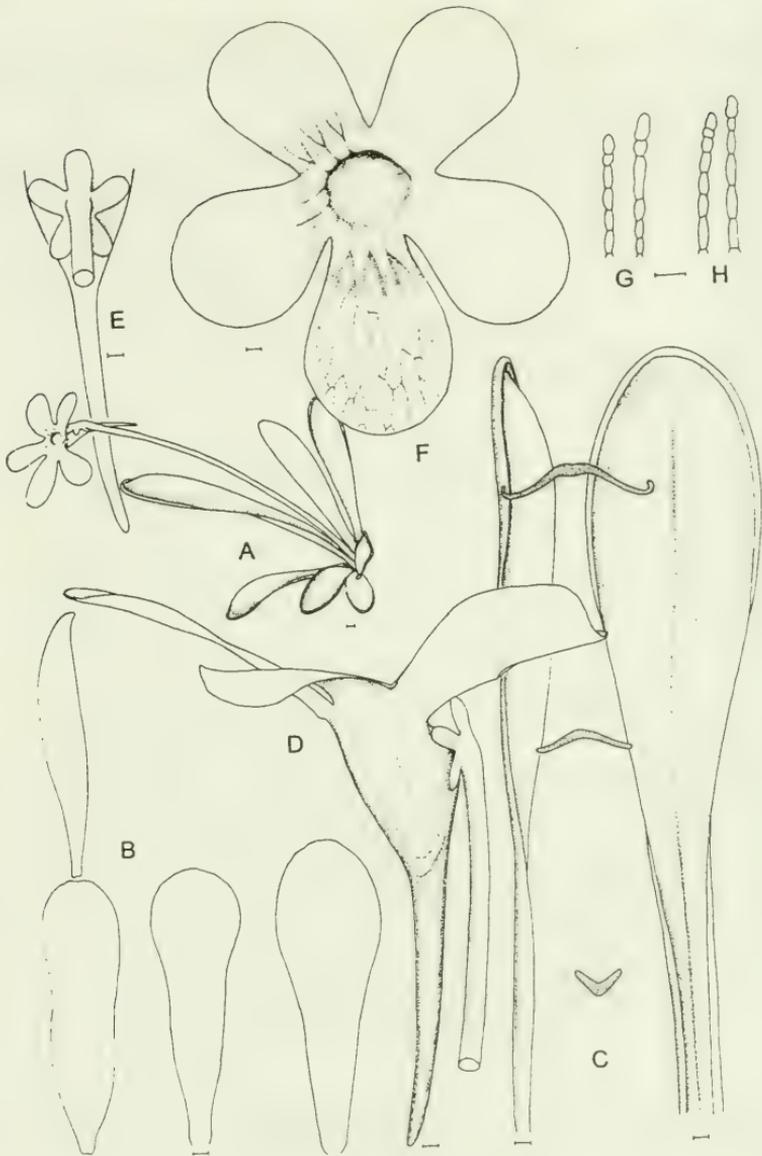
*Pinguicula jorgehintonii* B.L. Turner and *P. hintoniorum* B.L. Turner (Turner 1994), were thought to be related to *P. esseriana* Kirchner of the section *Crassifolia*. *Pinguicula jorgehintonii* is clearly related to the section *Heterophyllum*, because of the corolla with equal lobes, the cylindrical tube, and the short spur being well contracted from the tube. Within this it shows identical features with *P. rotundiflora* Studnicka (1985) of the subject. *Isolobopsis*. According to the description and the herbarium specimens accompanied by numerous photographs (*Hinton et al.* 24000 [HOLOTYPE: TEX]), the two types of leaves described are actually decayed late-summer leaves, and those who form the winter rosette of which the plant flowers. These are identical with the leaves of *P. rotundiflora* which flowers at the same time. The numerous capitate hairs on the orifice of the throat and inside the tube occur in both species. Because of the identical features alluded to, *P. jorgehintonii* is regarded as a synonym of *P. rotundiflora*. The obvious resemblances of the inflorescence of both species are found in Table 1.

*Pinguicula hintoniorum* is related to *P. esseriana* and belongs to the section *Crassifolia*, mainly because of the numerous succulent leaves, forming a tight rosette like those of a *Sempervivum*, a feature which cannot be observed in dried material. According to the herbarium specimens and the photographs accompanied (*Hinton et al.* 22661 [HOLOTYPE: TEX]), it is clearly identical to *P. ehlersae* Speta & Fuchs (1982), a species which has been observed by the author both in the field and in culture. *Pinguicula hintoniorum* is regarded as synonymous with *P. ehlersae*, because of the oblanceolate or spatulate winter leaves, the nearly glabrous scapes, the deeply bilabiate corolla, purple or mauve in color, the narrowly cuneate or obovate corolla lobes, the short funnel-shaped tube, and the long glabrous spur.



*P. stolonifera*

Figure 1. *Pinguicula stolonifera*. A. summer rosette with stolons; B. winter rosette; C. winter leaf, with lateral view; D. outer winter leaf; E, F, G. lamina and petiole of the summer leaf, with transverse sections, and margin hair of the petiole; H. calyx; I. calyx and spur, lateral view; J. corolla; K. corolla tube hairs; L. hairs from the upper region of the spur. Scale bars A-F, H-J 1 mm; G, K, L 0.1 mm.



*P. laxifolia*

Figure 2. *Pinguicula laxifolia*. A. flowering plant; B. winter leaves, with lateral view; C. summer leaf, with lateral view, and transverse sections; D. flower, lateral view; E. calyx and spur; F. corolla; G. corolla throat hairs; H. corolla tube hairs. Scale bars A-F 1 mm; G, H 0.1 mm.

Table 1. Comparison of inflorescence features between *Pinguicula jorgehintonii* and *P. rotundifolia*.

	<i>P. jorgehintonii</i>	<i>P. rotundiflora</i>
Scape	glabrous, 30-60 mm L.	glabrous, 20-75 mm L.
Corolla lobes	pink or pale purple, obovate or cuneate, 5-8 mm L./ 5-8 mm W.	pale purple, obovate, oblong or cuneate, 5-9 mm L./ 4-9 mm W.
Tube	cylindrical, $\pm$ 8 mm L./ 6 mm W.	cylindrical, 5-9 mm L./ 4-7 mm W.
Spur	short, 5-8 mm L.	short, 4-7 mm L.

Another species, *Pinguicula reticulata* Schlauer (1991), shows a remarkable resemblance with *P. kondoi* Casper (1974), both belonging to the section *Heterophyllum* and subsect. *Isolobopsis*. *Pinguicula reticulata* was thought to be different from *P. kondoi* because of the longer flower scapes, the truncate or somewhat emarginate calyx lobes, and the purple-veined corolla lobes. From habit observations, the average length of the flower scapes is equal to those of *P. kondoi*, the calyx lobes are not always truncate or emarginate but also obtuse, and the veining of the corolla lobes is not always visible, in white as well as in pale purple corollas. Herbarium specimens of *P. reticulata* (Hinton *et al.* 21936, 22700, 22716 [TEX]) show similar features with those of *P. kondoi* (Hinton *et al.* 19021 [TEX]), and according to the latter's description, the photograph of the holotype (*Kondo 1029* [NCU 381921]) clearly indicates dark venation in the corolla lobes, a feature that somehow must have been overlooked by the author. The most obvious resemblances of the inflorescence are:

	<i>P. reticulata</i>	<i>P. kondoi</i>
Scape	stipitate glandular, 30-65 (-90) mm L.	stipitate glandular, 30-65 mm L.
Calyx lobes	oblong or oblong-spatulate, truncate, emarginate or obtuse	oblong-spatulate, obtuse
Corolla lobes	suborbiculate, rotundate, 4-5 mm L./ 4-5 mm W.	suborbiculate, rotundate, 4-5 mm L./ 4-5 mm W.
Tube	8 mm L./ 3-4 mm W.	8 mm L./ 3-4 mm W.
Spur	$\pm$ 4 mm L.	3.5-4.5 mm L.

Despite its name, *Pinguicula reticulata* must be regarded as a synonym of *P. kondoi*, due to the identical features discussed.

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## FLORISTICS OF XERIC SANDHILLS IN NORTHWESTERN LOUISIANA

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### ABSTRACT

The floristics and edaphic conditions of three northwestern Louisiana xeric sandhills are described. This community occurs in central and northwestern Louisiana, east Texas, and southern Arkansas. The soil is nutrient poor and porous. Water and air move rapidly through it, causing rapid drying. In presettlement times, xeric sandhills were probably fairly common in northwestern Louisiana, but because of fire suppression, grazing, agriculture, oil exploration, and agroforestry, this community has been almost eradicated and is now considered imperiled.

KEY WORDS: Sandylands, xeric sandhills, floristics, Louisiana

### INTRODUCTION

As is the case for so many plant communities of the West Gulf Coastal Plain, there is little published information on xeric sandhills (synonyms: sandylands, oak-farkleberry sandylands, xeric sandy woodlands) (see MacRoberts & MacRoberts 1994 for literature). This community occurs in east Texas, central and northwestern Louisiana, and in southern Arkansas. The xeric sandhills of the West Gulf Coastal Plain appear to be similar to turkey oak sandhill forests in the East Gulf Coastal Plain except for the absence of several key species such as turkey oak (*Quercus laevis* Walt.) and wiregrass (*Aristida stricta* Michx.) and the presence of several western elements not found in the east (Harcombe *et al.* in press; Stout & Marion 1993).

Xeric sandhills occur mainly in Tertiary marine deposits on ridge tops and upper slopes, and on Pleistocene deposits on terraces near streams. The deep sandy soils are of low fertility and, because of their porous nature, water and air move rapidly through them causing rapid drying. Overstory, midstory, and herbaceous vegetation is often sparse allowing sun to reach the ground, and in some areas, trees are virtually absent. Reflected glare from the sand is often intense. Trees, typically a combination of overstory pines and midstory oaks, are often stunted. Lichens and mosses are

usually plentiful on the bare soils, and the soils, where undisturbed, are often cryptogamic.

In order to learn more about this community, we made a study of the vascular flora of three xeric sandhills in Caddo Parish in northwestern Louisiana. In addition we made brief and irregular surveys of other sandhills in Caddo Parish to assess their condition and to look for rare species. Many of these sites are known because of rare species records: others were located through soil maps.

## METHODS

We visited three xeric sandhills --- Ida, Kendrick Road, and Roger's Station --- every two to three weeks between the summer of 1994 and the fall of 1995. The three sites are located in T23N R15W Sec. 26, T22N R16W Sec. 11, T21N R16W Sec. 5, respectively, and are within 20 km of each other. The three sites are on private land.

All of the study areas are partly open (10% - 50% cover), the overstory dominated by *Quercus incana* Bartr., *Q. marilandica* Muenchh., *Q. stellata* Wang., and *Pinus taeda* L. Trees are often stunted and small openings occur among the wooded areas. Ida and Roger's Station are each about 1.2 ha. in size while Kendrick Road is only about 0.4 ha. All are about 90 meters above sea level.

The three study sites, although selected because of their relatively good condition, are badly damaged. Roger's Station is an oil field with active wells, pipelines, and storage tanks. It is also the site of earlier sand excavations that left large pits --- some excavated for sand, others as mud pits and for waste water --- now ponds. Ida has some oil/gas pipelines, and storage tanks. It is also the site of earlier sand excavations that left large pits ---some excavated for sand, others as mud pits and for waste water --- now ponds. Ida has some oil/gas pipelines through it but damage here is mainly the result of agribusiness, roads, herbicides, and fire suppression. Half of Kendrick Road is mowed annually; the remainder is a tangle of shrubs with little or no herbaceous layer. There is little or nothing "natural" about the processes keeping these sites open. Compared with the sites in Natchitoches Parish (MacRoberts & MacRoberts 1994), they are weedy with often a very dense cover of such species as *Cassia*, *Krigia*, *Ambrosia*, *Plantago*, *Oenothera*, *Rubus*, *Gnaphalium*, *Diodia*, and *Daucus*.

We collected and recorded all vascular plants found. Additionally, we consulted the herbarium at Louisiana State University in Shreveport [LSUS], which has a substantial collection of plants from Ida made by D.T. MacRoberts in the late 1970's (MacRoberts 1979). We follow Kartesz (1994) in most instances of botanical nomenclature. Voucher specimens of many of the species collected are deposited at VDB, LSUS, and LSU.

Soil samples were taken from the upper 15 cm of each sandhill community and analyzed by A&L Laboratories, Memphis, Tennessee.

While the specific fire history of these areas is not known, none has burned in decades. It can be inferred that in presettlement times the sites probably burned regularly since xeric sandhills are continuous with the oak-pine communities surrounding them.

We also made irregular observations of other sandhill sites in Caddo Parish, several of which are known because of the presence of state rare plants. Further sites were located using soil survey maps. We assessed the condition of these areas and looked for rare species. All are badly damaged by various anthropogenic activities.

Annual precipitation averages about 100 cm and is fairly evenly distributed throughout the year. In summer, temperatures rise to 35° C, which, combined with short droughts, translates into very hot and dry conditions. Under these conditions, especially when there are short droughts, the exposed sands become very dry. Drought occurred in August 1995, which may have prevented or delayed flowering in some of the grasses (Edwards *et al.* 1980).

General background information on geology, soils, climate, and plant communities in Caddo Parish can be found in MacRoberts (1979), Edwards *et al.* (1980), and Teague & Wendt (1994).

## RESULTS

We list the vascular plants found at Ida (I), Kendrick Road (K), and Roger's Station (R) in Table 1. If the species occurs at all three sites, we give no site location.

We recorded 170 taxa, representing 139 genera and 60 families for the three xeric sandhill sites. Asteraceae, Fabaceae, and Poaceae are the dominant families, accounting for about 36% of the total species. Ida had 143 taxa, Kendrick Road had 118, and Roger's Station had 139. Sorensen's Index of Similarity (IS) shows the three sites to be essentially the same community: Ida/Kendrick Road IS = 76, Ida/Roger's Station IS = 80, and Roger's Station/Kendrick Road IS = 83.

We list the soil characteristics of the three Caddo Parish sandhills in Table 2.

The soil on which this community occurs is acidic loamy fine sand of low fertility and rapid permeability (Edwards *et al.* 1980) and belongs to the same soil series described previously for Natchitoches Parish xeric sandhills (MacRoberts & MacRoberts 1994).

Table 1. Vascular plants at three xeric sandhills in Caddo Parish.

- ACANTHACEAE - *Ruellia humilis* Nutt. [K,R].  
 AGAVACEAE - *Yucca louisianensis* Trel.  
 AMARANTHACEAE - *Froelichia floridana* (Nutt.) Moq.  
 ANACARDIACEAE - *Rhus aromatica* Ait., *R. copallina* L., *Toxicodendron radicans* (L.) Kuntze.  
 ANNONACEAE - *Asimina parviflora* (Michx.) Duval.  
 APIACEAE - *Daucus pusillus* Michx., *Spermelepis echinata* (DC.) Heller.  
 AQUIFOLIACEAE - *Ilex decidua* Walt. [K,R], *I. vomitoria* Ait. [I,K].  
 ASCLEPIADACEAE - *Asclepias amplexicaulis* Sm. [I,R], *A. tuberosa* L. [I,R], *Matelea cynanchoides* (Engelm.) Wood [K,R].  
 ASTERACEAE - *Ambrosia artemisiifolia* L., *Aster patens* Ait. [R], *Berlandiera pumila* (Michx.) Nutt., *Conyza canadensis* (L.) Cronq. [I,R], *Coreopsis intermedia* Sherff [K,R], *Coreopsis lanceolata* L., *Croptilon divaricatum* (Nutt.) Raf., *Erigeron strigosus* Willd., *Gaillardia aestivalis* (Walt.) Rock., *Gnaphalium obtusifolium* L. [I,R], *Gnaphalium purpureum* L., *Heterotheca pilosa* (Nutt.) Shinnery, *Heterotheca subaxillaris* (Lam.) Britt. & Rusby [K,R], *Hieracium gronovii* L. [I], *Hymenopappus artemisiaefolius* DC., *Lactuca canadensis* L., *Liatris elegans* (Walt.) Michx., *Krigia virginica* (L.) Willd., *Rudbeckia hirta* L., *Solidago ludoviciana* (A. Gray) Small, *Tetragonotheca ludoviciana* (Torrey & A. Gray) A. Gray [I,R], *Vernonia texana* (A. Gray) Small [R].  
 BORAGINACEAE - *Lithospermum carolinense* (J.F. Gmel.) MacM.  
 BRASSICACEAE - *Draba brachycarpa* Nutt. ex Torrey & A. Gray [I], *Streptanthus hyacinthoides* Hook. [K,R], *Thlaspi arvense* L.  
 CACTACEAE - *Opuntia humifusa* (Raf.) Raf.  
 CAMPANULACEAE - *Trifolium perfoliata* (L.) Nieuwl.  
 CAPRIFOLIACEAE - *Viburnum rufidulum* Raf. [I,R].  
 CARYOPHYLLACEAE - *Arenaria serpyllifolia* L. [K], *Paronychia drummondii* Torrey & A. Gray [R].  
 CISTACEAE - *Helianthemum georgianum* Chapm., *Lechea mucronata* Raf.  
 CLUSIACEAE - *Hypericum gentianoides* (L.) B.S.P., *H. hypericoides* (L.) Crantz.  
 COMMELINACEAE - *Commelina erecta* L., *Tradescantia reverchonii* Bush.  
 CONVOLVULACEAE - *Ipomoea pandurata* (L.) Mey. [I], *Stylisma pickeringii* (Torrey ex Curtis) A. Gray.  
 CORNACEAE - *Cornus florida* L.  
 CUPRESSACEAE - *Juniperus virginiana* L. [I,K].  
 CYPERACEAE - *Bulbostylis ciliatifolia* (Ell.) Fern. [I,R], *Cyperus retrofractus* (L.) Torrey [I], *C. retroflexus* Buckl., *Rhynchospora grayi* Kunth [I,K], *Scleria triglomerata* Michx. [I].  
 EBENACEAE - *Diospyros virginiana* L.  
 ERICACEAE - *Monotropa uniflora* L. [I], *Vaccinium arboreum* Marsh., *V. stamineum* L. [I,R].  
 EUPHORBACEAE - *Cnidoculus stimulosus* (Michx.) Engelm. & A. Gray, *Chamaesyce cordifolia* (Ell.) Small, *Crotonopsis linearis* Michx. [K,R], *Stillingia sylvatica* L., *Tragia urticifolia* Michx. [I,R].

Table 1. (continued).

- FABACEAE - *Astragalus leptocarpus* Torrey & A. Gray, *Baptisia nuttalliana* Small [R], *Cassia fasciculata* Michx., *Centrosema virginianum* (L.) Benth., *Crotalaria sagittalis* L. [I], *Dalea villosa* (Nutt.) Sprengel var. *grisea* (Torrey & A. Gray) Barneby [I,K], *Dalea phleoides* (Torrey & A. Gray) Shinnery, *Desmodium sessilifolium* (Torrey) Torrey & A. Gray, *Erythrina herbacea* L. [I], *Galactia volubilis* (L.) Britton, *Lespedeza stuevei* Nutt. [I,R], *Pediomelum hypogaeum* (Nutt. ex Torrey & A. Gray) Rydb. var. *subulatum* (Bush) J. Grimes [K], *Stylosanthes biflora* (L.) B.S.P., *Tephrosia virginiana* (L.) Pers. [R], *Trifolium arvense* L. [I], *Zornea bracteata* (Walt.) J.F. Gmel.
- FAGACEAE - *Quercus falcata* Michx. [I], *Q. incana* Bartr., *Q. marilandica* Muenchh., *Q. stellata* Wang., *Castanea pumila* (L.) P. Mill. [I].
- HIPPOCASTANACEAE - *Aesculus pavia* L.
- HYDROPHYLLACEAE - *Phacelia strictiflora* (Engelm. & A. Gray) A. Gray [K,R].
- GERANIACEAE - *Geranium carolinianum* L.
- JUGLANDACEAE - *Carya tomentosa* (Poir.) Nutt., *Juglans nigra* L. [R].
- JUNCACEAE - *Juncus marginatus* Rostk. [K,R].
- LAMIACEAE - *Hedeoma hispidum* Pursh, *Monarda punctata* L., *Salvia azurea* Michx. & Lam. [I], *Scutellaria cardiophylla* Engelm. & A. Gray, *Teucrium canadense* L. [I], *Trichostema dichotomum* L. [K,R].
- LAURACEAE - *Sassafras albidum* (Nutt.) Nees.
- LILIACEAE - *Smilax glauca* Walt., *S. smallii* Morong.
- LOGANIACEAE - *Gelsemium sempervirens* (L.) St. Hil. [I,R].
- NYCTAGINACEAE - *Mirabilis albida* (Walt.) Heimerl.
- OLEACEAE - *Chionanthus virginicus* L.
- ONAGRACEAE - *Gaura sinuata* Ser. [I,R], *Oenothera biennis* L. [I,R], *O. laciniata* Hill.
- OXALIDACEAE - *Oxalis stricta* L. [I,R].
- PINACEAE - *Pinus echinata* P. Mill., *P. taeda* L.
- PLANTAGINACEAE - *Plantago aristata* Michx., *P. hookeriana* Fisch. & Mey., *P. virginica* L. [I,R].
- POACEAE - *Aristida desmantha* Trin. & Rupr. [K,R], *A. lanosa* Ell., *A. oligantha* Michx., *A. purpurascens* Poir. [I,R], *Cenchrus incertus* M.A. Curtis, *Dichanthelium oligosanthos* (Schult.) Gould, *D. villosissimum* (Nash) Freckman [I], *Eragrostis hirsuta* (Michx.) Nees [I,R], *Eragrostis secundiflora* Presl. [I], *Eragrostis spectabilis* (Pursh) Steud. [R], *Eragrostis trichodes* (Nutt.) Wood [R], *Erianthus alopecuroides* (L.) Ell. [I], *Gymnopogon ambiguus* (Michx.) B.S.P., *Leptoloma cognatum* (Schult.) Chase, *Paspalum setaceum* Michx., *Schizachyrium scoparium* (Michx.) Nash [I,R], *Sorghastrum elliottii* (Mohr) Nash [I], *Sphenopholis obtusata* (Michx.) Scribn. [I,K], *Tridens flavus* (L.) Hitchcock, *Triplasis purpurea* (Walt.) Chapm., *Vulpia octoflora* (Walt.) Rydb., *V. sciurea* (Nutt.) Henr.
- POLYGALACEAE - *Polygala polygama* Walt. [R].
- POLYGONACEAE - *Eriogonum longifolium* Nutt., *Polygonella americana* (Fisch. & Mey.) Small [I], *Rumex hastatulus* Ell.
- RANUNCULACEAE - *Anemone caroliniana* Walt. [K], *Clematis reticulata* Walt., *Delphinium carolinianum* Walt. [K,R].

Table 1. (continued).

- RHAMNACEAE - *Ceanothus americanus* L. [I].  
 ROSACEAE - *Crataegus uniflora* Muenchh. [K], *Potentilla recta* L. [I], *Prunus angustifolia* Marsh. [I], *Prunus caroliniana* (P. Mill) Ait. [I], *Prunus gracilis* Engelm. & A. Gray, *Prunus umbellata* Ell. [K,R].  
 RUBIACEAE - *Diodia teres* Walt.  
 RUTACEAE - *Zanthoxylum clava-herculis* L. [I,K].  
 SAPOTACEAE - *Bumelia lanuginosa* (Michx.) Pers.  
 SCROPHULARIACEAE - *Linaria canadensis* (L.) Dum.-Cours., *Penstemon australis* subsp. *laxiflorus* (Pennell) Bennett [K], *P. murrayanus* Hook. [I].  
 SELAGINELLACEAE - *Selaginella arenicola* Underw. subsp. *riddellii* (Van Eselt.) Tryon [R].  
 SOLANACEAE - *Physalis heterophylla* Nees., *P. mollis* Nutt. [I,R].  
 ULMACEAE - *Ulmus alata* Michx.  
 URTICACEAE - *Parietaria pensylvanica* Muhl. ex Willd. [I].  
 VALERIANACEAE - *Valerianella radiata* (L.) Dufr. [K,R].  
 VERBENACEAE - *Glandularia canadensis* (L.) Nutt., *Verbena halei* Small [I,R].  
 VIOLACEAE - *Viola rafinesquii* Greene, *V. villosa* Walt. [I,K].  
 VITACEAE - *Ampelopsis arborea* (L.) Koehne, *Vitis aestivalis* Michx., *V. rotundifolia* Michx.

Table 2. Soil characteristics of three xeric sandhills in Caddo Parish.

Sample	pH	Exchangeable Ions (ppm)				Organic Matter %
		P	K	Ca	Mg	
Roger Station	5.7	25	50	170	25	1.7
Kendrick	5.6	12	36	270	37	2.3
Ida	5.9	14	34	260	26	1.9

## DISCUSSION

Floristically, these three xeric sandhills are essentially the same as xeric sandhills farther south in Natchitoches Parish (MacRoberts & MacRoberts 1994). Since the sample sizes are different, Sorensen's Index of Similarity has not been calculated, but 82% of the species found in one Natchitoches Parish site also occur in the Caddo sandhills.

As mentioned above, in addition to surveying these three sites, we made brief surveys of locations where rare sandhill species had been previously found (Louisiana Natural Heritage files) or which showed up as being on similar soil types to the three study areas (Betis-Briley-Darden, Sacul-Ruston) (Edwards *et al.* 1980).

We found only one other site in the dozens surveyed to be comparable in quality to the three study sites. This site is an oil field with trash piles, pipe lines, well roads, and is badly fire suppressed. We first visited this site in the late 1970's and it has deteriorated substantially. It is briefly described by Teague & Wendt (1994), who consider it to be the highest quality site in the area, a conclusion with which we do not demur, except to emphasize that it is badly degraded.

Most of the other Caddo sandhills are either totally altered from original conditions (e.g., are now pastures, fields, mobile home sites, cemeteries, and churches) or are so badly degraded (e.g., are pine plantation with only a few sandhill species hugging the road edges) as to be basically unrecognizable as once having been xeric sandhills.

These surveys allowed us to compare sandhill communities in central Louisiana and in east Texas (MacRoberts & MacRoberts 1994). Our finding is that none of the Caddo Parish sites is of comparable quality to the best sites in the Kisatchie National Forest or in east Texas (see references in MacRoberts & MacRoberts 1994).

We are chary of estimating total area of this community remaining in Caddo Parish since we did not set out to determine this, but assuming that much of the sandy soils were once xeric sandhills, there is very little left. Today, this community is scattered in small, badly degraded, patches. None is high-quality. While there may be a lot of Betis/Briley/Darden and Sacul/Ruston soils in Caddo Parish, soil occurrence does not translate into a functional plant community. Consequently, we agree with Teague & Wendt (1994) and with the Louisiana Natural Heritage Program in designating this community imperiled in Louisiana.

How much of this community existed in Caddo Parish in presettlement times can only be conjectured, but it probably measured in the thousands of acres. The very little that is left is mostly due to the inadvertent creation of artificial refugia on road sides, and in oil fields and derelict hay fields.

Since xeric sandhills are usually found in badly disturbed areas, it has been assumed that they are "disturbance" communities. This conclusion is a natural one considering the appalling conditions in which sandhill species "hang on," and is probably true to the extent that sandhills surely require repeated but occasional fire for full development. Nevertheless, ground disturbance associated with logging, road construction, and oil field work will eventually destroy these communities. Sandhill species are often found in highly disturbed sandy areas because they require an open habitat and can tolerate some anthropogenic disturbance at least for awhile, but the original structure of both the community and the soil is obliterated under these conditions.

While seldom evident except under fairly intact conditions, sandhill soils are cryptogamous. In open areas among the scattered plants there is a substantial cover of mature cryptogamic crusts. Ground disturbances destroy this layer, leading in turn to rapid erosion, loss of soil nutrients, and rapid water evaporation (Hogan 1994). Also, under intact conditions the surface may have extensive patches of *Cladonia* moss. Neither cryptogamic crusts nor *Cladonia* are frequently encountered in Caddo Parish sandhills.

We believe that xeric sandhills in Caddo Parish have been degraded so badly that little remains of this community. Restoration efforts might simulate or counterfeit what this community might have been in presettlement times, but whether or not such efforts could actually bring the community back is not known.

In the course of this work we kept records of rare sandhill species (Louisiana Natural Heritage Program 1995) that occur in Caddo Parish. These are: *Astragalus soxmaniorum* Lundell, *Coreopsis intermedia* Sherff, *Crataegus uniflora* Muenchh., *Croton argyranthemus* Michx., *Dalea phleoides* (Torrey & A. Gray) Shinners, *Dalea villosa* (Nutt.) Sprengel var. *grisea* (Torrey & A. Gray) Barneby, *Eriogonum longifolium* Nutt., *E. multiflorum* Benth., *Matelea cynanchoides* (Engelm.) Woods., *Mirabilis albida* (Walt.) Heimerl., *Paronychia drummondii* Torrey & A. Gray, *Pediomelum digitatum* (Nutt. ex Torrey & A. Gray) Isely, *Pediomelum hypogaeum* (Nutt. ex Torrey & A. Gray) Rydb., *Penstemon murrayanus* Hook., *Phacelia strictiflora* (Engelm. & A. Gray) A. Gray, *Polygonella americana* (Fisch. & Meyer) Small, *Prunus gracilis* Engelm. & A. Gray, *Quercus arkansana* Sarg., *Scutellaria cardiophylla* Engelm. & A. Gray, *Selaginella arenicola* Underw. subsp. *riddellii* (Van Eselt.) Tryon, *Streptanthus hyacinthoides* Hook., *Talinum parviflorum* Nutt. ex Torrey & A. Gray, *Tetragonotheca ludoviciana* (Torrey & A. Gray) A. Gray, *Thelesperma filifolium* (Hook.) A. Gray, *Tradescantia reverchonii* Bush, *Zornea bracteata* (Walt.) Gmel. Only a few of these did not occur in one or more of the three study sites.

#### POSTSCRIPT

On our last round of visits to the study sites on November 16, 1995, Kendrick Road was destroyed and a house was being constructed on the site.

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