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HISTORICAL NOTES ON LOUISIANA PRAIRIES: CHANGES IN PRAIRIE FLORA IN HALF A CENTURY

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ABSTRACT

Unpublished field notes and herbarium specimens of C.A. Brown were used to reconstruct the 1939 floristics of the Keiffer prairies in central Louisiana. These historical data were compared with current species composition from the same prairies. Although the prairies are smaller today, we found that they have not lost species reported six decades ago. A comparison of the species composition of the Keiffer prairies with midwestern tallgrass prairies indicates that they are relatively high quality and have a rich array of conservative prairie species.

KEY WORDS: Prairie, Louisiana, floristics, Kisatchie National Forest, Keiffer Prairies

INTRODUCTION

Information on plant communities spanning decades is not easily obtained. This is particularly the case with prairies (Collins & Adams 1983). Their rapid demise has been documented and, since so little is left today, any virgin remnant is highly prized (Kucera 1992; Whitney 1994). This is especially true in the Southeast because the small isolated prairies, which were never common, were quickly destroyed or degraded by early settlers (DeSelm & Murdock 1993).

In the late 1930's, Clair A. Brown (1903-1982), Professor of Botany at Louisiana State University, took a special interest in Louisiana prairies and made numerous trips to study them (Brown 1941a, 1941b, 1953). Among the many prairies Brown visited were the Keiffer Prairies on the Winn Ranger District of the Kisatchie National Forest

in central Louisiana. These are a group of about 45 natural openings surrounded by shortleaf pine/oak/hickory forest (Smith, *et al.* 1989; Martin & Smith 1991). Land survey plats from the 1830's and 1940 aerial photographs show that these openings were larger than they are today.

After Brown's pioneering work, interest in prairies waned and the Keiffer Prairies were virtually forgotten until their rediscovery and subsequent surveys over a half century later (Smith, *et al.* 1989; Allen 1993; MacRoberts & MacRoberts 1996a, 1996b). During the last decade, studies have been undertaken on both the remnant coastal prairies and on the isolated prairies scattered through north and central Louisiana (Smith, *et al.* 1989; Smeins, *et al.* 1992; Allen 1993; Allen & Vidrine 1989; MacRoberts & MacRoberts 1995a, 1995b, 1996a, 1996b).

Brown left almost no formal record of his prairie work, publishing only three abstracts (Brown 1941a, 1941b, 1953). He did, however, leave a substantial informal record in his field notes and collections, which we believe provide a good indication of historical composition.

Using Brown's field notes and herbarium specimens, and current floristic data that were compiled independently over half a century later (Smith, *et al.* 1989; Allen 1993; MacRoberts & MacRoberts 1996a, 1996b), we hope to determine what, if any, floristic changes have occurred in five decades.

METHODS

We extracted all floristic information for the Keiffer Prairies from Brown's field notebooks and a summary of these note books labeled "Prairie Records" (Brown n.d.) stored at the LSU herbarium. On April 8, June 20, Sept. 9, 11, and 30, 1939, Brown visited the Keiffer Prairies, and collected and listed plants from several of them. He also made a visit to the "Keiffer Prairie Area" on October 25, 1941, but only collected eight species, all from the surrounding woodlands. This visit was probably short since he also visited other areas that day. He did not consider it a prairie visit since it is not listed in the "Prairie Records." Brown apparently discontinued his visits to the Keiffer Prairies at this point.

While Brown gives the location of one prairie (Sec. 26, T11N R5W), he simply designated others by such descriptions as "Twin Prairie" (now called Carpenter Road Prairie: Sec. 13, T11N R5W) and "Small black prairie [on] sand dump road." All these openings appear to have been within a short distance of each other and are part of what was then and still is a group of closely associated prairie remnants.

Using current lists of the Keiffer flora (Smith, *et al.* 1989; Allen 1993; MacRoberts & MacRoberts 1996b) and Brown's lists, we searched the LSU herbarium for his specimens. There were, of course, the normal problems: specimens on loan, misplaced, lost, never entered, or destroyed (after Brown's death, many of his plant collections were found in a shed behind his house in a decomposed condition).

Given these limitations, we attempt to 1) reconstruct what Brown found and 2) compare it with what currently grows in the Keiffer Prairies.

RESULTS

Table 1 lists the plants collected or listed by Brown. The difference between his list and current lists produced fifty years later can be compared by simply juxtaposing them (Smith, *et al.* 1989; Allen 1993; MacRoberts & MacRoberts 1996b).

Table 1. Keiffer Prairie vascular plants in 1939.

AGAVACEAE - *Manfreda virginica* (L.) Salisb. ex Rose

ANACARDIACEAE - *Rhus copallina* L.

APIACEAE - *Eryngium yuccifolium* Michx., *Polytaenia nuttallii* DC.

AQUIFOLIACEAE - *Ilex decidua* Walt.

ASCLEPIADACEAE - *Asclepias viridiflora* Raf., *A. viridis* Walt., *A. verticillata* L.

ASTERACEAE - *Ambrosia psilostachya* DC., *Aster oolentangiensis* Riddell, *Aster sericeus* Vent., *Coreopsis lanceolata* L., *Echinacea pallida* (Nutt.) Nutt., *Erigeron strigosus* Muhl. ex Willd., *Eupatorium semiserratum* DC., *Gaillardia aestivalis* (Walt.) H. Rock., *Helenium autumnale* L., *Helianthus angustifolius* L., *Helianthus hirsutus* Raf., *Iva annua* L., *Liatris pycnostachya* Michx., *L. squarrosa* Michx., *Rudbeckia hirta* L., *Silphium laciniatum* L., *Solidago rigida* L., *Vernonia missurica* Raf.

BORAGINACEAE - *Onosmodium bejariense* A. DC. var. *hispidissimum* (Mack.) B.L. Turner

CORNACEAE - *Cornus drummondii* C.M. Mey., *C. florida* L.

CUPRESSACEAE - *Juniperus virginiana* L.

CUSCUTACEAE - *Cuscuta cuspidata* Engelm.

EBENACEAE - *Diospyros virginiana* L.

FABACEAE - *Astragalus crassicaarpus* Nutt., *Baptisia alba* (L.) Vent., *Dalea candida* Willd., *Dalea purpurea* Vent., *Desmanthus illinoensis* (Michx.) MacM. ex B.L. Robins. & Fern., *Gleditsia triacanthos* L., *Mimosa strigillosa* Torrey & A. Gray, *Neptunia lutea* (Leavenworth) Benth.

GENTIANACEAE - *Sabatia angularis* (L.) Pursh, *S. campestris* Nutt.

HAMAMELIDACEAE - *Liquidambar styraciflua* L.

LAMIACEAE - *Monarda fistulosa* L., *Prunella vulgaris* L., *Pycnanthemum tenuifolium* Schrad., *Salvia azurea* Michx. ex Lam., *Salvia lyrata* L., *Scutellaria parvula* Michx.

LILIACEAE - *Allium canadense* L., *Hypoxis hirsuta* (L.) Coville, *Nothoscordum bivalve* (L.) Britt.

LINACEAE - *Linum sulcatum* Riddell

MALVACEAE - *Callirhoe papaver* (Cav.) A. Gray

ONAGRACEAE - *Gaura longiflora* Spach., *Oenothera speciosa* Nutt.

PINACEAE - *Pinus echinata* P. Mill., *P. taeda* L.

POACEAE - *Andropogon gerardii* Vitman, *Andropogon glomeratus* (Walt.) B.S.P., *Aristida oligantha* Michx., *Aristida purpurascens* Poir., *Eragrostis spectabilis* (Pursh) Steud., *Panicum flexile* (Gatt.) Scribn., *Paspalum floridanum* Michx., *Paspalum setaceum* Michx., *Schizachyrium scoparium* (Michx.) Nash, *Setaria geniculata* Beauv., *Sorghastrum nutans* (L.) Nash, *Sorghastrum junceus* (Beauv.) Kunth.

POLEMONIACEAE - *Phlox pilosa* L.

RANUNCULACEAE - *Delphinium carolinianum* Walt., *Ranunculus fascicularis* Muhl. ex Bigelow

RHAMNACEAE - *Berchemia scandens* (Hill) K. Koch, *Ceanothus americanus* L.

ROSACEAE - *Crataegus* spp.

RUBIACEAE - *Diodia teres* Walt., *Houstonia purpurea* L. var. *calycosa* A. Gray

SAPOTACEAE - *Bumelia lanuginosa* (Michx.) Pers.

SCROPHULARIACEAE - *Agalinis oligophylla* Pennell, *Buchnera americana* L., *Pedicularis canadensis* L., *Penstemon australis* Small

ULMACEAE - *Ulmus alata* Michx.

VERBENACEAE - *Glandularia canadensis* (L.) Nutt., *Verbena xutha* Lehm.

VITACEAE - *Ampelopsis arborea* (L.) Koehne

MacRoberts & MacRoberts (1996b) list 137 species for two Keiffer Prairies. Brown recorded 86 species, 80 (93%) of which are on the MacRoberts' list.

Brown lists or has vouchers for six species not listed by the MacRoberts: *Asclepias verticillata*, *Astragalus crassicaarpus*, *Oenothera speciosa*, *Panicum flexile*, *Ranunculus fascicularis*, and *Verbena xutha*. Four of these are reported by Smith, *et al.* (1989) or Allen (1993). The two remaining species, *Ranunculus fascicularis* and *Verbena xutha*, are widely scattered in Louisiana.

DISCUSSION

Although the sample is far from ideal (we can say nothing about relative abundance of species), clearly during the past 60 years the species list of the Keiffer Prairies has not declined. Brown's list contains no species missing today. This is an interesting finding since it appears to be generally accepted that a process of degeneration has been occurring over a wide range of "island type" communities (Hoehne 1981). Certainly, prairie degeneration occurred for most Louisiana prairies, which have ceased to exist altogether and where species once occurring in Louisiana, for example *Eustoma grandiflorum* (Raf.) Shinners, have not been found for almost 200 years (MacRoberts, *et al.* 1997). Habitat destruction caused this loss. Aerial photographs of the Keiffer Prairies show that they have shrunk considerably due to woody invasion. Many were grazed (and overgrazed) in Brown's time and after, and some have been cultivated (Smith, *et al.* 1989).

However, there is the question of the additional 40 to 50 species not reported by Brown (compare the list in Table 1 with that of MacRoberts & MacRoberts 1996b). Has the floristic diversity increased over the past fifty years or was Brown's sampling incomplete?

Brown made only irregular visits to the prairies: once each in April and June, and three times in September. He was not a driven collector or note-taker, and no evidence exists showing he attempted a total floristic list of the prairies. Quite the contrary: he often collected only a few species and otherwise merely listed plants he encountered. He paid particular attention to trees and shrubs (this was one of his specialties) and often listed woody vegetation adjacent to the prairies; he typically identified many herbaceous species only to genus. Many of the notebook entries remain incomplete and give only a blank number or genus name. Occasionally Brown gives short descriptions such as "small white flowers" but, because he did not rework his notebooks after determining species, the notebooks alone do not provide a reliable guide to the identification or location of herbarium specimens. He apparently avoided the Cyperaceae, although he found a few of the rare grasses.

While it is an intriguing possibility that species diversity in the prairies has increased since Brown's time, this is unfortunately not testable with the data we have available.

High-quality prairies are identifiable by their diversity and richness in conservative (fidel or near fidel) species, the absence of exotic species, and lack of overgrowth of

brush and trees (Packard & Ross 1997). While no one has developed a rating system for prairie species for the southern United States, such do exist for the midwestern tallgrass prairies (Masters 1997; Packard & Ross 1997; Ladd 1997). Taking into account such distributional differences as would be expected between central Louisiana and Missouri or Illinois, it is possible to estimate the overall prairie quality for the Keiffer Prairies by comparing their species with those found elsewhere, remembering, of course, that this type of comparison is highly subjective and open to different interpretations.

In 1996 we surveyed two Keiffer prairies (MacRoberts & MacRoberts 1996b). They measured 1.2 and 1.6 ha and contained 100 and 124 species, respectively. These are relatively high numbers considering the size of the prairies. Very few species were exotic. Many, such as *Carex microdonta* Torrey & Hook., *Heliotropium tenellum* (Nutt.) Torrey, *Spiranthes magnicamporum* Sheviak, and *Houstonia purpurea* var. *calycosa*, are fidel or nearly so to prairies. Keiffer Prairie grasses such as *Schizachyrium scoparium*, *Koeleria macrantha* Ledeb., *Andropogon gerardii*, *Sorghastrum nutans*, and *Panicum virgatum* L. are also characteristic of midwestern prairies.

A comparison of our plant list with Ladd's (1997) for midwestern tallgrass prairies shows a 63% similarity in species. This is impressive but an underestimate of the true similarity since many species found in the Keiffer Prairies, such as *Sporobolus junceus* (Beauv.) Kunth., *Mimosa strigillosa* Torrey & A. Gray, and *Neptunia lutea* (Leavenworth) Benth., are closely related southern congeners of more northern species. Further, when only the highest ranking conservative species are compared, it is clear that the Keiffer Prairies have basically the same species as the midwestern tallgrass prairies.

These results are encouraging and give us confidence that the Keiffer Prairie remnants are not only maintaining themselves but are high quality. That the Keiffer Prairies may be more diverse (in better condition floristically) today than they were in the late 1930's is not demonstrable from these studies, but the data do not exclude this possibility, which is an intriguing one. In 2050 some enterprising botanist can test this proposition since today we do have accurate floristic lists, notably of rare species, for all of them (MacRoberts & MacRoberts 1996a).

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NOMENCLATURAL NOTES ON NORTH AMERICAN GRASSES

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ABSTRACT

The source and nomenclatural type of the name *Arctophila trichopoda* Holm are discussed; a re-lectotypification for *Danthonia spicata* var. *pinetorum* Piper is proposed; the name *Festuca trachyphylla* Hack. ex Druce is a *nomen nudum*; lectotypes are provided for five *Festuca* names; five new combinations in *Festuca* are proposed.

KEY WORDS: *Arctophila*, *Danthonia spicata* var. *pinetorum*, *Festuca*, lectotype, Poaceae

In the course of preparing floristic treatments of various North American grasses a number of taxonomic, nomenclatural, and typification issues were noted. These are discussed in alphabetical order of taxa. Herbarium acronyms cited are from Holmgren, *et al.* (1990).

Arctophila trichopoda Holm, Ottawa Naturalist 16:82. 1902.

This taxon is generally considered as a synonym of *Arctophila fulva* (Trin.) Andersson. Its source of publication has been given in *Index Kewensis* (Prain 1913) and *Index to Grass Species* (Chase & Niles 1962) as "Repert. nov. spec. regni veg. 3:337., 1907". In 1902, however, Holm published *A. trichopoda* along with a diagnosis and clear holotype citation (Holm 1902). He stated that it was a new species and that he intended to publish "a full description and illustration . . . at an early date".

Although a more complete description was published in the 1907 paper, no illustration was provided.

The holotype is CAN 36690, which was mounted on the same sheet as the holotype of *Colpodium fulvum* (Trin.) Griseb. var. *aristatum* Polunin (CAN 36691), and bears the annotation "*Arctophila trichopoda* sp. nov., Mscr. Flora of the Hudson Bay Region" in Holm's script. The holotype and an isotype (US 947554) are referred to \times *Arctodupontia scleroclada* (Rupr.) Tzvelev. HOLOTYPE: Mansfield [Mansel] Island, Hudson Bay; CAN 36690(!). Isotype: Mansfield [Mansel] Island, Hudson Bay, crevices of rocks, *Dr. R. Bell 61*, Sept. 1884; US 947554(!).

Danthonia spicata (L.) Beauv. var. *pinetorum* Piper, *Erythea* 7:103. 1899.

Findlay & Baum (1974) selected a lectotype, WS 3075, and isolectotype, WS 3079, for this taxon based on the annotations by C.V. Piper "type" and "dupl. type", respectively. They noted that the label data are inconsistent with the protologue, *i.e.*, the specimens were collected on 22 July 1890 rather than 13 July 1890.

A specimen at US, 1913582, bears the annotation, "*Danthonia spicata pinetorum* n. var., - Type specimen -" in Piper's script. The collection number, location and date on the label are all consistent with the protologue and the indicated habitat differs only slightly; "In open coniferous woods, common" on the specimen, rather than "dry open coniferous woods, in gravel soil" in the protologue. As indicated in Art. 9.13 of the ICBN (Greuter, *et al.* 1994), a lectotype may be superseded if it is in "serious conflict" with the protologue and another element is available which is not in conflict. Also Recommendation 9A.3 advises that the intentions of the author of the name (*e.g.*, annotations) are to be used for lectotypification only when not in "serious conflict" with the protologue. There are at least three specimens available which are more consistent with the protologue than the lectotype selected by Findlay & Baum, although the label data are not always as complete as those on US 1913582: two at US (Findlay & Baum 1974) and one at WS (148246) acquired from the Suksdorf Herbarium. The specimen US 1913582 is selected here as the lectotype of *Danthonia spicata* var. *pinetorum* Piper. Not only does it bear annotation by Piper as "type" but it is more clearly consistent with the protologue than the specimen WS 3075 selected by Findlay & Baum (1974).

Festuca trachyphylla Hack. *ex* Druce, Report Bot. Exch. Club Brit. Isles, 1914, vol. 4(1):29. 1915.

Wilkinson & Stace (1988) have interpreted the name *Festuca trachyphylla* Hack. *ex* Druce as validly published and an earlier homonym of *Festuca trachyphylla* (Hack.) Krajina (Acta Bot. Bohem. 9:191. 1930.), the former referring to a South American taxon and the latter to a Eurasian taxon which has been widely distributed through the commercial seed trade under the name "Hard Fescue". Wilkinson & Stace (1988) state "Krajina (1930) was the first author to recognise subvar. *trachyphylla* Hack. at the

species level. However, Hackel (*ex* Druce 1915) had previously used the name to describe a totally different taxon from South America. The one character (prickles on the glumes) used to distinguish it from *F. dumetorum* Philippi [*sic*] non L. is sufficient to validate the name."

The use of *Festuca trachyphylla* Hack. by Druce in 1915 would seem to have been a lapsus or "orthographic" error. The account discussing a South American species as newly adventive to Britain begins on page 29 with the title "*FESTUCA TRACHYPHYLLA* Hackel", but continues on the next page with the following, quoted (but possibly translated) by Druce from Hackel's letter:

This "is surely one of the numerous Chilian species imperfectly described by Philippi [*sic*], and comes very near *F. dumetorum* Phil., not Linn. (which I propose to name *F. trachylepis*, but it has not the minute prickles on the fertile glume of that species)." E. HACKEL, (in lit.).

Druce did not apply the name *Festuca trachyphylla* Hack. to the adventive South American taxon in subsequent publications, but used the name *F. trachylepis* (Hayward & Druce 1919; Druce 1928). This is confirmed in Hayward & Druce (1919) when the citation of the name *F. trachylepis* is given as "Rep. B.E.C. 29, 1914." The name "*F. trachyphylla* Hackel" appears on page 29, while ". . . *F. dumetorum* Phil. non Linn. (which I propose to name *F. trachylepis* . . ." appears on page 30. Whatever Druce's intentions in later years, his non acceptance of *F. trachyphylla* Hack. *ex* Druce did not appear in the same publication so that *ICBN* Art. 34.1 cannot apply.

There is, however, ambiguity in the interpretation of the pronouns in the two phrases within parentheses in Druce's account. The things (specimen, species or name) to which the three pronouns ("which", "it", and "that") refer can be interpreted in different ways. Wilkinson & Stace (1988) have interpreted the pronoun "which" in the first phrase as applying to *Festuca dumetorum* Phil. (*i.e.*, provision of a new name for an illegitimate homonym), but it may also be considered to refer to the subject of the sentence (*i.e.*, the specimen examined by Hackel). In the second phrase "it" may be interpreted as applying to either the object of the previous phrase (*i.e.*, "*F. trachylepis*") or to the subject of the sentence (*i.e.*, the specimen). The pronoun "that" may be interpreted, depending on one's interpretation of "it", as applying either to the species represented by the specimen or to the species represented by the name *F. dumetorum* Phil. If one considers "which" as applying to *F. dumetorum* Phil., the descriptive phrase "but it has not the minute prickles on the fertile glume of that species" is not sufficiently clear enough to determine whether *F. trachylepis* or the specimen is the entity with the minute prickles. Philippi's description of *F. dumetorum* (Linnaea 36:297. 1865.) states that the spikelets are "glabrae vel omnino hirtae", but does not specifically mention "minute prickles" or the lemma vestiture.

Although *Festuca trachylepis* Hack. *ex* Druce is found in both *Index Kewensis* (Prain 1921) and *Index to Grass Species* (Chase & Niles 1962) as a new name for *F. dumetorum* Phil., no mention is made of *F. trachyphylla* Hack. *ex* Druce. Both Parodi (1953) and Matthei (1982) considered *F. trachylepis* Hack. *ex* Druce to be based on *F. dumetorum* Phil., but the name *F. trachyphylla* Hack. *ex* Druce is not included in their synonymy listings. Saint-Yves (1927) did not mention either name in his monograph on South American fescues.

The name *Festuca trachyphylla* Hack. ex Druce is here considered to be a *nomen nudum* because of ambiguity in the application of the pronouns in the descriptive phrase. This interpretation allows *F. trachyphylla* (Hack.) Krajina to stand as the earliest available name at species rank for the Eurasian taxon.

Lectotypification of *Festuca* names.

In his book on North American grasses, Beal (1896) cited holotypes for two *Festuca* species names as being in F. Lamson-Scribner's herbarium. All of Scribner's herbarium, except specimens of *Panicum*, was destroyed by a fire in August 1894 in Washington (Bot. Gaz. 19:388.). Here, we select lectotypes for these names from isotype material. These are now present at US and would almost certainly have been seen by Beal (Beal 1896, page iv). The specimens cited have been annotated by Piper as being type material.

Festuca dasyclada Hack. ex Beal, *Grass. N. Amer.*, ed. 2, 2:602. 1896.
LECTOTYPE: US 556197(!); U.S.A. central Utah: 1875, C.C. Parry 93.

Festuca jonesii Vasey var. *conferta* Hack. ex Beal, *Grass. N. Amer.*, ed. 2, 2:593.
1896. LECTOTYPE: US 556199(!); U.S.A. California: San José Normal School.

In his monograph on *Festuca* in North America, Piper (1906) effectively lectotypified many names in this genus. Some of these were also from the previously destroyed herbarium of Scribner. Here, we designate new lectotypes for these names based on the material which Piper indicated as "duplicate" to the material in Scribner's herbarium.

Festuca scabrella Torrey var. *vaseyana* Hack. ex Beal, *Grass. N. Amer.*, ed. 2, 2:605.
1896. LECTOTYPE: US 556147(!); U.S.A. Colorado: Veta Pass, [alt. 9300 feet], 1886, G. Vasey.

Festuca subuliflora Scribn. in Macoun, *Cat. Canad. Pl.* 2⁵:396. 1890.
LECTOTYPE: CAN 37761(!); CANADA. British Columbia: Vancouver Island, Goldstream, gravel, 29 June 1887, J. Macoun.

Festuca vaseyana Hack. ex Beal, *Grass. N. Amer.*, ed. 2, 2:601. 1896.
LECTOTYPE: US 556146(!); U.S.A. Colorado: Veta Pass, 1884, G. Vasey.

Proposed new combinations in *Festuca*

Festuca subgenus ***Subulatae*** section ***Subuliflorae*** (E.B. Alexeev) Darbysh., *stat. et comb. nov.* BASIONYM: *Festuca* subgenus *Subuliflorae* E.B. Alexeev, Novost. Sist. Vyssh. Rast. (Leningrad) 17:47. 1980.

Alexeev (1980) considered the elongate and pubescent callus of *Festuca subuliflora* so distinctive in the genus that he created the monospecific subgenus for it. With the exception of this character, other "diagnostic" morphological and anatomical features are similar to one or more species assigned to subgenus *Subulatae*. In addition, no difference in cpDNA restriction site variation was detected between *F. subulata* Trin. and *F. subuliflora* by Darbyshire & Warwick (1992) indicating a close relationship between the type species of the two subgenera *Subulatae* and *Subuliflorae*.

Festuca ammobia Pavlick, *nom. nov.* BASIONYM: *Festuca rubra* L. subsp. *arenicola* E.B. Alexeev, Byull. Mosk. Obva. Ispyt. Prir. Otd. Biol. 87:115, figs. 3. 1982. non *Festuca arenicola* (Prodín) Soo. 1973.

Festuca pseudovivipara (Pavlick) Pavlick, *comb. et stat. nov.* BASIONYM: *Festuca rubra* L. subsp. *aucta* forma *pseudovivipara* Pavlick, Phytologia 57:5. 1985.

Festuca rubra L. subsp. *mediana* (Pavlick) Pavlick, *comb. et stat. nov.* BASIONYM: *Festuca rubra* L. subsp. *secunda* Presl var. *mediana* Pavlick, Phytologia 57:8. 1985.

Festuca subverticillata (Pers.) E.B. Alexeev forma *pilosifolia* (Dore) Darbysh., *comb. nov.* BASIONYM: *Festuca obtusa* Biehler forma *pilosifolia* Dore, in McNeill & Dore, Naturaliste Canadien 103:560. 1977.

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NEW COMBINATIONS IN MEXICAN MONOCOTS II

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ABSTRACT

New combinations are provided for seven Mexican Spiranthinae (Orchidaceae).

KEY WORDS: Nomenclature, México, Orchidaceae, Spiranthinae

Many problems are apparent in generic delimitation of the subtribe Spiranthinae. Various treatments (Schlechter 1920; Burns-Balogh 1982, 1986; Garay 1982; Szlachetko 1991a, 1991b, 1991c, 1991d, 1992a, 1992b, 1993a, 1993b, 1993c, 1994a, 1994b, 1994c) range from those that are conservative and include only one genus--*Spiranthes*, to others that recognize as many as 40 genera.

We accept the generic delimitation proposed by Burns-Balogh (1982, 1986), with a moderate number of genera, and in order to validate the names of some Mexican monocot species for the publication of *Las Monocotiledóneas Mexicanas, una Sinopsis Florística 1. Lista de Referencia* (A. Espejo & A.R. López-Ferrari, in preparation), the following combinations are proposed:

BRACHYSTELE HINTONIORUM (Todzia) Espejo & López-Ferrari, *comb. nov.* BASIONYM: *Galeotiella hintoniorum* Todzia, *Brittonia* 46:332-334, fig. 1. 1994. TYPUS: MEXICO. Nuevo León: Municipio Zaragoza, Cerro Viejo, 1840 m, 20.II.1993, G.B. Hinton, et al. 22636 (AMO,TEX).

BRACHYSTELE MARKOWSKIANA (Szlach.) Espejo & López-Ferrari, *comb. nov.* BASIONYM: *Galeotiella markowskiana* Szlach., *Fragm. Florist. Geobot.* 35:61-63, fig. 1, 2e. 1991. TYPUS: MEXICO. Oaxaca: km 58.1 Río de la Y,

in moss on tree in humid pine-oak forest, 2640 m, 12.IX.1976, O. Suárez, E. Greenwood, & E. Hagsater G-296 (AMO!).

DEIREGYNE PALLENS (Szlach.) Espejo & López-Ferrari, *comb. nov.*
BASIONYM: *Oestlundorchis pallens* Szlach., *Fragm. Florist. Geobot.* 36:30, fig. 2, 5. 1991. TYPUS: MEXICO. Oaxaca: 13.2 miles from Díaz Ordaz on the road to Cuajimaloyas, 19.VIII.1968, G. Pollard S-126 (SEL).

DEIREGYNE SHEVIAKIANA (Szlach.) Espejo & López-Ferrari, *comb. nov.*
BASIONYM: *Oestlundorchis sheviakiana* Szlach., *Fragm. Florist. Geobot.* 36:29, fig. 2-3. 1991. TYPUS: MEXICO. Chiapas: San Felipe, village near Ciudad las Casas (San Cristóbal), Mt. Huitepec "Ecatepec", 3 miles W of town, *Carlson 1600* (F,SEL).
Spiranthes carlsonae L.O. Williams *ex* Szlach., *Fragm. Florist. Geobot.* 38:114. 1993. *pro. syn.*

SCHIEDEELLA CONFUSA (Garay) Espejo & López-Ferrari, *comb. nov.*
BASIONYM: *Deiregyne confusa* Garay, *Bot. Mus. Leafl.* 28:283, t. 18C. 1980. [25.VI.1982]. *Funkiella durangensis* (Ames & C. Schweinf.) Szlach. var. *confusa* (Garay) Szlach., *Fragm. Florist. Geobot.* 36:20. 1991, "*Funkiella*".
TYPUS: MEXICO. Hidalgo: Lagoon of Mezitlán, above the shore between rocks in high grass, 20° 40' N, 98° 51' W, 1600 m, 27.III.1933, J. González *sub* E. Oestlund 2194 (AMES!,US).

SCHIEDEELLA CRENULATA (L.O. Williams) Espejo & López-Ferrari, *comb. nov.*
BASIONYM: *Spiranthes trilineata* Lindl. var. *crenulata* L.O. Williams, *Bot. Mus. Leafl.* 12:236-237. 1946. *Gularia crenulata* (L.O. Williams) Garay, *Bot. Mus. Leafl.* 28:322, t. 28C. 1980. [25.VI.1982]. *Schiedeella trilineata* (Lindl.) Burns-Bal. var. *crenulata* (L.O. Williams) Szlach., *Fragm. Florist. Geobot.* 36:16, fig. 2f. 1991. TYPUS: MEXICO. Puebla: grass field, La Mesa, Necaxa, 20° 11' N, 98° 00' W, 1600 m, 21.II.1932, F. Froderstrom *sub* E. Oestlund 2592 (AMES!).

SCHIEDEELLA PANDURATA (Garay) Espejo & López-Ferrari, *comb. nov.*
BASIONYM: *Deiregyne pandurata* Garay, *Bot. Mus. Leafl.* 28:284, t. 21A. 1980. [25.VI.1982]. *Oestlundorchis pandurata* (Garay) Szlach., *Fragm. Florist. Geobot.* 36:25, fig. 2. 1991. TYPUS: MEXICO. Durango: between Guanceví and Guadalupe y Calvo, 25° 56'-26° 28' N, 105° 56'-105° 36' W, 2000-2400 m, 19.II.1936, J. González *sub* E. Oestlund 5018 "5810" (AMES!).

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REBUTTAL TO TERRELL'S TAXONOMIC NOTES OF TURNER'S
TREATMENT OF TEXAN AND MEXICAN *HEDYOTIS*

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ABSTRACT

A vigorous rebuttal to Terrell's evaluation of my treatment of Texan and Mexican *Hedyotis* is presented. It is suggested that populational work will prove pivotal in judging between the merits of the two contrasting nomenclatural systems, this to be performed by unbiased field workers using more sophisticated techniques than those employed by the contestants concerned.

KEY WORDS: Rubiaceae, *Hedyotis*, *Houstonia*, México, Texas, Terrell, Turner

Terrell (1996b) provided a "critique" of my taxonomic treatment of the *Hedyotis nigricans* (Lam.) Fosberg complex (Turner 1995a), and yet other elements of *Hedyotis* occurring in Texas and México (Turner 1995b, 1995c, 1995d). This after an introductory defense of his acceptance of *Hedyotis*, *Houstonia*, and *Oldenlandia*, which classification I did not follow, preferring instead to follow that of Fosberg (1937) and Shinnars (1949), if not other workers, who view *Hedyotis* in the broad sense, treating the several generic segregates as but infrageneric categories. The informed reader will understand that either *Hedyotis* (s.l.) or *Hedyotis* (s.s.) is equally acceptable, unless it can be shown that the former is patently polyphyletic or perhaps paraphyletic, which to my knowledge has not been demonstrated.

The only substantive comment made by Terrell in regard to my paper is that he called to the fore an error or lapse in my key to the varieties of *Hedyotis acerosa* A. Gray in which I inexplicably substituted the name var. "*fasciculata*" for the intended var. *acerosa*. But this is no big deal: any reader could have detected the lapse, and made allowances accordingly.

What Terrell fails to comment upon adequately in his paper is the considerable intergradation between *Hedyotis acerosa* var. *acerosa* and *H. a.* var. *polypremoides* (A. Gray) W.H. Lewis in west central Texas. This was commented upon and mapped in detail by me (*cf.* Figure 1), but these were crudely remapped and treated by Terrell

as if the taxa were nonintergrading *sympatric* subspecies, although he noted that there was intergradation in regions of overlap, as I also surmised. Since Terrell claims to have done field work over the range of *H. acerosa*, as I myself have, he must know that in the region of intergradation, the populations vary, some having specimens mostly resembling var. *acerosa*, some with specimens mostly resembling var. *polypremoides*. It matters not if Terrell wishes to call these two intergrading taxa subspecies: the latter categories can each house a morphogeographical variety, much as a monotypic subgenus can house a single species. He might *think* that the use of the terms "subspecies" and "variety" are mutually exclusive, but I do not read the *International Code of Botanical Nomenclature* in this fashion, nor should Terrell.

Terrell states (1979, but see his contrary views as expressed in 1996 as noted below) that "the differences between these two entities are on a higher level than the usual variety. In addition, the geographical separation in New Mexico and adjacent lands is clearly marked, despite intergradation in western Texas and northern Mexico." I never denied that the two taxa might not belong to different subspecies: I merely treated the two at the varietal level consistent with the treatment accorded most intergrading infraspecific categorical units by most modern workers (e.g., Cronquist, numerous publications; Turner 1956; *etc.*, cf. Kapadia 1963 for a reasonable review). I recognized four morphogeographical elements under the fabric of *Hedyotis acerosa*, providing a key to these and maps for each. That Terrell might not *think* these populational units worthy of recognition is fine with me, but he has not offered any real data to disprove their reality.

Terrell contends that "the type specimen of *Hedyotis acerosa*, Wright 237 (see Terrell 1996a), was collected in 'Western Texas to El Paso, New Mexico' in 1849 . . ." but he fails to note that this name needs lectotypification, as I clearly pointed out, and that Wright 237 was collected in what is now Kinney or Val Verde counties, Texas (east of the Pecos River) during June of 1849, and Terrell (were he to have looked this up in Wright's published field notes), need not ascribe its type locality as somewhere between "western Texas" and "El Paso, New Mexico [sic]," the latter region a rather meaningless locale, geographically speaking.

Further, commenting upon the veracity of my var. *potosina* B.L. Turner, he contends that the pulvinate low plants from southernmost Coahuila and San Luis Potosí, México, having elongate corolla tubes, are "part of a cline that northward has taller plants with coarser leaves and longer internodes. In southern Texas [a lapse here, he should have said in western or trans-Pecos Texas!], there are collections that are somewhat transitional, with rather fine leaves and small stature." I take the few sheets he cited in defense of this statement to be depauperate or otherwise atypical plants of var. *acerosa*, as occurs in populations everywhere, be these remarkably variable or remarkably invariable. In truth, there are no *populations* in north central México or western Texas which resemble the *populations* of var. *potosina* called to the fore in my paper, nor is there a cline of *populations* between these in the region concerned. I have traveled over this terrain many years now and would have been happy to find such, but none was observed. In fact, var. *potosina* is probably better marked than var. *polypremoides*, which Terrell accords subspecific status, and I was surprised to see that Terrell did not "elevate" or position var. *potosina* in its own subspecies, as he did var. *polypremoides*; certainly, the latter shows much greater "clinal" intergradation over a broader area than does var. *potosina*, as is clear from both of our distributional maps of the former complex. A similar comment could also

be made about his reluctant acceptance of my var. *gypsophila* B.L. Turner, this being much better marked than var. *polypremoides*. Terrell (1996b) also glibly passed over my somewhat more weakly circumscribed var. *tamaulipana* B.L. Turner, contending that, while well isolated and possessed of a differing calyx and corolla, it was not worthy of recognition because it somewhat resembled a collection of var. *polypremoides* from Jeff Davis Co. in trans-Pecos Texas (Rollins & Chambers 2759 [US]), as if a single atypical element from the mile-high volcanic outcrops of the Davis Mountains might mitigate the localized variation found in the populational units of the much lower calcareous outcrops of the Tamaulipan shrublands of northeastern México.

More disturbing, to me at least, has been Terrell's confusing presentation of the infraspecific variation found in *Hedyotis acerosa*. Thus, Terrell (1979), originally recognized two subspecies in this taxon, but in his 1996a revision he stated that "The variation [in *H. acerosa*] seems a continuum; there are no apparent discontinuities, and I now recognize only observable species." Pray tell: so why reinvent the subspecies so as to castigate my recognition of these at the varietal level?

Terrell (1996b) also waxes in a grumbling fashion about my recognition of *Hedyotis palmeri* (A. Gray) W.H. Lewis var. *muzquizana* B.L. Turner, which is clearly a morphogeographical populational unit, but must we believe his statement that "My presently limited sample leaves me [Terrell] reluctant to accept the existing morphological data as conclusive concerning *muzquizana*, pending further collecting of it."? In my opinion, there are sufficient collections of the taxon (LL,TEX) to venture the name I have proposed, although Terrell might mean *he* prefers to collect this himself before accepting the putative taxon.

It should also be noted that Terrell (1996b) sweeps under the fabric of *Hedyotis nigricans* var. *nigricans* my proposed varieties, *H. n.* var. *austrotexana* B.L. Turner and *H. n.* var. *papillacea* B.L. Turner, claiming the characters separating these "to be minor." But, no more minor than the varieties *H. n.* var. *floridana* Standl. and *H. n.* var. *pulvinata*, both weakly differentiated endemics of Florida, which Terrell accepted. Indeed, had Terrell *not* recognized the latter two morphogeographical units as worthy of nomenclatural status, I perhaps would not have provided formal varietal status to the two Texas populational systems. Thus, Terrell set the minimal standards for varietal recognition within *H. nigricans* in his 1986 paper (Sida 11:471-481).

Finally, it seems worth noting that Terrell passes over my proposed *Hedyotis pooleana* B.L. Turner (Turner 1995d), claiming this to be but part of the variation of his concept of *H. mullerae* Fosberg, a species of north central México. I was disappointed that he deigned even to examine the only specimen of *H. pooleana* known to me, the holotype (TEX). The differences between my proposed *H. pooleana* and his *H. mullerae* are certainly as great as the differences between *Houstonia butterwickiae* Terrell (a localized taxon in close proximity to *Hedyotis pooleana*) and the widespread *Hedyotis nigricans*. But he who erects a taxon likes to stand by it, myself included.

In the final analysis, any two differing systematic treatments are likely to be tested by field workers, who will attest to their populational validity, or by DNA workers using restriction site analysis, or some such, the latter presumably gathered and analyzed without bias. I sincerely believe that my classification of *Hedyotis*, vis-à-vis

that of Terrell, will meet the tests imposed; perhaps Terrell feels the same about his classification.

Field workers in the region concerned, myself included, should make a concerted effort to examine and comment upon *populational* units of *Hedyotis*. Indeed, such observations and extrapolations from these led to my particular treatment. I do not doubt that Terrell has done considerable field work in Texas and perhaps north central México, but this has not been especially obvious to me in the collections he has assembled and distributed, nor is this obvious from the information presented in his critique of my own work.

There is a truism in systematic botany, or should be: other things being equal (*i.e.*, brains and experience), the systematist most likely to know best the specific and infraspecific boundaries of a given group is that worker having the most field experience with the taxa concerned. I care not to judge the merits of the two antagonists in the present controversy, but I do find the competing hypotheses stimulating; hopefully some younger worker with more field experience and better sampling techniques will ultimately resolve the systematic problems posed in the present paper.

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**TALINUM RUGOSPERMUM HOLZ., NEW TO LOUISIANA WITH NOTES ON
TERETE-LEAVED TALINUM IN LOUISIANA**

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ABSTRACT

Talinum rugospermum Holz. (Portulacaceae), previously unreported in Louisiana, has been found in xeric sandylands in Caddo Parish. *Talinum parviflorum* Nutt. also occurs in Louisiana, but on saline prairies and sandstone outcrops.

KEY WORDS: *Talinum rugospermum*, *Talinum parviflorum*, Portulacaceae, Louisiana

INTRODUCTION/METHODS

Talinum rugospermum Holz., a north-central and Great Plains species recently found in Texas (Nixon, *et al.* 1980; Cochrane 1993; Singhurst 1996; Texas Natural Heritage Program 1995; Texas Organization for Endangered Species 1993), has not been reported for Louisiana (MacRoberts 1989; Teague & Wendt 1994; Louisiana Natural Heritage Program 1995).

In light of the frequency with which Singhurst (1996) reported *Talinum rugospermum* in east Texas, we reexamined herbarium collections (NLU, LSU, LSUS) from Louisiana. Herbarium material for terete-leaved *Talinum* is often indeterminate: seldom are flowers collected, seeds are easily lost after the plant has been pressed, and roots are not always present. Fresh, or at least well preserved, material is almost a necessity for a positive identification (Ware 1967). Therefore, beginning in May 1997 we examined flowering specimens in the field and plants collected from ten locations in east Texas and west Louisiana and maintained in the laboratory.

Our laboratory sample consisted of plants from five sandstone outcrops in Natchitoches and Sabine parishes, Louisiana, and Jasper County, Texas (MacRoberts & MacRoberts 1993, 1995a; Marietta & Nixon 1984), two saline prairies in Winn and

Caddo parishes, Louisiana (Smith 1988), and three xeric sandylands in Caddo Parish, Louisiana, and Anderson and Nacogdoches counties, Texas (MacRoberts & MacRoberts 1995b; Nixon, *et al.* 1980).

Louisiana and east Texas have only two terete-leaved *Talinum*. We obtained from Robert W. Kiger (pers. comm.) a key for terete-leaved species for this region, which we have slightly modified on the basis of our observations.

1. Stamens 13-28; stigmas 3, elongate, about one-third length of style; seed coat rugose (at 10 \times); root deep.....*T. rugospermum*
1. Stamens 5-14; stigma 1, capitate; seed textured but not rugose (at 10 \times); root shallow..... *T. parviflorum*

RESULTS

We found *Talinum rugospermum* at the xeric sandyland sites in Caddo Parish, Louisiana, and Nacogdoches and Anderson counties, Texas. The plants at all other sites were *T. parviflorum*.

In Louisiana and east Texas, on sunny days *Talinum rugospermum* flowers open between 4:15 to 6:00 pm CDT. Petal length is about 8 mm; petals are mucronate, and magenta. The style splits to about one third of its length into three stigmas (Figure 1). When the flower is fully open, the stigmas spread widely (see illustration in Gleason 1968). There are 13 to 28 stamens; in a sample of 111 greenhouse flowers from Caddo Parish and Nacogdoches County, the mean number of stamens was 21.38, SD 3.24. Anthers are small and spherical or slightly oblong. The seed is corrugate-rugose and about 1.25 mm wide.

Talinum parviflorum flowers open between 5:00 and 7:00 pm, an hour after *T. rugospermum*. Petals are about 5.5 mm long, not noticeably mucronate, and light pink. Stigmas are capitate but trilobed. Stamens number between 5 and 14. In a sample of 183 greenhouse flowers from seven sites in western Louisiana and eastern Texas, the mean number of stamens was 8.02, SD 1.74. Anthers are oblong. The seed is textured but not corrugate-rugose and is about 1 mm wide.

There was a slight overlap between the species in stamen number. In the sample of 183 *Talinum parviflorum* and 111 *T. rugospermum*, one *T. parviflorum* had 13, and one 14 stamens; and two *T. rugospermum* had 13 stamens.

Talinum rugospermum in Caddo Parish grows in Betis loamy fine sand (Edwards, *et al.* 1980). The sands are well drained and acidic. These soils are low in most minerals, for example, P, K, Ca, and Mg (MacRoberts & MacRoberts 1995b). Associated species include *Berlandiera punila* (Michx.) Nutt., *Clematis reticulata* Walt., *Cnidoscolus stimulosus* (Michx.) Engelm. & A. Gray, *Commelina erecta* L., *Coreopsis intermedia* Sherff, *Crataegus uniflora* Muenchh., *Cyperus retrofractus* (L.) Torrey, *Dalea villosa* (Nutt.) Sprengel var. *grisea* (Torrey & A. Gray) Barneby, *Froelichia floridana* (Nutt.) Moq., *Helianthemum georgianum* Chapm., *Hymenopappus artemisiaefolius* DC., *Monarda punctata* L., *Opuntia humifusa* (Raf.)

Raf., *Paronychia drummondii* Torrey & A. Gray, *Physalis heterophylla* Nees, *Pinus echinata* P. Mill., *Pinus taeda* L., *Pediomelum hypogaeum* (Nutt. ex Torrey & A. Gray) Rydb. var. *subulatum* (Bush) J. Grimes, *Prunus umbellata* Ell., *Quercus incana* Bartr., *Q. stellata* Wang., *Rhus aromatica* Ait., *Scutellaria cardiophylla* Engelm. & A. Gray, *Stillingia sylvatica* L., *Stylosanthes biflora* (L.) B.S.P., *Tradescantia reverchonii* Bush, *Vaccinium arboreum* Marsh., *Vitis aestivalis* Michx., *Vitis rotundifolia* Michx., and *Yucca louisianensis* Trel.

Talinum rugospermum in east Texas occurs in similar habitat with the same associated species (Singhurst 1996, pers. obs.).

We examined herbarium collections of terete-leaved Louisiana *Talinum* from NLU, LSUS, and LSU. For reasons given above, some specimens were indeterminate. Using mainly seed and habitat characteristics, we conclude that *T. parviflorum* occurs in Sabine, Caddo, and Natchitoches parishes. Our observations on fresh material definitely put *T. parviflorum* in Caddo, Sabine, Winn, and Natchitoches parishes. Herbarium material for Red River and Vernon parishes is indeterminate, but the habitat and plant size for both specimens suggest they are *T. parviflorum*. Except our earlier Caddo Parish collection (MacRoberts & MacRoberts 2757 [LSUS] originally misidentified as *T. parviflorum*), none of the herbarium specimens is *T. rugospermum*.

The distribution of terete-leaved *Talinum* in Louisiana is shown in Figure 2.

We found *Talinum parviflorum* in two habitats: shallow soils on sandstone outcrops in Sabine and Natchitoches parishes and on saline prairies in Winn and Caddo parishes. We have described the former sandstone outcrop plant community in detail elsewhere (MacRoberts & MacRoberts 1993). The saline prairies have yet to receive detailed attention (Smith 1988). Both habitats are very different from the xeric sandylands in which *T. rugospermum* occurs (MacRoberts & MacRoberts 1995b).

Even in the limited sample we examined for this project, we noted what appear to be consistent morphological differences among *Talinum* populations. For example, the *T. parviflorum* populations differed from each other in flower size, stamen number, and style length relative to stamen length: in some populations the stigma extends beyond the anthers; in others the stigma and anthers are the same height. Such local differences have been noted by Reinhard & Ware (1989), who feel it would be impractical and undesirable to recognize such local variations taxonomically.

DISCUSSION

The literature on *Talinum* and the communities in which it grows suggests that there is little awareness that *Talinum* occurs in east Texas and west Louisiana (Carter & Murdy 1985) or that sandstone outcrops floristically comparable to those found in Tennessee, Arkansas, and Alabama (Quarterman, *et al.* 1993) occur in east Texas and Louisiana. Terete-leaved *Talinum* has been known from Louisiana since at least the mid-nineteenth century when Riddell (1852) included it in his *Catalogus Florae Ludovicianae*. Central Louisiana and east Texas sandstone outcrops are well known

plant communities and have been the subjects of several floristic surveys (Marietta & Nixon 1984; MacRoberts & MacRoberts 1993).

Talinum parviflorum is on the Louisiana Natural Heritage Program (1995) rare plant list. It is rare because its habitat (saline prairies, sandstone outcrops) is vanishing. The xeric deep sand habitat in which *T. rugospermum* occurs is also rare in Louisiana (MacRoberts & MacRoberts 1995b). These three plant communities are on the Louisiana Natural Heritage imperiled list (Smith 1988; Teague & Wendt 1994).

Talinum rugospermum has been under consideration for listing as a federally endangered or threatened species. Cochrane (1993:33) studied its status and distribution and found that, at least in the northern part of its distribution, it "is not in imminent danger of extinction at the national level, but it is a potentially vulnerable species because it occurs in only a few scattered localities over most of its total range, exists in low numbers at most stations, and occupies very restricted habitats." He adds that "few populations enjoy public or private preservation status." This last point underlines the problem: both *T. parviflorum* and *T. rugospermum* favor habitat that is being destroyed rapidly. Fortunately, most known Louisiana *T. parviflorum* sites are on the Kisatchie District of the Kisatchie National Forest where they are protected (MacRoberts & MacRoberts 1995a). The one known site in Louisiana for *T. rugospermum* is in an active oil field and has a four-wheeler trail through it. Since it only covers a few square meters, its existence is precarious.

DOCUMENTATION

Talinum rugospermum: UNITED STATES. Louisiana: Caddo Parish: MacRoberts & MacRoberts 2757 [LSUS], 3338 [LSU], 3339 [CM].

Talinum parviflorum: UNITED STATES. Louisiana: Caddo Parish: Overby 189 [NLU]; MacRoberts & MacRoberts 3354 [LSU,LSUS]. Natchitoches Parish: Brown 8001 [LSU]; MacRoberts & MacRoberts 2056 [SFRP], 1758, 3332 [LSU], 1726, 3313 [LSUS], 1759, 1780 [VDB], 3313 [CM,WIS], 3333 [WILLI]; Thomas 107220, 110300 [NLU]. Red River Parish: Gilmore & Smith 3830 [NLU]. Sabine Parish: Allen 12816 [NLU]; MacRoberts & MacRoberts 3359 [LSU]. Vernon Parish: Thomas 105079 [NLU]. Winn Parish: MacRoberts & MacRoberts 3353 [LSU].

While this paper is concerned with terete-leaved *Talinum* in Louisiana, we did collect some information on Texas *Talinum* during the course of the work. While our Texas work was not thorough, and we did not examine herbarium collections, we can report *Talinum parviflorum* from Newton Co. (MacRoberts & MacRoberts 3360 [TEX]) and Jasper Co. (Marietta 116 [ASTC]), and *T. rugospermum* from Nacogdoches Co. (MacRoberts & MacRoberts 3334 [TEX], 3335 [WIS], 3336 [LSUS], 3337 [WILLI]) and Anderson Co. (MacRoberts & MacRoberts s.n. [TEX]). The Nacogdoches Co. site is where Nixon, et al. (1980) first reported this species from Texas.

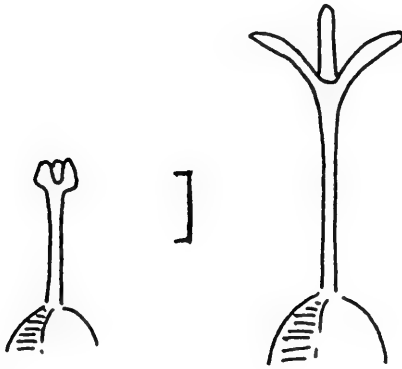


Figure 1. Pistil of T. rugospermum (right) and T. parviflorum (left). Scale is 1 mm.

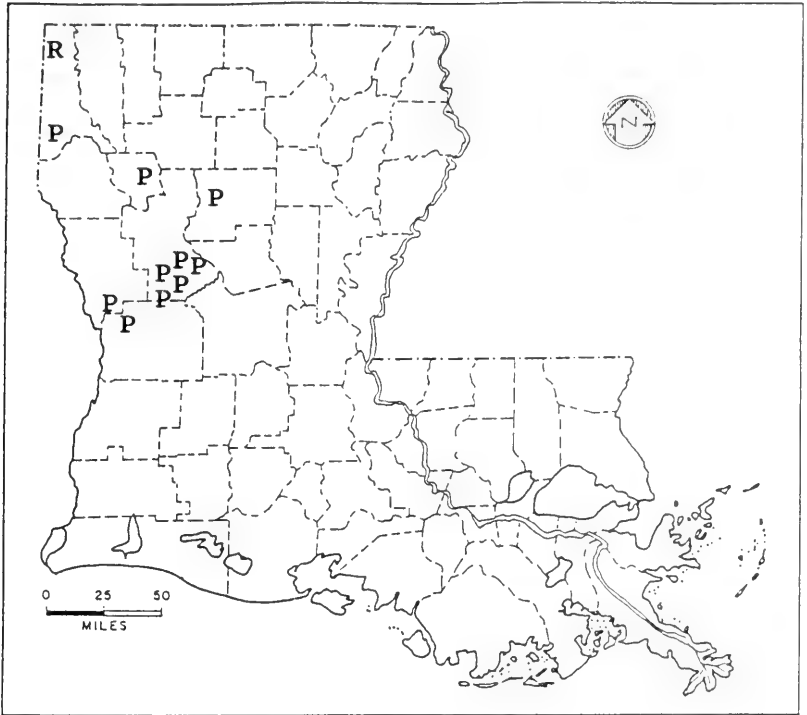


Figure 2. Distribution of *Talinum rugospermum* (R) and *T. parviflorum* (P) in Louisiana.

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NEW SPECIES OF *CALATHEA* (MARANTACEAE) FROM EASTERN BRAZIL

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ABSTRACT

Calathea fatimae from northern Edo. Rio de Janeiro and *C. annae* and *C. grazielae*, grown in cultivation, are described as new. All three species are in *C.* section *Breviscapus*. *Calathea fatimae* is related to *C. zebrina*; *C. annae* is most closely related to *C. louisae* and *C. albertii*; and *C. grazielae* to *C. aemula*.

KEY WORDS: *Calathea*, Marantaceae, Brazil, taxonomy, horticulture

CALATHEA FATIMAE H. Kenn. & Marcelo, *spec. nov.* (Figure 1). TYPE: BRAZIL. Cultivated at Sítio Roberto Burle Marx, Barra de Guaratiba, Munic. Rio de Janeiro, Edo. Rio de Janeiro, Brazil, accession number MAR-101, from rhizomes collected by *Fátima Gomes de Souza* from Morro do Coco, ca. 40 km north of the city of Campos, Munic. do Campos, Edo. Rio de Janeiro, Brazil, flowered in cultivation 11 Jan. 1991, *H. Kennedy & M. de F. Gomes de Souza 4700* (HOLOTYPE: RB; Isotypes: K, Sítio RBM, UBC).

Planta 1.0-1.9 m alta. Folia basilia 1-3, caulina 0, ovata vel obovata, obtusa cum acumine, basi acuta vel obtusa, supra viridia glabra, secus costam pallide viridia, minute tomentosa, subtus purpurea, glabra; pulvinus sparse minute tomentosus ad 10 cm longus, petiolus viridis interdum rufo-tinctus, minute tomentosus 30-75 cm longus; vagina minute tomentosa, 35-65 cm longa. Spica 1, subglobosa vel ovoida ad 9.0 × 5.5 cm, pedunculo minute tomentoso 50-68 cm longo elevata; bracteae ad 40, spiraliter dispositae, coriaceae, depresso ovatae vel late ovatae, apice marcescenti, obtuso vel rotundato, virides, adpresse tomentosae, paria florum ad 10 vel ultra, prophyllum et bracteae secundariae dense minute tomentosis apicibus marcescentibus, bracteolis 2, membranaceis; ovarium album, glabrum; sepala membranacea, elliptica, rotundata, ad apicem violacea, ad 11 mm longa;

corollae et staminodia flava, tubus ad 15 mm longus, lobis ellipticis obtusis, ad 13 mm longis; staminodium exterius late ellipticum retusum, ad 12 mm longum, staminodium callosum interdum purpureo-pictum ad 13 mm longum.

Rosulate herb, 1.0-1.9 m high, bearing 1-3 basal leaves. Cataphylls initially herbaceous, rapidly dying, becoming papery, narrowly ovate, apex apiculate, initially reddish purple becoming brown, innermost cataphyll 34-62 cm long. Leaf blade firm, ovate to obovate, apex obtuse with acumen, base acute to obtuse; 50-67 × 16-29 cm. Leaf blade above dark green with velvety sheen, glabrous, midrib pale yellow to whitish green, minutely tomentose; leaf surface below purple or lightly tinged purple, glabrous except minutely tomentose at very apex, midrib deep olive-green tinged with purple apically, minutely tomentose (14× magnification) in basal 2-3 cm, glabrous apically. Pulvinus broadly elliptic in cross-section, deep olive-green, sparsely minutely tomentose to subglabrous in age on upper side, articulate with slight ridge at junction with petiole, pulvinus smaller in diameter than petiole, 6.5-10 cm long. Petiole green, occasionally tinged reddish brown, minutely appressed tomentose (14×), 30-75 cm long. Leaf sheath (not auriculate, green or tinged with maroon, minutely appressed tomentose (14×), (12-)35-65 cm long.

Inflorescence terminal, 1 per shoot, borne below the leaf blades, imbricate, subglobose to ovoid, 6-9 × 4.5-5.5 cm. Peduncle with groove on one side, brownish green, minutely tomentose, 50-68 cm long. Bracts 28-40, spirally arranged, coriaceous initially, rapidly dying back at apex, broadly depressed ovate to broadly ovate in upper bracts, apex obtuse to rounded with acumen or rounded, 1.8-2.7 × 2.3-2.7 cm. Outer surface of bracts initially green, dying apically becoming brown, appressed tomentose; inner surface green, upper 1/4 sparsely tomentose, glabrous below. Bracts subtending up to 10 or more flower pairs. Flowers not shed from inflorescence, dying in place and drying black, the inflorescence thus appearing black. Bicarinate prophyll membranaceous, broadly elliptic, apex obtuse, translucent pale tan, dying apically turning black, densely minutely appressed tomentose throughout abaxially, hairs rufous, 2.2-2.6 × 2.1-2.6 cm, 1.2-1.3 cm wide, carina to carina. Secondary bract membranaceous, elliptic, apex acute, translucent pale tan, dying and turning black apically, densely minutely appressed tomentose, 2.2-2.6 × 1.2-1.3 cm; outermost ones occasionally lacking. Bracteoles 2 per flower pair, membranaceous, medial, both carinate, apex tomentose, ca. 1.8 cm long.

Sepals herbaceous to membranaceous, elliptic, apex rounded, white basally, upper 1/3-1/2 red-purple, sparsely minutely tomentose (14×), 9.5-11 × 3-4 mm. Corolla and staminodes light yellow; corolla tube slightly curved, glabrous, 13-15 mm long; corolla lobes subequal, elliptic to narrowly elliptic, apex obtuse, margins infolded appearing acute, glabrous, 11-13 × 3.5-5.0 mm. Outer staminode broadly elliptic, apex retuse, slightly reflexed downward, 11-12 × 9-10 mm. Callose staminode callose except apical 2 mm petaloid, apex obtuse, shallowly emarginate with sides reflexed, occasionally streaked with purple, 12-13 × 5-6 mm. Cucullate staminode ca. 6.5 × 5.0 mm. Stamen with lateral petaloid appendage to 1 mm wide extending to tip of anther; anther 2.5 mm long, upper 3 mm of filament free. Style and stigma pale yellow, back of style turning black after tripping. Ovary white, glabrous, 3 × 2 mm. Capsule unknown.

Calathea fatimae belongs to *C.* section *Breviscapus* Benth. and is most closely related to *C. zebrina* (Sims) Lindl. They share an acaulescent habit, the "velvety"

sheen of the leaves, numerous spirally arranged bracts, and the frequent retention of unpollinated flowers in the inflorescence which turn black upon drying. *Calathea fatimae* is a very striking foliage plant because of the contrast of the pale midrib region with the dark green above and the purple underleaf. It clearly has horticultural potential as a landscape plant in the wet tropics and as a house plant in the temperate region. The corolla and staminodes turn black upon drying or when preserved in 70% ETOH. This same reaction is seen in *Calathea capitata* (Ruiz & Pav.) Lindl. which likewise shows a color change in the style after tripping.

Calathea fatimae is named in honor of Sra. Maria de Fátima Gomes de Souza whose organization, documentation, and vouchering of the living collections, especially Marantaceae, and supervision of the herbarium for Fundação Nacional Pro-Memoria Sítio Roberto Burle Marx has been invaluable to both botanists and horticulturists. The late Roberto Burle Marx requested that this species, which she had collected, be named in her honor and also commissioned a painting of it by Mr. Mark Fothergill. The painting is at Sítio RBM.

CALATHEA ANNAE H. Kenn. & Marcelo, *spec. nov.* (Figure 2). TYPE. Cultivated at Sítio Roberto Burle Marx, Barra de Guaratiba, Edo. Rio de Janeiro, Brazil, accession number MAR-1, from Brazil, Edo. unknown, 11 Jan. 1991, *H. Kennedy & M. de F. Gomes de Souza 4696* (HOLOTYPE: RB; Isotypes: K, RB, Sítio RBM, UBC).

Planta caulina 1.2-1.7 m alta, frequenter demum ramificans. Folia basalia 0-1, caulina 1-4(-5), herbacea, ovata, interdum elliptica, obtusa cum acumine, base rotundata vel truncata, ad 53 × 23 cm, supra nitida saturate viridia, glabra, subtus purpurea, glabra; pulvinus olivaceus vel purpureo-tinctus, minute tomentosus, ad 5.5 cm longus; petiolus atroviridis interdum rufotinctus minute tomentosus ad 48 cm longus; vagina minute tomentosa, in foliis caulinis 10-21 cm longa. Spicae 1-3, ellipsoideae vel subcylindricae 6.5-9.5 cm longae, pedunculo 4.5-15 cm longo; bracteae 10-30 spiralliter dispositae herbaceae reniformae vel transverse ellipticae apice rotundato cum acumine vel obtuso recurvato, virides 2.5-2.8 cm longae; paria florum ad 8, bracteolis 1; ovarium album glabrum; sepala anguste elliptica vel anguste obovata rotundata; corolla et staminodia crenea, tubus corollae ad 24 mm longus; lobi anguste elliptici acuti vel obtusi; staminodium exterius late ellipticum emarginatum, staminodium callosum oblongo-obovatum.

Causcenscent herb 1.2-1.7 m high. Flowering shoots bearing (0-)1-4(-5) leaves, 0-1 basal and (0-)1(-2) cauline on the main stem; axillary shoots formed in the axil of the leaf subtending the inflorescence bear 2-3 leaves and an inflorescence. Up to 3 axillary inflorescences may be produced in this manner. Cataphylls stiff, thickened basally, narrowly ovate, apex rounded, apiculate, purple, minutely tomentose (14×). Leaf blade herbaceous, ovate, occasionally elliptic, apex obtuse with acumen to acute in smaller leaves, base rounded to truncate, very shortly attenuate, (18-)28-53 × (10-) 13-23 cm. Leaf blade above shiny deep green, glabrous, midrib olive-green, purple apically, sparsely minutely appressed tomentose (14× magnification). Pulvinus elliptic in cross-section deep olive-green or tinged with purple, yellow-green just at junction with petiole, minutely appressed tomentose (14×), nearly confluent

with petiole, pulvinus slightly larger in diameter, (1.4-)2.5-5.5 cm long. Petiole dark green to brownish green, minutely appressed tomentose, (1.8-)13-48 cm long. Leaf sheath not auriculate, dark green to brownish, minutely appressed tomentose, sheath of cauline, subtending leaf (4.5-)10-21 cm long; others 15-58 cm long. Stem dark green tinged purplish, minutely appressed tomentose (14 \times), felt not seen; internode between subtending leaf and next lower (second) leaf 14-71 cm, internode between second and third leaves, when present, 30-51 cm long.

Inflorescences 1-3, 1 terminal on main shoot, additional inflorescences terminating the 1-2 axillary shoots, rarely the inflorescence borne on a separate non-leafy shoot subtended by a bladeless sheath, ellipsoid to subcylindric, 6.5-9.5 \times 3-5 cm. Peduncle green with groove along one side, minutely appressed-tomentose at base, sparsely so above to subglabrous in apical half, 4.5-15 cm long. Bracts 10-30, spirally arranged herbaceous, lower ones reniform to transverse elliptic, apex rounded with acumen, upper bracts elliptic, apex obtuse, the apical margin recurved, 2.5-2.8 \times 2.7-5.2 cm; each subtending up to 8 flower pairs. Outer surface of bract shiny green, basal 1/3 minutely tomentose (14 \times magnification), gradually sparser above and glabrous near apex, inner surface shiny lighter green, glabrous. Bicarinate prophyll membranous, ovate, apex rounded, translucent chartreuse green, minutely appressed tomentose on sides, center and carina glabrous, 2.4-2.7 \times 1.5-2.0 cm, (0.6-)0.9-1.3 cm wide, carina to carina. Secondary bract membranous, ovate, apex rounded, translucent chartreuse, minutely appressed tomentose at sides and apex, 2.0-2.5 \times 1.3-1.7 cm. Bracteole 1 per flower pair, medial, carinate, glabrous, 1.4-1.8 cm long.

Flowers open, shed from inflorescence if not pollinated. Sepals herbaceous centrally, margins hyaline, narrowly elliptic to narrowly obovate, apex rounded, white at base, apical 2/3 chartreuse, glabrous, 14-16 \times 4-5 mm. Corolla and staminodes cream-colored, glabrous; corolla 32-36 mm long, tube 22-24 mm long; corolla lobes subequal, narrowly ovate to narrowly elliptic, acute to obtuse, ca. 11-12 \times 4-6 mm. Outer staminode broadly elliptic, emarginate, 12-14 \times 9-11 mm. Callose staminode oblong-obovate, apical 3 mm petaloid, the rest callose, ca. 12 \times 6 mm. Cucullate staminode white at tip, ca. 6 \times 4 mm. Stamen with lateral petaloid appendage to 1.5 mm wide extending to basal 1/3 of anther; anther 2 mm long. Style and stigma cream-colored. Ovary smooth, white, glabrous. Capsule unknown.

Calathea arnae also belongs to *C.* section *Breviscapus* and is most closely related to *C. louisae* Gagnep. and *C. albertii* I.W. Bailey & Raffill (syn. *C. glazioui* Petersen non Körn.). It is somewhat less closely related to *C. lietzei* E. Morren. The above species all have wider than long spirally arranged green bracts; herbaceous green sepals; cream-white corolla and staminodes with an apically petaloid callose staminode and leaves purple beneath. *Calathea arnae* is distinguished from *C. louisae* and *C. albertii* by the dark green, unpatterned, leaves; the taller stature (>1 m vs. <0.9 m high); the development of axillary shoots bearing additional inflorescences in the axil of the leaf subtending the inflorescence; the deep green vs. pale green or white bracts. The development of axillary shoots (and additional inflorescences) is shared with *C. lietzei*. The unpatterned leaves and more numerous bracts (10-30 vs. 3-7) readily distinguish it from *C. lietzei*.

Calathea arnae is named in honor of pianist Anna Candida, the musical colleague of the late Roberto Burle Marx, at his request that she be so honored. He



Fig. 1. *Calathea fatimae*. A. Habit. B. Inflorescence. C. Flower on upper leaf surface. Measurement in cm.



Fig. 2. *Calathea annae*. A. Habit. B. Inflorescence. C. Flower on upper leaf surface. Measurement in cm.



Fig. 3. *Calathea grazielae*. A. Habit. B. Inflorescence with flowers. C. Flower with mm ruler on upper leaf surface. Measurement in cm.

commissioned a watercolor painting of *C. annae* by Mr. Mark Fothergill which is at Sitfo RBM.

CALATHEA GRAZIELAE H. Kenn. & Marcelo, *spec. nov.* (Figure 3). TYPE: BRAZIL. Cultivated at Sítio Roberto Burle Marx, Barra de Guaratiba, Munic. Rio de Janeiro, Edo. Rio de Janeiro, Brazil, from rhizomes collected in Brazil, Edo. unknown, flowered in cultivation 19 Jan. 1991, *H. Kennedy & M. de F. Gomes de Souza 4699* (HOLOTYPE: RB; Isotypes: K,MO,Sítio RBM,UBC).

Planta caespitosa ad 90 cm alta. Folia basalia, 3-4 in quoque surculo principali, 2-3 in quoque surculo axillari, ovata, breviter acuminata vel obtusa cum acumine, base rotundata vel obtusa, brevissime angustata, ad 42×22 cm, supra smaragdina splendentia glabra, subtus nitentia viridi-grisea purpureo picta vel nebulosa, glabra; pulvinus sparse minute tomentosus 2.0-3.5 cm longus; petiolus obscure brunneo-vinosus minute tomentosus ad 31 cm longus; vagina obscure brunneo-vinosus minute tomentosa. Spicae 1-3, ellipsoideae vel cylindrica $4-11 \times 3.5-6.0$ cm, pedunculo velutino 11-18 cm longo; bracteae 50-120, spiraliter dispositae, herbaceae, depresso obovatae, obtusae cum acumine apice recurvato, virides interdum purpureo-pictae, velutinae, ad $3.4 \times 4.0(-4.6)$ cm; sepala membranacea, obovata vel elliptica, obtusa, glabra, ad 13 mm longa; corollae aureae, glabrae, tubus 38-45 mm longus; lobis ellipticis ad 13 mm longis; staminodia aurea, staminodium exterius obovatum, emarginatum, ad 13×10 mm, staminodium ad apicem vix petaloideum ad 10×5 mm, ovarium glabrum.

Rosulate herb, 0.5-0.9 m high, shoots densely clustered, main shoot bearing 3-4 basal leaves with axillary shoots bearing 2-3 leaves developing in the axils of the upper 2-3 leaves. Cataphylls, narrowly ovate, apiculate, purple. Leaf blade herbaceous, ovate, apex obtuse with acumen to shortly acuminate, base obtuse to rounded, abruptly short acuminate, $32-42 \times 13-22$ cm. Leaf blade above sparkling dark green with midrib pale to whitish green, glabrous; leaf surface below semi-shiny light grey-green, irregularly streaked and tinged with purple, glabrous, midrib tinged purple toward base, apically 3/4 yellow-green, glabrous. Pulvinus broadly elliptic in cross-section, same diameter as petiole, dark maroon, occasionally with a light green line along front, sparsely minutely appressed tomentose, more sparsely so along back, 2.0-3.5 cm long. Petiole dark purple-brown, sparsely minutely appressed tomentose (seen at $14\times$), 6-31 cm long. Leaf sheath not auriculate, dark purple-brown, minutely appressed tomentose, hairs borne on a minute cushion of cells, hairs longer and more dense toward base, visible to the naked eye, 18-40 cm long.

Inflorescences 1(-3) per shoot, the first one terminal on the main shoot, additional ones terminal on lateral shoots, imbricate, ellipsoid to cylindrical, $4-7(-11) \times 3.5-6.0$ cm. Peduncle green streaked or tinged with purple apically or purple throughout, densely velvety tomentose, less densely so near base, 11-18 cm long. Bracts 50-120 (-147), spirally arranged, depressed obovate, apex obtuse with acumen, upper margin and apex recurved, $2.3-3.4 \times 2.1-4.0(-4.6)$ cm, the first and second bracts the widest, 3.0-4.6 cm wide; each bract subtending up to 2 or more flower pairs. Outer surface of bracts light green, lowermost bracts may be tinged with purple, velvety tomentose; inner surface shiny, pale green, glabrous. Bicarinate prophyll

membranaceous, ovate to elliptic, apex rounded, occasionally retuse, translucent pale green apically, colorless below, glabrous at base, upper half sparsely pilose along sides, 2.1-2.6 × 1.4-2.1(-2.5) cm, 0.7-1.1 cm wide, carina to carina. Secondary bract membranaceous, ovate, apex rounded, pale translucent green apically, glabrous at base, upper half sparsely pilose, 2.1-2.5 × 0.8-1.4 cm. Bracteoles 1 per flower pair, medial, membranaceous, channeled, linear, transparent, glabrous, 1.1-1.5(-2.2) cm long.

Sepals membranous, obovate to elliptic, obtuse, transparent, glabrous, 11-13 × 4-5 mm. Corolla and staminodes bright golden yellow, glabrous. Corolla tube 38-45 mm long; lobes subequal, elliptic, acute to 90°, 11-13 × 4.0-6.5 mm. Outer staminode obovate, emarginate, 10-13 × 8-10 mm. Callose staminode, apex unequally 2-lobed, only the apical 1.5 mm petaloid, reflexed, 8-10 × 4-5 mm. Cucullate staminode 5-6 × 3-4 mm. Style and stigma yellow. Ovary smooth, cream-colored, glabrous, ca. 3 × 2 mm. Capsule unknown.

Calathea grazielae is most similar in inflorescence and floral structure to *C. aemula* Körn., sharing the spirally arranged, green, obtuse bracts with recurved apical margin; yellow corolla lobes and staminodes; and apically petaloid callose staminode. *Calathea grazielae* is readily distinguished from *C. aemula* by its plain green, unpatterned, leaves vs. patterned with a lighter yellowish 2-4 cm wide green band along the midrib; the purple tinged, glabrous vs. light green, velvety tomentose lower leaf surface and the deep purplish brown vs. green petiole and leaf sheath. The flowers in *C. grazielae* are well exerted with at least 1 cm of corolla tube evident beyond the bracts, whereas in *C. aemula* the tube is contained within the bracts. *Calathea grazielae*, like *C. fatimae*, is an attractive garden ornamental. The striking contrast of the shiny lime-green inflorescences and yellow flowers against the background of the dark maroon petioles combined with the distinctive whitish midrib of the blade above and the purple streaking and mottling below gives it great potential for horticulture.

This species is named in honor of Dra. Graziela Baroso in acknowledgment of her long devotion to the study of Brazilian plants and her numerous contributions to our knowledge of them through her teaching and numerous publications.

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Special gratitude goes to the late Sr. Roberto Burle Marx for the opportunity to work with his extensive Marantaceae collection, and for the many discussions about them over the years. Thanks to Dra. Dorothy Dunn de Araújo for her continuing assistance both at RB and later GUA and for sharing her accommodations; and to Dra. Graziela Baroso for providing facilities in the herbarium at RB for field work in 1971. We thank Sra. Fátima Gomes for her help at the Sítio and for preserving, documenting and vouchering the superb living collection there, Dr. Elaine Humphrey and Ms. Een Ten for their help with the illustrations and Mrs. Margaret Butschler for her contribution toward page charges. We thank the curators of GUA, MO, NY, RB, UBC, and US for the loan or use of their material. We wish to thank Mr. Bruce Holst and Dr. Fred Ganders for their reviews and helpful comments and Dr. Ganders for support to H. Kennedy.

NOMENCLATRURAL NOTE ON *ERICAMERIA PALMERI* VAR. *PACHYLEPIS*

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ABSTRACT

A nomenclatural problem in *Ericameria* is clarified.

KEY WORDS: *Ericameria*, Asteraceae, nomenclature

Lane & Hartman (1996) recently attributed a nomenclatural combination to me (as "Nesom *ex* Lane & Hartman") that is incorrect. They noted that I transferred *Haplopappus palmeri* subsp. *pachylepis* into *Ericameria* Nutt. (Nesom 1990) but later failed to make the combination for it within the genus *Xylothamia* Nesom, *et al.*, which was created from species otherwise treated most recently within *Ericameria* (Nesom, *et al.* 1990). They then published the combination thought necessary but lacking.

The root of the confusion lies here: *Xylothamia* (*Aster*) *palmeri* (A. Gray) Nesom (= *Ericameria austrotexana* M.C. Johnston) and *Ericameria* (*Haplopappus*) *palmeri* (A. Gray) Hall are different species based on different types. No infraspecific taxa are recognized within *Xylothamia palmeri* and the Lane & Hartman combination goes into the synonymy of *Ericameria palmeri* var. *pachylepis*.

To clarify the useful *Haplopappus* nomenclator assembled by Lane & Hartman (1996), the nomenclatural paragraph that includes the new synonym is given here.

Ericameria palmeri (A. Gray) Hall var. *pachylepis* (Hall) Nesom, Phytologia 68:151. 1990. *Haplopappus palmeri* A. Gray subsp. *pachylepis* Hall, Carnegie Inst. Washington, Publ. 389:267. 1928.
Xylothamia palmeri (A. Gray) Nesom var. *pachylepis* (Hall) Nesom *ex* Lane & Hartman, Amer. J. Bot. 83:364. 1996.

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**A NEW COMBINATION IN *MACHAERANTHERA CARNOSA* (ASTERACEAE:
ASTEREAE)**

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ABSTRACT

Machaeranthera carnosus comprises two allopatric varieties, following the study of Scott Sundberg. The typical variety is from Arizona and Sonora, México. The variety from California and Nevada is recognized as *M. carnosus* var. *intricata* (A. Gray) Nesom, *comb. nov.*

KEY WORDS: *Machaeranthera*, Astereae, Asteraceae, nomenclature

The generic status and infraspecific taxonomy of *Aster intricatus* (A. Gray) Blake (= *Leucosyris carnosus* [A. Gray] Greene) were studied by Sundberg (1986), who has provided details of morphology, geography, and nomenclature. He concluded that the single species should be maintained as the monotypic genus *Leucosyris* Greene but later decided that a position in the genus *Hazardia* Greene would be more appropriate. The transfer of *Aster intricatus* to *Machaeranthera* Nees (Nesom 1989) reflected yet another point of view.

Sundberg recognized two allopatric elements within the species: (a) a system of large-headed plants (var. *carnosus*) in four counties of southeastern Arizona, with an adjacent locality in Sonora, México, close to the international border; and (b) a system of small-headed plants (var. *intricata*) in eight counties of southern California and four of southern Nevada. He noted (p. 197) that var. *carnosus* is known only from a few collections and "may be threatened with extinction." Because of unsuccessful attempts to relocate plants at previous collection sites, he may have suspected that the entity already is extinct or nearly so.

In the transfer to *Machaeranthera*, I deferred to Sundberg for his choice of genera for the varietal combination. Since then, however, Cronquist (1994) maintained the species within *Leucosyris* and made the necessary varietal combination in that genus, reflecting his agreement with Sundberg's assessment of infraspecific variation and his initial choice of genera.

Machaeranthera carnos (A. Gray) Nesom has not been included in recent molecular studies of the tribe Astereae (Lane, *et al.* 1996) or the subtribe Machaerantherinae (Morgan & Simpson 1990) to provide a test of the competing morphological hypotheses of generic placement. The species has, however, been accepted within *Machaeranthera* by Hartman (1990) and in the treatment of that genus in California by Keil & Brown (1993). In Cronquist's treatment of the species (1994, p. 260, as *Leucosyris*), he made the following observation. "For the past century *Leucosyris* has usually been included in *Aster*, to which it bears no very close relationship. Possibly it is allied to *Haplopappus spinulosus*, which has very similar achenes and pappus." *Haplopappus spinulosus* (Pursh) DC. was treated by Turner & Hartman (1976) as a synonym of *Machaeranthera pinnatifida* Shinners *sensu lato*.

Following preliminary agreement that the species is correctly placed in *Machaeranthera*, with its greatest similarity to members of *Machaeranthera* sect. *Arida* R.L. Hartman (Nesom 1989; Hartman 1990; Nesom, *et al.* 1990), its formal taxonomy is completed here with the varietal combination.

MACHAERANTHERA CARNOSA (A. Gray) Nesom var. *intricata* (A. Gray) Nesom, *comb. nov.* **BASIONYM:** *Bigelovia intricata* A. Gray, Proc. Amer. Acad. Arts 17:208. 1882. *Aster intricatus* (A. Gray) Blake, J. Wash. Acad. Sci. 27:378. 1937. *Leucosyris carnos* (A. Gray) Nesom var. *intricata* (A. Gray) Cronq., *Interm. Fl.* 5:260. 1994.

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SYNOPSIS OF STEPHANODORIA (ASTERACEAE: ASTEREA)

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ABSTRACT

A full description and citation of specimens are provided for the monotypic Mexican genus *Stephanodoria*. *Stephanodoria tomentella* is restricted to a small area of northeastern San Luis Potosí, where it is rare and in danger of extinction. The species is part of the "*Xanthocephalum* group" of the subtribe *Machaeranthrinae*, but its phylogenetic position within the *Xanthocephalum* group is not clearly resolved. Some aspects of possible relationships among other genera of this group also are discussed.

KEY WORDS: *Stephanodoria*, Asteraceae, México, taxonomy

The single species that comprises *Stephanodoria* E. Greene was first described by Robinson (1892) as a species of *Xanthocephalum* Willd. It was formally excluded from the latter by Greene (1895), who created the new genus for it. After that, it was not discussed or included in published studies evaluating relationships among Astereae until the recent dissertation by Suh (1989) and its publication by Suh & Simpson (1990), who substantiated Greene's rationale for placing *Stephanodoria* as a monotypic genus closely related to *Xanthocephalum*.

Stephanodoria tomentella (B.L. Rob.) Greene is represented in herbaria by only a few specimens, including the type material collected by Pringle and a few much more recent collections from near the type locality. Because *Stephanodoria* is poorly known and endangered in its continued existence, a full description and citation of specimens are provided.

STEPHANODORIA TOMENTELLA (B.L. Robinson) E. Greene

Stephanodoria tomentella (B.L. Rob.) E. Greene, gen. & comb. nov. Erythea 3:12. 1895. BASIONYM: *Xanthocephalum tomentellum* B.L. Rob., Proc. Amer. Acad. Arts 27:172. 1892. TYPE: MEXICO. San Luis Potosí: alkaline

meadows, Hacienda de Angostura [ca. 7 mi SSW of San Bartolo], 11 Jul 1891, C.G. Pringle 3761 (HOLOTYPE: GH; Isotypes: LL!,MU!).

Perennial herbs from woody roots, producing short basal offsets, (0.5-)1.3-2.3 m tall, branching primarily in the inflorescence; stems, leaves, and phyllaries stipitate-glandular and minutely hirtellous-pilosulous, not glutinous. Leaves thick and noticeably fleshy when fresh, the basal ones numerous, persistent, the blades obovate-oblong-elliptic, entire, mostly 15-30 cm long, 12-40 mm wide, basally attenuate to a petiole 3-12 cm long and 1/4-3/5 the length of the leaf; cauline leaves reduced in size, becoming sessile upwards. Heads in an open, loose corymb, sessile to short-pedicellate in corymboid clusters of 2-6; pedicels 0.5-1.0 mm long; involucre turbinate, 4.5-6.0 mm long, 3-5 mm wide; phyllaries strongly graduated in 5-7 series with the outermost 1/4-1/3 as long as the inner, oblanceolate-obovate, mostly indurated, the apex greenish, spreading to reflexed, the lateral margins with a thin, hyaline rim, apical margins often minutely stipitate-glandular; receptacles slightly convex, with low alveolar ridges. Ray flowers ca. 20-30, golden-yellow, pistillate and fertile, with corollas 4.2-5.0 mm long, sparsely and minutely stipitate-glandular on the tube, and ligules 1.2-1.5 mm long, 0.3-0.5 mm wide. Disc flowers fertile, yellow, minutely stipitate-glandular on the tube and lower limb, erect except for the outer, which lean outward after elongation of the tube, with corollas 3.5-4.0 mm long, including the 2.0-2.5 mm long tube, elongating at maturity and elevating the corolla during anthesis, abruptly widened into the limb, with the deltate lobes 0.2-0.4 mm long, erect; anthers inserted ca. halfway down the tube, with the tube usually becoming noticeably different in color and texture at that point; style branches with deltate-triangular collecting appendages. Achenes mostly oblanceolate-oblong to oblong-elliptic, strongly flattened, 2-sided with 2 thick ribs or sometimes with a narrow third side and third rib, 1.3-1.8 mm long, 0.6-0.9 mm wide, straw-colored, shiny, glabrous or very sparsely short-strigose only at the apex; pappus a hyaline, lacerate- or erose-margined corona 0.3-0.5 mm high, or sometimes 1-sided and somewhat awn-like.

Flowering from June to October. Chromosome number, $2n=6II$ (Lane 2920, reported by Lane & Li 1993; Nesom & Wells 6681, reported here from a count obtained from field-collected buds).

The generic name is derived from the Greek elements "stephanos" ("crown," referring to the coroniform pappus) and "doria" (an early name for the goldenrod *Solidago*).

Additional collections examined: MEXICO. San Luis Potosí: Mpio. Cd. del Maiz: 0.65 km N of the Escuela Primeria in Las Tablas, 27 Jul 1979, Lane 2535 (TEX); Las Tablas, Lane 2920 (COLO, not seen); 1.2-1.6 mi N of Las Tablas (RR crossing in town), 14 Sep 1988, Nesom & J. Wells 6681 - voucher for chromosome count and chloroplast DNA studies (distributed to ARIZ, CAS, F, GH, M, MEXU, MO, NY, PATZ, RM, TEX, US); Mpio. Cerritos, near the railroad station at Cerritos, Jun 1981, Leidig & Lane s.n. (TEX).

Stephanodoria is endemic to a small area of northeastern San Luis Potosí near the towns of Cerritos, Las Tablas, and San Bartolo. The elevation ranges from about 950 to 1050 meters (as determined from topographic map). The plants grow in low, periodically wet, grassy pockets in areas of gypseous-alkaline meadows with scattered

mesquite, juniper, and succulent-leaved shrubs and herbs including *Lycium*, *Maytenus*, *Flaveria*, *Samolus*, *Sesuvium*, and *Suaeda*. Pringle described the distinctive area around Las Tablas in his diary (Davis 1936) as "meadows miles in extent, covered with deep grass, interrupted by belts of juniper forest and bounded by gray desert hills of half-bare lime-rock. These meadows appear to rest on a subterranean lake. A tough sod and layer of black soil a few feet in thickness covers mud and water." *Sporobolus airoides* (Torr.) Torr. is one of the dominant grass species.

The gypseous soil in this area is derived from the exposed gypsum and gypseous limestone of the surrounding hills and mountains (the "gray desert hills" described by Pringle). The ancient nature of this habitat is attested to by the occurrence of other gypsophilic endemics restricted to the same immediate area or nearly so: *Oldenlandia pringlei* B.L. Rob., *Pluchea mexicana* (Godfrey) Nesom, *Viguiera potosina* Blake, *Pinaropappus multicaulis* Brandegee, and *Geissolepis suaedifolia* B.L. Rob. Both *Stephanodoria* and *Geissolepis* are monotypic and are strongly divergent in morphology compared to their closest relatives.

The water table around Las Tablas and Angostura (the type locality) apparently has been lowered by artificially channeled drainage and the area is being modified in other ways. Much of it has been brought into pasturage and in 1988 the continued existence of *Stephanodoria* was estimated to be seriously endangered.

The *Stephanodoria* population sampled by Nesom & Wells in 1988 immediately north of Las Tablas consisted of about 50 to 75 individuals scattered along low areas near the road. The population of *Stephanodoria* sampled in 1981 by Lane & Leidig within the town of Cerritos could not be relocated in 1988 by the present author, apparently because the area in the vicinity of the railroad station is almost entirely under cultivation.

Phylogenetic position of *Stephanodoria*

In transferring *Xanthocephalum tomentellum* to *Stephanodoria*, Greene (1895, p. 12) noted that it is

"a plant not far removed in nature from *Solidago rigida*, but with a coroniform rather than capillary pappus, [which] on account of a mere analogy of its pappus, has been published under the wrong genus. . . . Typical *Xanthocephalum* has no pappus at all, but a turgid annulus instead; and the genus should be limited to those species, apparently. But neither the habit, the inflorescence, the involucre nor even the compressed achenes of this plant are at agreement with *Xanthocephalum* or any of its near allies."

The habit and overall appearance of *Stephanodoria* are indeed similar to *Oligoneuron (Solidago) rigidum* (L.) Small, as observed by Greene, but these two species are relatively distantly separated within the Astereae (Nesom 1994) and their similarities are convergent. Recent data (below) support Robinson's original

hypothesis that *Stephanodoria* and *Xanthocephalum* are closely related, but Greene's exclusion of *Stephanodoria* from *Xanthocephalum* has not been formally challenged by any subsequent students of the Astereae.

Morphological and molecular evidence that *Stephanodoria* is most closely related to a small cluster of genera, including *Xanthocephalum*, is summarized by Lane, *et al.* (1996). This is the "*Xanthocephalum* group" (Nesom 1994): *Xanthocephalum*, *Stephanodoria*, *Isocoma* Nutt., *Rayjacksonia* Hartman & Lane, *Grindelia* Willd. (including *Prionopsis* Nutt.), and *Olivaea* Benth. (= the "*Grindelia* group" in Figure 9 of Lane, *et al.*). Evidence for membership of the *Xanthocephalum* group within the strongly defined, North American *Machaeranthera* Nees clade was shown in the molecular data of Suh (1989) and Morgan (1990), summarized by Nesom, *et al.* (1990), and corroborated in Lane, *et al.* (1996) in a broader context. The *Xanthocephalum* group was formally placed within the subtribe *Machaerantherinae* by Nesom (1994).

The large, thick, entire, oblanceolate leaves of *Stephanodoria* are remarkably similar to those in some species of *Pyrrocoma* Hook. (e.g., *P. crocea* [A. Gray] Greene), more so than to any in the *Xanthocephalum* group. *Pyrrocoma* is a member of the *Machaerantherinae* but consistently placed outside of the *Xanthocephalum* group (Suh 1989; Morgan 1990; Morgan & Simpson 1992). The strongly flattened and elongate achenes of *Stephanodoria* also are more similar to those of *Pyrrocoma* than to any of the *Xanthocephalum* group. Mayes (1976) postulated that a close relationship might exist between *Pyrrocoma* and *Rayjacksonia*, based on their mutual production of flavones. Broader evidence, however, indicates that the similarity between *Pyrrocoma* and *Stephanodoria* (as well as *Rayjacksonia*) has resulted from evolutionary parallelism (but still reflective of close common ancestry).

Stephanodoria and *Xanthocephalum* are positioned essentially as sister taxa by molecular data (Lane, *et al.* 1996; Lane & Hartman 1996), but there is little in their morphology leading to the same conclusion. The two are placed as sister taxa in only two of the five trees based solely on morphology (Lane & Hartman 1996, Figures 1-5). Plants of both genera produce a coroniform pappus and sparsely pilose and stipitate-glandular ray and disc corolla tubes. Lane & Hartman scored achenes of both as glabrous, but in my observations both have minute twin-hairs near the fruit apex. The lack or slowness of coiling of the ray corollas also might be taken as a similarity between the two genera. In the DNA-based analyses of Lane & Hartman, the two genera as a pair are placed in various positions relative to others of the *Xanthocephalum* group.

Other taxa of the *Xanthocephalum* group

Grindelia, *Prionopsis*, and *Olivaea*

The monotypic *Prionopsis* has been treated as a species of *Grindelia* (Nesom, Suh, & Simpson 1992). The molecular data of Lane, *et al.* (1996) support this positioning, but Lane & Hartman (1996) maintained these two as distinct genera because of two morphological differences (besides the pappus) (p. 368): "In *Prionopsis*, the

phyllaries are abaxially eglandular and the leaf apices and marginal teeth are each tipped by a long, soft bristle, while in *Grindelia* the phyllaries are punctate-glandular, and equivalent bristles are missing from the leaves." At least some Mexican species of *Grindelia*, however, have distinctly indurate-spinulose teeth (Nesom 1990) surely homologous with the spinulose teeth of *Prionopsis*, which are drawn out to greater length. I have not surveyed the species for the phyllary character, but even if the difference should hold true, it would be weak rationale for maintaining a generic distinction.

Further evidence that *Grindelia* and *Prionopsis* have immediate common ancestry is found in the disc corolla throats (in *Prionopsis* and every *Grindelia* species I have examined), which produce large, elongate, highly distinctive prismatic crystals characteristic of no other species of the *Xanthocephalum* group (Nesom, Suh, & Simpson 1992). This character was not discussed or scored by Lane & Hartman (1966).

Finally, the comment by Lane & Hartman (1996, p. 368) that "*Grindelia* and *Prionopsis* are sister groups in all of the trees that result from analyses that include that molecular data" is incomplete without reference to the molecular studies by Suh (1989) and Lane, *et al.* (1996). Those studies included six species of *Grindelia* s. str. (vs. only one species in Lane & Hartman), and the accompanying analyses in both broader studies show *Prionopsis* phyletically imbedded within *Grindelia* (vs. a sister relationship).

The ditypic Mexican genus *Olivaea* was observed by De Jong & Beaman (1963) to be closely related to *Grindelia* as well as to *Xanthocephalum*, and McVaugh (1984, p. 643) noted that *Olivaea* is separated from *Grindelia* "by no very fundamental characters." The similarity between *Olivaea* and *Grindelia* is seen in their relatively large and conspicuously radiate heads, linear-lanceolate phyllaries, and dimorphic, somewhat blocky, glabrous achenes with caducous pappus elements. *Olivaea* species also have slightly clasping leaves (scored as sessile by Lane & Hartman). They differ from *Grindelia* in their aquatic habitat, hollow stems, leaves without resinous punctations, united phyllary bases that are chartaceous rather than indurate, winged achenes, pappus of antrorsely barbellate bristles, and lack of prismatic crystals in the disc corolla throats. Except for the pappus, these features could have resulted through simple modifications of *Grindelia* morphology (as implied, I believe, by McVaugh's comment). No molecular data have been available for *Olivaea*, but the morphological analyses by Lane & Hartman show the genus in a variable position within the *Xanthocephalum* group.

Even in view of a weak morphological hypothesis of sister relationship between *Grindelia* and *Olivaea*, the rest of the *Xanthocephalum* group (*Rayjacksonia*, *Isocoma*, *Stephanodoria*, *Xanthocephalum*) is decidedly heterogeneous. Plants of these four genera all produce non-clasping leaves, and the latter three have small heads and ray flowers small or consistently absent. The comment by Lane & Hartman (1996, p. 367) that it "seems likely that these [genera] did not arise in strictly dichotomous fashion" is substantiated by the difficulty in finding synapomorphic morphological features not apparently under simple genetic control.

Rayjacksonia

Hartman (1976, 1990) originally recognized the three species of the *Haplopappus*/*Machaeranthera* "phylocephalus group" as an undescribed genus closely related to *Xanthocephalum*. Description of the new genus and new combinations were provided as *Rayjacksonia* Hartman & Lane (1996). The three species of *Rayjacksonia* are coherent in vestiture, spinulose foliar teeth, solitary heads, and ray flowers with prominent ligules, but they apparently lack a set of morphological features that could be interpreted as specialized. Two species have monomorphic achenes and phyllaries strongly indurate at the base, while *R. phylocephala* (DC.) Hartman & Lane produces dimorphic achenes (apparently developed in parallel with those of *Grindelia* and *Olivaea*) and completely herbaceous (non-indurate) phyllaries.

Xanthocephalum humile

One of the most interesting problems remaining in the *Xanthocephalum* group is the nature of the relationship of *X. humile* Benth. to the rest of the genus and the generic group. Suh's molecular data show this species more closely related to *Isocoma pluriflora* (Torr. & Gray) Greene than to other species of *Xanthocephalum*. Natural hybrids between *X. humile* and *I. veneta* Kunth have been collected from several localities in central México (Hartman & Lane 1991). The analysis by Lane, *et al.* (1996), in contrast, shows *X. humile* basal to a clade that includes the rest of *Xanthocephalum* as well as *Stephanodoria*. Although *X. humile* is set apart from the rest of *Xanthocephalum*, its closest morphological similarity with those species seems apparent. It will be interesting to see if further studies provide evidence for this.

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THE ECOLOGY OF *AGRIMONIA INCISA* TORREY & A. GRAY (ROSACEAE) IN THE WEST GULF COASTAL PLAIN

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ABSTRACT

The ecology of *Agrimonia incisa*, incised groovebur, in east Texas is described. It can be abundant in open pine forest. It is probably not widespread today because of widespread habitat alteration resulting from fire suppression during the twentieth century.

KEY WORDS: *Agrimonia incisa* Torrey & A. Gray, Texas, Rosaceae, Angelina National Forest

INTRODUCTION

Little is known about the biology and ecology of *Agrimonia incisa* (Kral 1983; Robbins & Hardin 1987; Orzell 1990; Grace 1993; Singhurst 1996; G. Kline, pers. comm.). Until recently, its known distribution was the lower coastal plain from South Carolina to Florida, westward to Mississippi (Radford, *et al.* 1968; Orzell 1990; Singhurst 1996; Kline, pers. comm.). In 1989 a disjunct population was reported from Angelina National Forest, Jasper County, Texas, about 500 km west of the closest known Mississippi site (Mahler 1989).

In 1993 and 1994 Singhurst (1996) reported *Agrimonia incisa* for eleven sites in Jasper, Angelina, Newton, and Sabine counties. Beginning in 1995, we have conducted extensive surveys for *A. incisa* around the original known locations on the Angelina National Forest. We have identified a distribution area approximately 11 km × 4 km straddling the Jasper-Angelina county line south of the Sam Rayburn Reservoir centering on 31° 04' N 94° 11' W. Within this area the species is now known from over 50 sites, many of which have dense populations. Outside this area, we have searched for it in likely habitat on the Angelina National Forest (*e.g.*, north of

the Sam Rayburn Reservoir and especially along the area to the west, including Boykin Springs and Upland Island Wilderness, which has similar soils) but have failed to locate it.

Outside the National Forest, we have found *Agrimonia incisa* at three locations in northern Newton County along State Highway R255, about 32, 34, and 51 km east of the Angelina National Forest sites, and Singhurst (1996) has reported it for one location about 6 km east of the Sam Rayburn dam in Jasper County.

Singhurst (1996) reports it for two sites on the Sabine National Forest: one in southern Sabine County and one in northern Newton County. Also, recent herbarium searches have turned up specimens from Anderson County, Texas, 19 km northwest of Palestine near Sand Lake. This site is approximately 185 km northwest of the Angelina National Forest populations. A search of the Anderson County area on July 24, 1996, failed to discover *Agrimonia incisa* and reconfirm this important range extension of the species. The species is not listed as part of the flora of Engeling Wildlife Management Area just north of Sand Lake (Telfair, *et al.* n.d.).

GENERAL DESCRIPTION AND BIOLOGY

Agrimonia incisa is one of seven North American species in the genus (Kline, pers. comm.). Technical descriptions of it and its congeners can be found in several sources (Kral 1983; Robbins & Hardin 1987; Orzell 1990; Singhurst 1996). Four species of *Agrimonia* are known for Texas, three of which occur in the southeastern part of the state: *A. incisa*, *A. microcarpa* Wallr., and *A. rostellata* Wallr., (Correll & Johnston 1970; Johnston 1990; Nixon & Kell 1993; Kline, pers. comm.). *Agrimonia incisa* is the most distinctive: its mid-stem leaves with nine short, coarsely incised major leaflets (mid-stem terminal leaflet less than 3 cm long, usually with eight deep incisions or nine teeth) identify it immediately. Although it is not frequently illustrated, the line drawings in Rickett (1967:192) show the leaf pattern perfectly.

Agrimonia incisa is an easy plant to monitor because it can be located year round. It blooms from July to September and dies back in the fall. But before stems of the year die back, a new basal rosette appears from a bud adjacent to the old stem. Even the tall, dry stems and withered leaves of old plants persist long into the following year.

PLANT ASSOCIATIONS

In east Texas, *Agrimonia incisa* favors sparse-canopied pine uplands and moderately open pine-oak associations and a rich herbaceous layer with few shrubs. Harcombe, *et al.* (1993) refer to similar habitat in the "Big Thicket" as "dry upland forests and savannas" and provide a good description (see also Marietta 1979; Ward 1984; Bridges & Orzell 1989).

To determine plant associations, we surveyed ten permanent 10m² sites on three occasions (May 19, July 28, and October 3, 1996) and recorded all identifiable species present. The plot locations on the Angelina National Forest (Angelina and Jasper counties) were chosen for their abundance of *Agrimonia incisa* individuals and to give a representative geographic scatter over the Forest area occupied by the plants.

Species occurring in the sample plots are listed below according to relative frequency of occurrence, defined as presence in number of plots. Nomenclature mainly follows Kartesz (1994).

Occurred in ten plots: *Andropogon ternarius* Michx., *Centrosema virginianum* (L.) Benth., *Croton argyranthemus* Michx., *Dichantherium aciculare* (Desv. ex Poir.) Gould & Clark, *Pityopsis graminifolia* (Michx.) Nutt., *Pinus palustris* P. Mill., *Toxicodendron radicans* (L.) Kuntze, and *Schizachyrium scoparium* (Michx.) Nash.

Occurred in nine plots: *Ambrosia artemisiifolia* L., *Aristida purpurascens* Poir., and *Tragia urens* L.

Occurred in eight plots: *Aristolochia reticulata* Jacq., *Berlandiera pumila* (Michx.) Nutt., *Gelsemium sempervirens* (L.) St. Hil., *Helianthus mollis* Lam., *Paspalum setaceum* Michx., *Rhus copallina* L., *Ruellia humilis* Nutt., *Sassafras albidum* (Nutt.) Nees, *Stillingia sylvatica* Garden ex L., and *Tragia urticifolia* Michx.

Occurred in seven plots: *Asimina parviflora* (Michx.) Dunal, *Callicarpa americana* L., *Gymnopogon ambiguus* (Michx.) B.S.P., *Hedyotis nigricans* (Lam.) Fosberg, *Paspalum plicatulum* Michx., and *Vernonia texana* (A. Gray) Small.

Occurred in six plots: *Euphorbia corollata* L., *Galactia regularis* (L.) B.S.P., *Gnaphalium obtusifolium* L., *Rhynchosia latifolia* Nutt. ex Torrey & A. Gray, *Rudbeckia hirta* L., *Stylosanthes biflora* (L.) B.S.P., and *Vitis aestivalis* Michx.

Occurred in five plots: *Croton michauxii* G.L. Webster, *Eragrostis spectabilis* (Pursh) Steud., *Glandularia canadensis* (L.) Nutt., *Digitaria cognata* (J.A. Schultes) Pilger, *Quercus incana* Bartr., *Quercus marilandica* Muenchh., *Rubus* sp., *Schrankia hystericina* (Small) Standl., and *Sporobolus junceus* (Beauv.) Kunth.

Occurred in four plots: *Aster patens* Ait., *Baptisia leucophaea* Nutt., *Ceanothus americanus* L., *Cornus florida* L., *Erigeron strigosus* Muhl. ex Willd., *Eriogonum longifolium* Nutt., *Helianthemum carolinianum* (Walt.) Michx., *Hymenopappus artemisiaefolius* DC., *Hypericum hypericoides* (L.) Crantz, *Ilex vomitoria* Ait., *Lechea mucronata* Raf., *Liatris elegans* (Walt.) Michx., *Pinus taeda* L., *Pteridium aquilinum* (L.) Kuhn, *Scutellaria elliptica* Muhl., *Stylodon carneus* (Medic.) Moldenke, and *Tradescantia reverchonii* Bush.

Occurred in three plots: *Alophia drummondii* (Graham) R.C. Foster, *Carya alba* (L.) Nutt. ex Ell., *Chrysopsis pilosa* Nutt., *Cnidioscolus texanus* (Muell.-Arg.) Small, *Echinacea pallida* (Nutt.) Nutt., *Lobelia puberula* Michx., *Physalis mollis* Nutt., *Quercus stellata* Wangenh., *Rhynchospora globularis* (Chapman) Small, *R. grayi* Kunth, *Tephrosia virginiana* Pers., and *Tragia smallii* Shinners.

Occurred in two plots: *Aristida lanosa* Muhl. ex Ell., *Asclepias amplexicaulis* Sm., *Aster sericeus* Vent., *Croptilon divaricatum* (Nutt.) Raf., *Crotalaria sagittalis* L., *Erythrina herbacea* L., *Hypericum gentianoides* (L.) B.S.P., *Lobelia appendiculata* A. DC., *Liquidambar styraciflua* L., *Lithospermum carolinense* (Walt. ex Gmel.) MacM., *Matelea cynanchoides* (Engelm.) Woods., *Penstemon australis* subsp. *laxiflorus* (Pennell) Bennett, *Physalis heterophylla* Nees, *Pinus echinata* P. Mill., *Pediomelum hypogaeanum* (Nutt. ex Torr. & A. Gray) Rydb. var. *subulatum* (Bush) J. Grimes, *Scleria ciliata* Michx., and *Trichostema setaceum* Houtt.

Occurred in one plot: *Acer rubrum* L., *Agalinis pulchella* Pennell, *Aster linearifolius* L., *Carex complanata* Torr. & Hook., *Conyza canadensis* (L.) Cronq., *Dichanthelium laxiflorum* (Lam.) Gould, *Digitaria villosa* (Walt.) Pers., *Gaillardia aestivalis* (Walt.) H. Rock., *Helianthus angustifolius* L., *Hieraceum gronovii* L., *Nothoscordum bivalve* (L.) Britt., *Passiflora lutea* L., *Persea borbonia* (L.) Spreng., *Polypremum procumbens* L., *Salvia azurea* Michx. ex Lam., *Solidago odora* Ait., *Tephrosia onobrychoides* Nutt., *Trichostema dichotomum* L., *Ulmus alata* Michx., *Vaccinium arboreum* Marsh., *Vaccinium stamineum* L., and *Vitis rotundifolia* Michx.

In the study plots we identified 111 species. The number of species per plot ranged from 37 to 53 (mean = 46, SD = 4.5). Asteraceae dominated (19%), followed by Poaceae (12%), Fabaceae (10%), and Euphorbiaceae (7%).

The plant frequencies listed above are fairly typical of West Gulf Coastal Plain upland longleaf pine savanna. The sub-community in which *Agrimonia incisa* occurs most resembles upland longleaf pine savanna subtype 1 (Bridges & Orzell 1989; Harcombe, *et al.* 1993), but there are some important differences. The plants listed for subtype 1 in Bridges & Orzell (1989) and Harcombe, *et al.* (1993) clearly inhabit more xeric sites than those in which *A. incisa* usually occurs. For instance, subtype plants *Aureolaria pectinata* (Nutt.) Penn., *Bulbostylis ciliatifolia* (El.) Fern., *Dalea* spp., and *Scutellaria cardiophylla* Engelm. & A. Gray, characteristically species of xeric habitats, are absent from our sample plots; these species favor sandhills (MacRoberts & MacRoberts 1996).

Our observations suggest that *Agrimonia incisa* favors a slightly more mesic habitat than described by Bridges & Orzell (1989) and Harcombe, *et al.* (1993) for subtype 1, and that the upland longleaf pine community favored by *A. incisa* falls slightly to the left (see their Tables 1 and 3) of the subtype 1 community. Orzell's (1990:23) description of *A. incisa* as occurring on "well-drained but not xeric, sandy soils" agrees more closely with our observations (see also Orzell 1990:408-416).

The herbaceous associates for *Agrimonia incisa* in the East Gulf Coastal Plain are much the same as those described for the West Gulf Coastal Plain (Kral 1983), except that they indicate a slightly more xeric habitat in the east.

Reports always associate *Agrimonia incisa* with longleaf pine, which makes the Anderson County location particularly interesting since it is outside the range of longleaf pine and perhaps the distribution of pine altogether. Unfortunately, we were unable to relocate the Anderson County population, but the general community in which it was found is oak-sandylands with many of the species characteristic of upland longleaf pine savanna. The Newton County sites are in loblolly and slash pine plantations that were probably longleaf pine prior to this century.

LIGHT CONDITIONS

In order to gather some quantitative information on the light conditions favored by *Agrimonia incisa*, we gathered data on canopy and shrub cover.

In twelve study plots in Angelina, Newton, and Jasper counties we estimated canopy cover. This ranged from 20% to 55% and averaged 35%. *Agrimonia incisa* gets direct sun part of the day, but is not directly exposed most of the day. At the same time, it favors bright indirect light.

Along a pine savanna/shrub edge, we examined the distribution of individual plants in relation to cover. Shrubs were *Callicarpa americana*, *Liquidambar styraciflua*, *Ilex vomitoria*, *Persea borbonia*, *Asimina parviflora*, *Cornus florida* L., and *Rhus copallinum*. We examined the two meter edge, dividing it into three parts: open (normal 35% canopy), edge (some direct sun, but shaded most of the time), shade (always shaded). Along this edge we located 75 plants: 50 plants (67%) were in the open, 22 plants (29%) were at the edge, and 3 plants (4%) were in shade. Of the three plants that we found in the shade, two appeared to be in poor condition--leggy and chlorotic.

Using a Weston light meter, we measured light conditions of *Agrimonia incisa* under normal conditions at noon. In one study plot with 35% canopy, the Weston measure was 19/20 in direct sunlight; in shade, it was 16/17; that is, in shade the light is about one quarter to one third that measured in direct sunlight.

These findings confirm our general impression that *Agrimonia incisa* prefers open woodlands and disappears as light levels decrease, avoiding deep shade altogether.

We have never encountered *Agrimonia incisa* in closed canopy forest nor in any area with a dense midstory or shrub layer; even a dense cover of *Pteridium aquilinum* appears to be inhospitable to it. On the other hand, we have never located it in open areas with no shade.

SOILS

In the study area, *Agrimonia incisa* occurs on sands on undulating to hilly, gently sloping uplands that are well drained, moderately permeable, and which quickly dry during drought.

We found it on three soil types: (LTC) Letney-Tehran association, (DUB) Doucette-Boykin association, and (LeC) Letney loamy sands, which are classified as loamy, siliceous, thermic Arenic (Plinthic, Grossarenic) Paleudults. Apparently, LTC and LeC are the same or very similar (Dolezel, *et al.* 1988; Neitsch, *et al.* 1982). These soils are found in northern Jasper and Newton counties, southern Sabine

County, and southeastern Angelina County. *Agrimonia incisa*, therefore, should be expected to occur in western Louisiana where the same plant/soil association occurs.

We took soil samples from the upper 15 centimeters for five populations of *Agrimonia incisa* in three counties (Table 1). Samples were from the three soil types described above. Analysis was done by A & L Analytical Laboratories, Memphis, Tennessee.

The soils where *Agrimonia incisa* occurs are acidic and nutrient poor.

Table 1. Soil characteristics of *Agrimonia incisa* sites.

Sample	pH	Exchangeable Ions (ppm)				OM%
		P	K	Ca	Mg	
Angelina 13	5.7	8	26	110	15	1.6
Angelina 14	5.7	14	23	280	44	4.9
Jasper 1	5.3	7	25	70	13	1.8
Jasper 9	5.4	7	27	120	22	2.9
Newton 2	5.8	12	29	190	26	3.3

POPULATION

In September 1995, we set up ten 5.5m² permanent plots for plant monitoring. These sites were selected because they contained large numbers of *Agrimonia incisa* and had not been burned for some years. All were open, with typical canopy and little or no shrub layer. In September 1995 and 1996, we counted the number of separate plants (stems) in each (Table 2). There was no radical disturbance in any of the plots in the two successive years, *i.e.*, none was burned, lumbered, etc.

It is evident from these figures that, while numbers fluctuated within plots (for which we have no explanation), there was no overall change between the two successive years for the total sample. Although such a small sample is of minimal interest, populations that have not burned for some years clearly are holding.

In order to obtain information on population numbers and plant distribution, in 1996 we ran five transects (all were 3 m wide, but were 0.5, 0.9, 1.0, 1.0, and 1.2 km long) through upland longleaf areas with *Agrimonia incisa*. The shortest transect was in Newton County; the other four were in Jasper County. These allowed us to estimate, at least for favorable habitat, plant densities. The estimates for each of the five transects are 503, 507, 730, 1400, and 1843 plants per ha.

Table 2. Number of plants in ten plots during two successive years.

Plot	Number of Plants		% Change
	1995	1996	
1	33	34	+3
2	55	36	-35
3	52	51	-2
4	91	101	+11
5	55	58	+5
6	41	46	+12
7	37	48	+30
8	14	23	+64
9	26	32	+23
10	63	45	-29
Total	467	474	+1

From our unquantified survey observations, we suspected that plant distribution was clumped. This was confirmed by the high density-to-frequency ratio found for all transects. In the 4.6 km transect (the five transects combined), we located 88 places with plants. These occupied 493 meters (11%) of the total and averaged 5.6 m (range 1 to 37 m). The average number of plants per clump was 16.7 (range 1-200).

In 1.9 km of transect, we measured not only the area occupied by plants, but also the distance between clumps. In the 0.9 km transect, the average distance between clump sites was 55 m (range 3-170 m) and in the 1.0 km transect, the average distance between clump sites was 31 m (range 4-135 m).

At only four places of the 88 in the five transects where *Agrimonia incisa* was found was there only one plant.

Put simply, if one plant is found, the probability is high that more (often many more) will be found within a few meters of it.

FLOWERING

In Texas, *Agrimonia incisa* flowers and produces fruit from mid-July through mid-September. This pattern appears to characterize other populations in the southeast (Robbins & Hardin 1987; Grace 1993).

The inflorescence is a spikelike raceme, sometimes branched, bearing numerous alternately arranged flowers. Flowers open in succession up the raceme, at such intervals that only a few are open together. Fruit is top-shaped, with several rows of bristles spreading from the middle, and readily attaches to passers-by and adheres to hair, shoelaces, and clothing (for a technical description see Kral 1983; Robbins & Hardin 1987; Orzell 1990).

To gather information on *Agrimonia incisa* flowering pattern and pollinators, on 7, 8, and 18 August 1996, we made continuous observations and periodic checks on the status of flowers in the field and captured insect pollinators. The *A. incisa* population used for these observations was about halfway through flowering. In this population, we marked specific plants and flowers and monitored them throughout the day.

We also made continuous observations on two greenhouse plants from 15 August to 7 September. Since the greenhouse observations were almost identical with those we made in the field, but involve a larger number of flowers, and were made after we had determined the basic outline of the flowering pattern, we will describe these observations in detail after giving the basic outline of flowering in the field.

For this description we use local time (CDT): sunrise on 7 and 8 August was about 6:40 am and sunset was about 8:10 pm. On 30 August (the middle of the greenhouse observations), sunrise was 6:50 am and sunset was 7:42 pm. The greenhouse observations were made in Shreveport, Louisiana, 160 km north of where the plants grow naturally. The field observations were made in northern Jasper County on clear sunny days; a few short, late afternoon thunder showers occurred on 7 August. During the greenhouse observations, there was one wet, rainy, overcast period. On all days it was hot and humid.

The flowering behavior of *Agrimonia incisa* is relatively simple. Each flower lasts for two days and opens twice: the petals open the first time at about 1:00 pm—then close at about 9:00 pm for the night; the flower opens for the second time the next day at about noon, and the petals begin dropping at about 4:30 pm. Consequently, on any given day there are two classes of flowers: those that originally opened the previous day, and new flowers of the day. Stems have individuals of both classes at any given time, the older flowers generally being below the newer on the raceme since buds open successively up the raceme.

Flowering: Field Observations

Flowers begin opening just after noon. These flowers are those that first opened the previous day. They take about 30 minutes to open and stay open until about 4:00 pm at which time they begin dropping their petals, which are all dropped by 5:30 pm. Of the 30 flowers we marked at 6:00 pm on August 7, all reopened on 8 August between 12:15 pm and 12:45 pm.

Slightly later (at about 12:30 pm), new flowers begin opening and continue opening until about 4:00 pm, with most opening during the first two hours (12:30 pm and 2:30 pm). Flowers open rapidly: each takes less than half an hour to open. They remain open until between 9:00 pm and 10:00 pm and remain closed until mid-day the next day, at which time they follow the pattern described above. The anthers of

flowers-of-the-day do not fully introrse until late in the afternoon, beginning about 7:00 pm. When these flowers open the next day, their anthers remain introrsed.

To gather information on the percentage of stems flowering, we selected five widely separated areas where *Agrimonia incisa* occurs in typical habitat on the Angelina National Forest. We walked transects counting all plants within the transect and noting whether it had flowered or not (had a raceme with fruit or not). Table 3 summarizes these data.

Table 3. *Agrimonia incisa* stems with raceme and fruit.

Sample site	Plant with raceme and fruit	Plant without raceme or fruit
1	63 (32%)	132 (68%)
3	54 (27%)	133 (73%)
4	63 (39%)	100 (61%)
6	53 (38%)	87 (62%)
13	98 (44%)	127 (56%)
Total	331 (36%)	590 (64%)

Of 921 plants in the five transects, 36% had flowered and had fruit and 64% lacked racemes. The flowering plants were almost invariably larger than those that did not flower. Those that did not flower may be plants of the year germinated from last years' seeds or from tubers. In the first growing season, *Agrimonia* spp. produce only a short, few-leaved plant. Leaves rarely have more than three leaflets. In the second year, they develop leaves typical of the species and flower (Kline, pers comm.).

Flowering: Greenhouse

Flowering sequence and duration of greenhouse plants was the same as for field flowers. We made observations on two plants.

Plant 1 first bloomed on 15 August and had its final flower on 7 September. It had two racemes and 64 flowers. Plant 2 first bloomed on 30 August and was followed only until 4 September--about the first quarter of its blooming period. It had six flowers during this period.

On clear days, flowers that had first opened the previous day re-opened on average at 11:45 am (range = 11:00 am to 1:00 pm, sample size = 67) and began dropping their

petals at 4:00 pm (range = 3:00 pm to 5:00 pm, sample size = 57 flowers). Of 55 flowers, the total time open was 4.1 hours (range 3-5 hours).

On overcast days, flowers opened at 1:15 pm (range = 11:00 am to 3:00 pm, sample size = 15) and began dropping their petals at 7:00 pm (range = 4:00 pm to 10:00 pm, sample size = 19). Time open on overcast days averaged 6.6 hours (range 5.5-7.5 hours, sample size = 19). Thus, not only is timing delayed but the duration of opening is extended on overcast days.

On clear days, flowers-of-the-day opened on average at 1:15 pm (range = 1:00 pm to 2:00 pm, sample size = 66 flowers) and closed at 9:30 pm (range = 8:30 to 10:30 pm, sample size = 66 flowers). On overcast days, they opened at 3:30 pm (range = 2:00 pm to 6:00 pm, sample size = 29) and closed at 11:00 pm (range 8:30 pm to 12:00 pm, sample size = 23). Of 85 flowers, the total time open was 8.25 hours (range = 6-10 hours). There was no difference between clear or cloudy days: on cloudy days the timing of opening and closing is simply delayed about two hours.

Flowers-of-the-day and flowers of the previous day are easily distinguished. Those of the day are bright yellow and wide open, with petals and stamens at right angles to the ovary, and do not introrse until late afternoon or early evening. Anthers are bright yellow. Petals of previous-day flowers are dull yellow, with stamens fully introrsed, filaments twisted or arched, anthers against the stigma. Anthers are brown. Pollination will usually occur the first day a flower is open (Kline, pers. comm.). *Agrimonia* species are self-compatible; if they do not outcross, they will self-pollinate when the anthers introrse (Kline, pers. comm.).

Each stem has 1 to 9 flowers open at a time. On the thirteen plants we marked in the field and followed on 7 and 8 August, we found 48 flowers on the first day and 51 on the second, averaging 3.8 (range 1-9, SD = 1.7) flowers per plant per day, half of which were old and half new. This means that on average each plant has about two new flowers per day.

The greenhouse plants were slightly different because the main plant had two racemes. This plant had about 5.3 (range 1-9, SD = 2.4) flowers each day, half of which were new and half old.

POLLINATORS

Captured pollinators were small bees of the subfamily Halictinae (Hymenoptera, Apoidea, Halictidae), all probably the same species.

On sunny days, the bees were active between about 1:00 pm and 4:00 pm. We saw none after 4:00 pm, most activity being immediately after the flowers opened. They visited both flowers-of-the-day and those of the previous day. We did not make field observations on overcast and rainy days, so do not know how insect visits might have differed on those occasions. No insects were observed on the greenhouse plants, although the plants were not enclosed.

FRUIT

Agrimonia incisa, like all *Agrimonia* species, produces large, barbed fruit designed for long-range dispersal (although many, perhaps most, probably simply drop near the parent stem [Kline, pers. comm.]). We can add no information on seed dispersal, except to say that in late summer and fall, our pants and shoelaces were often covered with *Agrimonia* fruit, attesting to the effectiveness of their barbs. If we stooped over an *Agrimonia* patch, the mature fruit easily caught in our hair.

ROOTS

Agrimonia incisa has fusiform thickened tuberous roots and rhizomes. The tubers measure about 2.25(1.5-3.0) cm long and 3.2(2.0-5.0) mm wide ($n = 10$). To determine if these might play any part in reproduction and in the clumped nature of *A. incisa* distribution, we collected several plants, cut off the tubers, and planted ten in a pot with soils taken from the collection site. The tubers were collected on 20 May and planted on 21 May 1996. On 16 July 1996, four sprouted; by 22 July, five had sprouted. The remaining five did not sprout. The five sprouts survived and produced a typical leafy rosette.

About half of all North American *Agrimonia* species have tuberous roots. In addition to *A. incisa*, *A. microcarpa*, *A. pubescens* Wallr., and *A. rostellata* have such roots (Kline, pers. comm.). Since little is known about the ecology of any of these species, it is hard to tell what the function of tubers might be, except to suggest that all of these species might occur in fire-dependent or droughty areas where food reserves or the alternative of clonal reproduction might be important. Certainly, *A. incisa* is such a species, and from what little we know about *A. microcarpa*, it too might experience frequent fire or short periods of drought.

FIRE

All discussions of *Agrimonia incisa* management include statements about fire because the plant is associated with the longleaf system, which is clearly pyrogenic (Harcombe, *et al.* 1993; Platt, *et al.* 1988).

However, little is known about the effects of fire (or its seasonality, intensity, or timing) on the herbs and shrubs of any plant community in the southeastern United States (Robbins & Myers 1992; Grace 1993; Streng, *et al.* 1993). Certainly nothing has been published on *Agrimonia incisa* and fire (Singhurst 1996). The consensus appears to be that these upland pine systems burned regularly (every 1 to 3 years) and that they burned in the growing season.

While not extensive, we have made some observations relevant to this issue. In late February 1997, two of our 5.5m² study plots (numbers 7 and 8, Table 2) burned. On 24 March 1997, we counted the number of *Agrimonia incisa* rosettes in both. The numbers were 46 and 18, respectively. Clearly, in this small sample fire did not affect numbers. Within this same burn area was also one of our 10m² plots (see section "Plant Associations"). While we had not counted *Agrimonia* stems in this plot, we knew their distribution; their numbers seemed to have been unaffected by the fire.

We have not seen the effects of spring or summer fire on *Agrimonia incisa* and cannot say how plants might be affected by a "growing season" burn. But it is not unlikely that a similar pattern to that observed for this early burn would be found.

DISCUSSION

Agrimonia incisa is rare. It is on all state rare lists where it occurs and is considered threatened by the U.S. Forest Service. It is described as "very local and rarely encountered throughout its range" (Orzell 1990; see also Kral 1983).

Studying the populations in the Angelina National Forest, it is hard to imagine that this species is rare; that is, until it is realized that its habitat, open longleaf pineland, is a very rare community indeed. The biggest mystery is why the species in the West Gulf Coastal Plain is rather contained geographically on the Angelina National Forest, with apparently similar habitat existing along the Catahoula formation eastward into Louisiana and farther westward in Texas.

Reproductively, *Agrimonia incisa* appears to be stable in the study populations. It produces many fruits obviously adapted to long-range dispersal. When a shrub layer grows up, it is capable of surviving along the forested edge of roadsides, the edges of powerline rights-of-way, and pipelines. Most certainly, it is not a weedy species, but because of anthropogenic activity, it often only survives in refugia where its needs are met: areas that mimic the open savanna conditions once created by fire.

On the Angelina National Forest, the species is by no means confined to such refugia: it occurs in open savanna longleaf pinelands. Where we have found it in Newton County, it is also away from the roads in open slash and loblolly pine plantations.

MANAGEMENT

The populations of *Agrimonia incisa* on the National Forests and Grasslands in Texas are the only populations on public land in Texas or in the West Gulf Coastal Plain, which makes them readily accessible and potentially secure.

The major consideration for *Agrimonia incisa* management is how to maintain the integrity of the canopy and the herbaceous layer to promote proper light and shade levels. A dense canopy, shrub layer, and heavy rough are very likely detrimental to *A. incisa* development and maintenance. Traditionally, fire probably maintained open habitat, killing woody invaders and reducing ground litter. In the absence of fire, these conditions probably can be maintained by thinning the canopy to desired levels, bush-hogging shrubs, and mowing the grass layer. This procedure might be expensive for large tracts, but might work well for small populations.

But we know next to nothing about the one thing -- fire, as it interacts with *Agrimonia incisa* -- about which we should be informed best in order to manage this species. Thus, until the interaction of seasonal fire and *Agrimonia* is studied, little definitive can be said about management.

As regards other management factors, clearly excessive ground disturbance and herbicides should be avoided (see Kral 1983; Robbins & Hardin 1987; Orzell 1990; Singhurst 1996 for further comments on management).

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APPENDIX

Agrimonia incisa has been reported from Alabama, Florida, Georgia, Mississippi, South Carolina, and North Carolina (Texas Natural Heritage Program 1995). Apparently, the North Carolina report is an unverified site report (Jame Amoroso, pers. comm.; Kline, pers. comm.). It has been reported also for Angelina, Jasper, Newton, and Sabine counties in Texas (Singhurst 1996). Nixon & Sniffen collected *A. incisa* in Anderson County twenty-five years ago but misidentified it as *A. parviflora*. We looked in what appeared to be suitable habitat (Anderson County is outside the pine belt) in the location indicated on their herbarium label, but were unable to relocate it. Below are vouchers for Texas counties. We have not seen a voucher for Sabine County although Singhurst (1996) reports it from that county.

Anderson Co.: Nixon & Sniffen 3840 [ASTC]. Angelina Co.: MacRoberts & MacRoberts 3007, 3113 [ASTC], 3006 [LSUS], 3115 [DEK]. Jasper Co.: MacRoberts & MacRoberts 2886, 2896, 2898, 2900, 2910, 2929 [ASTC], 2899

[BRCH], 2861, 2897 [LSUS], 3121, 3289 [DEK]. Newton Co.: *MacRoberts & MacRoberts* 3120 [ASTC], 3117 [LSUS], 3119 [DEK].

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TWO NEW SUPRAGENERIC NAMES IN MAGNOLIOPHYTA

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ABSTRACT

Two new suprageneric names are proposed. The Superorder **Acoranae** is defined here to include only the genus *Acorus* (Acoraceae), a member of the Subclass Aridae. The name **Musales** has been in use for some time but never validly published. It is validated here.

KEY WORDS: Magnoliophyta, Aridae, Acoranae, Musales, nomenclature

Superorder **Acoranae** Reveal, *superord. nov.*, based on the Latin description of Tribe Acoreae C. Agardh (*Aphor. Bot.*: 133. 19 Jun 1822.).

The taxon is defined to include only a single genus, *Acorus* L. (Acoraceae, Acorales) and included in Aridae Takht.

Order **Musales** Reveal, *ord. nov.*, validated by a full and direct reference to the Latin description of Musaceae Juss. (*Gen. Pl.*: 61. 4 Aug 1789, as "Musae").

The above name has been in use for some time, and previously Reveal (1993) attributed it to Burnett (1835). This proved to be an error on my part as the Burnett name was proposed at a misplaced rank. Accordingly, the name is validated here so it may be used by those who wish to employ the name.

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VANCLEVEA (ASTERACEAE: ASTEREAEE): $n=9$ CONFIRMED

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ABSTRACT

A reexamination of *Vanclevea stylosa* shows its chromosome number to be $n=9$, in agreement with the original count for the species, and it may yet be confirmed as a member of the $x=9$ "*Chrysothamnus/Petradoria* group." A recently reported $n=6$ for *Vanclevea* was based on a misidentified collection of *Isocoma*.

KEY WORDS: *Vanclevea*, Asteraceae, cytology, systematics

The recent chromosome count of $2n=12$ for *Vanclevea stylosa* (Eastwood) Greene reported by Lane & Li (1993) contradicted an earlier report of $2n=18$ by Solbrig, *et al.* (1964). A phylogenetic study of North American Astereae based on cpDNA restriction site mutations (Lane, *et al.* 1996) added confidence that the new report was correct by placing *Vanclevea* Greene (a monotypic genus) where it would be expected with a base chromosome number of $x=6$ (within the subtribe Machaerantherinae *sensu* Nesom 1994).

In a subtribal classification of the Astereae (Nesom 1994), I did not accept the proposed revised placement of *Vanclevea* and called for a recount of the chromosome number. Meiotic counts of $2n=9\text{II}$ reported here from newly collected material confirm the original count as correct for that species. Further, an examination of the voucher for the count of $2n=12$ shows the collection to be a species of *Isocoma* Nutt. rather than *Vanclevea*.

Flower buds (population collections), along with leaf material for molecular analysis, were collected and sent to me from three populations of *Vanclevea* in north-central Arizona by Timothy Zola, Asst. Herbarium Curator at Northern Arizona University. Pressed vouchers for two of the populations were included with these materials; the vouchers have been deposited at the herbaria noted below. The leaf material has been sent for molecular analysis to David Morgan (Western Washington University, herb. WWB), who is proceeding with detailed studies of the Machaerantherinae and peripherally related taxa of the Astereae.

UNITED STATES. Arizona: Coconino County. Glen Canyon Recreation Area, on US 89 opposite headquarters of the NPSGCRA in Page, sand dunes on the side of the hwy; elev ca. 4000 ft, 21 August 1997, H.D. Hammond 11276 with T.N. Zola (KANU,WWB).

UNITED STATES. Arizona: Coconino County. US 89 ca. 9 mi S of Page, mile 538 on the Navajo Reservation, sand dunes on the E side of the hwy; elev ca. 5400 ft, 21 Aug 1997, H.D. Hammond 11274 with T.N. Zola (NCU,TEX).

UNITED STATES. Arizona: Coconino County. Hwy 98, 3 mi E of intersection with Hwy 89, near power plant, sandy area on S side of the road; elev 4000 ft, 21 Aug 1997, T.N. Zola (without voucher).

Meiotic counts of $2n=9\text{II}$ were obtained from flowers in three heads of each population of *Vanclveea*. Unequivocal counts from all three populations were observed in configurations at prophase I and metaphase I. Meiosis apparently is synchronous or nearly so among the flowers of a single head and pollen formation apparently occurs over a relatively short period. The original count for *Vanclveea* (Solbrig, *et al.* 1964) was "calculated from somatic counts," Anderson 1976 the voucher from Coconino County, Arizona.

Vanclveea of Lane & Li

The voucher for the count of $2n=12$ by Lane & Li (1993) was made from field-collected material collected from Kane County, Utah (44.5 mi E of Kanab, 13 Jul 1989, Lane 3247 [KANU]). It is a collection of *Isocoma rusbyi* Greene, its identity confirmed by vegetative and capitular features. Several sterile branches are mounted on the sheet; the leaves are narrowly elliptic-oblancoelate (vs. linear-triangular in *Vanclveea*), single-veined (vs. distinctly parallel-veined), and loosely ascending (vs. stiffly spreading or arcuate). The heads, which are not connected to any of the stems, are old and straw-colored (presumably from the previous year's flowering) but arranged in a short-pedicellate cluster (vs. long-pedunculate and solitary to cymose and distinctly pedicellate in *Vanclveea*) and the involucre bracts are apically rounded or blunt and erect (vs. narrowly triangular at the apex and often sharply recurved). None of the old (last year's) florets remain in the involucre. At least young buds presumably were present in the population, however, although none are evident on the branches of the vouchers. Flowering (anthesis) in *I. rusbyi* usually begins in August (Nesom 1991a).

The diploid count by Lane & Li for *Isocoma rusbyi* corroborates several others for that species, which were reported as $2n=6\text{II}$ (see Nesom 1991a). Their photograph of 12 mitotic chromosomes (published as Figure 1B) apparently was made from a tapetal cell, because the authors implied that all counts in their report were made from flower buds.

The molecular analysis by Lane, *et al.* (1996) placed "*Vanclveea*" closest to *Lessingia* Cham., *Xylorhiza* Greene, and *Haplopappus* Cass. within the $x=6$ group but apart from *Isocoma*. The sample analyzed for their cpDNA studies is from the population vouchered by Lane 3247. DNA studies on the subtribe by David Morgan

(using nuclear ribosomal ITS variation, pers. comm.) show the same entity positioned within the branches of *Isocoma* ($x=6$), based on his sample (the same sample of *Lane* 3247 used by Lane, *et al.*).

Vanclavea phylogeny

Great Basin floristicists such as Welsh, *et al.* (1993) and Cronquist (1994) have maintained *Vanclavea* as a monotypic genus without comment regarding similar or possibly related species. Anderson & Weberg (1974), however, had previously concluded that *Vanclavea* is most similar to species of *Hesperodoria* Greene ($x=9$), at that time regarded as a monotypic genus.

My interpretation has been essentially in agreement with Anderson & Weberg: *Vanclavea* is most closely similar and presumably closely related to species (particularly the two of *Hesperodoria*) of a broadly interpreted *Chrysothamnus* Nutt. (Nesom 1991b, 1994), all with a base chromosome number of $x=9$. *Chrysothamnus* (including *Hesperodoria* and *Petradoria* Greene), *Stenotus* Nutt., and *Vanclavea* were placed together as the "*Chrysothamnus* group" of the subtribe Solidagininae (Nesom 1994). Confirmation of $n=9$ as the chromosome number for *Vanclavea* indicates that a molecular reevaluation of its phylogenetic position based on the newly collected material will be interesting.

One other species also belongs with the "*Chrysothamnus* group." *Haplopappus microcephalus* Cronquist was too hastily transferred to *Tonestus* A. Nels. (Nesom & Morgan 1990) but was correctly placed in the analysis of Lane, *et al.* (1996). A more appropriate nomenclatural combination has not yet been supplied.

Vanclavea should fit (as a prediction) in the exact position where the analysis of Lane, *et al.* (1996) places *Oreochrysum parryi* (A. Gray) Rydb. within their "*Petradoria* group" (their Figure 3). My subtribal classification (Nesom 1994) places *Oreochrysum* in the Solidagininae, but with an observation of its relative isolation among putative North American relatives. *Chrysothamnus* also is positioned in my arrangement among genera of the "*Petradoria* group" (Figure 3 of Lane, *et al.*) rather than among those of Figure 6 of Lane, *et al.*

The monotypic genus *Columbiadoria* Nesom, *Columbiadoria hallii* (A. Gray) Nesom, was described as a member of the *Chrysothamnus/Petradoria* group (Nesom 1991b) in the subtribe Solidagininae. Later, it was removed from this group and placed as a basal element of the subtribe (Nesom 1993). *Columbiadoria* was inadvertently omitted from the accounting of the Solidagininae (1994, p. 211).

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