PHYTOLOGIA

An international journal to expedite botanical and phytoecological publication

Vol. 64 December 1987 No. 2

CONTENTS

Published by Harold N. Moldenke and Alma L. Moldenke
590 Hemlock Avenue N.W.
Corvallis, Oregon 97330-3818
U.S.A.

Price of this number $3.00; for this volume $16.00 in advance or $17.00 after close of the volume; $5.00 extra to all foreign addresses and domestic dealers; 512 pages constitute a complete volume; claims for numbers lost in the mail must be made immediately after receipt of the next following number for free replacement; back volume prices apply if payment is received after a volume is closed.

FURTHER ADDITIONS AND NOTEWORTHY COLLECTIONS IN THE FLORA OF ARKANSAS, WITH HISTORICAL, ECOLOGICAL, AND PHYTOGEOGRAPHICAL NOTES

Steve L. Orzell & Edwin L. Bridges
The University of Texas Herbarium
Austin, TX 78713

ABSTRACT

Sixty-four native or possibly native vascular plant taxa are reported as new to or reinstated in the flora of Arkansas, through integrated fieldwork, herbarium study, and literature surveys. Thirty of these taxa were apparently first collected in Arkansas by the authors from 1984 to 1986, seventeen were collected by the authors and also represented by previously misidentified or unreported material in herbaria, eight were collected by colleagues or uncovered in herbaria and determined or verified by the authors, and nine had previously been collected or known to occur in the state but were synonymized or overlooked in Smith (1978), the current authority on the Arkansas flora. A total of twenty-six taxa are reported here for more than one Arkansas county, indicating a broader distribution in the state than is usual for state record species. Noteworthy collections are presented extending the range of six plants which are extremely rare or narrowly endemic in Arkansas. Two species reported here have long been considered possibly extirpated from Arkansas. Six taxa are deleted from the flora of the state, as previous records were found to be misidentified. Brief ecological notes and a history of Arkansas reports are presented for each species. The phytogeographical discussion focuses on the distribution patterns relative to Arkansas expressed by these species, and their significance in the Arkansas flora.

INTRODUCTION

The Arkansas flora, after over 150 years of collecting, remains poorly known and little understood. The earliest Arkansas plant checklist (Nuttall 1835, 1836) was compiled when the state of Oklahoma was part of the Arkansas territory, thereby including many species clearly collected in present-day Oklahoma. Later checklists (Lesquereux 1860, Branner and Coville 1891, Demaree 1943) generally accepted all previous reports as part of the flora, without examination of the identity and locality of the collections, thereby perpetuating numerous errors. Such misinterpretation of early "Arkansas" collections still occurs, as exemplified by Benson (1982), who maps *Coryphantha missouriensis* (Sweet) Britt. & Rose var. *caespitosa* (Engelm.) L. Benson for Miller County, Arkansas

based only on a collection by Pitcher in 1830, from "Red River, Arkansas," a common locality description for collections from southern Oklahoma during this period. A good account of some of Nuttall's travels and collections in the part of "Arkansas" that is now Oklahoma is given by Geiser (1956). Numerous additional examples of these early "Arkansas" records were uncovered and excluded from the Arkansas flora by Smith (1978). In the history of Arkansas botany, the ultimate unworkable and untenable floristic list for the state is that by Demaree (1943), which includes every imaginable type of error in compilation and judgment. Based upon our efforts in uncovering the sources of his reports, this list was based on numerous misidentifications and includes plants collected in other states by Demaree, but not in Arkansas. In addition, the sources listed for the first state report of each species are not reliable. Demaree was certainly the most prolific general collector to work in Arkansas, and he provided much needed material of the common flora of the state. However, he rarely collected in less accessible areas or in specialized habitats, and therefore missed much of the floristic diversity of the state. The first carefully prepared list of Arkansas plants, citing voucher specimens, locations, and sources of reports is Buchholz and Palmer (1926). It was not, however, intended to be complete, but rather includes only those plants not listed by Branner and Coville (1891). The major, and current standard, floristic work for Arkansas is Smith's (1978) *An Atlas and Annotated List of the Vascular Plants of Arkansas*. This volume is based primarily on vouchered material at UARK, and part of, but not necessarily all, Arkansas material at APCR, HDX, HSU, LTU, MO, NLU, SMS, SMU, and STAR. Species previously reported but not vouchered by material seen by Smith at these herbaria were usually relegated to a list of "Possible Additions" or "Excluded Names", or may appear in the text along with the source of the report. Due to the inaccuracies and discrepancies of earlier lists, we accept Smith (1978) as the sole authority on the flora of Arkansas up to the date of compilation. Smith's *Atlas* was a valiant effort, and provided a much needed "starting point" for the floristic exploration of the state. Since 1978, five supplements to the *Atlas* (Smith 1979, 1980, 1981, 1982a, 1986) have been issued, each adding numerous new state and county records, revised nomenclature, and further documentation based upon new records at UARK and in the literature. In addition, numerous authors have reported new plant records for Arkansas since 1978 (Davis 1981; Lipscomb 1980; Orzell and Peck 1985; Orzell *et al.* 1985; Peck *et al.* 1985; Rettig 1982; Richards 1982, 1985; Smith 1983; Sundell 1983, 1986; Taylor and Taylor 1981; Taylor 1984; Taylor and Johnson 1979; Thomas and Hooks 1985; Thomas *et al.* 1985; Werth and Taylor 1980). If a taxon does not appear in Smith (1978), Supplements I-V, (1979-1986) or in the above cited works, we are considering it as "unreported" for Arkansas, even though some of these taxa are listed in earlier checklists of the state's flora. Some records reported in Smith's most recent Atlas

supplement (1986), issued while this manuscript was in preparation, and based upon our work for this paper, are included in order to more fully document their occurrence in the state.

In addition, many of the species included in this paper were synonymized in Smith (1978). Our decision to recognize these taxa is based upon the opinions of experts in the genera involved. This situation is particularly true for the genus *Carex,* for which we are relying on the generous advice of Dr. Anton A. Reznicek at The University of Michigan.

Despite the fact that many plant specimens have been collected in Arkansas, only the most abundant, non-habitat specific, and ruderal species are well-documented in the flora. Remote areas and specialized habitats generally have not been explored by botanists. Some notable exceptions have been the Arkansas collections of Ernest Palmer, Hugh Iltis, and Paul Redfearn, and the recent work of Gary Tucker, Eric Sundell, and R. Dale Thomas. Since many areas of Arkansas are essentially unknown to botanists, collections from the state take on added significance. Many of the records reported here are not unexpected, and several are apparently fairly common in parts of the state.

In considering the reasons for such floristic backwardness, we turn to the work of Fernald (1937), in one of his classic papers on countless new discoveries from the Coastal Plain of Virginia. In describing the occurrence of a fairly common species, previously collected several times but not recognized as occurring in the state by recent authors he states,

> "The fact that after such clear demonstrations of its abundance at the inner margin of the Coastal Plain in Virginia, the finding there of *Silphium compositum* should still be looked on as a new discovery speaks eloquently of the need for a trained taxonomist in the region (and by *trained* I mean one so familiar with vascular plants that he recognizes and promptly evaluates the insignificant and highly significant species when he sees them)."

While we have by no means achieved this level of competence in Arkansas, it has been a goal of our work. Systematic collection efforts by highly trained botanists are essentially nonexistent in the state. It is only after such collections have been made, and detailed information compiled on the sites and habitats searched, that the Arkansas flora can be understood at the level taken for granted in most eastern and northern states.

The large majority of the new records in this paper are based upon only 3000 collections made by the authors in 1985 and early 1986, with a deliberate eye towards significant records and taxonomically difficult groups. The vast majority of these collections were county records for Arkansas, with a large number being significant new records for rare species or range extensions within the state. Criteria for inclusion in this paper were that the taxon: 1) not be attributed to Arkansas as a distinct entity

in Smith (1978), Supplements I-V (1979-1986), or previously cited reports of additions to the flora, or 2) be a significant range extension for a species which is quite rare or had been considered possibly extirpated from the state. A forthcoming paper will report many other significant records for the state not included here.

After identifying our specimens as representing species new to Arkansas, we searched for additional collections of these species, which may have been previously misidentified or overlooked, at SMU, UARK, and APCR, and in the taxonomic literature. Most such collections were determined or verified by the authors; however, a few citations are included based on specimens we have not seen. In addition, we compiled county range maps for each species, based on the taxonomic literature, published floras, rare species publications, our collections from Arkansas and other states, and examination of specimens at APCR, ASTC, DUR, NLU, SMU, TEX, UARK, and VDB. These county range maps were used in analysis of the distribution patterns of each species, and to determine the significance of our Arkansas collections relative to the total range and nearest approach of the species to the state. A few species included are recorded for Arkansas in recent monographic works not yet assimilated into compilations of the Arkansas flora. The nomenclature used in this paper generally follows Kartesz and Kartesz (1980, 1985), differing primarily in our use of several recent nomenclatural changes found in works by Farmer and Bell (in prep.), Semple and Brouillet (1980), Thomas (1984) and Warnock (1981).

The format of the species accounts includes abbreviated locality information in the form of standard legal locations to the section level (full documentation of localities and habitats are available on specimen labels and from the authors), description of habitats in Arkansas, and a history of previous knowledge of the species in the state. The phytogeographical discussion section treats the species distribution patterns, overall habitats, and significance of the Arkansas records, in groups of similar patterns.

SPECIES ACCOUNTS

ASCLEPIAS LONGIFOLIA Michx. ssp. LONGIFOLIA (Asclepiadaceae). Calhoun Co.: Sec 22, T14S, R13W, 30 Jun 1985, *Orzell & Carl Amason 2293* (UARK); Sec 23, T14S, R13W, 6 Jul 1985, *Orzell and Bridges 2377* (SMU, UARK).

Asclepias longifolia ssp. *longifolia* was found in a seasonally saturated open graminoid dominated area with *Fuirena bushii* Kral, *Polygala cruciata* L., *Xyris ambigua* Beyr. ex Kunth, *X. torta* Sm., *Rhynchospora glomerata* (L.) Vahl., *R. inexpansa* (Michx.) Vahl., *R. globularis* (Chapman) Small, *Rhexia mariana* L., *Gelsemium sempervirens* (L.) St. Hil., *Sabatia gentianoides* Ell., *Gratiola pilosa* Michx., *Paspalum praecox* Walt., *Dichanthelium scoparium* (Lam.) Gould., *Ludwigia linearis* Walt., *Hypericum hypericoides* (L.) Crantz,

and *Eupatorium rotundifolium* L.

Branner and Coville (1891) list *Acerates longifolia* Ell. for Arkansas, previous to the description of *Acerates hirtella* Pennell, to which this report can undoubtedly be referred. Small (1933) includes Arkansas in the range of *A. floridana* (Lam.) A. Hitchc.. perhaps on the basis of the above report. Fernald (1950), Woodson (1954), Correll and Johnston (1970), and Godfrey and Wooten (1981) do not include Arkansas within the range of *Asclepias longifolia,* and Smith (1978) lists only *Asclepias hirtella* (Pennell) Woodson for Arkansas. Recent work for the Flora of the Southeastern United States indicated this taxon should be treated as *Asclepias longifolia* Michx. ssp. *hirtella* (Pennell) Farmer and Bell. Our specimens fit the characters used by Woodson (1954) in distinguishing *A. longifolia* from *A. hirtella;* however, our study of some specimens annotated by Farmer and Bell indicate that they may have a narrower concept of this subspecies which excludes many West Gulf Coastal Plain collections. Apparently, our collections are the first for ssp. *longifolia* in Arkansas.

ASTER SHORTII Lindl. (Asteraceae). Montgomery Co.: Sec 8, T4S, R27W, 8 Oct 1984, *Orzell and Bridges 1495* (UARK). **Newton Co.:** "Lost Valley" a deeply entrenched narrow valley, with rich, moist, mesophytic woods (mainly *Fagus*), 2 mi NE of Boxley (49 mi E of Fayetteville), Alt. 1000 ft., 25 Oct 1953, *H. H. Iltis 4456* (SMU); Sec. 29, T16N, R22W, 23 Sep 1976, *E. B. Smith 3095* (UARK).

Our collection of *Aster shortii* is from a rocky dry to dry-mesic forest adjacent to a shale glade, at 1250 ft. elev. in the central Ouachita Mountains (Novaculite Uplift). Here, it is found under a canopy of *Quercus shumardii* Buckl., *Pinus echinata* P. Mill., and *Carya tomentosa* (Lam. ex Poir.) Nutt., with a subcanopy of *Ostrya virginiana* (P. Mill.) K. Koch, *Amelanchier arborea* (Michx. f.) Fern., and *Acer rubrum* L. Herbaceous layer associates include *Antennaria plantaginifolia* (L.) Richards, *Arabis laevigata* (Muhl. ex Willd.) Poir., *Cunila origanoides* (L.) Britt., *Galium arkansanum* Gray var. *pubiflorum* E. B. Smith, *Porteranthus stipulatus* (Muhl. ex Willd.) Britt., *Liatris squarrosa* (L.) Michx., and *Solidago petiolaris* Ait.

Aster shortii is apparently close to *A. azureus* Lindl., which is common in the Ozarks and Ouachitas of Arkansas. No mention is made of *A. shortii* in Smith (1978). Cronquist (1980) includes Arkansas in the range of *A. shortii,* stating that it is apparently isolated in the Ouachita Mountains. The *Iltis 4456* specimen was determined by Almut G. Jones in 1978. The Smith specimen was annotated in 1980 by Jones as "Not *A. azureus;* perhaps near *A. anomalus* Engelm. - If found in Illinois, I would call the plant *A. shortii* Lindl. in Hook." We found that this specimen had the pubescent involucral bracts of *A. shortii,* but the inflorescence was unusually compact, with short branches and few bracts, as also is true of the other specimens examined. As a group, we refer them

to *A. shortii,* although they may be of hybrid origin or represent introgression from other species.

ASTRAGALUS DISTORTUS T. & G. var. ENGELMANNII (Sheld.) Jones (Fabaceae). **Garland Co.:** Sec 25, T3S, R22W, 4 Apr 1985, *Bridges and Orzell 85-17* (NY, TEX, UARK). **Miller Co.:** Sec 33, T18S, R28W, 31 Mar 1985, *Orzell and Bridges 1617* (NY, SMU, UARK), 18 May 1986, *Bridges 86-46* (TEX). **Polk Co.:** Sec 11, T2S, R32W, 30 Apr 1985, *Orzell and M. Medley 1801* (TEX, UARK). **Pulaski Co:** Sec 34, TIN, R12W, 16 Apr 1984, *Orzell 1267* (UARK), 19 Mar 1985, *Orzell and Bridges 1576* (SMU). **Sharp Co.:** Sec 7, T18N, R4W, 16 Apr 1985, *Orzell 1690* (TEX, UARK).

This variety was found in a large number of habitats in Arkansas, including dolomite glades, nepheline syenite (igneous) glades, shale roadbanks and pits, and sandhill woodland openings. In general, it occupies more xeric, specialized habitats than var. *distortus.* Smith (1978) synonymizes this variety under *A. distortus,* but it is recognized as distinct by Barneby (1964), Correll and Johnston (1970), and Kartesz and Kartesz (1985). All the above specimens were verified by Dr. Rupert Barneby at the New York Botanical Garden.

ASTRAGALUS LEPTOCARPUS T. & G. (Fabaceae). Miller Co.: Sec 17, T18S, R28W, 31 Mar 1985, *Orzell and Bridges 1615* (SMU, UARK), 18 Jun 1980, *Tucker 19422* (APCR); 2.5 mi N of ARK 160 int W ARK 237, 31 Mar 1981, *Davis and Rettig 2828* (APCR); 1.4 mi N of int of ARK 237 and road leading to Atlanta TX, 25 May 1974, *Tucker 14058* (APCR). **Nevada Co.:** Sec 24, T12S, R20W, 29 Mar 1985, *Orzell and Bridges 1604* (NY, SMU, TEX); Sec 11, T11S, R20W, 5 May 1978, *J. Roberts 728* (UARK). **Ouachita Co.:** Sec 35, T12S, R19W, 29 Mar 1985, *Orzell and Bridges 1602* (NY, SMU, TEX); Near Chidester, 27 Jun 1956, *D. M. Moore 56140* (UARK-2).

Astragalus leptocarpus is locally abundant along the edges of sandhill woodlands and sandy roadsides. In Miller County associates include *Quercus incana* Bartr., *Quercus margaretta* Ashe ex Small, *Hymenopappus artemisiifolius* DC., *Tradescantia reverchonii* Bush, *Astragalus soxmaniorum* Lundell, *Linaria canadensis* (L.) Dum.-Cours., *Krigia virginica* (L.) Willd., *Andropogon virginicus* L., *Viola rafinesquii* Greene, and *Triodanis perfoliata* (L.) Nieuwl.

We were surprised that the only annual *Astragalus* we had collected in southwestern Arkansas was *A. leptocarpus,* since Smith (1978) listed only *A. nuttallianus* DC. for these counties. To investigate this problem, we examined the cited specimens at APCR and UARK. Smith had in 1984 annotated all UARK collections cited as *A. leptocarpus,* and we determined all APCR material also to be this species. Apparently, *A. nuttallianus* has only been collected once in Arkansas (*Moore 400159,* UARK) from

Little River County. Arkansas is not included in the range of *A. leptocarpus* by Turner (1959), Barneby (1964), or Correll and Johnston (1970). Lasseigne (1973) reports it from six Louisiana parishes, and it has been collected by the authors and John and Connie Taylor in three counties in southeastern Oklahoma (Taylor and Taylor 1987). Despite having first been collected 30 years ago, ours is the first report of *A. leptocarpus* for Arkansas. Specimens *1602, 1604,* and *1615* were verified by Dr. Rupert Barneby at the New York Botanical Garden.

ASTRAGALUS SOXMANIORUM Lundell (Fabaceae). Miller Co.: Sec 17, T18S, R28W, 31 Mar 1985, *Orzell and Bridges 1614* (NY, UARK). **Nevada Co.:** Sec 28, T12S, R20W, 11 May 1982, *Rettig 518* (APCR), 9 May 1983, *Rettig 840* (pers. herb.); Sec 11, T12S, R20W, 9 May 1983, *Rettig 855* (UARK); Sec. 24, T12S, R20W, 29 Mar 1985, *Orzell and Bridges 1603* (NY, TEX); Sec. 11, T11S, R20W, 5 May 1978, *J. Roberts 727* (UARK). **Ouachita Co.:** Sec 12, T12S, R19W, 9 May 1983, *Rettig 832* (NY); Sec 33, T14S, R17W, 29 Mar 1985, *Orzell and Bridges 1599* (NY, SMU, TEX); Chidester, 1 Apr 1951, *D. M. Moore 510037* (UARK). **Union Co.:** Sec 13, T17S, R15W, 17 Mar 1985, *Orzell, Bridges, and Carl Amason 1573* (TEX), 3 Apr 1984, *Orzell and Carl Amason 1258* (SMU), 16 Mar 1984, *R.T. Huffman 35* (UARK).

All of the Arkansas collections of this species are from areas of deep sandy soil, including relatively undisturbed sandhill woodlands, sandy old fields, and roadsides through these areas. The open canopy of the sandhill woodland sites includes *Quercus arkansana* Sarg., *Quercus incana, Quercus margaretta,* and *Pinus taeda* L. The herbaceous layer in both sandhill woodland, sandy fallow field, and sandy roadsides, includes *Andropogon virginicus, Gymnopogon ambiguus* (Michx.) B.S.P., *Diodia teres* Walt., *Viola rafinesquii, Monarda punctata* L., *Opuntia humifusa* (Raf.) Raf., *Cassia fasciculata* Michx., *Astragalus leptocarpus, Lithospermum carolinense* (J.F. Gmel.) MacM., *Lechea villosa* Ell., *Froelichia floridana* (Nutt.) Moq., *Hymenopappus artemisiifolius, Tradescantia reverchonii, Linaria canadensis, Krigia virginica,* and *Triodanis perfoliata.*

Barneby (1964) noted this species to be a local endemic of eastern Texas, reporting it from 14 sites in nine counties. Since then it has been found in three parishes in northern Louisiana (Lasseigne 1973), and now in southern Arkansas. In addition to the above cited specimens, the authors have observed this species at over 30 other Arkansas locations in Miller, Nevada, and Ouachita counties, in sandhill woodlands, on sandy roadsides, and particularly in cemeteries on sandy soil. This represents the first report of the species in Arkansas, and a northward range extension from northeast Texas and adjacent northwest Louisiana. Specimens *1258, 1573, 1599, 1603,* and *1614* were verified by Dr. Rupert Barneby.

BERLANDIERA x BETONICIFOLIA (Hook.) Small, pro sp. (Asteraceae). Miller Co.: Sec 18, T18S, R28W, 17 May 1985, *Orzell and Bridges 1879* (UARK); Sec 33, T18S, R28W, 18 May 1986, *Bridges 86-47* (SMU, TEX, UARK); Sec 7, T20S, R27W, 7 Oct 1985, *Orzell, Bridges, and Peacock 3281* (TEX); Sec 17, T18S, R28W, 18 May 1986, *Bridges 86-54* (SMU, TEX, UARK).

This hybrid complex is occasional along sandy roadsides in Miller County, associated with *Hymenopappus artemisiifolius.* Additionally, it is found in natural openings in sandhill woodlands with *Tradescantia reverchonii, Thelesperma filifolium* (Hook.) Gray, *Selaginella arenicola* Underwood ssp. *riddellii* (Van Eselt.) R. Tryon, and other sandhill species. Neither this hybrid nor one of its parents, *B. pumila* (Michx.) Nutt., has previously been known to occur in Arkansas, although both are known from adjacent Cass County, Texas (Pinkava 1967). Our specimens mostly fit the putative backcross hybrid of *Berlandiera* x *betonicifolia* with *B. pumila,* which is probably the most abundant form of this hybrid complex in northeastern Texas (Pinkava 1967). Although some of our specimens have dense, matted white-tomentose pubescense, and could be referred to pure *B. pumila,* we feel it is best to simply recognize the fact that this hybrid complex extends to the state, and that individual collections will express the characters of various forms of the complex, from pure forms of each parent to exact intermediates.

CARDAMINE ANGUSTATA O. E. Schulz var. MULTIFIDA (Muhl.) Ahles (Brassicaceae). Polk Co.: Sec 21, T4S, R28W, 23 Mar 1985, *Orzell and Bridges 1577* (SMU, TEX, UARK), 1 Apr 1986, *Orzell and Bridges 3824* (SMU, UARK); Sec. 20, T4S, R28W, 1 Apr 1986, *Orzell and Bridges 3826* (NLU, TEX); Sec. 20, T4S, R28W, 1 Apr 1986, *Orzell and Bridges 3830* (TEX, US); Sec. 7, T4S, R28W, 1 Apr 1986, *Orzell and Bridges 3831* (DUR, MO, NCU, NY, SMU, TENN, TEX, UARK).

Cardamine angustata var. *multifida* was most often found on stable wet and sandy gravel streambanks covered with leaf litter along the spring-fed headwaters of Blaylock Creek. The nearby canopy consisted of *Liquidambar styraciflua* L. and *Fagus grandifolia* Ehrh., with a subcanopy of *F. grandifolia, Quercus alba* L. and *Carpinus caroliniana* Walt. Nearby herbaceous associates included *Iris cristata* Soland., *Toxicodendron radicans* (L.) Kuntze, *Viola sororia* Willd., *Solidago caesia* L., *Epifagus virginiana* (L.) Bart., *Trillium pusillum* Michx. var. *ozarkanum* (Palmer and Steyermark) Steyermark, *Arabis laevigata, Erythronium rostratum* W. Wolf, *Thalictrum thalictroides* (L.) Eames & Boivin, *Tradescantia ernestiana* Anderson & Woods., *Athyrium filix-femina* (L.) Roth var. *asplenioides* (Michx.) Farw., *Uvularia sessilifolia* L., *Cardamine angustata* var. *ouachitana* E. B. Smith, *Luzula echinata* (Small) F. J. Herm., *L. acuminata* Raf., and *Carex* sp. At one site this species was in a rocky seepage area at the headwaters of a small

stream with many of the same species, and a particularly large population of *Trillium pusillum* var. *ozarkanum*.

This taxon (as *Dentaria multifida* Muhl.) was first reported for Arkansas by the late Polk County botanist Aileen McWilliam (McWilliam 1966), who noted three distinct *Dentaria* species in the central Ouachita Mountains. Smith (1978) synonymized all previous reports of other taxa in Arkansas with *Dentaria laciniata* Muhl. Later (Smith 1982b) he recognized the uniqueness of one of Miss McWilliam's 3 species, and described it as a new variety (*Cardamine angustata* O.E. Schulz var. *ouachitana* E.B. Smith). In 1985 and 1986 we revisited the general area mentioned for *D. multifida* by Miss McWilliam and found it at several closely spaced stations. Miss McWilliam, being extremely conservation-minded, rarely collected vouchers, thus our collections probably represent the first of this taxon from Arkansas. Montgomery (1955), Fernald (1950), and Harriman (1965) do not include Arkansas in the range of this taxon. Harriman (1965) further notes its unusual discontinuous distribution pattern in the eastern states, and includes no records west of the Western Highland Rim of Tennessee and the Cumberland Plateau of Alabama. While examining specimens of *Cardamine* at DUR in May 1985, we annotated several collections, previously identified as *D. laciniata*, as *C. angustata* var. *ouachitana* and one as *C. angustata* var. *multifida* from the Ouachita Mountains of adjacent Oklahoma, both new for the state (Taylor and Taylor 1987). Our collections and that for Oklahoma are the first for this taxon west of the Mississippi River.

Notes on the genus *Carex*

Before discussing the occurrence of the following species of *Carex* in Arkansas, we feel that some general comments on the taxonomy of the genus, particularly in the southern states, is in order. *Carex* is predominantly a genus of the northern latitudes, and it is there that most of its taxonomy originates. The taxonomy of southern *Carex* species, and of northern species extending to the southern United States, has largely been based on too little material from too few localities to be thought of as definitive. Many species which are inherently uncommon and restricted to specialized habitats in the southern states are known from only a very few collections in each state. There has been a tendency, when confronted with only a handful of collections supposedly representing several closely related species in their states, for southern authors to synonymize *Carex* species or their reports for the state of concern. This is particularly true of the *Carex* treatments of Correll and Johnston (1970) and Smith (1978), and to a lesser extent in Radford *et al.* (1968). Undoubtedly, critical taxonomic study including a good, representative, and thorough set of collections from the southern states would eventually uncover the intergradations between many of these species. However, in the absence of such studies for most

sections of the genus, it seems best to follow the traditional morphological species concepts, and leave the interpretations of which constitute biological species to critical taxonomic studies. Recognition of the occurrence of these traditional species in each state is important as it provides systematists with clues to their ranges and possible intergradations. Therefore we are attempting to follow the species concepts of northern workers such as Fernald (1950), Voss (1972), Mohlenbrock (1975), and Reznicek (pers. comm.) in our interpretations of *Carex* species.

CAREX ARTITECTA Mackenzie (Cyperaceae). Jackson Co.: Sec. 16, T14N, R1W, 23 Apr 1987, *Orzell and Bridges 5143* (TEX, UARK). **Little River Co.:** Sec. 1, T10S, R33W, 1 Apr 1985, *Orzell and Bridges 1640* (MICH). **Montgomery Co.:** Sec. 8, T4S, R27W, 30 Apr 1985, *Orzell and M. Medley 1800* (MICH). **Searcy Co.:** Sec. 9, T16N, R17W, 11 Jul 1985, *Orzell and Bridges 2518* (UARK).

Smith (1978) includes *C. artitecta* for Arkansas, but in a later supplement (1982a) changes the name of this taxon to *C. physorhyncha* Liem. Most workers (Radford *et al.*, 1968, Mohlenbrock 1975, Russell and Duncan 1972) think of these as two distinct taxa, both of which are in Arkansas according to Mackenzie (1935). We suspect that *C. artitecta* is the common member of this group in the Interior Highlands and south to the Cretaceous section of the Coastal Plain, and that *C. physorhyncha* is confined to the Coastal Plain in Arkansas.

CAREX BICKNELLII Britt. var. BICKNELLII (Cyperaceae). Franklin Co.: Sec. 3, T7N, R28W, 8 Jun 1978, *G. Barber 861* (UARK).

This variety was found in a saline soil barrens developed on the Wing series (Aquic Natrustalfs). This unusual community type supports several plants which are rare in the state, such as *Sporobolus pyramidatus* (Lam.) A. S. Hitchc. and *Geocarpon minimum* Mackenzie. This species is listed by Barber (1979) in her flora of Franklin County, but apparently has not yet been reported in the published literature. The specimen was verified by the authors and by Dr. A. A. Reznicek.

The other variety of this species, *Carex bicknellii* var. *opaca* F. J. Herm., is endemic to the Grand Prairie region of eastern Arkansas (Hermann 1972). *Carex bicknellii* is listed for Arkansas by Mackenzie (1935) but this probably refers to the later described var. *opaca*. Smith (1978) does not mention the occurrence of var. *bicknellii* in Arkansas.

CAREX BULBOSTYLIS Mackenzie (Cyperaceae). Hempstead Co.: Sec. 24, T12S, R27W, 27 Apr 1985, *Orzell and M. Medley 1734* (MICH).

This species was found in a mesic sandy ravine forest on the

Coastal Plain, with some calcareous influence. Smith (1978) synonymizes this species under *C. amphibola* Steud., as do Correll and Johnston (1970). However, it is listed for Arkansas by Mackenzie (1935), and we consider it to be a distinct taxon. *Carex bulbostylis* ranges from western Arkansas and Louisiana south to central Texas.

CAREX HYALINA Boott. (Cyperaceae). Miller Co.: Rich woods, 27 Apr 1905, *B. F. Bush 2475* (NY); Texarkana, woods, 28 Apr 1905, *B. F. Bush 2500* (NY). **County uncertain:** near Fulton, *W. M. Canby 186* (PH).

This species is apparently a rare, or very undercollected, endemic of the upper West Gulf Coastal Plain. In addition to the above cited records, it is known only from one collection in McCurtain County, Oklahoma and from four counties in Texas (Correll and Johnston 1970). A collection originally identified as this species from Jackson Co., Arkansas (*E. J. Palmer 35530*, MO, NY) is apparently *C. reniformis* (Bailey) Small (Smith 1978), and is out of range for *C. hyalina*. Additional fieldwork is neccessary in order to understand the taxonomy and rarity of this little collected species of the section *Ovales*.

CAREX GRISEA Wahl. (*C. amphibola* Steud. var. *turgida* Fern.) (Cyperaceae). Howard Co.: Sec 29, T7S, R27W, 27 Apr 1985, *Orzell and M. Medley 1746* (SMU).

This species was found in a rich, dry-mesic calcareous slope forest developed on DeQueen Limestone (Cretaceous), with a canopy of *Quercus shumardii, Q. muhlenbergii* Engelm., *Juglans nigra* L., and *Carya cordiformis* (Wang.) K. Koch. Herbaceous associates include *Cypripedium kentuckiense* C. F. Reed, *Senecio obovatus* Muhl. ex Willd., *Adiantum pedatum* L., *Phryma leptostachya* L., *Carex texensis* (Torr.) L. H. Bailey, and *Solidago auriculata* Shuttlw. ex Blake.

Mackenzie (1935) includes this species for Arkansas. Smith (1978) references this species under *C. amphibola*, stating that *C. amphibola* includes *C. grisea* of authors, not Wahl., as do Correll and Johnston (1970). Steyermark (1963) considered *C. grisea* to be dubiously distinct from *C. amphibola*. However, it seems to be recognized still by at least some workers (Russell and Duncan 1972, Radford *et al.* 1968), and we reacknowledge its presence in Arkansas.

CAREX INTERIOR L.H. Bailey (Cyperaceae). Fulton Co.: Sec. 7, T20N, R8W, 23 May 1985, *Orzell and Bridges 1939* (MICH, MO, TEX, UARK). **Sharp Co.:** Sec 7, T18N, R4W, 18 Apr 1985, *Orzell 1700* (MICH), 24 May 1985, *Orzell and Bridges 1950* (MICH, UARK).

In Sharp County, *Carex interior* is known from a series of

calcareous seep fens (Orzell *et al.* 1985), where it forms hummocks on a gravelly marly substrate constantly saturated by cold, minerotrophic seepage. Associates at the Sharp County station are *Selaginella apoda* (L.) Fern., *Rudbeckia fulgida* Ait. var. *umbrosa* (C.L. Boynt. and Beadle) Cronq., *Parnassia grandifolia* DC., *Solidago riddellii* Frank, *Senecio aureus* L., *Carex suberecta* (Olney) Britt., *C. hystricina* Muhl. ex Willd., *C. leptalea* Wahlenb., *Castilleja coccinea* (L.) Spreng., and *Ludwigia microcarpa* Michx. At the Fulton County site it is common on quaking sphagnous peat saturated by cold minerotrophic seepage, with *Rudbeckia fulgida* var. *umbrosa*, *Pogonia ophioglossoides* (L.) Juss., *Senecio aureus*, *Carex suberecta*, and *Parnassia grandifolia*.

Smith (1978) reported *C. interior* in Arkansas, but in a later supplement (Smith 1981) he states that all Arkansas material annotated by A. Reznicek is either *Carex atlantica* Bailey subsp. *atlantica* or *C. atlantica* Bailey subsp. *capillacea* (Bailey) Reznicek, and thereby excludes *C. interior* from Arkansas. Our collections of *Carex interior* therefore represent the first authentic material from the state. Reznicek and Ball (1980) report this species as occurring south only to Pennsylvania, Ohio, Indiana, Illinois, and Missouri in eastern North America, although occurring sporadially south into Mexico in the west; therefore, our collection seems to be the first for the southeastern United States. Both specimens were verified by Dr. Anton Reznicek.

CAREX LAXICULMIS Schwein. (Cyperaceae). Van Buren Co.: Sec 15 & 14, T12N, R16W, 9 Jul 1985, *Orzell, Bridges, L. Peacock, and T. Foti 2462* (MICH).

This species was found in a dry-mesic calcareous ravine forest in the Boston Mountains of the Ozark Plateaus. Other carices at this site include *C. digitalis* Willd., *C. cephalophora* Muhl. ex Willd., *C. laxiflora* Lam., and *C. rosea* Schkuhr ex Willd. Other associated herbaceous species include *Uvularia sessilifolia*, *Brachyletrum erectum* (Schreb. ex Spreng.) Beauv., *Galium arkansanum*, *Taenidia integerrima* (L.) Drude, *Goodyera pubescens* (L.) R. Br., *Senecio obovatus*, and *Cypripedium pubescens* Willd.

Smith (1978) includes this species in his "possible additions", based on Steyermark (1963), as perhaps in northeast Arkansas. Bryson (1980) states that *C. laxiculmis* ranges southward to northern Arkansas, but cites no specimen nor indicates its presence on his distribution map. To our knowledge this is the first collection of this species for the state, and the southwestern most record for the species.

CAREX LAXIFLORA Lam. (Cyperaceae). Van Buren Co.: Sec 14 & 15, T12N, R16W, 9 Jul 1985, Orzell, Bridges, L. Peacock, and T. Foti 2471 (UARK).

The habitat and associates for this species are the same as that for the previous one, *C. laxiculmis*. It was listed for

Arkansas by Demaree (1943) and reported for Crittenden, Newton, and Stone counties by Wilcox (1973), Thompson (1975), and Browne (1974), respectively. Smith (1978) excludes this species from the flora, stating that he had not seen voucher material of authentic *C. laxiflora* var. *laxiflora* for Arkansas. We have not seen the specimens upon which these reports were based, so cannot judge if they are correctly identified. Bryson (1980) indicates that *C. laxiflora* ranges west only to Tennessee (to the Western Highland Rim) and Alabama (to the Cumberland Plateau). We present this record in order to have a citation for this species in Arkansas, perhaps the first from west of the Mississippi River and at its western limit.

CAREX LONGII Mackenzie (Cyperaceae). Calhoun Co.: Sec. 28, T14S, R13W, 16 Jun 1982, *J. Roberts 1599* (MICH); Sec. 32, T13S, R12W , 16 Jun 1982, *J. Roberts 1602* (MICH). Clark Co.: Sec 30, T9S, R21W, 15 Aug 1985, *Orzell and Bridges 2821* (UARK), 12 Oct 1985, *Orzell, Bridges, and Peacock 3465*(MICH). Pulaski Co.: Camp Robinson, north of Little Rock, 6 May 1939, *G. M. Merrill 1896* (A). Saline Co.: low moist bottoms, P.O. Benton, elev. 300 ft., 16 May 1942, *Demaree 22969* (SMU).

Carex longii was collected in Clark County from a roadside ditch with seepage from an adjacent slope. Associated plants include *Rhexia mariana, R. virginica* L., *Graticla pilosa, Ludwigia alternifolia* L., *Lobelia puberula* Michx., *Eupatorium rotundifolium, Arthraxon hispidus* (Thunb.) Makino, *Rhynchospora inexpansa, R. glomerata, Fimbristylis miliacea* (L.) Vahl, *Panicum verrucosum* Muhl., *Xyris difformis* Chapman var. *difformis, Juncus* sp., *Eleocharis* sp. and *Sphagnum* moss.

This species of the *Ovales* series was reported for Arkansas in Demaree (1943). Smith (1978) excluded this species from the flora as probably not in the state. *C. longii* is closely related to *C. albolutescens* Schwein., with which it may previously have been confused in Arkansas. We have not seen the Merrill specimen from Pulaski County.

CAREX LOUISIANICA L. H. Bailey (Cyperaceae). Hempstead Co.: Below Millwood Dam, bottoms, common, Beard Lake area, P. O. Columbus, Elev. 300, 25 Apr 1969, *Demaree 59933* (SMU). Miller Co.: Low wet areas, common, P. O. Garland, Elev. 320, 23 May 1960, *Demaree 42410* (SMU). Union Co.: El Dorado, heavy soil, creek bottom, woods, 12 Jul 1953, *A. J. Hoiberg 344* (SMU).

Carex louisianica was first reported for Arkansas by Buchholz and Palmer (1926), and listed for the state by Mackenzie (1935). This species was placed in synonymy under *C. lupulina* Muhl. ex Willd. by Smith (1978). Reznicek and Ball (1974) consider these taxa to be quite distinct, and we here reinstate *C. louisianica* in the Arkansas flora.

CAREX MOLESTA Mack. ex Bright (Cyperaceae). Washington Co.: Few in small seepage area just W. of the Art Dept. Annex (Parking Lot 19), U. of A. Campus in Fayetteville. Flowering stalks ascending and widely arching, 17 May 1982, *E. B. Smith 3678* (UARK).

Mackenzie (1935) does not list this species for Arkansas, however, it is listed for Arkansas by Steyermark (1963). Smith (1978) includes it in possible additions based on the Steyermark report. This collection, originally identified as *C. bicknellii,* may be the first for the state, and is the southernmost record for this species. The specimen was determined by A. A. Reznicek.

CAREX MUHLENBERGII Willd. var. ENERVIS Boott. (*C. plana* Mackenzie) (Cyperaceae). Pulaski Co.: Sec 34, T1N, R12W, 10 May 1985, *Orzell and Bridges 1823* (MICH), *Orzell and Bridges 1830* (UARK).

This variety was collected in dry, acidic woodlands within a nepheline syenite intrusive igneous glade complex on the south-facing slope of Granite Mountain, under an open canopy of *Quercus stellata* Wang., *Q. marilandica* Muenchh., and *Ulmus alata* Michx.

This variety was first reported for Arkansas by Buchholz and Palmer (1926) from Carroll and Logan counties, and listed for the state by Mackenzie (1935). It is synonymized under *C. muhlenbergii* by Smith (1978) and Radford *et al.* (1968), but maintained by Fernald (1950) and Steyermark (1963). It is perhaps dubiously distinct from typical *C. muhlenbergii,* but may have some merit.

CAREX MUSKINGUMENSIS Schwein. (Cyperaceae). Crittenden Co.: *Demaree 12959* (MICH). Lawrence Co.: Sec. 11, T17N, R2E, 24 Oct 1985, *Orzell and Bridges 3598* (MICH).

At the Lawrence County site, *Carex muskingumensis* is scattered in open areas of a wet-mesic interstream flatwoods dominated by *Quercus phellos* L., with *Q. pagoda* Raf., and *Q. lyrata* Walt. Nearby associates include *Lindera melissifolia* (Walt.) Blume, *Leitneria floridana* Chapman, *Scutellaria lateriflora* L., and *Ammannia coccinea* Rottb.

This species, perhaps the most distinctive member of the *Ovales* series, was first reported for Arkansas by Demaree (1941, 1943). Hermann, who had determined the Demaree specimen, included it for Arkansas in his "Addenda to North American Carices" (Hermann 1954). Smith (1978) excludes this species from the flora of Arkansas, stating "this is another 'minispecies' of the *Ovales* series, perhaps possible in the state, but I have seen no evidence of it". Dr. A. A. Reznicek, who verified our determination, considers it "a thoroughly distinct species" (pers. comm.).

CAREX OKLAHOMENSIS Mackenzie (Cyperaceae). Arkansas Co.: Moist rice prairie habitats, P. O. DeWitt, Elev. 170, 12 May 1940, *Demaree 21094* (SMU). **Drew Co.:** Margins of small swamp, P. O. Monticello, Elev. 250, 2 May 1941, *Demaree 22012* (SMU). **Hot Spring Co.:** Creek banks, P. O. Butterfield, Elev. 380, 23 Oct 1958, *Demaree 40786A* (SMU). **Lonoke Co.:** Rice prairies, common, never plowed, P. O. Carlisle, Elev. 230, 31 Apr 1967, *Demaree 55620* (SMU); Low wet areas, rice region, never plowed, river terraces, P. O. Carlisle, Elev. 230, 5 May 1968, *Demaree 57790* (SMU). **Polk Co.:** Small wet bottom, P. O. Cherry Hill, Elev. 850, 13 May 1962, *Demaree 45575* (SMU). **Prairie Co.:** Rice prairies, never plowed, common, river terraces, low spots, P. O. Hazen, Elev. 215, 20 May 1970, *Demaree 61903* (SMU). **Pulaski Co.:** Swampy areas 5 miles north of Little Rock on Highway 5, P. O. Little Rock, Elev. 400, 15 May 1963, *Demaree 47672* (SMU).

Carex oklahomensis seems to be the most common member of the series *Vulpinae* in low, open, wet areas throughout much of Arkansas. Correll and Johnston (1970) consider this species to be the product of past hybridization of "*C. stipata* Muhl. ex Willd. and *C. muhlenbergii* (especially the form "*C. lunelliana* Mackenzie")" but present no evidence for this claim. Smith (1978) includes this species in synonymy under *C. stipata;* however, many *Carex* experts consider it to be distinct as a variety or species. All of the cited specimens were determined or verified by A. A. Reznicek.

CAREX OUACHITANA Kral, Manhart & Bryson (Cyperaceae). Montgomery Co.: Sec 8, T4S, R27W, 2 Jun 1985, *Orzell and Bridges 2030* (MICH), 26 Apr 1986, *Orzell 4284* (MICH, MO, NCU, SMU, TEX, UARK). **Scott Co.:** Sec 8, T3N, R32W, 21 Apr 1986, *Orzell and Bridges 4212* (MO, NCU, TEX, UARK); Sec 30, T4N, R30W, 23 Apr 1986, *Orzell and Bridges 4274* (SMU, TEX). **Sebastian Co.:** Sec 8, T3N, R32W, 21 Apr 1986, *Orzell and Bridges 4214* (MICH, TEX, UARK).

This newly described species (Kral *et al.* 1987) provides a classic example of the underexplored and undercollected status of Arkansas botany. It is a common, sometimes dominant, species of the herbaceous layer of dry to dry-mesic acid, rocky ridgetop and slope forests throughout much of the Ouachita Mountains. This sedge is now known to occur in all three physiographic sections of the Ouachitas - in the Athens Piedmont Section on Stanley Shale in Howard and Polk counties, in the Novaculite Uplift Section on strongly faulted and folded Stanley Shale in Montgomery County, and in the Fourche Mountains Section on Jackfork Sandstone in Polk and Scott counties and LeFlore County, Oklahoma, and on the Savanna Formation of Poteau Mountain in Sebastian and Scott counties. At the Montgomery County site, *C. ouachitana* was common in a dry, steep, shaley slope forest dominated by *Quercus shumardii, Ostrya virginiana, Pinus echinata*, and *Carya tomentosa*,

with a subcanopy of *Acer rubrum* and *Amelanchier arborea*. Shrub and herb associates include *Rhus aromatica* Ait., *Dioscorea villosa* L., *Vaccinium pallidum* Ait., *Galium arkansanum* var. *pubiflorum*, *Helianthus divaricatus* L., *Antennaria plantaginifolia*, *Liatris squarrosa*, *Solidago petiolaris*, and *Aster shortii*. The Scott and Sebastian County sites are from stunted dry to dry-mesic oak forests on sandstone near the top of Poteau Mountain.

We first collected this species in 1985, and were made aware of its unusual characteristics by A. A. Reznieck. We planned fieldwork in 1986 to collect more material in order to determine if it was a distinct species and to prepare a description. Meanwhile, we learned that Robert Kral was also working on a new *Carex* from the Ouachita Mountains. In June 1986, we sent a preliminary description of our specimens to Robert Kral, and offered our material from the above new sites for his study and use in describing the species. Despite his refusal of our offer, we refrained from publishing this species as a courtesy to its authors. Apparently, Kral felt that if one has "sufficient" material to prepare a description, then there is no need for additional specimens to study. Our collections represent significant new habitats and range extensions for this species, and may be important in understanding the variation present in this group.

CAREX PLANOSTACHYS Kunze (Cyperaceae). Little River Co.: Sec 28, T12S, R32W, 1 Apr 1985, *Orzell and Bridges 1626* (MICH).

This species was found under scattered, open-grown *Juniperus virginiana* L. within a chalk glade/outcrop complex developed on Annona Chalk (Cretaceous). Nearby herbaceous associates include *Bouteloua rigidiseta* (Steud.) A. S. Hitchc., *Galium virgatum* Nutt., *Ophioglossum engelmannii* Prantl, *Carex cherokeensis* Schwein., *Dalea compacta* Spreng. var. *compacta*, and *Indigofera miniata* Ortega var. *leptosepala* (Nutt.) B. L. Turner.

This is the first collection of this species for Arkansas, and a disjunct from north central Texas, where it ranges south through the Edwards Plateau into Mexico. It is locally abundant and one of the most characteristic herbaceous species on limestone uplands and slopes dominated by a grassland - woodland vegetation mosaic in the Balcones region of the Edwards Plateau in central Texas (Riskind & Diamond 1986). Our specimen was determined by A. A. Reznicek.

CAREX SPARGANIOIDES Willd. (Cyperaceae). Baxter Co.: low moist spots by railroad, Common, Below Cotter, P. O. Cotter, Elev. 450, 21 May 1951, *Demaree 63552* (SMU). **Van Buren Co.:** Sec 7, T12N, R12W, 12 July 1985, *Orzell and Bridges 2558* (MICH).

Our collection is from a rich, mesic, north-facing limestone slope forest along the Middle Fork of the Little Red River. Among the herbaceous associates are *Diarrhena americana* Beauv.,

Galium triflorum Michx., *G. circaezans* Michx., and *G. concinnum* Torr. & Gray. Interestingly, the only Arkansas locality for the rare hybrid *Dryopteris* x *leedsii* Wherry is within one mile downstream from this site.

Smith (1978) includes this species in "possible additions", stating that it may be rare in north or northwest Arkansas. Arkansas was not included in the range given for this species by Mackenzie (1935), Fernald (1950), or Steyermark (1963). Our collection seems to the the first for Arkansas, and extends the southwestern limit of the species.

CAREX STRIATULA Michx. (Cyperaceae). Pope Co.: Nogo, rich woods, 24 Apr 1933, *G. M. Merrill 215* (SMU).

We found this sheet while studying Arkansas *Carex* collections at SMU. It was identified as and filed under *C. laxiflora*, and we determined it as *C. striatula*, later verified by A. A. Reznicek. Neither Smith (1978), Demaree (1943), Mackenzie (1935), or Bryson (1980) report *C. striatula* for Arkansas, although it was to be expected for the state based on its habitat and range in Mackenzie (1935) and Bryson (1980). Interestingly, the distribution given for this species in Bryson (1980) indicates that it would likely occur on the Coastal Plain of Arkansas, since it is cited for several Louisiana parishes and Texas counties bordering the state. This record seems to be the first for this species from Arkansas and from the Interior Highlands, and the northwesternmost record of the species.

CAREX SUBERECTA (Olney) Britt. (Cyperaceae). Fulton Co.: Sec. 7, T20N, R8W, 23 May 1985, *Orzell and Bridges 1941* (MICH, UARK, TEX), *Orzell and Bridges 1942* (MICH, MO, SMU). **Sharp Co.:** Sec. 7, T18N, R4W, 24 May 1985, *Orzell and Bridges 1955* (UARK).

At the Fulton County station this species is common on quaking sphagnous peat saturated by cold minerotrophic seepage with *Rudbeckia fulgida* var. *umbrosa*, *Pogonia ophioglossoides*, *Senecio aureus*, *Carex interior*, and *Parnassia grandifolia*. In Sharp County, *Carex suberecta* occurs in calcareous seep fens with *Selaginella apoda*, *Rudbeckia fulgida* var. *umbrosa*, *Parnassia grandifolia*, *Solidago riddellii*, *Senecio aureus*, *Carex interior*, *C. hystricina*, *C. leptalea*, *Castilleja coccinea*, and *Ludwigia microcarpa*.

Smith (1978) includes this species in his list of possible additions, stating "based on its distribution in Steyermark (1963) perhaps in NE or N-central Arkansas." Our specimens are the first collections of this species from the state, and were verified by Dr. A. A. Reznicek.

CAREX TEXENSIS (Torr.) L. H. Bailey (Cyperaceae). Howard Co.: marshy meadow and edge of pond, 4 mi SW of

Nashville, 14 Apr 1954, *H. H. Iltis and D. M. Moore 666* (SMU); Sec 29, T7S, R27W, 27 Apr 1985, *Orzell and M. Medley 1748* (MICH). **Jackson Co.:** Sec. 16, T14N, R1W, 23 Apr 1987, *Orzell and Bridges 5144* (MICH, MO, NCU, NLU, SMU, TEX, UARK).

Our Howard County site is a dry-mesic calcareous slope forest (Bridges, in prep.) developed on DeQueen Limestone (Cretaceous), with a canopy of *Quercus shumardii, Q. muhlenbergii, Juglans nigra,* and *Carya cordiformis.* Herbaceous associates include *Cypripedium kentuckiense, Phyrma leptostachya, Solidago auriculata, Carex grisea,* and *Osmorhiza longistylis* (Torr.) DC. The Jackson County site is a flatwoods forest in an aeolian dune/depression area, with a canopy of *Quercus alba, Q. phellos, Q. pagoda, Carya tomentosa, and Nyssa sylvatica* Marsh.

Arkansas was included in the range of this species by Mackenzie (1935). It is synonymized under *C. retroflexa* Muhl. ex Willd. by Smith (1978), Radford *et al.* (1968), and Correll and Johnston (1970). This species was recognized as distinct by Fernald (1950), in Georgia by Russell and Duncan (1972), in Illinois by Evans (1976), and as a variety of *C. retroflexa* by Steyermark (1963). We are considering it as at least of some merit, though further taxonomic study is necessary in order to understand at what level it should be recognized.

CAREX WILLDENOWII Schkuhr. (Cyperaceae). Ashley Co.: Sec. 7, T18S, R5W, 11 Apr 1986, *Orzell and Bridges 4021* (NLU, SMU, UARK); Sec. 19, T18S, R5W, 11 Apr 1986, *Orzell and Bridges 4032* (MO, TEX). **Bradley Co.:** Sec. 34, T14S, R9W, 22 Mar 1986, *Orzell and Bridges 3713* (SMU), *Orzell and Bridges 3714* (UARK). **Hempstead Co.:** Sec. 24, T12S, R27W, 27 Apr 1985, *Orzell and M. Medley 1733* (MICH), *Orzell and M. Medley 1735b* (MICH). **Montgomery Co.:** Sec 17, T4S, R24W, 29 Apr 1986, *Orzell 4310* (MO, SMU, TEX, UARK); 18 May 1982, *Rettig 532A* (pers. herb.). **Ouachita Co.:** Sec. 12, T12S, R18W, 23 Apr 1987, *Orzell and Bridges 5141* (MICH, SMU, TEX, UARK). **Union Co.:** Sec. 13, T17S, R14W, 12 Apr 1986, *Orzell and Bridges 4060* (UARK).

Carex willdenowii is found in a variety of mesic, well-drained, rather neutral soil situations throughout much of the Arkansas Coastal Plain and into the Ouachita Mountains. Where found in the Coastal Plain it occupies sites with a richer vernal flora than most Arkansas Coastal Plain forests, with associates at some sites including *Obolaria virginica* L., *Styrax grandifolia* Ait., *Lindera benzoin* (L.) Blume, and *Polygonatum biflorum* (Walt.) Ell. The two other members of the Section *Phyllostachyae* in Arkansas are found in quite different habitats; *Carex jamesii* Schwein. is found in more alkaline, calcareous clay soils, and *Carex latebracteata* Waterfall is found on well-drained dry to dry-mesic slopes in the Ouachita Mountains. In Bradley, Ashley, Hempstead, and Ouachita counties, *C. willdenowii* was found on lower slopes of ravine forests with sandy surface layers but with some

calcareous influence. The Union County site was on a mesic stream terrace surrounded by sandy uplands. The Montgomery County site was also on a stream terrace, but surrounded by siliceous rocky slopes.

Carex willdenowii is not mentioned in Smith (1978), nor is Arkansas included within its range by Mackenzie (1935), or Correll and Johnston (1970), the latter having seen no material of this species from Texas. Interestingly, we have collected *C. willdenowii* from nine Texas counties in 1987 alone. We believe these collections to be the first for Arkansas of this relatively common and widespread species in the Coastal Plain and Ouachita Mountains of the state.

CLADIUM JAMAICENSE Crantz (Cyperaceae). Bradley Co.: miry bog in hard pan prairie, P.O. Warren, elev. 170 ft., 9 Jun 1939, *Demaree 19433* (SMU, MO).

Typically, Demaree specimens with this locality information were collected in what is now known as Warren Prairie, an extremely unusual open, herbaceous-dominated saline soil barrens. The water table in these areas is very high in winter, and some areas are marshy almost year round. It is here we suspect that *Cladium* once occurred. The hydrology of this site has been altered, and despite the fact that this area has been investigated countless times by many botanists, *Cladium jamaicense,* as well as several other rare plants, have not been relocated and should be considered extirpated from Arkansas.

Demaree (1943) reported this species for Arkansas, and it was in searching for the source of this report that we uncovered these specimens. Smith (1978) justifiably excluded this species from the Arkansas flora, stating it "does not seem very likely for Arkansas, based on its habitat and distribution in Correll and Johnston (1970) and Radford *et al.* (1968)". In Louisiana, this species occurs north only to Tangipahoa and Calcasieu parishes (Joyce 1974). Additional specimens from Union Co. labelled by Demaree as *C. jamaicense* (*Demaree 19423,* SMU, MO) were determined by the authors to be immature material of a *Rhynchospora* or *Scirpus.*

CONVOLVULUS EQUITANS Benth. (Convolvulaceae). Little River Co.: Sec. 21, T12S, R32W, 18 Jun 1985, *Orzell and Bridges 2173* (UARK).

This species was occasional in gravelly blackland prairie openings, often climbing on *Engelmannia pinnatifida* Gray ex Nutt. Associates of *C. equitans* include *Croton monanthogynus* Michx., *Heliotropium tenellum* (Nutt.) Torr., *Dalea compacta* var. *compacta, Phyla nodiflora* (L.) Greene var. *incisa* (Small) Moldenke, *Sabatia campestris* Nutt., *Hedyotis nigricans* (Lam.) Fosberg, *Bouteloua curtipendula* (Michx.) Torr. and *Juniperus virginiana.*

This species was listed for Arkansas as *C. incanus* Vahl by Branner and Coville (1891), on the basis of its report by Nuttall

(1837) as *C. hastatus* Nutt., probably based on an Oklahoma collection. It was also listed for Arkansas by Demaree (1943). Smith (1978) excluded this species from the Arkansas flora, stating that it is "unlikely for Arkansas, based on its distribution in Correll and Johnston (1970)." We believe our collection to be the first from within Arkansas' current borders.

CYPRIPEDIUM KENTUCKIENSE C. L. Reed (Orchidaceae). **Clark Co.:** 27 Apr 1985, *Orzell and M. Medley 1710* (UARK). **Crawford Co.:** 30 Apr 1985, *Orzell and M. Medley 1802* (UARK). **Franklin Co.:** 30 Apr 1977, *G. Barber 417* (UARK); 31 Apr 1967, *G. Tucker 4104* (NCU, SMU). **Garland Co.:** May 1970, *D. Rhodes 7818* (LTU); 26 Apr 1975, *L. Adams s.n.* (ATU); 12 May 1984, *Orzell 1325* (NYS); 30 Apr 1942, *D. M. Moore 420073* (UARK); 14 Apr 1946, *D. M. Moore 460031* (UARK); 30 May 1967, *Grahams 747* (NCU)?; 11 May 1984, *J. & E. Price 8038* (SEL). **Grant Co.:** 19 Apr 1981, *M. Locke 4182* (UARK). **Hempstead Co.:** 18 May 1924, *E. J. Palmer 24993* (UARK); 27 Apr 1985, *Orzell and M. Medley 1743* (UARK). 4 Oct 1923, *J. T. Buchholz 401* (UARK); **Howard Co.:** 1 Oct 1974, *D. Lawson 2447* (NLU); 27 Apr 1985, *Orzell and M. Medley 1744* (UARK). **Jefferson Co.:** 20 Apr 1976, *M. Locke 1638* (UARK); 24 May 1975, *R. D. Thomas et al. 44018* (NLU). **Lincoln Co.:** 24 Apr 1984, *D. Flugrad 35* (UARK); 2 May 1985, *M. Medley and Orzell 12626-85* (pers. herb.) [possible hybrid specimen]. **Madison Co.:** 3 May 1977, *T. Fargue s.n.* (UARK); 1 May 1985, *Orzell and M. Medley 1803* (UARK). **Montgomery Co.:** 28 Apr 1985, *Orzell and M. Medley 1758* (UARK); 29 Apr 1985, *Orzell and M. Medley 1781* (NYS); 30 Apr 1985, *Orzell and M. Medley 1785 (SEL);* 29 Apr 1985, *Orzell and M. Medley 1778* (MO); 8 May 1932, *Gardner 265* (OKLA); 20 Aug 1964, *J. W. Thieret 18194* (USLA); 4 Apr 1979, *Plant Taxonomy Class s.n.* (ATU); 16 May 1966, *Demaree 53626* (NLU); 21 May 1977, *F. Sloan s.n.* (ATU). **Ouachita Co.:** 23 Apr 1987, *Orzell and Bridges 5139* (UARK). **Perry Co.:** 26 Apr 1951, *J. E. Moore 3335* (UCA). **Pike Co.:** 3 Oct 1985, *Orzell, Bridges, and A. Higgenbottom 3150* (UARK); 13 Oct 1977, *D. Lawson s.n.* (NLU). **Polk Co.:** 2 May 1982, *L. Magrath 12832* (OCLA - 2); 23 Apr 1955, *A. McWilliam s.n.* (UARK); Apr 1962, *D. M. Moore 62-022* (APCR); 2 May 1964, *D. M. Moore s.n.* (APCR). **Pulaski Co.:** 9 May 1985, *Orzell, Bridges, and L. Peacock 1804* (NYS); 28 Apr 1985, *F. Lane 101* (UARK). **Saline Co.:** 28 Apr 1985, *F. Lane 103* (UARK). **Sevier Co.:** 11 Oct 1985, *Orzell, Bridges, and L. Peacock 3437* (UARK). **Yell Co.:** 6 May 1951, *J. E. Moore 510242* (UARK).
In addition to the above the following specimens have been annotated by Max Medley (DHL) and Dr. John Atwood (SEL) as *Cypripedium kentuckiense:* **St. Francis Co.,** 19 Sept 1979, *F. Deneke 1443* (MEM); **Newton Co.,** 6 Aug 1974, *R. L. Thompson 692* (NLU, UARK); however we believe these collections to represent *Cypripedium pubescens* Willd.

This southeastern member of the *Cypripedium pubescens*

complex was recently described by Reed (1981) based on collections from Kentucky. Over the next few years, it was recognized that this plant also occurred in Tennessee, Alabama, Mississippi, Louisiana, Texas, Oklahoma, and Arkansas (Atwood 1985). Atwood also notes that the number of herbarium specimens of this species indicate that it may be most abundant in Arkansas. The senior author first noted the occurrence of this plant in Arkansas when first visiting one of the Garland County sites in May 1984. Independently, in the same month, the junior author learned of the occurrence of this plant in Arkansas through Larry Lowman of Wynne, Arkansas, who had a cultivated specimen taken from the Crawford County population. At this time, the only states to which this species had been definitely attributed were Kentucky and Tennessee. By 1985 we had discovered several additional localities for *C. kentuckiense* in Arkansas, and in April of 1985 the senior author led Max Medley on a systematic survey of the Arkansas sites. Full documentation of the ecology and status of *C. kentuckiense* in Arkansas will be provided in a manuscript in preparation by the authors. Two other yellow lady's slippers are still recognized as occurring in parts of Arkansas, *C. pubescens* Willd. and *C. parviflorum* Salisb.

It is important to note that this species, although newly described as such, represents an entity long known to orchidologists. Correll (1940, 1950) knew of this plant and included its distinctive characters within his description of *C. calceolus* L. var. *pubescens* (Willd.) Correll. In Correll (1950), Wherry considered it the "southeastern" ecological entity of the *C. calceolus* complex. Published photographs of yellow lady's slippers from Louisiana (Brown 1972; Dorman 1959; Duffy 1970) and Texas (Ajilvsgi 1979, 1983; Loughmiller 1984; Peacock 1980) have all been what is now called *C. kentuckiense*. We present these citations in order to unequivocally document the presence of *C. kentuckiense* in Arkansas, where it is more common than in any other part of its range, and more common than any other *Cypripedium* in Arkansas.

DALEA COMPACTA Spreng. var. PUBESCENS (Gray) Barneby (Fabaceae) Hempstead Co.: low ridges, open woods, P.O. McNab, elev 340 ft., 20 Jul 1961, *Demaree 44664* (SMU).

This variety was listed for Little River County, Arkansas by Smith (1978) as *Petalostemum pulcherrimum* (Heller) Heller. The specimen upon which this record was based *(Moore and Iltis 442*, UARK, WIS), was cited by Barneby (1977) as representing *D. compacta* var. *compacta*. Smith, in an atlas supplement (1980), therefore deleted *P. pulcherrimum* from the Arkansas flora. We uncovered the Demaree specimen while annotating Arkansas collections at SMU, and determined it to be correctly identified. Specimens originally identified as this taxon at APCR from Little River County (*Tucker 16113*, APCR) were found to be var. *compacta*. Arkansas was not included in the range given for this

taxon by Wemple (1970) or Barneby (1977).

DALEA VILLOSA (Nutt.) Spreng. var. GRISEA (T. & G.) Barneby (Fabaceae). Miller Co.: Sec. 33, T18S, R28W, 17 Jun 1985, *Orzell and Bridges 2146* (APCR, NY, SMU, UARK); Sec. 17, T18S, R28W, 17 Jun 1985, *Orzell and Bridges 2148* (TEX, UARK), 17 Jun 1980, *R. Davis and G. Tucker 2570* (APCR).

Both of our collections are from areas of deep Briley loamy fine sand (Arenic Paleudults). *Dalea villosa* var. *grisea* is occasional in a sandhill woodland dominated by *Quercus incana, Q. margaretta,* and *Pinus echinata,* with *Thelesperma filifolium, Liatris elegans* (Walt.) Michx., *Cassia fasciculata, Helianthemum georgianum* Chapman, and *Selaginella arenicola* ssp. *riddellii.* Associates along a sandy roadside through a partially cleared sandhill woodland include *Astragalus soxmaniorum, Chrysopsis pilosa* Nutt., *Heterotheca latifolia* Buckl., *Clematis reticulata* Walt., *Haplopappus divaricatus* (Nutt.) Gray, *Asclepias amplexicaulis* Sm., *Eragrostis secundiflora* Presl., *Pediomelum digitatum* (Nutt. ex T. & G.) Isley, and *Rhus copallina* L.

Demaree (1943) lists *Petalostemon villosum* Nutt. for Arkansas, apparently based on the earlier report by Buchholz and Palmer (1926) of a collection (*Palmer 5994,* MO) near Cotter in Marion County. We have not seen this specimen, but it would represent a significant disjunction of var. *villosa* to Arkansas. Smith (1978) excludes *P. villosum* from the Arkansas flora, and this species as well as *P. griseum* T. & G. are not recorded for Arkansas by Wemple (1970) or Barneby (1977). The Davis and Tucker specimen was in bud, and uncovered in the unidentified *Dalea* collections at APCR annotated by the authors. These collections are apparently the first of this variety for Arkansas.

DELPHINIUM CAROLINIANUM Walt. subsp. PENARDII (Huth) Warnock (Ranunculaceae). Hempstead Co.: Sec. 5, T12S, R27W, 15 May 1985, *Orzell and Bridges 1855* (SMU, UARK), 19 May 1986, *Bridges 86-55* (MO, TEX). **Little River Co.:** White Cliffs, 29 May 1940, *E. Brinkley 715* (UARK); Sec. 32, T12S, R32W, 16 May 1980, *R. Davis and G. Tucker 2085* (APCR), 28 May 1976, *G. Tucker 16174* (APCR). **Sevier Co.:** Sec. 25, T11S, R29W, 28 Apr 1981, *R. Davis and J. Rettig 2969* (APCR).

Delphinium carolinianum subsp. *penardii* is occasional on a dry hillside blackland prairie dominated by *Schizachyrium scoparium* (Michx.) Nash. Other associates include *Sorghastrum nutans* (L.) Nash, *Hedyotis nigricans, Dalea purpurea* Vent., *Grindelia lanceolata* Nutt., *Bothriochloa saccharoides* (Sw.) Rydb., *Brickellia eupatorioides* (L.) Shinners, and *Penstemon cobaea* Nutt.

This taxon was first reported for Arkansas (as *D. penardii* Huth) by Buchholz and Palmer (1926), from Carroll County (*Palmer 5585,* MO). Demaree (1943) lists *D. virescens* Nutt., now considered to be a later synonym of *D. penardii* (Warnock 1981),

for Arkansas. Smith (1978) excludes *D. virescens* from Arkansas, stating "Arkansas reports probably based on pale flowered forms of *D. carolinianum*". This is undoubtedly true for most reports, and no Arkansas collections of this subspecies were noted by Warnock (1981). However, he did not examine the specimens cited at UARK or APCR. We found that specimens of the *D. carolinianum* complex from the dry blackland prairies and chalk outcrops of the Cretaceous region of southwestern Arkansas match the vegetative characters noted by Warnock (1981) as distinguishing this subspecies, although their flower color can vary from white to pale blue. Specimens from elsewhere in the state lack the distinctive foliage of this subspecies.

DELPHINIUM CAROLINIANUM Walt. subsp. VIMINEUM (D. Don) Warnock (Ranunculaceae). Miller Co.: Sec. 17, T18S, R28W, 17 May 1985, *Orzell and Bridges 1896* (MO, SMU, UARK); Sec 36, T18S, R28W, 18 May 1986, *Bridges 86-43* (SMU, UARK); Sec 3, T19S, R28W, 18 May 1986, *Bridges 86-44* (MO, TEX). **Nevada Co.:** Sec. 11, T11S, R20W, 14 Jun 1977, *J. Roberts 342* (UARK). **Ouachita Co.:** Sec. 25, T11S, R19W, 20 Jun 1985, *Orzell and Bridges 2215* (UARK).

All Arkansas collections are on deep sand in sandhill woodlands dominated by *Quercus incana*, with *Selaginella arenicola* ssp. *riddellii*, *Helianthemum georgianum*, and *Cnidoscolus texanus* (Muell. - Arg.) Small. Other Ouachita County associates include *Cassia fasciculata*, and *Eriogonum multiflorum* Benth. in a disturbed sandhill, while *Thelesperma filifolium*, *Bouteloua hirsuta* Lag. and *Streptanthus hyacinthoides* Hook. are associates at the relatively undisturbed Miller County sandhill woodland.

Smith (1978) includes this taxon (as *D. vimineum* D. Don) in his possible additions to the flora of Arkansas, on the basis of its having been listed as "probably in La. and s.w. Ark." by Correll and Johnston (1970). Warnock (1981) did not include Arkansas in the range of this subspecies; however, he did not consult collections at UARK. These collections are the first of this taxon for Arkansas, and represent a slight range extension from adjacent northeast Texas.

DELPHINIUM NEWTONIANUM D. M. Moore (Ranunculaceae). Pike Co.: Sec. 10, T5S, R25W, 30 Jun 1985, *Albert Higgenbottom s.n.* (UARK).

This very distinctive *Delphinium* has long been considered as narrowly endemic to an area of about 1500 sq. km. in four contiguous counties (Newton, Searcy, Johnson, and Pope) in the Boston Mountains of the Ozark Plateau (Moore 1939, Tucker 1984b, Kral 1983, Orzell and Bridges, in prep.). This collection extends its range about 160 km south to the southern edge of the central Ouachita Mountains. Here it occurs in dry-mesic rocky forests similar to those supporting the largest Ozark populations. The

canopy is dominated by *Quercus alba*, with *Carya tomentosa*, *Quercus rubra* L., *Q. stellata*, *Acer rubrum*, *Liquidambar styraciflua*, and *Pinus echinata*. The subcanopy is dominated by *Cornus florida* L., and the most common species in the herb layer are *Toxicodendron radicans* and *Desmodium nudiflorum* (L.) DC. Small chert-like fragments of novaculite rubble cover 20-30% of the ground surface. Mr. Higgenbottom, who so kindly sent us the specimen, indicated that the species is quite common in several of the nearby ravines, and visible from logging roads in late June.

DROSERA CAPILLARIS Poir. (Droseraceae). Calhoun Co.: Sec. 23, T14S, R13W, 30 Jun 1985, *Orzell and Carl Amason 2300* (SMU); Sec. 1, T14S, R15W, 7 Jul 1985, *Orzell, Bridges, and Carl Amason 2402* (UARK); Sec. 23, T14S, R13W, 7 Jul 1985, *Orzell, Bridges, and Carl Amason 2412* (MO, TEX, UARK).

All the Arkansas collections are from the nearly level Quaternary terrace deposits east of the Ouachita River in southern Calhoun County. *Drosera capillaris* may be locally abundant on exposed seasonally saturated fine sandy loam where the common associates are *Lycopodium appressum* (Chapman) Lloyd and Underwood, *Sphagnum* moss, and *Polypremum procumbens* L. In one graminoid dominated area adjoining a seep forest, associates were *Eriocaulon decangulare* L., *Cynoctonum sessilifolium* (Walt.) Jaume St. Hil, *Polygala cruciata*, *Xyris difformis* Chapman var. *curtissii* (Malme) Kral, *X. torta*, and *X. jupicai* L.C. Rich.

This species was first reported for Arkansas by Branner and Coville (1891); however, they did not report *D. brevifolia* Pursh (or any synonym of this species), which is much more common in the state. Demaree (1943) and Correll and Johnston (1970) also list this species for Arkansas, presumably based on the previous report. Arkansas is not included in the range of *D. capillaris* given by Wynne (1944), Wood (1960, 1966), or Shinners (1962). Smith (1978) excluded this species, since "Wood (1960) does not mention Arkansas in the range of this species, and I believe that reports of it for the state are probably based on *D. brevifolia*." We agree with Smith and believe that our collections are the first authentic material of this species for the state, which differs from *D. brevifolia* in its glabrous scapes and papillose seeds.

ECHINACEA SANGUINEA Nutt. (Asteraceae). Miller Co.: Sec. 6, T20S, R27W, 18 May 1985, *Orzell and Bridges 1911* (SMU, UARK), 17 Jun 1985, *Orzell and Bridges 2142* (TEX).

This species was listed for Arkansas by McGregor (1968) and Smith (1978) based only on a specimen from Miller County (*Eggert s.n.*, MO) collected in 1898. We found it to be locally common in the southern part of Miller County, in both sandy and gravelly-clayey soils. Apparently no collections were made in Arkansas in the 85 years between the Eggert collection and ours, and this species had been considered as possibly extirpated from Arkansas.

GEOCARPON MINIMUM Mackenzie (Caryophyllaceae). Franklin Co.: Sec. 10, T7N, R28W, 20 Apr 1986, *Orzell and Bridges 4135* (MO, UARK).

This federally listed threatened species (Norquist 1986) was found on a saline soil barrens developed on soils of the Wing series (Aquic Natrustalfs). The entire area is dominated by low herbs, with microtopographic variation from high, better drained mounds, flats of intermediate elevation, to low, wet, almost barren "slick spots" of the exposed natric subsoil horizon. *Geocarpon* occurs near the lower edges of the flats of intermediate elevation, often with high cover of lichens and Nostoc sp. Associates of *Geocarpon* include *Coreopsis grandiflora* Hogg ex Sweet, *Ambrosia bidentata* Michx., *Croton capitatus* Michx., *Nothoscordum bivalve* (L.) Britt., *Diodia teres, Oenothera linifolia* Nutt., *Juncus tenuis* Willd., *Talinum parviflorum* Nutt. ex Torr. & Gray, *Sagina decumbens* (Ell.) Torr. & Gray, *Hedyotis australis* W. H. Lewis & D. M. Moore, *Erigeron tenuis* Torr. & Gray, *Astragalus distortus* var. *distortus, Neptunia lutea* (Leavenworth) Benth., *Aristida* sp. and *Sporobolus* sp.

Geocarpon minimum has long been known to occur in Arkansas only in the southeastern Coastal Plain, in Bradley, Cleveland, and Drew Counties (Smith 1978, Rettig 1983). It also has been previously reported on Channel Sands (Pennsylvanian age) glades in six southwestern Missouri counties (Morgan 1980). This collection is the first for the Arkansas River valley section, of the Ouachita Province. Previous to this collection, the Arkansas and Missouri ranges of this species were separated by 390 km; this intervening site is 180 km south of the nearest Missouri sites and 230 km northwest of the nearest Arkansas sites. A complete inventory of all areas mapped as Wing soil in western Arkansas (with the exception of one area in the target area for heavy artillery training at Fort Chaffee, in which no human has set foot for 40 years!), conducted from April 20-23, 1986, revealed no additional sites for *Geocarpon.* This inventory should be repeated at an earlier date in the growing season in a wetter year, as most of the plants seen at the Franklin County site were dead and drying by this date due probably in part to droughty weather conditions in 1986.

JUNCUS SUBCAUDATUS (Engelm.) Coville and Blake (Juncaceae). Sharp Co.: Sec. 7, T18N, R4W, 23 Oct 1984, *Orzell and Bridges 1559* (UARK).

Juncus subcaudatus is scattered along narrow streamsides of Rock Creek, a calcareous spring-fed stream, and in adjacent calcareous streamside seep fens. Associates include *Lysimachia quadriflora* Sims, *Parnassia grandifolia, Pycnanthemum virginianum* (L.) Durand and Jackson, *Rhynchospora capillacea* Torr., *Scleria verticillata* Muhl. ex Willd., *Solidago riddellii, Aster novae-angliae* L., *Polypremum procumbens,* and *Hypericum sphaerocarpon* Michx.

Smith (1978) includes this species in his possible additions, stating "based on its distribution in Steyermark (1963), perhaps rare in extreme N-central Arkansas". Our collection confirms this prediction, and this species is probably restricted to fens in Arkansas.

LASALLEA SERICEA (Vent.) Greene subsp. **SERICEA** (*Aster sericeus* Vent.) (Asteraceae). Newton Co.: Sec 29, T17N, R20W, 28 Jun 1985, *Orzell and Bridges 2233* (UARK).

This species (as *Aster sericeus)* was first reported for Arkansas by Demaree (1943), but listed as a "possible addition" by Smith (1978). We found the Demaree specimen on which his report was apparently based (16 Oct 1943, *Demaree 24786,* SMU), originally identified as *A. sericeus,* but annotated as *A. pratensis* Raf. by B. Lipscomb in 1979 and J. C. Semple in 1980; therefore Demaree first collected in Arkansas the taxon we are considering as *L. sericea* subsp. *pratensis* (Raf.) Semple & Brouillet. This taxon was reinstated as new to the Arkansas flora by Sundell (1983) as *A. pratensis,* and it is locally abundant on saline soil barrens in southeastern Arkansas. *Lasallea sericea* ssp. *sericea* was first discovered in Arkansas by Paul Nelson of the Missouri Department of Natural Resources while on a natural area workshop field trip to Devil's Knob-Devil's Backbone State Natural Area in Izard County, and this record was reported by Rettig (1982). Our site for this taxon is the second for the state, and indicates the potential for many additional sites on calcareous glades in the intervening and adjacent counties. Our nomenclature for this group is following Semple and Brouillet (1980).

LILIUM SUPERBUM L. (Liliaceae). Logan Co.: Magazine Mountain, near top - south end, 29 Jun 1952, *D. M. Moore 520773* (SMU, UARK). Pope Co.: Sec. 5 & 6, T10N, R20W, 24 Jun 1985, *Orzell and Bridges 2224* (MO). Stone Co.: Vicinity of Cole Fork/Stewarts confluence (on Stewarts Fork). Very rare. 14 Apr 1981, *R. Davis 2914* (APCR).

At the Pope County station a colony of robust plants occurs in a canopy opening along a lower north-facing slope dominated by *Fraxinus americana* L., *Acer saccharum* Marsh, *Carya cordiformis, Juglans nigra,* and *Liquidambar styraciflua.* The understory and shrub layers include *Acer saccharum, Cornus florida, Hamamelis virginiana* L., *Lindera benzoin, Dirca palustris* L., and *Halesia carolina* L. Herb layer associates include *Delphinium newtonianum, Carex albursina* Sheldon, *Asarum canadense* L., *Phryma leptostachya, Adiantum pedatum,* and *Desmodium glutinosum* (Muhl. ex Willd.) Wood.

This species was first reported for Arkansas by Nuttall (1835) and listed by Branner and Coville (1891) on the basis of this report. Buchholz and Palmer (1926) report this species from Washington Co., but no specimen was cited. Demaree (1943) also

listed this species for the state, but Smith (1978) includes this taxon under *L. michiganense* Farw. as "*L. superbum*" of auth., not L." The history of knowledge of these taxa in the midwestern United States is complicated by the relatively late date of description of *L. michiganense* (1915) and *L. canadense* L. ssp. *editorum* (Fern.) Wherry (1943), previous to which these taxa were commonly called *L. superbum,* and the slow and inconsistent recognition of these as distinct taxa (cf. Hull 1942, 1943, Gleason 1952, Boivin and Cody 1956). More recent works (Wherry 1947, Mohlenbrock 1962, Adams and Dress 1982) maintain all of these as distinct taxa, but report only *L. michiganense* as occurring in Arkansas. We have critically examined the above cited specimens and conclude that true *L. superbum* does occur very rarely in Arkansas, often in very mesic areas known to support other primarily Appalachian species. Our specimen has the glabrous leaf margins and veins, ribbed sepal midribs, and large medifixed anthers characteristic of this species, and the other specimens (the Davis specimen is vegetative and agrees with *L. superbum* in those characters) examined have characters consistent with these.

LITHOSPERMUM TUBEROSUM Rugel ex DC. (Boraginaceae). Hempstead Co.: Sec. 24, T12S, R27W, 2 Apr 1985, *Orzell and Bridges 1652* (UARK, SMU). **Howard Co.:** Sec. 12., T8S, R29W, 2 Apr 1985, *Orzell and Bridges 1655* (UARK). **Sevier Co.:** Sec. 14, T10S, R29W, 3 Apr 1985, *Orzell and Bridges 1658* (TEX, UARK); Sec. 32, T10S, R29W, 8 Oct 1985, *Orzell, Bridges, L. Peacock, and T. Foti 3314* (MO).

Lithospermum tuberosum is a characteristic plant of dry-mesic calcareous ravine forests on Cretaceous strata in the southwestern Coastal Plain of the state. These forests are dominated by *Quercus muhlenbergii, Q. shumardii, Juglans nigra, Acer saccharum, Carya ovata* (P. Mill.) K. Koch, and *C. myristiciformis* (Michx. f.) Nutt., in contrast to the surrounding mixed pine-hardwood forests with *Pinus taeda.* These calcareous ravine forests have a lush, species-rich vernal flora, in a region intrinsically depauperate in this floristic element. Herbaceous associates of *L. tuberosum* include *Phlox pilosa* L., *Osmorhiza longistylis, Sanguinaria canadensis* L., *Trillium recurvatum* Beck, *Uvularia sessilifolia, Solidago auriculata,* and *Phryma leptostachya.*

This species is not listed in Smith (1978) nor in any other work on the flora of Arkansas. We believe our collections to be the first for the state, representing a short range disjunction from northcentral and northeast Louisiana.

LUDWIGIA MICROCARPA Michx. (Onagraceae). Sharp Co.: Sec. 7, T18N, R4W, 25 Oct 1985, *Orzell and Bridges 3628* (UARK, SMU).

Ludwigia microcarpa is common in calcareous seep fens on a gravelly marly substrate saturated by minerotrophic seepage.

Associates include *Scleria verticillata, Rhynchospora capillacea, R. capitellata* (Michx.) Vahl., *Parnassia grandifolia, Lysimachia quadiflora, Selaginella apoda, Solidago riddellii, Cynoctonum mitreola* (L.) Britt., and *Fuirena simplex* Vahl.

Smith (1978) includes this species in his possible additions, stating "based on the distribution given in Steyermark (1963), should be in Arkansas." Actually, this species is known only from two sites in Missouri (Sharon Morgan, pers comm), and is very rare in Louisiana (Peng 1982), Tennessee (Peng 1982; Milo Guthrie, pers. comm.), and Texas (Orzell and Bridges, in prep.).

LYCOPODIUM CAROLINIANUM L. (Lycopodiaceae). Calhoun Co.: Sec 27, T14S, R13W, 1 Nov 1985, *Orzell and Bridges 3648* (MIL, MO, UARK).

Lycopodium carolinianum has been found at a single station on wet exposed fine sandy loam with *Aletris farinosa* L., *Cynoctonum sessilifolium,* scattered *Sphagnum* moss, *Rhynchospora inexpansa, R. rariflora* (Michx.) Ell., *R. gracilenta* Gray, *Lycopodium appressum, Anthaenantia rufa* (Ell.) Schultes, *Xyris baldwiniana* Schultes, *Aristida longespica* Poir., and *Drosera capillaris.* Nearby associates include *Eryngium intergrifolium* Walt., *Platanthera ciliaris* (L.) Lindl., *Rhynchospora plumosa* Ell., *Myrica cerifera* L., and *Eriocaulon decangulare.*

This species is not listed for Arkansas by Smith (1978) or Taylor (1984), and we believe our collection to be the first for the state. This record represents a disjunct of about 220 km from the more continuous range in the longleaf pine belt of central Louisiana, with only one intervening record in Jackson Parish, Louisiana (Thieret 1980). Peck et al. (1987) have also reported this new record for Arkansas. Our determination was verified by Dr. James Bruce.

LYCOPODIUM x COPELANDII Eiger (Lycopodiaceae). Calhoun Co.: Sec. 1, T14S, R15W, 7 Jul 1985, *Orzell, Bridges, and Carl Amason 2399* (MIL, MO, TEX, UARK).

This natural hybrid was found with *Platanthera ciliaris, Drosera capillaris,* and *Lycopodium appressum* in a shallow roadside ditch adjacent to a seep forest. When we made this collection, we could not locate one of the putative parents, *L. alopecuroides* L., at this site or from the state of Arkansas. The nearest documented sites for *L. alopecuroides* are 270 km south in Rapides Parish, Louisiana and 270 km east in Attala County, Mississippi (Thieret 1980; Evans 1978). This hybrid is known to occur in the absence of *L. alopecuroides* in Kentucky (Cranfill 1980, 1981). Hybridization between *L. appressum* and *L. alopecuroides* is common in mixed populations on the outer Coastal Plain (Thieret 1980). Later searches of this and nearby sites by Peck et al. (1987) resulted in the discovery of not only this hybrid, but also *L. alopecuroides, L. prostratum, L.* x *bruceii* (*L. appressum* x *L.*

prostratum), and *L. alopecuroides* x *L. prostratum*. The result is a remarkable assemblage of *Lycopodium* species and hybrids for an area about 420 km from the Gulf coast.

LYGODESMIA JUNCEA (Pursh) Hook. (Asteraceae). Hot Springs Co.: Igneous intrusive area, bottoms and foothills, P.O. Magnet Cove, elev. 600 ft., 18 Sept 1937, *Demaree 16264* (SMU).

Demaree (1943) reported this species from Arkansas, and Vuilleumier (1973) noted its occurrence in the southeastern United States "only in the region of Little Rock, Arkansas (*fide* Tomb)." Smith (1978) excluded this species from Arkansas, stating "reported from Pulaski Co. by Vuilleumier (1973), probably on the basis of waifs." Tomb (1980) cites and maps the above Demaree specimen for Arkansas, as long-disjunct from the main range of the species. We believe that *L. juncea* naturally occurred on open, very xeric granitic outcrops at Magnet Cove, now almost completely destroyed by mining activities, and that this species has probably been extirpated from the state.

OENOTHERA HETEROPHYLLA Spach subsp. HETEROPHYLLA (Onagraceae). Miller Co.: Sec 17, T18S, R28W, 18 May 1986, *Bridges 86-53* (UARK), 17 Jun 1980, *G. Tucker 19400* (APCR).

This species is common in natural openings in sandhill woodlands dominated by *Quercus incana*, with *Dalea phleoides* (Torr. & Gray) Shinners var. *microphylla* (Torr. & Gray) Barneby, *Opuntia humifusa*, *Eriogonum longifolium* Nutt., *Helianthemum georgianum*, *Streptanthus hyacinthoides*, and *Selaginella arenicola* ssp. *riddellii*.

The description of *O. heterophylla* subsp. *orientalis* Dietrich, Raven & W. L. Wagner (Wagner 1983) from Arkansas and Alabama left subsp. *heterophylla* as occurring from central and eastern Texas to eastern Louisiana. Subsp. *orientalis* occurs in Calhoun, Nevada, and Ouachita counties in Arkansas, whereas we have found subsp. *heterophylla* only west of the Red River in Miller County, where it is contiguous with the range of this subspecies. Our specimen has the spreading, longer sepal tips and red pustulate hairs characteristic of this subspecies (Wagner 1983). We have not seen the Tucker specimen, but presume it to be the same taxon as it was collected from the same site.

OENOTHERA PILOSELLA Raf. subsp. SESSILIS (Pennell) Straley (Onagraceae). Lafayette Co.: Sec. 25, T16S, R24W, 19 May 1985, *Orzell and Bridges 1925* (MO, UARK).

The Lafayette County site for this taxon is a fragipan flatwoods forest dominated by *Quercus phellos*. Herbaceous associates include *Tradescantia occidentalis* (Britt.) Smyth and *Carex* spp.

Almost all known extant sites for this subspecies are on

prairie remnants in the Grand Prairie region of the Mississippi Alluvial Plain of eastern Arkansas, in Arkansas, Prairie, and Lonoke counties (Tucker 1984a), and recently St. Francis County. It is also known from single historical collections in Louisiana and Texas. This collection represents a very different habitat for this taxon, and greatly increases our knowledge of its area and habitat of potential occurrence.

PASPALUM PRAECOX Walter (Poaceae). Calhoun Co.: Sec. 22, T14S, R13W, 30 Jun 1985, *Orzell and Carl Amason 2292* (TEX); 1 Nov 1985, *Orzell and Bridges 3646A* (SMU, UARK).

This species is common in a open graminoid dominated area with *Fuirena bushii, Polygala cruciata, Xyris ambigua, X. torta, Rhynchospora glomerata, R. inexpansa, R. globularis, Rhexia mariana, Sphagnum* moss, *Gelsemium sempervirens, Asclepias longifolia* ssp. *longifolia, Graticia pilosa, Sabatia gentianoides, Dichanthelium scoparium, Ludwigia linearis, Hypericum lobocarpum* Gattinger, and *Eupatorium rotundifolium.*

Smith and Lipscomb (1975) reported this species from Chicot County, but Smith (1978) later excluded this species, stating it to be based on a misidentification of *P. pubiflorum* Rupr. ex Fourn. We have not seen the specimen for this report. Our collections represent the first authentic material of this species from Arkansas, and a slight range extension northward from Louisiana.

PEDIOMELUM DIGITATUM (Nutt. ex T. & G.) Isley (*Psoralea digitata* Nutt. ex T. & G.) **(Fabaceae). Miller Co.:** Sec. 33, T18S, R28W, 17 May 1985, *Orzell and Bridges 1902* (SMU, UARK), 25 Jun 1980, *Davis and Kral 2689* (APCR), *Kral 65502* (VDB). County uncertain: "Arkansas, common," 23 Jul 1894, *B. Bush 67* (NY, US).

Pediomelum digitatum is occasional along a sandy roadside, through a former sandhill woodland that is now a cleared field. Associates include *Astragalus soxmaniorum, Chrysopsis pilosa, Heterotheca latifolia, Clematis reticulata, Haplopappus divaricatus, Asclepias amplexicaulis, Eragrostis secundiflora,* and *Dalea villosa* var. *grisea.*

Pediomelum digitatum was first reported for Arkansas by Branner and Coville (1891), and included in the Arkansas flora by Demaree (1943). An early collection of *P. digitatum* was examined by the authors, and based on what we know of Bush's itinerary, could have been collected in Miller County. A Leavenworth collection from Arkansas at NY could well have been collected in Oklahoma. Smith (1978) listed *Psoralea digitata* var. *digitata* as a possible addition to the flora of Arkansas, stating "reported for Arkansas by Demaree (1943) and Correll and Johnston (1970), perhaps in west or southwest Arkansas". Davis (1981) reported *P. digitata* var. *digitata* from Arkansas, based on his collection cited above. Shinners (1951) described *Psoralea digitata* var. *parvifolia*

Shinners as a narrow-leaved variety occurring only in eastern Texas, therefore necessitating the above references to var. *digitata*. Smith (1978) does not mention this variety, but by giving a variety name alludes to its existence. Our collection and the specimens cited by Davis (1981) are actually all referable to var. *parvifolia*. James Grimes (pers. comm.) believes var. *parvifolia* to intergrade with var. *digitata*, and perhaps not worthy of recognition. However, the specimens we have seen from areas of sandy soil in eastern Texas, adjacent Louisiana and southwestern Arkansas mostly retain the characters Shinners used to distinguish this variety. We agree that it probably does not represent a valid subspecific taxon, but, nevertheless is the ecological form of this species in Arkansas.

PEDIOMELUM HYPOGAEUM (T. & G.) Rydberg subsp. SCAPOSUM (Gray) Ockendon (*Psoralea hypogaea* Nutt. ex T. & G. var. *scaposa* Gray) (Fabaceae). Miller Co.: Sec 17, T18N, R28W, 18 May 1986, *Bridges 86-48* (UARK).

This species was rare in openings in a sandhill woodland dominated by *Quercus incana*. Herbaceous associates include *Selaginella arenicola* ssp. *riddellii*, *Thelesperma filifolium*, *Bouteloua hirsuta*, *Scutellaria cardiophylla* Engelm. & Gray, and *Berlandiera* x *betonicifolia*. Our specimen was determined by James Grimes at TEX, who found that it had the glands, size, and leaflet shape of *P. hypogaeum* but the inflorescence and pubescence of *P. subulatum* (Bush) Rydberg.

This unusual record was not listed for Arkansas by Smith (1978) or any other list for the state. *P. hypogaeum* ssp. *scaposum* ranges from central to north-central Texas, where it commonly occurs on limestone outcrops. It was considered as endemic to Texas by Turner (1959) and Ockendon (1965). Our collection is unusual both in being disjunct 300 km from the nearest locality, and in occurring on deep sand, a habitat more commonly associated with the more western ssp. *hypogaeum*. This collection, and several additional collections we have made of this variety in eastern Texas, suggest that *P. hypogaeum* ssp. *hypogaeum*, *P. hypogaeum* ssp. *scaposum*, and *P. subulatum* may all be part of the same wide-ranging species complex, with the variation within the group tied to habitat conditions.

PEDIOMELUM SUBULATUM (Bush) Rydberg (Fabaceae) (*Psoralea subulata* Bush). Miller Co.: Sec. 7, T20S, R27W, 18 May 1985, *Orzell and Bridges 1910* (MO, SMU, TEX, UARK). Nevada Co.: Near Bluff City, in a field, 12 May 1984, *H. D. Moore s.n.* (UARK).

At our collection site, this species was rare in a sandhill woodland on Sparta sand overlying the Weches formation (Eocene). The canopy is dominated by *Quercus velutina* Lam., *Q. margaretta*, and *Q. incana*. Associates of *Pediomelum subulatum* include

Pteridium aquilinum (L.) Kuhn, *Tradescantia reverchonii, Rhus aromatica, Cnidoscolus texanus, Aristolochia reticulata* Jacq., *Callicarpa americana* L., and *Castanea pumila* (L.) P. Mill.

This species was not included in the Arkansas flora by Smith (1978) or any other source. *Psoralea subulata* was considered as endemic to Texas by Ockendon (1965), although Turner (1959) noted that it occurred in Louisiana and possibly adjacent Oklahoma. Waterfall (1972) reports it from two counties in central Oklahoma, and we have collected this species on deep sand in Atoka County in southeastern Oklahoma. Lasseigne (1973) reports *P. subulata* from only Natchitoches Parish in Louisiana. The Nevada Co. specimen at UARK had been identified as *P. esculenta* Pursh until our annotation.

POGONIA OPHIOGLOSSOIDES (L.) Ker. (Orchidaceae). Fulton Co.: Sec. 7, T20N, R8W, 23 May 1985, *Orzell and Bridges 1938* (MO, SMU, TEX, UARK).

This species was common in two open graminoid dominated fens in this section, particularly on *Osmunda regalis* L. hummocks within the fens. Herbaceous associates include *Sphagnum* sp., *Dulichium arundinaceum* (L.) Britt., *Juncus effusus* L., *Eupatorium perfoliatum* L., *Andropogon gerardii* Vitman, *Rhexia mariana, Ludwigia alternifolia, Dichanthelium scoparium, Aster lateriflorus* (L.) Britt., *Senecio aureus, Coreopsis tripteris* L., *Pedicularis lanceolata* Michx., *Carex suberecta, C. lurida* Wahlenb., and *C. interior*. Over 200 individuals were counted at one of the sites, several with two flowers per plant.

These two colonies represent the second and third extant sites for this species in Arkansas, the other being in Jefferson County, with a historical record from Saline County. This also is the second reported site for the Interior Highlands, and the first in this region of Arkansas. The only other site for *P. ophioglossoides* in the Interior Highlands is a fen on the Salem Plateau, in Reynolds County, Missouri (Steyermark 1963; Orzell 1983).

PORTULACA UMBRATICOLA H.B.K. (Portulacaceae). Monroe Co.: Sec. 18, T1N, R2W, 6 Nov 1985, *Orzell 3653* (UARK), 7 Nov 1985, *Orzell 3663* (MO, NCU, NLU, SMU, TEX, UARK).

Portulaca umbraticola was common along the edge of a harvested soybean field on a moist deep sandy upland, with *Cassia obtusifolia* L., *Chamaesyce maculata* (L.) Small, *Eleusine indica* (L.) Gaertn., *Campsis radicans* (L.) Seem. ex Bureau, and *Digitaria sanguinalis* (L.) Scop.

This species has not been previously reported for Arkansas by Smith (1978) or any other source. It has long been known from the southeastern United States as *P. coronata* Small, considered to be synonymous with the widespread southwestern *P. umbraticola* (Matthews and Levins 1985). We consider this species

to be questionably native in Arkansas; it does occur in a region naturally having somewhat droughty deep eolian sand deposits, and it could have been a part of the native flora. However, ample opportunity has existed for it to have been introduced from further southwest in this highly disturbed region.

PRUNUS GRACILIS Engelm. and Gray (Rosaceae). Miller Co.: Sec. 6, T20S, R27W, 18 May 1985, *Orzell and Bridges 1919* (MO, NLU, SMU, TEX, UARK).

Prunus gracilis is locally abundant at the edge of a cleared sandhill woodland (now planted in pines). Associates include *Quercus margaretta, Pteridium aquilinum, Tradescantia reverchonii, Rhus copallina, Cnidoscolus texanus, Alophia drummondii* (Graham) R.C. Foster, *Chionanthus virginicus* L., *Astragalus soxmaniorum, Stillingia sylvatica* Garden ex L., *Hymenopappus artemisiifolius, Tetragonotheca ludoviciana* (Torr. and Gray) Gray, and *Tephrosia virginiana* (L.) Pers.

This species was listed for Arkansas by Correll and Johnston (1970) and Robertson (1974). Tucker (1976) did not include this species in the flora, but noted that it was very likely in the southwest corner of the state. Smith (1978) included it in possible additions, based on the above reports. We believe our collection to be the first of this species from Arkansas, and that the previous reports for Arkansas were likely based on specimens collected in present-day Oklahoma.

RHYNCHOSPORA COLORATA (L.) Pfeiffer (*Dichromena colorata* (L.) A. H. Hitchc.) (Cyperaceae). Little River Co.: Sec. 4, T13S, R32W, 13 Aug 1985, *Orzell and Bridges 2726* (APCR, MO, NCU, SMU, TEX, UARK).

Our new site is a vigorous and dense stand of thousands of plants in a disturbed, artificially open wet swale in a shallow drainage. Associated species include *Rhynchospora caduca* Ell., *Cynoctonum mitreola, Polypremum procumbens, Lythrum alatum* Pursh var. *lanceolatum* (Ell.) Torr. & Gray, *Eupatorium perfoliatum, Desmanthus illinoensis* (Michx.) MacM. ex B. L. Robins. & Fern., *Diodia virginiana* L., *Setaria geniculata* (Lam.) Beauv., and *Axonopus furcatus* (Flugge) A. S. Hitchc.

This species has long been known to occur in Arkansas only on the basis of specimens collected by Demaree in Bradley County between 1937 and 1939 [*Demaree 15044* (F, MO, SMU, NY), *Demaree 19264* (GH-2, MO, NY, SMU, UARK), *Demaree 19268* (SMU), *Demaree 19269* (MICH, NLU, NY-2, TEX-5, UARK)]. Despite the relatively specific site information and the efforts of numerous botanists to relocate this conspicuous species, it has not been seen at the Bradley County site since 1939. Many of the labels of the Demaree collections state that the species was "not common", and each sheet contains numerous entire plants. We feel that *R. colorata* was overcollected to the point of local

extirpation by 1939, and until our recent collection, was generally accepted as extirpated from Arkansas.

RHYNCHOSPORA MICROCARPA Baldw. ex Gray (Cyperaceae). Calhoun Co.: Sec. 34, T14S, R13W, 14 Jun 1985, *Orzell and Bridges 2118* (SMU, TEX, UARK).

Rhynchospora microcarpa is common in a wet cutover *Pinus taeda* flatwoods where it grows in association with *Rhynchospora inexpansa, R. corniculata* (Lam.) Gray, *R. glomerata, R. globularis, Xyris laxifolia* Mart. var. *iridifolia* (Chapman) Kral *ined., Diodia virginiana,* and *Myrica heterophylla* Raf.

This remarkable find has not been previously reported for Arkansas, and is disjunct over 220 km from the nearest isolated locality in LaSalle Parish and over 420 km from the more continuous range in extreme southern Louisiana (Joyce 1974). We have found this species to occur typically near the boundary between the coastal prairie and freshwater marsh regions of southwestern Louisiana. This is by far the most inland record for this outer Coastal Plain species. Our determination was verified by Dr. Wm. Wayt Thomas at the New York Botanical Garden.

RHYNCHOSPORA PLUMOSA Ell. (Cyperaceae). Calhoun Co.: Sec. 27, T14S, R13W, 3 Aug 1985, *Orzell and Carl Amason 2628* (UARK).

Rhynchospora plumosa is common in a wet swale with *Aster umbellatus* P. Mill., *Eupatorium rotundifolium, Rhynchospora inexpansa, R. globularis, R. glomerata, R. gracilenta, Lycopodium appressum, Helianthus angustifolius* L., *Pluchea foetida* (L.) DC., *Eryngium integrifolium, Crotonopsis elliptica* Willd., *Gelsemium sempervirens,* and *Eriocaulon decangulare.*

This very distinctive sedge was not listed for Arkansas by Smith (1978) or any other source. Our collection is the first for Arkansas and is disjunct 210 km from the nearest locations in the longleaf pine belt of central Louisiana (Joyce 1974).

SABATIA GENTIANOIDES Ell. (Gentianaceae). Calhoun Co.: Sec. 22, T14S, R13W, 30 Jun 1985, *Orzell and Carl Amason 2281* (APCR); Sec. 23, T14S, R13W, 6 Jul 1985, *Orzell and Bridges 2378* (UARK, SMU).

At both Calhoun County stations, *Sabatia gentianoides* thrives in open areas with *Fuirena bushii, Polygala cruciata, Rhynchospora inexpansa, R. glomerata, Eupatorium rotundifolium,* and *Dichanthelium scoparium.* Other associates which occur at one of the two sites include *Xyris ambigua, X. torta, Paspalum praecox, Ludwigia linearis, Hypericum lobocarpum, Polypremum procumbens, Cynoctonum sessilifolium, Rhynchospora rariflora, Hypericum hypericoides, Crotonopsis elliptica,* and *Myrica cerifera.*

Sabatia gentianoides was first found in Arkansas by Carl

Amason, who called the authors when it flowered in 1985 and led the senior author to the site that day. This species was not listed for Arkansas by Smith (1978) and the state was not included in its range by Wilbur (1955) or Perry (1969). We believe our collections to be the first for the state, and disjunct over 170 km from the more continuous range in the longleaf pine belt of central Louisiana.

SANGUISORBA ANNUA Nutt. (Rosaceae). Sebastian Co.: Sec. 16, T4N, R32W, 21 Apr 1986, *Orzell and Bridges 4202* (MO, NCU, SMU, TEX, UARK).

This species was found in a disturbed saline soil barrens (Wing soil series: Aquic Natrustalfs) in the prairie region of the western Arkansas River valley near Hartford. Associated species included *Nemophila phacelioides* Nutt. ex W. Bart., *Delphinium carolinianum, Solanum elaeagnifolium* Cav., and *Camassia scilloides* (Raf.) Cory.

This species has long been included in the Arkansas flora (Lesquereux 1860, Branner and Coville 1891, Demaree 1943, Correll and Johnston 1970, Robertson 1974), likely all on the basis of the original Nuttall collections probably made in present-day Oklahoma. A specimen at GH, collected by Leavenworth in Arkansas, is part of a sheet which Gray designated as the type, and another specimen at GH is labeled "Ark. Mts., Douglas". Again, both of these were likely to have been collected in Oklahoma. We are considering our collection to be the first from within the present borders of Arkansas.

SCLERIA RETICULARIS Michx. (Cyperaceae). Calhoun Co.: Sec. 23, T14S, R13W, 6 Jul 1985, *Orzell and Bridges 2380* (TEX, UARK). **Fulton Co.:** Sec. 7, T20N, R8W, 2 Oct 1984, *Orzell 1434* (UARK), *Orzell 1439* (SMU, TEX).

In Fulton County, *S. reticularis* was found in two minerotrophic seeps, one with quaking sphagnous peat accumulation, on the Salem Plateau, associated with *Rudbeckia fulgida* var. *umbrosa, Dichanthelium scoparium, Parnassia grandifolia, Pedicularis lanceolata, Carex lurida, Rhynchospora capitellata, Senecio aureus,* and *Xyris torta.* The Calhoun County site is in an open clearcut recently planted in *Pinus taeda* on the almost level Quaternary terrace desposits east of the Ouachita River, in the Gulf Coastal Plain, associated with *Aletris farinosa, Polygala cruciata, Cynoctonum sessilifolium, Polypremum procumbens, Rhynchospora rariflora, Fuirena bushii,* and *Sabatia gentianoides.*

Scleria reticularis was listed for Arkansas by Nuttall (1835), Branner and Coville (1891), and Demaree (1943), but was excluded from the Arkansas flora by Smith (1978), based upon its distribution as shown by Fairey (1967). Our specimens have the characteristics of var. *pubescens* Britt. (*S. muhlenbergii* Steud., *S.*

setacea Poir.), but we believe this form to be of little taxonomic merit.

SEBASTIANA FRUTICOSA (Bartr.) Fern. (Euphorbiaceae). **Lafayette Co.:** Sec. 23, T17S, R24W, 7 Oct 1985, *Orzell, Bridges, and Peacock 3218* (NCU, SMU, UARK); Sec. 14, T17S, R24W, 7 Oct 1985, *Orzell, Bridges, and Peacock 3247* (TEX).

This shrub was first discovered in Arkansas by Lance Peacock, who brought it to our attention. It is rather abundant along Bodcau Creek on the lower slopes of the uplands bordering the stream floodplain, often adjacent to seepage areas, and occasionally on infrequently flooded stream terraces. Typical overstory associates include *Liquidambar styraciflua* and *Quercus nigra* L., sometimes also with *Nyssa sylvatica* or *Taxodium distichum* (L.) L.C. Rich.

This species was not listed for Arkansas by Smith (1978) or any other source. It is a typical species of the Coastal Plain west to southeast Texas, and we believe our collections to be the first for Arkansas.

SOLIDAGO BICOLOR L. (Asteraceae). Garland Co.: Weyerhauser Forest, rocky disturbed woods, P.O. Mountain Pine, elev. 650 ft., 26 Oct 1971, *Demaree 64307* (SMU).

This species was reported for Arkansas by Branner and Coville (1891), but they did not list its much more common relative, *S. hispida* Muhl. ex Willd. It was listed as occurring in the Ouachita mountains of Arkansas by Cronquist (1980), but Smith (1978) referred Arkansas reports of *S. bicolor* to *S. hispida*. We have examined the Demaree specimen and found it to be true *S. bicolor*. Cronquist (1980) states that this species hybridizes extensively with *S. hispida* and *S. erecta* Pursh, but retains its populational identity over large areas. Perhaps in the western part of its range, pure *S. bicolor* is quite rare, since *S. hispida* is quite abundant in the Interior Highlands.

SOLIDAGO ULMIFOLIA Muhl. var. MICROPHYLLA Gray. (Asteraceae). Garland Co.: 11 Aug 1937, *Demaree 15622A* (SMU), *Demaree 16662A (sic)* (SMU). **Logan Co.:** 25 Aug 1937, *Demaree 16052* (SMU). **Polk Co.:** 12 Aug 1937, *Demaree 15712* (SMU); 19 Aug 1937, *Demaree 15877* (SMU-2); 10 Sep 1953, *Demaree 34229* (SMU); 26 Oct 1966, *Demaree 54970* (SMU); 18 Sep 1954, *A. McWilliam s.n.* (UARK-2); 12 Oct 1952, *D. M. Moore and H. H. Iltis 520823* (UARK); 8 Sep 1954, *D. M. Moore 54266* (SMU); 19 Aug 1969, *Gary Morton 3988* (SMU).

Although *Solidago ulmifolia* is quite common throughout Arkansas, confusion exists as to the varieties present in the state. Smith (1978) includes *S. delicatula* Small in synonymy under *S. ulmifolia* var. *palmeri* Cronq., and *S. ulmifolia* var. *microphylla* in

synonymy under *S. ulmifolia* var. *ulmifolia*. In contrast, Cronquist (1980) lists as occurring in Arkansas the taxa *S. delicatula*, *S. ulmifolia* var. *palmeri*, and *S. ulmifolia* var. *ulmifolia*, with no additional synonymy. Taylor and Taylor (1984) list *S. ulmifolia* var. *microphylla* as the common variety of the species in Oklahoma and Texas, and include *S. delicatula* and *S. helleri* Small in its synonymy. We concur with the nomenclature and synonymy of Taylor and Taylor (1984) for this group, and have reexamined all Arkansas specimens of *S. ulmifolia* at SMU and UARK (103 sheets) using several published descriptions and keys to determine the taxa. We found specimens of var. *microphylla*, var. *palmeri*, and var. *ulmifolia* in the state, with distinct geographic separation. *Solidago ulmifolia* var. *microphylla* reaches its eastern limit in the Ouachita Mountains of west-central Arkansas, from the above cited counties. *Solidago ulmifolia* var. *palmeri*, described twice from Arkansas and Alabama specimens by Cronquist (1947, 1955), is common throughout all but the extreme western part of the Ouachita Mountains, and occurs occasionally in the Ozark Plateaus. *Solidago ulmifolia* var. *ulmifolia* is the only variety in the Coastal Plain and Mississippi Alluvial Plain sections of the state, and occasionally reaches slightly into the Interior Highlands. Some of the specimens cited were first determined as *S. ulmifolia* var. *microphylla* by C. E. Taylor.

SPIRANTHES ODORATA (Nutt.) Lindl. (*Spiranthes cernua* (L.) L.C. Rich. var. *odorata* (Nutt.) Correll) (Orchidaceae).
Cleveland Co.: Sec. 10 and 11, T11S, R12W, 19 Oct 1985, *Orzell, Bridges, and Peacock 3480* (MO, NCU, NLU, NYS, SMU, TEX, UARK).

This species was first found in Arkansas by Lance Peacock, who brought it to our attention. The population consists of several hundred plants, forming stoloniferous colonies over a five acre area, growing in shallow standing water of a backswamp dominated by scattered *Taxodium distichum*, *Liquidambar styraciflua*, and *Quercus lyrata* over a dense subcanopy of *Fraxinus caroliniana* P. Mill. Common associates of *S. odorata* include *Panicum gymnocarpon* Ell., *Aster vimineus* Lam. var. *subdumosus* Wieg., *Justicia ovata* (Walt.) Lindau var. *lanceolata* (Champman) R.W. Long, *Rhynchospora corniculata*, *Carex joorii* Bailey, *C. gigantea* Rudge, *Saururus cernuus* L., and *Tradescantia occidentalis*.

Our specimen was verified by Dr. Charles Sheviak at the New York State Museum. He states that two other Arkansas specimens we sent him for verification [Hot Springs Co.: 20 Oct 1923, *Palmer 24239* (UARK); Union Co.: n.d., *D. M. Moore s.n.* (UARK)] can be referred to *S. cernua*, but with a genetic contribution from *S. odorata*, which is to be expected. An additional collection, *Orzell, Bridges, and Peacock 3277* from Miller County, was stated by Sheviak to perhaps be depauperate *S. odorata*, but material was insufficient for proper determination. This species was not listed for Arkansas by Smith (1978) or Sheviak (1982), and our collection

seems to be the first for the state, and a slight range extension from northern Louisiana.

SPIRANTHES PRAECOX (Walt.) S. Wats. (Orchidaceae). **Calhoun Co.:** Sec. 32, T14S, R13W, 20 May 1985, *Orzell and Bridges 1932* (UARK); 26 May 1978, *J. Roberts 800* (UARK). **Hot Spring Co.:** low places, 9 Jul 1896, *H. Eggert s.n.* (MO).

Scattered plants of *Spiranthes praecox* were found growing in a saline soil barrens, with *Schoenolirion wrightii* Sherman, *Ambrosia bidentata,* and *Fimbristylis puberula* (Michx.) Vahl ex Small & Britt. The particular barren developed on the Bonn soil series (fine-silty, mixed, thermic Glossic Natraqualf).

Spiranthes praecox was first reported for Arkansas by Branner and Coville (1891), on the basis of a Grand Prairie report by Harvey; however, they did not include the much more common *S. vernalis* Engelm. & Gray. *Spiranthes praecox* had been reported for Arkansas by Moore (1965) on basis of misidentified *Spiranthes vernalis.* This orchid was listed for Arkansas by Demaree (1943), and Arkansas was included in the ranges given by Correll and Johnston (1970) and Correll (1950). Smith (1978) considered it under possible additions, "perhaps in south Arkansas." We have not seen the Eggert specimen from Hot Spring County. Our specimens and those of J. Roberts were determined by Dr. Charles Sheviak at the New York State Museum.

TETRAGONOTHECA LUDOVICIANA (Torr. & Gray) Gray (Asteraceae). **Miller Co.:** Sec. 6 and 7, T20S, R27W, 18 May 1985, *Orzell and Bridges 1914* (UARK, SMU, MO, TEX).

Tetragonotheca ludoviciana is locally abundant at the edge of a cleared sandhill woodland (now planted in pine) and occassional in openings in more intact sandhill woodland. Associates include *Quercus incana, Pteridium aquilinum, Tradescantia reverchonii, Rhus copallina, Cnidoscolus texanus, Aristolochia reticulata, Chionanthus virginicus, Schizachyrium scoparium, Stillingia sylvatica, Hymenopappus artemisiifolius, Rhynchosia latifolia* Nutt. ex Torr. and Gray, and *Tephrosia virginiana.*

Tetragonotheca ludoviciana was not included in the Arkansas flora by Smith (1978) or any previous checklist. Lesquereux (1860) reported *T. helianthoides* L., a more eastern species, for Arkansas, but Coville thought this was probably a mistake, and had no idea of the true identity of this report (Branner and Coville 1891). *T. ludoviciana* was known only from eastern Texas and Caddo Parish, Louisiana by Turner and Dawson (1980). It has since been found in Allen and Sabine parishes in Louisiana (Nelwyn Gilmore, pers. comm.).

TRADESCANTIA BRACTEATA Small (Commelinaceae). **Scott Co.:** Sec. 30, T4N, R30W, 23 Apr 1986, *Orzell and Bridges 4268* (TEX, UARK). **Sebastian Co.:** Sec. 34, T4N, R32W, 21 Apr 1986,

Orzell and Bridges 4217 (TEX, UARK); Sec. 35, T4N, R32W, 21 Apr 1986, *Orzell and Bridges* 4228 (MO, TEX, UARK).

Tradescantia bracteata was found in rocky, siliceous, dry-mesic to mesic north-facing upper slope and ravine forests near the top of Poteau Mountain, at elevations from 500 to 800 meters. Associated species include *Trillium viridescens* Nutt., *Smilacina racemosa* (L.) Desf., *Uvularia grandiflora* Sm., *Thelypteris hexagonoptera* (Michx.) Weatherby, *Camassia scilloides, Porteranthus stipulatus, Erythronium rostratum*, and *Carex ouachitana*.

No mention is made of this species in Smith (1978) or any Atlas supplements. Anderson and Woodson (1935) show it as occurring south to central Missouri and southern Kansas, primarily in prairies. McGregor et al. (1977) extend the range to northeastern Oklahoma, including Delaware, Adair, and Sequoyah counties on the Arkansas border. MacRoberts (1980a) reports having seen specimens of *T. bracteata* from McCurtain County, Oklahoma at DUR and TAES, and having collected plants "resembling" this species in central Texas. All of our specimens are from within 40 miles of Sequoyah County, and seem to be the first verified reports of this species in Arkansas, and perhaps at the southeastern limit and the highest elevations for the species.

TRADESCANTIA VIRGINIANA L. (Commelinaceae). Arkansas Co.: Sec. 4, T5S, R3W, 14 Apr 1986, *Orzell and Bridges 4076* (LSUS, MO, NCU, SMU, TEX, UARK).

This remarkable record was found in a very rare and significant habitat, a rich, mesic hardwood slope forest along a small stream well within the Mississippi Alluvial Plain. The canopy trees include *Carya ovata, C. cordiformis, C. laciniosa* (Michx. f.) Loud., *Fraxinus americana, Quercus falcata* Michx., *Q. nigra, Q. texana* Buckl., *Q. michauxii* Nutt., *Celtis laevigata* Willd., and *Ulmus americana* L. Much of the site has a dense subcanopy of *Asimina triloba* (L.) Dunal, *Cercis canadensis* L., and *Staphylea trifolia* L. The herbaceous layer is extremely rich, including the first records of *Solidago auriculata, Uvularia sessilifolia*, and *Smilax lasioneuron* Hook. for the Mississippi Alluvial Plain of Arkansas, as well as other species rare in the region, such as *Dentaria laciniata, Erythronium albidum* Nutt., *Sanguinaria canadensis, Trillium recurvatum*, and *Viola pubescens* Ait.

This species was listed by Smith (1978) as a "possible addition," and he states that "much Arkansas material has been determined this. Most such material is misidentified and represents putative hybrids." Deneke (Deneke 1981; Deneke and Browne 1987) listed this species for St. Francis County, and Smith (1982) included this report in Atlas Supplement IV. However, in Atlas Supplement V, Smith (1986) again deleted *T. virginiana* from the Arkansas flora, stating that "all material at UARK that had been determined this apparently represents *T. occidentalis* or

hybrid material." Since Deneke had sent a duplicate to UARK (Deneke 534), his report was apparently erroneous.

The taxonomy and identification of *Tradescantia* in the south-central United States is notoriously difficult, and it is with great trepidation that we report our records of this genus. As far as *T. virginiana* is concerned, MacRoberts (1980a) shows its clear distinction from *T. hirsutiflora* Bush, and does not include it is the Louisiana flora (MacRoberts 1980b). Our specimens have the very sparse pubescence and thicker roots characteristic of *T. virginiana*. The nearest approach to Arkansas of this species of the northeastern and north-central states is in southeastern Missouri and middle Tennessee. These two new *Tradescantia* species for Arkansas bring the total number of taxa recognized for this genus in the state to twelve, equaling the number in Texas and more than any other state.

TRAGIA SMALLII Shinners (Euphorbiaceae). Miller Co.: Sec. 17, T18S, R28W, 17 May 1985, *Orzell and Bridges 1897* (TEX, UARK); 17 Jun 1985, *Orzell and Bridges 2149* (APCR), 12 Aug 1985, *Orzell and Bridges 2690* (MO, SMU).

In Miller County this plant is common in a sandhill woodland on Briley loamy fine sand dominated by *Quercus incana, Q. margaretta, Pinus echinata,* and *Cornus florida.* Associates of *Tragia smallii* include *Pteridium aquilinum, Vitis rotundifolia* Michx., *Clematis reticulata, Cnidoscolus texanus, Opuntia humifusa,* and *Aristolochia reticulata. Tragia smallii* is also occassional in natural sandhill openings with *Matelea cynanchoides* (Engelm.) Woods. and *Tradescantia reverchonii.*

This species was not included in the Arkansas flora by Smith (1978) or any other source. The ranges given for this species by Shinners (1956) and Miller and Webster (1967) confine it to the longleaf pine belt of the Gulf Coastal Plain. These collections are the northernmost for the species, and disjunct about 170 km from the nearest locations in central Louisiana. We have found this species to be rather common in the dry longleaf pine savannahs of southeastern Texas. Our determinations were verified by Robert Kral at Vanderbilt University.

XYRIS DIFFORMIS Chapm. var. CURTISSII (Malme) Kral (Xyridaceae). Calhoun Co.: Sec 29, T14S, R13W, 11 Jun 1985, *Orzell and Bridges 2060* (UARK, VDB), 17 Jul 1981, *R. Kral 67522* (VDB); Sec 23, T14S, R13W, 30 Jun 1985, *Orzell and Carl Amason 2298* (VDB).

Xyris difformis var. *curtissii* and *X. baldwiniana* are the rarest of the seven *Xyris* species now known from Arkansas. All the Arkansas collections of *Xyris difformis* var. *curtissii* are from nearly level Quaternary deposits east of the Ouachita River in the West Gulf Coastal Plain of Calhoun County. Both sites are in open graminoid dominated areas adjacent to seep forests with

Magnolia virginiana L., *Pinus taeda*, and *Acer rubrum*. Associated species at these sites include *Rhynchospora rariflora*, *R. inexpansa*, *Eriocaulon decangulare*, *Utricularia subulata* L., *Lycopodium appressum*, *Drosera capillaris*, and at one site *Eriocaulon kornickianum* van Huerck and Muell.-Arg.

This species was not listed for Arkansas by Smith (1978), and Arkansas was not included in its range by Kral (1966). The above collections are the first for the state. Specimen *2060* was verified by Robert Kral at Vanderbilt University.

XYRIS DIFFORMIS Chapm. var. DIFFORMIS (Cyperaceae). **Clark Co.:** Sec. 30, T9S, R21W, 15 Aug 1985, *Orzell and Bridges 2820* (VDB), 12 Oct 1985, *Orzell, Bridges, and Peacock 3464* (SMU, TEX, UARK). **Hot Springs Co.:** 3.9 mi NW Malvern on US 67, sphagnous sandy seepage area by highway, 3 Sep 1967, *R. Kral 29174* (VDB). **Ouachita Co.:** Margins of Bragg Lake, Bragg City, P.O. Chidester, 13 Sept 1964, *Demaree 51311* (VDB). **Perry Co.:** Common in gravel and brush of river bed, Big Maumelle River, near the bridge on Hwy 9, 0.35 mi S of Williams Junction (jct. Hwys 9 & 10), 27 Jul 1977, *E. B. Smith 3227* (LSU).

Our collection of *Xyris difformis* var. *difformis* is from a roadside ditch saturated by seepage from an adjacent slope. Associated plants include *Carex longii*, *Rhexia mariana*, *R. virginica*, *Gratiola pilosa*, *Ludwigia alternifolia*, *Lobelia puberula*, *Eupatorium rotundifolium*, *Arthraxon hispidus*, *Rhynchospora inexpansa*, *Panicum verrucosum*, *Juncus* sp., *Eleocharis* sp. and *Sphagnum* moss.

The taxonomy and nomenclature of this species was quite confused before the revision of the genus by Kral (1966); therefore it is difficult to interpret the nature of earlier reports. Branner and Coville (1891) and Demaree (1943) report *X. torta* and *X. caroliniana* Walt. for Arkansas. The name *X. caroliniana* was often misapplied during this period to the species now known as *X. difformis (e.g.* Small 1933), but we have not seen a specimen upon which this report could have been based. *Xyris difformis* is not listed for Arkansas by Smith (1978) or Kral (1966), and we believe the above cited specimens to be the first for the state. All the above specimens were determined or verified by Robert Kral.

EXCLUDED SPECIES

In addition to the new and additional records reported for Arkansas in the above accounts, some deletions of species previously reported for the Arkansas flora and nomenclatural changes need to be made. Smith (1983) reported *Cypripedium candidum* Muhl. ex Willd. *(S. L. Timme 2434,* UARK) from Benton County. The specimen upon which this record was based has been determined to be a white-lipped specimen of a normally yellow-lipped taxon, probably *C. parviflorum* Salisb., by the authors and Dr. Charles Sheviak. We have also collected small white-lipped

Cypripediums similar to this one in Sharp County.

Lithospermum multiflorum Torr. ex Gray in Arkansas was based in Smith (1978) on an *Iltis 5156* specimen (UARK), which when examined by the authors proved to be an unusually small, late season, fruiting specimen of *L. incisum* Lehm. Later collections originally identified as *L. multiflorum* at APCR (*Davis s.n., Davis and Rettig 2843*) were all found to be misidentifications of *L. incisum* and *L. carolinense*. *Lithospermum multiflorum* is a far western species very unlikely for Arkansas, and should be deleted from the flora.

Rhynchospora chalarocephala Fern. & Gale was included in Smith's Atlas Supplement V (1986) on the basis of a collection from Cleveland County (*W. M. Shepherd and M. Schiffl 243*, UARK). The specimen was tentatively determined by E. B. Smith and subsequently verfied by the authors and by W. W. Thomas (NY). However, as part of a critical study of *Rhynchospora* in the West Gulf Coastal Plain, we have reexamined this specimen and determined it to be an immature *R. glomerata*. The specimen has underdeveloped second florets in each spikelet, which rules out *R. chalarocephala*. We find specimens of the highly variable *R. glomerata* to often be misidentified as the one-fruited species *R. chalarocephala* and *R. cephalantha* Gray, or as the more northern *R. capitellata* (Michx.) Vahl.

Several subspecific taxa in Smith (1978) were examined by the authors to see if they were in fact good representations of these taxa in the state. All *Phlox pilosa* L. subsp. *fulgida* (Wherry) Wherry collections for Arkansas at UARK had been determined by J. R. Gibson at UNC in 1983 to represent subsp. *pilosa*, the most common subspecies in the state, and we concurred. We found the *Hite 164* and *Smith 3568* collections of *Teucrium canadense* L. var. *occidentale* (Gray) McClintock & Epling at UARK to differ in several characters from good var. *occidentale* and best referred to var. *virginianum* (L.) Eat., the only variety of this species in the state. Despite much taxonomic and nomenclatural confusion, we found no good distinctive characters for the presence of the northern *Viola pubescens* Ait. var. *pubescens* in Arkansas, the *Moore 410149* specimen at UARK is var. *eriocarpa* (Schwein.) Russell. This taxon is poorly differentiated from var. *leiocarpa* (Fern. & Wieg.) Seymour, and it seems best to us to refer all stemmed yellow violets in Arkansas to one taxon, leaving the choice of the proper name to rangewide population studies, with the possibility that only one good taxon may emerge from this complex.

PHYTOGEOGRAPHICAL PATTERNS

In reporting native species new or rediscovered in a state, it is important to assess the significance of the new records relative to the total range of the species, patterns of habitat distribution, and status of the species in adjacent states. By analysis of this information in relation to distribution patterns of the known flora,

hypotheses can be made as to the origin and relative significance of these new records. Since many of the species considered in this paper exemplify several recurring general distribution patterns, they will be discussed in groups of related patterns.

Very little has been written on the general phytogeography of Arkansas, and some background is needed before discussing the rather unusual distribution patterns of the species reported here. The state lies near the western boundary of the Eastern Deciduous Forest, and includes several of the sections described by Braun (1950). The northwestern half of the state is within the Interior Highlands section of the Southern Division of the Oak-Hickory Forest Region. This area is characterized by sedimentary rocks of Pennsylvanian to Ordovician age, and includes both siliceous and calcareous strata, with calcareous strata more common in the Salem and Springfield Plateaus and siliceous strata in the Boston and Ouachita Mountains, although some outcrops of almost all rock types of the region can be found in most sections. The eastern part of the state is within the Mississippi Alluvial Plain section of the Southeastern Evergreen Forest Region. Actually, this is a misnomer since this section has very few vegetation types dominated by evergreen trees (a few outlying stands of loblolly pine do occur). The natural vegetation is a mosaic of wetland deciduous hardwood forests, sandy upland deciduous forests, graminoid dominated upland fragipan barrens (=Grand Prairie of Arkansas), and floodplain swamps. This entire region (with the exception of Crowley's Ridge, a Tertiary Coastal Plain outlier) is the Quaternary floodplain of the Mississippi River and its major tributaries. The southern part of the state is within the Gulf Slope Section of the Oak-Pine Forest Region. This region is underlain by sands and sandy clays of Eocene age, and generally has a characteristic Upper Coastal Plain vegetation and flora, with mixed pine-hardwood forests (primarily *Pinus taeda, Liquidambar styraciflua,* and *Quercus falcata*) dominating most of the uplands. A small area in the southwestern part of the state is included in the Forest-Prairie Transition Area of the Southern Division of the Oak-Hickory Forest Region. This area is developed on heavy clays interspersed with gravelly sands of Cretaceous age, and had a natural vegetation of bands of blackland prairie and calcareous ravine forests alternating with forests more like those of the Eocene region of the Coastal Plain.

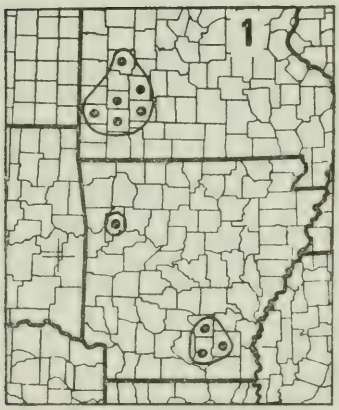
Major floristic elements in the state include the general Eastern Deciduous Forest element, found more or less throughout the state, the Northern or Upland Eastern Deciduous Forest element, centered to the north and northeast of Arkansas, and generally most common in the Interior Highlands within the state, and the Southeastern Coastal Plain element, most common in the Mississippi Alluvial Plain and Coastal Plain. All of these could be considered as intraneous elements, that is, consisting of species found throughout much of the state and tending not to reach their range limits within its borders. The patterns in the following discussion tend to represent extraneous elements, that is, those

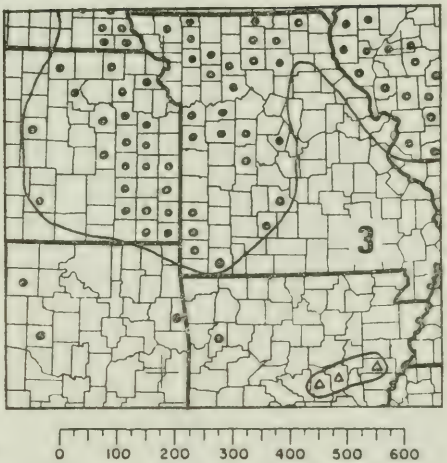
including species which are disjunct to or reach their range limits in some direction within the state. Rare species and new state records tend to exhibit extraneous distribution patterns, and understanding these is critical to comprehending the significance of their records. The remainder of this section will discuss these extraneous patterns in relation to the species reported in this paper. References will be given to published detailed range descriptions or maps for these species, but the bulk of the patterns presented are based on unpublished range maps compiled by the authors. Other rare or restricted species in Arkansas exhibiting the same general patterns are noted. No attempt is made to provide a full historical phytogeographic interpretation of these patterns; rather, they are presented in a descriptive manner as they are currently known, to stimulate ideas on their origin and historical phytogeographical significance.

Some records included here are new, shortly disjunct, records for endemic or near-endemic species of the physiographic sections represented in Arkansas. These include *Delphinium newtonianum, Carex ouachitana, Oenothera pilosella* ssp. *sessilis,* and *Geocarpon minimum* (Figure 1). While the distance between the previous records and those reported here is generally less than 250 km, these species have such narrow ranges that these are extremely important records which may be significant in understanding their origin and migration patterns.

A few of the species reported in this paper generally range to the north of Arkansas, being most common in the northeastern to north central United States and adjacent Canada. Two of these, *Carex interior* (Reznicek and Ball 1980) and *C. suberecta* (Figure 2), are found in fens or minerotrophic seepage areas resembling fens in Arkansas and Missouri (Orzell and Kurz 1986) and throughout much of their range. Both of these species are rare south of the glacial boundary, with the exception of a secondary center of distribution in the Salem Plateau of the Ozark Uplift. Several other species rare in Arkansas exhibit this same pattern, notably *Spiranthes lucida* (H. H. Eaton) Ames, *Rhynchospora capillacea, Lysimachia quadriflora, Solidago riddellii,* and *Pedicularis lanceolata* (Orzell *et al.* 1985), all of which are found with or nearby these species. The Arkansas locations are the southernmost known for these carices, and are contiguous with the disjunct secondary center of distribution in south central Missouri.

Several of the species reported here are most common in the prairie and prairie-forest border regions of the north central United States, and reach their southeastern range limit in northwestern Arkansas, although they may extend south to Oklahoma and Texas at their southwestern limits. Among these are *Carex bicknellii* var. *bicknellii* (Figure 3), *Carex molesta,* and *Tradescantia bracteata.* Other species which are rare in Arkansas and tend to display this pattern include *Helianthus rigidus* (Cass.) Desf., *Muhlenbergia bushii* Pohl, *Amorpha canescens* Pursh, *Androsace occidentalis* Pursh, *Gentiana puberulenta* J. Pringle, and





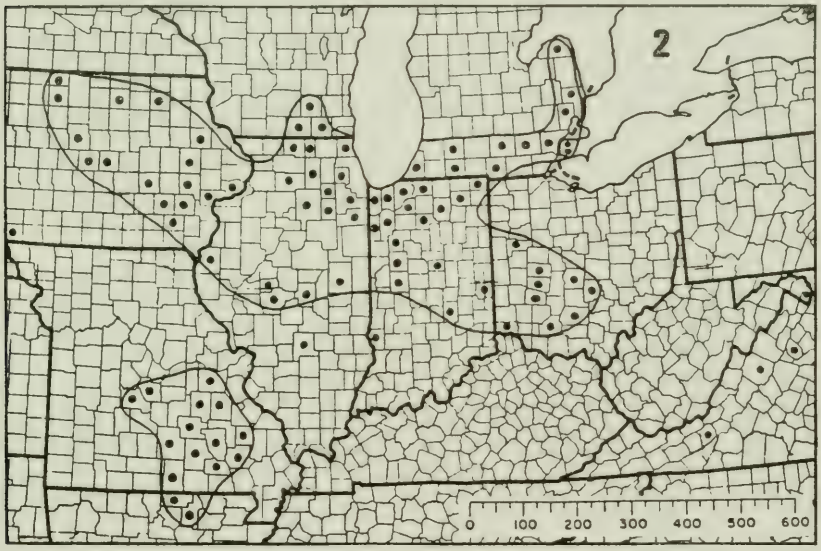


Figure 1. Range of *Geocarpon minimum*. **Figure 2.** Range of *Carex suberecta*. **Figure 3.** Southwestern part of range of *Carex bicknellii* var. *bicknellii* (dots) and total range of *Carex bicknellii* var. *opaca* (triangles). **Scales of all figures in paper are expressed in kilometers.**

Sagittaria rigida Pursh. In Arkansas, all of these species have the majority of their occurrences in counties which at least historically supported some tallgrass prairie vegetation, although now many survive only on rocky glades and disturbed areas within their former range in the state.

A generally distributed north central wetland species reaching its southern limit in the Mississippi Alluvial Plain of northeastern Arkansas is *Carex muskingumensis* (Figure 4). This sedge tends to reach its range limits in the alluvial plains of major rivers, including the Mississippi, Des Moines (Gilly 1946), and Cumberland. The only other southeastern state where this species occurs is Tennessee, where it is listed by the Tennessee Heritage Program as a species of special concern.

Some species reported here are generally found in the forest regions of the north-central states east to the Appalachian provinces. These include *Aster shortii* and *Carex sparganioides* (Figure 5), both of which reach their southwestern limit in Arkansas. Numerous rare species in Arkansas display similar patterns, including many of more restricted occurrence or longer disjunctions in the state. Examples with related patterns include *Orbexilum onobrychis* (Nutt.) Rydb., *Trillium flexipes* Raf., *Stylophorum diphyllum* (Michx.) Nutt., *Hydrophyllum macrophyllum* Nutt., *Euonymus obovatus* Nutt., *Carex careyana* Torr. ex Dewey, *Collinsia verna* Nutt., *Carex hitchcockiana* Dewey, and *Cacalia muhlenbergii* (Schultz-Bip.) Fern. Many of these are calciphilic species which are more common in the Interior Low Plateaus and glaciated Central Lowlands than in the more siliceous regions of the Appalachians.

Several species are common in both the northeastern and north central United States, becoming less common in the western and southern portions of their range and reaching their southwestern limit in Arkansas. Among these are *Carex laxiculmis* (Figure 6), *Solidago bicolor,* and *Tradescantia virginiana.* Other species exhibiting this pattern in Arkansas include *Dennstaedtia punctilobula* (Michx.) T. Moore, *Thelypteris noveboracensis* (L.) Nieuwl., *Gaylussacia baccata* (Wang.) K. Koch, and *Waldsteinia fragarioides* (Michx.) Tratt. These tend to be rare in adjoining regions of other states and disjunct to Arkansas. An unusual related pattern is exhibited by *Juncus subcaudatus* (Figure 7), which is most common in the Appalachian Mountains from Pennsylvania south to North Carolina. It occurs in a few counties of Georgia, Tennessee, Kentucky, and Ohio, and then has a disjunct secondary center of distribution in the Salem Plateau of south central Missouri and adjacent north central Arkansas. Here it occurs in similar habitats to those of the northern *Carex interior, Carex suberecta,* and previously mentioned associates which are rare or absent from the central and southern Appalachians. This disjunct center is 650 km from the main range of the species and 320 km from the nearest isolated localities.

True Appalachian disjunctions are rather rare in Arkansas, since most such species can find at least some areas of suitable

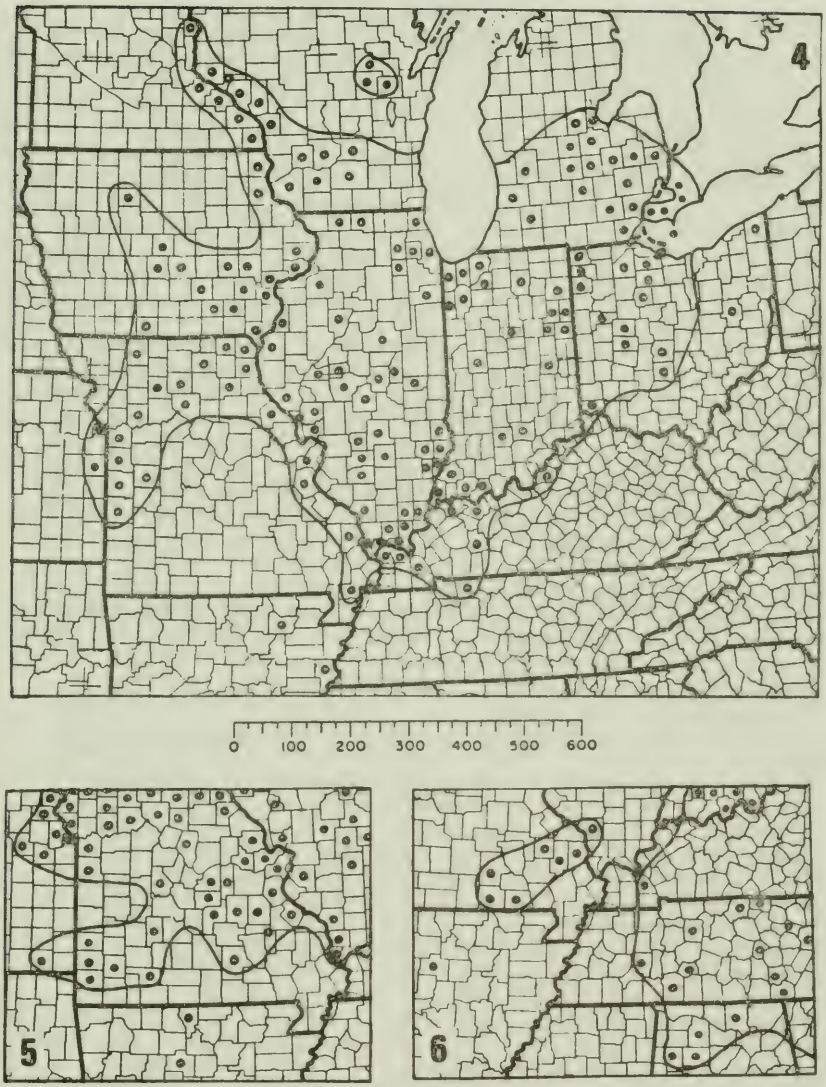
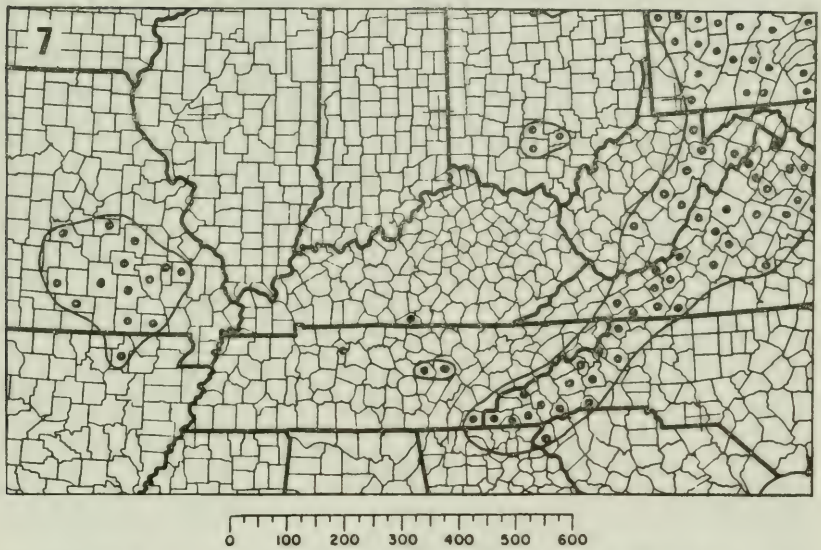


Figure 4. Range of *Carex muskingumensis*.
Figure 5. Southwestern part of range of *Carex sparganioides*.
Figure 6. Southwestern part of range of *Carex laxiculmis*.

habitat in the Interior Low Plateaus or even in the East Gulf Coastal Plain. One species which exemplifies this pattern is *Lilium superbum* (Adams and Dress 1982), which is most common in the central and southern Appalachians from Pennsylvania to Georgia, but extends well onto the Coastal Plain in Georgia, Alabama, and Misisisippi, and to the Interior Low Plateaus in southern Indiana and Illinois. Other mostly Appalachian disjuncts in Arkansas include *Fothergilla major* (Sims) Lodd. (Tucker, in prep.), *Melanthium hybridum* Walt., *Disporum lanuginosum* (Michx.) Nichols., and *Iris verna* L., all of which have their only localities west of the Mississippi River in Arkansas.

Few species of restricted southern distribution are found in both the southeastern states and in Arkansas. These tend to have unusual patterns, but generally are found west and south of the Appalachians, sometimes also including areas in the Piedmont, or the Appalachian provinces themselves. One of these is *Cardamine angustata* var. *multifida* (Montgomery 1955), which is centered on the Cumberland Plateau and Interior Low Plateaus from southern Indiana through Kentucky and Tennessee to Alabama, and extends into the Blue Ridge and Piedmont of Georgia with a disjunct area in the central Piedmont of North Carolina. The Arkansas and Oklahoma localities are at least 600 km from the nearest occurrences in Alabama. Another unusual pattern included here is that of *Cypripedium kentuckiense* (Figure 8). This newly described, yet long known variant of the yellow lady slipper complex, seems to occur in three distinct but isolated areas of the southeastern United States. One is part of the Cumberland Plateau in Kentucky and Tennessee, where it occurs on sandy stream floodplains. The second is within the East Gulf Coastal Plain in Alabama and Mississippi, where it is now very rare near seepage areas, but was perhaps somewhat more common before extensive conversion to monoculture pine plantations. The third region includes the Boston Mountains, Ouachita Mountains, and eastern part of the West Gulf Coastal Plain in southern Arkansas, southeastern Oklahoma, Louisiana, and eastern Texas. In this region it is almost always found adjacent to seepage areas, and is much more abundant in Arkansas than elsewhere in the range, although still declining due to land alteration. Another unusual southern distribution pattern is that of southern calciphiles, an example of which is *Lithospermum tuberosum* (Figure 9). This species is most common in the Interior Low Plateaus and East Gulf Coastal Plain, and extends west on calcareous sediments in the Mississippi Alluvial Plain and West Gulf Coastal Plain. A similar pattern is shown by *Solidago auriculata*. Other rare or restricted species in Arkansas exhibiting unusual southern distribution patterns include *Heuchera villosa* Michx. *(s.l.* incl. *H. villosa* var. *arkansana* (Rydb.) E. B. Smith), *Philadelphus hirsutus* Nutt., *Halesia carolina*, and *Schizandra glabra* (Bickn.) Rehd.

A few species reported here are generally species of the southern part of the Eastern Deciduous Forest region. This is a common pattern in the Arkansas flora, and the fact that these are



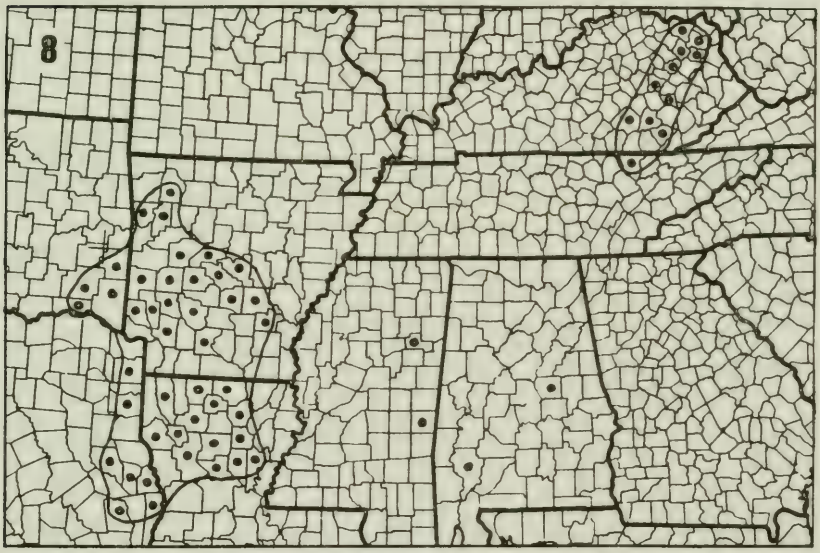


Figure 7. Southern part of range of *Juncus subcaudatus*.
Figure 8. Range of *Cypripedium kentuckiense*.

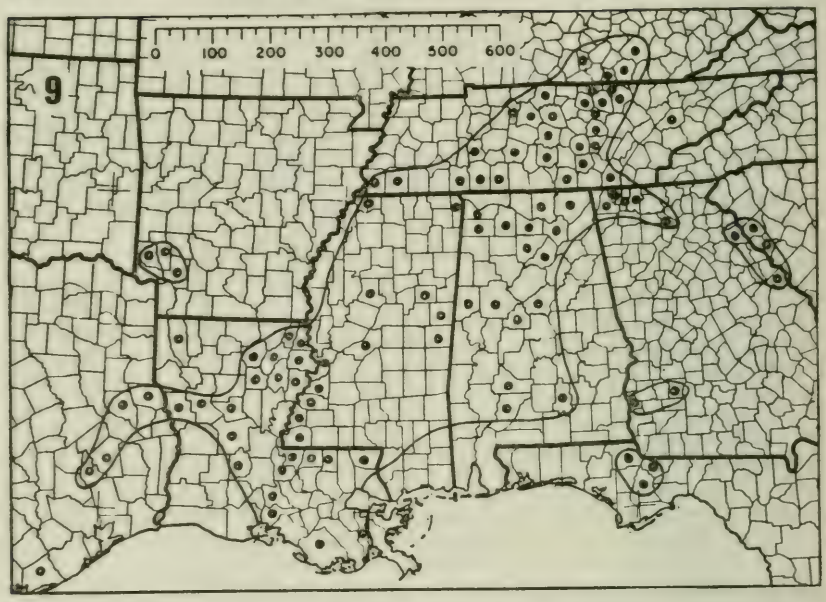
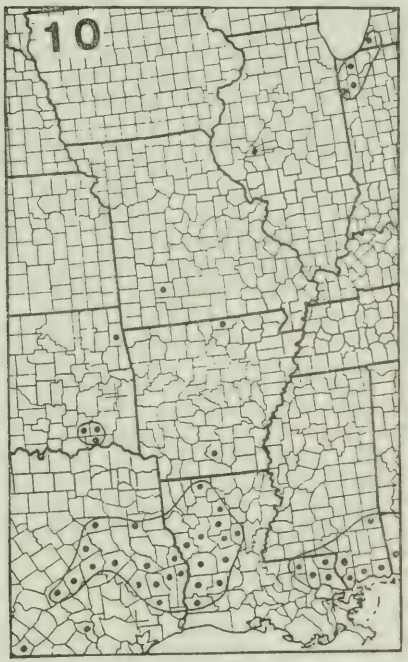
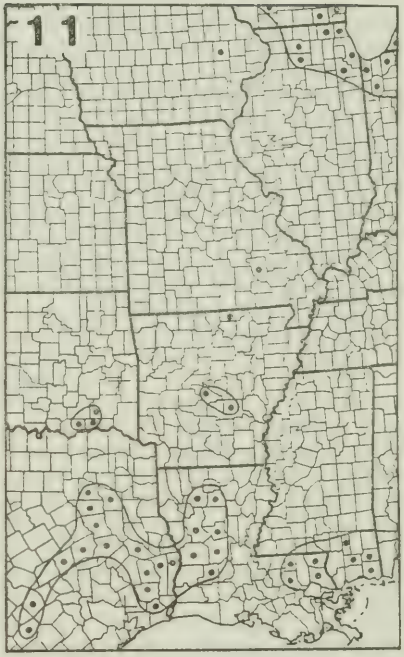


Figure 9. Range of *Lithospermum tuberosum.*

"new" for Arkansas indicates that they have previously been subsumed into other taxa or overlooked by collectors, rather than being rare or restricted in the state. Among these are several of the species of *Carex* reported here, such as *C. striatula* and *C. willdenowii.* Some other sedges are similarly intraneous, though centered more in the south central states, including *Carex texensis* and *C. oklahomensis.* It is predicted that these species would be found, with dilligent collecting, to be rather common and widespread in the southern two-thirds of the state.

Several species reported here are most common on the Atlantic and Gulf Coastal Plains, but also occur inland in other provinces, having some localities as far north as the Great Lakes region. These are part of the Coastal Plain element in the flora of the Great Lakes region discussed by Peattie (1922) and others. Those reported here include *Carex longii, Xyris difformis* var. *difformis* (Kral 1966), and *Scleria reticularis* (Figure 10). All of these are rare or unknown in the upland provinces of the southeast and midwestern states between the Coastal Plain and the Great Lakes region. Another rare species in Arkansas displaying this pattern is *Eleocharis equisetoides* (Ell.) Torr. Other species, such as *Pogonia ophioglossoides* (Figure 11), are common in both the Coastal Plain and the boreal forest region south to the Great Lakes states, and are rare in the interior states.





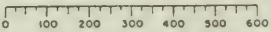


Figure 10. Western part of range of *Scleria reticularis*.
Figure 11. Southwestern part of range of *Pogonia ophioglossoides*.

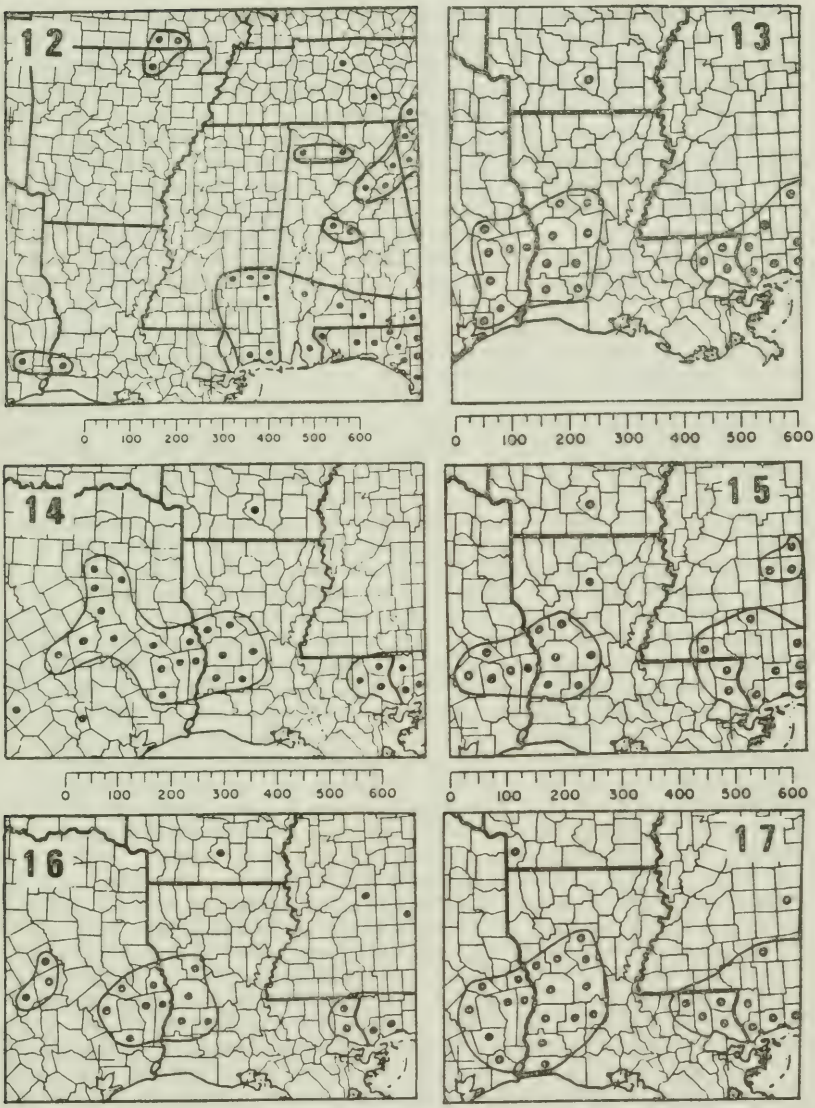
A few species primarily found on the southeastern Coastal Plain tend to have ranges extending northward in the Mississippi valley of the central United States, or have disjunct localities in this region. Among those reported here are *Carex louisianica* and *Ludwigia microcarpa*. *Carex louisianica* can be expected to occur throughout the Coastal Plain and Mississippi Alluvial Plain sections of Arkansas, whereas *Ludwigia microcarpa* (Figure 12) is disjunct to seepage areas near the eastern margin of the Salem Plateau in Arkansas and Missouri. Other rare species in Arkansas exhibiting variations on this pattern include *Carex decomposita* Muhl., *Scirpus divaricatus* Ell., and *Cynoctonum mitreola*.

The largest number of species reported in this paper have ranges which are centered on part or all of the Coastal Plain of the southeastern United States, extending sometimes north on the Atlantic Coastal Plain, inland into the upland provinces of the southeast, or west into the southern Great Plains and adjacent regions. These patterns will be discussed in relation to their degree and direction of disjunction to Arkansas. The first of

these includes characteristic species of the Coastal Plain east of the Mississippi River which reach their northern limit west of the Mississippi in the southern counties of Arkansas, and sometimes also southeastern Oklahoma. These include *Sebastiana fruticosa, Spiranthes odorata* (Luer 1975, Sheviak 1982), and *Spiranthes praecox* (Luer 1975). Numerous rare species in Arkansas exhibit variations on this pattern, including *Sporobolus junceus* (Michx.) Kunth, *Platanthera cristata* (Michx.) Lindl., *Lycopodium appressum, Smilax walteri* Pursh, *Seymeria cassioides* (Walt.) Blake, *Polygala nana* (Michx.) DC., *Erynigium integrifolium, Asimina parviflora* (Michx.) Dunal, *Coelorachis rugosa* (Nutt.) Nash, *Cynoctonum sessilifolium, Aletris aurea* Walt., *Habenaria repens* Nutt., *Quercus incana, Solidago patula* Muhl. var. *strictula* Torr. & Gray, *Tillandsia usneoides* L., *Helianthemum georgianum,* and *Helianthemum rosmarinifolium* Pursh.

More significantly, many Coastal Plain species reported here for southern Arkansas are apparently disjunct from the longleaf pine belt of central Louisiana and the open seepage-bog habitats of southeastern and east central Texas. These species often occur inland to the fall line in the Atlantic Coastal Plain, and even in the upland provinces. They become progressively more restricted westward to the outer part of the East Gulf Coastal Plain, and west of the Mississippi River are generally absent from the Inner Coastal Plain, that area either north of 32 degrees latitude or developed on Eocene or earlier strata. Typically, these reach their northern limit in Louisiana in Grant and Natchitoches parishes, and are disjunct about 200 km to a small area of Calhoun County, Arkansas. Among those reported here are *Asclepias longifolia* ssp. *longifolia* (Woodson 1954), *Rhynchospora plumosa* (Figure 13), *Drosera capillaris* (Figure 14), *Lycopodium carolinianum* (Figure 15), L. x *copelandii, Paspalum praecox, Xyris difformis* var. *curtissii* (Figure 16), and *Sabatia gentianoides* (Wilbur 1955). Other species with similar disjunctions to Calhoun County include *Xyris baldwiniana, Rhynchospora rariflora, R. gracilenta,* and *Eriocaulon decangulare. Rhynchospora colorata* (Thomas 1984) is known historically from Bradley County, and now is reported for Little River County. One species of the sandy uplands of the Longleaf Pine Belt, *Tragia smallii* (Figure 17), is reported here as disjunct to Miller County, Arkansas. Longleaf pine belt species disjunct to other southern Arkansas counties include *Anthaenantia rufa, Dryopteris ludoviciana* (Kunze) Small, *Stewartia malachodendron* L., *Halesia diptera* Ellis, *Platanthera nivea* (Nutt.) Luer, and *Persea borbonia* (L.) Spreng., the last three known only from historical records in Arkansas.

A few species in Arkansas are disjunct from the extreme Outer Coastal Plain, generally isolated inland 400 km from the more continuous range. These include *Cladium jamaciense* (Figure 18), found only as far inland as Iberville and Calcasieu parishes in Louisiana, but occurring far inland in the Edwards Plateau and Chihuahuan Desert in Texas, and *Rhynchospora microcarpa* (Gale 1944), most common in southern Georgia and Florida, but having



Figures 12-17. Western part of ranges of Coastal Plain species.
12. *Ludwigia microcarpa*. 13. *Rhynchospora plumosa*.
14. *Drosera capillaris*. 15. *Lycopodium carolinianum*.
16. *Xyris difformis* var. *curtissii*. 17. *Tragia smallii*.

isolated localities west to extreme southern Louisiana and the coastal bend of Texas, as well as inland in the Carolinas and Georgia. Few other rare species in Arkansas exhibit far southern patterns, one of which, *Lilaeopsis carolinensis* Coult. & Rose, is known only from a single historical record.

Numerous records presented here are for taxa more or less restricted to the West Gulf Coastal Plain. Most of these species were described from specimens collected in east Texas and until recent years most were thought to be endemic to Texas. Recently, many have been found in a few specialized localities in Louisiana, southeastern Oklahoma, and/or southern Arkansas. One rare species collected only twice in Arkansas is *Carex hyalina,* otherwise known only from four collections in eastern Texas and one in southeastern Oklahoma. This species of the section Ovales is in need of field study to determine its status, relationships, and overall distribution. Other facultative wetland species restricted to the same region include *Crataegus brachyacantha* Sarg. & Engelm., *Rudbeckia maxima* Nutt., and *Amorpha paniculata* Torr. & Gray.

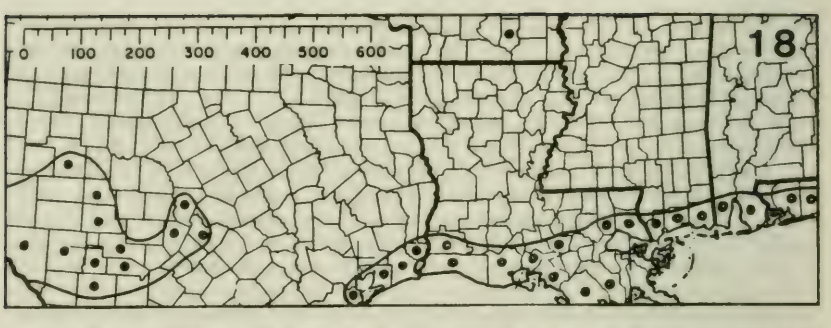
Most species reported here having a restricted West Gulf Coastal Plain pattern are found on deep sandy soils, primarily in east Texas, and are reported as new to Arkansas from Miller County. A large number of such endemics exist, and many have been found in adjacent Louisiana, Oklahoma, and Arkansas, with a few extending into the southern Great Plains in Oklahoma and Texas. Among these are *Echinacea sanguinea* (McGregor 1968), *Oenothera heterophylla* ssp. *heterophylla* (Figure 19), *Tetragonotheca ludoviciana* (Turner and Dawson 1980), *Dalea villosa* var. *grisea* (Wemple 1970), *Berlandiera* x *betonicifolia* (Pinkava 1967), *Pediomelum subulatum* (Ockendon 1965), and *Prunus gracilis* (Figure 20). Other species with this pattern are here reported for Miller County as well as other counties in Arkansas. These include *Astragalus distortus* var. *engelmannii, A. leptocarpus, A. soxmaniorum* (Barneby 1964), and *Delphinium carolinianum* ssp. *vimineum* (Warnock 1981). Other rare or restricted species in Arkansas with this pattern found presently only in Miller County include *Dalea phleoides* var. *microphylla, Aphanostephus skirrhobasis* (DC.) Trel., and *Matelea cynanchoides.* Several species with this pattern are found in Nevada and Ouachita counties, as well as Miller County, including *Tradescantia reverchonii, Eriogonum multiflorum, Hymenopappus artemisiifolius,* and *Streptanthus hyacinthoides.* Others are found in Nevada and/or Ouachita counties but not in Miller County, and include *Coreopsis basalis* (A. Dietr.) Blake, *Aristida desmantha* Trin. & Rupr., *Penstemon murrayanus* Hook., *Stylisma pickeringii* (Torr. ex M. A. Curtis) Gray var. *pattersonii* (Fern. & Schub.) Myint, and *Polanisia erosa* (Nutt.) Iltis. *Selaginella arenicola* ssp. *riddellii,* like *Astragalus distortus* var. *engelmannii,* is found in xeric habitats in several regions of Arkansas.

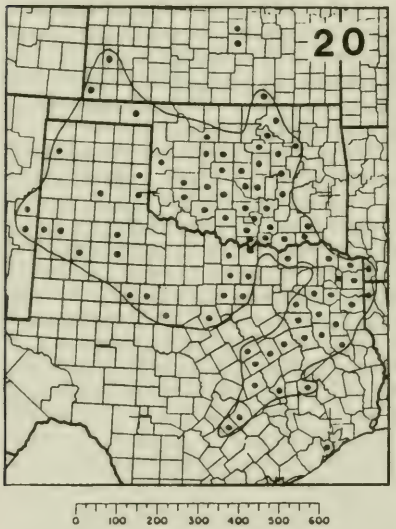
A species primarily found in the southwestern United States with an isolated occurrence in the Mississippi Alluvial Plain of Arkansas is *Portulaca umbraticola.* This species is also found on

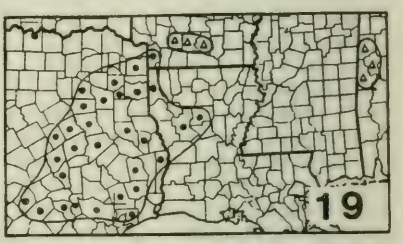
granitic outcrops in Georgia and South Carolina, and an isolated station on a sandy hill in southern Misisisippi (Matthews and Levins 1985). Otherwise, it is widespread and rather weedy in Texas, Oklahoma, and westward. The Arkansas record is 400 km from the nearest locality, and must be considered as possibly adventive.

Several species reported here have ranges centering in the southern Great Plains, western and southern parts of the West Gulf Coastal Plain, Edwards Plateau, and other areas generally south and west of Arkansas. These tend to be found in Arkansas in the Cretaceous region of southwestern Arkansas, primarily in Little River County. Among these are *Dalea compacta* var. *pubescens* (Wemple 1970, Barneby 1977), *Carex planostachys* (Figure 21), and *Convolvulus equitans* (Figure 22), all disjunct from north central Texas or adjacent south central Oklahoma. Other rare species in Arkansas with similar patterns include *Eriogonum annuum* Nutt. and *Boutelous rigidiseta*. Some species with the same general range occur more continuously through southeastern Oklahoma to the Cretaceous region of Arkansas, including *Delphinium carolinianum* ssp. *penardii* (Warnock 1981). Other rare species in Arkansas with similar patterns include *Dalea compacta* var. *compacta, Astragalus nuttallianus, Carex microdonta* Torr. & Hook., *Engelmannia pinnatifida, Pyrrhopappus multicaulis* DC., *Lindheimera texana* Gray, *Ruellia humilis* Nutt. var. *depauperata* Tharp & Barkl., *Lesquerella gracilis* (Hook.) S. Wats., *Indigofera miniata* var. *leptosepala, Hedeoma drummondii* Benth., *Allium drummondii* Regel, *Astragalus crassicarpus* Nutt. var. *crassicarpus,* and *Eryngium leavenworthii* Torr. & Gray. Two species reported for Miller County are more commonly found further west. *Pediomelum digitatum* ranges throughout the Great Plains and into the West Gulf Coastal Plain, where it occurs in adjacent Louisiana and Texas. *Pediomelum hypogaeum* ssp. *scaposum* (Ockendon 1965) is unusually disjunct from north central Texas to Miller County, and with a distinct difference in habitat.

Two species reported here are Great Plains species which reach their eastern range limits in the Ouachita Province of west-central Arkansas. One of these, *Solidago ulmifolia* var. *microphylla* (Taylor and Taylor 1984), is found in dry forests with rocky outcrops. Other species with similar patterns include *Marshallia caespitosa* Nutt., *Paronychia virginica* Spreng. var. *scoparia* (Small) Cory, and *Galium texense* Gray. Others, such as *Sanguisorba annua* (Figure 23), are primarily prairie species, and reach their eastern limit in the prairies of the western Arkansas River valley in Arkansas. Other species with this pattern include *Castilleja indivisa* Engelm., *Croton lindheimerianus* Scheele, *Rosa foliolosa* Nutt. ex Torr. & Gray, and *Sporobolus pyramidatus*. The farthest western species reported here is *Lygodesmia juncea* (Tomb 1980), generally found only east to west-central Oklahoma, central Kansas, and on loess hill prairies in northwestern Missouri. The Arkansas record is 380 km from the nearest isolated locality, and about 470 km from the limit of the continuous range.







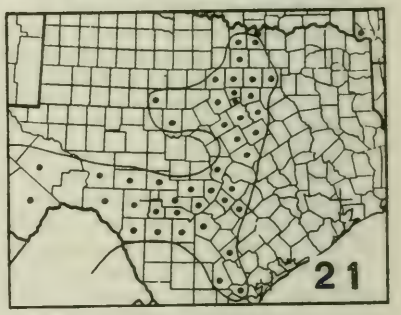
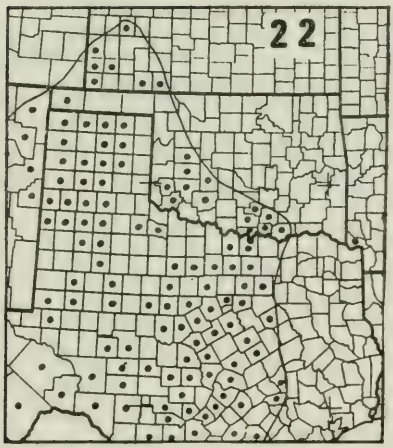


Figure 18. North central part of range of *Cladium jamaciense*.
Figure 19. Range of *Oenothera heterophylla* ssp. *heterophylla* (dots) and ssp. *orientalis* (triangles).
Figure 20. Range of *Prunus gracilis*.
Figure 21. Northern part of range of *Carex planostachys*.

The large number of new records reported in this paper, both those based on new discoveries and on reinterpretation or relocation of historical collections, indicate that much more work is needed in order to document and understand the flora of Arkansas and its phytogeographical relationships. It is hoped that the records and interpretations presented here will spur further work on the flora of Arkansas, particularly more fieldwork in the



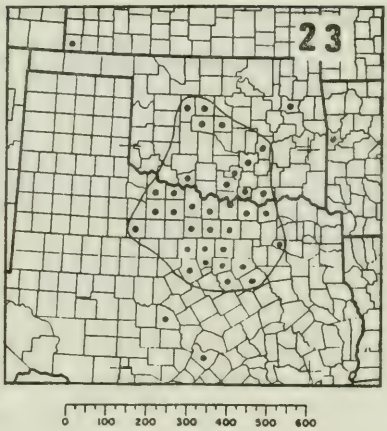


Figure 22. Eastern part of range of *Convolvulus equitans*.
Figure 23. Range of *Sanguisorba annua*.

---

unusual and specialized habitats of the state and among taxonomically complex groups. Although, as shown in many instances in this paper, the state does have a botanical history on which to draw, much of it is inconsistent and difficult to interpret correctly. We hope that our presentation of the field, herbarium, and literature study that has gone into this paper will be useful in understanding the importance of all of these sources in the compilation of new records towards a state flora.

ACKNOWLEDGMENTS

In a paper drawing from as many diverse sources and fields of specialization as this one, it seems appropriate to acknowledge those workers who directly or indirectly have influenced the approach taken by the authors in floristic exploration and documentation. Among past botanists the diligent explorations of M. L. Fernald and the phytogeographic interpretations of E. L. Braun have been an inspiration and challenge. The viewpoints and approaches taken have been directly influenced by the brilliant work of contemporary scholars who have transcended modern boundaries of specialization, particularly J. A. Steyermark and A. E. Radford. Special thanks is given to Jerry Roberts, Albert Higgenbottom, and Lance Peacock, astute observers of the Arkansas landscape and its flora who first led us to the sites of some of these records, and provided additional information on their collections and observations. In particular, we are especially grateful to Carl Amason of Calion, Union County, Arkansas for introducing the senior author to the wonders of the Coastal Plain

flora and his lifetime of observation of the local flora of south central Arkansas. Publication of this paper would be impossible without this encouragement and generous financial assistance. Our specimens of *Carex* were determined or verified by Anton A. Reznicek, who also generously shared his extensive knowledge of the genus and helped us sort out the taxonomy and nomenclature of Arkansas *Carex* species. Thanks is due to Robert Kral, Charles Sheviak, James Bruce, James Grimes, Rupert Barneby, and Wm. Wayt Thomas who determined or verified many of the cited collections. Our compilation of distributional records was facilitated by the cooperation of curators of several herbaria, including E. B. Smith (UARK), Gary Tucker (APCR), Barney Lipscomb (SMU), Guy Nesom (TEX), John and Connie Taylor (DUR), Elray Nixon (ASTC), Robert Kral (VDB), and R. D. Thomas (NLU), who also gave us access to his unpublished compilation of Louisiana county records at NLU, LSU, and USL.

REFERENCES

ADAMS, R. M. II and W. J. DRESS. 1982. Nodding *Lilium* species of eastern North America (Liliaceae). Baileya 21:165-188.

AJILVSGI, G. 1979. Wildflowers of the Big Thicket: east Texas and western Louisiana. Texas A & M Univ. Press, College Station.

_____. 1983. Color them beautiful - wild orchids of the Big Thicket. Texas Highways 30(5):16-25.

ATWOOD, J. T. 1985. The range of *Cypripedium kentuckiense*. Amer. Orchid Soc. Bull. 54:1197-1199.

BARBER, M. G. 1979. A floristic study of Franklin County, Arkansas. M. S. Thesis, The University of Arkansas, Fayetteville. 129 pp.

BARNEBY, R. C. 1964. Atlas of North American *Astragalus*. Mem. New York Bot. Gard. 13:1-1188.

_____. 1977. Daleae Imagines. Mem. New York Bot. Gard. 27:1-892.

BENSON, L. 1982. The Cacti of the United States and Canada. Stanford University Press, Stanford, California. 1044 pp.

BOIVIN, B. and W. J. CODY. 1956. The variations of *Lilium canadense* Linnaeus. Rhodora 58:14-20.

BRANNER, J. C. and F. V. COVILLE. 1891. A list of the plants of Arkansas. pp. 155-242 *In* J. C. Branner, Annual Report of the Geological Survey of Arkansas for 1888, Vol. IV. Press Printing Co., Little Rock.

BRAUN, E. L. 1950. The deciduous forests of Eastern North America. The Blakiston Company, Philadelphia. 597 pp.

BROWN, C. A. 1972. Wildflowers of Louisiana and adjacent states. Louisiana State Univ. Press, Baton Rouge.

BROWNE, E. T. 1974. A preliminary report on the vascular flora of the Sylamore Ranger Distict Ozark National Forest, Stone Co., Arkansas. Castanea 39:170-188.

BRYSON, C. T. 1980. A revision of the North American *Carex*

section *Laxiflorae* (Cyperaceae). Ph.D. diss., Mississippi Sate University. 191 pp.

BUCHHOLZ, J. T. and E. J. PALMER. 1926. Supplement to the catalogue of Arkansas Plants. Trans. Acad. Sci. St. Louis 25:91-155.

CORRELL, D. S. 1940. Some southern orchids. Amer. Orchid Soc. Bull. 9:79-83.

_____. 1950. Native Orchids of North America north of Mexico. Stanford Univ. Press, Stanford, California. 399 pp.

_____ and M. C. JOHNSTON. 1970. Manual of the vascular plants of Texas. Texas Research Foundation, Renner. 1881 pp.

CRANFILL, R. 1980. Ferns and fern allies of Kentucky. Kentucky Nature Preserves Commission. Scientific and Technical Series #1, Frankfort. 284 pp.

_____. 1981. Bog clubmosses (Lycopodiella) in Kentucky. Amer. Fern J. 71:97-100.

CRONQUIST, A. 1947. Notes on the Compositae of the Northeastern United States. IV. *Solidago.* Rhodora 49:69-79.

_____. 1955. A new variety of *Solidago ulmifolia.* Rhodora 57:36.

_____. 1980. Vascular flora of the southeastern United States. Vol. I. *Asteraceae.* Univ. of North Carolina Press, Chapel Hill. 261 pp.

DAVIS, R. 1981. Additional records and updates on the Arkansas flora. Proc. Arkansas Acad. Sci. 35:84.

DEMAREE, D. 1941. Noteworthy Arkansas plants. Proc. Arkansas Acad. Sci. 1:17-19.

_____. 1943. A catalogue of the vascular plants of Arkansas. Taxodium 1:1-88.

DENEKE, C. F. 1981. The vascular flora of St. Francis County, Arkansas. M.S. thesis, Memphis State University.

_____ and E. T. BROWNE, JR. 1987. The vascular flora of St. Francis County, Arkansas. Sida, Bot. Misc. 2:1-13.

DORMAN, C. 1959. Flowers native to the deep south. Claitors Book Store, Baton Rouge, Louisiana.

DUFFY, M. 1970. A yellow lady's-slipper. Louisiana Conservationist. July-Aug 1970:24-29.

EVANS, A. M. 1978. Mississippi flora: a guide to the ferns and fern allies. Sida 7:282-297.

EVANS, D. K. 1976. Taxonomy of the *Carex rosea - Carex retroflexa* complex in Illinois (Sect. *Bracteosae:* Cyperaceae). Ph.D. dissertation, Southern Illinois University, Carbondale.

FAIREY, J. E., III. 1967. The genus *Scleria* in the Southeastern United States. Castanea 32:37-55.

FERNALD, M. L. 1937. Local plants of the inner coastal plain of Southeastern Virginia. Rhodora 39:321-366, 379-415, 433-459, 465-491.

_____. 1950. Gray's Manual of Botany, 8th. ed. Amer. Book Company, New York. 1632 pp.

GALE, S. 1944. *Rhynchospora,* section *Eurhynchospora,* in Canada, the United States, and the West Indies. Rhodora 46:89-134, 159-197, 207-249, 255-278.

GEISER, S. W. 1956. Thomas Nuttall's botanical collecting trip to the Red River, 1819. Field & Lab. 24:43-60.

GILLY, C. L. 1946. The Cyperaceae of Iowa. Iowa State Coll. J. Sci. 21:55-151.

GLEASON, H. A. 1952. The new Britton and Brown illustrated flora of the Northern United States and adjacent Canada. New York Bot. Gard., Lancaster Press, Inc., Lancaster.

GODFREY, R. K. and J. W. WOOTEN. 1981. Aquatic and wetland plants of Southeastern United States - Dicotyledons. Univ. of Georgia Press, Athens. 933 pp.

HARRIMAN, N. A. 1965. The genus *Dentaria* (Cruciferae) in eastern North America. Ph.D. diss., Vanderbilt University, Nashville, Tennessee.

HERMANN, F. J. 1954. Addenda to North American carices. Amer. Midl. Naturalist 51:265-286.

_____. 1972. A new variety of *Carex bicknellii* from Arkansas. Sida 5:49.

HULL, E. D. 1942. *Lilium superbum* and *L. michiganense*. Rhodora 44:220-227.

_____. 1943. *Lilium michiganense, L. canadense,* and *L. superbum*. Rhodora 45:512-515.

JOYCE, J. O. 1974. *Rhynchosporae* and *Scleriese* of Louisiana. M. S. Thesis, Univ. of Southwestern Louisiana, Lafayette. 64 pp.

KARTESZ, J. T. and R. KARTESZ. 1980. A synonymized checklist of the vascular flora of the United States, Canada, and Greenland. Vol. II. The Biota of North America. Univ. of North Carolina Press, Chapel Hill. 498 pp.

_____. 1985. A synonymized checklist of the vascular flora of the United States, Canada, and Greenland. Unpublished draft of second edition.

KRAL, R. 1966. *Xyris* (Xyridaceae) of the continental United States and Canada. Sida 2:177-260.

_____. 1983. A report on some rare, threatened, or endangered forest-related vascular plants of the South. USDA, Forest Service, Technical Publ. R8-TP2. 1305 pp.

_____, J. MANHART, and C. T. BRYSON. 1987. A new *Carex* sect. *Oligocarpae* (Cyperaceae) from western Arkansas and eastern Oklahoma. Ann. Missouri Bot. Gard. 74:440-442.

LASSEIGNE, A. 1973. Louisiana Legumes. Univ. of Southwestern Louisiana, Southwest Studies Series 1, Lafayette. 255 pp.

LESQUEREUX, L. 1860. A catalogue of the plants of Arkansas. pp. 346-399. *In* D. D. Owen, Second report of a geological reconnaissance of the middle and southern counties of Arkansas made during the years 1859 and 1860. C. Sherman & Son, Printers, Philadelphia.

LIPSCOMB, B. L. 1980. Additions to the Cyperaceae of Arkansas. Castanea 45:70.

LOUGHMILLER, C. and L. 1984. Texas wildflowers: a field guide. Univ. of Texas Press, Austin.

LUER, C. A. 1975. The Native Orchids of the United States and

Canada. New York Botanical Garden, New York. 361 pp.
MCGREGOR, R. L. 1968. The taxonomy of the genus *Echinacea*. Kansas Univ. Sci. Bull. 48:113-142.
MACKENZIE, K. K. 1935. *Cariceae*. North American Flora 18:1-478.
MACROBERTS, D. T. 1980a. Notes on *Tradescantia* IV (Commelinaceae), The distinction between *T. virginiana* and *T. hirsutiflora*. Phytologia 46:409-416.
_____. 1980b. Notes on *Tradescantia* (Commelinaceae), V. *Tradescantia* of Louisiana. Bull. Mus. Life Sci., Louisiana St. Univ. in Shreveport 4:1-15.
MCWILLIAM, A. 1966. Observations on occurrence and range of three species of *Dentaria* (Cruciferae) in the Ouachita Mountains. Proc. Arkansas Acad. Sci. 20:22-24.
MATTHEWS, J. F. and P. A. LEVINS. 1985. The genus *Portulaca* in the Southeastern United States. Castanea 50:96-104.
MILLER, K. I. and G. L. WEBSTER. 1967. A preliminary revision of *Tragia* (Euphorbiaceae) in the United States. Rhodora 69:241-305.
MOHLENBROCK, R. H. 1962. On the occurrence of *Lilium superbum* L. in Illinois. Castanea 27:173-176.
_____. 1975. Guide to the vascular flora of Illinois. Southern Ill. Univ. Press, Carbondale and Edwardsville. 494 pp.
MONTGOMERY, F. H. 1955. Preliminary studies in the genus *Dentaria* in eastern North America. Rhodora 57:161-173.
MOORE, D. M. 1939. *Delphinium newtonianum*, a new species from the Arkansas Ozarks. Rhodora 41: 193-197.
MORGAN, S. W. 1980. Status report on *Geocarpon minimum* in Missouri. Missouri Dept. of Conservation, Jefferson City. 16 pp.
NORQUIST, C. 1986. Endangered and Threatened Wildlife and Plants; Threatened Status Proposed for *Geocarpon minimum*. Federal Register 51:12460-12463.
NUTTALL, T. 1835. Collections towards a flora of the territory of Arkansas. Trans. Amer. Philos. Soc. (n. s.) 5:139-184.
_____. 1836. Collections towards a flora of the territory of Arkansas. Trans. Amer. Philos. Soc. (n. s.) 5:185-203.
OCKENDON, D. J. 1965. A taxonomic study of *Psoralea* subgenus *Pediomelum* (Leguminosae). Southw. Naturalist 10:81-124.
ORZELL, S. L. 1983. Natural area inventory and floristic analysis of fens in selected Southeastern Missouri counties. M. S. thesis, Southern Illinois University, Carbondale. 203 pp.
_____, E. L. BRIDGES, and S. L. PEACOCK. 1985. Additions and noteworthy vascular plants from Arkansas, with some ecological notes. Sida 11:226-231.
_____ and J. H. PECK. 1985. Southern woodfern, *Dryopteris* x *australis*, new to Arkansas. Proc. Arkansas Acad. Sci. 39:144.
_____ and D. R. KURZ. 1986. Floristic analysis of prairie fens in the Southeastern Missouri Ozarks. pp. 50-58 *In* G. K.

Clambey and R. H. Pemble, eds., The prairie: past, present and future, Proceedings of the ninth North American prairie conference. Tri-college University Center for Environmental Studies, Fargo, North Dakota. 264 pp.

PEACOCK, H. 1980. "Rare" takes on new meanings in the Big Thicket. Texas Highways 27(10):14-19.

PEATTIE, D. C. 1922. The Atlantic Coastal Plain element in the flora of the Great Lakes. Rhodora 24:57-70, 80-88.

PECK, C. J., J. H. PECK, S. ORZELL, and E. BRIDGES. 1987. Discovery of *Lycopodium* communities in the Gulf Coastal Plain region of Arkansas. Proc. Ark. Acad. Sci. (in press).

PECK, J. H., E. SUNDELL, and C. J. PECK. 1985. Louisiana log fern (*Dryopteris ludoviciana)* new to Arkansas. Proc. Arkansas Acad. Sci. 39:144.

PENG, C. I. 1982. A biosystematic study of *Ludwigia* section *Microcarpium* (Onagraceae). Ph.D. diss., Washington University, St. Louis, Missouri.

PERRY, J. D. 1971. Biosystematic studies in the North American genus *Sabatia* (Gentianaceae). Rhodora 73:309-369.

PINKAVA, D. J. 1967. Biosystematic study of *Berlandiera* (Compositae). Brittonia 19:285-298.

RADFORD, A. E., H. E. AHLES, and C. R. BELL. 1968. Manual of the Vascular Flora of the Carolinas. Univ. of North Carolina Press, Chapel Hill. 1183 pp.

REED, C. F. 1981. *Cypripedium kentuckiense* Reed, a new species of orchid in Kentucky. Phytologia 48:426-428.

RETTIG, J. H. 1982. Seven significant vascular plant records for Arkansas. Proc. Arkansas Acad. Sci. 36:98.

_____. 1983. A new Arkansas station for *Geocarpon minimum* Mackenzie (Caryophyllaceae). Bull. Torrey Bot. Club 110:213.

REZNICEK, A. A. and P. W. BALL. 1974. The taxonomy of *Carex* series *Lupulinae* in Canada. Can. J. Bot. 52:2387-2399.

_____. 1980. The taxonomy of *Carex* section *Stellulatae* in North America north of Mexico. Contr. Univ. Michigan Herb. 14:153-203.

RICHARDS, E. L. 1982. New and interesting plants for the Arkansas flora from Northeastern Arkansas. Proc. Arkansas Acad. Sci. 36:99.

_____. 1985. New and interesting plants for the Arkansas flora. Proc. Arkansas Acad. Sci. 39:147-148.

RISKIND, D. H. and D. D. DIAMOND. 1986. Plant communities of the Edwards Plateau of Texas: an overview emphasizing the Balcones Escarpment zone between San Antonio and Austin with special attention to landscape contrasts and natural diversity. pp. 21-32 *In* Abbott, P. L. and C. M. Woodruff, Jr., eds., The Balcones Escarpment, Central Texas. P. L. Abbott, San Diego, California. 200 pp.

ROBERTSON, K. R. 1974. The genera of Rosaceae in the Southeastern United States. J. Arnold Arbor. 55:303-401, 611- 662.

RUSSELL, G. E. G. and W. H. DUNCAN. 1972. An annotated

checklist of *Carex* (Cyperaceae) for Georgia. Castanea 37:200-214.

SEMPLE, J. C. and L. BROUILLET. 1980. A synopsis of North American asters: the subgenera, sections, and subsections of *Aster* and *Lasallea*. Amer. J. Bot. 67:1010-1026.

SHEVIAK, C. J. 1982. Biosystematic study of the *Spiranthes cernua* complex. New York State Mus. Bull. 448:1-73.

SHINNERS, L. H. 1949. The genus *Dalea* (including *Petalostemum)* in north-central Texas. Field & Lab. 17:85-89.

_____. 1951. The Texas species of *Psoralea*. Field & Lab. 19:14-25.

_____. 1956. *Tragia smallii* Shinners, sp. nov. Field & Lab. 24:37.

_____. 1962. *Drosera* (Droseraceae) in the Southeastern United States: an interim report. Sida 1:53-59.

SMALL, J. K. 1933. Manual of the Southeastern Flora. J. K. Small, New York. 1554 pp.

SMITH, E. B. 1978. An atlas and annotated list of the vascular plants of Arkansas. Student Union Bookstore, Univ. of Arkansas, Fayetteville. 592 pp. (Supplements I-IV, 1979, 1980, 1981, 1982a; Supplement V, 1986).

_____. 1982b. A new variety of *Cardamine angustata* (Cruciferae) from the Ouachita Mountains of Arkansas. Brittonia 34:376-380.

_____. 1983. *Cypripedium candidum* Muhl. ex Willd. (Orchidaceae) in Arkansas. Sida 10:189.

_____ and B. L. LIPSCOMB. 1975. Some new or otherwise noteworthy plants of the Arkansas flora. Proc. Arkansas Acad. Sci. 29:64-66.

STEYERMARK, J. A. 1963. Flora of Missouri. Iowa State Univ. Press, Ames. 1728 pp.

STRALEY, G. B. 1977. Systematics of *Oenothera* sect. *Kneiffia* (Onagraceae). Ann. Missouri Bot. Gard. 64:381-424.

SUNDELL, E. 1983. Two additions to the Arkansas flora from Warren Prairie. Sida 10:188-189.

_____. 1986. Noteworthy vascular plants from Arkansas. Castanea 51:211-215.

TAYLOR, R. J. and C. E. TAYLOR. 1981. Plants new to Arkansas, Oklahoma, and Texas. Sida 9:25-28.

_____. 1984. *Solidago* (Asteraceae) in Oklahoma and Texas. Sida 10:223-251.

_____. 1987. Additions to the vascular flora of Oklahoma - IV. Sida 12:233-237.

TAYLOR, W. C. 1984. Arkansas ferns and fern allies. Milwaukee Public Museum. 262pp.

_____ and D. M. JOHNSON. 1979. *Thelypteris* in Arkansas. Amer. Fern J. 69:26-28.

THIERET, J. W. 1980. Louisiana ferns and fern allies. Lafayette Natural History Museum, Lafayette, Louisiana. 123 pp.

THOMAS, R. D., and S. HOOKS. 1985. *Limnoscidium pumilum* new to Arkansas. Phytologia 57:374.

_____, S. LESLIE, and S. HOOKS. 1985. *Seymeria cassioides* (Walt.) Blake: new to Arkansas. Phytologia 59:81-82.

THOMAS, W. W. 1984. The systematics of *Rhynchospora* section *Dichromena*. Mem. New York Bot. Gard. 37:1-116.

THOMPSON, R. L. 1977. The vascular flora of Lost Valley, Newton County, Arkansas. Castanea 42:61-94.

TOMB, A. S. 1980. Taxonomy of *Lygodesmia* (Asteraceae). Syst. Bot. Monog. 1:1-51.

TUCKER, G. E. 1976. A guide to the woody flora of Arkansas. Ph.D. dissertation. University of Arkansas, Fayetteville.

_____. 1984a. Status report for *Oenothera pilosella* ssp. *sessilis*. Unpub. rep. submitted to the U. S. Fish and Wildlife Service.

_____. 1984b. Status report for *Delphinium newtonianum*. Unpub. rep. submitted to the U. S. Fish and Wildlife Service.

TURNER, B. L. 1959. The Legumes of Texas. Univ. of Texas Press, Austin.

_____ and D. DAWSON. 1980. Taxonomy of *Tetragonotheca* (Asteraceae - *Helianthease*). Sida 8:296-303.

VOSS, E. G. 1972. Michigan flora - Part I, Gymnosperms and Monocots. Cranbrook Institute of Science, Bloomfield Hills, Michigan. 488 pp.

VUILLEUMIER, B. SIMPSON. 1973. The genera of *Lactuceae* (Compositae) in the Southeastern United States. J. Arnold Arbor. 54:42-93.

WAGNER, W. L. 1983. New species and combinations in the genus *Oenothera* (Onagraceae). Ann. Missouri Bot. Gard. 70:194-196.

WARNOCK, M. J. 1981. Biosystematics of the *Delphinium carolinianum* complex (Ranunculaceae). Syst. Bot. 6:38-54.

WATERFALL, U. T. 1969. Keys to the flora of Oklahoma. U. T. Waterfall, Stillwater, Oklahoma. 246 pp.

WEMPLE, D. K. 1970. Revision of the genus *Petalostemon* (Leguminosae). Iowa State Coll. J. Sci. 45:1-102.

WERTH, C. R. and W. C. TAYLOR. 1980. *Asplenium* x *gravesii* discovered in Arkansas. Amer. Fern J. 70:28.

WHERRY, E. T. 1947. A key to the eastern North American lilies. Bartonia 24:5-8.

WILBUR, R. L. 1955. A revision of the North American genus *Sabatia* (Gentianaceae). Rhodora 57:1-33, 43-71, 78-104.

WILCOX, W. H. 1973. A survey of the vascular flora of Crittenden County, Arkansas. Castanea 38:286-297.

WOOD, C. E., JR. 1960. The genera of Sarraceniaceae and Droseraceae in the south-eastern United States. J. Arnold Arbor. 41:152-163.

_____. 1966. On the identity of *Drosera brevifolia*. J. Arnold Arbor. 47:89-99.

WOODSON, R. E., JR. 1954. The North American species of *Asclepias* L. Ann. Missouri Bot. Gard. 41:1-211.

WYNNE, F. E. 1944. *Drosera* in eastern North America. Bull. Torrey Bot. Club 71:166-174.

TAXONOMY OF CARPHOCHAETE (ASTERACEAE-EUPATORIEAE)

B.L. Turner

Department of Botany, Univ. of Texas, Austin, TX 78713

ABSTRACT

A taxonomic treatment of Carphochaete is rendered. Seven species are included in the genus: C. bigelovii, C. durangensis, C. grahamii, C. macrocephala, C. pringlei, C. schaffneri and C. wislizeni. These include the monotypic genera Cronquistia King, and Revealia King & H. Robinson. One new species, C. durangensis, and one new varietal combination, C. pringlei var. simulans, is proposed; in addition C. gummifera McVaugh is reduced to synonymy under D. grahamii. Descriptions, keys, distribution maps, and a complete synonymy are provided.

The genus Carphochaete was first proposed by Gray in 1849 with his description of C. wislizeni. Shortly thereafter (1852) he added two additional species, C. bigelovii and C. grahamii. Greenman, in 1901, added C. schaffneri, B.L. Robinson in 1906 added C. simulans and McVaugh in 1972 proposed C. gummifera. The most recent additions, C. durangensis and C. macrocephala, were first proposed by the late Dr. Jerold Grashoff, who was engaged with a revisionary study of the group at the time of his early death.

I have accepted seven species in the genus including all those proposed by Gray, Greenman, and Grashoff. Robinson's C. simulans has been reduced to varietal status under C. bigelovii and McVaugh's C. gummifera has been placed in synonymy under C. grahamii.

It should be noted that King (1968) excluded C. pringlei from the complex, creating the monotypic genus Cronquistia, and King and Robinson (1976) subsequently described a new monotypic genus Revealia, based upon their R. stevioides. This was soon found to be a synonym of the earlier Oxylobus macrocephala Paray, which name was transferred to Revealia, replacing R. stevioides. In my opinion, neither of the two monotypic genera are worthy of recognition and I follow Grashoff in reducing them here.

CHROMOSOME COUNTS

Relatively few chromosome counts are published for Carphochaete. Those available to date are listed below. The genus would appear to be dibasic with x=11 or 12; two

of the species C. bigelovii and C. grahamii, possess x=11 and C. durangensis has x=12. The latter was reported as Cronquistia pringlei by King et al. (1976).

Taxon	Chromosome count	Reference
C. bigelovii	2n=22	Gaiser (1953)
C. bigelovii	n=11 pairs	Powell and Powell (1978)
C. bigelovii	n=11 pairs	Turner (1959)
C. durangensis*	n=12 pairs	King et al. (1976)
C. grahamii	2n=22	Grasshoff et al. (1972)

A base chromosome number of x=11 or 12 would suggest a relationship with Stevia which is essentially tribasic with x=11,12 and 17. On morphological grounds Carphochaete appears closer to those taxa of Stevia possessing base numbers of x=11 or 12.

GENERIC RELATIONSHIPS

The species of Carphochaete superficially resemble certain species of Stevia (e.g., S. pelophila Blake) as noted by Grashoff (1972) in his monumental treatment of Stevia for North America. Carphochaete, however, is readily distinguished by its style branches, and yet other characters of the head and florets.

Robinson and King (1976) place Carphochaete and their monotypic generic segregates, Cronquistia and Revealia, next to each other near Metastevia and Stevia, which is about where I would place the groups, as would, presumably, Grashoff (1975) to judge from his remarks as to the relationships of Metastevia. That is, the latter genus is closer to Stevia, on morphological grounds, than it is to Carphochaete (indeed, on phyletic grounds I would include Metastevia within Stevia, as presently constituted); but Carphochaete has characters of both Stevia and Metastevia and is perhaps ancestral to both. Certainly the semipaleate, large heads with numerous florets, and bristly pappus of C. durangensis makes that species a likely candidate. But these are matters for the future; any resolution of the problem will require new insights into the groups, especially using macromolecular data.

SPECIES RELATIONSHIPS

As I view the species they fell into four groups as follows: Group I) C. pringlei and C. durangensis; Group II) C. wizlizeni, C. grahamii and C. schaffneri; Group

species \ character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
pringlei	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
var. simulans	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	1	0
durangensis	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	1	0
wizlizenii	0	1	0	1	1	0	0	1	1	1	0	0	1	0	0	0	1	0
grahamii	0	0	0	1	1	0	0	0	1	1	0	1	1	0	0	1	1	0
schaffneri	0	1	0	1	1	1	0	1	1	1	0	1	1	0	0	1	1	0
macrocephala	1	0	0	1	0	0	1	0	1	0	1	1	0	1	1	1	0	1
bigelovii	1	0	0	1	1	0	1	1	1	1	1	1	1	0	0	1	1	1
Metastevia	0	1	0	0	0	1	0	1	1	1	1	1	0	1	–	–	0	0

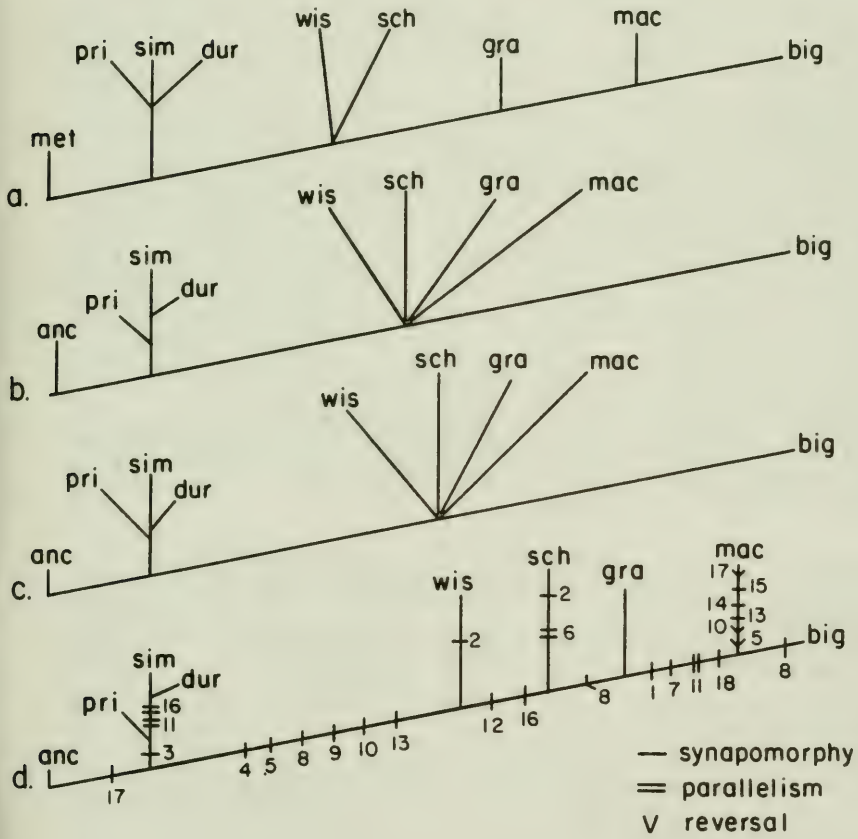
Table I. Character states among species of Carphochaete and Metastevia.

III C. bigelovii; and Group IV C. macrocephala. The relationships among these are shown in Fig. 1. Construction of the diagram was based upon the following assumptions as regards primitive (0) or advanced states (1) of the characters concerned:

Character	Primitive State (0)	Advanced State (1)
1.Habit	suffruticose herb	shrub
2.Stems	from woody crown	rhizomatous
3.Leaf arrangement	opposite throughout	alternate above
4.Leaf venation	3-nervate	1-nervate
5.Involucral bracts(I.B)	subequal	graduate
6.I.B. vestiture	not glandular	glandular
7.I.B. margins	not scarious	scarious
8.I.B., number	9 or more	5-9
9.Receptacle	chaffy(in part)	not chaffy
10.Florets/head	7-15	3-5
11.Corolla pubescent without	absent	present
12.Corolla pubescent within	absent	present
13.Style node abrupt	not so	yes
14.Achenes	8-9 ribbed	4-5 ribbed
15.Pappus	with mid-rib	w/o mid-rib
16.Pappus bristle no.	4-5	8-16
17.Anthers bifid	not so	yes
18.Heads single and sessile	not so	yes

Character states for the various species of Carphochaete are presented in Table 1 and these were used to construct the cladistic analysis shown in Fig. 1. In this I have used a hypothetical outgroup (HOG), for cladistic purposes. Other workers might have proposed their own HOG but for me, for my analysis of Carphochaete, I like the HOG proposed here. Cladistic purists might wish to have an appropriate "real" outgroup selected for such analysis, but to what avail? I mean, how does one recognize an outgroup where relationships are obscured by reticulate divergence, or whatever. Nevertheless, to this end I have provided such an analysis using the genus Metastevia as an outgroup, since Grashoff (1975) felt that the latter genus "developed from S. elatior-like ancestors during the early colonization of Mexico by members of this group". Stevia elatior belongs to a group of species that share many characters with Carphochaete, thus the selection of Metastevia as an appropriate outgroup is not too far-fetched. Besides, Metastevia is monotypic, making the

Fig. 1. a-d. Cladograms showing relationships among Carphochaete species. a. Consensus tree 1; b. Consensus tree 2; c. Second-level consensus tree; d. Subjective (derived) cladogram-anc=ancestor; met=Metastevia; big=C. bigelovii; dur=C. durangensis; gra=C. grahamii; mac=C. macrocephala; pri=C. pringlei var pringlei; sim=c.p. var. simulans; sch=C. schaffneri; wis=C. wislizeni. Additional explanation in text.



calculations relatively simple. Results of the calculation are shown in Fig.1 .

The hypothesis of phylogeny presented here is based on a cladistic analysis using Wagner parsimony. The computer program PAUP written by David Swofford was used to analyze the data. Two outgroups were used to polarize the character states: (1) the monotypic genus Metastevia, and (2) a hypothetical ancestor (HOG) that best represents my ideas regarding primitiveness in Carphochaete.

Using Metastevia as the outgroup, six trees of 31 steps each and a consistency index of 0.581 were found. They are represented in Figure 1a by a strict consensus tree that summarizes the topologically stable areas of the six trees. Using the HOG, seven trees of 27 steps each and a consistency index of 0.667 were found. They are represented in Figure 1b by a second strict consensus tree. In these two analyses, two lineages are clearly represented: C. pringlei-simulans-durangense, defined by alternate leaves and C. schaffneri-wislizeni-grahamii-macrocephala-bigelovii, defined by characters 4, 5, 8, 9, 10 and 13. If a consensus of the trees in Fig. 1a and Fig. 1b is constructed, the resulting tree (Fig. 1c) provides only this minimal level of resolution. Finally, I offer an admittedly somewhat subjective cladogram (Fig. 1d) constructed from the two consensus trees that displaces unresolved topology from one tree with resolved portions from the other and also that best fits my personal view of evolution in Carphochaete. This tree, however, exactly matches one of the seven trees obtained using the HOG as outgroup. Character state changes have been appended to the tree in Fig. 1d, using HOG to establish the polarities.

It should be noted that the cladistic branch bearing C. durangensis C. pringlei and its variety simulans (Fig. 1d) is at variance with the nomenclature adopted here. That is, the var. simulans, on cladistic grounds, using the data adopted here would more logically be treated as a variety of C. durangensis. However, I have not let my putative phylogeny affect the nomenclature in this instance, for if so treated the correct specific name would be C. simulans, with C. durangensis becoming a variety of the latter. Of course both of these could be treated at the specific level, but lacking new experimental data I have maintained the existing nomenclature so far as possible.

ACKNOWLEDGEMENTS

This study is based upon the examination of approximately 465 specimens, as follows: ARIZ(79), ASU(37), CAS-DS(21), F(24), GH(76), LL(30), MO(32), MICH(38), MSC(20), TEX(60), UC(44). I am grateful to the Directors concerned for these loans. Guy Nesom provided the Latin diagnosis and assisted with the cladistic analyses.

CHARPHOCHAETE A. Gray

Perennial suffruticose herbs or shrubs to 3 m high. Stems arising from short rhizomes or ligneous root crowns. Leaves opposite throughout or markedly alternate, sessile or nearly so, 1-nerved or with 3 parallel nerves, markedly glandular-punctate. Heads large, cylindrical or turbinate, borne in 1-numerous terminal cymes. Involucres 2-4 seriate, graduate to eximbricate, persistent. Receptacle convex or plane, epaleate or rarely partially paleate. Corollas tubular, white, pink or lavender, the throat cylindrical, glabrous or hirtellous without, pubescent or glabrous within; the lobes linear, of differing lengths. Anthers with well-developed appendages, these often with a central rib, or bifid. Style branches filiform with smooth, linear, narrowly-oblanceolate, appendages, the shaft with a gradually or abruptly swollen basal node. Achenes linear to narrowly obpyramidal, 4-5, or more often, 8-9 ribbed, the pappus scales ribless or ribbed, or both. Base chromosome number, $\underline{x}$=11 or 12.

Type species, Carphochaete wislizeni A.Gray.

A genus of seven species, all of which are confined to Mexico, mostly from Guerrero northward, where they usually occur in pine-oak woodlands from 1500-3800 m.

Key to Species

1. Leaves predominantly alternate along the upper stems; blades at least faintly 3-nerved.

 2. Leaves 5-8 cm long; blades strongly 3-nerved----------C. durangensis

 2. Leaves 1-3 cm long; blades faintly 3-nerved----------C. pringlei

1. Leaves predominantly opposite along the upper stems; blades with a single mid-vein.

 3. Sprawling shrubs to 3 m high; pappus a laciniate crown; Guerrero----------C. macrocephala

3. Suffruticose erect herbs; pappus of prominent scales; Central Plateau of Mexico.
   4. Heads 3-4 cm high, sessile or nearly so; Chihuahua, Coahuila and adjacent U.S.A.----------C. bigelovii

   4. Heads 2-3 cm high, pedunculate, arranged in a terminal capitulescence.

      5. Involucral bracts densely covered with minute, stipitate-glandular, trichomes; San Luis Potosi----------C. shaffneri

      5. Involucral bracts glabrous or merely ciliate, sometimes gummy or viscid
         6. Pappus bristles 8-16----------C. grahamii
         6. Pappus bristles 4-6----------C. wislizeni

CARPHOCHAETE BIGELOVII A. Gray, Smithson. Contr. Knowl. 3:89.1852. TYPE:U.S.A. (MEXICO?): "On the boundary between Mexico and New Mexico", Mimbres" (on type sheet), w/o date, I. J. Bigelow s.n. (holotype GH!)

Perennial suffruticose herbs or subshrubs 0.3-1.0 m high. Stems stiffly erect, densely short-puberulous to glabrate, tan or reddish. Leaves opposite throughout, mostly in axillary fascicles, 1-3 cm long, 3-10 mm wide, sessile or nearly so, 1-nerved, glabrous, linear-oblanceolate to somewhat elliptic (very rarely 3-nervate and somewhat denticulate). Heads large, single, terminal or axillary, mostly 3.0-3.5 cm high, the capitulescence a spike-like or loose corymbose panicle. Involucres 4-5 seriate, graduate, mostly 15-20 mm long, the bracts 10-14, linear oblanceolate, puberulent, glandular-punctate, the apices acute or apiculate. Florets mostly 4 per head; corollas white or pinkish-white, 15-18 mm long, glandular or hirtellous without, pubescent within along the lower part. Achenes 11-12 mm long, 8-9 ribbed, hispidulous; pappus of 10-12 linear-lanceolate scales 12-15 mm long, the mid-rib extending into barbellate bristles 2-4 mm long, the outer pappus of 1-4, ribless, linear scales, 1-3 mm long, or absent; chromosome number, 2n=22.

DISTRIBUTION (Fig. 2): Southern Arizona, New Mexico and trans-Pecos Texas in the U.S.A. and adjacent Son, Chi and Coa in Mexico; pine-oak-juniper woodlands in mostly igneous soils from 1700-2500 M; Sep-Jul, depending open rains.

REPRESENTATIVE SPECIMENTS: U.S.A. ARIZONA: Cochise Co.: Chiracahua Natl. Monument, Bonita Canyon, below Shake Springs, Cupressus forest, 5760 ft, 18 Apr 1975, Reeves

R2519 (ARIZ, ASU). Gila Co.: Tonto Forest, Parker creek, 5750 ft; 9 Apr 1935, Johnson 104 (ASU). Graham Co.: Pinaleno Mts., Frye Mesa Reservoir, 5000 ft. 17 Apr 1985, Johnson 11456 (ASU). Pima Co.: Santa Catalina Mts, Sabino Canyon, "The Horse", 9 Apr 1905, Thornber & Terrell s.n. (ASU, TEX). Pinal Co.: Superstition Mts., Top of ridge, S side, 4000 ft 26 Mar 1932, Gillespie 5468 (GH). Santa Cruz Co.: Cobre Ridge, 10 mi SSE of Arivaca, 4200 ft, 17 Apr 1973, Holmgren & Holmgren 6834 (ASU). Yavapa: Co.: Happy Valley, 13 Mar 1966, Hesselberg s.n. (ARIZ). NEW MEXICO. Dona Ana Co.: Organ Mts, Apr 1852, Wright (GH, TEX). Grant Co.: Emory Point, 6600 ft, 1905, Blumer 189 (GH). Greenlee Co.: Clifton, Apr 1987, Traphagen s.n. (GH). Hidalgo Co.: Animas Mts., 23 mi S of Animas, 6500 ft, 2 May 1976, Hess & Stickney 3760 (ARIZ). TEXAS. Brewster Co.: Chisos Mts., above Lost Mine Peak Trail, 2 Apr 1959, Correll 20692 (LL). Jeff Davis Co.: upper canyon of Limpia Creek, 10 Jun 1926, Palmer 30669 (A,TEX). Presidio Co.: NE slope of Chinati Peak, Horse Creek Canyon, ca 6500 ft, 21 Jun 1942, Hinckley 2516 (ARIZ, GH).

MEXICO. CHIHUAHUA: Sierra Charuco, 17-25 Apr 1948, Gentry 8016 (ARIZ, MICH, UC); Cascada de Basaseachic, ca 2150 m, 27 Apr 1986, Nesom 5457 (TEX). COAHUILA: Sierra de Hechiceros, 17-19 Sep 1940, Johnston & Muller 1311 (GH,LL,MICH,MSC); Sierra Maderos del Carmen, 2100 m, 1 Apr 1974, Wendt et al. 121 (LL); Serranias del Burro, 12 Apr 1976, Riskind & Patterson 1977 (TEX). SONORA: 5 mi E of Esqueda, 27 Mar 1970, McGill & Pinkava 6429 (ASU); 17 mi SE of Magdalena, Palm Canyon, 10 Mar 1979, Steadman & Schmidt s.n. (ARIZ).

CARPHOCHAETE DURANGENSIS Grasshoff ex B. Turner, sp. nov.

C. pringlei var. simulans simile sed foliis multum grandioribus laminis valde 3-nervatis et capitulis grandioribus flosculis numerosioribus.

Perennial, somewhat suffrutiose, herbs 30-60 cm high. Stems glandular-pubescent or puberulous, reddish, stiffly erect, 1-8 arising from a short, fibrous-rooted, rhizomatous caudex. Leaves opposite for the first several nodes then markedly alternate thereafter, 4-8 cm long, 7-14 mm wide, gradually reduced upwards, sessile or nearly so, the blades linear-elliptic, strongly 3-nervate from the base, with fine reticulate-nerves between the major veins, glabrous or nearly so. Heads 2-15, bright pink-lavender to purple, arranged in stiffly erect, terminal, flat-topped cymes, the ultimate peduncles glandular-pubescent, mostly 1-3 cm long. Involucres turbinate, eximbricate or nearly so, 10-13 mm

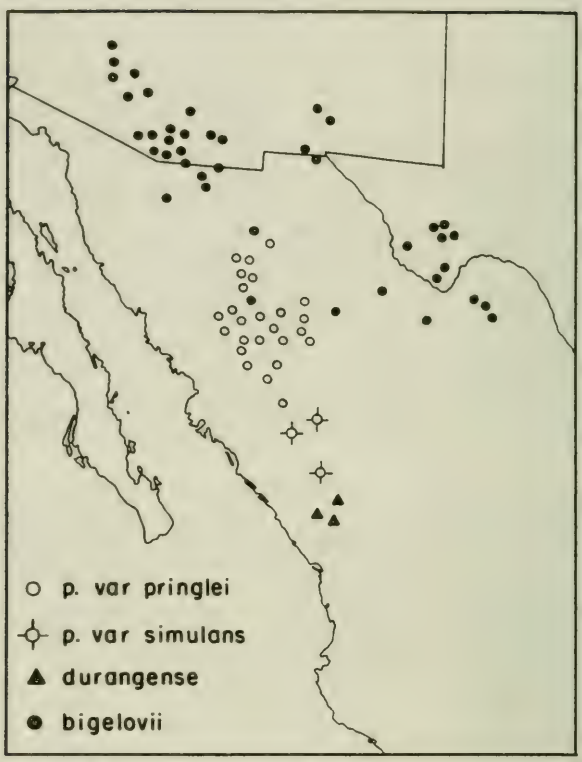


Fig. 2. Distribution of Carphochaete spp.

high; bracts densely glandular-pubsecent, broadly lanceolate, 3-5 nervate, the apices acute. Receptacle somewhat convex, epaleate or with well-developed chaff. Florets 15-20 per head; corollas tubular, 6-8 mm long, pubescent without, glabrous within, the lobes 2-3 mm long. Achenes 4.0-4.5 mm long, 8-9 ribbed, the faces 4 or 5, pubescent; pappus of 3-5 lanceolate scales, 2-5 mm long, with their mid-ribs extending into short bristles, these alternating with 3-5 ribless scales; chromosome number, 2n=22.

DISTRIBUTION (Fig. 2): Known only from southern Durango in pine-oak woodlands, 2400-2700 m; Aug-Sep.

TYPE: MEXICO. DURANGO: ca 30 mi W of Durango, ca 8500 ft, "In rocky, rhyolitic soil in oak-pine woodland". 28 Sep 1962, A. Cronquist 9539 (holotype TEX; isotypes GH!, MICH!, NY).

ADDITIONAL SPECIMENS EXAMINED: DURANGO: 50 km W of Durango along highway 40 (23°52'N x 105°00W), area with much exposed rock, 2500m, 12 Sep 1984, Barrie 1003 (MEXU;TEX); Parque El Teivan, 58 km al ESE de Durango, 4 Sep 1984, Casillas et al. 6 (TEX); Jarocho, railroad W of Durango, 2400-2500 m, 27 Aug 1934, Pennell 18242 (GH).

This taxon superficially looks like a robust form of C. bigelovii var simulans but differs by a number of characters, the most notable being the large, strongly parallel-nerved, leaves. King (1968) included the type and only collection known to him, within his concept of Cronquistia pringlei, but subsequent collections reveal the taxon to be fairly uniform and common to the west and south of Durango City. It does not intergrade with C. pringlei and is remarkably distinct, as surmized by the late J. Grashoff, who first annointed the species and designated its type.

Some of the specimens (Casillas et al. 6, TEX) have well-developed chaff on the receptacles; occasionally, chaff also occurs among the peripheral florets of C. pringlei, contrary to the observations of King (1968).

CARPHOCHAETE GRAHAMII A. Gray, Smithson. Contr. Knowl. 3:89. 1852. TYPE: MEXICO. MEXICO STATE or MICHOACAN: according to McVaugh (1984), who examined type material, the type was probably collected about the villages of Tlalpujahua and Angangueo, in NW Mexico State or adjacent Michoacan, 1830, G. J. Graham 81 (holotype K).

Carphochaete gummifera McVaugh, Contr. Univ. Michigan Herb. 9:385.1972. TYPE: MEXICO. ZACATECAS: between Jalapa

and Tlaltenango, 2300-2500 m, 22 Dec 1970, McVaugh 25617 (MICH!).

Perennial suffruticose herb or shrublets, 30-70 cm high. Stems sparsely puberulent to glabrate, reddish. Leaves opposite throughout, linear-oblanceolate to oblanceolate or somewhat spatulate, 2-4 cm long, 3-7 mm wide, sessile, glabrous to sparsely pubescent on both surfaces, markedly glandular-punctate, 1-nerved, the apices usually obtuse or rounded, but rarely acute. Heads 1-3 at the apices of stems, the ultimate peduncles 5-20 mm long, pubescent to glabrate. Involucres 14-17 mm high, 3-4 seriate, puberulent, ciliate; bracts 8-10, the apices usually rounded and apiculate but sometimes gradually narrowed and acute. Style shaft with basal node. Florets usually 4 to a head; corollas lavender-pink, 15-20 mm long, glabrous within and without, the lobes 5-6 mm long. Achenes ca 1 cm long, with 8-9 ribs, sparsely hispid to glandular-hirtellous; pappus of 8-10 linear-lanceolate scales 9-14 mm long, the apical barbellate extensions mostly 3-4 mm long, an outer series of short ribless scales may be present or absent. Chromosome number, n=11 pairs (Grasshoff 533, TEX).

DISTRIBUTION (Fig. 3): Southern Durango to Mexico State, mostly along the western Central Plateau in pine-oak woodlands, 1400-2700 m; Sep-Nov.

REPRESENTATIVE SPECIMENS: MEXICO. AGUASCALIENTES: ca 10 mi SE Calvillo, 2000-2300 m, 4 Nov 1959, McVaugh & Koelz 179 (LL,MICH). DURANGO: Mcpio. El Mezquital, 22 km NE Los Charcos, 2750 m, 1 Nov 1982, Gonzales & Rzedowski 2347 (CAS, TEX); 74 km WNW Huejuquilla El Alto, 2720 m, 22 Oct 1983, Breedlove 59187 (CAS, TEX); Mcpio. Suchil, San Juan de Michis, 21 Nov 1985, Alvarado 608 (TEX). GUANAJUATO: 30 km WSW Dolores Hidalgo, 2300 m, 29 Dec 1967, Rzedowski 25935 (DS,LL,MICH,MSC). JALISCO: summit of mountains above Etzatlan, 27 Oct 1903, Pringle 8772. (F,GH,LL,MO,MSC,UC). MEXICO: Bluffs, Flor de Maria, 18 Oct 1890, Pringle 3315 MORELIA: Lake Maria, 9 Oct 1911, Arsene s.n. (CAS); ZACATECAS: Sierra de los Huicholes, 5 mi N of Tepetates, 2400-2600m, 13 Jan 1975, McVaugh 25772 (MICH).

Collections from Durango generally have broader more oblanceolate blades which are more puberulent than is typical, but otherwise differ but little from material to the south.

I take C. gummifera to be a somewhat, narrow-leaved, gummy, form of C. grahamii. In nearly all other characters it is like the latter and falls within the

geographic range of that species.

CARPHOCHAETE MACROCEPHALA (Paray) Grashoff ex B. Turner & Kerr, Pl. Syst. Evol. 151:86.1985.

Oxylobus macrocephalus Paray, Bol. Soc. Bot. Mex. 22:1.1958. TYPE: MEXICO. GUERRERO: Cerro Teotepec, NE of Chilpancingo, 3500-3600m, 27 Dec 1946, Paray 973 (MEXU; photoholotype TEX!)

Revealia stevioides King & H. Rob., Phytologia 33:277.1976. TYPE: MEXICO. GUERRERO: ca 60.5 mi NE of Atoyac and 67.5 mi NE of Puerto del Gallo, 10,500 ft, 19 Oct 1975, Reveal et al. 4319 (holotype US).

Revealia macrocephala (Paray) King & H. Rob., Phytologia 23:376.1976.

Sprawling semi-succulent shrubs to 3 m high. Stems puberulent ot glabrate, reddish, the nodes numerous and mostly shorter than the leaves. Leaves opposite throughout, 1-2 cm long, 2-5 mm wide, sessile, 1-nerved, glabrous, oblanceolate, entire or with a few minute serrations. Heads lavender or purple, single or 2-5 in terminal cymes, the ultimate peduncles mostly 2-8 mm long. Involucre campanulate, 2-3 seriate, subimbricate; bracts elliptic with scarious margins, the apices rounded. Receptacles somewhat convex, glabrous, epaleate. Florets 10-14 per head; corollas 13-15 mm long, lavender, tubular, pubescent without and within, the lobes 3-6 mm long. Achenes 6-8 mm long, with 4-5 sides, the faces occasionally with weaker ribs, glabrous or faintly pubescent above; pappus a lacerate crown ca 1 mm high.

DISTRIBUTION (Fig. 4): Known only from Guerrero in the region of Cerro Teotepec in pine-fir forests from 2900-3500 m; Sep-Dec (Apr).

ADDITIONAL SPECIMENS EXAMINED: MEXICO. GUERRERO: Summit of Teotepec, 3100 M, 12 Nov 1973 Breedlove 36075 (CAS); Cerro Teotepec, ca 40 mi N Coyuca de Benitez, Feddema 2931 (CAS,MICH,TEX); 19.5 km al NE de Puerto del Gallo, 23 Nov 1983, Martinez & Barrie 5659 (TEX); Cerro Teotepec, 3300 m, 11 Apr 1963, Rzedowski 16494 (F, MICH, TEX); Cerro Teotepec, 3350m, 5 Dec 1963, Rzedowski 18156 (DS,LL,MICH,TEX); ca 8 km NE de Puerto del Gallo, 7 Sep 1983, Villasenor Rios 558 (TEX).

King and Robinson (1976) thought that this species diverged (as Revealia!) "from between Carphochaete and Cronquistia [=C. pringlei]..." They contend that the

most important difference between these two taxa is that of hairs on the inner surface of the corolla in Revealia. Actually the inner surface of the corolla of Carphochaete bigelovii is pubescent like Revealia and I can find little merit in the recognition of their monotypic proposal, nor did Grashoff, to judge from his annotations.

Nevertheless, the species is perhaps the most distinct member of Carphochaete, possessing a well-defined, semi-succulent, shrubby, habit and 4-5 ribbed achenes, characters which suggest a remote position within the genus.

CARPHOCHAETE PRINGLEI (S. Wats) Grashoff ex B. Turner, comb. nov. Based upon Stevia pringlei S. Wats., Proc. Amer. Acad. Arts 23:276.1888.

Perennial suffructicose herbs 30-70 cm high. Stems purplish, hirtellous to puberulous, but soon glabrate, arising from a ligneous root-stock. Leaves opposite for the first several nodes but thereafter markedly alternate, mostly 2-4 cm long, 2-4 mm wide, gradually reduced upwards, 3-nerved, linear-lanceolate and often somewhat falcate, the apices acute. Heads lavender-pink, turbinate, borne in 1-10, rather flat-topped, terminal cymes, the ultimate peduncles mostly 1-4 cm long. Involucres 2-3 seriate, subimbricate; bracts 14-16, lanceolate, 7-10 mm long, puberulent to glabrate, the apices acute. Florets 3-9 per head; corollas tubular, 6-7 mm long, glabrous or rarely pubescent without, glabrous within, the lobes 2-3 mm long. Achenes 8-9 ribbed, 4-5 sided, densely hispidulous, 4-5 mm long; pappus of 3-5, awned, scales alternating with 4-5 short awnless scales, or of 10 awnless scales 1-2 mm long, these often united into a crown.

Two varieties are recognized:

Involucral bracts and corollas densely pubescent with glandular trichomes; Chi and Dur (Fig. 3)----------var. simulans

Involucral bracts and corollas without glandular trichomes----------var. pringlei

C. PRINGLEI (S. Wats) Grashoff ex. B. Turner var. PRINGLEI

Stevia pringlei S. Wats., Proc. Amer. Acad. Arts 23:276.1888. TYPE: MEXICO. CHIHUAHUA: foothills of the Sierra Madre, Sep 1887, Pringle 3101 (holotype GH!;

isotypes F!,NY,UC!,US!).

Cronquistia pringlei (S. Wats) R.M. King, Brittonia 20:12.1968.

DISTRIBUTION (Fig. 3). Sierra Madre Occidental of Chihuahua and possibly adjacent Sonora, in pine-oak woodlands from 2000-2500m; Aug-Oct.

REPRESENTATIVE SPECIMENS: MEXICO. CHIHUAHUA: SW of Tomochi, ca 2100 m, 25 Sep 1980, Cronquist 11718 (CAS, F, GH, MICH, MO, TEX); 10 mi SE Madera, 22 Sep 1939, Muller 3414 (GH,MICH,TEX,UC).

A large number of additional specimens are cited by King (1968) all of which belong to this variety except for the two collections from Durango which serve as the types of the following variety, and Carphochaete durangensis, described above.

C. PRINGLEI var. SIMULANS (B.L. Rob.) B. Turner, comb. nov.

Stevia simulans B.L. Rob., Proc. Amer. Acad. Arts 42:34. 1906. TYPE: MEXICO. DURANGO: on Mesa de Sandia, 3050m, 14 Oct 1905, C. G. Pringle 10144 (holotype GH!; isotypes F!, NY!,UC!,US!).

This taxon can be distinguished by its copious glandular-trichomes on the upper stems, involucral bracts, and usually the corollas; the latter, if not pubescent, will take on a viscid or gummy sheen. The var. pringlei is usually without glandular trichomes, or these are relatively few and confined to the peduncles. I agree with King (1968) that the pappus characters emphasized by Robinson in his recognition of Stevia simulans are not valid, but the glandularity appears to hold for populations in southern-most Chihuahua and adjacent Durango.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. CHIHUAHUA: 17.6 km NNE of El Vergel, open woods of pine-oak-manzanita, 2450 m, 24 Aug 1983, Nesom 4912 (TEX); 20 km WNW of Santiago Papasquiaro (25° 04' N x 105°47'W), mixed pine, fir and oak woodland, 2800 m, 25 Aug 1983, Diaz 660 [Worthington 11406] (TEX).

CARPHOCHAETE SCHAFFNERI Greenm., Proc. Amer. Acad. Arts 40:34,1904. TYPE: MEXICO. SAN LUIS POTOSI: Sierra de San Miguelito, valley of San Luis Potosi, Sep 1986, J.G. Schaffner 241 (lectotype GH!, selected by King and Robinson, by annotation, 1984; isolectotype F!, UC!).

Suffruticose erect, rhizomatous, perennials, 25-45 cm high. Stems minutely glandular-pubescent to glabrate, reddish. Leaves opposite throughout, sessile, linear-lanceolate, 2-4 cm long, 1-3 mm wide, glabrous, 1-nerved, markedly glandular-punctate, the apices acute. Heads 1, or rarely 2, on terminal peduncles 5-20 mm long, the whole arranged in an open, 3-15-headed, capitulescence with ascending branches. Involucres 10-15 mm high, 2-3 seriate; bracts 5-7, gradually tapering to an acute apex, or abruptly obtuse and apiculate, densely short glandular-hirtellous or merely glandular-punctate, not at all ciliate. Florets mostly 4 per head; corollas pinkish to purplish, 15-18 mm long, glabrous without, very sparsely pubescent within near orfice, the lobes 3-4 mm long. Achenes with 8-9 ribs, ca 1 cm long, minutely glandular-hirtellous; pappus dimorphic, an inner series of 6-8 linear-lanceolate, 1-ribbed scales, 14-16 mm long, the mid-rib extending into well-defined awns, 6-8 mm long, the outer series of 2-6, short, ribless scales, 1.5-3.0 mm long.

DISTRIBUTION (Fig. 3): Mountainous regions about San Luis Potosi in oak woodlands from 2300-2500 m; Oct-Jan.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. SAN LUIS POTOSI: region of San Luis Potosi, 1850-2465 m, 1878-79, Parry & Palmer 329, (GH,MO); Sierra de San Miguelito, ca Cueva del Mezquite, "chaparral de encino", 2300 m, 9 Nov 1954, Rzedowski 5456 (MICH,MSC); Sierra de San Miguelito, "parte superior de la Canada de San Antonio," 2350 m, 5 Jan 1955, Rzedowski 5671 (MSC).

The taxon is closely related to C. grahamii but can be distinguished by its glandular-hirtellous involucral bracts and a few other minor characters. Ultimately it may be reduced to varietal rank under that species.

Collections by Parry & Palmer 329, cited in the protologue by Greenman, in part at least, are apparantly mixed, for sheets at F and MO are clearly C. grahamii, possessing the ciliate eglandular involucral bracts and pubescent achenes of the latter.

CARPHOCHAETE WISLIZENI A. Gray, Mem. Amer. Acad. Arts 4:65.1849. TYPE: MEXICO. CHIHUAHUA: mountains W of Chihuahua, ca Cosiquiriachi, 19 Sep 1846, Wislizenus 175 (holotype MO!; fragment GH!)

Perennial, basally suffruticose, herbs 20-40 cm high. Stems glabrous, or nearly so, reddish, arising from slender rhizomes, forming small colonies. Leaves

opposite throughout, 2-5 cm long, 1-2 mm wide, sessile, linear, glabrous, 1-nerved, markedly glandular-punctate, the apices acute. Heads 1-5 in rather congested terminal corymbs, often numerous-headed, with lateral branches and associated stems producing a flat-topped capitulescence. Involucre 10-12 mm high, 2-3 seriate; bracts 6-8, linear-lanceolate, reddish, ciliate or nearly glabrous, gradually, or rarely abruptly, tapered into an acute apex. Florets usually 4 per head; corollas pinkish-purple to lavender, 13-15 mm long, glabrous within and without, the lobes ca 4 mm long. Achenes 8-9 mm long, 8-9 ribbed, hispidulous; pappus dimorphic, an inner series of 4 or 5, linear-lanceolate, scales, 11-12 mm long, the mid-ribs extending into bristles 2-4 mm long, the inner series of 4 or 5 alternating ribless scales, 1.0-1.5 mm long.

DISTRIBUTION (Fig. 3): Chihuahua, Durango and Zacatecas, pine-oak woodland in mostly rocky igneous soils, 2000-2500 m; Aug-Nov.

REPRESENTATIVE SPECIMENS: MEXICO. CHIHUAHUA: Mountains near Chihuahua, 16 Oct 1886, Pringle 765 (ARIZ, F, GH, LL, MICH, MO, MSC, TEX, UC); Cascada de Basaseachic, ca 2000 m, 4 Oct 1982, Tenorio L. 1 9 6 8 (TEX). DURANGO: ca 50 mi W of Durango, ca 8000 ft, 1 Oct 1962, Cronquist 9579 (GH,MICH,MO,TEX); 49 mi W of Parral, ca 8400 ft, 13 Sep 1972, Reveal & Hess 3058 (GH, MO, TEX, UC). ZACATECAS: ca Sombrerete, ca 2400 m, 26 Sep 1948, Gentry 4876 (ARIZ,GH,MICH,UC).

LITERATURE CITED

Gaiser, L. 1953. Chromosome studies in Kuhniinae (Eupatorieae). I. Brickellia. Rhodora 55:253-267.

Grashoff, J. 1972. A systematic study of the North and Central American species of Stevia. Doctoral Thesis, The Univ. of Texas, Austin.

_____. 1975. Metastevia (Compositae: Eupatorieae): a new genus from Mexico. Brittonia 69:73.

King, R. 1968. Studies in the Eupatorieae (Compositae) VI. Brittonia 20:11-12. 1968.

King, R. et al. 1976. Chromosome numbers in Compositae. XII. Eupatorieae. Ann. Missouri Bot. Gard. 63:862-888.

King, R. and H. Robinson. 1976. A new genus Revealia from Mexico. Phytologia 33:270-280.

Powell, A. and S. Powell. 1978. Chromosome numbers in Asteraceae. Madrono 25:160-169.

Turner, B. 1959. Meiotic chromosomes for 12 species of Texas Compositae. Brittonia 11:173-177.

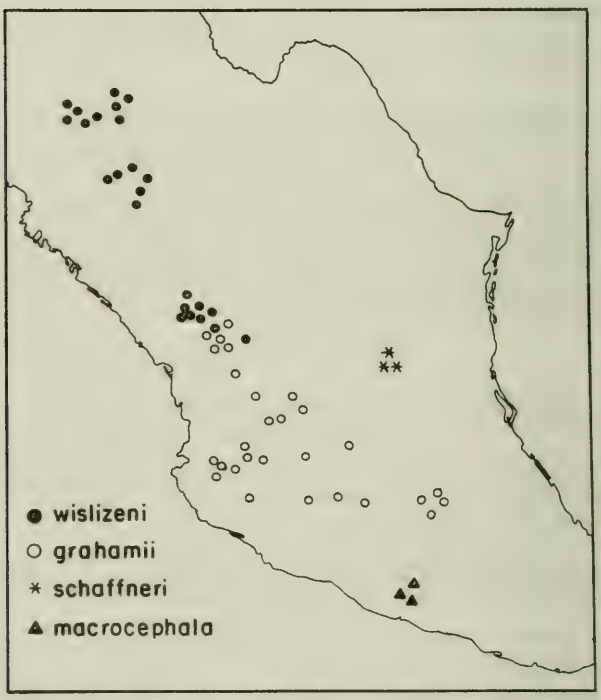


Fig. 3. Distribution of Carphochaete spp.

NOMENCLATURA PLANTARUM AMERICANARUM VI. GRAMINEAE

A. Lourteig and Th. Soderstrom

This note should had been published in collaboration with Thomas Soderstrom († 1st. sept. 1987). His untimely death has deprived the World of an outstanding agrostologist; the Bamboos, particularly,would weep for this lose.

As soon as I discovered this problem I explained it to Thomas, and an exchange of letters followed up. We agreed from the beginning on the necessity of a new combination, and we came to the last fine details. However, it is my turn to put our paper out with: Arthrostylidium farctum (Aublet) Soderstrom et Lourteig n.c.

PLUMIER described in MSS 5: ic. 92 :

Arundo farcta tenuis,altissimique scandens

which was put in binomial nomenclature by Aublet who cited Plumier's protologue and the corresponding illustration. At the same time he quoted P. Browne, Jamaica 139. 1756.

Plumier's description excels in perfection : placing the species in Arundinaceae, starting with the roots in details; then, ... "culmi seu stipitis arundinacei and farcti seu omnino pleni, exiles, politissimi, flexiles seu fractu contumaces...." &c. It is remarkable to learn that the culms are solid. No doubt the leaves so characteristic are also well interpreted as: ".... nude e nodis subtiles longissimique dependent funiculi arbores ipsas penitus onustantes ac per quasdam intervallia verticillatim radiatimque emittentes innumera foliola angustissime acutissima, virentia duos aut tres aut quatuor pollices longa ex eadem vaginula squamata quaterna aut quina simul exorientia". The icon corresponds exactly with the description.

No specimen related to Browne's protologue has been found (Doctor Ch. Jarvis' personnal communication, to whom we are much obliged).

According with Soderstrom who wrote : "Aublet (1775, vol. 1, p. 52), under "arundo (farcta) refers to the Plumier manuscript and illustration. His Latin description, taken from Browne, certainly refers to Arthrostylidium capillifolium. This name "farcta"and Latin description are correct for this species of bamboo and represent the earliest name", the nomenclature is as follows :

Arthros

Arthrostylidium farctum (Aublet) Soderstrom et Lourteig n.c.

Arundo farcta Aublet, Fl. Guiana Franc. 1: 52. 1775 quoad protol. et icon. Plumer., MSS 5: 92 excluding all reference to French Guiana).
Calamagrostis farcta Gmelin, Systema 2 : 172. 1791 quoad synon. Plum. excl. Guiana.
Arthrostylidium capillifolium Grisebach, Plantae Wrightianae 2. Mém.

Acad. Sci. Arts n.s. 8: 531. 1862. Type: Cuba, in sylvis densis, frutices vel arbores scandens, Wright 738 a. 1860. Isotype P.
Arundinaria capillifolia (Griseb.) Hackel, Osterr. bot. Zeitschr. 53: 69. 1903. Urban, Symb. Antil. 8: 51. 1920; Repert. Spec. Nov. Beihefte 5: 108. 1920.

Type: MSS 5: 92 by Plumier, based on a plant from Saint Thomas Island, found also in Insula Dominicana: La Bande su Sud, Grand Cul de Sac.

This species is known as the "slender climbing reed".

After Soderstrom, who was among this plant in the Dominican Republic early in 1987, this species is known only from the West Indies, not South America.

Inasmuch as we do no editing, papers accepted for publication *must* be submitted in *exactly* the form that the author wants to have them published. They will then be photographed and printed by photo-offset in exactly the form as submitted except that we will add page numbers and running-heads.

Typescripts should be prepared single-spaced on clean white heavy bond smooth and opaque paper. Elite type is probably the most space-economical. Typescript text must not exceed a rectangle 5⅝ inches wide (horizontal) by 8⅝ inches high (vertical), not including the running-head and page number.

The title of the paper should be typed in all uppercase (capital) letters with 2 blank lines above the title and one beneath; then the name of the author in ordinary upper- and lower-case letters, along with his address (if so desired); followed by 2 blank lines; then the first line of text. It is usually best to leave a blank line between paragraphs.

All scientific plant and animal names and group names should be typed either in italic type (if available) or underscored. Any corrections in the text made by the author must be complete and neat as they will be photographed as they are.

The finished typescript as submitted by the author will be reduced from the 8⅝ x 5⅝ inch size as submitted to 6⅔ x 4 inches by the printer. It is therefore advisable to place a centimeter or millimeter scale on all text figures and plates included.

Use a *new* heavily inked black typewriter ribbon and be sure to *clean* the type on the typewriter after each several pages of typing.

Cost of publication at present is $12.00 US per page, with no subsequent rebates, but this rate may vary depending on inflation and costs, so it is best to inquire as to current rates. The page charges are due *with* the typescript and no paper will be published before payment is received in full. Each author will receive gratis a proportionate share of the printed copies remaining after paid subscriptions are filled, but if separates (reprints or offprints) are desired, these will be charged extra in accord with the current rate for offprints provided by the printer. The cost of all such separates ordered must also be paid for in advance at the time the typescript is sent. No orders for separates will be accepted later, nor can additions or corrections be accepted.

Authors are asked to indicate in light pencil on the *reverse* side of each page of their typescript the page number so that no mistakes in sequence occur.

All manuscripts accepted will be published in the next issue, so that the size of the numbers may vary greatly. A volume will contain 512 pages. The plan insures prompt publication of all accepted manuscript.

Illustrations will be published according to the desires of the authors. No extra charge is made for line drawings, such as are ordinarily reproduced in zinc, or for diagrams, tables, or charts, provided they conform to certain limitations of size and proportion. An extra charge will be made for halftones, depending on their size, as fixed by the engraver.

Articles dealing with research in all lines of botany and plant ecology, in any reasonable length, biographical sketches, and critical reviews and summaries of literature will be considered for publication.