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WHAT DO WE KNOW ABOUT *DIAMORPHA SMALLII* (CRASSULACEAE), "ONE OF THE BETTER-KNOWN TAXA IN THE SOUTHEASTERN FLORA?"

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All might agree that the principal aim of botany is to study plants rather than to pervert the science into an interminable debate over the names of plants. Still it is disturbing to find that a plant recently described as "one of the biologically better-known taxa in the southeastern flora" (Spongberg 1978) is not only without a currently acceptable generic name but even its specific epithet is and has been the subject of much recent debate. There is little reason for complacency when one of our better known species is more or less nameless for more than a century and a half after its discovery. Even the merit of this isolated species to generic status has been challenged not only by some ecologists but also by systematists including Ahles in the regionally highly influential *Manual of the Vascular Flora of the Carolinas* (Radford et al. 1968). Certain cladists even question the possibility of monotypic genera (Platnick 1976). Consequently it seems worthwhile to discuss the name of this unique plant which of necessity involves us not only with some of the early botanical history of the Southeast but also with the machinations of some of today's leading nomenclaturalists. In order not to overlook the sentiment expressed in the opening sentence, a summation of the botanical findings of the past several decades will be appended that have allegedely made this plant one of the biologically better known of all the plants in the extensive southeastern flora.

The principal subject of our discussion is the species called *Sedum smallii* in the Carolina Flora. However, it is hoped that what is related here will convince everyone that it is not a *Sedum* at all but a most distinctive plant with morphological features totally unlike those of *Sedum* or of any other genus in the Crassulaceae.

Approaching the subject chronologically, it is necessary to learn something about another unusual member of the Crassulaceae often found growing nearby that was confused with it from the beginning and was completely confounded with it for well over a half a century.

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André Michaux (1746-1802) was sent to the United States by the royal French government in 1785 to study forest trees and to determine on how best to transport them to France. He had still not found it possible to return to republican France six years after the French Revolution largely because he had received no money from the oft-changing French governments of that troubled period. One might suspect that a former royal gardener and plant collector might easily be judged as sympathetic to the Old Regime and guillotined as though he were royalty. This was not the case for Michaux had become an ardent republican so much so that his American diary was kept with the post-Revolutionary calendar. Furthermore André Michaux became a not too successful agent of the notorious Citizen Edmond Genêt (1763-1834), the minister of the revolutionary government of France to the United States. Genêt tried to initiate an attack by Americans upon the Spanish then in possession of Louisiana so that vast area might then be returned to France and to entice the United States to join France in a war against England. President Washington reacted firmly to this violation of our declared neutrality and Genêt was ordered home for trial. He wisely declined to go and remained and prospered here. It is perhaps safe to conclude that only Michaux's love of plants kept him from being more deeply involved in Genêt's plot. Instead of international intrigue, on 23 April 1795 Michaux botanized on the outcrop of granitic rock north of Camden, in Kershaw County, South Carolina. Unfortunately this historic outcrop has since been converted into a quarry for stone monuments.

These often widely disjunct rock outcrops, ranging from southern Virginia (Harvill 1976) southwestward through the Carolina and Georgia into Alabama and north into Tennessee, support a spectacular flora adapted to that stringent habitat and to its drastically changing environment. Among the more interested members of the limited flora adapted to these extreme conditions are 17 endemic species. Two of these are so unique as to be assigned to monotypic genera: *Amphianthus* (Scrophulariaceae) and *Diamorpha* (Crassulaceae). About as many other species are largely confined to these outcrops although not restricted solely to them (McVaugh 1943). On the flatrock near Camden, Michaux collected for the first time in April 1795 the plant usually known as *Sedum pusillum*. The species was described in Michaux's *Flora Boreali-Americana* published posthumously (1803, p.276) and there placed with the other species of *Sedum* in the *Decandria Pentagynia*. Most species of *Sedum* known at that time had 10 stamens and five pistils and hence properly belong in the Linnaean *Decandria Pentagynia* but *Sedum pusillum* has eight stamens and four pistils and hence, one naturally would have looked for it in the Linnaean sexual system in the

Octandria Tetragynia. The plants were in flower and Michaux described the white petals and the eight stamens. No mention was made of the fruit in the brief thirteen word diagnosis and one might conclude that none had yet formed so early in the season. This may be an erroneous conclusion for there exists a fragment with fruit at Harvard, presumably a snippet of the holotype, taken by A. Gray alledgedly from Michaux's specimen in Paris. Since the Camden flatrock was located along a principal colonial road, it is at least possible that the flowering and fruiting collections were made at different times as Michaux passed this way on several occasions. Michaux's Flora indicates that *Sedum pusillum* was collected in "Carolina septentrionali" and Joseph Ewan in his notes in the preface of the recent reprint of Michaux's Flora cites the locality as Flatrock in Henderson County, N.C. This is an error for that flatrock was far from Michaux's route (McVaugh 1943; Uttal 1984). *Sedum pusillum* has never been collected in that part of North Carolina—but Nuttall's species of *Diamorpha*, long confused with it, is known from the outcrops of North Carolina's Henderson County. Michaux's journal (1889) makes it clear that the type locality of *Sedum pusillum* was from the rock outcrop about 15 miles north of Camden, as pointed out by McVaugh (1943, p.128).

The modest but most accomplished English botanist and ornithologist Thomas Nuttall (1786-1859), who later served for over a decade as a professor at Harvard and even later appeared aboard the brig *Pilgrim* in Richard Henry Dana's classic *Two Years Before the Mast*, visited in the winter of 1816 the same Camden outcrop 21 years after Michaux's visit. Nuttall's sense of geography was no better than Michaux's for he too thought he was in North Carolina! Nuttall found a crassulacean plant in fruit at the Camden Flatrock and concluded that it was Michaux's *Sedum pusillum*. Although this was an excusable assumption, it proved to be totally wrong and resulted in confusion that is not completely resolved today. The fruiting specimens were well enough preserved to display a feature that is unique among the perhaps 1500 species of the Crassulaceae. Instead of splitting open along the upper suture of each of the apocarpous follicles, as is the case in all members of the several hundred species of *Sedum* and the hundreds of species belonging to the 35 or so other genera in the Crassulaceae, Nuttall's species dehisced by a tear-shaped flap that separates from the lower surface of each carpel of the syncarpous gynoecium. Nuttall, however, knew nothing about the fruit of Michaux's species and concluded that (1) he had rediscovered Michaux's species and (2) it was not a *Sedum*. Nuttall (1818), in his enduring botanical classic *Genera of North American Plants*, first assigned it to the Linnaean class *Tetrandria* (presumably because he thought four of the stamens sterile) and to the Order *Tetragynia*.

Questioningly he placed it in the genus *Tillaea* about which he knew little. Nuttall had a new genus with unique characters that he carefully described, but since he thought it was Michaux's species, he placed Michaux's name, *Sedum pusillum*, in synonymy. He did not transfer Michaux's epithet, although according to modern nomenclatural rules he should have done so. Instead he substituted the new epithet *"cymosa"* presumably because the inflorescence actually was cymose and the epithet *pusilla* did not seem particularly appropriate for a species of *Tillaea* L., a genus of which several of the species were even smaller. As he proceeded throught the various genera in the Linnaean sequence, his understanding of the flora increased and by the time he reached the *Decandria Pentagynia*, Nuttall had concluded that his granitic outcrop plant deserved generic status and called it *Diamorpha*. Nuttall did acknowledge (p.293) that this genus should have been placed in the *Octandria Tetragynia*. He still thought is was the same as Michaux's plant and since *Diamorpha* was montypic there seemed no reason not to use Michaux's epithet in the new genus since in the montypic *Diamorpha* it was not being compared in size to any other member. With our present botanical system of double citation, we would write the name of the species today as *Diamorpha pusilla* (Michx.) Nutt. The trouble is that the plants that Nuttall was describing with the unique abaxial and non-sutural dehiscence of the fruit were not the same as the species which Michaux had named from flowering material. The species that Michaux found in flower has, it turns out, adaxial dehiscence of its apocarpous carpels. Two species were thus included in Nuttall's *Diamorpha* since Nuttall had included information about the flowers from the only source available to him—Michaux's description of a species that most now agree belongs to a very different genus. Torrey and Gray (1840) in their incomplete classic, *A Flora of North America* (1:561) exemplify the confused understanding that existed for over five decades in treating both Michaux's and Nuttall's species as one and calling it *Diamorpha pusilla*.

Clearly this confounded origin of the two species created a most lamentable mix-up that we are still trying to resolve today. The clarification of this confused beginnings of both species was not even partly achieved until Asa Gray, together with his wife, made a southern excursion to meet the advancing spring of 1875 along the Appalachicola River in the panhandle of Florida where he saw the famous disjunct stands of endemic species of both *Torreya* and *Taxus*. On the way back he stopped off at Atlanta and visited the enormous granitic outcrop of Stone Mountain east of that city. There he saw both Michaux's and Nuttall's very different plants and for the first time learned that he and other botanists had compounded two genera under one species for over half a century. He partially corrected this long-standing error in a publication the next year (1876), referring Michaux's species fittingly enought to the original *Sedum pusillum* and adopting for Nuttall's species the second of the names used by Nuttall, *Diamorpha pusilla*. The continued use of the epithet *pusilla* for the *Diamorpha* obviously perpetuated the past confusion and is certainly nomenclaturally unacceptable. Nuttall had published the binomial *Diamorpha pusilla* (Michx.) Nutt. and it was impossible for A. Gray to refurbish that binomial to serve as the name for Nuttall's species.

Nuttall's first binomial, *Tillaea cymosa*, although it was primarily based upon Nuttall's own species with its abaxially dehiscing fruit, definitely included as a synonym Michaux's *Sedum pusillum* and therefore is an illegitimate name being nomenclaturally superfluous when published (Art.63 of the ICBN). Nuttall's second attempt to provide a binomial, *Diamorpha pusilla*, was no more successful. Since *Sedum pusillum* was clearly included in the synonymy of *D. pusilla*, we have no choice but to treat the name as a transfer, *Diamorpha pusilla* (Michx.) Nutt., which of course makes it a synonym of *Sedum pusillum*. There then was at that time no specific epithet available for this unique, crassulacean plant!

In 1903 there was a flurry of activity stimulated by the New York Botanical Garden's dedication to floristic research and their perverse leadership in the peculiarities of the American Code of Botanical Nomenclature. This resulted in the formation of the binomial *Diamorpha cymosa* (Nutt.) Britt. ex Small (Small 1903, p.498) due to the American Codes' adherence to such peculiar niceties as page and line priority; the epithet *cymosa* appeared first by 183 pages in Nuttall's Genera.

Some will argue, that Article 72 of the ICBN and especially its Note 1 sanctions the binomial *Diamorpha cymosa* by merely attributing the name to "Britt. ex Small" and dropping *post facto* the parenthetical, reference to Nuttall. Small originally (1903, p.498) published the binomial attributing it to Britton. The binomial was a new combination based on a transfer of the epithet from its basionym *Tillaea cymosa* Nutt. Britton and Rose (1905, p.56) also cited the authorities of the binomial as "(Nutt.) Britt.; Small;" when they covered the genus in their treatment of the Crassulaceae in the *North American Flora*. Article 72 indicates that an author dealing with a species with no available or valid name as one option has the right to adopt or "reuse" an epithet previously employed for that species in another genus illegally (i.e. an epithet from a later homonym) but that the resulting binomial would be a new name originating from its publication in the second genus and not a transfer with the author of the first binomial included with the new binomial parenthetically. In other words the original epithet could be used in the second genus if there was no prior use of that epithet in the second genus but it would not be a transfer of the basionym from the original genus but a newly created name (i.e. one lacking a basionym). Small and/or Britton clearly were making a transfer from Nuttall's illegitimate binomial, *Tillaea cymosa*, and this is not permissable. Article 72, Note 1 is not a prescription on how to salvage botched nomenclatural operations but directions on how to avoid inflicting them upon the botanical community. Consequently I see no possibility under the provisions of Article 72, Note 1 of treating *Diamorpha cymosa* Britt. ex Small as a new name published by Small (1903); it is a transfer based upon *Tillaea cymosa* Nutt., an illegitimate name (Article 63) as it was superfluous upon publication as it included Michaux's earlier binomial, *Sedum pusillum*.

At about that time Britton (1905) proposed a second species of *Diamorpha* based upon a single small collection made in the upper Piedmont of North Carolina that apparently rested upon immature stages of the flowering plants. It was called *Diamorpha smallii* in honor of the most prominent authority on the plants of the Southeast during the first third of this century, John Kunkel Small (1869-1938). As a separate taxon, it has not impressed other investigators. Although Small (1933, p.588) retained it in his Manual, Fröderström (1936), the most recent mongrapher of *Sedum*, concluded both that (1) the genus *Diamorpha* should be included with the genus *Sedum* and (2) *D. smallii* was only varietally distinct from *S. cymosum*. Fröderström made the appropriate combinations. McVaugh (1943, p.155) noted that *Diamorpha smallii* "appears to be no more than a form of *D. cymosa*," but he apparently was using the category "form" in the non-technical sense as he did not formally transfer *D. smallii* to the rank of *forma*. In spite of its inauspicious beginning, *Diamorpha smallii*, although not deserving of any consideration for recognition as a second taxon within the genus *Diamorpha*, turns out to be the only available name for Nuttall's species. The late Robert Clausen (1975, p.604), diligent student of the exceedingly complex genus *Sedum*, argued that we could not rule *Diamorpha cymosa* out as superfluous just because Nuttall mistakenly had included Michaux's name in its synonymy. A reading of Article 63 of the ICBN makes it clear, however, that just such an interpretation is mandatory.

Clausen claimed that since "no name was available which ought to have been adopted" by Nuttall "a new name was necessary." Clausen also argued that "Nuttall's description of the capsules of *Tillaea cymosa* ... precludes the possibility of including *Sedum pusillum* Michx. within the circumscription of his (i.e. Nuttall's) species." This is all true but Nuttall knew nothing about the manner of dehiscence of *Sedum pusillum* as Michaux wrote nothing about the fruit, and Nuttall had included portions of Michaux's account to supplement the description of his own discovery. "Having never seen this plant in flower" since he visited the outcrop in winter when only dead stems with their attached dehiscent capsules were present, Nuttall was forced to rely upon Michaux's account for the little floral information included in his two accounts of the species. Nuttall, like all botanists before Asa Gray's careful analysis of both species on Stone Mountain in 1875, thought that his plant and that of Michaux's from the same Camden outcrop were the same and for that one species he first suggested a generic transfer to *Tillaea* providing the new epithet *cymosa* but with Michaux's binomial in synonymy. Later, having decided that the Michaux-Nuttall "species" belonged to a new genus, he proposed *Diamorpha* which together with Michaux's epithet formed the new binomial *D. pusilla* (Michx.) Nutt.

The generic name has not been so readily resolved and in fact as of this moment there is no "correct" name that can be employed for it. Before the machinations of a small group of overly zealous nomenclaturalists and prior to the Sydney Botanical Congress in 1981, there was what seemed to be a working consensus among botanists that the nomenclatural type of a generic name was a species. In the case of a genus like *Diamorpha*, it was thought to be the species described by the author, i.e. the species he had in hand and which formed the principal basis of his concept. The type was the species described and not necessarily the species whose binomial was included. In the case of *Diamorpha*, since not only was Michaux's species cited in synonymy but such floral features as the four white petals and 8 stamens that could only have been derived from Michaux's account were also included by Nuttall, one can fairly argue that Nuttall included two species within *Diamorpha*: his own and Michaux's. But clearly the principal features that formed Nuttall's concept of the genus and that ultimately convinced him to recognize a genus separate from *Sedum* and *Tillaea* were derived from the fruiting specimens that he himself had collected from near Camden in the winter of 1816. Sorting out the principal component of an author's concept and designating that to be the type or at least the basis of the type has been the past botanical practice, and it was a most sensible one that maintained generic stability in scores of difficult cases. Now due to the persuasiveness of a handful of botanists at the Sydney Botanical Congress who were repeatedly warned of their folly, we have a new ruling that states that the type of such a genus will be the species whose binomial was mentioned in the original account rather than necessarily the species described. As a result of this legislation (Art. 10.1 of the ICBN), the well-known generic name *Diamorpha* must now be typified by *Sedum pusillum* Michaux and is hence a *Sedum*. Nuttall's genus consequently would be left without a proper name. However Art. 10.3 provides a cumbersome means of circumventing such confusion by stating that "By conservation, the type of the name of a genus can be a specimen used by the author in the preparation of the protologue, other than the type of an included species." Perhaps it would be tolerable if, without conservation, the monotypic genus first pointed out by Nuttall were alone affected by this radical reinterpretation legislated at Sydney. However there are scores of similar cases that are now being proposed for nomenclatural conservation. The Committee for Spermatophyta has been convinced by a proposal (Wilbur, 1984) that the generic name *Diamorpha*, in spite of usually being associated with a monotypic endemic, ought to be conserved in Nuttall's sense, i.e. for the plant with abaxial dehiscence of its united carpels. This finding must be approved by the General Committee and then by a vote of The Nomenclatural Section of the Botanical Congress. If the Botanical Congress meeting in the summer of 1987 in Berlin approved the Committee's recommendation, we will then have at long last an approved generic name! The very same name that Nuttall proposed in 1818 for the abaxially dehiscent plant called *Diamorpha* in reference to the anomalous condition of its fruit would now be given official approval. If all of these steps were not successfully completed before or during the Berlin Botanical Congress, the best one can hope for is tentative approval awaiting confirmation at the 1993 Congress. We botanists have certainly established a most cumbersome bureaucracy!

In view of the extremely confused nomenclature of *Diamorpha* and the fact that recent changes in the ICBN now make it mandatory that, unless conserved, the type species of *Diamorpha* would be a *Sedum* with four apocarpous, ventrally dehiscing follicles, it is perhaps understandable that some might view with relief the suggestion that *Diamorpha* (in the old dorsally dehiscent, syncarpous sense) ought to be combined with *Sedum*. This was proposed by Fröderström (1935) and without explanation by the late Harry Ahles (1964) and also by the ecologists McCormick and Platt (1964, p.272). The two ecologists claimed that hybrids were found between *Diamorpha* and *Sedum pusillum* (on one out of 100 outcrops examined) and furthermore had even been artificially produced. The only difficulty in this claim is that it was only briefly alluded to by McCormick and Platt who promised to publish full details later. However, it turns out that in moving, the data, as well as the seeds and specimens, were all lost. McCormick still was convinced that he had observed natural hybrids between the two genera in the field and had also made artificial crosses between them. It was stated that "there is a great deal of variability in the few morphological characteristics used to separate the two genera." Consequently, McCormick and Platt concluded that the two should be combined. This is a most unlikely conclusion to reach at least by anyone familiar with the profound morphological differences between the two. Only if the investigators based their identifications of *Diamorpha* and *Sedum pusillum* upon such environmentally readily modified features as color or size and degree of branching could such a statement be accurate. One might find plants growing on the margins of their natural niches that approached one another in those particular features, but it is manifestly absurd to claim that the basic and fundamental anatomical and morphological differences that actually separate the two genera are so variable that none of them hold up. All of the fundamental anatomical and morphological differences "hold up." It would be well, if researchers are going to make such claims that they deposit the vouchers that supposedly document their fantasies before losing them. And the rest of us ought to be a bit more wary before accepting such unsubstantiated claims.

Of all the other investigators who have studied these plants in the past two decades, not one has knowingly encountered a hybrid. Of the five or six investigators who have attempted to cross *Diamorpha* and *Sedum pusillum* at Duke and elsewhere in the past two decades not one has succeeded. Murdy (1968) reported that in his studies "several hundred artificial pollinations between the two species ... failed to yield any seed" and that "populational analysis of a large outcrop in Rockdale County, Georgia, where both species are abundant, has yielded neither hybrids nor any indication of introgression." The chromosome numbers of the two are so unlike that the cytological state of the alleged hybrid would be of particular interest if hybrids could be produced. *Diamorpha* has $2n = 18$ and *Sedum pusillum* $2n = 8$. No other member of the Crassulaceae has a chromosome number as low as that of this *Sedum*. Baldwin (1940) suggested that *Diamorpha* was the amphidiploid product of "fusions between the 4- and 5-chromosome tendencies" within the genus *Sedum*. To combine the two genera into one, however, is to ignore the profound morphological and anatomical differences that exist between the species comprising the two genera as is summarized in table I.

The anatomical differences of the flowers of *Diamorpha* and *Sedum* and especially between *Sedum pusillum* are at least as great as those morphological features of their flowers discernable with a hand lens or even a sharp eye (Sherwin & Wilbur). They emphatically confirm that the differences between the genera are anything but superficial and would make any hybrid between the genera an object of extreme interest - if only one could be found in nature or artificially produced. A summary of the anatomical differences found between *Diamorpha* and what might be supposed to be its closest relative in *Sedum* is presented in Table II (Sherwin & Wilbur 1971).

Table I. Morphological and anatomical differences between the species comprising *Diamorpha* and *Sedum*.

Character	*Diamorpha*	*Sedum*
1. Carpels:	Syncarpous at base	Apocarpous
2. Fruit dehiscence:	Tear-shaped valvular flap from abaxial surface	Longitudinal slit along of of the adaxial suture
3. Petals:	Cucullate and initially partially enclosing 4 anthers of the 8	Flat and never enclosing any anthers.

Spongberg (1978) concluded that "it is probable that *Diamorpha* and the taxa to which it has been allied share superficial resemblances as a result of similar selection pressures and represent convergent groups within the Crassulaceae."

Before leaving the subject it should be emphasized that Baldwin's suggestion on the origin of *Diamorpha* as a possible amphiploid of the 4- and 5-chromosome lines within *Sedum* is only a hypothesis based on the simple arithmetial observation that $4 + 5 = 9$ and that number when doubled equals 18, the sporophytic chromosome number of *Diamorpha*. This has not been experimentally proven either by synthesis or by such indirect tests as chromatographic analysis, starch gel electrophoresis, etc. Until there is some supportive data it would seem wiser not to rely too heavily upon the simple arithmetrical hypothesis proffered by Baldwin. *Diamorpha* is still an extremely aberrant member of the Crassulaceae and like the equally isolated endemic and monotypic genus *Amphianthus* of the Scrophulariaceae, which also occurs on many of these same granitic outcrops, is morphologically so unlike any other genus in the family that we ought not obscure its uniqueness by forcing it into a genus from which it differs so greatly. Clausen (1975, p.606), long-time student of *Sedum* and author of two books and numerous papers on the genus noted that: "*Diamorpha* has no close relatives. Although unique in the mode of dehiscence of the fruits, it probably is derived from *Sedum*." McVaugh (1943, p. 138) in commenting on the uniqueness of the outcrop flora noted that *Diamorpha* and *Amphianthus* "each belong to a monotypic genus which has no close relatives in its family. A third species *Sedum pusillum*, is scarcely akin to any other American *Sedum* and by some workers has been considered the type of another monotypic genus, *Tetrorum*." Cladists apparently have philosophical difficulty in accepting monotypic genera which is perhaps understandable since according to their credo speciation is a process in which an ancestral population is dichotomously divided into two sister species. Therefore any existing species must have one sister species, either extant or extinct. I know of no evidence to suggest that *Diamorpha* was

TABLE II is a summary of the anatomical differences found between *Diamorpha smallii* and *Sedum pusillum*.

	Diamorpha smallii	*Sedum pusillum*
SEPALS:	A single median trace formed from vascular whorl I.	The 3 traces with the marginal derived from the vascular whorl I and the midvein from whorl II.
PETALS:	The single trace is derived from whorl II and after branching into 3 veins rarely branch again.	The single trace is derived from whorl I and after branching into 3 veins these often branch again.
STAMENS:	Outer stamens derived from whorl II. Inner stamens derived from whorl III.	Outer stamens derived from whorl I. Inner stamens derived from whorl II.
CARPELS:	Dorsal (= abaxial) carpellary trace derived from whorl II and extends from only 1/4 the length.	Dorsal carpellary trace derived from whorl I and extends the entire length.
	Lateral capellary trace derived from whorl III.	Lateral carpellary trace derived from whorl III.
	Ventral (= abaxial) carpellary trace derived from whorl IV.	Ventral carpellary trace derived from whorl III.
SUMMARY:	4 whorls	3 whorls

derived from *Sedum*; both *could* have been derived from an ancestral common ancestor or from even more distantly related stock.

McVaugh (1943, p. 144), after demonstrating that the granitic outcrop flora was a small but ancient one that had occupied the same specialized habitat for an extremely long time, concluded that a significant portion of this outcrop flora and to a lesser extent of the adjacent Piedmont was derived from the "southwestern United States and the Mexican highlands" i.e. a derivative of what is known as the Madro-Tertiary geoflora. Wyatt (1977), although accepting McVaugh's hypothesis as to the southwestern origin of some elements of this specialized flora, felt that McCormick, Bozeman & Spongberg (1971) had gone beyond the evidence in suggesting that *Minuartia glabra* (Michx.) Mattf. (= *Arenaria glabra* Michx.) was a derivative of the montane Arcto-Tertiary geoflora while, *Minuartia uniflora* (Walt.) Muhl.) was another representative of the Madro-Tertiary flora. Surely the necessary information to make it profitable to speculate upon the geographical or geofloristic source of *Diamorpha* is presently non-existent.

Now that the nomenclatural travail of *Diamorpha* has been belabored and the claim of *Diamorpha* to generic rank at least shown to rest upon a sizable number of significant morphological and anatomical differences (Sherwin and Wilbur 1971), an outline of the biological findings of the past two decades that have made this species "one of the biologically better-known taxa in the southeastern flora" will be summarized.

First let us consider some of the adaptations that have been postulated as enabling this winter annual to flourish on the apparently inhospitable rock outcrops to which it is confined. The rock substrate in the vast majority of cases is granite but those in Tennessee are reportedly limestone (McVaugh 1943. p. 122). Upon these rock outcrops *Diamorpha* is found in rather pure stands occupying shallow soil pans found in depressions on the outcrops or it is found about the margin of the larger and/or deeper islands of soil found on these outcrops. On these deeper soil pans the inner or transitional boundary is sharp with the dominants primarily controlled by interspecific competition for soil moisture in habitats of varying soil depths. *Diamorpha* is at a competitive advantage in the soils of less than 2 cm but either *Minuartia uniflora* (Walt.) Mattf. or *Minuartia glabra* (Michx.) Mattf. is at a competitive advantage over *Diamorpha* in the more favorable moisture levels prevailing in soils 4 – 10 cm deep (Sharitz & McCormick 1973). Soils deeper than this support yet other species which are at a competitive advantage over the species of *Minuartia*. From 1962 onward the prevailing ecological wisdom that the seeds, which seemingly were morphologically mature by late May, were held in the fruit through the summer and only released with the onset of late fall rains. According to this hypothesis the seeds escaped the furnace-like temperature of the shallow soil pans during the blazingly hot days of June, July and August and were only shed and then germinated after the onset of the late autumnal rains (Wiggs & Platt 1964). The only trouble with this plausible scenario is that in most populations of *Diamorpha* by late spring or very early summer the fruit has already dehisced and that all or most of the seeds have been shed. Wilbur (1964) pointed out these facts but the granite outcrop ecologists have persisted in further embellishing their imaginative myths.

Baskin and Baskin (1972) repeated the Wiggs-Platt-McCormick seed retention story but in addition did study the germination requirements in considerable detail. They found that, although some seeds could be germinated under experimental conditions during the summer, this only occurred at temperatures well below those which prevail on the outcrops before late autumn. The percentage of seeds that would germinate increased as the summer progressed. By October or November the seeds were almost 100% nondormant. They found that cool temperatures, light and, of course, moisture were necessary for germination. Wiggs & Platt (1962, p.658) also found that seeds could not be germinated in complete darkness. Some light, even of low intensity, was necessary for germination. In spite of the solid contributions made by Baskin and Baskin (1972), they did not resist speculating on the advantages of retaining the seeds during the summer in the fruit held an inch or two above the scorching granite.

The suggested advantage was that the seeds would not be "fooled" by temporary periods of rainy and even cool weather in the late summer and early fall as they were held above the temporarily moistened soil within the closed capsules. The seeds were released in late September and October when moister and cooler conditions would be expected. (When questioned by letter, J. Baskin stated that they had made no observation on seed retention during the summer but had relied upon the claims of Wiggs and Platt and others.) Not to be outdone, Sharitz and McCormick(1973) discovered a new advantage for the retention of the seeds in the "air-cooled fruit" held several centimeters above "the high temperatures and desiccating conditions of the summer months" on the shallow soil pans on the blazing outcrops. They did not even deign to refute the observation that the seeds had been dispersed and were spending their summers as they had for countless generations in the soil surface of the same shallow soil pans. The new advantage of not being dispersed during the hot summer months was that the seeds would be mostly lost by being washed away by the heavy rains of summer unless they were able to escape that fate by being retained in the unopened fruit. The *Minuartia* (= *Arenaria*) which all admit sheds its small seeds soon after flowering would be expected to lose relatively few seeds to overwash by summer rains because it is restricted to the next inner zone on the soil mat. Nuttall (1818), who first described the species, stated that the seeds germinated "as soon as they fall," but it is difficult to see how he could have observed that since he only visited the site for a day or two "in winter" when the seeds would long since have been shed and germinated.

Germination occurs during late October or early November after the early rains of autumn and when daytime temperatures have fallen to about 20°C. Seedling establishment is dependent on extensive root development, which occurs only in a narrow range of pH—between $4.5 - 5.0$ (Wiggs & Platt 1962). The seedlings can be flooded for several weeks or be desiccated for an equal time before dying. They overwinter as compact, rosette-like plants and develop very little until late February or March with considerable growth during March and flowering from late March to late April. The plants are dead by late May and what happens next to their seeds, is as outlined above, highly controversial. A reader of the several papers dealing with the seed retention hypothesis cannot help being perplexed. Ecologists believe one thing, and I expect most of their readers do too. I have observed and reported something else (Wilbur 1964, 1971). My observation about all of this is that many scientists have become much more adept at hypothesizing than at observing.

Wyatt (1981) and Wyatt and Stoneburner (1981) have recently investigated more of the biology of these plants. They have reported that:

(1) *Diamorpha* is self-incompatible, while *Sedum pusillum* is self-compatible. Wiggs and Platt (1962) believed that cross-pollination was the usual condition in *Diamorpha* but that self-pollination was also possible.

(2) *Diamorpha* represents perhaps the second reported case of ant-pollination. Earlier suggestions that honey bees are the prime pollinator is perplexing if not manifestly absurd since the honey bee is a post-European introduction and *Diamorpha* would appear to be an inhabitant of these outcrops for perhaps several million years. Spongberg (1978) reported that others have "noted that the four anthers opposite the sepals dehisce at the onset of anthesis, while the remaining four, which are held by the four petals, have a retarded dehiscence, shedding pollen towards the end of flowering."

The pollen dispersal range of the ants is very short, and electrophoretic studies (Chapman 1977) have shown that plants from different soil pans on the same flatrock tend to be genetically distinct, especially if the pans are not connected by water channels that allow the seeds to be more widely dispersed. Flies are apparently responsible for most of the pollination in *Sedum pusillum*.

Martin, Lubbers and Teeri (1982), in their survey of CAM metabolism in succulent species in the Carolinas, found that *Diamorpha* had significantly higher nighttime CO_2 uptake than in the daytime. This is suggestive of CAM metabolism. However, the overall evidence (i.e. carbon isotope ratios) led them to believe that the majority of the carbon dioxide fixed over the life of the plant was through the C_3 pathway. Similar results were found with *Sedum pusillum* while the succulent *Sedum ternatum* Michx., that occurs along mesic bottomlands of the Piedmont, gave evidence only of the C_3 pathway. It was thought that possibly *Diamorpha* and perhaps *Sedum pusillum* might prove to be C_3 plants during the majority of their life cycles when water was relatively abundant but became CAM plants late in their life when the depression or bordering xeric glades were drying up. This is speculation but worth further investigation.

McVaugh (1943) advanced the view that these flatrocks have existed as a habitat in the same general area in recent geologic times and "possibly have never had such a covering since the last general peneplanation of the Piedmont surface." The taxonomic uniqueness of such plants as *Amphianthus pusillus* Torr. and *Diamorpha*, so unlike any other genus in their respective families is a strong argument for the antiquity of their separation from the ancestral stock. McVaugh's opinion was in striking contrast to that of Oosting and Anderson (1939) who postulated a recent origin of these outcrops and presumably of their unique inhabitants.

Diamorpha, having caught the attention of some of our earliest naturalists, has proven its versatility by being the subject of experimentation in the age of artificially induced ionizing radiation. McCormick and Platt (1962) demonstrated that following "radiation doses of 8,000 – 30,000 r upon *Arenaria brevifolia* Nutt." [=*Arenaria uniflora* (Walt.) Muhl. or *Minuartia uniflora* (Walt.) Mattf.] in the parental generation that "the first filial generation of *Arenaria* was observed to increase in density, distribution, and growth at the expense of a competitive species, *Diamorpha cymosa*" [=*D. smallii* Britt. ex Small].

This is a reasonably compelte summation of what we now know of the biology of supposedly one of the Southeast's better-known plants. It isn't a very full picture or one that is the basis for any feeling of smugness over our collective botanical insights and discoveries. We obviously have much to learn even about a plant as "well-known" as *Diamorpha*. The bright part of the picture is that it proves that there is still a great deal to do in our figurative backyards.

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SENECIO MAHINDAE (SENECIONEAE: ASTERACEAE), A NEW SPECIES FROM TAMAULIPAS, MÉXICO

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ABSTRACT

Senecio mahindae Nesom & Vorobik is described from the Sierra de San Carlos in Tamaulipas, México. It is most closely related to *S. platypus* Greenman but differs from it most prominently in its strongly rhizomatous habit, shorter and nearly scapose stems, and lyrate leaves.

SENECIO **mahindae** Nesom & Vorobik, sp. nov. Fig. 1.

Senecio platypus Greenman affinis sed habitu rhizomatoso, caulibus fere scaposis, foliis lyratis, capitulis campanulatis, phyllariis glabris brevioribus, et flosculis discii brevioribus differt.

Herbaceous, colonial perennial from a branching system of slender woody rhizomes up to 15 cm long. Stems (8−) 12−30 cm tall, moderately villous with appressed hairs, occasionally branched in the lower 1/3 − 1/2. Leaves mostly basal, sometimes distributed in the lower 1/8 − 1/6 of the stem except for a few minute, filiform bracts at the upper nodes, lyrate to pinnatifid with broad lobes, basally auriculate-clasping, 6 − 12 cm long, 2.5 − 5.5 cm wide, white-villous beneath, sparsely villous above but greenish, upper surface also with numerous larger, jointed, flattened and vitreous hairs, glabrescent except for the larger, vitreous hairs. Heads 1 − 4, clustered in the upper 1 − 4 cm of the stem, campanulate, 12 − 15 mm broad (pressed); receptacle shallowly conical, ca 3 mm broad; phyllaries linear-lanceolate, 5 − 7 mm long 0.8 − 1 mm wide, with narrow, scarious margins, midportion green and densely villous. Ray flowers 11 − 14 in one series, 12 − 15 mm long, the tube 3 − 4 mm long, abruptly broadened to the ligule, ligule 3 − 3.8 mm wide, 3 − 4-veined, yellow-orange. Disc flowers 4.5 − 5.5 mm long, the tube 2.5 − 2.8 mm long, the lobes lanceolate, 1 mm long. Achenes cylindrical to narrowly fusiform-cylindrical, 2.5 − 3 mm long, 0.8 mm wide, dark

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brown to blackish at maturity, densely set in lines with short, thick, white, blunt-tipped hairs.

TYPE: MÉXICO. TAMAULIPAS, Mpio. San Carlos, Sierra de San Carlos, ca. 8 km N of San Carlos, N side of Bufa El Diente, igneous bedrock, woods of *Quercus, Ostrya, Carya*, scattered *Abies*, ca 750 – 1100 m, 24°31.5'N, 98°57.6'W, 18 June 1987, *Guy Nesom 6098* with John Norris, Mahinda Martínez and Lindsay Woodruff (HOLOTYPE: TEX; ISOTYPES: KSC, MEXU, US, UAT [Victoria, Mex.]).

Additional collection examined: [type locality], 2 Jun 1986, *Mahinda Martínez 1093* (TEX).

The new species is named for Mahinda Martínez, Curator of the Herbarium at the Instituto de Ecología y Alimentos, Victoria, Tamaulipas. She is an able taxonomist and enthusiastic explorer and collector of the Tamaulipan region.

Senecio mahindae is known only from the type locality, where it is common. It grows in scattered colonies on the tops of large boulders, commonly mixed with bryophytes, and forms yellow patches scattered through the woods. It is easily recognized by its rhizomatous, colonial habit, basal clusters of lyrate leaves with auriculate-clasping bases, and slender, nearly scapose stems. Also of distinction are two types of hairs on the upper leaf surface (one threadlike and forming the villosity, the other much thicker, shorter, flattened, and vitreous), campanulate heads with phyllaries densely villous and 5 – 7 mm long, and disc flowers 4.5 – 5.5 mm long.

The species most similar to *Senecio mahindae* and almost certainly related as a sister species is *S. platypus* Greenman, which is known only from the area immediately to the south of Monterrey, Nuevo Leon, about 175 air kilometers to the west of the Sierra de San Carlos. Greenman (1907) commented in his description of *S. platypus* that "the conspicuous stipular-like development at the base of the petioles renders this species easily recognizable, and quite distinct from any other species known to the writer." Most prominently, the two taxa share similarly shaped leaves with the "stipular-like," auriculate-clasping bases, villous leaves and stems, and similar achenes. *Senecio platypus*, in contrast, is an erect, annual (?) herb 0.5 – 2 meters tall from a taproot; its leaf blades are triangular to oblanceolate (much less dissected), the leaves are not reduced upwards and extend into the inflorescence, and they lack the large, vitreous hairs of *S. mahindae*; the heads of *S. platypus* are cylindrical, its phyllaries glabrate and 7 – 8.5 mm long, and its disc flowers are 6 – 7 mm long. Barkley (1975) placed *S. platypus* in [group] Herbacei [series] Triangulares.

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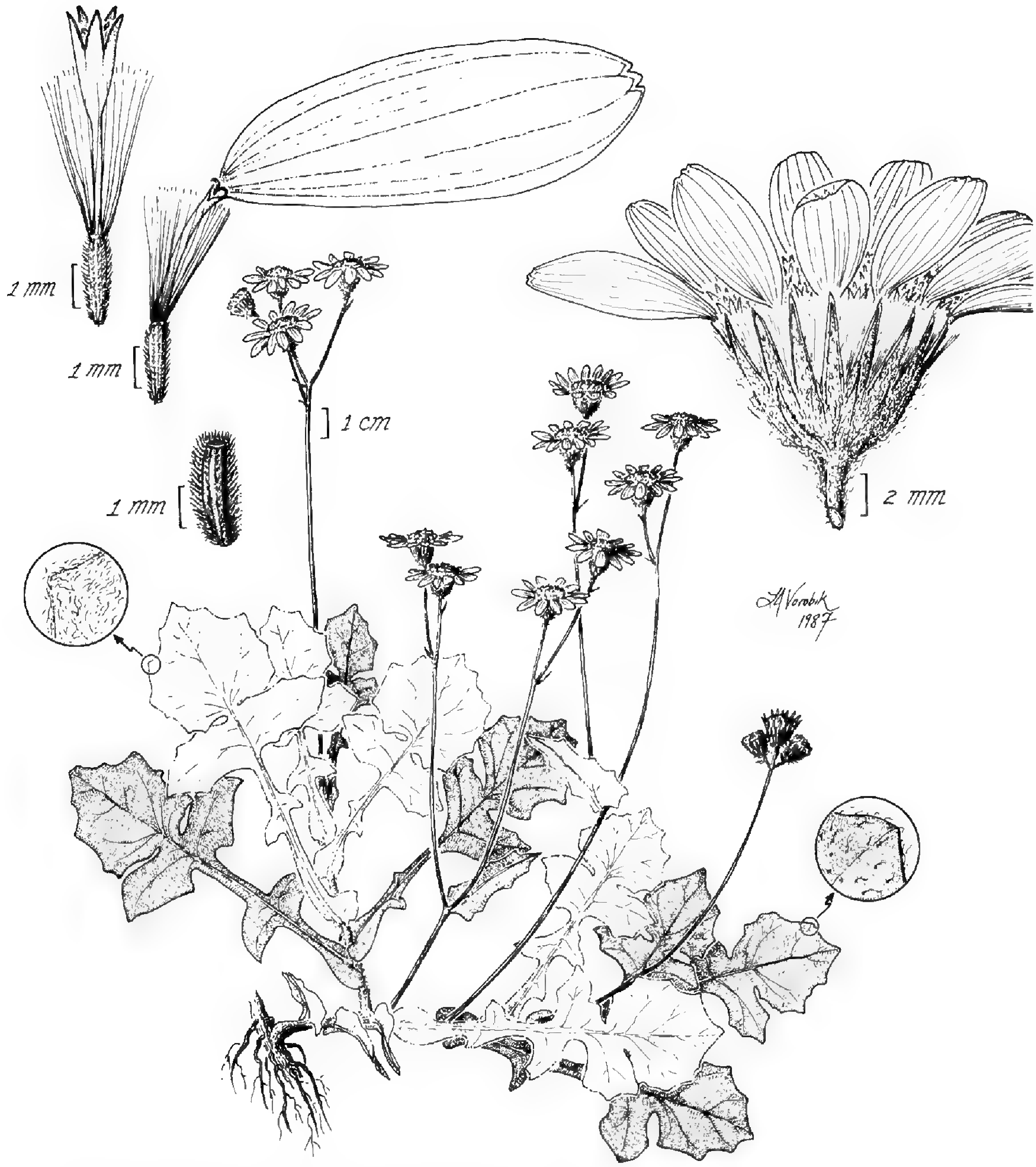

FIG. 1. Habit sketch and details of *Senecio mahindae* Nesom & Vorobik.

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Errata, Gandhi, K.N. et al. 1987. SIDA 12(2):361 – 379.

p. 365—Delete the illustration of *C. campestris* from fig. 1.
p. 369—Change *C. glabrior* to *C. pentagona* var. *glabrior in fig. 2.*
p. 375—Change *C. glabrior* to *C. pentagona* var. *glabrior* in fig. 5.
p. 376—Delete the map for *C. campestris* and add its dots to *C. pentogona* in fig. 6.
p. 378—Add to the reference: BENTHAM, G. 1876. Convolvulaceae. In: G. Bentham and J.D. Hooker, Gen. Plan. 2:865-881.

NEW SPECIES OF CRASSULACEAE FROM NORTHEASTERN MÉXICO

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ABSTRACT

Villadia jimulcensis Nesom, sp. nov., appears to be a narrow endemic from the Sierra de Jimulco in southwestern Coahuila. It is similar to *V. cucullata* Rose of northeastern México but differs from it in having a more open inflorescence with flowers in axillary clusters, smaller sepals and petals, and petals with a rounded, non-hooded, non-apiculate apex. **Sedum tamaulipense** Nesom, sp. nov., is known from the Sierra de San Carlos in north-central Tamaulipas. It is most similar to *S. reptans* R. Clausen but differs in its smaller leaves, smaller flowers, triangular petals without a subapical apiculus, and transparent carpels connate in their basal 1/2 − 3/5 and with "cellular" walls.

Recent intensive collecting in the Sierra de San Carlos of north central Tamaulipas has revealed the existence of a distinctive species of yellow-flowered *Sedum*, described below. Another heretofore undescribed species, a *Villadia*, was collected fifteen years ago in the Sierra de Jimulco of southwestern Coahuila and initially misidentified. The plant was broken into several pieces, placed in a large packet, and remained unexamined critically until I began a curatorial study of Mexican Crassulaceae in TEX-LL.

VILLADIA **jimulcensis** Nesom, sp. nov.

Villadia cucullata Rose simile sed inflorescentia laxa florum in fasciculis remotis axillaribus et petalis parvioribus apice rotundato non cucullato.

Roots fibrous, tuberculate. Stem branched at base, 23 cm tall, 1.5 mm thick, glabrous, streaked with red. Leaves ca 35, distributed evenly on the stem below the inflorescence, sharply ascending, narrowly elliptic-lanceolate, spurred, 12 − 20 mm long, 2 − 3 mm wide, greenish, prominently red-dotted. Inflorescence 9 cm long, formed of ca 25 axillary clusters of 1 − 3 sessile flowers each; floral bracts 4 − 5 mm long, broadly lanceolate, spurred, dark purple-red. Sepals ovate-lanceolate, free to the base, 2.5 − 2.8 mm long, shorter than the petals, purple, minutely papillate-tuberculate, particularly along the margins. Corolla tube 0.8 − 1 mm long; petals dark red to purple-red or orange-red, elliptic-oblong, 3.2 − 3.8 mm long, keeled, not hooded or only very slightly so, margins white, very narrow, minutely crenulate-erose; nectar glands yellow-

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orange, cuneate-truncate, 0.6 mm wide, 0.4 mm high. Carpel body 1.5 mm long; stigmas and styles 0.8 mm long. Mature fruit and seeds not observed.

TYPE: MÉXICO. COAHUILA. Mpio. Torreón, Sierra de Jimulco and up to 3 km N of Mina San José, which is 8 km NE of Estación Otto [ca 60 km SE of Torreón]; 25°6'30"-8'30"N, 103°13'30" W; 1800 – 3138 m; mat. esp. lat. - chaparral on higher slopes, steep to very steep slopes of limestone in places highly mineralized; with *Acacia berlandieri*, *A. crassibolia*, and *Fouquieria*, with *Quercus* on higher slopes; 27 Sep 1972, *F. Chiang, T. Wendt*, and *M.C. Johnston 9557i* (HOLOTYPE: TEX).

Villadia jimulcensis is known only from a single collection from the type locality in Coahuila. It is the fourth species known from the Chihuahuan Desert Region (sensu Henrickson and Straw, 1976), joining *V. cucullata* Rose, *V. squamulosa* (S. Wats.) Rose, and *V. misera* (Lindl.) R. Clausen. The new species is similar to *V. cucullata* of Nuevo León, Coahuila, San Luis Potosí, and Hidalgo in its red-mottled petals with minutely erose margins; *V. cucullata*, however, differs in its much longer sepals, larger, prominently hooded, apiculate petals and densely flowered inflorescence with the rachis barely or not at all visable. Among the other Chihuahuan Desert species *V. jimulcensis* is similar to *V. squamulosa* of south Texas, Coahuila, and Chihuahua in the compact nature of its inflorescence, but the latter has elliptic-obovate sepals and petals with entire margins and an attenuate-acute apex.

SEDUM **tamaulipense** Nesom, sp. nov.

Sedum reptans R. Clausen simile sed foliis et floribus parvioribus, petalis triangularibus sine apiculo subapicali, et carpellis translucidis parietibus cellulosis connatis in 1/2 – 3/5 basali differt.

Prostrate, glabrous herbs with numerous adventitious roots. Stems terete, 0.5 – 1 mm thick (dry). Leaves 1 per node, spirally arranged, narrowly oblong, 2.5 – 6 (– 7) mm long, 0.8 – 1.2 mm wide, flattened, divaricate, sessile, prominently spurred, apex rounded-obtuse. Flowers in terminal cymes of 1 – 3 cincinni; pedicels 1 – 2 mm long; sepals ovate, 1.2 – 2.2 mm long, 0.6 – 0.8 mm wide; petals triangular, bright yellow, 2.5 mm long, 0.8 – 1 mm wide, filaments 2 mm long. Mature carpels 2.5 – 4 mm long, basally connate for 1/2 – 3/5 their length, prominently arcuate-divaricate and adaxially gibbous, walls shiny, transparent, white at fullest maturity, with cellular outlines clearly visible; style persistent, filiform, ca 1 mm long. Seeds brown, minutely papillate, pear-shaped, 0.6 – 0.7 mm long.

TYPE: MÉXICO. TAMAULIPAS. Mpio. San Carlos, Sierra de San Carlos, ca 5 mi S of San Carlos, N side of Bufa El Diente, just below crest of ridge on N-facing slope; 1200 m; 24°31.5'N, 98°57.6'W; prostrate on tops of large boulders with bryophytes; igneous bedrock; woods of *Quercus* with abundant *Ostrya*, scattered *Carya* and *Abies*, understory of *Cercis, Ungnadia, Ptelea, Persea, Croton, Forestiera, and Rubiaceae*; 18 Jun 1987, *Guy Nesom 6166* with John Norris, Mahinda Martínez, and Lindsay Woodruff (HOLOTYPE: TEX; ISOTYPES: BH, MEXU, UAT {Victoria, Mex.}, WTU).

Sedum tamaulipense is closely related to *S. reptans* R. Clausen and will key to that species in Clausen (1984). Both are glabrous, prostrate herbs with adventitious roots, long leaves, and yellow flowers. Both grow in mats on tops of boulders in temperate communities dominated by oaks on the east side of the Sierra Madre Oriental. *Sedum reptans* is known from a system of populations in extreme southern San Luis Potosí and adjacent Querétaro (Clausen, 1978), about 340 kilometers south-southwest of the Sierra de San Carlos in Tamaulipas. I have examined 15 sheets of specimens of *S. reptans*, representing field collections as well as plants cultivated at Cornell, and all are relatively uniform among themselves and discontinuous in morphology from *S. tamaulipense*. The leaves of the new species are 2.5 – 6 (– 7) mm long {vs. 6.5 – 8.5 mm}, the sepals are 1 – 1.2 mm long {vs. 2.5 – 3.5 mm}, the petals are 2.5 mm long {vs. 6 – 8 mm} and 0.8 – 1 mm wide {vs. 1.8 – 2 mm}, and the filaments are 2 mm long {vs. 5 mm}. In addition to these prominent quantitative differences that lend a diminutive appearance to the new species, the carpels of *S. tamaulipense* are basally connate for 1/2 – 3/5 their length {vs. completely free or connate for only about 1/4 their length}, arcuate-divaricate {vs. nearly straight-sided}, and the walls are shiny-transparent, white at fullest maturity, with cellular outlines clearly visible {vs. dark, opaque, and without clear cellular outlines}. Further, the petals of *S. tamaulipense* are triangular {vs. lanceolate} and lack the "grooved" midvein and its extension into a prominent apiculus below the petal apex characteristic of *S. reptans*. In its small, yellow flowers with transparent, "cellular" mature carpels, *S. tamaulipense* is similar to *S. nutallianum* Raf. of the United States (Texas, Oklahoma, Arkansas and Missouri), but the latter is an erect annual very different in habit and habitat.

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SYNOPSIS OF THE SPECIES OF *OMPHALODES* (BORAGINACEAE) NATIVE TO THE NEW WORLD

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ABSTRACT

A key and summary of typification are provided for the six Mexican species of *Omphalodes*, including the new species **O. richardsonii** Nesom from the Gómez Farías region of Tamaulipas, México. All are from México and are the only taxa of *Omphalodes* native to North America. The locality of the new speices reinforces the observation that northeastern México is a secondary center of diversity for this primarily Eurasian genus.

Six Mexican species of *Omphalodes* Miller are recognized. All are primarily narrow endemics from Coahuila, Nuevo León, and Tamaulipas in northeastern México, although *O. cardiophylla* A. Gray is disjunct in southern Puebla from its main range to the north. *Omphalodes aliena* A. Gray has the widest distribution and is the only species that crosses the México-United States border into south-central Texas. Apart from the native Mexican species and the two North American introductions noted below, the remainder of the genus comprises about 20 – 30 species, primarily from temperate Asia and the Mediterranean region. Ingram (1960) provided a key and comments for five Eurasian species in American cultivation as well as notes on the correct citation of authority for the genus.

In their checklist of plants of the United States, Canada, and Greenland, Kartesz and Kartesz (1980) listed *Omphalodes aliena, O. linifolia* (L.) Moench, and *O. verna* Moench; the records for the latter two species are from Ontario and Quebec, Canada, respectively (J. Kartesz, pers. comm.). As noted by Johnston (1924), *Omphalodes linifolia* also has been collected in Oregon ("Salem, on street parking, 26 Jul 1919, *Nelson 2749*", GH!, annotated "First occurrence"). It is distinguished by the following characteristics: annual, taprooted, erect, 5 – 40 cm tall, flowers in terminal, ebracteate racemes, leaves narrowly oblanceolate and mostly basal, without a distinct petiole, and nutlets with incurved, crenate or dentate wings. It is a species native to southwestern Europe (Tutin et al., 1972) and apparently was a non-reproducing waif in Oregon, because it has never been reported in floristic manuals from the Pacific Northwest.

The Mexican species of *Omphalodes* can be identified using the following key:

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1\. Stems at least partially erect, solitary, from a slender or thick, woody taproot; flowers in terminal racemes, ebracteate. (2)

2\. Plants perennial; stems stiffly erect, 3 – 6 dm tall; leaves elliptic to elliptic-oblanceolate with an acute to short-acuminate base . . . . 1. *O. erecta*

2\. Plants annual or short-lived perennial, from very slender taproots; stems weakly erect to decumbent; leaves broadly ovate to deltate with a distinctly cordate base . . . . 2. *O. aliena*

1\. Stem procumbent to decumbent, forming colonies or mats from slender rhizomes; flowers at least mostly axillary, scattered along stems. (3)

3\. Stem vestiture of even-length hairs, with at least some hairs widely spreading near the stem tips, densely spreading or spreading-deflexed below; leaves densely strigose on both surfaces with erect hairs; nutlets glabrous . . . . 6. *O. mexicana*

3\. Stem vestiture absent or of short, appressed hairs near the stem tips with the hairs appressed or longer, vary sparse, and spreading below; leaves sparsely to moderately strigose, hairs appressed at least on lower surface; nutlets sparsely hairy to glabrous. (4)

4\. Stem vestiture appressed from top to bottom; nutlets glabrous, the wing strongly incurved, entire . . . . 5. *O. chiangii*

4\. Stem vestiture completely absent or long, sparse, and spreading on lower part of stems; nutlets hairy, the wing erect or slightly incurved, prominently toothed. (5)

5\. Stems sparsely hairy; hairs on upper leaf surfaces with expanded, multicellular, pustulate bases; calyx lobes 3 – 5 mm long in fruit; teeth of nutlet wing with sharp, straight, antrorse serrations along the sides and apex . . . . 3. *O. cardiophylla*

5\. Stems glabrous; hairs on upper leaf surfaces with simple, unexpanded bases; calyx lobes 2 – 2.2 mm long in fruit; teeth of nutlet wing with 2 – 3 minute, recurved hooks (uncinate trichomes) at the apex, otherwise entire . . . . 4. *O. richardsonii*

1\. Omphalodes erecta I. M. Johnston, J. Arnold Arbor. 16:204. 1935. Type: MÉXICO, Nuevo León, Alamar to Taray, ca 15 mi SW of Galeana, *C. H. and M.T. Mueller 992* (holotype: GH!; isotype: TEX!).

Distribution: Central Nuevo León to west-central Tamaulipas; in oak woods or nearby fields, ca 2000 m; Jun-Aug.

2\. Omphalodes aliena A. Gray in Hemsley, Biol. Centr. Amer. Bot. 2:377. 1882. Type: MÉXICO, Nuevo León, Monterrey, *E. Palmer 893* (holotype K: isotype: GH!).

Distribution: Southern Texas (Brewster, Presidio, Terrell, and Val Verde cos.) to Nuevo León and central Coahuila; rocky limestone soil, hillsides, bluffs, or ledges, occasionally sandy riversides, mostly in areas of matorral, less commonly with oaks, 500 – 1200 m; Feb – Apr (– May).

In the original description , Gray commented "We think there can be no doubt that the nucules of this species are dimorphic, the wing in a few of the lower ones being thickened, hispid, and turned back, and in the rest thin, glabrous, and flat." After examining many more collections than Gray had at his disposal, I can affirm that significant variation exists in the teeth of the nutlets, but variation between the extreme forms (Fig. 2a, b and c) appears to be continuous rather than dimorphic. There is a tendency, on long inflorescences, for thin and glabrous teeth to be on the upper fruits but it is much more common to find only the thickened and hispid teeth on a single plant.

In an envelope on the type of sheet of *O. aliena* is a letter from Asa Gray to Sereno Watson, written from Kew in July, 1881, in response to a short manuscript by Watson (also in the envelope) describing Palmer's collections 893 and 894 as two species of a new genus, "Leptocarya." Having duplicates before him at Kew, Gray's replay was "My Dear Watson, Withhold your genus *Leptocarya*" ... and Gray could "confidently say, refer these species to *Omphalodes*." "I'm running over Palmer's Mex.-Tex. plants here to help the Kew herbarium. I am putting names to some new things in order to stop off—as well as to help—Hemsley."

3. Omphalodes cardiophylla A. Gray in Hemsley, Biol. Centr. Amer. Bot. 2:377. 1882. TYPE: MÉXICO, COAHUILA, mountains near Saltillo, *E. Palmer 894* (HOLOTYPE: K; ISOTYPE: GH!).

Omphalodes acuminata B. L. Rob., Proc. Amer. Acad. Arts 26:170. 1891. TYPE: MÉXICO, NUEVO LEÓN, in the Sierra Madre near Monterrey, *C.G. Pringle 2220* (HOLOTYPE: GH!).

Distribution: Coahuila to Nueva León and west-central Tamaulipas, with a disjunct population system in southern Puebla; rocky soil, rock slides or ledges in oak or pine-oak woods, ca 800 – 2500 m; Feb – Aug.

Robinson distinguished *Omphalodes acuminata* from *O. cardiophylla* by its longer stems, longer leaves more attenuate at the apex, greater number of nutlet teeth, and 2 – 4 (vs. only one) nutlets maturing per flower. Johnston (1924) later contrasted the two in leaf width and texture and in corolla size. I find, however, that the variation in these features is continuous within what appears to be a single species. Further, there is no consistent pattern to the abortion of nutlets. In fact, in all species all four nutlets normally mature.

4. OMPHALODES **richardsonii** Nesom, sp. nov.

A *O. cardiophylla* A. Gray in Hemsley simile sed caulibus glabris, lobis calycis brevioribus, dentibus nucula ad apicem 2 – 3 uncis differt.

Herbaceous perennials. Stems procumbent or trailing, seldom branched, glabrous, to at least 85 cm long, to 3 mm thick near the base. Leaves alternate, blade deltate- to lanceolate- to hastate-cordate, often auriculate, 6 – 50 mm wide, 18 – 55 mm long, sparsely to densely strigose beneath, sparsely strigose above with hairs 0.3 – 1 mm long, apex acuminate, petioles 4 – 50 mm long, moderately strigose. Flowers solitary, axillary, each subtended by a leaf, sometimes also with 1 – 5 ebracteate flowers at the branch tips; pedicels 5 – 11 mm long in flower, 16 – 20 mm long in fruit, glabrous or very sparsely strigose; calyces divided 5/6 to the base, the lobes 5, broadly lanceolate, prominently short-strigose, 2 – 2.2 mm long in flower and fruit; corollas rotate, blue with yellow throats, the tubes 2 mm long, the limbs ca 6 mm wide; style and stamens included. Nutlets (mericarps) depressed-pyramidal, (1 – 3 –) 4 maturing or persisting, 2 – 2.5 mm broad, sparsely but prominently strigose, wings thin, erect, with 30 – 45 entire teeth that terminate in 2 – 3 recurved hooks (Fig. 1).

Known only from the region of Rancho del Cielo near Gómez Farías, Sierra de Guatemala, Tamaulipas, at ca 2100 – 3800 ft in elevation.

TYPE: MÉXICO, TAMAULIPAS, Mpio. Gómez Farías, area of Rancho del Cielo, ca 3.5 km NW of Gómez Farías, Aguacates grade, 29 Mar 1969, *A. Richardson 1148* (HOLOTYPE: TEX).

Additional collections examined: MÉXICO. TAMAULIPAS. Mpio. Gómez Farías, area of Rancho del Cielo, ca 4 – 6.5 km NW of Gómez Farías: between shrine and Aguacates grade, 27 Dec 1968, *Richardson 1092* (TEX); road near ranch, 28 Dec 1968, *Richardson 1114* (TEX); Casa Piedras, ca 1.6 km NNW of San José, 30 May 1969, *Richardson 1279* (TEX); NW of Gómez Farías, E-facing slope midway to summit, 17 Mar 1987, *Woodruff 160* with M.C. Johnston et al. (MEXU, TEX); NW of Gómez Farías, E-most ridge of Sierra de Guatemala, 18 Mar 1987, *Woodruff 171* with M.C. Johnston et al. (GH, MEXU, TEX, US).

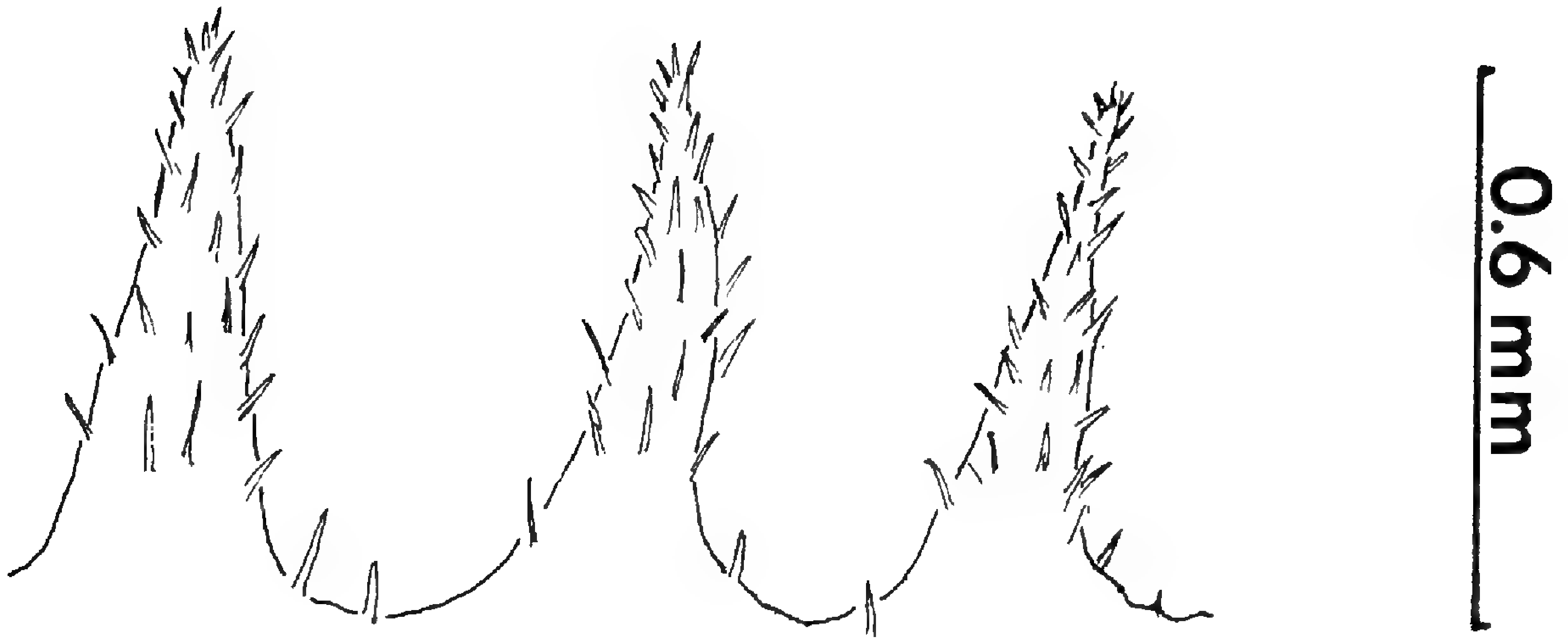
The new species is named for Dr. Alfred Richardson of the Department of Biology at Texas Southmost College, Brownsville, who made four of the six known collections of the taxon. He collected about 1400 numbers of vascular plants from the foot trails of the Rancho del Cielo area in 1968 and 1969 as an undergraduate at the University of Texas at Austin. His collections (all at TEX-LL) still provide the most complete view of the flora of that region.

Omphalodes richardsonii is most similar to *O. cardiophylla*. In addition to the differences noted in the key above, the new species produces a short, terminal raceme of 1 – 5 ebracteate flowers as well as its primary complement of axillary ones. *Omphalodes cardiophylla*, *O. chiangii* Higgins, and *O. mexicana* S. Wats. also are characterized by the production of axillary flowers, but none appears to form the terminal, ebracteate ones.

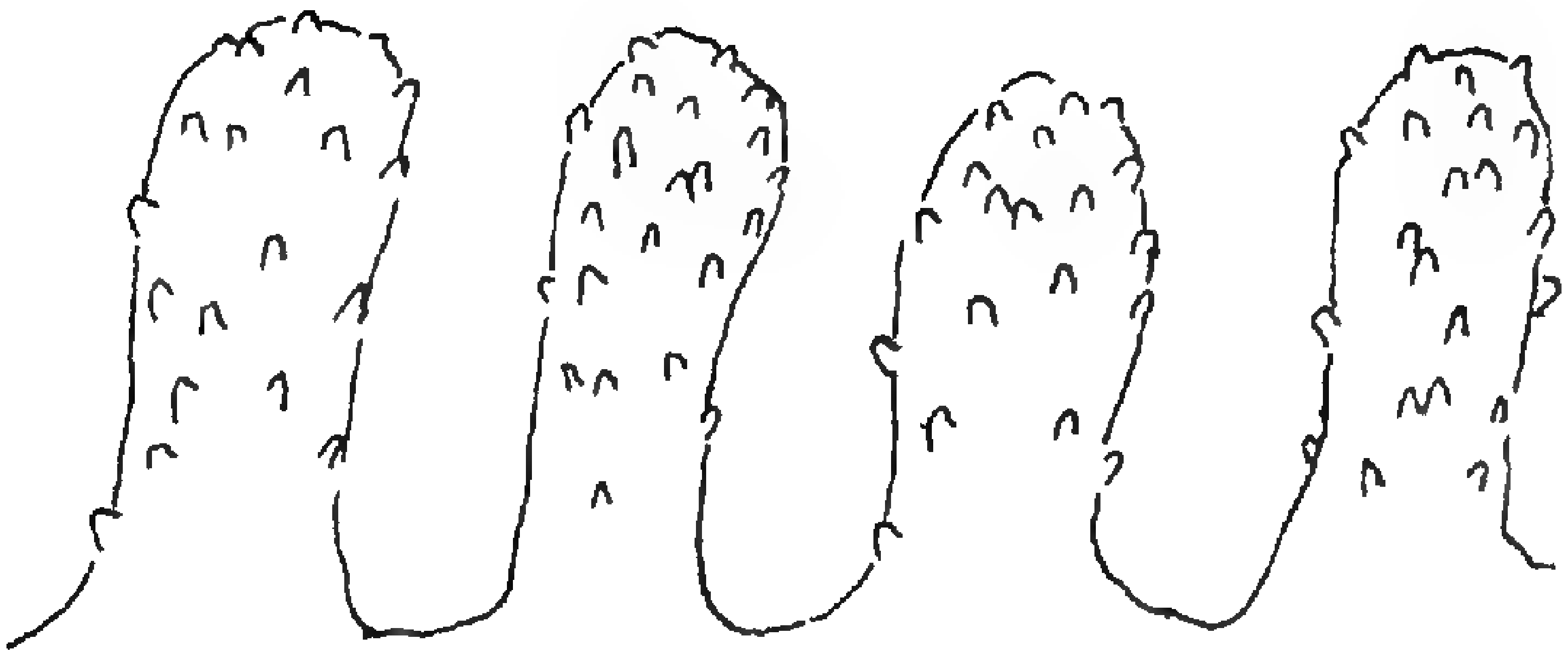
FIG. 1. Nutlet teeth of *Omphalodes richardsonii*.

FIG. 2. Nutlet teeth of *Omphalodes aliena*, extremes in form: 2a, 2b and 2c.

1



2a



2b

2c

5. Omphalodes chiangii Higgins, Phytologia 33:412 – 413. 1976. Type: MÉXICO, Coahuila, Cañon de Centinela, Sierra del Jardín, *M.C. Johnston et al. 11975B* (holotype: LL!; isotype: WTS).

Distribution: Known only from the type collection in north central Coahuila; sandy-gravelly soil with oak, pine, and douglas fir, 1600 – 2225 m; Jun – Aug.

6. Omphalodes mexicana S. Watson, Proc. Amer. Acad. Arts 25:158. 1890. Type: MÉXICO, Nuevo León, Sierra Madre near Monterrey, *C.G. Pringle 1878* (holotype: GH!).

Distribution: Central Nuevo León; rocks or boulders in areas of oak woods, ca 1400 m; May – Jun.

ACKNOWLEDGEMENTS

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A NEW SPECIES OF *GLANDULARIA* (VERBENACEAE) FROM TAMAULIPAS, MÉXICO

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ABSTRACT

Glandularia brachyrhynchos is described from the Sierra de San Carlos in north central Tamaulipas, México. It has a strongly inflated nutlet and other characters of *G. tumidula* (Perry) Umber that imply that the two are sister species. The new species differs most prominently from its close relative in having non-glandular stems and leaves, shorter, stiffer stem pubescence, and an extremely abbreviated calyx "beak."

GLANDULARIA **brachyrhynchos** Nesom & Vorobik, sp. nov. Fig. 1.

Glandularia tumidula (Perry) Umber affinis sed caulibus et foliis non glandulosis, pubescentiis caulis brevioribus rigidiore, pagina supera foliorum strigosa, rostro calycum brevi, et lobis corollarum angustioribus differt.

Annual herbs from a very slender taproot and numerous fibrous roots. Stems 7 – 25 cm tall, erect to ascending, primary branches on the lower half; moderately pubescent with spreading to slightly deflexed, stiff, dull trichomes 0.3 – 1 mm long, eglandular or minutely stipitate-glandular for 3 – 10 mm immediately below the inflorescence. Leaves opposite, widely ovate-deltate with three pairs of primary lobes, the lobes again shallowly lobed or serrate-dentate, apices rounded to acute, base cuneate and attenuate to a petiole 5 – 10 mm long, blades sparsely hispidulous beneath, moderately strigose above with appressed trichomes 0.2 – 0.6 mm long, both surfaces eglandular. Spikes compact in flower and fruit, ca 8 – 13 flowered, on short peduncles 12 – 30 mm long; bractlets ovate-lanceolate to linear-lanceolate, 4 – 5 mm long, ca half as long as flowering calyx. Calyx in flower 6.5 – 8 mm long, including the filiform-lanceolate teeth 0.5 – 0.7 mm long, strongly inflated in fruit, 5.5 – 6.5 mm long with a very short non-inflated portion ("beak") 2 – 3 mm long, half or less the length of the inflated portion; calyx and bractlets moderately pubescent with spreading trichomes, moderately to densely glandular with stipitate-glandular trichomes 0.1 – 0.2 mm long. Corolla blue-purple, the tube 12 – 15 mm long, 7 – 8 mm longer than the calyx, sparsely puberulent outside, limb 6 – 10 mm wide, the lobes 1.8 – 3 mm wide.

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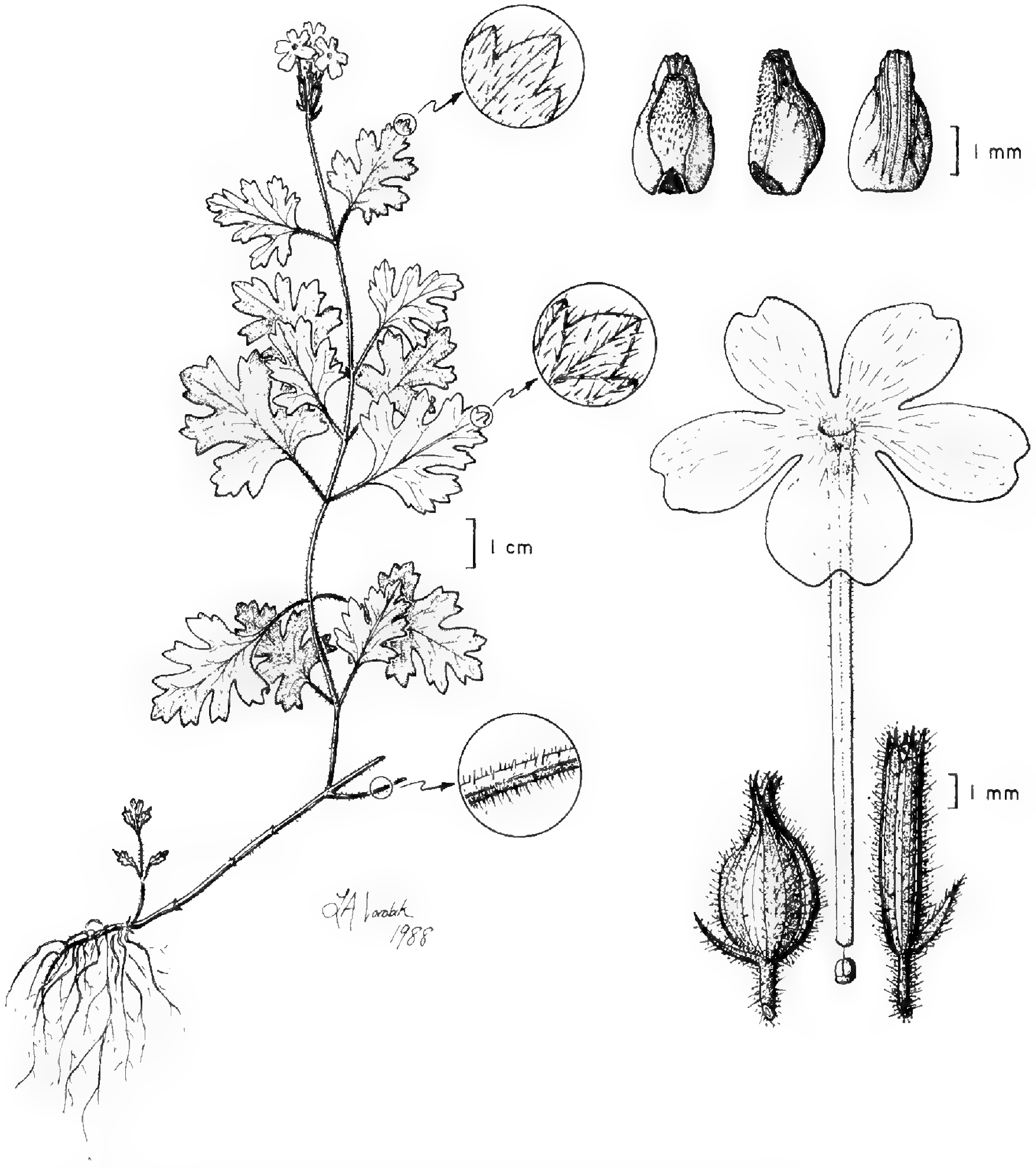

FIG. 1. Habit and details of *Glandularia brachyrhynchos* (from the holotype).

Anthers not glandular. Nutlets 2.8 – 3 mm long, the lower 2/3 – 3/4 laterally inflated and 1.5 mm wide, lateral surfaces smooth, dorsal ridge prominently ridged, reticulate at the apex, the commissural face nearly reaching the top of the nutlet, rounded and smooth in the inflated portion, densely white toothy-papillate on the upper half.

TYPE: MEXICO. TAMAULIPAS, Mpio. San Carlos, Sierra de San Carlos, ca 8 km N of San Carlos, N side of Bufa El Diente, igneous bedrock, woods of *Quercus, Ostrya, Carya*, scattered *Abies*; common in partial clearings in woods; ca 750 – 1100 m; 24°31.5′N, 98°57.6′W; 18 Jun 1987, *Guy Nesom 6084* with John Norris, Mahinda Martínez, and Lindsay Woodruff (HOLOTYPE: TEX; ISOTYPES: MEXU, VICT).

Glandularia brachyrhynchos is a member of the species group that includes *G. delticola* (Small) Umber, *G. polyantha* Umber, *G. verecunda* Umber (the preceding three are very similar among themselves), *G. quadrangulata* (Heller) Umber, and *G. tumidula* (Perry) Umber. These all possess leaves that are generally deltate to ovate with lobed but not strongly pinnatifid margins, nutlets with widely flaring bases, commissures nearly reaching the top of the nutlet, and densely white toothy-papillate commissural faces. Within this group, the new species is clearly most similar to *G. tumidula*, with which it shares nutlets that are strongly inflated in the lower 2/3 – 3/4 and that have smooth lateral faces and a prominent, wide, often ornamented, dorsal ridge.

Glandularia tumidula differs from *G. brachyrhynchos* in the following features: leaves more dissected; leaves and stems densely stipitate-glandular from top to bottom of the plant; trichomes of upper leaf surfaces erect; trichomes of stems 0.4 – 2 mm long, more dense, flexuous, and vitreous; non-inflated portion ("beak") of fruiting calyx as long or longer than the inflated portion; and corolla lobes 3.5 – 5.5 mm wide. The geographic range of *G. tumidula* is from northeastern Coahuila to south-central Texas; from the Sierra de San Carlos to the closest known collection of *G. tumidula* in Coahuila, the two species are separated by about 400 kilometers.

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"This book, the first comprehensive history of explicit medical ethics in pre-modern China, spans the period from about 500 B.C. through the nineteenth century and provides literal translations of all accessible codes of ethics in the known Chinese medical literature. The inclusion in addition of writings possessing ethical implications makes possible cross-cultural comparisons with the corresponding literatures in the West."—WFM

A NEW SPECIES OF *RATIBIDA* (ASTERACEAE, HELIANTHEAE) FROM NORTHERN COAHUILA, MÉXICO

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ABSTRACT

Ratibida coahuilensis B. Turner fron north central México is described as new. It is related to *R. latipalearis* Fisher of western Chihuahua, but can be distinguished by a number of features, including leaf partition, shape and size of segments, vestiture and achenal characters. An illustration is provided.

Richards (1968) monographed the genus *Ratibida*, recognizing six species. Five were known to occur in northern México, several of these extending into the region from more widespread distributions in the United States. Two of these, *R. mexicana* (S. Wats) Sharp and *R. latipalearis* Fisher, are thought to be endemic to western Durango and adjacent Sonora. The present novelty adds a third, quite distinctive, species which is endemic to northern Coahuila, suggesting that the genus has its center of diversity in north central México.

RATIBIDA **coahuilensis** B. Turner, sp. nov., Fig. 1.

Ratibida latipalearis Fisher simile sed vestimento pilorum patulorum mollium sericeorum 0.5 – 1.0 mm longorum, foliis mid-caulinis plerumque 3 – 5 partitis divisionibus ultimis 1 – 3 cm latis, et achenorum coronis ciliatis ca 0.3 mm elatis differt.

Tap-rooted or rhizomatous (?) perennials, 70 – 100 cm high; stems erect, sparsely branched, striate, densely hirsute with spreading hairs, the roots appearing to be fibrous; basal leaves 12 – 30 cm long, 5 – 9 cm wide, 3 – 5 partite, the petioles 8 – 15 cm long, the divisions ovate, mostly 3 – 7 cm long, 2 – 4 cm wide, soft silky-pubescent on both surfaces; midstem leaves like the basal, but smaller; peduncles 15 – 30 cm long, puberulent with spreading hairs; ray florets 8, spreading (not reflexed), the ligules 10 – 20 mm long, 8 – 12 mm wide, yellow, well-endowed with minute, brown, glandular hairs; column of receptacle 25 – 30 mm high, 9 – 11 mm wide, yellow or yellowish; receptacular pales more-or-less quadrangular in outline, completely enfolding the achenes, the apices with tufted white hairs, the resin-gland orbicular or nearly so, 0.5 – 1.0 mm across; disk corollas ca 2 mm long, yellow, the lobes ca 0.5 mm long; style branches with abrupt, tufted, appendages; achenes black, broadly

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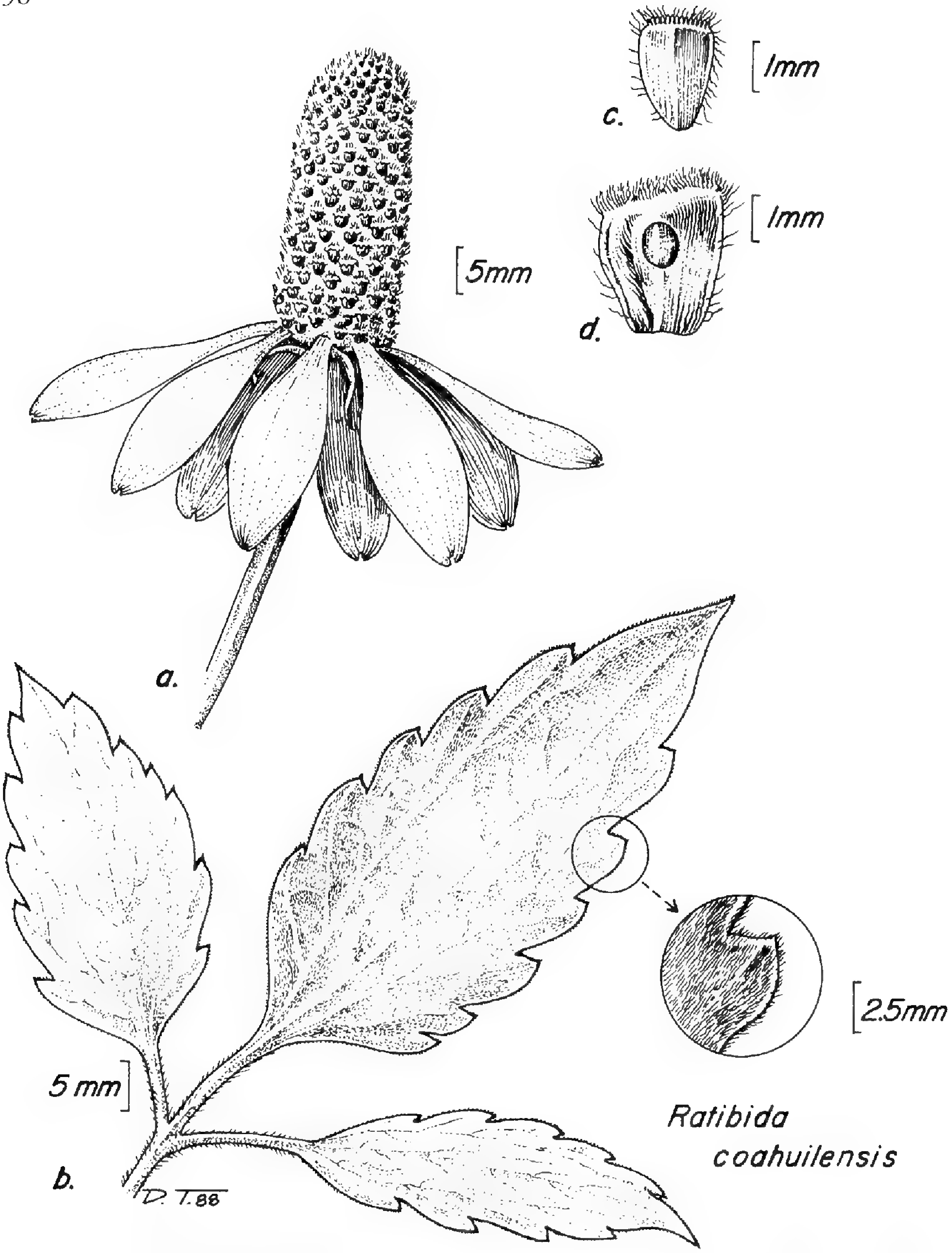

FIG. 1. *Ratibida coahuilensis* (from holotype). a. Head; b. Mid-stem leaf; c. Achene; d. Pale, lateral view.

obovoid, glabrous, 2.5 – 3.0 mm long, 1.7 – 2.0 mm wide, the margins without wings or cilia, the pappus a well-defined ciliate crown ca 0.3 mm high.

TYPE: MÉXICO. COAHUILA: Mcpio. Muzquiz, Rincon de Maria (28°27′30″N, 102°04′W), "common perennial in oak woodland in mesic, sheltered, northern exposed portion of saddle at summit of Rincon, ca 2320 m". Reportedly associated with *Quercus gravesii, Salvia regla*, etc., 23 Aug 1975, *T. Wendt, E. Lott & D. H. Riskind 1290* (HOLOTYPE: LL; ISOTYPE: MEXU).

Additional specimen examined: COAHUILA: Mcpio. Muzquiz, "Rancho Agua Dulce. Wooded canyon on the east slope of the Sierra de San Manuel", 28 Jun 1936, *Wynd & Mueller 341* (TEX).

The species is superficially similar to *Ratibida latipalearis* Fisher of western Chihuahua but can be distinguished by a number of features, as noted in the Latin diagnosis. Richards (1968) apparently did not examine the *Wynd & Mueller* collection (cited above), or at least this was not cited or called to the fore in his treatment of the group.

ACKNOWLEDGEMENTS

I am grateful to Dr. Guy Neson for the Latin diagnosis and to D. Tischler for the illustration.

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TWO NEW SPECIES OF *VERBESINA* SECT. *PLATYPTERIS* (ASTERACEAE) FROM JALISCO, MÉXICO

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ABSTRACT

Two new species belonging to the genus *Verbesina* sect. *Platypteris*, **V. vallartana** and **V. lottiana**, are described from Jalisco, México. According to characters of the involucre, the former is presumably related to *V. fraseri*, the latter to *V. crocata*. Illustrations of the new taxa are provided.

The present authors, working independently, brought to the fore two previously undetected species of *Verbesina* section *Platypteris*, a group of usually clambering shrubs with eradiate orange heads, confined to the subtropical and tropical regions of México and Central America. McVaugh (1984) possessed specimens of the taxa proposed here, including these in his concept of *Verbesina crocata* (Cav.) DC. The latter taxon is readily distinguished from both of those proposed here by its much largers heads with closely appressed graduate involucral bracts; it is also largely confined to the trans-volcanic regions of south-central México, occurring at higher elevations. McVaugh, nevertheless, was well aware of the anomalous nature of the collections upon which our new taxa are based, as noted below.

A revisional treatment of sect. *Platypteris* has been completed by the junior author (Olsen 1988); in this, additional documentation for the species described here will be presented.

VERBESINA **vallartana** B. Turner & J. Olsen, sp. nov. Fig. 1.

Verbesina fraseri aemulans, differt foliis profundis 5-lobis capitulis parvioribus magis numerosus bracteis multo brevioribus et flosculis parvioribus dense pubscentibus.

Clambering (?) shrub 1.5 – 2.0 m high. Stems terete, 4-winged, moderately hispid. Leaves opposite throughout, 10 – 25 cm long, 8 – 13 cm wide, pinnately (5)7-lobed, the lobes 3 – 7 cm long, 2 – 5 cm wide, hispid above and below with broad-based incurved hairs; petioles 3 – 6 cm long, broadly winged. Heads 8 – 15, eradiate, arranged in a terminal open panicle ca 18 cm high and 18 cm wide. Involucres hemispheric, ca 6 mm

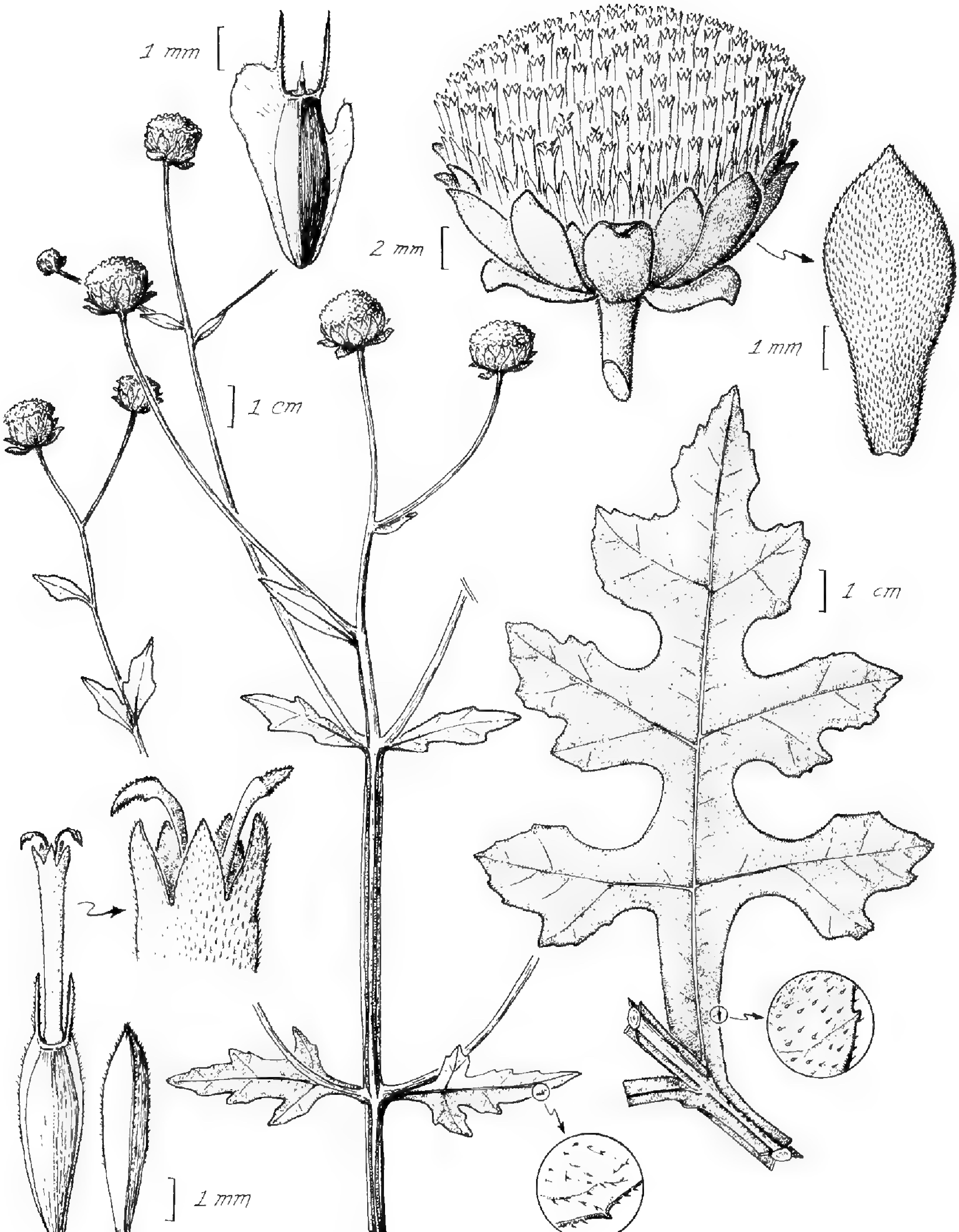

FIG. 1. *Verbesina vallartana*, from holotype.

high, 10 — 14 mm wide (pressed); involucral bracts 30 — 40, 3 — 4 seriate, subimbricate, obovate to spatulate, densely soft-pubescent. Receptacle convex, 5 — 6 mm across; receptacular bracts linear-lanceolate, acute, puberulent apically. Disk florets numerous (100 +); corollas tubular, "deep orange" (label data), very densely hispid, 5 — 6 mm long, the tubes 1 — 2 mm long, the lobes ca 0.75 mm long. Achenes 5 — 6 mm long, the body glabrous, obovate, 4.0 — 4.5 mm long, ca 1.5 mm wide, prominently winged; pappus of 2 unequal hispid awns 1.5 — 2.0 mm long.

TYPE: MÉXICO. JALISCO: ca 10 km NE of Puerto Vallarta, near the village of Milagro, on the road to Mascota, tropical deciduous forest with *Brosimum*, 100 m, 15 Nov 1963, *Charles Feddema 2584* (HOLOTYPE: TEX; ISOTYPES: ENCB, MICH, NY).

Additional Specimens Examined: MÉXICO. COLIMA: Mountain summits near pass ca 11 miles SSW of Colima on Manzanillo road, 400 — 500 m, 7 — 8 Dec 1959, *McVaugh & Koelz 1548* (ENCB, LL, MICH). JALISCO: Quimixto, trail from San Pedro el Tuito, 60 m, 2 Dec 1926, *Mexia 1236* (UC, US).

McVaugh (1984) treated the type collection of this taxon under *V. crocata*, but notes that Blake identified it as *Verbesina fraseri* Hemsl. The latter is known to us only from Central America. *Verbesina fraseri* is readily distinguished from *V. vallartana* by its simple, deltoid-ovate leaves and much larger heads, etc. We would also include in *V. vallartana* the collection, *McVaugh & Koelz 1548* which McVaugh (1984, p.973) notes "may represent yet another species ... but better flowering material is needed." In fact, we would place nearly all of the anomalous collections cited by McVaugh under *V. crocata* in our *V. vallartana*. These all have loose, oblanceolate outer involucral bracts and smaller heads with fewer florets than does *V. crocata*; in addition, they occur at lower elevations (100-500 m) along the Pacific-facing slopes of the Sierra Madre Occidental.

VERBESINA **lottiana** B. Turner & J. Olsen, sp. nov. Fig. 2.

Verbesina crocata aemulans, differt flosculis paucioribus parvioribus et capitulis parvioribus solitariisin pedunculis elongatis.

Clambering or arching shrub 1.4 — 4.0 m high. Stem terete, sparsely hispid to glabrate, 4-winged. Leaves opposite, 8 — 15 cm long, 4 — 12 cm wide, deeply pinnate (5)7-lobed, the lobes 3 — 7 cm long, 1 — 2 cm wide, irregularly serrate, hispid above and below, hairs less dense below; petiole 1 — 3 cm long, auriculate-based. Heads eradiate, mostly single on terminal or axillary peduncles 7 — 16 cm long. Involucre hemispheric, 3 — 4 seriate, subimbricate, 4 — 5 mm high, 8 — 12 mm across (pressed); involucral bracts ovate, 2 — 3 times as long as wide, appressed pubescent. Receptacle convex, ca 5 mm across; receptacular bracts linear-lanceolate, acute, 3 — 4 mm long, pubescent apically. Disk florets numerous (100 +); corollas

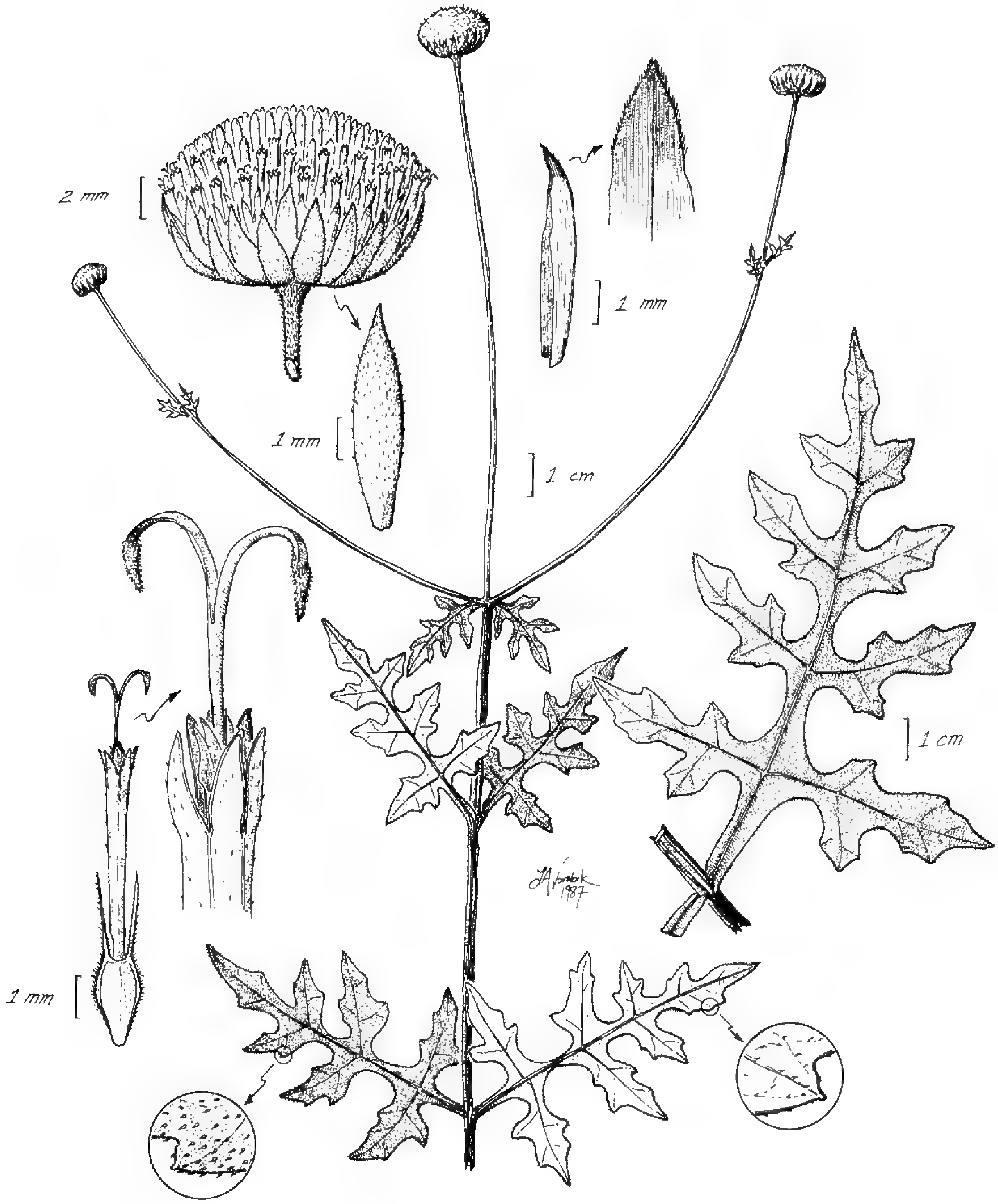

FIG. 2. *Verbesina lottiana*, from holotype.

tubular, 5 – 6 mm long, orange, sparsely hispid to nearly glabrous, the tubes ca 2 mm long, the lobes ca 1 mm long. Achenes 5 – 6 mm long, the body puberulent, obovate, ca 3.5 mm long, ca 1.5 mm wide, prominently winged; pappus of 2 subequal hispid awns 1.0 – 1.5 mm long.

TYPE: MÉXICO. JALISCO: Mpio. La Huerta, Estacion de Biologia Chamela (UNAM), 19°30′ x 105°03′. 12 Oct 1982, *Emily J. Lott 1474 & R. Hernandez M.* (HOLOTYPE: TEX; ISOTYPES: ENCB, UNAM).

Addtional Specimens Examined: JALISCO: Estacion Biologia, Chamela, 200 m, 17 Jul 1976, *Delgado 317* (MEXU); Estacion Biologia, Chamela, edge of Eje Central, 1 Feb 1983, *Bullock 1300* (MEXU; Estacion Biologia Chamela, 3 Nov 1981, *Lott 736* (MEXU, TEX); 8 km E Chamela, 30 – 50 m, 8 – 10 Dec 1970, *McVaugh 25077* (ENBC, LL, MICH); Estacion Biologia Chamela, 14 Dec 1976, *Megallanes 381* (MEXU, TEX).

The species is related to the more montane, interior, *V. crocata* but differs in its fewer, much smaller, heads with smaller florets which are borne singly on elongate peduncles. McVaugh (1984) listed his collection 25077 (cited above) as *V. crocata*, without comment.

It is a pleasure to name the taxon for Ms. Emily Lott, exceptional plant systematist, formerly working at the Chamela Biological Station (UNAM).

ACKNOWLEDGEMENTS

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A REVISION OF *VERBESINA* SECTION *PLATYPTERIS* (ASTERACEAE: HELIANTHEAE)

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ABSTRACT

A revision of *Verbesina* section *Platypteris* is presented. Five species are recognized in the section: *V. crocata, V. vallartana, V. lottiana, V. fraseri* and *V. ovatifolia*. A distribution map and one figure are provided.

Verbesina is a large, New World genus comprised of ca 300 species. Robinson and Greenman (1899), in the most recent synopsis of *Verbesina*, recognized 109 species distributed in 12 sections. Since this treatment, several of the sections have been revised (Blake 1925 [*Lipactinia*]; Coleman 1964, 1966a, b [*Pterophyton, Sonoricola* and *Ximenesia*]; Olsen 1985, 1986 [*Ochractinia* and *Verbesina*]; Turner 1986 [*Pseudomontanoa*]); the present study brings the total to eight.

Kunth (1820) described a monotypic genus, *Platypteris*, noting affinities with *Salmea, Bidens* and *Spilanthes* and indicating an association with *Verbesina*, from which it was said to differ in characters of the involucre and its discoid heads. De Candolle (1836) treated *Platypteris* as a section of *Verbesina* and included in it the three known orange-flowered, discoid species, *V. crocata, V. auriculata* and *V. arborea*. Robinson and Greenman (1899) retained the former, but transferred the latter two species to section *Lipactinia* on the basis of their alternate leaves and small heads. As recognized by Robinson and Greenman, section *Platypteris* included those taxa with opposite leaves, winged stems and large, discoid, subglobose heads. The section included four taxa, *V. crocata, V. fraseri* (with variety *nelsonii*) and *V. ovatifolia*. Greenman (1904) added another taxon, *V. tonduzii* and Turner and Olsen (1988) added *V. vallartana* and *V. lottiana*. The present study reduces *V. tonduzii* to synonymy under *V. ovatifolia*, thus five species are recognized for the section.

Section *Platypteris* occurs from western Mexico (Durango to Colima) east and south through Central America to Costa Rica. No Panamanian or South American specimens have been found in the herbaria examined. Usually noted as a montane element, members of section *Platypteris* often occur in deciduous forests and have been collected at elevations ranging from near sea level up to ca 2100 m.

SIDA 13(1):45–56. 1988.

MORPHOLOGY: Section *Platypteris* includes perennial robust herbs and sprawling or clambering shrubs, bearing capitulescences ranging from solitary to several headed cymes or cymose panicles. The heads in this group are almost always discoid, although there is occasionally differentiation in size between outer and inner disk florets, with yellow-orange to red disk corollas. McVaugh (1984), in his discussion of *V. crocata*, indicates that the discoid nature of the heads that characterizes section *Platypteris* (and a few other species) "... does not seem to be firmly fixed." This is true also in section *Ochractinia* (Olsen 1985) and in section *Lipactinia* (Blake 1925). Indeed, Blake notes that "It has gradually become apparent that the absence of rays, the principal character, in connection with the small heads, on which the section is based, is not absolutely distinctive of the group, since some of the species related to *V. arborea*, and even that species itself according to Hieronymous, occasionally or always have a few small rays." Thus, it is clear that the taxonomic use of 'discoid heads' within *Verbesina* is to be used with caution, with greater reliance placed upon the size and number of heads and phyllotaxis.

The most useful diagnostic character for this section is the shape of the involucral bracts, which varies from linear-lanceolate in *V. crocata* to ovate-lanceolate in *V. ovatifolia* and *V. lottiana* to the broadly obovate or spatulate bracts seen in *V. fraseri*, and *V. vallartana* (Figure 1).

Leaf morphology within section *Platypteris* is variable and rarely provides useful taxonomic characters. It is not uncommon to find both simple and pinnately-lobed leaves in the same taxon and even on the same plant. Turner (pers. comm.) notes that *V. ovatifolia* may contain simple, 3-lobed, 5-lobed or 7-lobed leaves on garden-grown material, the younger, uppermost leaves being simple or 3(5)-lobed. Pubescence on the leaves is always harsh.

CHROMOSOME NUMBERS: The genus *Verbesina* is apparently monobasic with $x = 17$ (Stuessy 1977). The only apparent exception to this is *V. crocata*, which has been reported as $n = 18$ (Turner, Ellison and King 1961; Turner, Powell and King 1962) and $n = 17$ (Keil and Stuessy 1977). *V. ovatifolia* was recently reported as $2n = 17\text{II} + 1\text{B}$ (Sundberg, Cowan and Turner 1986). The presence of B chromosomes may explain the two earlier reports of $n = 18$ for *V. crocata*. The remaining three species in section *Platypteris* have not been examined and additional work is needed to clarify the conflicting reports for *V. crocata*.

CHEMISTRY: There is a single published study of a species belonging to section *Platypteris*. Notes on herbarium sheets of *V. ovatifolia* indicate the odor of turpentine (eg. *Nee 22590*). Volatile components have not been surveyed, however, Fang et al. (in press) examined the non-polar

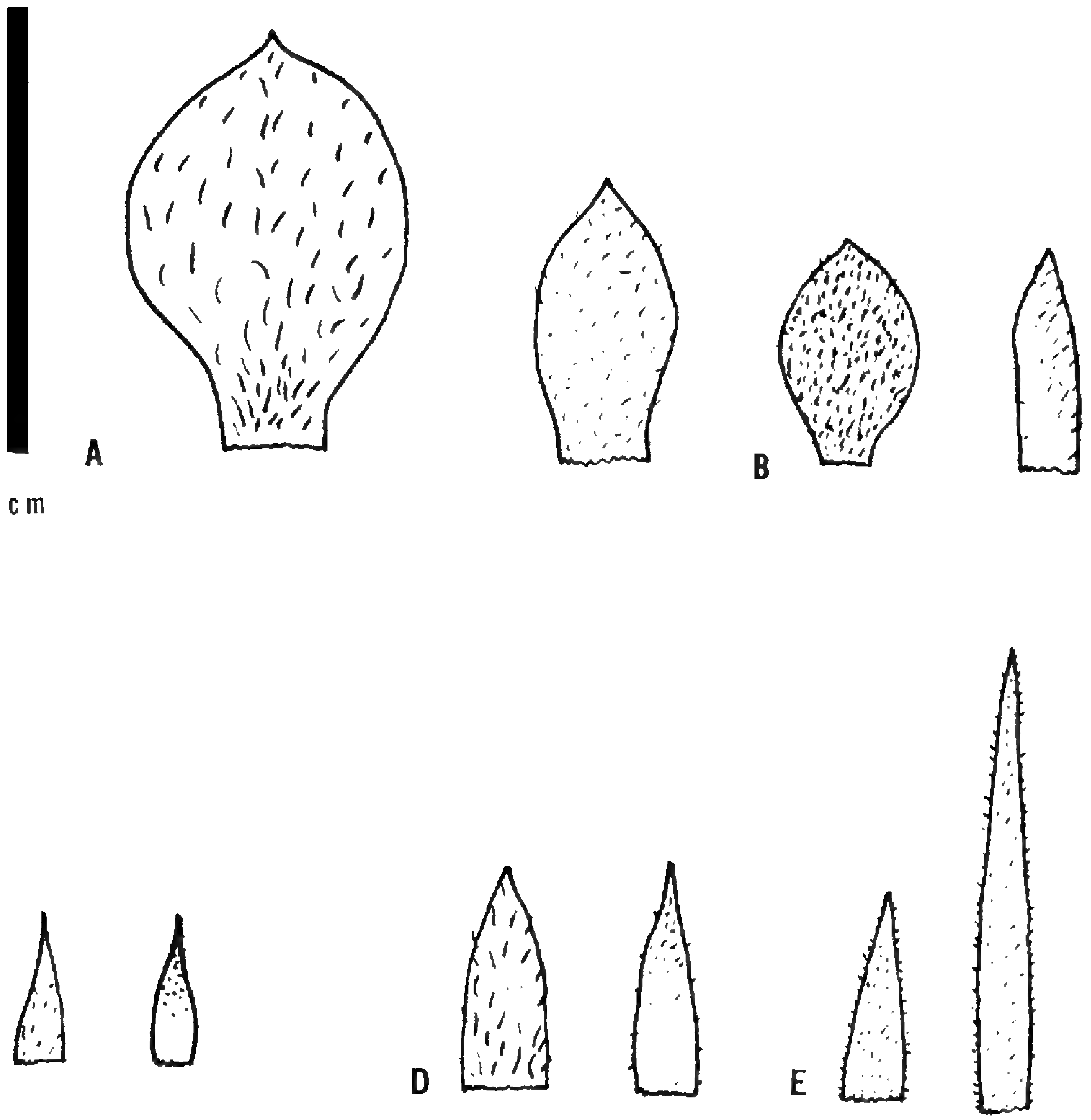

FIG. 1. Outer (left) and inner (right) involucral bracts in *Verbesina* section *Platypteris*: A. *V. fraseri* (*Molina* and *Molina 24900*, NY), B. *V. vallartana* (*Feddema 2584*, MICH), C. *V. lottiana* (*McVaugh 25077*, MICH), D. *V. ovatifolia* (*Dryer 1663*, F), E. *V. crocata* (*King 2538*, MICH).

components of this species and found no flavonoids or sesquiterpene lactones. Flavonoids were observed in an aqueous extract, however this has not yet been investigated. Other species in the section remain to be examined.

VERBESINA section PLATYPTERIS (Kunth) DC., Prodr. 5:617. 1836. TYPE: *Platypteris crocata* Kunth, in, Humboldt, Bonpland and Kunth, Nov. Gen. Sp. 4:200. 1820.

Herbs or erect or clambering shrubs to 8 m high; stems up to 4 cm across, winged; scabrous. Leaves opposite, simple to pinnately lobed;

scabrous. Capitulescence solitary or few-headed cymose panicles. Heads discoid; involucre, 2 – 7 seriate, bracts linear-lanceolate to broadly ovate or obovate. Corollas yellow-orange to red, variously pubescent. Achenes gray-white to brown, glabrous to tuberculate, broadly winged; pappus of 2 subequal awns.

KEY TO THE SPECIES

A. Involucre 4 – 7 seriate, phyllaries linear-lanceolate, 3.5 – 10 times as long as wide . . . . 1. *V. crocata*
AA. Involucre 2 – 4 seriate, phyllaries broader, <3 times as long as wide
  B. Involucral bracts broadly ovate to obovate or spatulate ca 2 – 2.5 times as long as wide
    C. Leaves usually lobed; outer phyllaries <6 mm long; corollas densely pubescent . . . . 2. *V. vallartana*
    CC. At least the upper leaves simple; outer phyllaries <8 mm long; corollas glabrous to sparsely pubescent . . . . 3. *V. fraseri*
  BB. Involucral bracts ovate-lanceolate
    C. At least the upper leaves simple, petioles not auriculate at the base; achenes glabrous, awns to 3.5 mm long . . . . 4. *V. ovatifolia*
    CC. Leaves usually pinnately lobed, petioles auriculate at the base; achenes puberulent, awns to 1.5 mm long . . . . 5. *V. lottiana*

1. VERBESINA CROCATA (Cav.) Less., Syn. Gen. Compos. 232. 1832. TYPE: "Habitat in Mexico. Vidi floridam in dicto horto mense Februario et Martio." (the plate serves as the type).—*Bidens crocata* Cav., Icon. 1:66, pl. 99. 1791.—*Spilanthes crocata* (Cav.) Sims, Bot. Mag. 39: pl. 1627. 1814.—*Platypteris crocata* (Cav.)Kunth, Nov. Gen. Sp. 4:201. 1820.

Clambering shrub to 8 m high. Stems winged, hispidulous below, becoming more dense in the capitulescence. Leaves mostly opposite, deltoid-ovate in outline, simple or coarsely pinnately 3 – 7 lobed; blade to 14.5 cm long, 9.5 cm wide, apex acuminate, margin irregularly serrate, pubescence above coarse with short, broad-based hairs, below confined mainly to the veins, less dense, the hairs not broad-based, somewhat longer than on the upper surface; main veins conspicuously raised beneath; petiole broadly winged, to 7 cm long. Capitulescence a loose panicle of 1 – 5 heads; peduncles to 20 cm long, hispidulous; heads large, discoid, 2.0 – 3.5 (– 5.0) cm wide, 1.5 – 2.5 (– 3.0) cm tall. Involucre grayish, 4 – 7 seriate; phyllaries linear-lanceolate, outer series 3.5 – 4.5 mm long, 1.0 – 1.4 mm wide, usually somewhat reflexed, densely covered with short hairs, ciliate-margined with similar hairs, base indurate, apex narrowly acute; inner series grading into the pales, to 13 mm long, 1.2 – 1.5 mm wide. Pales linear-lanceolate, to 12 mm long, sparsely pubescent along entire length with short hairs, ciliate along the upper 1/3, apex acuminate. Disk florets ca 100 – 200; corollas orange, outer florets smaller, corolla to 3.5 mm long, tube to 1.0 mm long, inner florets larger, corolla cylindric, 6.5 – 8.0 mm long, 1.0 – 1.2 mm wide, pubescent only on the upper 1/2 – 1/5; tube often greenish, 1.0 – 1.5 mm long, very sparsely pubescent. Anthers yellow, apices acute. Achenes obovate, shiny brown to grayish-white, 5.5 – 8.2 mm long, 1.5 – 2.0 mm wide (excluding the wings), mostly glabrous or with a few thin hairs near the apex; wings thin, 2.0 – 2.3 mm wide, attached above to the awns for about 1/3 the length of the awns; pappus of 2 subequal awns to 4.2 mm long. Flowering year round.

Representative specimens: MÉXICO. **Durango**: 6 km al S de Huazamota, mcpo. El Mexquital, 700 m, 7 May 1983, *Gonzales & Rzedowski 2405* (MEXU, TEX). **Guerrero**: Cañon de la Mano Negra, 4 – 8 km N of Iguala, 1100 – 1150 m, 15 Feb 1970, *Anderson & Anderson 5774* (MICH); 3 km al W de Chilpancingo, 1350 m, *Blanco & Toledo 136* (MEXU); Calavera, 1000 m, 4 Oct 1937, *Hinton, et al. 10039* (GH, LL). **Jalisco**: Subtropical deciduous forest ca 11 mi S of Acatlán, 4200 ft, 5 Nov 1962, *Cronquist 9808* (GH, MEXU, MICH, NY, TEX). **México**: Ixtapan, District of Temascaltepec, 1000 m, 2 Nov 1932, *Hinton 2476* (MEXU, US); Ixtapan, Ciudad Arenal, 1950 m, 21 Dec 1952, *Matuda 27500* (ENCB, MEXU). **Michoacan**: Huetamo, 28 Feb 1934, *Hinton, et al. 5707* (GH, NY, US); En los Laureles, 12 Mar 1978, *Nuñez 612* (MEXU); Al 21 km al SW de Zitácuaro, entre las Trincheros y Laureles, 1450 m, 18 Mar 1981, *Nuñez, et al. 3665* (MEXU). **Morelos**: Cuantla, 1200 m, 19 Dec 1908, *Conzatti 2329* (F, GH); 4 mi W of Yautepec on Hwy 190, 28 Dec 1970, *Dunn, et al. 17369* (ENCB, NY); Along, rte 95 ca 11 mi S of Cuernavaca, 14 Mar 1961, *King 4159* (F, MICH, NY, TEX, UC, US); Valley of Cuantla, 4000 ft, 28 Oct 1900, *Pringle 9062* (F, GH, MEXU). **Oaxaca**: Mcpo. El Barrio, ca 5 km al S de Almoloya, 750 m, 13 Nov 1978, *Koch, et al. 78279* (ENCB, MEXU). **Puebla**: Atlixco, 1600 m, May 1899, *Conzatti 928* (GH); Along rte 190, ca 7 mi N of the Oaxaca - Puebla border, 1 Feb 1960, *King 2536* (MICH, TEX, US); Along rte 190 ca 1 mi S of Acatlán, 1 Feb 1960, *King 2538* (MICH, TEX).

Commonly known as "capitaneja" or "nahuitiput", *V. crocata* has a long history of taxonomic confusion; the name has been applied to almost any large-headed, orange-flowered *Verbesina* from the west coast of México through Central America. As recognized here, *V. crocata* is restricted to an area of south-central México, from eastern Michoacan north into Durango, south and east to the states of Puebla and Oaxaca (Figure 2) at elevations of 50 – 2100 meters. It is clearly separated from other members of section *Platypteris* on the basis of its 4 – 7 seriate involucre with linear-lanceolate phyllaries. It also has the largest heads in the section (up to 5 cm across). Although members of *V. lottiana* may approach *V. crocata* in phyllary shape, *V. lottiana* has a 2 – 4 seriate involucre, consistently smaller heads and shorter pappus awns.

Verbesina crocata is the only member of section *Platypteris* with any reputed medicinal value; it has been used as a "remedy for wounds." Label data also indicate that the leaves can be bruised and immersed in water for a cool drink.

2. VERBESINA VALLARTANA B. Turner & J. Olsen, Sida 13:39. 1988. TYPE: MÉXICO. JALISCO: ca 10 km NE of Puerto Vallarta, near the village of Milagro, on the road to Mascota, tropical deciduous forest with *Brosimum*, 100 m, 15 Nov 1963. *Feddema 2584* (HOLOTYPE: TEX!; ISOTYPES: ENCB!, MICH!, NY!).

Turner & Olsen (1988) provide both a description and a list of representative specimens for *Verbesina vallartana*. This taxon is the most geographically restricted of the taxa in section *Platypteris* (Figure 2). It approaches *V. fraseri* in leaf and phyllary morphology but is easily distinguished on the basis of its densely pubescent corollas.

3. VERBESINA FRASERI Hemsl., Biol. Cent. -Amer., Bot. 2:187 – 188. 1881. TYPE: GUATEMALA: Dueñas, hillside, 5000 ft., 10 Oct 1873, *Fraser, Salvin and Godman (2)* (HOLOTYPE: K!).

Robust herbs or clambering shrubs to 3 m high. Stem winged, glabrous below, becoming hispidulous in the capitulescence. Leaves opposite, petiolate, ovate to deltoid in outline, simple to coarsely 3 – 5 pinnately lobed; blade to 24 cm long, 14 cm wide, apex acuminate, margins serrate, base narrowing abruptly to the petiole, pubescence above coarse with short broad-based hairs, below softer with more numerous, longer hairs lacking the thickened bases; petiole narrowly winged, to 5 cm long. Capitulescence of 1 to several heads borne on hispidulous peduncles to 12 cm long; heads discoid, 1.5 – 3.0 cm wide, 1.0 – 1.5 cm tall. Involucre gray-green, 2 – 3 seriate; phyllaries broadly ovate to obovate, outer phyllaries 8 – 12 mm long, 3 – 6 mm wide, strongly reflexed, pubescent with short broad-based hairs, margin entire, base indurate, apex broadly acute; inner series narrower, to 10 mm long, 2 – 3 mm wide. Pales lanceolate, 7 – 8.5 mm long, pubescent on upper 1/2 – 1/3, ciliate margined along upper 1/2, apex acuminate, subherbaceous. Disk florets numerous, ca 100 – 150, corollas orange, cylindric, 6.0 – 8.0 mm long, 1.3 – 2.0 mm wide, sparsely pubescent; tube 1.0 – 1.5 mm long, glabrous to very sparsely pubescent, anthers light in color, apices acute. Achenes obovate, grayish-white, 5.5 – 6.5 mm long, 1.5 – 2.0 mm wide (excluding the wings), glabrous; wings 1.5 – 2.0 mm wide, margins entire, attached to the awns for about 1/3 the length of the awns; pappus of 2 subequal awns to 3.5 mm long. Flowering Nov-Apr.

Representative specimens. **EL SALVADOR**. **Ahuachapán**: Lagunita de las Ninphas, high above town of Apaneca, 5 Dec 1978, *Funk & Langdon 2941* (US); vicinity of Ahuachapán, 700 – 1100 m, 16 – 25 Jan 1947, *Standley & Padilla 2599* (F). **La Libertad**: Hacienda Cuyagualo, S of Lago de Zapotitlan along Rio Gualo, 27 Jan 1946, *Carlson 305*

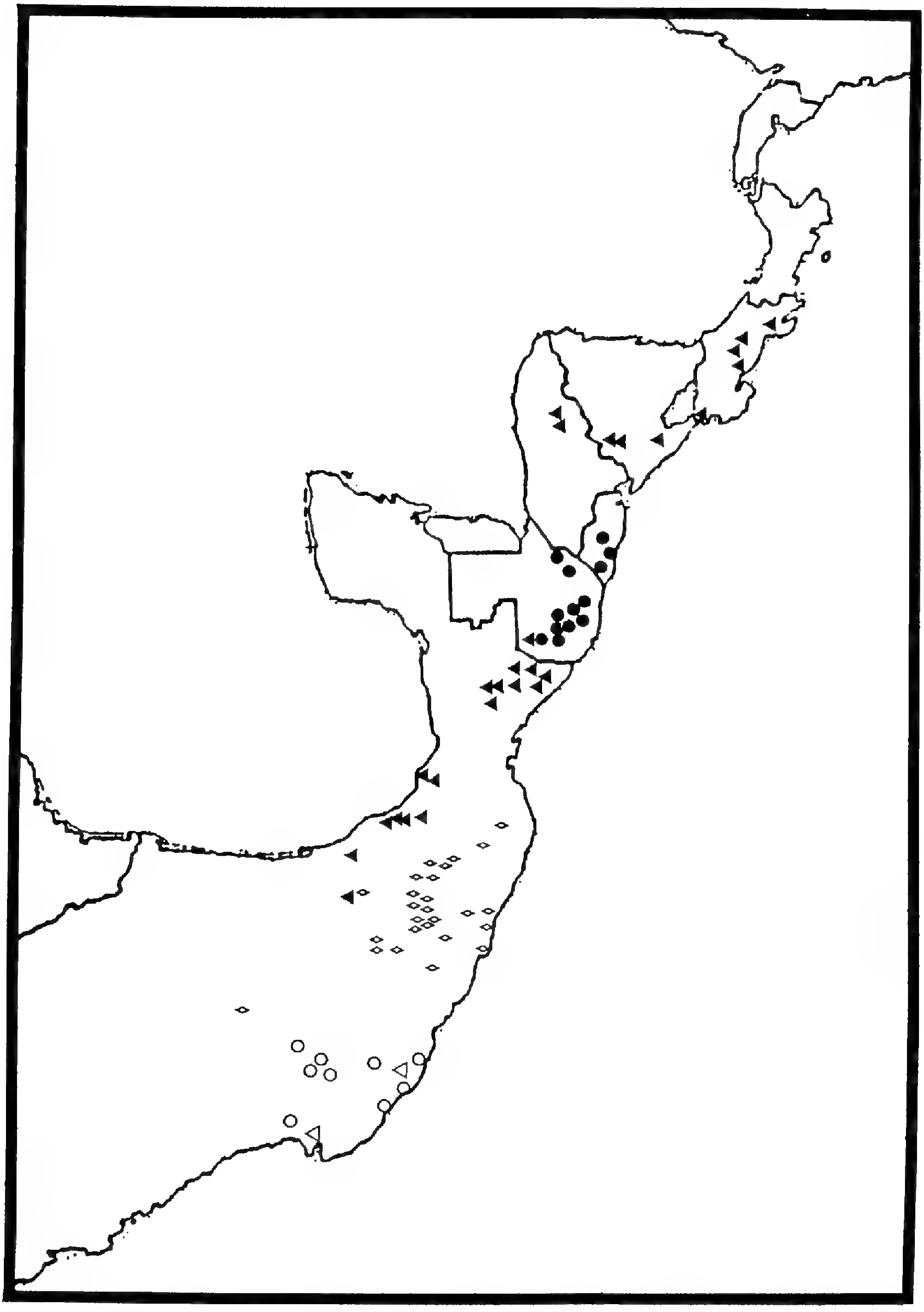

FIG. 2. Distribution of the taxa of *Verbesina* section *Platypteris*: open triangles, *V. vallartana*; open circles, *V. lottiana*; open diamonds, *V. crocata*; solid triangles, *V. ovatifolia*; solid circles, *V. fraseri*.

(F); slopes of Volcán San Salvador, above Santa Tecla, 1230 m, 22 Jan 1949, *Williams & Molina 15227* (F). **SAN SALVADOR**: San Salvador, 1921, *Calderon 165* (GH, US); dense forest of El Picacho NE of El Boqueron, Volcán San Salvador, 1950 m, 1 Mar 1968, *Molina & Montalvo 21856* (F); vicinity of San Salvador, 650 – 850 m, 20 Dec 1921 - 4 Jan 1922, *Standley 19140* (NY, US); Volcán de San Salvador, 1000 – 1800 m, 7 Apr 1922, *Standley 22980* (GH, NY, US). **GUATEMALA**. **Alta Verapaz**: near Cobán, 1260 – 1440 m, 25 Mar – 15 Apr 1939, *Standley 71458* (F); 1350 m, Nov 1907, *Von Turckheim 1879* (GH, NY, US); Cobán, 1350 m, Nov 1912, *Von Turckheim 3985* (F, US); 1 – 8 km NW of Cobán, 1200 – 1300 m, 4 Jan 1973, *Williams, et al. 42041* (F, US). **Chimaltenango**: Alameda, 25 Nov 1936, *Johnston 489* (F); Chimaltenango, 1260 m, 26 Jan 1947, *Williams & Molina 11841* (F). **Chiquimula**: Cerro Brujo, in vicinity of Rio Negro, below Montaña Montenegro near village of Cerro Brujo, 1500 – 2000 m, 1 Nov 1939, *Steyermark 30965* (F). **Escuintla**: 6 mi N of Escuintla on CA-9, 2400 ft, 7 Nov 1970, *Harmon 4660* (ENCB, NY); along road to Escuintla, ca 16 km SW of Amatitlán, 2750 ft, 23 Jan 1977, *King 7167* (NY, US); along Rio Guacalate, 500 – 550 m, 28 Nov 1938, *Standley 58275* (F). **Guatemala**: along Rio Villalobos, 1300 m, 12 – 23 Jan 1966, *Molina, et al. 16072* (F, GH, NY, US); near Amatitlán, 1170 m, 29 Dec 1938, *Standley 61263* (F, GH); 4 mi NE of Guatemala City, road to Chinautla, 4400 ft, 20 Nov 1943, *White 5131* (ENCB, F, LL, MICH). **Huehuetenango**: vicinity of Tachique, E of Huehuetenango, 1900 m, 7 Jan 1941, *Standley 82596* (F). **Sacatépequez**: Volcán Acatenango, 9000 ft, 20 Feb 1905, *Kellerman sn* (F); between Santa Maria de Jesus and San Juan de Obispo, 1700 m, 27 Nov 1969, *Molina & Molina 24900* (F, NY); slopes of Volcán de Agua, N of Santa Maria de Jesus, 1800 – 2100 m, 10 Dec 1938, *Standley 59347* (F); near Pastores, 1560 – 1650 m, 14 Dec 1938, *Standley 59941* (F, NY); near Antigua, 1500 – 1600 m, Nov 1938-Feb 1939, *Standley 60380* (F); along Rio Guacalate, on road between Antigua and Chimaltenango, 1660 m, 23 Dec 1940, *Standley 81030* (F); 10 km N of Antigua, 1700 m, 30 Jan 1949, *Williams & Molina 15416* (F, GH); lower slopes of Volcán de Fuego, 3 km SW of Alotenango, 1200 – 1300 m, 15 Jan 1974, *Williams & Willliams 43465* (F, MICH). **Santa Rosa**: Jumaytepeque, 6000 ft, Nov 1892, *Heyde & Lux 4236* (F, GH, MICH); Cuijiniquilapa, 800 m, Nov 1893, *Heyde & Lux 6171* (F, GH, US); near Cuilapa, 895 m, 20 – 27 Nov 1940, *Standley 78550* (F). **Sololá**: entre Puente Panajachel y el Rio, 1800 m, 30 Oct 1965, *Williams & Molina 15277* (F, NY, US). **Quetzaltenango**: south facing slopes of Volcán Santa Maria, between Finca Pirineos and Los Positos, between Santa Maria de Jesus and Calahuache, 1300 – 1500 m, 8 Jan 1940, *Steyermark 33733* (F).

Common names for this taxon include "esponja" and "valeriana." *Verbesina fraseri* is entirely Central American, found only in Guatemala, El Salvador and Honduras (Figure 2), where it occurs at elevations of 300 – 2000 meters. Most closely related to the more northerly distributed *V. ovatifolia*, *V. fraseri* is easily distinguished by its broad, strongly reflexed involucral bracts.

4. VERBESINA OVATIFOLIA A. Gray, Proc. Amer. Acad. Arts 19:15. 1883. TYPE: MÉXICO. CHIAPAS. Nov 1864 – 1870, *Ghiesbreght 523* (HOLOTYPE: GH!; ISOTYPE: K!).

Verbesina tonduzii Greenman, Proc. Amer. Acad. Arts 40:42. 1904. TYPE: COSTA RICA. SAN JOSÉ: Dans les boissons a las Vueltas, Tucurrique, 635 m, Nov 1898, *Tonduz 12765* (LECTOTYPE: GH!; ISOTYPES: F! GH! MICH! UC! US!).

Verbesina fraseri var. *nelsonii* Donn.-Smith, Bot. Gaz. 23:9. 1897. TYPE: GUATEMALA. HUEHUETENANGO: near Nenton, 3000 – 4000 ft 13 – 15 Dec 1895. *Nelson 3551*. (LECTOTYPE: US!; ISOTYPE: US!).

Robust herbs to clambering shrubs to 7 m tall. Stems reddish, conspicuously winged by continuation of the petiole wings extending the length of the internodes; hispidulous, becoming denser in the capitulescence. Leaves opposite, mostly simple above, broadly ovate to deltoid in outline, pinnately 5 – 7 lobed below, apex acuminate, margins serrulate to irregularly serrate, blade to 17 cm long, 15 cm wide, pubescence scabrous above, lower surface similar, but less dense; petiole to 4 cm long, winged. Capitulescence solitary to few paniculate; peduncles to 14 cm long when heads are solitary, shorter when several heads are present; heads discoid, 2.0 – 3.5 cm in diameter, 1.5 – 2.0 cm tall. Involucre 2 – 4 seriate; phyllaries ovate-lanceolate, densely puberulent, weakly ciliate-margined, apex acute, not reflexed, base indurate, outer bracts 2.5 – 8.5 mm long, 1.3 – 3.5 mm wide, inner series lanceolate, grading into the pales, to 8 mm long, 1.5 mm wide, less puberulent than outer series. Pales linear-lanceolate, to 8.5 mm long, pubescent on upper 1.3, apex acuminate, herbaceous, margin not markedly ciliate. Disk florets numerous, ca 100 – 150. corollas yellow to orange, cylindric, 6.0 – 9.0 mm long, 1.8 – 2.5 mm wide, lobes sparsely pubescent, tube greenish, 1.3 – 1.5 mm long, ca 0.25 mm wide, glabrous to sparsely pubescent; anthers light colored, apex acute. Achenes obovate, brown to gray in color, 4.7 – 7.7 mm long, 1.5 – 2.0 mm wide (excluding the wings), glabrous; wings to 2.5 mm wide, very weakly ciliate to entire, attached above to the pappus awns for ca 1/3 the length of the awns; pappus of 2 unequal awns to 3.5 mm long. Flowering year round.

Representative specimens: **COSTA RICA. Alajuela**: Entre Calera de San Ramon y Rio Jesus, 23 Dec 1927, *Brenes 5921* (F, NY); Carrillos, de Poas, 26 Oct 1931, *Brenes 14346* (F); Bordes del Rio Burio, 20 Feb 1964, *Jimenez 1763* (F, US); along stream in wet rain forest region, near Fortuna, 150 m, 21 Feb 1966, *Molina, et al. 17633* (F, US). **Cartago**: San Pedro, 500 – 600 m, 27 Dec 1928, *Brenes 6525* (F); forest, high over Rio Reventazon, 950 m, 11 Apr 1972, *Lent 2486* (F, NY, US); Terrenos del Instituto Interamericano de Ciencias Agricolas, Turrialba, 600 m, 17 Nov 1949, *Leon 1968* (US). **Guanacaste**: vicinity of Cañas, Finca Taboga, 28 Dec 1969, *Daubenmire 482* (F, US); Monteverde, Cordillera de Tilarán, 1250 – 1350 m, Oct 1977, *Dryer 1663* (F, US); along stream ca 11 km N of La Cruz, 0.5 km W of main road, 0 – 150 m, 2 Feb 1978, *Liesner 4854* (F); vicinity of Libanno, 260 – 360 m, 15 Jan 1926, *Standley 44914* (GH, US); escarpment from the savanna down to Rio Guajiniquil on Bahia de Santa Elena, 50 – 200 m, 5 Jan 1964, *Williams, et al. 26718* (F, US). **Puntarenas**: Buenas Aires, Jan 1892, *Pittier 4905* (GH). **San José**: Santa Rosa de Puriscal, 13 Dec 1982, *Poreda, et al. 3384* (F, US); along a small stream ca 1.4 km NW of Brazil de Santa Anna, 800 m, 21 Dec 1974, *Taylor 17366* (US); San José, 850 m, 16 Nov 1966, *Weston 3271* (UC). **GUATEMALA. Huehuetenango**:

Cayon El Tapon on hwy to La Mesilla, 1000 – 1400 m, 9 Jan 1974, *Molina 30138* (ENCB, F, MICH). **HONDURAS. Olancho**: vicinity of Juticalpa, 380 – 480 m, 5 – 16 Mar 1949, *Standley 17390* (F); vicinity of Catacamas, 450 – 500 m, 18 – 26 Nov 1949, *Standley 18167* (F). **MEXICO. Chiapas**: Mcpo. Ocozocoautla de Espinosa, 32 km N of Ocozocoautla along road to Mal Paso, 2500 ft, 19 Oct 1965, *Breedlove & Raven 13581* (ENCB, F, MICH, NY, US); Mcpo. Motozintla de Mendoza, near Ojo de Agua, 2000 m, 14 Dec 1976, *Breedlove 42704* (MEXU); Mt. Ovando, 14 – 18 Nov 1939, *Matuda 3949* (GH, MEXU, MICH, NY); above Finca Carmen along the road from Acala to Pugiltik, Mcpo. Venustiano Carranza, 1800 ft, 7 Nov 1967, *Ton 3187* (ENCB, F, MICH); Mcpo. San Fernando, Mirador Roblar, 19 km N de Tuxtla Gutierrez, sobre carretera a Cañon El Sumidero, 3 km S de Mirador Las Chiapas, 1290 m, 9 Dec 1979, *Wendt 2377* (MEXU, TEX). **Hidalgo**: Pachuca, 2500 m, 8 Apr 1951, *Gold 10* (NY). **Oaxaca**: District of Tuxtepec, Chiltepec and vicinity, 20 m, Jul 1940 – Feb 1941, *Calderón 325* (GH, LL, MEXU, US); Chiltepec, 200 m, 2 Nov 1941, *Calderón 770* (GH, MEXU, MICH, US). **Vera Cruz**: Isla de Catemaco, 8 Oct 1970, *Calzada 31* (F, GH, MEXU, US); Las Cabanas, 5 km N de la desviacion de la carretera que va al Jical, Catemaco, 22 Oct 1974, Calzada 01614 (ENCB, NY); Region of San Andrés Tuxtla, Laguna Encantada, 24 Aug 1953, *Dressler & Jones 168* (GH, MEXU); E side of entrance of Laguna de Sontecomapan into the Gulf of Mexico, 7 km NE of Sontecomapan, Mcpo. Catemaco, 0 – 50 m, 1 Nov 1981, *Nee 22590* (F, TEX, US); Zacuapan, Barranco de Tenampa, Nov 1906, *Purpus 2184* (F, GH, UC, US); Coyame, 400 m, 22 Oct 1968, *Rosas 1394* (F, MEXU, MICH, US); Teocelo, 1000 m, 15 Nov 1971, *Ventura 4497* (ENCB, LL, MICH, NY, TEX); San Pablo, Mcpo. Naolinco, 950 m, 5 Nov 1981, *Ventura 19070* (ENCB); 3 – 7 km NW of Pueblo Nuevo, 600 – 700 m, 24 Nov 1973, *Williams & Molina 42400* (MICH, US). **NICARAGUA**. 8 Oct 1927, *Chaves 336* (US). **Managua**: Sierra de Managua, 600 – 900 m, *Garnier 186* (LL, US); Casa Colorada and vicinity, S of Managua, 850 m, 27 June 1923, *Maxon, et al. 7361* (US).

The very brief original description by Gray (1883) was not expanded upon by Robinson and Greenman (1899), nor was this taxon mentioned in either Greenman's (1904) discussion of *V. tonduzii* or Nash's (1976) treatment of Guatemalan Verbesinas. Donnell-Smith's *V. fraseri* var. *nelsonii* was apparently not seen by Robinson and Greenman, who note only that it was "Said to have leaves lobed and heads smaller than in the typical form."

Commonly referred to as "guaco rojo" and also known as "capitaneja," *Verbesina ovatifolia* is found from Vera Cruz south into Costa Rica (Fig. 2) at elevations ranging from 50 meters to ca 1500 meters. Gray (1883) indicated that a close relationship exists between *V. ovatifolia* and *V. fraseri*. These two taxa are sympatric in Guatemala and probably also in Honduras, El Salvador and Nicaragua, although collections of both taxa from the same locality are not known from these countries. Morphologically, *V. ovatifolia* is closest to *V. crocata*, from which it differs in its broader involucral bracts (though not nearly so broad as in *V. fraseri*) and its smaller, more numerous heads. *Nee 22590* from near sea level in Vera Cruz has broader, more reflexed involucral bracts than other specimens seen of *V. ovatifolia*, and B.L. Turner (pers. comm.) indicates that he has seen another specimen from the Chiapas-Oaxaca border with similar characters. These are best treated within *V. ovatifolia* on the basis of their overall morphology, even though the characters of the involucre would place them into *V. fraseri*.

5. VERBESINA LOTTIANA B. Turner & J. Olsen, Sida 13:41. 1988. TYPE: MÉXICO. JALISCO: Municipio La Huerta, Estacion de Biologia Chamela (UNAM), 19 30′ x 105 03′, 12 Oct 1982, *Lott & Hernandez 1474*. (HOLOTYPE: TEX!; ISOTYPES: ENCB!, UNAM!).

Turner & Olsen (1988) provide both a description and a list of representative specimens for *Verbesina lottiana*. A western Mexican species (Figure 2), the recently described *V. lottiana* was included within *V. crocata* by McVaugh (1984). It is easily distinguished from the latter by its involucre. *V. crocata* has linear-lanceolate involucral bracts in 4 – 7 series, while *V. lottiana* has ovate bracts in fewer series.

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I would like to thank the curators of the following herbaria for the loan of specimens examined in this study: ENCB, F, GH, K, LL, MEXU, MICH, MO, NY, TEX, UC, US. I would also like to thank Annette Cates who provided bibliographic assistance.

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A COMPARISON OF VEGETATIVE CHARACTERISTICS OF SEVERAL GENERA WITH THOSE OF THE GENUS *CIMICIFUGA* (RANUNCULACEAE)

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ABSTRACT

Cimicifuga is frequently confused with *Actaea*, *Aruncus*, and *Astilbe*, when only vegetative structures are present. A chart is presented comparing and contrasting the subtle morphological features existing between these four genera, *Thalictrum*, *Caulophylum*, and *Trautvetteria* are also sometimes misidentified as *Cimicifuga*. Photographs of the leaf or most terminal leaflets from herbarium speciments of all seven genera accompany the discussion and illustrate their diagnostic vegetative differences. A simple key is offered as a tool for the possible field identification of vegetative specimens.

INTRODUCTION

Cimicifuga and *Actaea* (Ranunculaceae), *Aruncus* (Rosaceae), and *Astilbe* (Saxifragaceae), are often misidentified when only vegetative parts are available for observation. If inflorescences or fruits are present, one should have little or no difficulty in distinguishing these genera with the use of present-day keys. However, identification mistakes do occur with unusually high frequency even when reproductive structures are present.

Statements in the literature are few regarding the conspicuous vegetative similarities of genera discussed in this paper. Lawrence (1951) states that "generic distinctions are admittedly weak in the Ranunculaceae", but he does not limit this statement solely to vegetative characteristics. Gleason (1963) includes the statement under the description of *Astilbe biternata* (Vent.) Britt., "our plant bears a surprising superficial resemblence to species of *Aruncus*." Gleason and Cronquist (1963) state under the description of *Astilbe biternata*, "Habitally much like *Aruncus*." Voss (1985) indicates under the description of *Cimicifuga*, "the foliage is quite similar to that of *Actaea*."

MATERIALS AND METHODS

During the past twenty-five years I have studied the genus *Cimicifuga* (Ramsey 1965), including the examination of thousands of herbarium

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specimens and living specimens in natural populations. It has been observed that *Cimicifuga* is often misidentified for one of the other genera mentioned and vice versa. Comparative morphological notes concerning these genera have been made, and their differences and similarities are summarized in Table I. From herbarium specimens, photographs have been made of the terminal leaflets of the central division of the compound leaves of all genera mentioned with the exception of *Trautvetteria* which has a simple leaf. Also, a simple bracketed key, based primarily on terminal leaflet characteristics, has been prepared which may serve as an additional aid for the possible field identification of vegetative specimens.

OBSERVATION AND DISCUSSION

Aruncus (Table I) can be distinguished from the other three genera (Table I) by the prominent pinnate venation of the terminal leaflet, since the other genera have at least three prominent palmately arranged veins arising at the base of their terminal leaflets. Of all the genera mentioned in this paper, only *Aruncus* has leaflets with prominent, doubly serrate margins throughout.

Aruncus (Fig. 1), *Astilbe* (Fig. 2), and *Cimicifuga* (Fig. 3) have terminal leaflets possessing serrations to the apex terminus, whereas in *Actaea* (Fig. 4) the serrations are absent from the apex terminus resulting in a rather long, entire, apical tooth. The terminal leaflets of *Astilbe* (Fig. 2) are comparatively thin dorsiventrally, shiny, scabrous, with acute-acuminate, serrate, stout lobes, while in *Aruncus* (Fig. 1) the terminal leaflets are comparatively thicker dorsiventally, less shiny or dull, smooth, and have thin, acuminate-caudate lobes. Of all the genera mentioned in this paper, only *Astilbe* has scabrous leaflets.

Cimicifuga (Fig. 3) and *Actaea* (Fig. 4) are extremely difficult to distinguish in the herbarium or in the field in the absence of reproductive structures even by the professional taxonomist. It is just as difficult to describe the subtle differences by which the experienced eye may differentiate between these two genera on the basis of leaf and stem morphology. The habit of *Actaea* is generally smaller and more delicate in comparison to that of *Cimicifuga*. Moreover, the teeth of the terminal leaflets of *Actaea* are usually more nearly at right angles to the apex; there is a higher frequency of shallow sinuses; leaflet apices tend to be long acuminate-caudate without serrations; the branching habit is not strongly monopodial since the erect stem bearing the inflorescence arises on one side of the central axis of the plant, and the first cauline leaves are more distant from the base of the plant. In *Cimicifuga* the teeth are generally more serrate and extend farther toward the base of the terminal leaflet and are pointed more toward

Table I. A comparison of vegetative characteristics of three genera with those of the genus Cimicifuga.

CHARACTERISTIC	*CIMICIFUGA*	*ACTAEA*	*ASTILBE*	*ARUNCUS*
Family	Ranunculaceae	Ranunculaceae	Saxifragaceae	Rosaceae
No. of terminal leaflet lobes	0 – 7 (mostly 3) acute-acuminate	0 – 3 stoutly, acuminate-caudate	0 – 3 acute-acuminate	0 weakly accuminate-caudate
Venation of terminal leaflet	3 – 7 prominent veins arising basally	3 prominent veins arising basally	3 prominent veins arrising basally	pinnate venation
Terminal leaflet pubescence	glabrous to densely pubescent	glabrous to scarcely pubescent	scabrous	glabrous
Terminal leaflet margin	serrate and incised, teeth oriented more toward apex, few shallow sinuses	strongly dentate-serrate, teeth more at right angles to apex, many shallow sinuses	sharply serrate to doubly serrate, few shallow sinuses	coursely doubly serrate throughout, no sinuses
Color of petiolule nodes	darker color than petiole	darker color than petiole	no color difference	no color difference
Usual method of branching	strongly monopodial	not strongly monopodial	strongly monopodial	strongly monopodial
Usual position of the first cauline leaf	near base	distant from base	near base	near base
Habit	relatively large, coarse	relatively small, delicate	relatively large, coarse	relatively large, coarse

FIG. 1. Terminal leaflets of *Aruncus dioicus* (Rosaceae). Scale = 1.1 cm.
FIG. 2. Terminal leaflet of *Astilbe biternata* (Saxifragaceae). Scale = 1.1 cm.

FIG. 3. Terminal leaflets of *Cimicifuga racemosa* (Ranunculaceae). Scale = 1.1 cm.
FIG. 4. Terminal leaflets of *Actaea pachypoda* (Ranunculaceae). Scale = 1 cm.

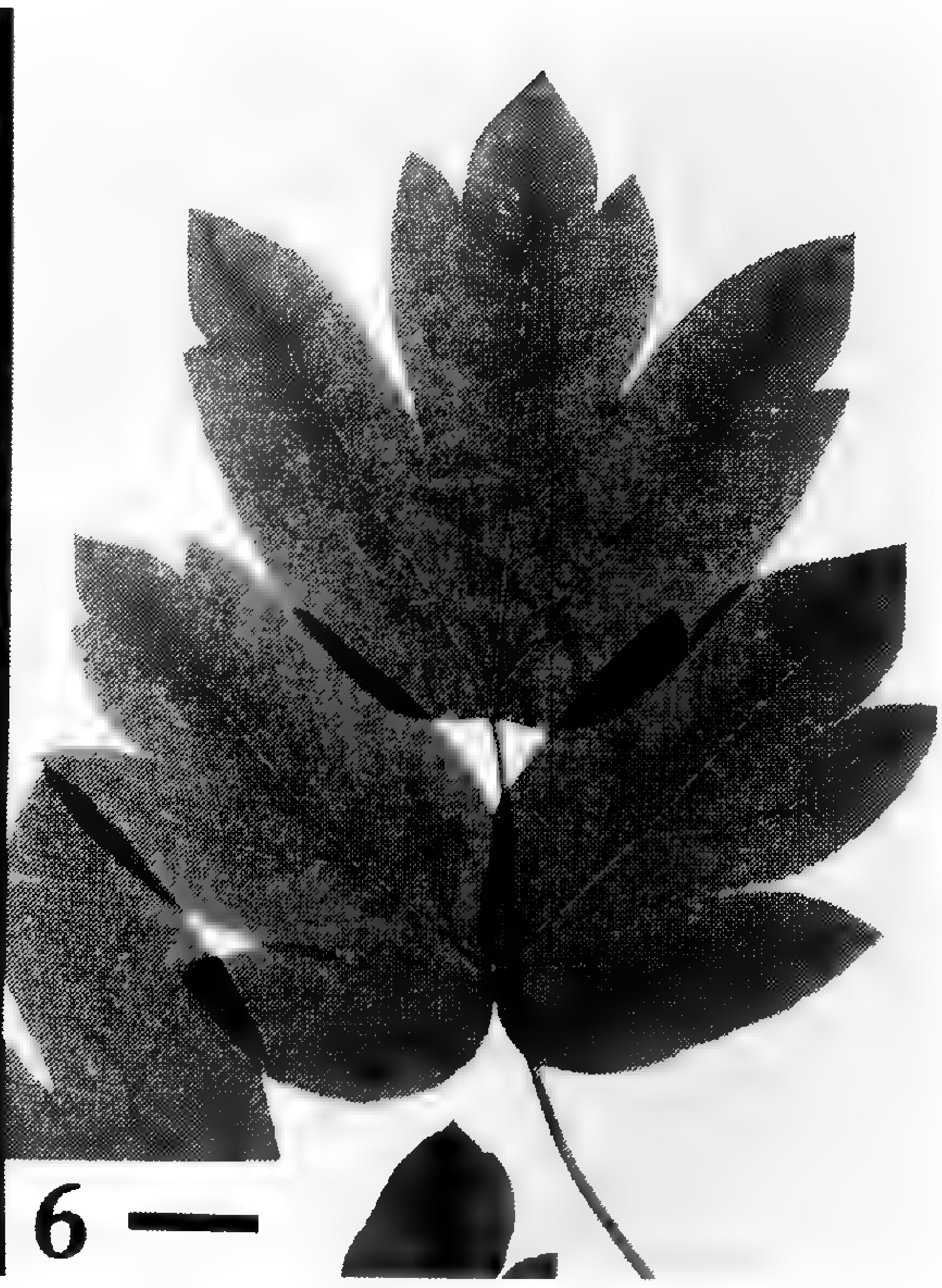

FIG. 5. Terminal leaflets of *Thalictrum pubescens* (Ranunculaceae). Scale = 1.1 cm.
FIG. 6. Terminal leaflets of *Caulophyllum thalictroides* (Berberidaceae). Scale = 1 cm.

FIG. 7. Simple leaf of *Trautvetteria carolinensis* (Ranunculaceae). Scale = 3 cm.

the leaflet apex; there is a low frequency of shallow sinuses; leaflet apices tend to be shortly acute-acuminate with serrations; the branching habit is strongly monopodial, since the erect stem bearing the inflorescence forms the central axis, and the first cauline leaves are near the base of the plant. In *Actaea*, the bracts at the junction of the aerial stem and the rhizome are larger in relation to the size of the aerial stem than those of *Cimicifuga*.

Although the leaflets pictured (Fig. 3, 4) are typical, the terminal leaflet morphology of *Cimicifuga* and *Actaea* may be more strikingly similar than shown by these examples. Because distinctions in vegetative morphology are subtle betweem *Cimicifuga* and *Actaea*, it is hoped that future anatomical investigations will yield even more positive discriminating characteristics than those offered here.

Other genera which are occasionally mididentified as *Cimicifuga* are: *Thalictrum* (Ranunculaceae), *Caulophyllum* (Berberidaceae), and *Trautvetteria* (Ranunculaceae). When only vegetative material is available, both *Thalictrum* (Fig. 5) and *Caulophyllum* (Fig. 6) can be distinguished from *Cimicifuga* by their smaller, entire leaflets which have rounded lobes. *Trautvetteria* (Fig. 7) has large, simple, palmately or pedately incised, broadly reniform and rounded leaves, while the leaves of *Cimicifuga* are ternately decompound.

VEGETATIVE KEY TO GENERA

1a. Leaf simple . . . . 1. *Trautvetteria*
1b. Leaf compound 2
    2a. Terminal leaflet margins entire 3
    2b. Terminal leaflet margins serrate or doubly-serrate 4
3a. Terminal leaflets with mostly 4 or more small lobes, not glaucous, green; erect stem bearing more than 2 well-developed leaves . . . . *Thalictrum*
3b. Terminal leaflets with mostly 2 – 5 large lobes, glaucous, blue-green; erect stem bearing 1 well-developed leaf . . . . 3. *Caulophyllum*
    4a. Terminal leaflet margin doubly-serrate, no lobes, major venation pinnate . . . . 4. *Aruncus*
    4b. Terminal leaflet margin serrate, 3-more lobes, major venation palmate 5
5a. Terminal leaflet upper epidermis scabrous . . . . 5. *Astilbe*
5b. Terminal leaflet upper epidermis slightly pubescent or smooth 6
    6a. Terminal leaflet margins strongly dentate-serrate, teeth oriented more at right angles to apex, many shallow sinuses, lobes acuminate-caudate; stalk of inflorescence arises off center from a leaf petiole; plants only aroung 2 feet tall, not strongly monopodial . . . . 6. *Actaea*
    6b. Terminal leaflet margins serrate-incised, teeth oriented more toward apex, few shallow sinuses, lobes acute-acuminate; stalk of inflorescence arises centrally (axilly) from base of plant; plants 3 – 8 feet tall, strongly monopodial . . . . 7. *Cimicifuga*

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REVIEW

HILL, MADALENE AND BARCLAY, GWEN with HARDY, JEAN 1987. Southern Herb Growing. 196 pp. Shearer Publishing, Fredericksburg, TX. ISBN 0-940672-41-3. Hardbound, $29.95.

Growing and cooking with herbs are ancient arts that are returning as popular hobbies throughout the US. While much has been written for the northern parts of the country on cultivation and care of herbs, Southern gardeners have needed a special reference for their soils and climate variations. Madalene Hill, Gwen Barclay, and Jean Hardy have come to the rescue with *Southern Herb Growing*, a lavishly illustrated and beautifully designed book that addresses the needs of Southern herb gardeners.

The authors use accurate nomenclature, including naming specific varieties appropriate for Southern gardens. Each herb has been carefully photographed and descriptive information includes history, uses, and regional soil, fertilizer, and water requirements.

This book is a useful reference for Southern herb gardeners, but it is a joy for people from all regions who enjoy the trivia and history of herbs. The recipe section could entice the non-cook to experiment. Madalene Hill is president of the Herb Society of America, and she and her daughter, Gwen Barclay, have tested their recommendations by growing the herbs used for their restaurant at Hilltop Herb Farm in the Texas Hill Country.

This book attracts the reader with its beauty, and should transform most readers into active herb enthusiasts with its practical advice. It is one of those books that makes a perfect gift for someone else, but ends up never leaving the library of the buyer. APM.

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LECTOTYPIFICATION AND STATUS OF *VACCINIUM MARGARETTAE* ASHE (ERICACEAE)

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ABSTRACT

Vaccinium margarettae Ashe is lectotypified and proposed as a hybrid *pro species*.

Ashe (1918) described *Vaccinium margarettae* from Rabun County South Carolina with designation of holotype. Instead, he stated representative specimens (= syntypes) were deposited in CHARL, CM, F, NY, US, and USC. The needed lectotype is selected:

VACCINIUM MARGARETTAE Ashe, Torreya 18:71. 1918. *Cyanococcus margarettae* (Ashe) Small, Man. Southeast Fl. 1015, 1507. 1933. LECTOTYPE: GEORGIA. RABUN CO.: near Wiley, 1 Oct 1917, *W.W. Ashe s.n.* (US!); ISOLECTOTYPE: (NY!). Syntypes reported from F, CHARL, CM, and USC were not seen because they were not located despite search. Seven specimens from Oconee County, South Carolina, collected and determined by W.W. Ashe s.n. (NCU!). Two specimens from the same county collected and determined by L.J. Uttal (#'s *14661* and *14663*), VPI!, USC!

The sheet holding the lectotype bears two segments, the lectotype itself, designated segment "A," and two flowering twigs collected from the same clump 5 May 1917, designated segment "B." A note on the label states that the fruit in July 1912 was "black and shining".

Camp (1945) ascribed *Vaccinium margarrettae* as a hybrid between *Vaccinium atrococcum* (Gray) Heller × *V. vacillans* Torr. The name of the first parent is now subsumed under *V. fuscatum* Ait. (Ward 1974); that of the second under *V. pallidum* Ait. (Rehder 1940). Camp (1945) provides a lead to this putative hybrid in a key to *Vaccinium* hybrids. He reports that environmental factors are often favorable for the production of this hybrid: *V. vacillans* oftens grows on dry hillsides adjacent to small streams, hillside springs, and seepage spots which host *V. atrococcum*. He describes the hybrid as "relatively low growing, with considerable pubescence on the leaves and with dark or black berries." He reports combinations between the putative parents as "numerous" with evident backcrossing. Camp and Gilly (1943) report a segregative population derived from this combination. I have putatively determined such segregates in NCU and VPI from North Carolina, South Carolina and Virginia.

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Camp (1945) discussed *Vaccinium* hybrids as formulae. He wrote before present ICBN rules permitted the use of a binary name to apply to either a putative or definitive hybrid: hence *Vaccinium* × *margarettae* Ashe *pro. sp. (fuscatum* × *pallidum)*. This name must be applied to all offspring of this cross, including backcrosses. Application of this name to specimens in the field is not overly difficult if one or both parents are present, as is usually the case. Determination of herbarium specimens is favored by experience in this group.

EXCLUDED TAXA:

Vaccinium vacillans var. *crinitum* Fern., Rhodora 13:236. 1911. (*V. pallidum* Ait.)
Vaccinium vacillans var. *missouriense* Ashe, Torreya 25:10. 1925. (*V. pallidum* Ait.)
Vaccinium missouriense (Ashe) Ashe, Rhodora 33:195. 1931. (*V. pallidum* Ait.)

ACKNOWLEDGEMENTS

The curators of herbaria of deposition for Ashe's syntypes are thanked for searching for the specimens, and, in the case of NY and US, for the loan of type material located. Loans from NCU and USC are gratefully acknowledged.

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CLARIFICATION OF THE SECTIONAL STATUS OF *CAREX BOELCKEIANA* BARROS (CYPERACEAE) FROM NORTHERN PATAGONIA

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ABSTRACT

Examination of the holotype of *Carex boelckeiana* suggests that this Patagonian species belongs in *Carex* sect. *Junciformes* rather than in sect. *Inflatae*, where it was originally placed. It is then more closely related (i.e., morphologically similar) to carices from southern South America than to *C. breweri* and *C. engelmannii* from western North America, as was previously suggested.

INTRODUCTION

Carex boelckeiana Barros (subg. *Primocarex* Kük., sensu Kükenthal 1909) was originally placed in *Carex* sect. *Inflatae* Kük. (Barros 1969). Recent examination of the holotype suggests that it more properly belongs in sect. *Junciformes* (Boeckeler) Kük. Full citations are given near the end of this report for specimens examined of *C. boelckeiana*.

Barros (1969, p. 70, Fig.58) described and illustrated *Carex boelckeiana* from plants collected in northern Patagonia, citing only the type collection from Neuquén Province, Argentina (*Boelcke 11405* [HOLOTYPE: BAB!]). To date, I have seen only one additional collection of this species (*León 3409* [BAA]), also from Neuquén Province (Fig. 1). *Carex boelckeiana* has been collected at an elevation of 2050 m and apparently grows in dry sites. Mature fruit has been collected in late January and February.

SECTIONAL PLACEMENT AND DISCUSSION

Barros (1969) originally placed *Carex boelckeiana* in sect. *Inflatae* and noted its similarity to the North American *C. breweri* Boott, though in the same paper he also pointed out several features of *C. boelckeiana* that differ from those of the latter species. He writes (p. 70), "...se asemeja a *Carex breweri* Boott de la que difiere por su espiga más pequeña, la porción masculina escondida y pluriflora, la forma de las glumas con su dorso y mucrón verdes, sus utrículos con sólo dos nervios cerca de los bordes en la cara dorsal sobre una línea verde y por último por la forma de la raquilla." Clearly, some of these differences, as well as other features of *C. boelckeiana* pointed out below, make this species an anomaly in sect. *Inflatae*.

SIDA 13(1):67–75. 1988.

Kükenthal (1909) placed both sect. *Inflatae* and sect. *Junciformes* in subg. *Primocarex* (most present-day authors consider *Primocarex* to be a highly artificial subgenus and use the name primarily for convenience when discussing monoecious species with a solitary spike). In Kükenthal's key (p.69), sect. *Inflatae* is allied with sect. *Leucocephalae* (which contains the single species *C. fraseri* Andr. and upon which Mackenzie (1931) later founded his genus *Cymophyllus*) while sect. *Junciformes* is placed near sects. *Petraeae, Grallatoriae*, and *Psilocarpae*. Nelmes (1952) considered the perigynia of *Carex fraseri* [– *Cymophyllus fraseri* (Andr.) Mackenzie] to resemble those of *C. breweri* and the closely related *C. engelmannii* L. Bailey, but he noted that vegetatively the two member of sect. *Inflatae* are quite distinct from *C. fraseri*. While Nelmes did not comment on the origin of sect. *Inflatae* and also admitted candidly that he was perplexed as to the origin of *C. fraseri*, he was convinced that members of sect. *Junciformes* were reduced species of *Uncinia* (Nelmes 1952, p. 434). It seems very clear that neither Kükenthal (1909) nor Nelmes (1952) considered the two sections in question to be closely related.

In Kükenthal's (1909) key, sect. *Inflatae* and sect. *Junciformes* are differentiated by the following features: the perigynia of the former are very membranaceous (paper-like) and inflated and the achenes do not completely fill the perigynium; by contrast, the perigynia of the latter are neither paper-like nor inflated and the achenes nearly fill the perigynium. Along with differences in perigynium and achene characters, differences in other characters (e.g., rachilla, bract, scale) also serve to distinguish these two sections. A synopsis of each section is given below, but only those characters helpful in sectionally placing *C. boelckeiana* are included in the descriptions.

The two members of sect. *Inflatae* (Kükenthal 1909; Mackenzie 1931), *Carex breweri* and *C. engelmannii*, both grow on rocky slopes and high mountain summits in the western part of North America (Mackenzie 1931; Hermann 1970). The former occurs in the Cascade and Sierra Nevada mountains (California, Oregon, and Washington) and the latter has a somewhat wider distribution from the Rocky Mountains (e.g., Colorado, Montana, and Wyoming) westward to the mountains of the intermontane basin (e.g., Utah) and coastal states (e.g., California and Washington). Based on descriptions given by Mackenzie (1931), as well as from my own observations, sect. *Inflatae* is characterized by: perigynia ovoid to broadly ovoid, very membranaceous, inflated, margins smooth, veinless or sometimes with a few weak veins; perigynium beak 0.5 – 1 mm long, hyaline; achene much narrower than the perigynium and less than one-half of its length, oblong-obovoid, sharply angled, sides concave,

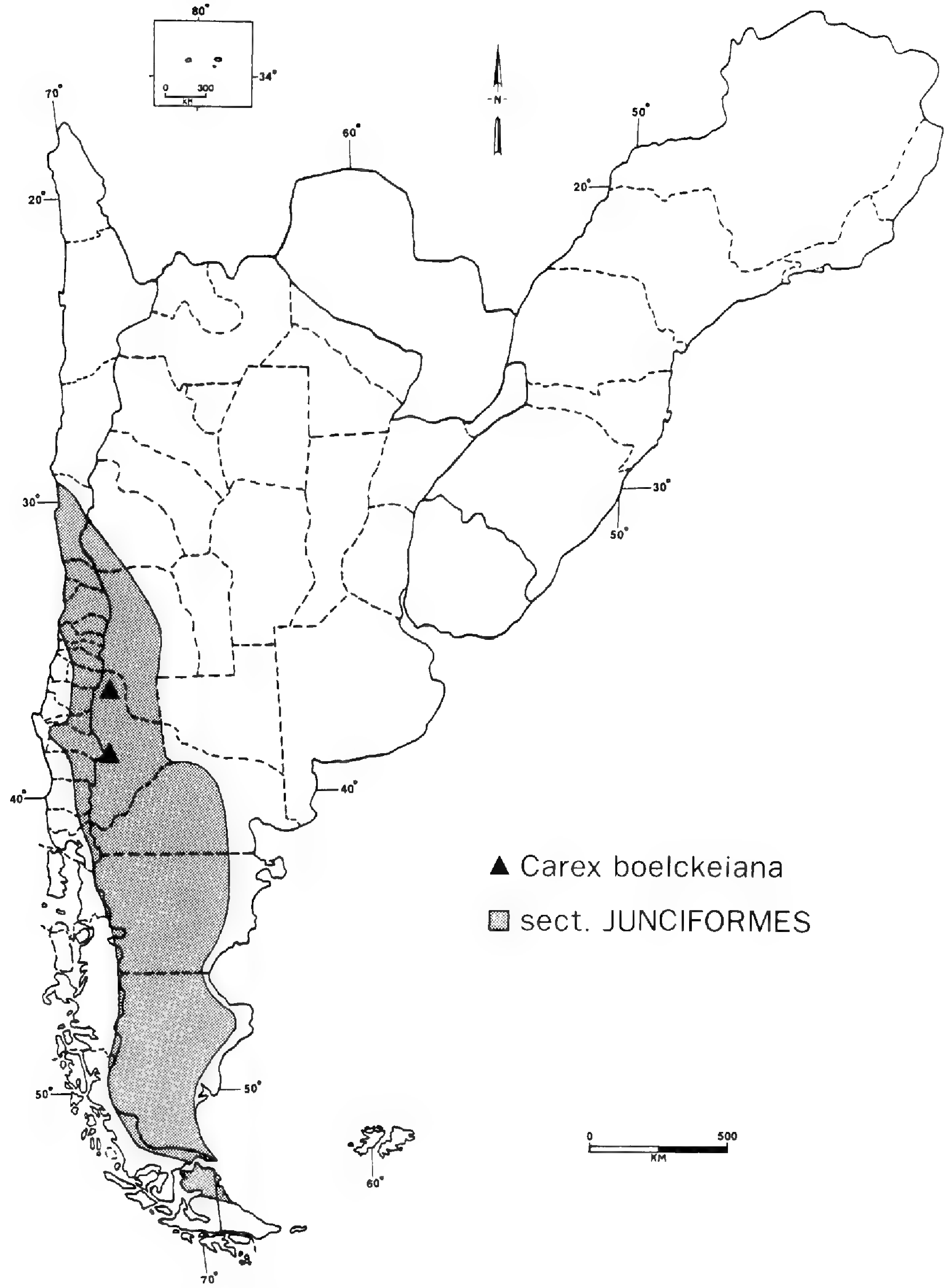

FIG. 1. Map of southern South America showing the distribution of *Carex boelckeiana* and the generalized range of members of *Carex* sect. *Junciformes*. [Stippling denotes the major area of concentration for members of sect. *Junciformes*, but isolated populations do occur outside this demarcation; for example, one species that occurs primarily in Chile is also reported from Peru.]

somewhat stipitate; rachilla setiform, exceeding the achene; stigmas 3; inflorescence bractless; pistillate scales membranaceous, ovate, the apex obtuse to acuminate or slightly cuspidate; leaf sheaths light brown; and rhizomes elongate.

Unlike the two members of sect. *Inflatae*, both of which are endemic to western North America, all known members of sect. *Junciformes* are indigenous to South America (Fig. 1). Kükenthal (1909) placed five species and two varieties in this section, and the remainder have been assigned by Barros (1948, 1957) and Wheeler (1986, in press). Ten of the twelve taxa in the section are tristigmatic, one is strictly bistigmatic, and the remaining one is mostly bistigmatic although it sometimes bears perigynia with three-branched styles (Wheeler in press). Based on a recent examination of all twelve taxa, sect. *Junciformes* is characterized by: perigynia semi-coriaceous, the body obovate to pyriform or broadly elliptical to subglobose, little if at all inflated, margins smooth or scabrous, two veins prominent, these sometimes bordered by greenish strips, the remaining veins obscure or sometimes a few to several visible; perigynium beak lacking or distinct; achene nearly filling the perigynium, obovoid, blunt on the angles, sides more or less straight, sessile to short-stipitate; rachilla setaceous or relatively broad, much shorter than the achene to greatly exceeding it; inflorescence subtended by one or more bracts or bractless; pistillate scales membranaceous to semi-indurate, ovate to broadly ovate or lanceolate, the apex acute to acuminate to cuspidate or awned; leaf sheaths pale brown to dark brown and sometimes reddish-tinged; and rhizomes short or elongate.

From the descriptions and discussion presented above, it is abundantly clear that sect. *Inflatae* and sect. *Junciformes* differ considerably in regard to morphology. Supported by this knowledge, I will first attempt to show that *C. boelckeiana* is not closely related (i.e., it is not morphologically similar) to *C. breweri* and *C. engelmannii*, and then present a case (based on morphological similarities among taxa) that it more properly belongs in sect. *Junciformes*. Based on an examination of the holotype (Fig. 2), *C. boelckeiana* is characterized by: perigynia broadly elliptical to suborbicular, semi-coriaceous, flattened (except where distended over the trigonous achene); 2 veins prominent, each bordered by a greenish strip; perigynium beak 0.1 – 0.2 mm long, semi-coriaceous, brown; achene slightly narrower than the perigynium and approximately one-half of its length, blunt on the angles, sides more or less straight, subsessile; rachilla ovate, much shorter than the achene; inflorescence subtended by 1 – 3 bracts, the longest sometimes reaching 20 mm; pistillate scales semi-indurate, lanceolate, the apex mucronate; leaf sheaths dark brown; and rhizomes short.

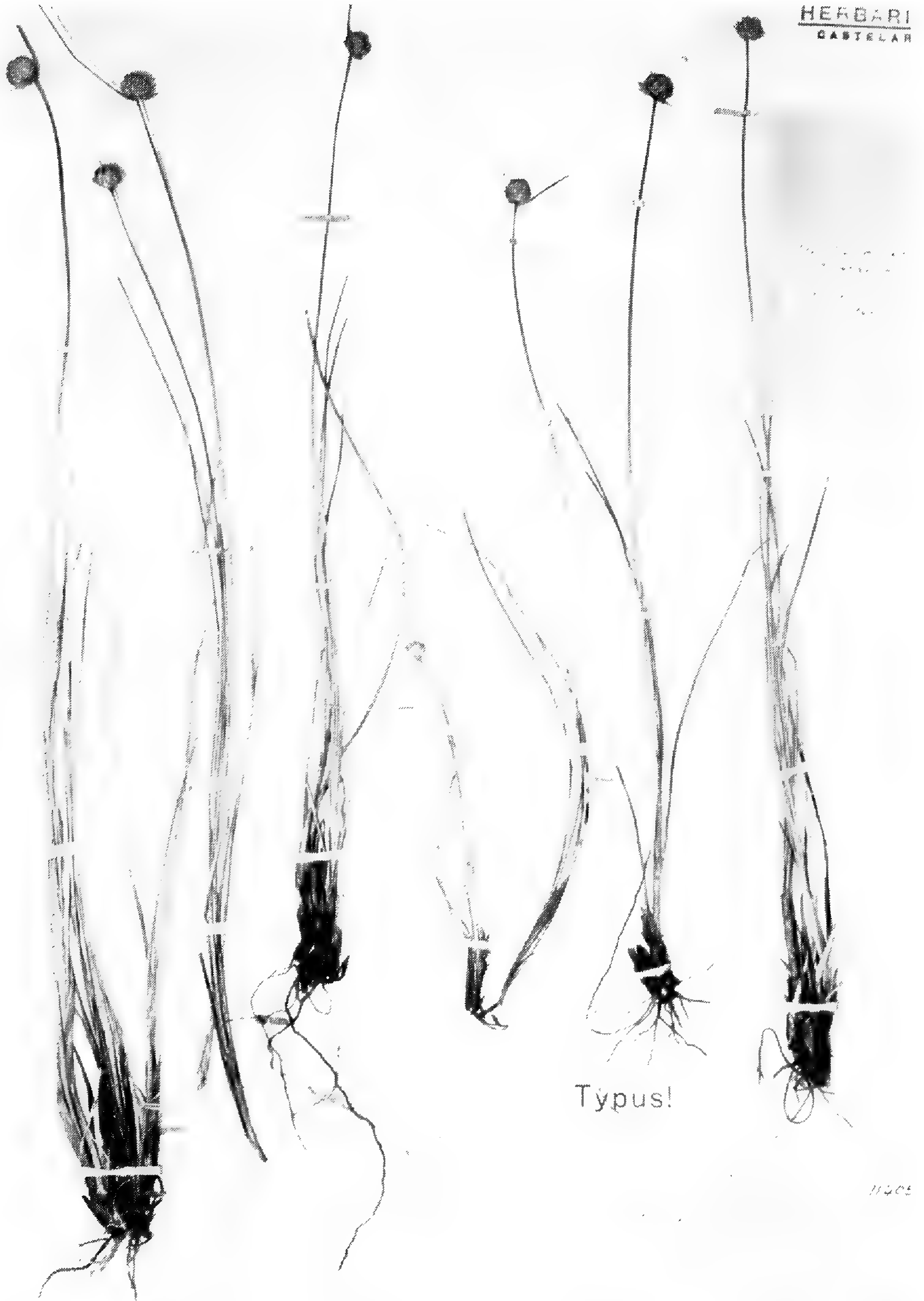

FIG. 2. Holotype specimen of *Carex boelckeiana* Barros (*Boelcke 11405*). Herb. BAB.

To prevent possible confusion to the reader, as well as to clarify a discrepancy between what is reported in the literature and what is written in this paper, two perigynium characteristics (i.e., texture, veination) of *Carex boelckeiana* will be discussed here in more detail. Barros (1969, p.70) described the perigynia of *Carex boelckeiana* as "papiráceos" and reported them to be similar to those of the North American members of sect. *Inflatae*. However, I have found the texture of the perigynium in *C. boelckeiana* to be quite unlike that of the perigynia in *C. breweri* and *C. engelmannii*. For example, transmitted light passes readily through the diaphanous perigynium of both members of sect. *Inflatae* (i.e., the enclosed achene and rachilla are distinctly visible), whereas the same type of light passes with much more difficulty through the semi-opaque perigynium of *C. boelckeiana* (i.e., the rachilla is not visible and the achene only indistinctly so). Furthermore, the perigynium of both members of sect. *Inflatae* is easily ruptured when teased, whereas the comparatively "harder" perigynium of *C. boelckeiana* is not easily torn.

In regard to veination, while the ventral face of the perigynium in *Carex boelckeiana* is veinless, 2 prominent veins run down the dorsal face (the rest obscure), these widely separated and situated near opposite edges of the body and each bordered by a greenish strip. It is suggested here that the 2 prominent "dorsal" veins are actually lateral (or marginal) veins that have been displaced due to stretching of the perigynium walls, which in turn is the result of pronounced flattening of the perigynium. In *C. vallicola* Dewey and its var. *hidalgensis* F.J. Herm. (sect. *Bracteosae*) the lateral veins are also displaced, but in that North American species the 2 prominent veins run down the ventral face as a result of pronounced dorsal bulging of the perigynium (Hermann 1974, p. 28). In contrast to the veination in *C. boelckeiana*, the lateral veins of the perigynium in both member of sect. *Inflatae* are only slightly thickened and are never bordered by greenish strips; furthermore, in both species a few additional weak veins are sometimes visible on one or both faces of the perigynium.

Some of the other differences between *Carex boelckeiana* and the two members of sect. *Inflatae* are also briefly discussed here. The small achenes in both members of sect. *Inflatae* are stipitate and are rather loosely enveloped by the more or less inflated perigynia, and the accompanying rachilla is setaceous and generally exceeds the achene. By contrast, in *C. boelckeiana* the comparatively larger achenes are subsessile and are tightly enveloped by the pronouncedly flattened perigynia, and the rachilla is ovate and usually much shorter than the achene. The relatively broad rachilla and rather large achenes of *C. boelckeiana* are features difficult to reconcile in sect. *Inflatae*. Also, the semi-indurate scales and bracts subtending the inflorescence are features of *C. boelckeiana* that do not fit easily into sect. *Inflatae*.

Taking into account all of the features of *Carex boelckeiana* that are anomalous in sect. *Inflatae*, retaining the species in the *Inflatae* group is untenable. Also, with the exception of (1) the size and general shape of the perigynia and (2) the achene being narrower and shorter than the perigynium, *C. boelckeiana* shares few other features in common with the two members of sect. *Inflatae*.

Physiognomically, *Carex boelckeiana* closely resembles some members of sect. *Junciformes*, particularly *C. andina* Philippi. Features shared in common by these two species are: spike androgynous, hemispherical to subglobose, pistillate part several- to many-flowered, staminate part inconspicuous, subtended by 1 – 3 bracts; perigynia with 2 prominent veins, each bordered by a greenish strip, the remaining veins obscure; perigynium beak very short; achenes obovate, trigonous, blunt on the angles, the sides more or less straight, subsessile; rachilla relatively broad, shorter than the achene; pistillate scales semi-indurate, lanceolate, cuspidate; culms terete, smooth, striate, stiff; leaves generally shorter than the culms, mostly basal, the blades linear, canaliculate proximally, more or less flattened distally, the margins scaberulent to scabrous (at least distally); leaf sheaths glabrous, dark brown, the inner band hyaline or pale brown, smooth at the mouth; plants cespitose, with short rhizomes; and stigmas 3.

The features of *Carex boelckeiana* fit reasonably well into sect. *Junciformes*, but two characters that appear (at least superficially) to be anomalous in this section are (1) the pronounced flattened perigynia and (2) the achene being smaller than the perigynium (i.e., it is slightly narrower than the perigynium and it fills only about one-half of the body). Is it possible that due to severe flattening the perigynia of *C. boelckeiana* look quite unlike those of its closest related congeners (which is here believed to be members of sect. *Junciformes*)? It is hypothesized that stretching of the perigynium walls in *C. boelckeiana* has resulted in (1) the 2 prominent lateral veins being displaced abaxially, (2) the broadly elliptical to suborbicular shape of the perigynium, and (3) the fact that the perigynium is somewhat larger than the achene. Some support for this hypothesis comes from the structures enclosed within the perigynium. Stretching of the perigynium walls presumably would have little (if any) affect on the enclosed achene and rachilla, and, indeed, both of these structures in *C. boelckeiana* are very similar to those in members of sect. *Junciformes*.

In conclusion, the features of *Carex boelckeiana* that "appear to be anomalous" in sect. *Junciformes* do not deter the author from suggesting placement for this species in the *Junciformes* group, and particularly since all other observable features of the plant seem to indicate close relationship with the members of this section. Wood (1972) and Raven (1972) stressed that an accurate taxonomic framework is a prerequisite in the study of plant disjunctions. Although Barros (1969) claimed that *C. boelckeiana* is related (i.e., morphologically similar) to the North American members of sect. *Inflatae*, this study shows that it is an anomaly in sect. *Inflatae*, thus negating Barros' claim that the *Inflatae* group is represented in South America. Finally, with *C. boelckeiana* placed in sect. *Junciformes*, one is pleasantly saved from having to postulate long-distance dispersal or complicated orographic migration to explain the occurrence of this species on the South American continent.

Specimens examined: *Carex boelckeiana*. ARGENTINA. PROV. NEUQUÉN: **Dpto. Minas**, Piedra del Gallo, 36°42′30″S, 70°30′W, 2050 m, 30 – Jan – 1964, *Boelcke 11405* (HOLOTYPE: BAB); **Dpto. Picunches**, Pino Hachado, Portezuelo Sanguileo, 20 – Feb – 1983, *León 3409* (BAA).

ACKNOWLEDGMENTS

I want to thank the curator and director of the Departmento de Botánica Agrícola, I.N.T.A., Castelar, for the loan of the holotype of *Carex boelckeiana*; also, the curators and directors of those herbaria whose specimens were used to draw the generalized range of sect. *Junciformes:* B, BAA, BAB, BM, C, DS, F, GH, H, HIP, K, L, LIL, LP, MICH, MIN, MO, NA, NY, P, RNG, S, SGO, SI, UC, UPS, and US.

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REVIEW

ARONSON, J. K. 1985. An account of the foxglove and its medical uses, 1785 – 1985. 399 pp. Oxford University Press, New York. ISBN 0-19-261501-7. Hardbound, $45.00.

The first part of the book is a facsimile of William Withering's monograph *An Account of the Foxglove and some of its Medical Uses: with Practical Remarks on Dropsy, and other Diseases* to which the author has added annotations that help to elucidate certain aspects of that time period in relation to current conditions.

The second half of the book is an account of the history of the use of the digitalis glycosides and related compounds over the last 200 years. "I have hoped thereby to learn something about how modern practice has been influenced and about what we can learn about our own practices through a knowledge of the previous habits of others." (Preface)

The second half is divided into Part I, II, & III. Part I is the Introduction with Chapter 1 entitled "The Foxglove as Flower and Herb." Sections within Chapter 1 are: The Botany of Foxgloves, Terminology, Naming the Flower, The Foxglove in Literature, The Cardiac Glycosides in *Digitalis* Plants, The Pharmacology of Digitoxin and its influence on Withering's Methods of Treatment with the Foxglove, and Digitalis Toxicity. Chapter 2, "Uses of the Foxglove before Withering," includes topics on: Use of the Foxglove in Tuberculosis, Use of the Foxglove in Epilepsy, and Use of the Foxglove in Dropsies.

Part II, "William Withering of Birmingham", begins with Chapter 3 by the same title with a biographical sketch. The next section discusses "Withering's Other Scientific Activities" followed by "Withering's Character" and a "Chronology of Withering's Life and Publications." Chapter 4: "Withering's Discovery and Use of the Foxglove," Chapter 5: "Attitudes to the Use of the Foxglove in Withering's Lifetime".

Part III, "Attitudes to the Foxglove after Withering's Death" begins with Chapter 6 entitled "The Nineteenth Century," Chapter 7, "The Twentieth Century, 1900 to 1950," Chapter 8, "The Twentieth Century from 1950," and Chapter 9, "Envoi," followed by the bibliography and three indices.

In the preface the author states that he wrote this book to celebrate the 200th anniversary of the publication in 1785 of Withering's monograph. "Withering's *Account of the Foxglove* is the first English text in which the therapeutic effects of a drug are described in detail and its therapeutic usefulness discussed. I believe that it stands a a model for all subsequent such accounts, given the state of the practice of medicine at the time in which it was written, and it deserves commemoration as such."

This book is interesting and readable for anyone interested in the history of the trials and tribulations of the numerous endeavors encountered from the leaf harvest to the final manufacture of the drugs. With the same drug content, various altered formulations resulted in different absorption rates and finally to the introduction of pharmacopoeial standards for the manufacturers.—WFM

NEW TAXA OF *EUPATORIUM* SECT. *DALEA* (COMPOSITAE: EUPATORIEAE)

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ABSTRACT

Eupatorium yashanalense sp. nov. from Chiapas, Mexico differs from *E. conzatti* and *E. lozanoanum* in its terete stems, ovate leaves, spirally inserted phyllaries and glabrous achenes; **E. parviflorum** var. **monticola** var. nov. from Blue Mountain Peak, Jamaica, differs from var. *parviflorum* in its smaller narrower leaves and its small condensed inflorescences.

In the course of preparing a monograph of *Eupatorium* sect. *Dalea* (Whittemore 1987) I have come across two new taxa which I publish here in advance of the complete monograph. I am following McVaugh (1982) in treating *Eupatorium* broadly; if the classification of King and Robinson (1987) is accepted, both of these taxa would fall into the segregate genus *Critonia*.

EUPATORIUM **yashanalense** A.T. Whittemore sp. nov. Fig. 1.

Eupatorio lozanoano similaris, sed foliis ovatis vel elliptico-ovatis, 5 1/2 – 7 1/2 cm latis, trinervibus; phyllariis spiralibus; acheniis glabris vel fere glabris.

Shrub or climber to 5 m tall; stem to 1 1/2 – 3 mm in diameter, terete or nearly so, lightly striate, glabrous, greenish brown to brown, usually pithy but hollow when large. Phyllotaxy decussate; petiole to 8 – 11 mm long, dorsally channelled; lamina membranous, ovate to elliptic-ovate, to 11 – 16 cm long, to 5 1/2 – 7 1/2 cm wide, 2 – 3 times as long as wide, widest about 0.3 above the base, trinerved from the base, the lateral veins strong to the base of the acumen, the secondary veins almost transverse; apex slenderly acuminate, base obtuse to rounded-obtuse, margins serrate; veins and petiole yellow-green to brown, sometimes with a few scattered hairs, lamina dark green, glabrous, rendered punctate by translucent resin cavities along veinlets and in the areoles, resin cavities mostly isodiametric, 40 – 70 μm wide. Inflorescence a leafy panicle of several hundred heads, its branches glabrous; heads sometimes rather crowded but never densely glomerate, sessile or pedicellate, 8 – 9 mm long, 2 – 3 mm wide, 5-flowered; involucre 6 – 8 mm long, phyllaries spirally arranged in 4 – 5

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series, glabrous or the margins bearing short hairs, in texture delicate and membranous margined, green, lightly ca. 5-striate, apices rounded, the phyllaries graduated in length, the outermost ovate, the innermost oblong linear, the inner phyllaries decidous; receptacle 0.3 mm wide, its summit flat, glabrous, without sclerotization. Corolla tubular, 4 – 4 1/2 mm long, glabrous, its lobes triangular, 0.4 – 0.6 mm long; anther appendages well developed, about 0.3 mm long, about twice as long as wide, rounded apically; style branches filiform, smooth, stigmatic for less than half of their length; pappus bristles ca 30 – 35 per achene, 4 – 5 mm long, their tips weakly broadened and flattened. Achene clavate, 5 ribbed, glabrous or with a few hairs at the summit of the ribs, 3.0 – 3.3 mm long; carpopodium cylindrical, 30 – 70 μm high, set off by a strong constriction above, its upper margin sharp.

Ecology and distribution: Steep humid slopes, tropical evergreen forest or *Pinus* - *Quercus* - *Liquidambar* forest, ca 2000 m elevation; endemic to the highlands of northern Chiapas, Mexico.

TYPE: MEXICO. CHIAPAS: Municipio of Tenejapa, evergreen cloud forest with *Pinus*, *Quercus* and *Liquidambar* near paraje Yashanal; plant sprawling in trees. 28 January 1981, *D.E. Breedlove 49640* (HOLOTYPE: CAS; ISOTYPES: [according to Breedlove *in lit.*] MEXU, MO).

Additional specimens: CHIAPAS: Municipio of Rayon, steep slopes near Puerto del Viento, 15 km NW of Pueblo Nuevo Solistahuacan along hwy 195 to Tapilula, 1800 m, *R.F. Thorne and E. Lathrop 41760* (CAS), *D.E. Breedlove 12005* (CAS, MICH); Municipio of Rayon, La Selva Negra, ca 17 km NW of Pueblo Nuevo Solistahuacan, 1800 m, *F. Miranda 9180* (US).

This species seems to be most closely related to *E. conzattii* Greenm. and *E. lozanoanum* B.L. Rob., neither of which is found in Chiapas. *E. conzattii* differs in its 6-angled stem, *E. lozanoanum* in its lanceolate leaves which are at least 4 times as long as wide and its pubescent achenes, and both differ in their decussate rather than helically inserted phyllaries. The name is derived from the type locality.

EUPATORIUM PARVIFLORUM Sw. var. **monticola** A.T. Whittemore var. nov.

Folia petiolis 6 – 10 mm longis, lanceolato-elliptica vel lanceolata, 8 – 10 cm longa, 2 – 2 1/2 cm lata; inflorescentia parva, condensata, capitulis congestis, quinquefloribus.

Shrub or small tree, bark ash-gray; young stem ca 3 mm in diameter, brown, glabrous (at least when mature), 6-angulate, pith solid. Phyllotaxy decussate; petiole to 6 – 10 mm long, grooved dorsally, lamina membranous, drying dark brown or blackish, lance-elliptical to lanceolate (occasionally weakly oblanceolate), to 8 – 10 cm long, to 2 – 2 1/2 cm wide, 4 – 5 times as long as wide, widest 0.4 – 0.6 above the base, venation

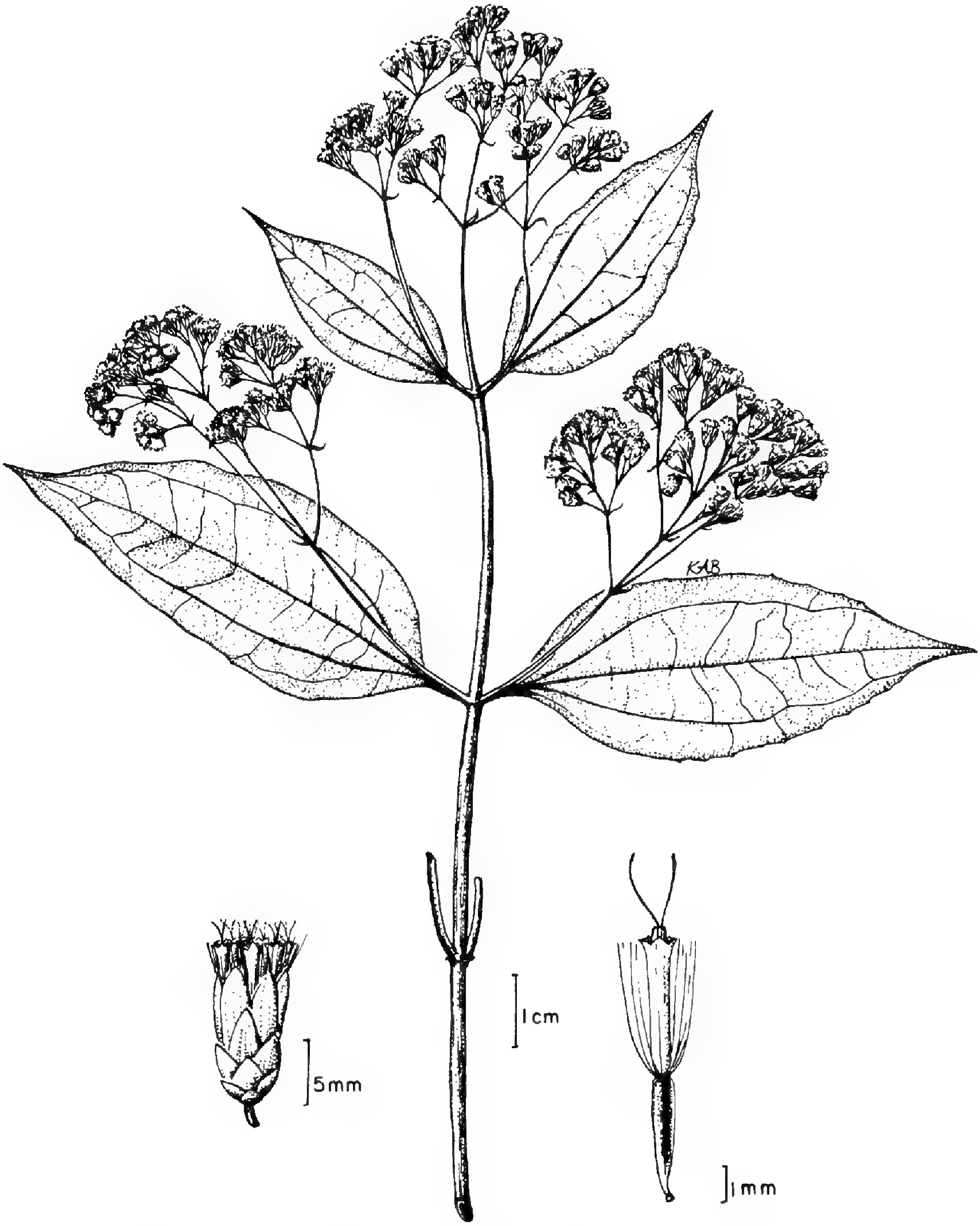

FIG. 1. *Eupatorium yashanalense* sp. nov., from the holotype.

pinnate; apex acuminate, base acuminate, margins serrate; leaves glabrous (sometimes with a few very inconspicuous appressed hairs), rendered punctate by crowded resin cavities along the veins and in the areoles, the largest 100 – 150 μm wide and sometimes greatly elongated, the smallest isodiametric and about a quarter as wide. Inflorescence a terminal panicle of 100 – 300 heads, the bracts very much smaller than the foliage leaves, the branches crisped-pubescent, heads densely glomerate, sessile, 5 1/2 – 6 mm long, 2 1/2 – 3 1/2 mm wide, 5-flowered; involucre 5 mm long, phyllaries spirally arranged in 3 – 4 series, glabrous, in texture delicate and membranous margined, brown to dark purplish brown, lightly to distinctly 5-striate, apices rounded, the phllaries graduated in length, the outermost ovate to elliptical-ovate, the innermost narrowly oblong-elliptical, the inner phyllaries deciduous; receptacle 0.3 mm wide, its summit flat, glabrous, without sclerotization. Corolla tubular, 2 – 3 mm long, glabrous, its lobes long-triangular, 0.6 mm long; anther appendages to 0.1 mm long, half to two-thirds as long as wide, rounded to retuse; style branches weakly clavate, smooth or nearly so, stigmatic for less than half their length; pappus bristles 25 – 30 per achene, very irregular in length and thickness, the longest 2 – 3 mm long, well developed bristles mostly flattened for their whole length, sometimes forked, their apices mostly not tapering to a slender point. Achene strongly clavate, 5-ribbed, sparsely pubescent over the whole pericarp, 1.5 – 2 mm long, carpopodium none.

Wet montane forests, flowering September through November, endemic to Blue Mountain Peak, Jamaica, from 1800 – 2000 m elevation.

TYPE: JAMAICA. ST. THOMAS: upper west slope of Blue Mountain Peak, 6500 – 7000 feet, mossy montane woodland; small tree, heads whitish; September 18, 1963; *George R. Procter 24027* (HOLOTYPE: TEX; ISOTYPES: GH, MICH).

Additional specimens: JAMAICA. Parish unknown: without locality, *J. H. Hart s.n.* (F, NY); without locality, 6000 feet, *J.H. Hart 352* (US). ST. THOMAS: west slope of Blue Mountain Peak, 6000 – 7000 feet, *George R. Proctor 9438* (GH, NY); same locality, 6500 feet, *G.R. Proctor 7224* (US).

This variety corresponds to the "montane" variant of Adams (1972). The typical variety, *E. parviflorum* var. *parviflorum*, differs from var. *monticola* in its larger, broader leaves (commonly with the petiole over 15 mm long and the lamina to 15 – 23 cm long, 1.7 – 3 times as long as wide), its mostly 2- to 3-flowered heads, its much broader, laxer inflorescences and its occurrence at lower elevations (usually below 1000 m). Two apparently intermediate specimens have been seen (Jamaica: Blue Mtn. Peak, 2420 m, Shreve *s.n.* [NY]; New Haven Gap, Britton 143 [NY]).

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REVIEW

ATTA-UR-RAHMAN, H. M. SAID, & V. U. AHMAD (Editors). 1986. Pakistan Encyclopaedia Planta Medica. Vols. 1, 2. Hamdard Foundation Press, Hamdard Centre, Nazimadad, Karachi-18, Pakistan. Pak. Rs. 300/$US 50, per vol.

This joint research project of Hamdad Foundation Pakistan and H.E.J. Research Institute of Chemistry was initiated in 1983. "A computer assisted compilation has been made in Chicago (NAPALERT) but this relates only to work carried out mainly after 1977. It was therefore considered desirable to produce a more comprehensive work which would provide research workers with an encyclopaedic series of volumes on which they could base their future researches, and which would bring into focus those aspects of medicinal plants of Pakistan towards which their efforts should be directed... The first volume covers 94 out of 217 medicinal plants of Pakistan beginning with the alphabet "A" and containing almost five thousand references to the original literature was published in early

1986. The present volume covers 65 medicinal plants and contains some six thousand references to the original literature. In addition to references to journals, references to Chemical Abstracts have also been included. Work on the remaining plants of "A" series has also been completed and the volume relating to them would be published within the few months (Foreward, vol. 2)."

Of the 217 medicinal plants of Pakistan selected for inclusion in the series, several cosmopolitan cultivated plants are included such as *Allium ampeloprasum* (Wild leek), *A. cepa* (Onion), *A. sativum* (Garlic), *Arachis hypogaea* (Peanut), *Albizzia julibrissin* (Silk-tree), *Aloe vera* (Aloe vera), and *Anthemis cotula* (Chamomile). Common names, if known, are given in the native language and I have inserted one of the English common names known for each of the above taxa.

Each listing, alphabetical by genus, then species, lists Common name (when known), Synonymy, Family, Occurrence within Pakistan, Chemical constituents, Pharmacological activity, Uses in indigenous medicine, and References.

Arachis hypogaea has the most references (2903) with *Allium cepa* second with 575 and *Allium sativum* third (377). Only one mushroom (*Agaricus campestris*) is included with the others being vascular plants. The references are numbered and within brackets following comments within the sections.

The colored plates (12 in vol. 1; 13 in vol. 2), depicting habitat, habit, inflorescence (flowers and/or fruit) where appropriate, are of poor quality in the reproduction as viewed in our copies. In Volume 1, the legends of *Acalypha* and *Acacia* are reversed.

The volumes are hard bound and our copy of Volume 2 has a repeat of the contents of Volume 1 on the spine. Volume 2 should read "Alli - Arac" on the spine. Perhaps our review copies are the rejects and imperfect ones.

"It is therefore hoped that this series of volumes would catalyse further researches to find out the active principles which are responsible for the various biological activities in the plant extracts, and thus lead to the discovery of new and more powerful drugs for the treatment of various diseases which afflict mankind today (Forward, vol. 1).

This series should prove to be a valuable aid in selecting those taxa that are producing chemical compounds that are potentially antitumoric, etc. for further study that is expressed in the Foreword. I hope that this series is completed and does not succumb after these first volumes.—WFM.

THE VASCULAR FLORA OF CENTRAL FLORIDA: TAXONOMIC AND NOMENCLATURAL CHANGES, ADDITIONAL TAXA, II[1]

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ABSTRACT

Forty-one taxa new to the vascular flora of central Florida are reported, 19 of which are exotics and nine reported for the first time for the state. Twenty nomenclatural or taxonomic changes are also included.

Since the publication of *Guide to the Vascular Plants of Central Florida* (Wunderlin 1982), additional taxa have been discovered, based largely upon recent botanical explorations within the geographic region of that *Guide*. In addition, taxonomic studies by various investigators require nomenclatural changes for some taxa already recognized in the *Guide*. Wunderlin et al. (1985) reported 51 additional taxa and 65 nomenclatural changes. Subsequent to the publication of that paper, 41 additional taxa and 20 nomenclatural changes have been noted and are presented below. Nineteen taxa of these 41 taxa represent exotic introductions, and nine taxa are new to Florida.

NOMENCLATURAL AND TAXONOMIC CHANGES

POACEAE

PASPALUM DISTICHUM L. = *Paspalum paspalodes* (Michx.) Scribner—Since the discovery that the Linnean type of *P. distichum* is a mixed collection, considerable controversy has been generated concerning the application of the name. The ICBN Committee for Spermatophyta (Taxon 32:279−284. 1983) ruled that the first lectotypification, that of Guedes (1976) must stand, thus *Paspalum distichum* is retained in the traditional sense. Therefore, *Paspalum paspalodes* is reduced to synonymy under *Paspadum distichum* and at the same time *P. vaginatum* is reinstated to apply to material called *P. distichum* in Wunderlin (1982).

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[1] This paper is Florida Agricultural Experiment Station Journal Series No. 8229.

SIDA 13(1):83−91. 1988.

PASPALUM VAGINATUM Sw.—*Paspalum distichum* L. misapplied in Wunderlin (1982); see above.

ROTTBOELLIA COCHINCHINENSIS (Lour.) W. Clayton = *Rottboellia exaltata* L. f.—The decision by the ICBN Committee for Spermatophyta (Taxon 34:659–708. 1985) not to conserve the later name, *Roettboellia exaltata*, for this troublesome weedy species means that the earlier name must now be employed.

SCHIZACHYRIUM SANGUINEUM (Retz.) Alston = *Schizachyrium hirtiflorum* Nees—Following Clayton (1972), *S. hirtiflorum* is considered a synonym of the wide-ranging, variable *S. sanguineum*.

ZEA MAYS L. subsp. MEXICANA (Schrader) Iltis = *Euchlaena mexicana* Schrader—Following Iltis & Doebley (1980), this is the correct name when wild and cultivated taxa of corn are combined as a single species.

BROMELIACEAE

Luther (1985) proposed a hybrid origin for the following two *Tillandsia* taxa.

TILLANDSIA X FLORIDANA (L.B. SMITH) LUTHER = *Tillandsia fasciculata* var. *floridana* L.B. Smith—The putative parents are *T. fasciculata* var. *densispica* Mez and *T. bartramii* Elliott.

TILLANDSIA X SMALLIANA Luther—Florida plants previously referred to *T. polystachya* (L.) L. are in fact hybrids of *T. balbisiana* Schultes and *T. fasciculata* var. *densispica* Mez. True *T. polystachya* is a common tropical American species not known to occur in Florida.

TILLANDSIA VARIABILIS Schldl. = *Tillandsia valenzuelana* A. Rich.—The name *T. variabilis* Schldl. (Linnaea 18:418. 1844) has priority over the well known *T. valenzuelana* A. Rich. (Hist. Fis. Cuba, Bot. 11:267. 1850). (H. Luther, pers. comm.).

BRASSICACEAE

BRASSICA RAPA L. var. CAMPESTRIS (L.) Koch = *Brassica campestris* L.—Our taxon should be considered a variety of *B. rapa* L. (Al-Shehbaz 1985).

FABACEAE

BAPTISIA ALBA (L.) Vent.—The name *B. lactea* (Raf.) Thieret has been shown to be misapplied to our plant. In turn, southeastern material formerly determined as *B. alba* must now be called *B. albescens* Small (Isely 1986a).

LUPINUS WESTIANUS Small var. ARIDORUM (McFarlin ex Beckner) Isely = *Lupinus aridorum* McFarlin ex Beckner—*Lupinus aridorum* is treated as a variety of *L. westianus* because it apparently differs from that species only in flower color, habitat, and geography (Isely 1986b).

MEDICAGO POLYMORPHA L.—Specimens from Volusia County previously determined as *M. arabica* All. are now identified as *M. polymorpha*. The former must be deleted from the flora. Additional material of *M. polymorpha* has been seen from Hillsborough County. *Medicago polymorpha* is native to the Old World. Volusia Co.: *Baltzell 5931* (FLAS); *Moulton s.n.* (FLAS, USF); Hillsborough Co.: *Lassiter & Lassiter 2191* (USF).

ORBEXILUM LUPINELLUM (Michaux) Isely = *Psoralea lupinella* Michaux—Stirton (1981) restricts *Psoralea* to about 20 species in South Africa. Isely (1986a), accepting this, recognizes the New World species previously placed in this genus to comprise the genera *Orbexilum, Pediomelum*, and *Psoralidium*.

SCHRANKIA MICROPHYLLA (Dryander ex Smith) Macbr. var. FLORIDANA (Chapman) Isely = *Schrankia uncinata* Willd.—This taxon is weakly distinct from the widespread and variable *S. microphylla* and is best treated as a variety of that species (Isely 1986).

VIGNA SPECIOSA Kunth—Plants reported as *Vigna caracalla* (L.) Verdc. are this species according to D. Isely (pers. comm.).

ASCLEPIADACEAE

MATELEA FLORIDANA (Vail) Woodson—Specimens from central Florida previously determined as *M. caroliniensis* (Jacq.) Woodson have been determined by Donald J. Drapalik (Georgia Southern College, Statesboro) to be this species. *Matelea caroliniensis* is excluded from the flora.

ACANTHACEAE

DICLIPTERA SEXANGULARIS (L.) A.L. Juss. = *Dicliptera assurgens* (L.) A.L. Juss.—The basionym of *D. sexangularis* (*Justicia sexangularis* L., Sp. Pl. 16. 1753) predates that of *D. assurgens* (*Justicia assurgens* L., Syst. Nat. ed. 10. 850. 1759).

ASTERACEAE

PECTIS GLAUCESCENS (Cass.) Keil = *Pectis leptocephala* (Cass.) Urban—The basionym of *Pectis leptocephala* is predated by *Chthonia glaucescens* Cass; Keil (1986) made the required combination in *Pectis*.

PTEROCAULON PYCNOSTACHYUM (Michaux) Elliott—Accepting D'Arcy's (1975) treatment of this taxon as part of a single variable species, *Pterocaulon virgatum* (L.) DC. was adopted for the central Florida material by Wunderlin (1982). Upon further review of the specimens and following prevailing opinion, it appears that *P. virgatum* should be applied to a tropical American species while the name *P. pycnostachyum* should be reinstated for ours.

THYMOPHYLLA TENUILOBA (DC.) Small = *Dyssodia tenuiloba* (DC.) Robinson—Because of his reevaluation of morphological and cytological data, Strother (1986) splits the artificial genus *Dyssodia* into several segregate genera. Our material is placed in the genus *Thymophylla*.

TAXA NEW TO CENTRAL FLORIDA

POACEAE

Study of University of Florida and University of South Florida specimens of *Aristida* by K.W. Allred for the Vascular Flora of the Southeastern United States revealed the following six additional taxa. (See also Allred 1986).

ARISTIDA LONGESPICA Poiret—Hardee Co.: *Baltzell 7002* (FLAS). Hillsborough Co.: *Hansen et al. 6764* (USF).

ARISTIDA PALUSTRIS (Chapman) Vasey—Charlotte Co.: *Frye s.n.* (FLAS). DeSoto Co.: *West s.n.* (FLAS). Hendry Co.: *Davis s.n.* (FLAS). Hillsborough Co.: *DuBois 79-7-25* (USF); *Nash s.n.* (FLAS). Indian River Co.: *Kral 5572* (USF). Lee Co.: *Davis s.n.* (FLAS). Manatee Co.: *Rugel 380* (FLAS); *Shuey 1725* (USF). Sumter Co.: *Rochow s.n.* (USF).

ARISTIDA PURPURESCENS Poiret var. TENUISPICA (A. Hitchc.) Allred-Brevard Co.: *Shuey & Poppleton 1565* (USF); *Shuey & Poppleton s.n.* (USF). Charlotte Co.: *Frye s.n.* (FLAS); *Hansen & Richardson 6816* (USF). Hardee Co.: *Kirk s.n.* (FLAS). Hendry Co.: *Davis s.n.* (FLAS). Highlands Co.: *Brass 15740* (FLAS). Hillsborough Co.: *Lakela 31739* (USF); *Shuey 1507* (USF); *Shuey s.n.* (USF). Indian River Co.: *Lakela 26598* (USF); *Wunderlin & Beckner 6522* (USF). Lake Co.: *Ray 10507* (USF). Lee Co.: *Lakela et al. 30583* (USF). Manatee Co.: *Perdue 1790* (USF). Marion Co.: *Godfrey 76838a* (FLAS). Okeechobee Co.: *Brass 15570* (FLAS). Pinellas Co.: *Fleming & Genelle 3252* (USF); *Fleming 3382* (USF). Polk Co.: *Shuey 2270* (USF). Volusia Co.: *Hood s.n.* (FLAS).

ARISTIDA PURPURESCENS Poiret var. VIRGATA (Trin.) Allred—Brevard Co.: *Shuey M0905* (USF). Hillsborough Co.: *Lakela 26228* (USF); *Lakela 26519* (USF). Levy Co.: *Swallen s.n.* (FLAS). Volusia Co.: *Hood s.n.* (FLAS).

ARISTIDA RHIZOMOPHORA Swallen—An uncommon Florida endemic occurring in Martin County and "north of Lake Okeechobee, Fla., *Weatherwax 1081*" (Hitchcock 1950), probably Okeechobee County. The species is also found in Baker, Bradford, and Clay counties in north Florida. Martin Co.: *Yarlett 141* (FLAS).

ARISTIDA SIMPLICIFLORA Chapman—Hillsborough Co.: *DuBois 78-12-30* (USF).

DIGITARIA BICORNIS (Lam.) Roemer & Schultes ex Loudon—Our material of this species had been confused with material of the closely related *D. ciliaris*. Hall (1978) restricted the species to southernmost Florida, based on Swallen's (1963) report as *D. diversiflora* Swallen. Webster (1980) called our attention to this species which is now widespread in the coastal plain, ranging from North Carolina to Texas. Brevard Co.: *Shuey s.n.* (USF).

PONTEDERIACEAE

HETERANTHERA LIMOSA (Sw.) Willd.—This is a wide ranging aquatic in North and South America. Palm Beach Co.: *Timmer s.n.* (FLAS).

SALICACEAE

SALIX HUMILIS Marshall—This northern willow ranges as far south as north Florida. Argus (1986) cites the following 1843 collection which represents the southernmost station for the species. It may no longer be extant in our area. Levy Co.: *Rugel s.n.* (NA, US, neither collection seen).

POLYGONUM PENSYLVANICUM L.—Sporadic in Florida to the north and south of our area, this species was to be expected. Hernando Co.: *van Hoek s.n.* (USF). Marion Co.: *Wunderlin et al. 9900* (USF).

BRASSICACEAE

CAPSELLA BURSA-PASTORIS (L.) Medikus—This native of southern Europe is now a nearly cosmopolitan weed. Volusia Co.: *Nett s.n.* (FLAS).

ROSACEAE

CRATAEGUS UNIFLORA Muenchh.—This species of thickets and woodlands ranges from Virginia south to northern central Florida and west to Mississippi. Marion Co.: *Wunderlin et al. 9981* (USF).

FABACEAE

LESPEDEZA STUEVEI Nutt.—This is an eastern North American species. Citrus Co.: *Schmid A-65* (USF).

TRIFOLIUM CAMPESTRE Schreber—A native of Europe and cultivated in the southeastern U.S. where occasionally naturalized. Manatee Co.: *Cuthbert s.n.* (FLAS). Volusia Co.: *Nett s.n.* (USF).

TRIFOLIUM PRATENSE L.—A native of Europe and commonly cultivated throughout temperate North America where widely naturalized. Volusia Co.: *Hood s.n.* (FLAS); *Nett s.n.* (USF).

BALSAMINACEAE

IMPATIENS CAPENSIS Meerb.—The inclusion of this frequent eastern

North American species adds a family to the flora. Polk Co.: *Gross s.n.* (FLAS).

MALVACEAE

HIBISCUS ACULEATUS Walter—This plant of the southeastern states is now known from our area. Levy Co.: *Beckner 2652* (USF).

HIBISCUS MOSCHEUTOS L. subsp. INCANUS (Wendl.) Ahles—A taxon ranging from North Carolina south just into our area. Marion Co.: *Wunderlin et al. 10000* (USF).

MALVA PARVIFLORA L.—A native of Europe, this species is well established in the southern states, but is rare in our area. Orange Co.: *Scudder 907* (FLAS).

SIDA SPINOSA L.—This is a weedy species ranging from central U.S. to central Argentina. It is frequent in cultivated fields and waste ground in our area but rarely collected. Hardee Co.: *Hansen 4894* (USF). Indian River Co.: *Scudder 1383* (FLAS).

TURNERACEAE

TURNERA ULMIFOLIA L.—A native of tropical America cultivated in Florida where occasionally escaped. Hillsborough Co.: *Santos 66* (USF). Manatee Co.: *Delaney s.n.* (USF).

OLEACEAE

FORESTIERA GODFREYI L. C. Anderson—This species of north Florida and extreme South Carolina was recently described by Anderson (1985) who cited material from Levy, Marion, and Hernando cos. To this we append an additional collection from Marion Co.: *Norman & Buckner s.n.* (USF).

GENTIANACEAE

SABATIA MACROPHYLLA Hook.—This is a southward extension of this north Florida species. Lake Co.: *Christman s.n.* (FLAS).

CONVOLVULACEAE

IPOMOEA TURBINATA Lagasca—A pantropical species that is sometimes cultivated in Florida where rarely escaped. Levy Co.: *Teem & England s.n.* (FLAS).

BIGNONIACEAE

CATALPA BIGNONIOIDES Walter—Native northwest of our area and sparingly planted but rarely naturalized here. Citrus Co.: *van Hoek s.n.* (USF).

ACANTHACEAE

ERANTHEMUM PULCHELLUM Andrews—A native of India and cultivated in Florida, the species is locally naturalized. Pinellas Co.: *Wunderlin et al. 10353* (USF).

RUBIACEAE

GUETTARDA ELLIPTICA Sw.—This tropical American species extends north along Florida's east coast in tropical hammocks. St. Lucie Co.: *Wunderlin et al. 10152.*

CUCURBITACEAE

LUFFA CYLINDRICA (L.) M. J. Roem.—The sponge gourd, native to the Old World tropics, is frequently cultivated in Florida but rarely escaped. A population was found in a thicket near an old dump. Hillsborough Co.: *Wunderlin et al. 10206* (USF).

ASTERACEAE

ASTER LATERIFLORUS (L.) Britton—A common northern species. Lake Co.: *Daubenmire s.n.* (USF). Marion Co.: *Mather s.n.* (FLAS).

COREOPSIS LANCEOLATA L.—This species is well known to the north. Volusia Co.: *Nett s.n.* (USF).

VERBESINA HETEROPHYLLA (Chapman) A. Gray—An uncommon species in northeastern Florida. Volusia Co.: *Nett s.n.* (USF).

XANTHIUM STRUMARIUM L. var. CANADENSE (Miller) Torrey & A. Gray—This variety is wide spread in North America, but is not as common in central Florida as var. *glabratum* (DC.) Cronq. Hillsborough Co.: *Lassiter & Lassiter 2221* (USF).

TAXA NEW TO THE STATE

POACEAE

BOTHRIOCHLOA ISCHAEMUM (L.) Keng. var. SONGARICA (Rupr. ex Fischer & C. Meyer) Celarier & Harlan—This Eurasian taxon is introduced in Texas and Mexico (Gould 1975). It had been cultivated at the Experimental Station of the University of Florida from the 1920's into the 1950's (Hall, 1978) and has been recently found locally established along roads in Florida. The species was initially collected in Florida in 1981 in Dade County [*Avery 2319* (FLAS)]. Hernando Co.: *Hall 1331* (FLAS); *Terry s.n.* (FLAS); *van Hoek s.n.* (USF).

COMMELINACEAE

TRADESCANTIA PALLIDA (Rose) D. R. Hunt—This native of Mexico, commonly planted as a bedding plant or ground cover, is locally established. Pinellas Co.: *Beckner 2676* (USF).

POLYGONACEAE

POLYGONUM ARGYROCOLEON Steudel ex Kunze—This native of Near and Middle East is adventive in the southern United States as well as Texas and California. Orange Co.: *Scudder s.n.* (FLAS); *Dusky s.n.* (FLAS).

CONVOLVULACEAE

IPOMOEA AQUATICA Forsskal—A sizable population of this aggressive pantropical weed has been found in a borrow pit. Manatee Co.: *Delaney & Robertson s.n.* (USF).

VERBENACEAE

VITEX NEGUNDO L.—A native of China, this species is cultivated and locally escaped in Texas (Correll & Johnston 1970) and Florida. Hernando Co.: *Lassiter & Lassiter 156* (USF).

LAMIACEAE

PLECTRANTHUS PARVIFLORUS Willd.—A native of Australia and frequently cultivated in Florida, this species has locally become established. Polk Co.: *Hall 1380* (FLAS).

ACANTHACEAE

HYGROPHILA BRASILIENSIS (Sprengel) Lindau—A native of tropical America and collected twice in the same location (1934 and 1939) in our area. The plant has not since been collected. Polk Co.: *Baker s.n.* (FLAS).

HYGROPHILA CORYMBOSA (Blume) Lindau—A native of southern Asia, introduced into the United States as an aquarium plant and escaped in south Florida. This is the first report of the species for the United States. Broward Co.: *Hendrickson & Buckley 603* (USF).

ASTERACEAE

PITYOPSIS FALCATA (Pursh) Nutt.—This species of Connecticut, Massachusetts, New Jersey, New York, and Rhode Island, was collected along a beach in St. Petersburg, Florida in 1955 (Semple 1985). An attempt by Bowers to relocate the population in 1972 has been unsuccessful. The species was apparently a waif in Florida and is probably no longer extant. Pinellas Co.: *Gunnison 2593* (fide Semple and Bowers 1985).

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NOTEWORTHY PLANTS FROM NORTH FLORIDA. III.

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ABSTRACT

The following appear to be first reports for the state of Florida: *Aristida tuberculosa*, *Bumelia thornei* (an endangered species), *Chaerophyllum procumbens*, *Centaurea maculosa*, *Desmodium nuttallii*, *Dodocatheon meadia*, *Phyla lanceolata*, *Polygonum bicorne*, *Rhus aromatica*, and *Sporobolus vaginiflorus*. A few adventive and naturalized species are also listed that could be considered new to the state. Also, 28 additions to the flora of the Florida panhandle are documented here, and several significant range extensions within the area are given.

This is the third installment of a series (Anderson 1984, 1986) to update our knowledge of the flora of the Florida panhandle and Clewell's guide (1985) to the flora. The area of coverage is from the Suwannee River west to the Alabama state line. Burkhalter (1984, 1985) Ward and Gholson (1987), and Wilhelm (1984) have also added new records from this region.

New discoveries—i.e., taxa not listed by Clewell (1985)—and range extensions are given here; a few collections appear to be first reports for the entire state. Exotics that appear to be adventive or naturalized are also listed. Voucher specimens are at FSU unless noted otherwise.

TAXA NEW TO THE AREA

ACACIA FARNESIANA L. Franklin Co.: St. Vincent Island, *L. C. Anderson 8584, 10205* (first bloomed in December 1986); native, new to Florida panhandle.

ARISTIDA TUBERCULOSA Nutt. Holmes Co.: W of Graceville, *R. K. Godfrey 79130*; Taylor Co.: 9 mi N of Steinhatchee, *R. K. Godfrey 79119*; native, new to Florida.

AUREOLARIA VIRGINICA (L.) Pennell. Calhoun Co.: Altha, *E. West* in 1941 (FLAS); Gadsden Co.: Aspalaga, *H. Foster 58* (FLAS), 3 mi NNW of Gretna, *L. C. Anderson 9733, 10664*; Holmes Co.: 5 mi NW of Westville, *E. S. Ford 5226* (FLAS); Jackson Co.: Graceville, *S. C. Hood 2008* (FLAS); Walton Co.: 9 mi SE of DeFuniak Springs, *E. West & L. E. Arnold 257* (FLAS); native, new to Florida panhandle.

BUMELIA THORNEI Cronq. Jackson Co.: 16.2 mi N of Sneads beside rte 271, *A. K. Gholson 11720, R. K. Godfrey 79745, 82429, 82430, 82491, 82601*; native, new to Florida.

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This species was previously known from only four counties in the coastal plain of Georgia (Cronquist 1949). With the designation as an endangered species (Smithsonian Institution 1975), it is appropriate to give additional information about the Florida population. The shrubs (50-100 in number) grow in a wooded shallow basin that seasonally has surface water one to two feet deep. Associated species include *Acer rubrum, Ampelopsis arborea, Berchemia scandens, Campsis radicans, Cephalanthus occidentalis, Cocculus carolina, Crataegus aestivalis, C. uniflora, C. viridis, Diodia virginiana, Diospyros virginiana, Quercus laurifolia, Q. virginiana, Viburnum obovatum,* and *Vitis rotundifolia*. The plants match the type description very closely in their slender habit, leaf pubescence, and fruit size but differ in being more robust. Godfrey (pers. comm.) describes the Florida plants as generally up to 2.5 m tall (with rare, vigorous shrubs to 6 m tall), and the leaves are up to 7 cm long and 2.5 cm wide. The type description (Cronquist 1949) says plants to 1.5 m tall and leaves to 4 cm long and 20 mm wide. However, additional plants collected at the type locality of *B. thornei* in Early County, Georgia (*A. K. Gholson 11701, R. K. Godfrey 82063, 82155*) are also noted to be up to 2.5 m tall, and some leaves are 7 cm long or 2.5 cm wide.

CALLISIA REPENS L. Franklin Co.: Apalachicola, *L. C. Anderson 9008*; adventive, new to Florida panhandle.

CANAVALIA MARITIMA (Aubl.) Thouars. Dixie Co.: Shired Island, *S. W. Leonard 8101*; native, new to Florida panhandle. Chapman (1860) reported it for St. Vincent Island in Franklin Co. (as *C. obtusifolia*), but apparently it has not persisted there.

CANNABIS SATIVA L. Franklin Co.: East River, 6 air mi N of Apalachicola, *L. C. Anderson 9451*; adventive, new to Florida panhandle.

CAREX LAEVIVAGINATA (Kukenth.) Mack. Jackson Co.: Apalachee Game Management Area, Lake Seminole, *A. K. Gholson 6063* (personal herbarium); native, new to Florida panhandle. Godfrey and Wooten (1979) list the species for north Florida, but Clewell (1985) did not.

CATHARANTHUS ROSEUS (L.) G. Don. Franklin Co.: beach between Carrabelle and Lanark Village, *L. C. Anderson 9651*; adventive, new to Florida panhandle.

CENTAUREA MACULOSA Lam. Escambia Co.: junction rte 297 and I-10, *J. R. Burkhalter & F. R. Hedges 178*; ruderal, new to Florida.

CHAEROPHYLLUM PROCUMBENS (L.) Crantz var. PROCUMBENS. Franklin Co.: Scipio Creek, N edge of Apalachicola, *L. C. Anderson 9380*, St. Vincent Island, *L. C. Anderson 9293*; Jackson Co.: floodplain W of Chattahoochee, *A. K. Gholson 7722*; native, new to Florida.

CRINUM ZEYLANICUM (L.) L. Franklin Co.: Eastpoint, *L. C. Anderson 9491*, Big Towhead Island, *L. C. Anderson 9636*; Madison Co.: 4 mi S of

Lovett, *G. W. Ramsey 109*; naturalized, new to Florida panhandle.

Desmazeria rigida (L.) Tutin. Franklin Co.: Apalachicola cemetery, *L. C. Anderson 9236, 9356*; naturalized, new to Florida panhandle. Chase (1950) listed this species from Florida [as *Scleropoa rigida* (L.) Griseb.], but Hall (1978) noted no specimens were seen from Florida.

Desmodium nuttallii (Schindler) Schubert. Leon Co.: Tall Timbers Research Station, *R. K. Godfrey 69084*; Wakulla Co.: N of Crawfordville, *R. K. Godfrey 80101*; native, new to Florida.

Dodocatheon meadia L. Gadsden Co.: limestone glades 1.5 air mi SW of Chattahoochee, *L. C. Anderson 9194, A. K. Gholson 11432* (personal herbarium); native, new to Florida. This white-flowered phase is sometimes segregated as *D. hugeri* Small.

Eleocharis nana Kunth. Franklin Co.: Graham Creek, 8.5 air mi NNE of Apalachicola, *L. C. Anderson 9731*; native, new to Florida panhandle.

Emilia fosbergii Nicols. Leon Co.: Tharpe Street, Tallahassee, *L. C. Anderson 4531*; adventive, new to Florida panhandle. This species in peninsular Florida has gone under the misapplied name of *E. coccinea* (Sims) Sweet.

Ficus carica L. Gulf Co.: kitchen midden on Depot Creek, *L. C. Anderson 9804*; naturalized, new to Florida panhandle.

Freesia refracta Klatt. Franklin Co.: common in several sparsely sodded lawns, Apalachicola, *L. C. Anderson 9128*; naturalized, new to Florida panhandle.

Hibiscus trionum L. Franklin Co.: edge of tidal marsh, St. George Island, *L. C. Anderson 10093*; adventive, new to Florida panhandle.

Hymenocallis henryae Traub. Liberty Co.: 0.7 mi N of Sumatra, *L. C. Anderson 10617*, rte 379 NW of Sumatra, *R. K. Godfrey 82044*. Clewell (1985) was reluctant to recognize this species, but Smith and Flory (1987) have shown it has distinctive morphology and karyology. Smith (pers. comm.) reports that *H. caroliniana* (L.) Herb. and *H. floridana* (Raf.) Morton are widespread species in the Florida panhandle but not listed by Clewell.

Hypoxis wrightii (Baker) Brackett. Calhoun Co.: 5 mi W of Blountstown, *R. K. Godfrey 52966*; Franklin Co.: 6 air mi N of Eastpoint, *L. C. Anderson 10472*, St. George Island, *L. C. Anderson 9180*, St. Vincent Island, *L. C. Anderson 9299*; Wakulla Co.: St. Marks lighthouse, *L. B. Trot 101* (det. A. Herndon); Washington Co.: Rock Hill, *J. Wooten 1015*; native, new to Florida panhandle. These collections were previously identified as either *H. juncea* J. E. Smith or *H. micrantha* Pollard.

Lespedeza virgata (Thunb.) DC. Leon Co,.: Sharer Road, Tallahassee, *L. C. Anderson 8912, 9243*; naturalized, new to Florida panhandle.

LILIUM LONGIFLORUM Thunb. Escambia Co.: Pensacola, *J. R. Burkhalter 8908*; Jackson Co.: Merritts' Mill Pond, E of Mariana, *J. B. Nelson 2804*; Leon Co.: Sharer Road, Tallahassee, *L. C. Anderson 9861*; Wakulla Co.: Lake Ellen Road near Panacea, *S. W. Leonard 6449*; naturalized, new to Florida panhandle.

LIMNODEA ARKANSANA (Nutt.) L. H. Dewey. Escambia Co.: Santa Rosa Island, *J. R. Burkhalter 6364*: Franklin Co.: St. Vincent Island, *L. C. Anderson 9292, 9354*: naturalized, new to Florida panhandle. Hall (1978) stated that the species had been reported for Florida, but he had seen no specimens.

MACFADYENA UNGUIS-CATI (L.) A. Gentry. Leon Co.: Tallahassee, *L. C. Anderson 4328, R. K. Godfrey 74221*: naturalized and potentially weedy, new to Florida panhandle.

MATELEA PUBIFLORA (Dcne.) Woods. Lafayette Co.: 1 mi E of Mayo, *R. K. Godfrey 81371, 81630*; native, new to Florida panhandle.

PETROSELINUM CRISPUM (Mill.) Mansf. Leon Co.: Tallahassee, *L. C. Anderson 9661*; adventive, new to Florida panhandle.

PHYLA LANCEOLATA (Michx.) Greene. Jackson Co.: Apalachicola River floodplain E of Sneads, *R. K. Godfrey 82050*; Santa Rosa Co.: Escambia River at rte 4 bridge, *J. R. Burkhalter 9960*: native, new to Florida.

PHYLLANTHUS ABNORMIS Baill. Dixie Co.: Shired Island, *R. K. Godfrey 82137, W. S. Judd 2797* (FLAS); native, new to Florida panhandle.

PLATANATHERA × BICOLOR (Raf.) Luer. Escambia Co.: near Pensacola, *J. R. Burkhalter 10394*.

PLATANTHERA × CHAPMANII (Small) Luer. Liberty and Franklin counties eastward; several collections at FSU and FLAS, but not listed by Clewell (1985).

POLYCARPON TETRAPHYLLUM L. f. Escambia Co.: Seville Square area, Pensacola, *J. R. Burkhalter 8681*; naturalized, new to Florida panhandle. Reported by Wilhelm (1984) but not listed by Clewell (1985).

POLYGONUM BICORNE Raf. Escambia Co.: San Marcus Creek, W of Pensacola, *R. Kral 6042*; native, new to Florida.

RHUS AROMATICA Ait. Escambia Co.: Canoe Creek, 5.7 mi W of Century, *R. K. Godfrey 81663, E. S. Ford 5404* (FLAS), *A. K. Gholson 11128* (FLAS); native, new to Florida.

RHYNCHOSPORA HARPERI Small. Franklin Co.: Bucks Siding Rd, 2 mi E of rte 65, *L. Conde* in 1976; native, new to Florida panhandle.

ROTTBOELLIA EXALTATA L. f. Leon Co.: 12 air mi W of Tallahassee, *L. C. Anderson 10926*; Madison Co.: lake margin in Greenville, *L. C. Anderson 10268*; naturalized, new to Florida panhandle. Hall (1982) noted this species has been found in Leon and Jefferson counties, but Clewell (1985) did not list it in his guide.

SCHWALBEA AMERICANA L. Gadsden Co.: 3 air mi NNW of Gretna, *L. C. Anderson 10548, 10638*. Clewell (1985) stated the species was reportedly in the panhandle; these collections confirm its presence.

SPOROBOLUS VAGINIFLORUS (Torr.) Wood. Gadsden Co.: calcareous glade 1.5 mi S of highway 90 bridge at Chattahoochee, *R. K. Godfrey 82566*; native, new to Florida.

VIOLA TRICOLOR L. Franklin Co.: Apalachicola River near Brickyard Landing, *L. C. Anderson 7324*; adventive, new to Florida panhandle.

ZIZIPHUS JUJUBA Mill. Bay Co.: Deer Point Lake, E of Southport, *E. Jackson* in 1986 (FLAS); Okaloosa Co.: 5 mi N of Crestview, *E. Thomason* in 1985 (FLAS); naturalized, new to Florida panhandle.

NOTEWORTHY RANGE EXTENSIONS

ERIOCHLOA MICHAUXII (Poir.) Hitchc. Franklin Co.: Picaline Area, St. Vincent Island, *L. C. Anderson 10147*. Shaw and Webster (1987) cited a collection from Wakulla County. These reports extend the range much farther west than was reported by Clewell (1985).

QUERCUS PAGODA Raf. Franklin Col: 6 mi N of Apalachicola on St. Marks River, *L. C. Anderson 7908*. Clewell (1985) states the Cherry Bark Oak (as *Q. falcata* var. *pagodaefolia* Ell.) is rare, but it is common on the floodplain of the lower Apalachicola River system.

Many taxa are listed in Clewell's guide (1985) as being found in only one county each. Such listings may reflect relative rareness of the species, oversight in collecting of more widespread species, or an error in documentation. Based on collections at FLAS and FSU, the following are widespread in the Florida panhandle: *Ludwigia leptocarpa* (Nutt.) Hara is documented for 14 counties (beyond the one listed by Clewell); *Platanthera blephariglottis* (Willd.) Lindl., *Rosa laevigata* Michx., and *Spiranthes tuberosa* Raf. for eight additional counties; *Bartonia paniculata* (Michx.) Muhl. for seven additional counties; *Perilla frutescens* (L.) Britt. and *Petunia violacea* Lindl. for six additional counties; and *Polygala leptostachys* Shuttlew. and *Veratrum virginicum* (L.) Ait. f. (as *Melanthium virginicum* L. in Clewell) for five additional counties.

The following were listed by Clewell for one county but have been found in one to three additional counties as noted:

AMARANTHUS BLITUM L. [reported as *A. lividus* L. (Anderson 1986)]. Leon Co.: *L. C. Anderson 9737*. Wilhelm (1984) listed this species for Escambia County.

Bowlesia incana Ruiz. & Pav. Escambia Co.: *J. R. Burkhalter 885* (FLAS); Franklin Co.: *L. C. Anderson 6971, 7010, 7890*; Jackson Co.: *R. K. Godfrey 56357*.

Calamintha georgiana (Harper) Shinners. Escambia Co.: near Pensacola, *J. R. Burkhalter 10535*.

Carex caroliniana Schw. Franklin Co.: *L. C. Anderson 9436*; Jackson Co.: *A. K. Gholson 10435*; Leon Co.: *L. C. Anderson 8005*.

Cleome hassleriana Chod. Calhoun Co.: *R. K. Godfrey 75716*; Lafayette Co.: *Nieland* in 1940 (FLAS).

Cleome viscosa L. [as *Polansia viscosa* (L.) DC. in Clewell]. Jefferson Col.: *L. Halsey* in 1983.

Dactylis glomerata L. Franklin Co.: *L. C. Anderson 7602*; Leon Co.: *L. C. Anderson 10614*.

Echinodorus rostratus (Nutt.) Engelm. Escambia Co.: near Pensacola, *J. R. Burkhalter 10310*.

Eragrostis atrovirens (Desf.) Trin. ex Steud. Franklin Co.: *L. C. Anderson 7572*; Gulf Co.: *R. K. Godfrey 80721*; Liberty Co.: *R. K. Godfrey 82209*.

Eragrostis hypnoides (Lam.) BSP. Calhoun Co.: *R. K. Godfrey 76107*. Gadsden Co.: *A. K. Gholson 6561*; Liberty Co.: *R. K. Godfrey 57802, 75734*.

Erythronium umbilicatum Parks & Hardin. Leon Co.: *L. C. Anderson 9214, R. K. Godfrey 81965*.

Fatuoa villosa (Thunb.) Nakai. Escambia Co.: *J. R. Burkhalter 3176* (FLAS); Franklin Co.: *L. C. Anderson 8761*; Santa Rosa Co.: *J. R. Burkhalter 9555*.

Gymnocarpon brevifolius Trin. Franklin Cop.: *L. C. Anderson 10227, 10252, 10334*; Walton Co.: *E. G. Hume* in 1940 (FLAS).

Hypochaeris radicata L. Escambia Co.: *J. R. Burkhalter 3980* (Flas); Leon Co.: *L. C. Anderson 6388*; Walton Co.: *D. B. Ward 6339* (FLAS).

Hypoxis rigida Chapm. Franklin Co.: Ft. Gadsden State Park, *L. C. Anderson 6924*; Gulf Co.: 6.5 air mi NW of Apalachicola, *L. C. Anderson 9143*; Liberty Co.: 1.2 mi NNE of Sumatra, *L. C. Anderson 6413*, 2 mi NNE of Sumatra, *L. C. Anderson 5019*.

Ipomoea hederacea Jacq. Escambia Co.: *J. R. Burkhalter 7924* (FLAS); Franklin Co.: *L. C. Anderson 6654*; Walton Co.: *E. G. Hume* in 1938 (FLAS).

Ipomoea macrorhiza Michx. Calhoun Co.: *R. K. Godfrey 78000*; Escambia Co.: *J. R. Burkhalter 10400*; Walton Co.: *E. G. Hume* in 1938 (FLAS).

Lobelia flaccidifolia Small. Gadsden Co.: *R. K. Godfrey 78991*;

Leon Co.: *D. L. Flichtner* in 1981; Santa Rosa Co.: *L. C. Anderson 9825.*

MANIHOT GRAHAMII Hook. Franklin Co.: *L. C. Anderson 7757*; Gadsden Co.: *R. K. Godfrey 80765, 80830*; Washington Co.: *C. M. Senner* in 1942 (FLAS).

MANISURIS TESSELLATA (Steud.) Scribn. Franklin Co.: *L. C. Anderson 10021, 10127*; Okaloosa Co.: *E. West* in 1950 (FLAS); Santa Rosa Co.: *E. L. Tyson 491* (FLAS).

ROBINIA HISPIDA L. Escambia Co.: *J. R. Burkhalter 5906* (FLAS); Franklin Co.: *L. C. Anderson 9246*; Gadsden Co.: *A. K. Gholson 6158* (FLAS), *R. K. Godfrey 79838.*

RUELLIA BRITTONIANA Leonard. Escambia Co.: *J. R. Burkhalter 7205*; Franklin Co.: *L. C. Anderson 7278, 7536.*

SAGOTIA TRIFLORA (L.) Duch. & Walp. Franklin Co.: *L. C. Anderson 10102*; Lafayette Co.: *L. E. Arnold* in 1941 (FLAS).

SALPICHROA ORIGANIFOLIA (Lam.) Baillon. Jackson Co.: *D. B. Ward 2922* (FLAS); Leon Co.: *L. C. Anderson 6457.*

SPERGULA ARVENSIS L. Gadsden Co.: just S of Quincy on rte 267, *L. C. Anderson 10695, A. K. Gholson 11639.*

SPHENOCLEA ZEYLANICA Gaertn. Gulf Co.: *L. C. Anderson 9836*; Jackson Co.: *G. R. Knight 277.*

STROPHOSTYLES LEIOSPERMA (T. & G.) Piper. Franklin Co.: *L. C. Anderson 8601, 10122, 10132*; Gulf Co.: *L. C. Anderson 8803.*

TRAGIA CORDATA Michx. Gadsden Co.: *L. C. Anderson 11067.*

TRIADENUM TUBULOSUM (Walt.) Gleason. Escambia Co.: *J. R. Burkhalter 9042*; Franklin Co.: *L. C. Anderson 7695.*

TRILLIUM DECIPIENS Freeman. Walton Co.: *Freeman 515, D. B. Ward 6644* (FLAS), *E. West & L. E. Arnold* in 1937 (FLAS).

TRITONIA CROCOSMIIFOLIA Nichols. Escambia Co.: *J. R. Burkhalter 10332*; Franklin Co.: *L. C. Anderson 6446, 7396.*

Finally, the following species listed for only one county by Clewell have been found in Franklin County as an additional county of record:

ANTIGONON LEPTOPUS Hook. & Arn. *L. C. Anderson 6719.*

APIUM GRAVEOLENS L. *L. C. Anderson 9168.*

ARUNDO DONAX L. *L. C. Anderson 6771.*

ASTER PRAEALTUS Poir. *L. C. Anderson 6694.*

CALYPTOCARPUS VIALIS Less. *L. C. Anderson 9655, 9795.*

CUSCUTA CAMPESTRIS Yuncker. *L. C. Anderson 7220, 8390, 9278.*

HELIANTHUS ARGOPHYLLUS T. & G. *L. C. Anderson 9931.*

IPOMOEA INDICA (Burm. f.) Merr. *L. C. Anderson 6706.*

PARIETARIA PRAETERMISSA Hinton. *L. C. Anderson 6798, 7178, 7927, 9294.*

Polygala mariana Mill. *W. B. Masters 112.*

Portulaca amilis Speg. *L. C. Anderson 10112*; corollas pink, not yellow as reported by Clewell (1985).

Scutellaria lateriflora L. *L. C. Anderson 8527.*

Setaria viridis (L.) Beauv. *L. C. Anderson 8268.*

Sporobolus clandestinus (Bieler) Hitchc. *L. C. Anderson 9916.*

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NOTEWORTHY MONOCOTS OF MOBILE AND BALDWIN COUNTIES, ALABAMA

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ABSTRACT

The following 44 species of monocots are reported as new or otherwise noteworthy in south Alabama: *Amphicarpum muhlenbergianum, Bothriochloa ischaemum* var. *songarica, Bulbostylis warei, Carex cherokeensis, C. elliottii, Catapodium rigidum, Chamaelirium luteum, Corallorhiza wisteriana, Cyperus oxylepis, Eleocharis robbinsii, Eragrostis amabilis, E. lugens, E. minor, Eustachys glauca, Fimbristylis schoenoides, F. vahlii, Halodule wrightii, Heteranthera reniformis, Ipheion uniflorum, Juncus abortivus, Koeleria gerardii, Leptochloa fascicularis, L. panicoides, Lilium iridollae, Limnobium spongia, Limnodea arkansana, Luziola bahiensis, Manisuris tessellata, Nothoscordum inodorum, Panicum nudicaule, Parapholis incurva, Paspalum conjugatum, Peltandra saggitifolia, Phalaris angusta, Pleea tenuifolia, Potamogeton robbinsii, Sagittaria platyphylla, Scirpus cubensis, Setaria corrugata, S. faberii, Spartina spartineae, Tradescantia fluminensis, T. subaspera*, and *Triglochin striata*.

New or otherwise interesting collections of vascular plants have been made in Mobile and Baldwin counties in recent years. Kral (1973, 1976, 1981) reported over 40 new or noteworthy collections in these two counties among over 250 taxa. I listed over 100 noteworthy species or varieties in an earlier paper (1977) on the flora of west Mobile. I am presently completing a floristic list of some 1,900 species occurring in our two coastal counties based primarily on my own collections there in the past 20 years; it seems appropriate to report additional interesting collections of vascular plants before completion of the project.

Reported plants are arranged in alphabetical order by families with mention of synonyms used by Mohr (1901), indicated by "M," and Small (1933), indicated by "S" when appropriate. References are made repeatedly to Mohr (1901) and Small (1933); therefore mention of the date after those two authors is omitted for convenience in the rest of this paper. Specimens of reported plants are kept at the University of South Alabama herbarium and, when available, duplicates of them were sent or will be sent to Vanderbilt University (VDB) and/or to the University of North Carolina at Chapel Hill (NCU). The names of 22 species which appear to represent first county records are preceded by an asterisk. The names of the nine species which may represent first reports for Alabama are preceded by two asterisks.

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ALISMATACEAE

*SAGITTARIA PLATYPHYLLA (Engelm.) J. G. Smith. Baldwin Co.: Open muddy bank of canal parallel to L&N RR tracks across Mobile Delta, directly east of its intersection with Big Briar Creek, ca 2 mi W of Hurricane, 16 Sept 1981, *Lelong 12280*.

Although Mohr reported that this species was frequent on the Coastal Plain in muddy ditches and ponds, it seems to be far less common at present. Haynes (1980) indicates its presence in ten Alabama counties including Mobile County.

ARACEAE

PELTANDRA SAGITTIFOLIA (Michx.) Morong. (*P. glauca* (Ell.) Feay—S). Mobile Co.: Marshy roadside along county road 57, 2.3 mi N of its intersection with county road 22, 21 May 1969, *Smith & McIntosh s.n.*; marshy border of small stream emptying into large west pond, NW corner of Langan Municipal Park, West Mobile, 28 May 1972, *Lelong 6515*.

Although Mohr reported that this species was not rare in our two counties before the turn of the century, it is presently included in the list of threatened species of Alabama (Freeman et al. 1979). Jones (1974) documents its presence only in adjacent Jackson County, Mississippi, and Davenport and Haynes (1981) note its occurrence in Baldwin County, Alabama.

COMMELINACEAE

**TRADESCANTIA FLUMINENSIS Vell. Baldwin Co.: Moist woodland along State Hwy 98, ca halfway between U.S. Hwy 90 intersection and Daphne, 22 Apr 1971, *Threadgill s.n.*

Small mentioned the occurrence of this escaped ornamental species from Florida to North Carolina. Godfrey and Wooten (1979) indicated that it is naturalized, sometimes very abundantly in wet woodlands and floodplain forests of northern Florida and probably elsewhere in the southeastern United States.

*TRADESCANTIA SUBASPERA Ker-Gawl. (*Tradescantia montana* Shuttl.—M; *T. pilosa* J.C.C. Lehm.—S). Baldwin Co.: Wooded slope of large Indian mound, ca 0.25 mi W of Bottle Creek and 0.5 mi S of Tensaw River, Mound Island, Mobile Delta, 24 May 1978, *Lelong 10185*. Monroe Co.: Rich woods on bluff along Alabama River along State Hwy 84, ca 1 mi NW of Claiborne, 16 May 1973, *Lelong 7098A*.

Mohr reported this species as rare in his "Metamorphic" and "Lower Hills" regions of Alabama. Small reported its occurrence in our region generally from north Florida to Louisiana, noting that it was quite variable in size and habit. MacRoberts (1980) notes that this is one of the rarest species of *Tradescantia* in Louisiana, having been reported from only three southern parishes. It seems to be uncommon also in south Alabama.

CYPERACEAE

BULBOSTYLIS WAREI (Torrey) Clarke. (*Stenophyllus warei* (Torr.) Britt.—S). Baldwin Co.: Sand dunes along southwestern shore of Ono Island, 27 Sep 1975, *Lelong 8727*.

Mohr did not report this species for Alabama. Small noted its occurrence on the Coastal Plain of Florida and Georgia and Godfrey and Wooten (1979) indicated its presence from southeastern North Carolina to south Florida and the Florida panhandle.

*CAREX CHEROKEENSIS Schwein. Baldwin Co.: Moist roadside along State Hwy 59, directly north of bridge over Major Creek, 20 Apr 1974, *Lelong 7643*.

Mohr reported this sedge as frequent in the Central Prairie region and as far south as Henry County. Small noted its occurrence generally from Florida to Texas and Georgia. It does not seem to be common in the Mobile region.

*CAREX ELLIOTTII Schwein. & Torr. Baldwin Co.: Low woods along west shore of Alabama River, ca 0.5 mi E of Boatyard Lake, Mobile Delta, 3 Aug 1972, *Lelong 6730*. Mobile Co.: Bay forest along southeastern bank of Three-Mile Creek, University of South Alabama property, West Mobile, 25 Apr 1968, *Lelong 4395*.

Mohr reported that this species was infrequent in the state, occurring in Grand Bay, Mobile County. Small noted that it grew on the Coastal Plain from Florida to Alabama and North Carolina. Kral (pers. comm.) informed me recently that it was not common in Alabama.

**CYPERUS OXYLEPIS Nees ex Steud. Mobile Co.: Open, sandy dredge spoil area along east shore of Chickasaw Creek, ca 500 ft S of mouth of Shell Bayou, 7 Aug 1981, *Lelong 12228*.

Neither Mohr nor Small reported this species. Godfrey and Wooten (1979) noted its occurrence in Louisiana, Texas and Central and South America.

*ELEOCHARIS ROBBINSII Oakes. Mobile Co.: Submerged along border of small spring-fed stream emptying into western lake, SE of jct of Ziegler and University Blvds, Langan Park, West Mobile, 20 Aug 1976, *Lelong 9421*.

Kral (1973) reported the first collection of this species in Alabama on the basis of one of his specimens from Geneva County.

*FIMBRISTYLIS SCHOENOIDES (Retz.) Vahl. Mobile Co.: Moist open grassy area directly east of Battleship Park, south of Battleship Parkway (U.S. Hwy 90), 12 Oct 1980, *Lelong 11663*.

This inconspicuous tropical Asiatic sedge was introduced after the turn of the century in the Southeast. Mohr did not list it for Alabama. Small noted its occurrence in western Florida and south Georgia and Kral (1971) extended its distribution to south Florida and Louisiana, indicating its presence also in Baldwin County, Alabama.

*Fimbristylis vahlii (Lam.) Link. Baldwin Co.: Mud flat in NW part of Chacaloochee Bay, 7 Aug 1980, *Lott 94*; clay bluff along south bank of Alabama River Cutoff, T3N, R2E, SW 1/4 of Section 40, 25 Oct 1980, *Lelong 11776.* Mobile Co.: Small island along west shore of Tombigbee River, directly N of its confluence with Alabama River, T2N, R1E, E boundary of Section 20, 25 Oct 1980, *Lelong 11730.*

This small cespitose annual species was not listed in Mohr. Small indicated its occurrence generally from Florida to Texas, Missouri and North Carolina. Kral (1971) documented its distribution, noting additional collections from Oklahoma, Illinois, Kentucky, Georgia, South Carolina and New Jersey. He indicated its presence in four northern counties of Alabama. In our coastal counties, it seems to be fairly common on denuded shores and banks of streams throughout the Mobile Delta.

*Scirpus cubensis Poepp. & Kunth. Baldwin Co.: Floating mat in shallow water along northeast border of beaver pond on Baptizing Creek, T4S, R1E, Section 44, 19 Sep 1976, *Lelong 9502.*

Mohr reported that this species was rare on floating rotting timber in Three-Mile creek, Mobile County. Kral (pers. comm.) informed me that he was not aware of any other recent collection of this species in the Mobile region.

HYDROCHARITACEAE

*Limnobium spongia (Bosc) Steudel. Mobile Co.: T3S, R1W. Floating along shores of Harry Creek near its source, E of Back Creek and Bayou Sara; SE portion of Louisiana Land & Exploration Co. property, Saraland, 11 Aug 1980, *Lelong 10458.*

Mohr does not list this species for Alabama and Small indicates that it occurs generally from Florida to Texas. More recently, Jones (1974) noted that it occurs in Noxubee and Wilkinson counties, Mississippi, and Haynes (1980) reported it for Baldwin and Wilcox counties, Alabama.

JUNCACEAE

*Juncus abortivus Chapman. Baldwin Co.: Depression in sandy pineland along north shore of Black Water River, ca 0.5 mi NE of mouth of Green Branch, 22 Sep 1980, *Lelong 11574.*

Small reported the occurrence of this species on the Coastal Plain from middle Florida to South Carolina. Godfrey and Wooten (1979) noted that its range extends northward to southeastern Virginia. Kral (pers. comm.) recently informed me that it is rare in Alabama.

JUNCAGINACEAE

*TRIGLOCHIN STRIATA R. & P. Baldwin Co.: Tupelo-slash pine swamp along banks of Emanuel Bayou, 27 Sep 1980, *Lelong 11582*.

Mohr noted that this species was "not rare" in fresh or brackish marshes of the Coast region, mentioning a collection site in marshy banks at the mouth of Dog River, Mobile County, and noting its presence in Baldwin County. Haynes (1980) wrote that only one specimen of this plant was known from Alabama (Mobile River, Oct 1878, *C. Mohr s.n.*) and that the species was probably extirpated from Alabama. This species was therefore only mentioned for Mobile County in Appendix II of the State list of rare and endangered species (Freeman et al. 1979). Fortunately, urbanization, industrialization, and elimination of natural areas are not proceeding as rapidly yet in Baldwin County as in Mobile County; it may be the reason that this rare plant still occurs in the relatively undisturbed swamps along Emanuel Bayou.

LILIACEAE

*CHAMAELIRIUM LUTEUM (L.) Gray. Mobile Co.: Moist, sandy soil along north bank of Three-Mile Creek, University of South Alabama property; T4S, R2W, S 1/2 of Sec. 16, 28 Apr 1967, *Lelong 3083*.

Mohr indicated that this species was common over the State in dry open woods and Small wrote that it occurred in moist thickets, meadows and pinelands from Florida to Arkansas. Kral (1966) reported it from Lincoln Parish, Louisiana, noting that it had not been previously reported from south of Arkansas. It appears to be uncommon in the Mobile region, occurring in mesic sites.

**IPHEION UNIFLORUM (Lindl.) Raf. Mobile Co.: Open, grassy roadside along Government Blvd, directly W of Little Flower Ave. intersection, West Mobile, 21 Mar 1981, *Lelong 11949*.

This species, native of Argentina, occasionally escapes from cultivation or occurs as a waif in southeastern United States. Neither Mohr nor Small mentioned it in their comprehensive works.

LILIUM IRIDOLLAE M. G. Henry. Baldwin Co.: Cypress swamp along upper reaches of northern fork of Caney Creek, Lilian Swamp, 18 Sep 1980, *Lelong 11535*; wet pineland along southern shore of Black Water River, on *Sphagnum* mat, ca 0.75 mi E of mouth of Narrow Gap Creek, 22 Sep 1980, *Lelong 11569*.

Godfrey and Wooten (1979) noted that the range of this species extends from Walton County in the Florida panhandle to Baldwin County, Alabama. With the possible exception of *Lilium philadelphicum*, it is the rarest native lily in the State, occurring only in Baldwin, Covington, and Escambia counties and it is included in the latest list of endangered plant species of Alabama (Freeman et al. 1979).

**NOTHOSCORDUM INODORUM (Ait.) Nichols. (*N. fragrans* (Vent.) Kunth—S). Mobile Co.: Open disturbed roadside of street to baseball park, SE part of Mobile Municipal Park, West Mobile, 5 May 1972, *Lelong 6517*.

Kral (pers. comm.) informed me recently that he had not yet collected this species in south Alabama. This African plant was not reported by Mohr for the State; it was reported by Small and its distribution was given as extending from Florida to Louisiana and South Carolina. Radford et al. (1968) noted that it was rare in South Carolina (two counties), and that they had seen specimens from Florida.

PLEEA TENUIFOLIA Michx. Baldwin Co.: Pine savannah on hillside along State Hwy 90, ca 2 mi W of Seminole, 16 Oct 1976, *Lelong 9594*; moist sandy pineland along west shore of Gum Branch, ca 1 mi NE of its confluence with Mifflin Creek, 3 Oct 1980, *Lelong 11592*.

Kral (1976) first reported this species for Alabama from Baldwin County and noted that Sid McDaniel first found it in the same locality. Although I was not aware of those two collections at the time, my first collection was made on a site which must be very close to that of Kral's collection. This uncommon plant is included in the list of species of special concern in Alabama (Freeman et al. 1979).

ORCHIDACEAE

*CORALLORHIZA WISTERIANA Conrad. Baldwin Co.: Low woods along east shore of Tensaw River directly north of its confluence with Apalachee River, W of historic Blakeley site, 1 Mar 1971, *Lelong 5647*.

Mohr noted that this species was rare in the Central Pine Belt and Small indicated that it occurred in rich woods from Florida to Texas. It is listed as a species of special concern in Alabama (Freeman et al. 1979) and its presence in five counties is reported.

POACEAE

*AMPHICARPUM MUHLENBERGIANUM (Schult.) Hitchc. (*Amphicarpon floridanum* Chapman—S). Baldwin Co.: Dry, sandy, open pineland on dunes along Gulf of Mexico, ca half way between Gulf Shores and Fort Morgan, 7 Oct 1967, *Lelong 3848*.

Kral (1973) based the first report of this interesting grass for Alabama on a specimen which he collected in October 1971 in Covington County; this species was previously known to occur from Florida to South Carolina. In south Alabama, I have also observed it in moist sands along the west shore of Perdido Bay.

**BOTHRIOCHLOA ISCHAEMUM (L.) Keng. var. SONGARICA (Fish. & Mey.) Celarier & Harlan. Mobile Co.: Grassy median along Water Street, near E end of Government Blvd. at Mobile River, downtown Mobile, 7 Oct 1978, *Lelong 10554*.

This Eurasian pasture grass was not listed by Mohr nor by Small. Hitchcock and Chase (1951) noted that it was "a promising pasture grass in southern Texas; adventive in Kansas, Knoxville, Tenn., and in wool waste, Yonkers, N.Y." Gould (1975) reported that it was common along roadsides in Texas. Thieret (1966) first reported it in two parishes of south Louisiana and Allen (1980) recorded its occurrence in six additional Louisiana parishes.

CATAPODIUM RIGIDUM (L.) C. E. Hubbard (*Scleropoa rigida* (L.) Griseb.—M). Mobile Co.: Dry, open area among shells in "Shell Mound" State Park, Dauphin Island, 15 May 1972, *Lelong 6499*.

This small European species was reported by Mohr as "fugitive on ballast. Mobile," some 50 miles north of Dauphin Island. Hitchcock and Chase (1951) noted that it has been sparingly introduced throughout the United States. It was not reported by Deramus (1970) for Dauphin Island.

*ERAGROSTIS LUGENS Nees. Baldwin Co.: Open sandy roadside north of dunes along Gulf of Mexico and Hwy 182, Perdido Key, 4 Aug 1978, *Lelong 10417*.

Mohr reported this species as "adventive with ballast. Mobile. July to September, 1893-4. Annual or perennial?" Small noted that it occurred from Louisiana to California and that it was naturalized in the Coastal Plain of Georgia and Alabama.

*ERAGROSTIS MINOR Host. (*E. eragrostis* (L.) Beauv.—M & S). Baldwin Co.: Open, sandy roadside along U.S. Hwy 90, ca 200 ft W of I-10 intersection, 30 Aug 1980, *Lelong 11371*. Mobile Co.: Open, grassy area along L&N RR tracks at intersection with Eslava Str. S of downtown Mobile, 7 Oct 1978, *Lelong 10547*; common weed along cracks in concrete median, Airport Blvd. east of University Blvd. intersection, west Mobile, 30 Sep 1981, *Lelong 12378*.

Mohr noted that this European species was a rare adventive in cultivated and waste places and on ballast heaps. Hitchcock and Chase (1951) state that it had been sparingly introduced throughout the United States. It seems to be still uncommon enough in the Mobile region to deserve mention.

*ERAGROSTIS TENELLA (L.) Beauv. ex R. & S. (*E. amabilis* (L.) Wight & Arn. ex Nees—S). Mobile Co.: Crack in sidewalk along St. Francis Street near Trailways bus station, downtown Mobile, 24 May 1971, *Lelong 5712*; crack in sidewalk at intersection of St. Francis and Jackson Str., downtown Mobile, 10 Jul 1976, *Lelong 9287*.

Mohr did not report this European species for the State, and Harper (1944) did not include it in his preliminary report on the weeds of Alabama. Small and later Hitchcock and Chase (1951) reported it only for Georgia, Florida, and Texas. Kral (1973) recorded it for Escambia and Geneva counties, Alabama, and noted that its occurrence in the United States probably resulted from its introduction from the Tropics.

**EUSTACHYS GLAUCA Chapman (*Chloris glauca* (Chapm.) Vasey—S). Baldwin Co.: Moist, grassy shores of Cotton Bayou along State Hwy 161, 0.3 mi N of its jct with Hwy 182, 20 Jul 1974, *Lelong 8046*; moist slash pineland with dense undergrowth of *Serenoa repens*, along west shore of Wolf Bay, directly W of Mulberry Point, 15 Sep 1980, *Lelong 11517*.

Mohr did not include this species in his book and Small noted its distribution in the Southeast as extending from Florida to North Carolina. Hitchcock and Chase (1951) reported it for Florida, Wilmington, North Carolina, and Baker County, Georgia. Therefore, these collecttions document a western range extension for this species.

KOELERIA GERARDII (Vill.) Shinners (*K. phleoides* (Vill.) Pers.—S). Mobile Co.: Open weedy area along L&N RR tracks at intersection of Water and Elmira Str., near downtown Mobile, 30 May 1971, *Lelong 5718*.

This European species was not listed by Mohr for Alabama. Small noted its occurrence in the Southeast as "Pensacola, Fla. and Ala." More recently, Hitchcock and Chase (1951) mentioned that it had been introduced "at Pensacola, Fla., Mobile, Ala., Cameron Co., Tex., Portland, Oreg. and at several points in California." I have not seen the previous collection(s) from Mobile and Kral (pers. comm.) informed me that he had not collected it in Alabama.

*LEPTOCHLOA FASCICULARIS (Lam.) Gray (*Diplachne fascicularis* (Lam.) Beauv.—M). Baldwin Co.: Marshy area along the SW shore of Chacaloochee Bay and N side of U.S. Hwy 90, E of Mobile, 25 Aug 1980, *Lelong 11379*. Mobile Co.: Dry, sandy denuded area beneath newly completed Interstate 10 overpass. S part of Blakely Island, 6 Oct 1973, *Lelong 7323*.

Kral (1973) reported this species for Mobile County and noted that Hitchcock and Chase (1951) did not map it for Alabama, although it had been reported previously by Mohr as rare in Dauphin Island. At present, it appears to be fairly common in brackish marshes throughout the Mobile region.

**LEPTOCHLOA PANICOIDES (Presl.) Hitchc. (*Leptochloa floribunda* Doell.—S). Mobile Co.: Small island near the west bank of the Alabama River, directly N of its confluence with the Tombigbee River, 25 Oct 1980, *Lelong 11732*; wooded banks of Bottle Creek, Mound Island, Mobile Delta, 15 Nov 1980, *Lelong 11892*.

This plant was not included in Mohr's list of Alabama plants. Small noted its occurrence generally from south Mississippi to Texas and southern Indiana. Hitchcock and Chase (1951) did not record it in the Southeast, east of Mississippi. It seems to have become well established on sand bars and river banks in the Mobile Delta.

LIMNODEA ARKANSANA (Nutt.) L. H. Dewey. Mobile Co.: Shell Mound State Park, Dauphin Island; common with *Boerhavia erecta, Vicia ludoviciana* ..., 15 May 1972, *Lelong 6498*.

Mohr noted that this species was local and rare on shell mounds in Baldwin and Mobile counties. Deramus (1970) did not list it for Dauphin Island. It is one of numerous interesting calciphilic plants restricted to shell mounds in our region where sandy, acidic soils otherwise predominate. Kral (pers. comm.) indicated to me that he had only one record of this species for Alabama, collected in the Black Belt.

*LUZIOLA BAHIENSIS (Steud.) Hitchc. (*L. alabamensis* Chapman—M). Baldwin Co.: Partly submerged along shore of Baptizing Branch, NE of beaver pond, T4S, R1E, near center of Sect. 44, 19 Sep 1976, *Lelong 95071*. Mobile Co.: Wet, sandy marshy area along Three-Mile Creek, University of South Alabama property, West Mobile, 1 Oct 1968, *Lelong 4785*.

This species was listed by Mohr as not frequent in Conecuh and Mobile counties, Alabama. Hitchcock and Chase (1951) indicated that outside of tropical America, it occurs only in southern Alabama.

MANISURIS TESSELLATA (Steud.) Scribn. (*M. corrugata* (Bald.) Mohr var. *areolata* (Hackel) Mohr—M). Baldwin Co.: Moist slash pineland with dense undergrowth of *Serenoa repens* along north shore of Graham Bayou, directly W of its mouth on Wolf Bay, 15 Sep 1980, *Lelong 11518*. Mobile Co.: Wet pine savannah drained by Chickasaw Creek along U.S. Hwy 45, ca 1.5 mi S of Sweetwater Creek, 3 Sep 1972, *Lelong 6806*.

This taxon was listed by Mohr for Mobile County. He noted that it was not infrequent in Florida and eastern Mississippi and that it should be "looked for in western Alabama." Kral (pers. comm.) informed me that he collected this species some years ago in Baldwin County; he also considered it rare in Alabama.

PANICUM NUDICAULE Vasey. Baldwin Co.: Small, shallow, water-filled depression adjacent to Bay forest along Negro Creek at bridge (Co. Rd. 87) ca 4 mi N of intersection with U.S. Hwy 98 (Elberta), 30 Apr 1977, *Lelong 9690*; tree stump "island" in South Fork of Caney Creek, directly S of its confluence with North Fork, Lilian Swamp, 18 Sep 1980, *Lelong 11532*. Mobile Co.: Wet *Sphagnum* bog along Co. Rd. 59 ca 0.5 mi N of Fowl River, 24 Apr 1972, *Lelong 6492*.

This rare species, described by Vasey in 1889, was not listed by Mohr nor by Small. Hitchcock and Chase (1951) stated that it was rare in swamps of western Florida, southern Alabama and Mississippi. It is listed as a threatened plant in the State by Freeman et al. (1979).

**PARAPHOLIS INCURVA (L.) C. E. Hubbard. Mobile Co.: Inconspicuous weed along foot path at base of large Indian shell mound, NE part, Indian Mound State Park, 8 May 1983, *Lelong s.n.*

This species was not listed by Mohr for Alabama nor by Small for the southeastern States. Hitchcock and Chase (1951) reported that it had been introduced from Europe and occurred in mud flats and salt marshes along the coast from New Jersey and Pennsylvania to Virginia as well as in California and Portland, Oregon. More recently, Radford et al. (1968) noted that it occurred in two coastal counties of North Carolina. Correll and Johnston (1970) reported it for Texas and Allen (1980) reported one collection from St. Bernard Parish, Louisiana.

PASPALUM CONJUGATUM Bergius. Mobile Co.: Shaded lawn west of Basic Medical Sciences Bldg., University of South Alabama campus, west Mobile, 7 Nov 1975, *Lelong 8891*.

This pantropical species was reported by Mohr as occurring rarely on shaded damp banks in Mobile County. Although both Small and Hitchcock (1951) also noted its occurrence in Alabama, it seems to be still uncommon enough in the Mobile region to deserve mention. Kral (pers. comm.) informed me in 1979 that he had not collected it in Alabama.

**PHALARIS ANGUSTA Nees ex Trin. Baldwin Co.: Dry, open area on western shore of Chacaloochee Bay, ca 1.5 mi N of U.S. Hwy 90, 9 May 1980, *Lott 45*; marshy area along small stream between Grand Bay and Spanish River, lower Mobile Delta, 23 Apr 1981, *Lelong 11968*.

This species was not reported by Mohr for Alabama nor by Small for the Southeast. Hitchcock and Chase (1951) noted its occurrence in Mississippi, Louisiana, Texas, Arizona, California, and southern South America. Anderson (1961) reports it also for Savannah, Georgia.

*SETARIA CORRUGATA (Ell.) Schult. (*Chaetochloa corrugata* (Ell.) Scribn.—S). Baldwin Co.: Path in dry, sandy pine-oak woods SW of beaver dam on Baptizing Branch, T3S, R2E, Sect. 44, 19 Sep 1976, *Lelong 9490*.

Mohr did not report this species for the State and Small reported its distribution generally as extending from Florida to Texas and North

Carolina on the Coastal Plain. It does not seem to be common, at least in extreme south Alabama.

*SETARIA FABERI W. Herrmann. Mobile Co.: Open, grassy roadside along Co. Rd. 5, 2.3 mi S of Tanner-Williams, 3 Aug 1974, *Lelong 8079*.

According to Hitchcock and Chase (1951), this species was "introduced from China, probably in seed of Chinese millet." They did not indicate its occurrence south of Arkansas and North Carolina. Since then, Radford et al. (1968) recorded one collection from South Carolina and Allen (1980) reported it in nine Louisiana parishes. Kral (1973) first reported it from Alabama on the basis of one of his collections from Lawrence County; he also noted that it had recently been reported from Georgia.

*SPARTINA SPARTINEAE (Trin.) Merr. Baldwin Co.: Brackish marsh along NE shore of Ono Island, 27 Sep 1975, *Lelong 8716*. Mobile Co.: Brackish marsh along western shore of Mobile Bay along State Hwy 163 at Cedar Point, 23 Nov 1968, *Lelong 5003*; brackish marsh around airport, Dauphin Island, 1 Sep 1970, *Lelong 5552*.

Although Small noted that this species occurs generally from Florida to Texas, the first actual report of it from Alabama was made by Kral (1973) on the basis of a 1969 collection from Mobile County. It seems to be fairly common in coastal Alabama, occupying an ecological niche intermediate between that of *Spartina alterniflora* and of *S. patens*.

PONTEDERIACEAE

HETERANTHERA RENIFORMIS Ruiz & Pavon. Mobile Co.: Submerged in shallow water along cleared bank of 12-mile Creek, SW of intersection of Old Shell Road and University Blvd., 16 Jul 1983, *Lelong s.n.*

Mohr reported that this aquatic species occurred infrequently in muddy ditches of Mobile County, Alabama. Small noted that its geographical range extended from Georgia to Texas, and Connecticut in various provinces. Jones (1974) based his report of this species in Mississippi on a collection from Claiborne County only. It seems to be fairly uncommon also in Alabama.

POTAMOGETONACEAE

POTAMOGETON ROBBINSII Oakes. Baldwin Co.: Submerged at mouth of Three-Mile Creek off Tensaw River with *P. nodosus, P. illinoensis, Heteranthera dubia,* and *Egeria densa*, 7 Aug 1970, *Lelong 5476*.

Haynes (1980) noted that this is only the second known collection of this pondweed in the southeastern United States and that the nearest known localities for this species are in Delaware. Fernald (1932) reported the other southeastern collection of this species by Hotchkiss and Ekvall (no. *3904*) in "an outlying extreme southern station in southeastern Alabama (Mobile Delta)." Six other species of *Potamogeton* occur in the Mobile region.

ZANNICHELLIACEAE

HALODULE WRIGHTII Ascherson. Baldwin Co.: Submerged in shallow water of Old River along sandy SW shore of Ono Island, 4 Oct 1975, *Lelong 8811*.

This aquatic plant was not reported by Mohr for Alabama. Small noted its occurrence in southern Florida, "particularly on the Reef." Godfrey and Wooten (1979) indicated that its distribution extends from Florida to North Carolina and from Florida to Texas. It seems to be far less common in coastal Alabama than it is in adjacent States, being reported from only two sites in Baldwin County and one location in Portersville Bay, Mobile County, from which it has apparently been extirpated (Haynes 1980; Stout and Lelong 1981). Small patches of Turtle grass (*Thallassia testudinum*) have been observed in *Halodule* beds of Old River noted above.

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Although the reported plants except for *Tradescantia fulminensis* are my collections, I also consulted the herbaria of Auburn University (AUA), the University of Alabama (UNA), and Vanderbilt University (VDB) in the preparation of this paper. I am thankful to the curators of those herbaria for allowing me to examine their valuable collections as conveniently as possible. I am also thankful to Robert Haynes (UNA) for providing me valuable information about *Potamogeton robbinsii*.

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NOTES

FIRST REPORT OF *CIRSIUM VULGARE* (ASTERACEAE) FROM TEXAS.—*Cirsium vulgare* (Savi) Tenore was not reported from Texas by Correll and Johnston (1970) and is not represented in the collections at TEX-LL or SMU. Its presence in Texas, apparently the first report from the state, is documented by the following collection data and vouchers:

TEXAS. Gillespie Co.: 7 mi S of Doss and 7 mi N of Harper on the McGinley Ranch on Texas FM Rd 783, in the northwestern part of the county, 29 Oct 1987, *Bob O'Kennon 1001* (NY, SMU, TAES, TEX).

The population is known to have existed at this locality for at least 6 years. It consists of about 50 scattered plants along the bank of a creek and in seepy pastures adjacent to it. The plants are 6[6]18 dm tall, apparently annual or perhaps biennial, and they arise from a thick taproot. Although the collection was made near the end of the normal flowering season for this population (June-November), numerous plants were still in flower.

Cirsium vulgare is a native of Eurasia and is naturalized in scattered localities in North America. It seems unusual that the species has not been reported from Texas, because it is known from Louisiana and Arkansas (Cronquist 1980), New Mexico (Martin and Hutchins 1981) and Oklahoma (McGregor and Barkley 1986). At least in the southern part of their North American range, however, and certainly at the locality in Gillespie County, the plants of this species do not appear to be very invasive. This is perhaps because of an apparent peculiarity in their dispersal biology. The achenes are enclosed inside the heads even after they are fully mature and are released from the involucral bracts only at the end of the season, when the whole plants eventually fall over. Numerous achenes then germinate in situ in a cluster, but apparently only one of them survives to maturity.—*Bob O'Kennon, 30 St. Laurent Place, Dallas, TX 75230 and Guy Nesom, Department of Botany, University of Texas, Austin, TX 78731, U.S.A.*

ACKNOWLEDGMENTS

We thank Barney Lipscomb, Curator at SMU, for checking for possible records in the collections there.

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SIDA 13(1):115. 1988.

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MCGREGOR, R. L. (coord.) and T. M. BARKLEY (ed.). 1986. Flora of the Great Plains. University Press of Kansas, Lawrence.

NEW LOCATIONS OF *ILEX VERTICILLATA* (AQUIFOLIACEAE) IN SOUTHEASTERN TEXAS.—Correll and Correll (1941) lists and Little (1977) maps *Ilex verticillata* (L.) Gray in southeast Louisiana but not for Texas. Correll and Johnston (1970) list *I. verticillata* for Texas based on a single location (*Correll, Johnston, and Edwin 22310A*, TEX) collected on 24 May 1959 beside the Interstate 10 bridge over the Sabine River (Orange Co.) in extreme southeastern Texas. Correll recollected the plant at the same site in November 1961 and February 1962. After an extensive search turned up no additional specimens in Texas, I hypothesized that the small I-10 population was either an escape from cultivation or, if native, additional locations for this rare Texas plant should be found along the Sabine north of Correll's collection site.

On January 1, 1986 Eric Lautzenheiser, Lynn Lowrey and the author searched both sides of the Sabine River by boat from Highway 12 in Newton Co. south to the mouth of the Old River in Calcasieu Parish, Louisiana for specimens of *Ilex verticillata*. Although many gray-barked *Ilex decidua* plants were found on the river banks in both Newton Co., Texas and northern Calcasieu Parish, La., no specimens of the dark olive-barked *I. verticillata* were found until we reached Orange Co. about six miles north of Interstate 10 at Orange, Texas. Here the first single partially submerged specimen (*McWilliams M11862*, TAES) of *I. verticillata* was found on the Texas side of the river. This collection represents the second known location for the species in Texas. No specimens were seen on the Louisiana side of the river until we reached the area opposite West Bluff Community, Texas in the NE 1/4 of Section 20 R13W, T10S, Calcasieu Parish (*McWilliams M11863*, TAES). Fruiting specimens of *I. verticillata* were found only on the low shore growing over *Lysimachia* sp. and adjacent to a population of *Saururus cernuus*. Additional trees were found on the Louisiana side of the river one mile south of this location at the mouth of the Old River in the NW 1/4 of Section 28, R13W, T10S growing beneath knee-producing *Taxodium distichum* trees. Eight different clumps of *I. verticillata* were seen at this site.

SIDA 13(1):116. 1988.

R. Dale Thomas (pers. comm.) reports specimens of *Ilex verticillata* from Evangeline Parish, La. (*Cormier 1157*, NLU in 1978) and Rapides Parish (*Thomas 50023*, NLU in 1976). *Ilex verticillata* also appears to be native on the southern Sabine drainage and further searching along low banks of the Old River in Calcasieu Parish or below Toledo Bend may result in new locations for this predominantly northeastern species.

ACKNOWLEDGMENTS

I thank Dr. R. Dale Thomas for his assistance.—*Edward L. McWilliams, Department of Horticultural Sciences, Texas A&M University, College Station, TX 77843, U.S.A.*

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DICHANTHIUM ANNULATUM AND *BOTHRIOCHLOA PERTUSA*, (POACEAE), NEW TO LOUISIANA—Numerous species of the Old World genera *Dichanthium* Willemet and *Bothriochloa* Kuntze have been introduced as experimental grasses into parts of the southern United States where some have become naturalized (Chase 1951, Gould 1975, Allen 1980). Previously in the United States, *D. annulatum* Stapf. was known as an escape from cultivation in Texas and Florida (Gould 1975, D. Hall, Univ. of Fla., pers. comm. 1987). The discovery of about 300-400 plants of *D. annulatum* growing in the median along Interstate Highway 10, St. James Parish, 1.0 mi E of the St. James/Ascension Parish boundary, ca 7.0 mi NNW of Gramercy, 23 May 1987 (*McKenzie 606*, FLA, LSU, NLU, SLU, TAES, and US), represents the first report of this species in Louisiana. This introduction appears to have been unintentional.

Bothriochloa pertusa (L.) A. Camus has been recorded in coastal Texas, Alachua, Clayton, Dade and Monroe counties, Florida, and Oktibbeha County, Mississippi (Gould 1975, Chase 1951, D. Hall, pers. comm., 1987). The first record for Louisiana was collected in Washington Parish, along Louisiana Highway 16 ca 200 meters east of the Tchefuncte River bridge near the Tangipahoa Parish boundary, 17 Oct 1986 (*L. Smith 1487*, LSU). A colony of numerous individuals was growing on the roadside embankment about 20 meters from the roadway. Its presence may be associated with the activities of the nearby LSU Dairy Experiment Station even though they have no records of introducing this particular species as a forage grass.

We thank David Hall, Univ. of Florida, Gainesville, for providing distributional information for these species and Steven Hatch, Tracy Herbarium, Texas A&M University for confirming the identifications.—*Paul M. McKenzie, Louisiana Cooperative Fish and Wildlife Research Unit, Lowell E. Urbatsch, Department of Botany, Louisiana State University, Baton Rouge, LA 70803, and Latimore Smith, Louisiana Natural Heritage Program, P.O. Box 44124, Baton Rouge, LA 70804.*

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GOULD, F. W. 1975. The grasses of Texas. Texas A&M Univ. Press, College Station. 653 pp.

CYPERUS HYSTRICINUS (CYPERACEAE) NEW TO FLORIDA—*Cyperus hystricinus* Fern. is a distinctive and widespread eastern North American sedge. It is rare to occasional in well drained sands of the Atlantic and Gulf Coastal Plains from New Jersey, south into Georgia, then west into southwestern Arkansas and eastern Texas. *Cyperus hystricinus* has an umbelliform inflorescence of simple oblong spikes in which the spikelets are primarily one-fruited and all but the terminal few divaricate to declined. It may be distinguished from closely related *C. retrofractus* (L.) Torr. and *C. plukenetii* Fern. by narrower glabrous leaves and bracts, glabrous culms and peduncles, spikelets with golden-brown scales, and usually narrower achenes. During systematic studies of *Cyperus*, done primarily at Vanderbilt University Herbarium, specimens from the following herbaria were examined: EKY, FLAS, FSU, GA, GH, IBE, LL, MISSA, MO, NATC, NLU, NY PH, SMU, TENN, TEX, USCH, USF, UWFP, VDB, VPI, and VSC. Among them none of *C. hystricinus* from Florida was found. Furthermore, recent floristic treatments of Florida contain no reference to *C. hystricinus* (Ward 1968, Wunderlin 1982, and Clewell 1985). Although nomenclature of this complex has been problematical (see Carter & Jarvis 1986), it seems apparent from their keys and synonymies that Wunderlin (1982) and Clewell (1985) did not treat *C. hystricinus*. Thus, following is the first report of this species from Florida.

Collection data: FLORIDA. Walton Co.: 3.1 mi E of hwy FL 285, sandhill along I-10, locally abundant in turkey oak-dwarf post oak-longleaf pine community, 28 Aug 1982, *R. Carter 3505* (VDB, VSC, SMU, FSU, FLAS, USF, others to be distributed).

—*Richard Carter, Herbarium, Biology Department, Valdosta State College, Valdosta, GA 31698, U.S.A.*

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WUNDERLIN, R. P. 1982. Guide to the vascular plants of central Florida. University Presses of Florida, Tampa.

NOMENCLATURAL CHANGES IN *TAENIATHERUM* AND *DIGITARIA* (POACEAE).—Nevski (1934) described the genus *Taeniatherum* recognizing three species: *T. crinitum* (Schreb.) Nevski, *T. caput-medusae* (L.) Nevski, and *T. asperum* (Simonkai) Nevski. These species, the first two originally described in *Elymus* and the last one in *Cuviera*, have undergone numerous nomenclatural combinations. In recent systematic studies, authors have varied in their treatments: Humphries (1978) recognized one species (*T. caput-medusae*) with two varieties. Frederiksen (1986) recognized one species (*T. capt-medusae*) with three subspecies; Tsvelev (1976) recognized three species with *T. crinitum* as the type; and Clayton and Renovoize (1986) recognized one species, *T. crinitum*. The confusion in the type species for the genus was clarified in Nevski (1934) where *T. crinitum* was the only species mentioned in association with the generic description.

Fredericksen and Bothmer (1986) concluded that the three taxa should be treated as one species using data from pollen fertility and meiotic pairing studies of intra and interspecific crosses. Frederickson (1986) treated the three taxa as subspecies within *T. caput-medusae*. When the distribution data were examined there was no geographical separation between the three subspecies. Thus we recognize varieties instead of subspecies. Based on the gross morphology and previous studies of others we recognize two varieties of *T. crinitum*. The following nomenclatural change will make this

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name available for use in the *Manual of North American Grasses.*

TAENIATHERUM CRINITUM (Schreb.) Nevski var. **caput-medusae** (L.) Wipff, comb. and stat. nov. *Elymus caput-medusae* L., Sp. Pl. 84. 1753. TYPE: sheet no. 100.6 (LECTOTYPE: LINN). *Taeniatherum caput-medusae* (L.) Nevski, Trudy Sredne-Aziatsk. Gosud. Univ. Ser. 8b, Bot. 17:38. 1934.

Chase (1906) described the genus *Leptoloma* designating, the North American species, *L. cognatum* (Schult.) Chase as the type. Three Australian species (*L. divaricatissima* (R. Br.) Chase, *L. macratenium* (Benth.) Chase, and *L. coenicolum* (F. Muell.) Chase) were also transferred from *Panicum. Leptoloma* is distinguished from *Digitaria* only by the divergence of the spikelets and pedicels from the primary branches. Pilger (1931) transferred all species of *Leptoloma* to *Digitaria* including *L. cognatum* (*L. arenicola* Swallen was not described until 1950). Henrad (1950) concluded that the divergence of the spikelets from the main axis was not enough difference to justify the recognition of the genus *Leptoloma.* Webster (1983) showed that in the Australian species of *Leptoloma* there is a gradual transition from spikelets appressed to the primary branches to spikelets divergent from the primary branches in the paniculate forms. He concluded that the Australian *Leptoloma* should be placed in *Digitaria.* Webster (1988) stated, "*Leptoloma* can be defined only in terms of the North American species and therefore should be included in *Digitaria.*" *Panicum autmnale* Bosc. ex Spreng. var. *pubiflorum* Vasey ex L.H. Dewey was described in 1894. Chase (1951) treated *P. autumnale* and var. *pubiflorum* as synonyms of *L. cognatum.* We concur with Chase in treating *P. autmnale* as a synonym, but recognize the taxon *pubiflorum* as distinct. Based on our studies the following nomenclatural change is made.

DIGITARIA COGNATA (Schult.) Pilger ssp. **pubiflora** (Vasey ex L.H. Dewey) Wipff, comb. & stat. nov. *Panicum autumnale* Bosc. ex Spreng. var. *pubiflorum* Vasey ex L.H. Dewey, Contr. U.S. Natl. Herb. 2:508. 1894.

This is Technical Bulletin TA No.23707, Texas Agricultural Experiment Station. These two nomenclatural changes are made by J.K. Wipff.—*J.K. Wipff and Stephan L. Hatch, S.M. Tracy Herbarium, Department of Range Science, Texas A&M University, College Station, TX 77843, U.S.A.*

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AMORPHA ROEMERIANA SCHEELE, (FABACEAE), AN UPLAND SPECIES.—Wilbur (Rhodora 77:337 – 409. 1975) revised the North American genus *Amorpha* and regarded *Amorpha roemeriana* as one variable species that included *A. texana*, etc. This taxon is endemic to the Edwards Plateau region of Texas and its range extends from Travis County in the east to Uvalde and Real counties in the west. This taxon is an upland species fairly common on the "Devil's Back Bone" area (Hwy 32) in Comal County near the Hays County line growing on the ridge and upland breaks. Since it is an upland species, it is quite true that it is extremely rare in the bottomlands functioning as a wetland species.—*Wm. F. Mahler, Biology Department, Southern Methodist University, Dallas, TX 75275, U.S.A.*

TWO LEGUME EMENDATIONS—One of four notes preliminary to a treatment of the Leguminosae for the Vascular Flora of the Southeastern United States was published in this journal (Isely 1986). Dr. J.H. Wiersema has kindly called two nomenclatural matters to my attention. The cited Isely paper presents the context of the following:

I should have listed *Sesbania virgata* (Cav.) Persoon, Syn. Pl. 2:316. 1807, not (Cav.) Poiret in Lam. Encyl. 7:129. 1806 (p. 438 in Isely) to be consistent with author citation of *Sesbania* otherwise. This is based on the

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Code of Nomenclature position that *Sesbania* and *Sesban* are different names, not orthographic variants. Poiret's names were published in *Sesban.*

Subsequent to the Isely publication (pp. 431 – 432) of a nomenclatural summary of *Orbexilum pedunculatum* (Miller) Rydb., Dr. James Grimes, University of Texas, who has revised the erstwhile America *Psoralea* (yet unpublished) has lectotypified the basionym, *Hedysarum pedunculatum.* It seems incumbent to follow Dr. Grimes' position. The consequence is that the widely distributed, eglandular form of the species traditionally known as *Psoralea psoralioides* (Walt.) Cory var. *eglandulosa* (Elliott) Freeman, must now be known as *Orbexilum pedunculatum* var. *pedunculatum* while the glandular Coastal Plain kind assumes the name of *Orbexilum pedunculatum* var. *psoralioides* (Chapman) Isely (Basionym *Trifolium psoralioides* Walt., Fl. Carl. 184. 1788). The latter combination is necessitated by the recent autonym decree (Voss, E.G. et al. 1983) wherein (Article 57.3) it is stated that the autonym has priority over the simultaneous name(s) that established it. The autonym is a consequence of Freeman's (1937), segregation of *Psoralea psoralioides* (Walt.) Cory into vars. *"typica,"* *eglandulosa* (Elliott) Freeman, and *gracilis* (Chapman) Freeman. Since I am regarding vars. *gracilis* and *"typica"* taxonomically as the same, the autonym takes precedence.—*Duane Isely, Department of Botany, Iowa State University, Ames, IA 50011, U.S.A.*

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NOMENCLATURAL CHANGES IN *ACALYPHA* (EUPHORBIACEAE) AND *CHAMAECRISTA* (FABACEAE).—The taxon *Acalypha gracilens* var. *monococca* Engelm. *ex* Gray was elevated from its varietal status to the rank of species, as *A. monococca* (Engelm.) L. Miller by Lilian Miller in *Manual of the Vascular Plants of Texas* (Correll & Johnston 1970).

According to Article 33.2 of Intenational Code of Botanical Nomenclature (Voss et al. 1983), all new combinations of avowed substitutes, published after 1 January 1953, require the citation of basionym, and a full and direct reference given to its author and original publication with page or plate reference and date. The *stat. nov.* proposed by Miller does not men-

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tion publication details of *A. gracilens* var. *monococca*. Hence, to date, Miller's *stat. nov.* remains invalid.

In this connection, the *stat. nov.* is proposed by L. Miller and Gandhi:

ACALYPHA **monococca** (Gray) L. Miller & Gandhi, stat. nov. *A. gracilens* Gray var. *monococca* Engelm. *ex* Gray, Man. Bot. ed. 2, 390. 1856.

Irwin and Barneby (1979) transferred *Cassia leptadenia* Greenman to *Chamaecrista* and treated it as a synonym of *Chamaecrista nictitans* (L.) Moench var. *mensalis* (Greenman) Irwin & Barneby. When Greenman proposed the var. *mensalis* under *Cassia leptadenia*, automatically var. *leptadenia* was established (Article 26.2), whether or not it appeared in print (Article 32.6). If these two varieties are united as a variety of *Chamaecrista nictitans,* the autonym has priority over the name that established it (Article 57.3). Accordingly, a new combination is proposed here:

CHAMAECRISTA NICTITANS (L.) Moench var. **leptadenia** (Greenman) Gandhi & Hatch, comb. & stat. nov. *Cassia leptadenia* Greenman, Proc. Amer. Acad. Arts 41:238. 1905.

Cassia leptadenia Greenman var. *mensalis* Greenman, loc. cit. *Chamaecrista nictitans* var. *mensalis* (Greenman) Irwin & Barneby, Phytologia 44:501. 1979.

Cassia leptadenia var. *leptadenia*, automatically established by *C. leptadenia* var. *mensalis*.

This is Technical Bulletin TA No. 23740, Texas Agricultural Experiment Station.—*Kancheepuram N. Gandhi and Stephan L. Hatch, S. M. Tracy Herbarium, Department of Range Science, Texas A&M University, College Station, TX 77843, U.S.A.*

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NOMENCLATURAL CHANGES IN CHIHUAHUAN DESERT *OPUNTIA* (CACTACEAE)

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ABSTRACT

Plant names published in Engelmann's 1848 Letter to Emory are provisional and therefore not valid. These include *O. californica, O. microcarpa, O. stanlyi,* and *O. violacea*. Of these, only *O. californica* was never validated. The remainder were validated by Jackson in Index Kewensis in 1895. The first two names cannot be applied with certainty from the drawings and diagnoses. The last two are predated by *O. emoryi* Engelm. and *O. macrocentra* Engelm. respectively; in neither species do we recognize varieties. Other changes are **O. aureispina** (Brack & Heil) Pinkava & Parfitt, comb. et stat. nov. and **O. × spinosibacca** Anthony, pro sp., the latter a hybrid between putative parents, *O. aureispina* and *O. phaeacantha* Engelm.

David Hunt (1969) and Nigel Taylor (1985) have questioned the validity of certain cactus names that George Engelmann (1848b) suggested in a letter dated 13 February 1848 to Col. W. H. Emory and published in Appendix No. 2 of Emory's "Notes of a Military Reconnoissance from Ft. Leavenworth, in Missouri, to San Diego, in California."

Based only on J.M. Stanly's drawings of cacti and perhaps the notes of the itinerary, Engelmann provided brief diagnoses for the following opuntias: *Opuntia californica, O. microcarpa, O. stanlyi,* and *O. violacea*. The only other opuntias listed were *O. arborescens* and *O. vaginata*, both validly published earlier by Engelmann (1848a).

Engelmann states in the Letter to Emory (1848b, p. 155) that "I have ventured to describe some of your species from the drawing; my description, however, and the names given by me, must remain doubtful till we are able to obtain some more data to characterize the species. I have written it more for your information than for publication, but if you choose to append it to your published report, I have no objection to it, but must request you to make such corrections or alterations as your notes or your recollection of the plants will enable you to do; for example as to size, as in some of the drawings no size is mentioned,* in which case I have assumed them to represent the natural size." The asterisk refers to a footnote, "*Where the size is not mentioned, the original drawings are the same size of nature. W.H.E.," the only known contribution (correction or addition) by Emory to Engelmann's letter. Taylor (1985, pp. 51−53) comments

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SIDA 13(2):125−130. 1988.

that this footnote does not remove "... all earlier expressed doubts about the taxa being named." Further, he states that "... as Engelmann's letter reads, it is difficult to escape the conclusion that his new species were provisional in the sense of ICBN Art. 34.1(b) and their names, therefore, were not validly published in 1848."

We agree with Taylor's conclusion that all names appearing in Engelmann's letter (1848b), but not previously published, are invalid because they are provisional according to ICBN Art.34.1(b) (Voss et al. 1983). Engelmann (1848b) states specifically that "the names given by me must remain doubtful till we are able to obtain some more data to characterize the species."

In subsequent publications, Engelmann never accepted any of these provisional names in *Opuntia*, not even in his "Synopsis" (1856). The provisional names and diagnoses in the letter (Engelmann 1848) are considerably different in style from his earlier and later publications (see, for example, Engelmann 1848a, 1856). Only in the letter are diagnoses in English, not in Latin, and each name appears in his commentary following the brief diagnosis, rather than being placed foremost in the thorough description.

Because several of these names were later validated by Jackson (1895), typification is necessary before the names can be accurately placed. There is evidence that Engelmann never saw Emory's specimens. Not only did Engelmann (1848b) state that he described them from drawings, but Emory in his letter of 26 February 1848 to Engelmann (George Engelmann Papers, MO) acknowledges receipt of the descriptions (and necessarily Stanly's drawings because they were published and bear figure numbers assigned by Engelmann). Emory further states that Engelmann's "descriptions are from drawings & not from specimens of the plant itself" and admits that the drawings are "... not sufficiently anatomical." Engelmann could not have received Emory's specimens prior to his descriptions because Emory also states "... I will yet send them."

Correspondence among Emory, Engelmann and Torrey needs further study, but there are a number of letters where Emory states that he is waiting for Torrey to release his specimens to Engelmann and for Engelmann to return the drawings and identifications so that he can get them to the printer (J.M. Ricketson, pers. comm.).

Therefore, Stanly's original drawings, the only materials Engelmann used for his new diagnoses, are holotypes. Since these have not yet been found, the published drawings qualify as "authentic material" and would serve as lectotypes. We shall await further search before attempting formal typification.

The status of the four opuntias in question follows:

OPUNTIA CALIFORNICA Engelm. in Emory, Notes Mil. Reconn. 158, fig. 11. 1848; invalid provisional name according to ICBN Art. 34.1(b).—not *O. californica* (Torr. & Gray) Cov., Proc. Biol. Soc. Wash. 13:114. 1899.

Benson (1982), believing *O. californica* Engelm. was valid, erroneously designated the following as "lectotype": " 'Ex Hb. Torrey, *Emory*,' (excluding one label, 'arbuscula, Emory, Nov. 13, 1846,' which belongs with a collection of that species from the lower Gila)" (MO 1797128/2015251!, photo ASU!). However, because Benson never provided or made reference to a previously and effectively published Latin description or diagnosis (ICBN Art. 36.1) he did not validate the name.

Treated as a synonym of *O. acanthocarpa* Engelm. & Bigel. by B.D. Jackson (1895); as a synonym of *O. leptocaulis* DC. by W.T. Marshall (1950); and as a synonym of *O. kleiniae* DC. by Britton and Rose (1919) and var. *tetracantha* (Toumey) W.T. Marshall by L. Benson (1969, 1982).

OPUNTIA MICROCARPA Engelm. [in Emory, Notes Mil. Reconn., 157, fig. 7. 1848, nom. prov.] ex B.D. Jackson, Index Kewensis 2:358. 1895. —[*O. microcarpa* Engelm. in Emory, Notes Mil. Reconn., 157, fig. 7. 1848; invalid provisional name (ICBN Art. 34.1(b)).] TYPE: drawing by Stanly (not found).

Treated as a *bona fide* species growing from Solomonville to Tucson, in Arizona, by Griffiths (1916), but he cited no specimens to document his description. Considered by Benson (1982) as a *nomen dubium* because he believed that no present-day taxon fits the locality and description by Engelmann (1848b).

OPUNTIA EMORYI Engelm., Proc. Amer. Acad. 3:303. 1856. —*Cactus emoryi* Lemaire, Cactees 88. 1868. TYPE: "Arid soil south and west of El Paso, especially between the sand hills and Lake Santa Maria, *Wright, Bigelow*, in Sonora, *Wright*, and on the lower Gila and in the Colorado desert, *Schott*..." (lectotype: no locality, *Bigelow in 1852* (MO, seeds only) and no locality or collector (MO 2015170, seeds only, photo ASU!); two seed specimens selected by Benson (1982)).

[*O. Stanlyi* Engelm. in Emory, Notes Mil. Reconn., 157, fig. 9. 1848; invalid provisional name (ICBN Art. 34.1(b)).]

O. Stanlyi Engelm. [in Emory, Notes Mil. Reconn., 157, fig. 9. 1848, nom. prov.] ex B.D. Jackson, Index Kewensis 2:358. 1895.—*Corynopuntia Stanlyi* Knuth in Backeberg & Knuth, Kaktus-ABC, p. 114. 1935.—*Grusonia stanlyi* (Engelm.) H. Robinson, Phytologia 26:176. 1973. TYPE: drawing by Stanly (not found). TOPOTYPE: NEW MEXICO. HIDALGO CO.: along the Gila River, 3 mi SE of Virden, 23 Apr 1966, *L. Benson 16638* (POM 317489! (2 sheets) designated as "neotype" by Benson (1982), photos ASU!).

Although Benson (1969, 1982) recognized three additional (non-autonym) varieties of *O. stanlyi*, we have not transferred them to *O. emoryi* because we consider them to be distinct from that species.

OPUNTIA MACROCENTRA Engelm., Proc. Amer. Acad. 3:292. 1856. *O. violacea* Engelm. var. *macrocentra* L. Benson, Cacti Arizona, ed. 3:21, 92. 1969. TYPE: sandhills in the Rio Grande bottom near El Paso, *Ch. Wright in 1852* (LECTOTYPE: MO 2015392!, 2015393! designated by Benson (1969), photos ASU!).

[*O. violacea* Engelm. in Emory, Notes Mil. Reconn., 157, fig. 8. 1848; invalid provisional name (ICBN Art. 34.1 (b))]

O. violacea Engelm. [in Emory, Notes Mil. Reconn., 157, fig. 8. 1848, nom. prov.] ex B.D. Jackson, Index Kewensis 2:358. 1895. TYPE: drawing by Stanly (not found). TOPOTYPE: ARIZONA. northeast of Solomon, 22 Apr 1966, *L. Benson 16632* (POM 311337! designated as "neotype" by Benson (1969), photo ASU!).

O. violacea Engelm. var. *castetteri* L. Benson, Cact. & Succ. J. (U.S.) 41(3):125. 1969. TYPE: U.S.A. TEXAS. EL PASO CO.(?): Hueco Mts., S of US hwys 62 and 180 combined, limestone, 4300 ft. elev., 11 Jul 1955, *L. Benson 15433* (HOLOTYPE: POM 284747! (2 sheets), photos ASU!).

Benson (1982) recognized five varieties of *O. violacea*. *Opuntia violacea* var. *macrocentra* becomes a synonym of *O. macrocentra*. We consider two of the varieties distinct at the species level (*O. santa-rita* (Griffiths & Hare) Rose and *O. gosseliniana* Weber). The varieties *violacea* and *castetteri* do not warrant taxonomic recognition.

In our studies of the Chihuahuan Desert opuntias, we find two taxa of Big Bend National Park, Texas, that require nomenclatural changes:

OPUNTIA **aureispina** (Brack & Heil) Pinkava & Parfitt, comb. et stat. nov.—*O. macrocentra* Engelm. var. *aureispina* Brack & Heil in Heil & Brack, Cact. & Succ. J. (U.S.) 60(1):17 – 34. 1988. TYPE: U.S.A. TEXAS. Brewster Co.: near Rio Grande, Big Bend National Park, 15 May 1985, *K. Heil 2191* (HOLOTYPE: San Juan College Herbarium 3777!, photo ASU!).

The drying, spiny fruits and the pattern of dispersed glochids in mid-pad areoles keep this taxon from being part of *O. macrocentra* which has fleshy, spineless fruits and a pattern of densely tufted glochids in mid-pad areoles. It is best treated as a species with some affinities to *O. chisosensis* (Anthony) Ferguson. Barbara Ralston obtained a diploid count of $n = 11$ (1987 unpubl.) for this taxon (*Ralston 150 & Hovy*, SRSC).

OPUNTIA ×**spinosibacca** Anthony, pro sp. (= *O. aureispina* (Brack & Heil) Pinkava & Parfitt ×*O. phaeacantha* Engelm.) *O. spinosibacca* Anthony, Amer. Midl. Nat. 55(1):225 – 256. 1956.—*O. phaeacantha* Engelm. var. *spinosibacca* (Anthony) L. Benson, Cact. & Succ. J. (U.S.) 41(3):125. 1969. TYPE: U.S.A. TEXAS. Brewster Co.: Boquillas, rocky limestone slopes east of ranger's quarters, 26 Aug 1948, *M.S. Anthony 236* (HOLOTYPE: MICH; ISOTYPE: US 2346076!, photo ASU!).

The putative parents are diploid ($2n = 22$) *O. aureispina* and hexaploid ($2n = 66$) *O. phaeacantha*. *Opuntia* ×*spinosibacca* is tetraploid ($2n = 44$) based on counts by Weedin and Powell (1978). The hybrid status of these plants is further substantiated by reduced fertility together with a morphology largely intermediate between the putative parents (including the spiny, yet fleshy, fruit).

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We thank Drs. E.G. Voss and D.H. Nicolson for assistance in interpreting the ICBN rule on provisional names, though final decisions are ours. We also thank Dr. Allan D. Zimmerman for the challenging discussions regarding some taxa, and curators of the following herbaria for loans of specimens: ASU, MICH, MO, POM, San Juan College (Farmington, NM), SRSC, US. Information and suggestions provided by Dr. A. Michael Powell, Barbara Ralston, Jon M. Ricketson and James F. Weedin are gratefully acknowledged.

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A NEW SPECIES OF *PICEA* (PINACEAE) FROM NUEVO LEÓN, MÉXICO

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ABSTRACT

A new species, *Picea* **martinezii** T.F. Patterson, is described from Nuevo León, México, It is a low elevation, large-cone spruce most similar to *Picea chihuahuana* Martínez.

Recently, *Picea chihuahuana* was reported by Müller-Using and Alanis (1985) from two locations in the Sierra Madre Oriental of Nuevo León, México. Previously, *P. engelmannii* Parry var. *mexicana* (Martínez) Silba was the only known spruce occurring in the Sierra Madre Oriental (Martínez 1963; Taylor and Patterson 1980). A trip was made to confirm the presence of the spruce and to make herbarium collections. Instead of *P. chihuahuana*, I found a different and very distinctive species, which is herein described. The locations of the new species, *P. chihuahuana*, and *P. engelmannii* var. *mexicana* are shown in Figure 1.

PICEA **martinezii** T.F. Patterson, sp. nov. (Fig. 2).

Picea chihuahuana Martínez simile sed acis planis flexilibus, pulvinis rotundatis, squamis strobili latioribus denticulatis, et seminibus longioribus differt.

Trees to 30 m tall, forming an open, irregular crown; bark thin, scaly, gray. Young twigs glabrous, yellow, becoming reddish brown and then gray; pulvini rounded; sterigmata ca 1 mm long. Buds conic, reddish-brown, 8 − 10 mm long, scales appressed, glabrous, margins scarious, apex acute; terminal buds with a basal ring of subulate scales. Leaves dark green, directed forward, straight or slightly incurved, flexible, 16 − 27 mm long, flat, 1 − 2 mm wide, sharp-pointed, keeled on one or both surfaces, with 4 − 10 rows of stomata on each side, resin canals none. Staminate cones not observed. Mature ovulate cones reddish brown, oblong-cylindric, 85 − 161 mm long, 40 − 62 mm wide, with thick, rigid, obovate scales 19 − 30 mm long, 18 − 25 mm wide, denticulate, apex becoming reflexed; bract 4 mm long, brown, deltate to oblong with a round apex, with or without a short, contracted base, margins, including the apex, erose-denticulate. Seeds brown, fusiform, slightly flattened, 5 − 8 mm long, apex rounded, base acute, wings 16 − 23 mm long.

SIDA 13(2):131 − 135. 1988.

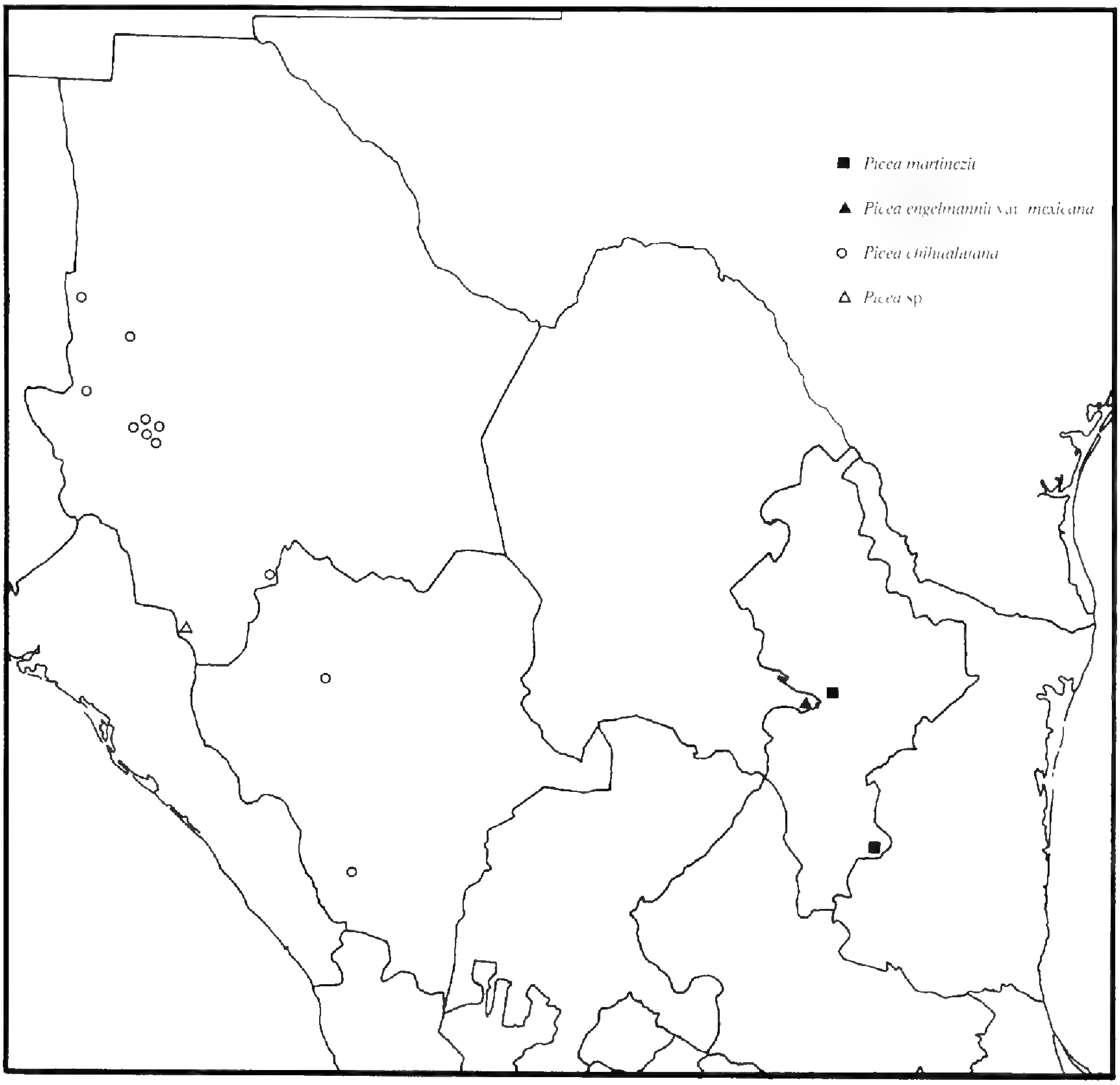

FIG. 1. Distribution of *Picea* in México.

TYPE: MÉXICO. NUEVO LEÓN, Mpio. Montemorelos, 6 km SE of La Trinidad on a NE exposed talus slope below the precipice "El Butano;" 25 11'N, 100 07'W; mixed conifer-deciduous forest; 2200 m elev.; 8 Jul 1987, *T.F. Patterson* 5629 (HOLOTYPE: TEX; ISOTYPES: ENCB, INIF, MEXU, MO, US).

Additional collection examined: MÉXICO. NUEVO LEÓN, Mpio. Zaragoza, Cañada La Tinaja, Rancho La Encantada, *T.F. Patterson 5732 (TEX).*

Picea martinezii is distinguished from all North American species except *P. breweriana* S. Wats. and *P. chihuahuana* by its large cone size. Like *P. breweriana*, it has flat needles but differs in its sharp-pointed needles with stomata on both surfaces, glabrous stems, and thicker cone scales. In its cones, *P. martinezii* is most similar to *P. chihuahuana* but differs in its needles (flat and flexible versus 4-sided and stiff in *P. chihuahuana*), pulvini (rounded versus flattened in *P. chihuahuana*), cone scales (18 – 25 mm wide

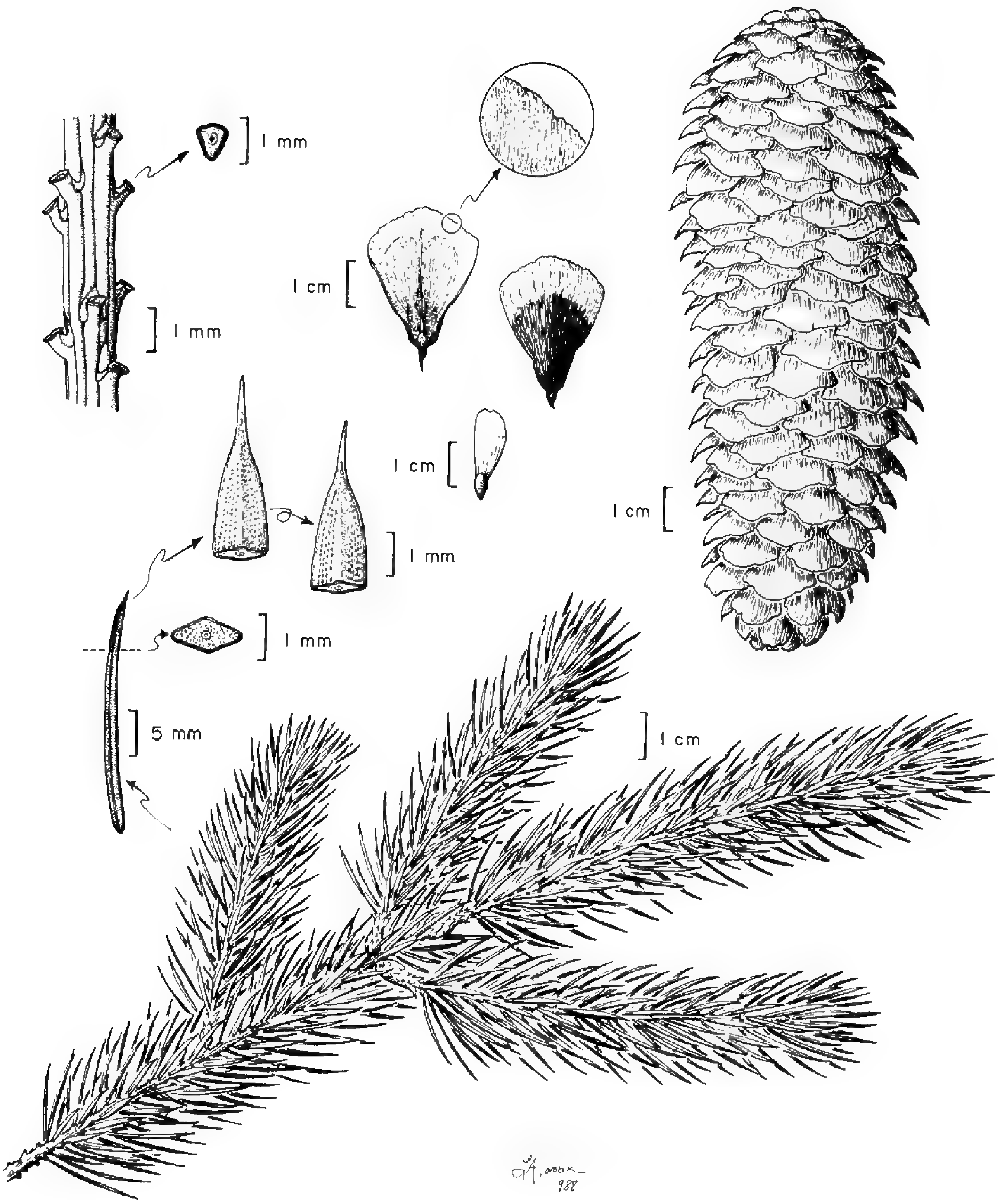

FIG. 2. Branch, cone, and details of *Picea martinezii*, from the holotype.

and erose-denticulate versus 11 – 18 mm wide and entire in *P. chihuahuana*), and seeds (5 – 8 mm long versus 3 – 5 mm long in *P. chihuahuana*). *Picea martinezii* is separated from previously known populations of *P. chihuahuana* in the Sierra Madre Occidental by more than 450 kilometers.

In the Sierra Madre Oriental, *Picea martinezii* is separated from *P. engelmannii* var. *mexicana* by about 25 kilometers. In habitat, these two spruces differ considerably. *Picea engelmannii* var. *mexicana* is a subalpine species that occurs above 3400 meters. *Picea martinezii* is a temperate montane species that occurs as low as 2150 meters in a mixed conifer-deciduous forest. At La Trinidad, *Picea martinezii* is associated with conifer species of *Pinus, Abies*, and *Taxus*, and is associated with the broadleaf species of *Quercus, Tilia, Ostrya, Cornus, Ilex, Juglans*, and *Crataegus*. This community occurs in a sheltered ravine protected by a limestone precipice of over 500 meters known as "El Butano." The trees are growing in pockets of deep humus between blocks of limestone talus. Surface water is non-existent because of numerous sinks and crevices in the limestone. Heavy rainfall, frequent fog, and a sheltered environment apparently have allowed this spruce community to persist.

The future of *Picea martinezii* looks promising. Presently, there is a considerable amount of regeneration. There is also much concern about protecting these populations. Müller-Using and Alanis (unpubl. ms. 1985) suggested ways these putatively disjunct populations of spruce could be legally protected. Seeds of the La Encantada population have been introduced to the Royal Botanic Gardens of Kew and to other arboreta (Rushforth 1986). The lumbering communities of La Trinidad and La Encantada have been told by the government foresters to protect the spruce population (pers. comm., local citizen). The La Encantada spruce community has been fenced off. And probably most encouraging of all, the logging road to the La Trinidad spruce community is starting to become overgrown and impassable.

Picea martinezii is a relict endemic of the Sierra Madre Oriental, a mountain range extending from northeastern México to southern México. Of the three spruces occurring in México, *P. martinezii* is a likely candidate for the source of spruce pollen recovered from lignites in southern México (Graham 1975), because it occurs at low elevations and is associated with temperate deciduous species on the eastern flank of the Sierra.

It is a pleasure to dedicate this new species to Dr. Maximino Martínez, whose book, *Las Pinaceas Mexicanas*, inspired me to explore the mountains of México.

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RE-DISCOVERY OF *CALAMOVILFA CURTISSII* (GRAMINEAE) IN THE FLORIDA PANHANDLE

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ABSTRACT

The range of *Calamovilfa curtissii* (Gramineae) in the Florida panhandle has been rediscovered and expanded. Observations on habitat, soils, associated species, and flowering response to fire are reported.

The Florida Natural Areas Inventory (FNAI) tracks populations of rare species in Florida, of which Curtiss' sand grass, *Calamovilfa curtissii* (Vasey) Scribn., is one. According to the published literature, this perennial grass is endemic to Florida in two disjunct regions: the northeast coast of the peninsula in Brevard, Volusia, St. Johns, and Duval counties (Kral 1983) and the panhandle in Santa Rosa and Okaloosa counties (Thieret 1966). However, none of the major Florida herbaria had specimens from the latter two (panhandle) counties. A query of major herbaria in the eastern United States turned up two specimens in the U.S. National Arboretum from Santa Rosa County. These were labelled "Grasses of the W.A. Silveus Collection, San Antonio, Texas" and had been collected on 14 August and 25 September, 1939 from "low damp ground - coast road east from Pensacola, U.S. 98."

Accordingly, in August 1987 we checked the area east of Pensacola as described and found two populations of *C. curtissii* whose identity was confirmed by John Thieret (KNK), David Hall (FLAS), and Robert Kral (VDB). Subsequent fieldwork uncovered over thirty sites for the species on the Florida panhandle in Santa Rosa, Okaloosa, Walton and Bay counties (Fig. 1). One specimen from the Florida panhandle was deposited in each of the following: FLAS, FSU, KNK, NA, NY, UWFP, as well as at Tall Timbers Research Station, Tallahassee, and at Eglin Air Force Base, Niceville.

In the Florida panhandle, *C. curtissii* appears to be confined to the coastal plain below the 50-foot contour line in the four counties. Searches on adjacent barrier islands, as well as in suitable habitat on the coastal plain of neighboring Escambia and Gulf counties failed to turn up any populations (Fig. 1).

The plant occurs in wiregrass (*Aristida stricta*; nomenclature in this paper follows Clewell 1981) flatwoods where it occupies the lightly shaded ecotone between the lower, wetter, unshaded areas of wiregrass, pitcher plants (*Sarracenia* spp.) and *Sphagnum* moss, and the slightly higher, drier areas with heavier shade from gallberry (*Ilex glabra*) and slash pine (*Pinus elliotii*). A second habitat for the species is in depressions known as temporary ponds surrounded by more xeric communities dominated by turkey oak (*Quercus laevis*) or sand pine (*Pinus clausa*). In these situations it may form monospecific stands without admixture with wiregrass. It is distinguishable in the field as large clumps, (up to 1 m diameter), resembling a head of hair, in the midst of the smaller, finer-bladed clumps of wiregrass. It can be distinguished from clumps of *Andropogon* spp. with which it grows by its longer, more scabrous leaf blades and short, thick rhizome. It often occurs on Leon Sand, a soil type with upper horizons colored dark gray by organic matter and a water table close to the surface during the rainy season (Soil Survey of Santa Rosa County, Florida 1980). Only populations that had signs of being recently burned or mechanically disturbed were flowering profusely; most populations visited during flowering season (July-October) had few or no flowering stalks. In its flowering response to fire it resembles the associated wiregrass, as well as cutthroat grass (*Panicum abscissum*), a species endemic to similar habitats in south central Florida (Myers and Boettcher 1987). Although *C. curtissii* occurs on many sites and has a population probably numbering in the thousands in the Florida panhandle, most of these sites are slated for real estate development. The only populations on publicly managed lands (and thus able to be protected) in the panhandle were found on Eglin Air Force Base (5 populations), Grayton Beach State Recreation Area (2 populations), and Naval Live Oaks, Gulf Islands National Seashore (1 small population).

In Brevard County, on the northeast peninsular coast, the species is known to occur only on the Kennedy Space Center, where it dominates several long, narrow coastal swales of the ridge and swale topography of Merritt Island. Kral (1983) also lists it from Volusia, St. Johns, and Duval Counties on this coast, but no herbarium specimens could be located from these counties, and fieldwork has produced only one questionable specimen (near Samsula, Volusia County; *Johnson 8039* FSU). Appropriate wiregrass flatwoods habitat in these counties, however, might well repay a more intensive search for this rare species.

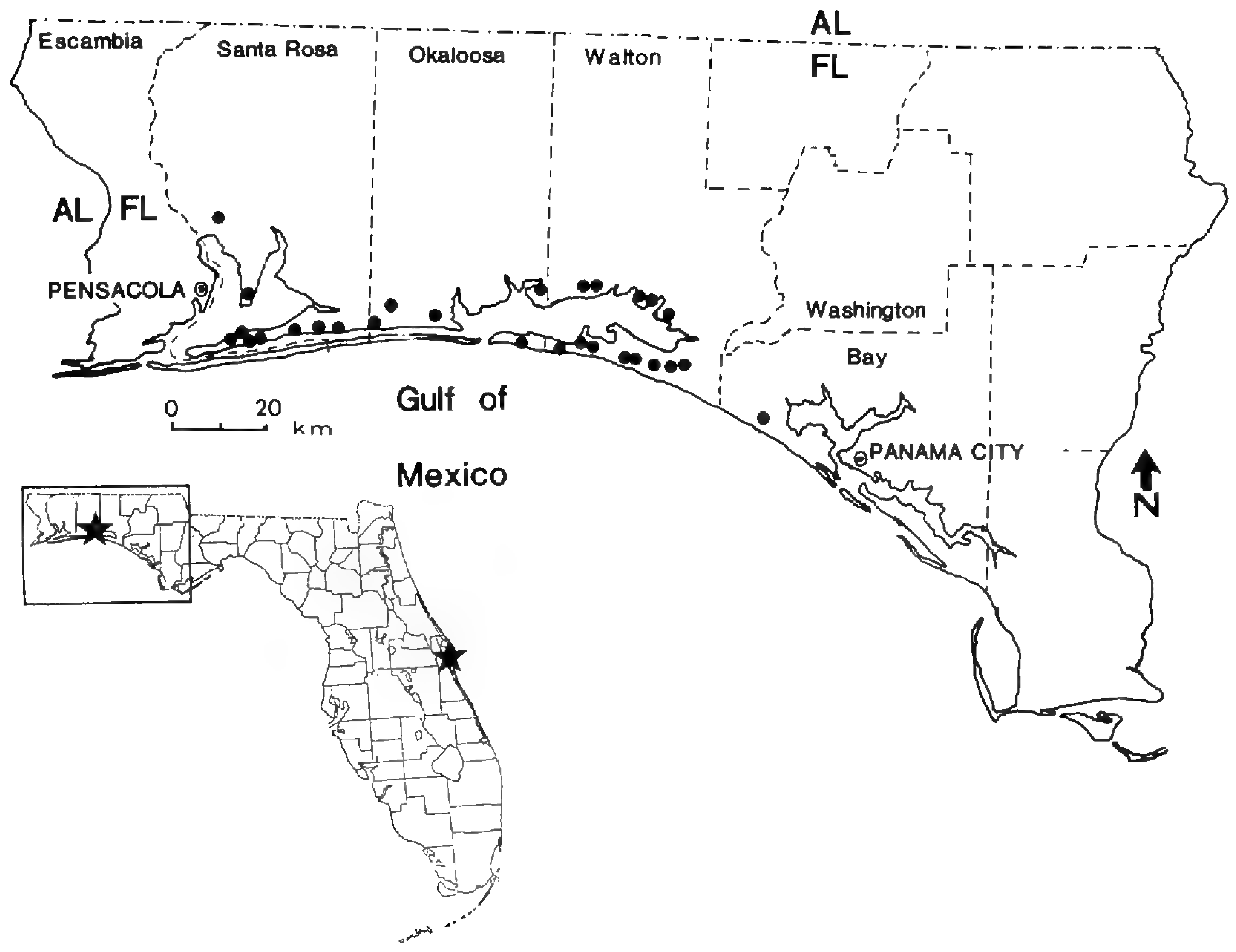

FIG. 1. Range of *Calamovilfa curtissii* in the Florida panhandle. Stars = the disjunct range of *C. curtissii* in Florida; filled circles = sites where *C. curtissi* was found in the panhandle.

A similar disjunction between the Florida panhandle and the peninsula is seen in the ranges of several other Florida endemics (Kral 1983), i.e. *Andropogon arctatus, Manisurus tuberculosa, Nolina atropocarpa*, and *Rhododendron chapmanii*, all of which are also found in wet flatwoods. One could speculate that the greatly expanded coastal terraces bordering the Gulf of Mexico during low sea level stands of glacial maxima provided a continuous wet flatwoods habitat between the panhandle and the peninsula, a habitat that was subsequently severed by sea level rise, producing the disjunct ranges we now see.

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TWO *LOBELIA* (CAMPANULACEAE) GYPSOPHILES FROM NUEVO LEÓN, MÉXICO

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ABSTRACT

The taxonomy of two gypsum endemics, *Heterotoma pringlei* and *Lobelia margarita*, is discussed and their relationship clarified. *Heterotoma pringlei* is transferred to *Lobelia*, "series *Angustifolia*," requiring a new name, for which **L. gypsophila** is proposed. A key, descriptions, distributions, and illustrations are provided for both species.

A recent monographic study of the genus *Heterotoma* Zucc. (Ayers 1986) revealed that two species occur only on gypsum outcrops in Nuevo León, México, and are closely related. The species are allopatric, the closest populations separated by approximately 40 miles. They have been treated as conspecific (McVaugh 1943) and as species of different genera (Wimmer 1953). Field, herbarium, and micromorphological studies have revealed many unique characteristics common to both. The presence of these characteristics argues that, although the taxa deserve specific recognition, they should not be segregated in separate genera.

Heterotoma pringlei B. L. Robinson (1909) was described from a single collection (*Pringle 13274*) reported to possess calyces "3 – 4 mm longo valde gibboso." Gibbose hypanthia or nectar spurs are the single criterion delimiting *Heterotoma* Zucc. sensu lato from *Lobelia* L. McVaugh (1943) broadened the species (and the generic) concept to include plants with hypanthia "varying to regular or essentially so." Wimmer (1948) described the plants with regular hypanthia as a new species of *Lobelia, L. margarita*, which he included in his "series *Angustifolia*." Wimmer (1953) continued to recognize *Heterotoma pringlei*, still known only from the type, by its "oblique-oblong" hypanthium.

With the continuing exploration of the Sierra Madre Oriental in southeastern Nuevo León, numerous recent collections have documented the existence of two distinct species. Both are perennials that produce basal rosettes and flowering shoots from a woody rootstock. They are nearly identical vegetatively, but may be separated easily by floral morphologies unique among Mexican lobeliads. *Heterotoma pringlei* can be recognized by its hypanthium, which appears asymmetrical because the pedicel is

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attached at the top of the hypanthium and the extension of corolla tissue forms a nectar spur (Fig. 1B). A non-median pedicel attachment is unusual in lobeliads and is found only rarely, as in the Australian *Lobelia gibbosa* Labill., in which the pedicel attaches to the lower side of the hypanthium. *Lobelia margarita* has a regular hypanthium, but the corolla tube diverges upward at a 45° angle creating a "pouch" on the lower side at the base of the corolla tube (Fig. 1C). Corolla tubes of lobeliads are often slightly longer on the lower side (and the hypanthium subsequently slightly shorter), but the corolla tube usually lies in the same plane as the hypanthium.

To my knowledge both of these gypsophiles are unique among Mexican lobeliads in their pedicellar movement during fruit maturation. The pedicel deflexes abruptly at the hypanthium and the fruit is pendant with the "gibbose" or lower side closest to the stem axis (Fig. 1). In almost all other species, the fruit remains stationary or the pedicel reflexes near the hypanthium so that the fruit is presented above the pedicel with the lower side oriented away from the stem axis or upward.

In addition to soil preferences, vegetative features, and pedicellar movement during fruit maturation, a variety of macro and micromorphological characters supports the hypothesis that the two taxa are more closely related to one another than to other Mexican species of *Lobelia*. The pollen exine in both taxa is reticulate with lumina 0.3 − 0.5 m in diameter (Ayers 1986), similar to the exine of *Isotoma fluviatalis* F. Muell. (Dunbar 1984). Pollen exine of all other species of Mexican lobeliads studied was reticulate-striate with lumina 0.1 − 0.25 um in diameter (Ayers 1986). Seed testa sculpturing of both *Heterotoma pringlei* and *Lobelia margarita* are sinuo-striate (Ayers in prep.), a unique condition not observed in any other species studied. In addition to the unusual sculpturing, both species have seeds that are slightly smaller than average (0.3 vs 0.5 mm long) and unusually colored (burgundy red vs tan to dark brown).

The number of unique characteristics shared by the two gypsophiles argues that despite the differences in hypanthium morphology, they should not be placed in separate genera. In a recent delineation of *Heterotoma* (Ayers 1986), the genus has been restricted to include only the generotype, *H. lobelioides*. The remaining species are referred to *Lobelia* (Ayers 1987 & in prep). *Heterotoma pringlei* is here transferred to *Lobelia* as *L. gypsophila*.

Lobelia gypsophila may be referred to Wimmer's "series *Angustifolia*," an artificial group delimited by the presence of small corollas (5 − 12 mm long) and narrow leaves. Wimmer placed 24 African and Australian species and seven New World species (six Mexican including *L. margarita*)

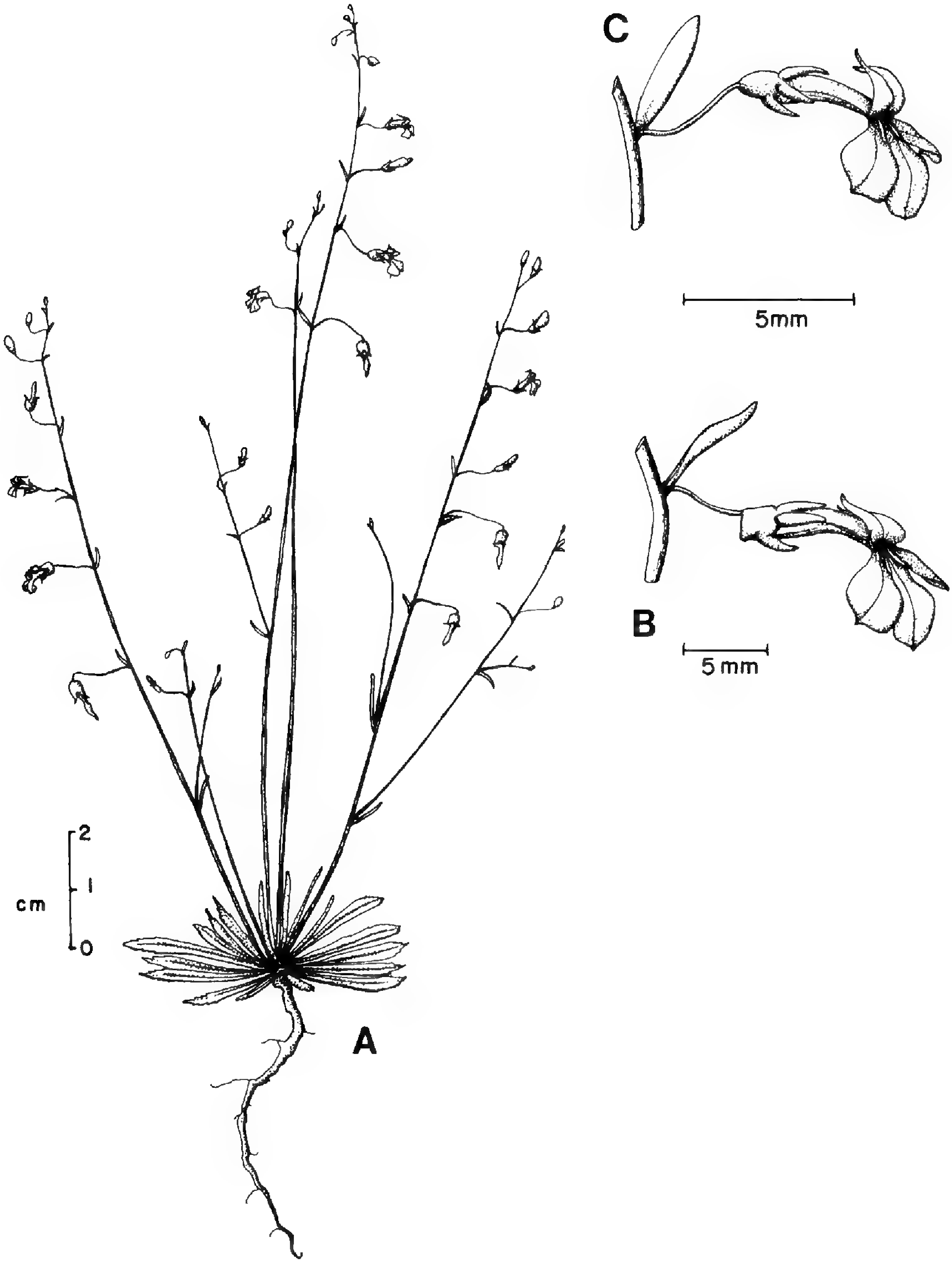

FIG. 1. Illustration of *Lobelia gypsophila* and *L. margarita*. A – B: *L. gypsophila*. A. Habit. B. Lateral view of flower. C. *L. margarita* lateral view of flower.

in the group. An additional Mexican species, *Lobelia henricksonii* M. C. Johnston, was tentatively referred to the group as well (Johnston 1982). *Lobelia trivialis* F. Wimmer, the only lobeliad species sympatric with both gypsum endemics, occurs on sandy alluvium. Although L. trivialis was also placed in "series *Angustifolia*," it is an annual with minute flowers and not thought to be related to the gypsophiles. Possible relatives of the gypsophiles might include the perennial, woody-based *L. henricksonii* and *L. pringlei* S. Wats. although this feature may be adaptive to the arid regions they inhabit.

The two *Lobelia* gypsophiles may be separated by the following key:

1. Stems usually simple from a basal rosette; hypanthia asymmetrical, truncate at base; pedicels attaching to top of ovary (Fig. 1A-B) . . 1. *L. gypsophila*
1. Stems often branching above basal rosette; hypanthia symmetrical, rounded at base; pedicels attaching to middle of ovary (Fig. 1C) . . . . 2. *L. margarita*

1. Lobelia **gypsophila** Ayers, nom. nov. (Fig. 1). *Heterotoma pringlei* B. L. Robinson, Proc. Amer. Acad. Arts 44:615. 1909. non *L. pringlei* S. Wats. 1890.—TYPE: MÉXICO. NUEVO LEÓN: chalky mountains near Doctor Arroyo, 7 Nov 1904, *C. G. Pringle 13274* (HOLOTYPE: GH!; ISOTYPES: F!, MICH!, MO!, US!).

Herbaceous perennials 12 – 25 cm tall, from woody persistent rootstocks. Stems erect from basal rosettes, glabrous, waxy, tinged with purple. Leaves mostly basal, considered sessile without a distinct petiolar junction; rosulate leaves spatulate, 5 – 30 mm long, 1 – 2.5 mm wide, attenuate at base, acute at apex, the margins somewhat undulate with 2 – 4 pair of teeth; cauline leaves narrowly oblanceolate to linear, usually much reduced, entire, all leaves glabrous, with a thick waxy cuticle, green above, purple below. Inflorescences of strongly secund, 5 to 15-flowered racemes; bracts linear, 2 – 10 mm long, ca 1 mm wide, green or tinged with purple, glabrous; lower pedicels 6 – 10 mm long, much reduced above, diverging at right angles from stem, glabrous; bracteoles absent. Flowers 4.5 – 6.5 mm long (including hypanthium); hypanthium asymmetrical, oblong, 2.5 – 4.0 mm long, truncate at base, appearing gibbose due to pedicelar attachment at top; spurs 2.0 – 2.5 mm long (measured from base of upper calyx lobes), extending 1.0 – 1.5 mm below lower calyx lobes; calyx lobes subulate, 1.0 – 1.2 mm long, green, purple margined, appressed or slightly spreading, the two lower lobes slightly shorter than upper three, positioned 0.5 – 1.5 mm below the hypanthium rim; corolla white to lavender with the upper portions often more deeply pigmented, the tube 2 – 4 mm long, slit dorsally to within 1 mm of base, the upper corolla lobes narrowly triangular, 2 – 4 mm long, ca 0.8 mm wide, reflexed and often crossed above anther tube at anthesis, lower lobes narrowly obovate, slightly spreading, 3 – 5 mm long, 1 – 3 mm wide, obtuse, with two small circular green spots on white ridges opposed to sinuses at throat; stamens 2.5 – 3.0 (– 4.0) mm long, the filaments white, ciliate at base, connate in the distal half, the anthers ca 1 mm long, blue, appearing exerted above dorsal slit by a reflexed corolla tube, minutely cannescent with longer trichomes along sutures, the two lower anthers with a triangular flap and numerous short bristles at apex. Fruit turbinate, 2.5 – 3.0 mm long, 1.0 – 1.5 mm wide, pendant by a sharp bending of the pedicel at the hypanthium, rarely the pedicel twisted 180° and the spur side of flower proximal to the pedicel. Seeds numerous, burgundy-red, ovoid, ca 0.3 mm long, shiny, the testa appearing faintly lined to the naked eye.

DISTRIBUTION (Fig. 2): On heavily eroded gypsum outcrops in juniper-oak woodland on the western side of Cerro Peña Nevada and neighboring ranges in extreme s.e. Nuevo León at 2000 – 3500 m. Flowering: July to November.

Representative specimens: MÉXICO. Nuevo León: 4.3 mi NE of San Antonio Peña Nevada on road to Zaragosa, 10 Oct 1984, *Ayers & Scott 480* (TEX); 3.7 mi N of Zaragosa on road to Aramberri, 10 Oct 1984, *Ayers & Scott 508* (TEX); ca 30 km ENE of Dr. Arroyo, 2.5 km ENE of San Antonio Peña Nevada, 3 Aug 1981, *Nesom 4284* (TEX); 3 mi N of Zaragosa, just above Cuesta Blanca, 28 Sep 1983, *Nixon 4039* (TEX); 8.6 mi S of Aramberri on road to Zaragosa, 20 Oct 1979, *Warnock 2042* (TEX); ca 7 km NE of San Antonio Peña Nevada, Jul 1977, *Wells 505* (LL).

2. LOBELIA MARGARITA F. Wimmer, Ann. Naturhist. Mus. Wien. 56:355. 1948.—TYPE: MÉXICO. NEUVO LEÓN: Mpio. Galeana, Hacienda Pablillo, 14 Aug 1936, *M. Taylor* 167 (HOLOTYPE: F!; ISOTYPE: TEX!).

Herbaceous perennials, 15 – 32 cm tall, from woody persistent rootstocks. Stems erect from a basal rosette, glabrous, waxy, tinged with purple. Leaves mostly basal, considered sessile without a distinct petiolar junction; rosulate leaves spatulate, 0.5 – 50 mm long, 0.2 – 2.5 mm wide, decurrent at base, acute at apex, the margins somewhat undulate with 2 – 6 pair of teeth, cauline leaves linear, usually much reduced, entire, all leaves glabrous with a thick waxy cuticle, green above, purple below. Inflorescence of strongly secund, 10 to 20-flowered racemes; bracts linear, 4.5 – 12 mm long, ca 1 mm wide, green or tinged with purple, glabrous; lower pedicels 8 – 12 mm long, much reduced above, diverging at right angles from stem, glabrous; bracteoles absent. Flowers 4.5 – 6 mm long (including hypanthium); hypanthium cylindrical, 1 – 1.5 mm long, rounded at base; calyx lobes subulate, 1 – 1.2 mm long, green, purple margined, appressed or slightly spreading, the two lower lobes positioned ca 0.2 mm below hypanthium rim at base of the spur-like corolla pouch; corolla white to lavender with the upper portions often more deeply pigmented, the tube 1.8 – 2 mm long, slit dorsally to within 0.5 mm of base, appearing gibbose by a spur-like pouch at base of ventral side of tube, the upper corolla lobes narrowly triangular, ca 2 mm long, ca 0.5 mm wide, reflexed at anthesis, lower lobes narrowly obovate, slightly spreading, 1.5 – 2 mm long, ca 1 mm wide, obtuse, with two small circular green spots on white ridges opposed to sinuses at throat; stamens 2 mm long, the filaments white, ciliate at base, connate in the distal half, the anthers ca 1 mm long, blue, appearing exerted above dorsal slit by a reflexed corolla tube, minutely cannescent with longer trichomes along sutures, the two lower anthers with a triangular flap and numerous short bristles at apex. Fruit subglobose, ca 2 mm long, 1 – 1.5 mm wide, pendant by a sharp bending of the pedicel at the hypanthium, rarely the pedicel twisted 180° and the lower side of the flower proximal to the pedicel. Seeds numerous, burgundy-red, ovoid, ca 0.3 mm long, shiny, the testa appearing faintly lined to the naked eye.

DISTRIBUTION (Fig. 2): On heavily eroded gypsum outcrops in juniper-pine woodland on slopes of Cerro Potosí and foothills near Galeana at 1845 – 2100 m. Flowering: (May) July to October.

Representative specimens: MÉXICO. **Nuevo León**: Mpio. Galeana: 2.2 mi above Dieciocho de Marzo on road to microwave station and top of Cerro Potosí, 14 mi N of Galeana, 8 Oct 1984, *Ayers & Scott 455* (TEX); cliffs of dry arroyo, 3.2 mi S of Galeana, 9 Oct 1984, *Ayers & Scott 459* (TEX); 2 km W of Rincón de San Antonio, ca 6 mi N of Pablillo off Pablillo-Galeana highway, 9 Oct 1984, *Ayers & Scott 461* (TEX); dry face of clay wall in arroyo, 29 Jul 1939, *Chase 7638* (GH); Low gypsum hills S of Cerro Potosí, ca 2 mi N of Ejido Santo Domingo, ca 7 mi NE of San Roberto Junction, 24 Oct 1982, *Dorr, et al. 2545* (TEX); El Potosí, 13 Jan 1981, *Hinton, et al. 18101* (TEX); 10 km E of Las Norias, 19 Jul 1984, *Hinton, et al. 18746* (TEX); 2.5 mi S of Pueblo Galeana near junction of road to Linares, 6 Aug 1965, *Irving 150* (TEX); 11 km by winding road east of Tokio on the San Roberto-Galeana highway, 17 May 1973, *Johnston, et al. 11054b* (LL); Cerro Potosí, west base, ca 3 mi up road from 18 de Marzo, 12 Oct 1984, *Lavin & Sundberg 5239* (TEX); calcite and limestone hills beyond Pablillo toward Santa Clara, about 15 mi SW of Galeana, 18 Jul 1934, *Mueller & Mueller 1061* (F, GH, TEX); near town of La Laguna ca 4 mi W of Galeana, ca 1.6 mi S of lake in view of town, 19 Jun 1987, *Nesom, et al. 6215* (TEX); Santa Rita de Cordelada, gypsum hills to the south of Cerro Potosí accessible from Hwy 57; ca 10 km NNE of San Roberto junction, 24 Oct 1982, *Nixon, et al. 3792* (TEX); ca 11 km NW of Galeana on road to San Lucas, 16 May 1981, *Poole, et al. 2306* (TEX); 12.6 mi E of San Roberto Junction toward Linares, 26 Sep 1970, *Turner 6226* (TEX); NE lowermost slope of Cerro Potosí, along road to microwave station, ca 12 mi NW of Galeana, 20 Aug 1979, *Turner & Davies A-17* (TEX); 3.2 mi S of Galeana, 10 Oct 1985, *Turner, et al. 15561* (TEX); 6.9 mi N of galeana on dirt road to San Lucas, 10 Oct 1985, *Turner, et al. 15571* (TEX); 1.6 mi N of Galeana on S facing gypsum hillside, 10 Oct 1985, *Turner, et al. 15591* (TEX).

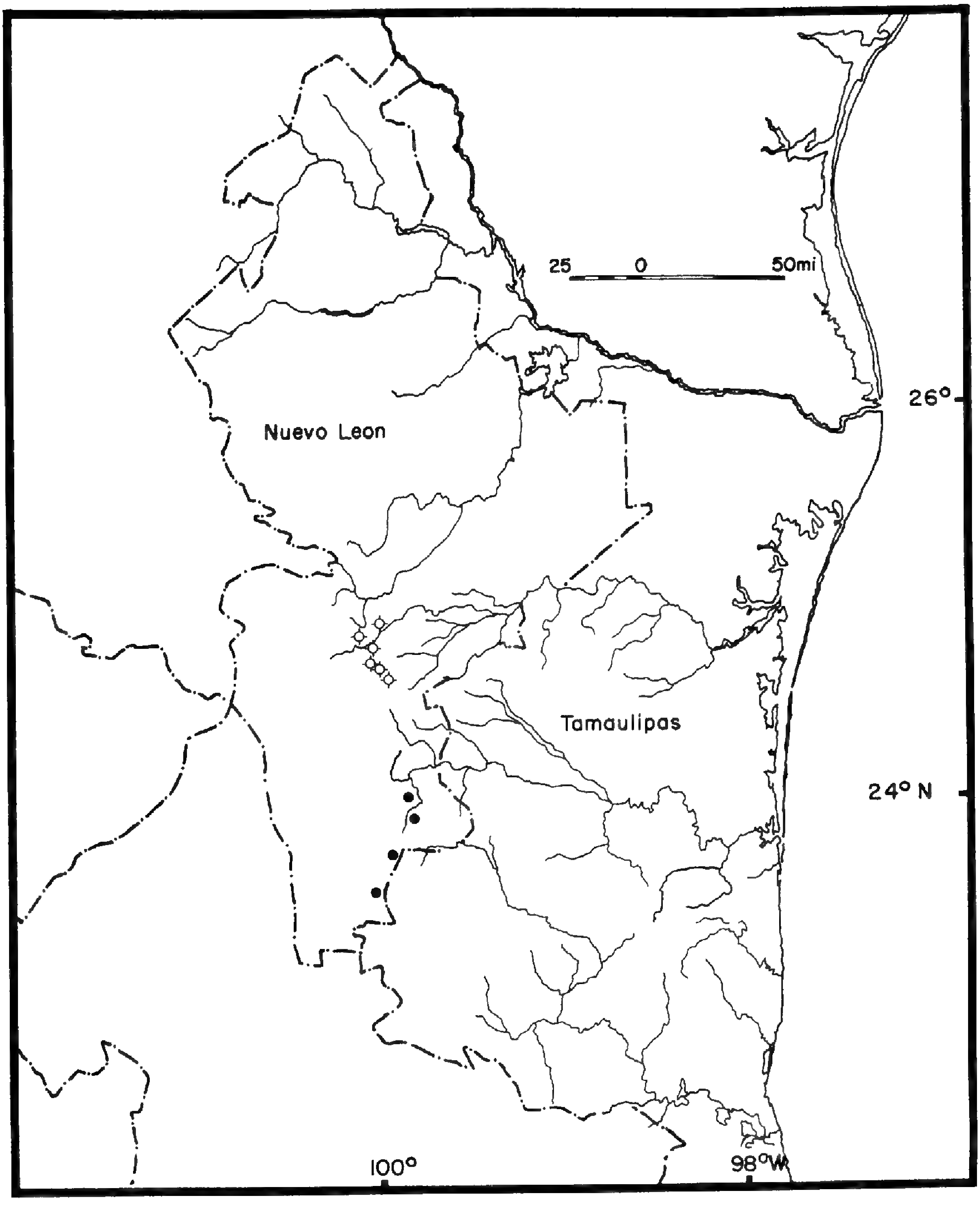

FIG. 2. Distribution of *Lobelia gypsophila* (●) and *L. margarita* (-ϙ-) in Nuevo León, México. Each dot may represent more than one collection.

ACKNOWLEDGEMENTS

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COMMENTS ON THE CARYOPHYLLACEAE OF THE SOUTHEASTERN UNITED STATES

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ABSTRACT

Selected significant records from a study of the Caryophyllaceae for the Vascular Flora of the Southeastern United States are presented. *Gypsophila oldhamiana* Miq. is reported as new to the flora of North America.

The following comments derive from our preparation of the account of the Caryophyllaceae for *Vascular Flora of the Southeastern United States.*

Cerastium

CERASTIUM DIFFUSUM Pers. may now be reported from Arkansas. SHARP CO.: lawn and cemetery of Highland Assembly of God Church, US 62, Highland, Sec. 33, T19N, R5W, 12 Apr 1974, *Thomas et al. 38521* (NLU).

Contrary to Fernald (1938, 1950), *Cerastium diffusum* Pers. is not known from Virginia. He reported collecting the species (as *C. tetrandrum* Curtis) from a sandy field in Sussex County, the first record of the species in North America. An inspection of his collection (*Fernald & Long 7819*, GH) showed it to be *C. brachypetalum* Desp. in Pers., a taxon that Fernald subsequently discovered and reported (Fernald 1939).

CERASTIUM GLUTINOSUM Fries was first reported in North America—specifically in the flora of the southeastern United States—by Shinners (1966) on the basis of a collection from Wayne County, Mississippi (*Shinners 29342*, SMU). However, we exclude *C. glutinosum* from our treatment for two reasons. Sell and Whitehead (1964) noted that *C. glutinosum* Fries is included in synonymy with their usage of *C. pumilum* Curtis subsp. *pallens* (F. Schultz) Schinz & Thell., stating that both *C. pumilum* and subsp. *pallens* have scarious-margined bracts. Jalas (1983) furthered this notion when he formed the combination *C. pumilum* subsp. *glutinosum*

SIDA 13(2):149–156. 1988.

(Fries) Jalas to replace the superfluous illegitimate name *C. pumilum* subsp. *pallens*. Accordingly, the bracts, especially the uppermost ones, of Shinners' collection should have scarious margins. Our inspection of *Shinners 29342* revealed that this is not the case. The specimen, as Shinners (1966) noted, contains two plants of *C. glomeratum* and three plants of slightly different appearance. Study of these three plants revealed the entirely herbaceous inflorescence bracts on each, a characteristic of *C. diffusum*, not *C. pumilum*.

The only published report of CERASTIUM PUMILUM within the region is for Baltimore County, Maryland (Brown & Brown 1984). In addition to confirming that report (*Balters 3510*, NCU), 11 specimens collected since 1958 confirm the existence of this species in disturbed areas in five additional states; Arkansas, North Carolina, South Carolina, Tennessee, and Virginia.

SPECIMENS EXAMINED. **Arkansas**. CLEBURNE CO.: pastured limestone glade, Drasco, 11 Jun 1967, *Tucker 4838* (NCU). **Maryland**. BALTIMORE CO.: railroad N of Cowenton Ave, E of Whitemarsh, 9 May 1964, *Baltars 3510* (NCU). PRINCE GEORGES CO.: lawn, Plant Introduction Station, Beltsville, 20 May 1958, *L. L. Jansen s.n.* (MICH, MO; duplicate at UC is *C. fontanum* Baumg.). **North Carolina**. HAYWOOD CO.: railroad yard, Canton, 25 Apr 1958, *Ahles & Duke 38748* (NCU). SCOTLAND CO.: roadside, Rt. 74 near Laurinburg, 29 Apr 1971, *Morton NA4408* (JKM). SURRY CO.: 3 mi N of Mt. Airy, 7 May 1968, *Morton NA1142* (JKM). **South Carolina**. LAURENS CO.: rest stop on US 276 near I-26 junction, 20 Apr 1979, *Douglass 210* (CLEMS). **Tennessee**. FRANKLIN CO.: field, Henderson Farm, Sherwood, 4 May 1961, *Shaver 2636* (WILLI). **Virginia**. CHESTERFIELD-HENRICO COS.: outskirts of Richmond, 18 Apr 1969, *Morton NA2602* (JKM). MATHEWS CO.: roadside, 4 mi S of junction of Rts. 14 & 611, near Mathews, 14 Apr 1979, *von Montfrans 272* (WILLI). MIDDLESEX CO.: grassy roadside, junction of Va Rts. 33 & 630, W of Wilton, 20 May 1981, *North & Hall 147* (WILLI).

Our findings allow comments on the list of *Cerastium* species in Louisiana presented by MacRoberts (1984). His skepticism in admitting *C. arvense* L. and *C. brachypetalum* Desp. in Pers. to the Louisiana flora is justified since we saw no specimens of either taxon from Louisiana. Recognition of *C. brachypodum* (Engelm. ex A. Gray) Robinson is appropriate because all specimens identified as *C. nutans* Raf. from Louisiana are referable to *C. brachypodum*. Specimens of *C. semidecandrum* L. from four Louisiana parishes were located (3 at NLU, 1 at TENN); it is more likely an easily overlooked member of the flora of Louisiana, rather than being a ballast plant as MacRoberts (1984) suggested.

Dianthus

DIANTHUS ARMERIA L. can now be reported for Florida. BAY CO.:

woods and ditches along Steel Field Road, West Bay, 10 Jul 1971, *Hester 066* (AUA).

The only state in the region in which the existence of wild populations of *Dianthus armeria* is still in doubt is Louisiana. Thomas and Allen (1982) and MacRoberts (1984) listed *D. armeria*, but their listings may be based on the same cultivated collection (*Thomas et al. 30432*, NLU) from Ouachita Parish. A specimen at NATC (*Thomas 75* in 1948) may also be of cultivated origin (W. C. Holmes, pers. comm.).

Louisiana, Texas, and Virginia should be added to the range of D. BARBATUS L. based on the following collections, which we believe to represent non-cultivated plants. **Louisiana.** OUACHITA PARISH: 1.5 MI N OF WHITES-FERRY ROAD, WEST MONROE, 21 APR 1964, *Patrick 121* (NLU). **Texas**. HUNT CO.: in clay soil, left side of road, 1 mi W of Wolfe City, 5 Apr 1974, *Wisdom 27* (TAES). **Virginia**. GILES CO.: long-abandoned homesite, corner of Giles Co. 613 & 615, near Kire, 21 Jun 1981, *Rabeler 585* (MSC). RUSSELL CO.: edge of woods, Rt. 80, 18 Jun 1971, *Harvill & Stevens 23718* (FARM).

DIANTHUS DELTOIDES L., first reported within our region from Clay County, Arkansas (Richards 1985), is also known in North Carolina and Virginia. **North Carolina**. DURHAM CO.: abundant in weedy meadow beyond formal plantings of Sarah Duke Memorial Garden, 16 May 1959, *Wilbur 6222 & 6223* (DUKE, FSU). **Virginia**. HENRY CO.: naturalized along Edgewood Drive, near Bassett Forks, 27 May 1969, *Straley 69125* (VPI).

DIANTHUS PLUMARIUS L. can now be reported from Missouri, South Carolina, and Virginia. **Missouri**. CAMDEN CO.: infrequent along roadside in very rocky soil, 20 May 1975, *McReynolds 750713* (LSU). **South Carolina**. GREENVILLE CO.: escaped near Patterson property, Lakemont, 4 May 1977, *Evans 01* (CLEMS). **Virginia**. PULASKI CO.: on rocky slope at entrance way to New River Community College, 23 May 1979, *Frank 67* (VPI). A report of escape in Prince Georges County, Maryland (H.G. Bedell, pers. comm.) remains unconfirmed.

Gypsophila

GYPSOPHILA ELEGANS M. Bieb. is reported in our region on the basis of two collections from North Carolina. CARTERET CO.: Beaufort, 21 Apr 1946, *Whitford s.n.* (NCSC). FORSYTH CO.: fence corners, old gardens, Winston-Salem, 30 Sep 1921, *P. O. Schallert s.n.* (GH).

GYPSOPHILA OLDHAMIANA Miq. (Fig. 1) is now known from the southeastern United States. **Alabama**. LEE CO.: open field, Highway 29

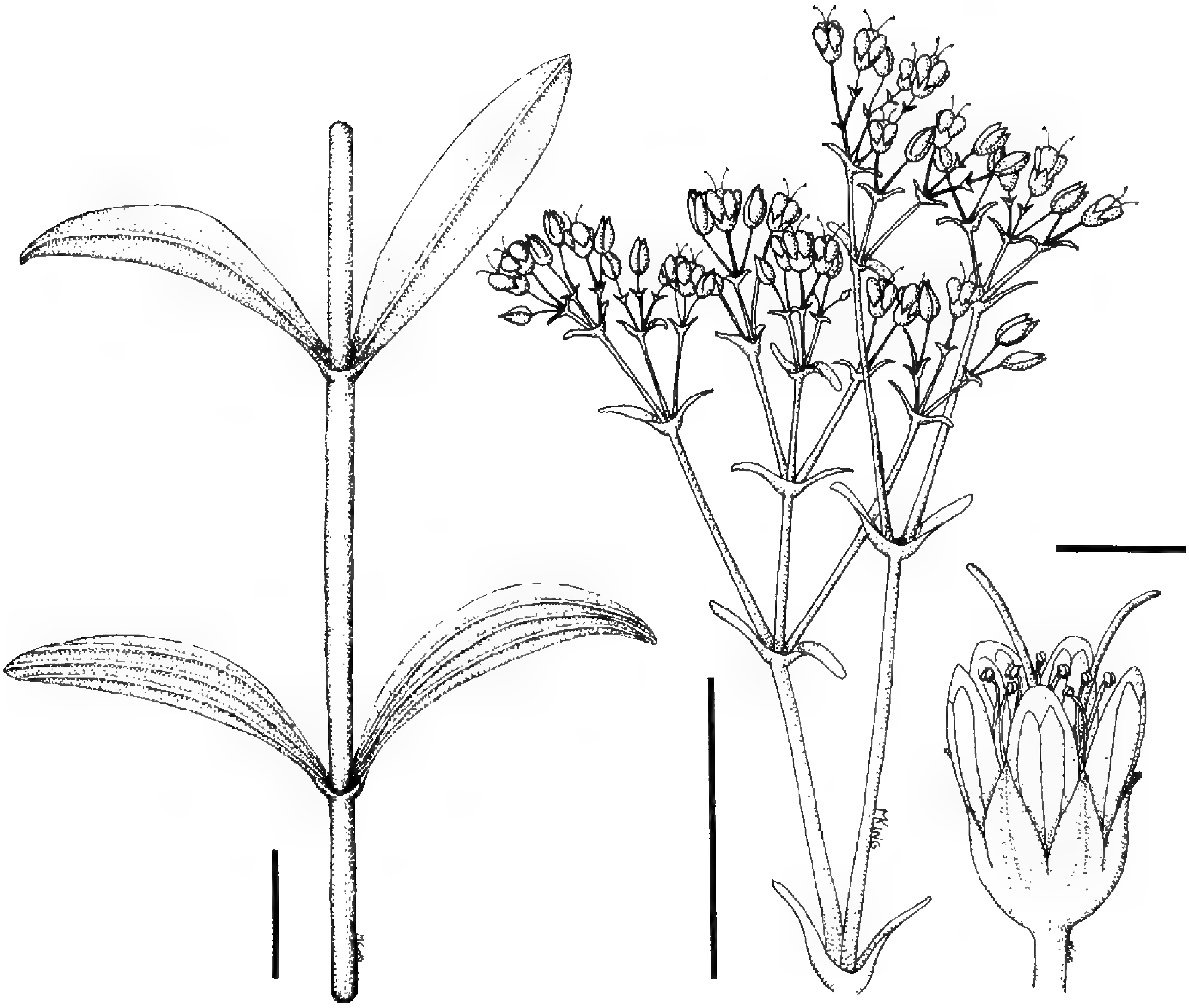

FIG. 1. *Gypsophila oldhamiana*. Stem and leaves, portion of the inflorescence, and flower. Horizontal line equals 1 cm, vertical line equals 1 mm.

between Auburn and Opelika, 17 Jul 1969, *Rebois 049* (AUA). We believe this to be the first report of this species outside of cultivation in North America.

Gypsophila paniculata L. is added to the flora of the southeastern United States based on the following Florida collection. Jackson Co.: Covering several acres of a watermelon field near Marianna, Jun 1982, *L. Cobb s.n.* (FLAS). The appearance of the species is not surprising given the commercial culture of *G. paniculata* 'Bristol Fairy' in Florida (see Raulston et al. 1973 for further information).

Myosoton

Myosoton aquaticum (L.) Moench may now be reported from Missouri. Clay Co.: S side of Missouri River, E of Labenite Park, 23 Jun 1985, *Raveill 2319* (MO).

We share MacRoberts' (1984) reluctance in including *M. aquaticum* in the flora of Louisiana. Brown's (1930) report from Grand Isle is based on a misidentified specimen of *Stellaria prostrata* Baldw. (*Brown 2030* [LSU], MICH). The listing of Louisiana in the range statement for *M. aquaticum* in all three editions of Small (1903, 1913, 1933) is also suspect in light of his determination of *Brown 2498* (Lake Pontchartrain beach; MICH) as *Alsine aquatica*—it also is *Stellaria prostrata*!

Petrorhagia

We could not locate a specimen of PETRORHAGIA PROLIFERA (L.) P. Ball & Heyw. to substantiate Logan's reference (1963) to the species' existence in Lincoln Parish, Louisiana, and thus have not listed it for that state. MacRoberts (1984) noted that Logan was at LTU at the time of his study, but no specimen is in that collection (D. G. Rhodes, pers. comm.).

One species to watch for in Louisiana is PETRORHAGIA VELUTINA (Guss.) P. Ball & Heyw. This species is very abundant along many roadsides in eastern Texas and has been collected within 5 miles of the Texas-Louisiana border (*MacRoberts 2339*, LSUS, NO). See Rabeler (1985) for additional information on *P. velutina*.

Scleranthus

The following collection of SCLERANTHUS ANNUUS L. is the first recorded for Kentucky. GALLATIN CO.: in fallow field 1.5 mi E of Warsaw, 21 Apr 1984, *Thieret 55020* (KNK). In the Warsaw area the species is locally common in fallow fields and nurseries. This widely distributed Eurasian weed is now reported from all of the southeastern states except Mississippi; however the species certainly occurs there.

Stellaria

We saw several important collections of STELLARIA ALSINE Grimm, confirming its existence in Georgia and extending the known range into Florida, Louisiana, and West Virginia.

Four specimens of *S. alsine* from Georgia were located, all collected in 1904. RICHMOND CO.: In spring run in ravine, Augusta, 28 Mar 1904, *A. Cuthbert s.n.* (FLAS); same data, 29 Apr 1904 (FLAS); in spring near Fruitlands, Augusta, 29 Apr 1904, *Cuthbert 1063* (NY); Birckman's pumphouse, Augusta, *Cuthbert sec[ond]. of 1063* (NY). The only other reference to *S. alsine* in Georgia is in Maguire (1952), no doubt based on the NY collections, both bearing the synonym *Alsine uliginosa* (Murray) Britton.

The following collection represents the first report of *S. alsine* for Louisiana. LASALLE PARISH: run-off seepage area from a sulfur spring beside Trout Creek, NW of LA 8 and White Sulfur Springs, Sec. 5, T7N, R2E, 23 Feb 1975, *Thomas (and Laird) 42599* (NLU, 2 sheets). Inspection of these collections revealed plants which matched other *S. alsine* specimens in every aspect except one: five white petals nearly equal in length (2 – 4 mm) to the sepals were present in some flowers. We know of no other reports of this phenomenon; *S. alsine* is normally described as either having narrow, inconspicuous petals or being apetalous. Procurement of additional material is necessary before any decision on formal recognition of this variation can be made.

Stellaria alsine can now be reported for West Virginia. HAMPSHIRE CO.: along Ca[ca]pon River, Yellow Spring, 20 Sep 1941, *W. M. Frye s. n.* (WVA). TUCKER CO.: Canaan Valley, sandy soil near Blackwater River at Davis, alt. 900 – 1200 m., 30 May 1946, *Allard 11894* (MICH, US, WVA); damp bank near bridge over Beaver Creek near Davis, 16 Jun 1947, *Allard 12254* (MT, PENN, US, WVA). UPSHUR CO.: gravel creek bed, Glady Fork, 4 mi W of Buckhannon, 21 Sep 1962, *Rossbach 4165* (NCU, WVA).

The Allard collections of *S. alsine* were labeled *S. borealis* Bigelow var. *isophylla* Fern., with *Allard 11894* being the basis of Allard's report (Allard 1947) of *S. borealis* as new to West Virginia. STELLARIA BOREALIS was reported again in West Virginia by Hutton (1977) [as *S. calycantha* (Ledeb.) Bong.] for his collection in Tucker County. Although the Hutton collection noted in that article could not be located at WVA, material collected by Dr. Hutton at the same site (a cold pool at base of cranberry bog, Dolly Sods) received by Rabeler (24 Aug 1984, *E. E. Hutton s.n.*, MICH, MSC, NCU, WVA) indeed proved to be *S. borealis*.

Although Brown and Brown (1984) list STELLARIA LONGIPES Goldie as occurring in Baltimore County, Maryland, we doubt this species should be admitted to the flora of the southeastern United States. *Stellaria longipes* is defined as either a highly plastic species (Chinnappa & Morton 1984) or as a complex of closely-related species (see Scoggan 1978 for a key to 11 segregate species) native to the northern reaches of the continent, extending as far south in the east as western New York (Fernald 1950). Wherry, Fogg, and Wahl (1978) did not include *S. longipes* in their *Atlas of the Flora of Pennsylvania*. Core included *S. longipes* in his preliminary treatment of *Stellaria* in the southeastern United States, citing *Balters 917* from Baltimore, Maryland. Reveal (1985) noted that Brown and Brown (1984) included records based on Balters collections. We were unsuccessful in locating *Balters 917*, but given Reveal's (1985) statements about suspicions surrounding the origins of some Balters collections, we feel justified in deleting *Balters 917* from consideration in our treatment.

A few comments on the *Stellaria* species listed for Louisiana by MacRoberts (1984) are in order. First, his statement that *S. longifolia* Muhl. ex. Willd. is "treated by most authors as a synonym for *S. graminea*" L. is not correct. Additionally, both *Stellaria graminea* and *S. longifolia* should be deleted from the MacRoberts (1984) list since no specimens of these taxa from Louisiana were seen. Two collections labeled *Stellaria graminea* (*Thomas 28437*, FLAS, NCU, NLU, RSA, SMU, WILLI; *Thomas & Thomas 51710*, DOV, MARY, MSC) are in reality *Minuartia patula* (Michx.) Mattf.

ACKNOWLEDGMENTS

Thanks are expressed to curators of the following herbaria for the use of their specimens in this study: AUA, CLEMS, CM, DOV, DUKE, FARM, FLAS, FSU, GH, JEPS, KNK, KY, LAF, LSU, MARY, MICH, MISS, MO, MSC, MT, MUR, NCSC, NCU, NLU, NO, OKL, OKLA, OS, PENN, POM, RSA, SMU, TAES, TENN, UARK, UC, UNA, URV, US, USCH, USF, VPI, WILLI, WIS, WKY, WVA, USDA Southern Weed Science Laboratory (Stoneville, MS), and the personal herbaria of Steven R. Hill (at CLEMS) and John K. Morton (at WAT). The assistance of Linda Rader (WVA) and Eugene E. Hutton in acquiring West Virginia specimens of *Stellaria borealis*, D. T. MacRoberts for information on his *Petrorhagia* collections at LSUS, Dan Skean, Jr. (FLAS) for providing the Raulston reference, Edwin B. Smith (UARK) for providing the Richards reference, and the hospitality of John Beaman (MSC), Steven Boyd (RSA), Thomas Duncan (UC), Barbara Ertter (UC), John Furlow (OS), Roy Gereau (MO), Larry Heckard (JEPS), John K. Morton (WAT), Randy Scott (GH), Ihsan El-Shebazz (GH), and Sue Taylor (MO) during Rabeler's herbarium visits is gratefully acknowledged. Figure 1 was drawn by Michelle R. King, Northern Kentucky University.

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ADDITIONAL OBSERVATIONS ON *ROBINSONELLA GLABRIFOLIA* FRYX. (MALVACEAE)

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ABSTRACT

A recent collection of *Robinsonella glabrifolia* extends the range of the species from southern México to Guatemala, permits an amplification of the description to include flowers and fruits (previously unknown), and clarifies our understanding of inflorescence structure in the genus, and consequently of sectional subdivision of the genus. On the basis of this improved understanding, section *Mirandella* is reduced to synonymy with section *Robinsonella*. Section *Grayella* is retained as distinct.

Robinsonella glabrifolia was described from a single locality in Chiapas (Fryxell 1985) on the basis of two collections that were in an early stage of flowering and therefore lacked fruiting structures. Additional material of this species extends the geographical range, provides new information on flowers and fruits, and provides added data relative to the nature of the inflorescence in the genus, bearing importantly on the infra-generic classification of *Robinsonella* (Fryxell 1973). This paper addresses the taxonomic implications of these three points.

GEOGRAPHICAL DISTRIBUTION

The type collection is from:

MEXICO: CHIAPAS. Mpio. La Trinitaria, 10 km ENE of Dos Lagos above Santa Elena, 1170 m, montane rain forest, 9 Feb 1982, *Breedlove 58430* (HOLOTYPE: CAS; ISOTYPE: pf).

The additional collections that have come to hand are:

CHIAPAS: Mpio. de Yajalón, Rancho Carmen, arbol de 10 m con flores blancas, 25 Mar 1984, *Ton 7472* (MEXU, pf). GUATEMALA: DEPT. PETÉN. La Cumbre, east of the village, in zapotal, on top of hill, small tree 35 ft high, 5 in. diam., corolla violet-white, 16 Mar 1975, *Lundell & Contreras 19108* (LL).

These localities are separated by distances of 200 – 300 km, and the range of the species now is known to extend to both sides of the Mexican-Guatemalan border.

SIDA 13(2):157 – 160. 1988.

FLOWER AND FRUIT STRUCTURE

The corolla on the Lundell & Contreras specimen is described by the collectors as "violet-white." Examination of the specimen suggests that this refers to a petal that is white or pale lavender with a darker blotch at the base. The Ton collection bears mature fruits, although the label refers to white flowers. In amplification of the original description, the flowers and fruits may be further described as follows:

> Petals obtriangular, 4.5 – 5 mm long, 3.5 mm wide, conspicuously ciliate on claw (hairs 0.6 mm long), otherwise glabrous; staminal column 3 – 4 mm long, glabrous, pallid, prominently 10-veined, antheriferous at the apex, the filaments 12 – 14, 1.7 mm long, the anthers 1 mm long, occasionally geminate; styles 7 – 8, slender, glabrous, pallid, exceeding the staminal column by up to 4 mm, the stigmas capitate. Fruits minutely stellate-pubescent; mericarps 7 – 9, 8 – 12 mm long, 3 – 4 mm wide, more or less falcate, inflated, 1-seeded; seeds basally situated, 3 mm long, minutely pubescent.

It may be noted that *R. glabrifolia* generally has fewer carpels (7 – 9) than other species of the genus, which have 8 – 30 carpels, most species having 10 or more.

INFLORESCENCE STRUCTURE

Robinsonella was divided into three sections by Fryxell (1973):

> sect. *Robinsonella* having condensed axillary racemes, so condensed as to appear fasciculate (generally shorter than the subtending petiole);
> sect. *Grayella* having paniculate inflorescences (generally longer than the subtending petiole); and
> sect. *Mirandella* having an intermediate condition—the inflorescence racemose but less condensed, and longer or shorter than the subtending petiole.

These inflorescence characters are supported by pubescence characters.

The original description of *R. glabrifolia* (based on the Chiapan material) stated the inflorescences to be racemes about twice the length of the subtending petioles. The species was referred to section *Grayella* on the basis of these elongated inflorescences. The Guatemalan specimen, on the other hand, has racemes that are much shorter than the subtending petioles (Fig. 1). In the latter case, the inflorescences conform to those typical of other species of section *Robinsonella*, but in the former case they do not, in that the racemes are elongated rather than condensed. The axis of the inflorescence varies in length from 5 – 12 mm in the Guatemalan plant to 25 – 55 mm in the Chiapan plant. Apart from this difference in axis length, however, the racemose nature of the inflorescence is a common feature of the two collections, including the tendency to have the flowers borne in pairs along the raceme axis.

In our opinion, these two collections are conspecific; the expression of

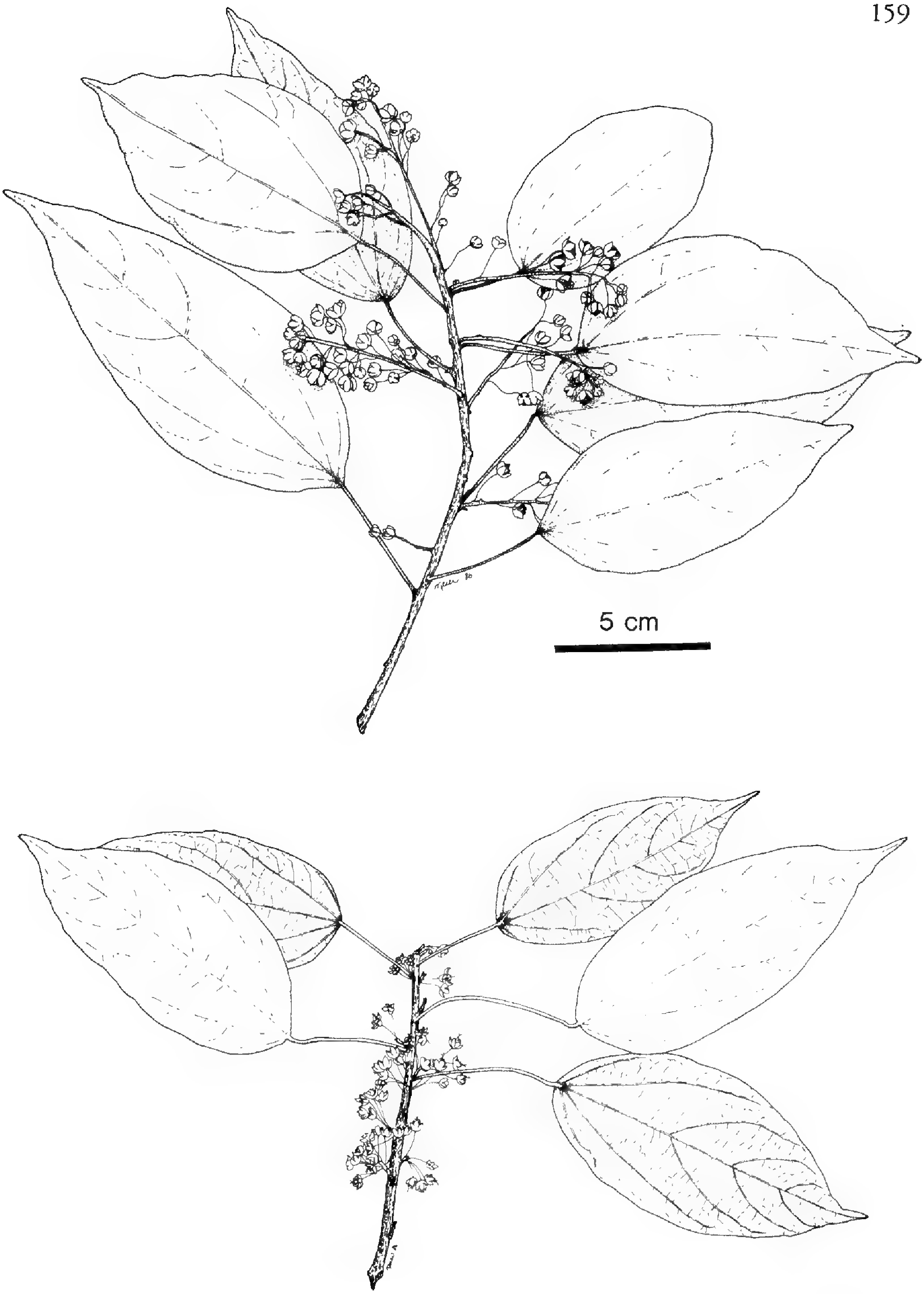

FIG. 1. *Robinsonella glabrifolia*. Inflorescence and subtending leaf of Chiapan plant (above, *Breedlove 58430*) and of Guatemalan plant (below, *Lundell & Contreras 19108*).

inflorescence size is labile but the racemose nature of the inflorescence, with paired flowers, is stable. This being so, a re-examination of these characters at the sectional level is needed, especially concerning the "intermediate" section *Mirandella*, with the lability of inflorescence size especially in mind. A reconsideration (and re-examination of inflorescences of *R. mirandae* Gómez-Pompa, the only species in section *Mirandella*) strongly indicates that *R. mirandae* be included in section *Robinsonella*, and therefore that section *Mirandella* be reduced to a synonym of section *Robinsonella*. Furthermore, we believe that *R. glabrifolia* is properly included in section *Robinsonella*, and not in section *Grayella*.

Inflorescence length varies intraspecifically in *R. glabrifolia* and is therefore not a useful character in distinguishing sections of the genus. The type of inflorescence (axillary panicle vs. axillary raceme), however, appears stable among the species. In further consideration of this question, a more detailed study of pubescence types and a search for additional supporting characters among the species of *Robinsonella* is desired. Because of its labile inflorescence development, *R. glabrifolia* clearly holds a pivotal position in a reconsideration of sectional characterization in *Robinsonella*, and it would be desirable to have additional collections of this species available, beyond those reported here, as a basis for such a study.

ACKNOWLEDGMENT

We are grateful to Debra K. Meier for the illustration.

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THE CORRECT SCIENTIFIC NAME OF THE PALE, YELLOW OR WHITE GENTIAN OF THE EASTERN UNITED STATES

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ABSTRACT

After demonstrating that the binomial *Gentiana alba* Muhl. was not originally validly published, it is concluded that the correct name for this distinctive species is *Gentiana flavida* A. Gray.

After the barest suggestion by Gillett (1963, p. 5) together with Pringle's fuller explanation (1965), there has developed an overwhelming consensus among botanists that *Gentiana alba* Muhl. is the correct scientific name of the gentian of the eastern United States whose vernacular name is allegedly the White, Pale or Yellowish Gentian. Pringle's account indicated that Muhlenberg's binomial is the name that species has been known by throughout most of its history until Porter (1899) proved to his own satisfaction at least that what had been passing as *Gentiana alba* Muhl. could not have been what Muhlenberg had in mind when he ever so briefly introduced this species since Muhlenberg's species was thought by Porter to be unknown in eastern Pennsylvania, the area with which Muhlenberg had personal familiarity. Having apparently thoroughly discounted the claim of *Gentiana alba* Muhl., as the earliest correct name for this species Porter reverted to the binomial *Gentiana flavida* A. Gray, a name introduced by Gray in 1846 with some trepidation since he even then suspected the species he had collected in what is now West Virginia might well be Muhlenberg's *Gentiana alba*. This suspicion grew into conviction and A. Gray by 1848 took up Muhlenberg's name and the species was known as *Gentiana alba* Muhl. for most of the next half century or until Porter cast doubts on the application of the name at century's end for the reason related above. Thereafter *Gentiana flavida* A. Gray has been the binomial by which the species was most frequently known (i.e. Fernald 1950 and Gleason 1953) until Gillett (1963) and Pringle (1965) reversed the trend.

Since Pringle's paper almost all floras, checklists, revisions, and papers that have come to my attention have employed the name *Gentiana alba* Muhl. in preference to *G. flavida* A. Gray. Examples of these include Andrews & Cooperrider (1981), Barkley (1977), Baumgartner & Baumgartner (1987), Bolick (1986), Gillett (1963), Kartesz & Kartesz

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(1980), Mason & Iltis (1965); Mohlenbrock (1975), Mohlenbrock & Ladd (1978), Pringle (1965 & 1967), Radford, Ahles & Bell (1968), Shetler & Skog (1978 where both names are listed), Strausbaugh & Core (1973) and Wood & Weaver (1982). Although listed as *G. flavida* A. Gray in such earlier basic regional floras as Fernald (1950), Gleason (1952) and Gleason and Cronquist (1963) the name has been more recently largely replaced in the botanical literature. Examination of the nomenclatural background and origins of both names does not in my opinion justify the wholesale stampede to abandon *Gentiana flavida* A. Gray which I believe is the correct binomial for this species.

Gillett, as related by Pringle (1965), settled the matter to their satisfaction at least by disproving Porter's principal objection that Muhlenberg was unlikely to be referring to the White Gentian as that species was not known to eastern Pennsylvania, the area most familiar to Muhlenberg. Gillett reported finding a specimen of *G. alba* so identified among the Muhlenberg specimens at PH which clearly demonstrated that Muhlenberg's *Gentiana alba* was the species that Gray had originally renamed *G. flavida* although suspecting it might well prove to be *G. alba*.

The more crucial question concerning *Gentiana alba* Muhl. is not whether it was the same as *Gentiana flavida* A. Gray but whether the binomial *G. alba* was validly published according to the requirement of the ICBN. Muhlenberg's account (1813) of *Gentiana* from his Catalogue is reproduced below to demonstrate the form in which this meager checklist appeared.

CL. V. PENTANDRIA.

DIGYNIA.

Calix.	**Corolla.**					**Habitat. Fructus, et Tempus florendi.**
part.	5 fid.	201.	GENTIANA		GENTIAN	caps. oblonga, 1 loc, 2 valv.
	caer.	1.	pneunomante	♃	Calathian violet	Can.
	caer.	2.	saponaria L.	♃	soapwort	Pens. fl. Sept. Car.
	ochrol.	3.	ochroleuca saponaria Mx	♃	pale white	Pens. fl. Sept. Virg. Car.
	alb.	4.	alba	♃	white	Pens. fl. Sept.
	lutesc.	5.	villosa		villous	Virg.
		6.	linearis		linear-leaved	Pens.
	caer.	7.	puberula		hairy	Cherok.
	caer.	8.	angustifolia		narrow-leaved	Car. N. Caes.
	caer.	9.	quinqueflora amarelloides Mx.		five-flowered	Pens. Ten.
	vir.lut.	10.	acuta		sharp-leaved	Car.
	caer.	11.	crinita		fringe-flowered	Pens.fl.Sept.N.Angl. Ohio.
	lut.	12.	lutea		yellow	Virg. (Kalm)N.Caes.

To be validly published, Article 32 the ICBN requires that the "name of a taxon must ... be accompanied by a description or diagnosis or by a reference (direct or indirect) to a previously and effectively published description or diagnosis..." Art 32.2 indicates that "A diagnosis of a taxon is a statement of that which in the opinion of its author distinguishes the taxon for others." Although *G. alba* is the only species listed with a white corolla, I do not believe that the statement of corolla color being "alb." constitutes a valid diagnosis nor do I think that the scholarly Muhlenberg meant it to be taken as the publication of a new species. A letter from Muhlenberg is quoted by Merrill & Hu (1949, p. 7) as stating that "My Catalogue . . . has no descriptions. . . " Merrill & Hu (1949) concluded in the most detailed account of Muhlenberg's work yet published "that all of the new names first published in Muhlenberg's 'Catalogus' should be considered as *nomina nuda* except in those cases where explanatory synonyms are entered. It is true that from the very brief descriptive data included in the tabulation under the floral characters, together with the common names listed, and the data included under the habitat, together with certain descriptive specific names, shrewd guesses can be made as to what was intended by this or that entry." They did not nor do I think we should accept as validating diagnoses such brief notes as corolla "alb.," inflorescence "long-spiked" together with the locality and time of flowering such as "Pens.fl.Aug." as constituting valid publication.

Although the shrewd guess of Asa Gray as to the identity of *Gentiana alba* Muhl. has been confirmed by the presence of a specimen of *G. alba* Muhl. in Muhlenberg's collection now at PH, the fact remains that when originally published the name was not accompanied by either a description or a diagnosis. *Gentiana alba* Muhl. is an example of a *nomen nudum* or what some would call a *nomen subnudum* since there is some semblance of discription material. It consequently should not be taken up in place of the *Gentiana flavida* A. Gray (Amer. J. Sci. II, 1:80. 1846) even though Asa Gray did just that. There were no codified regulations in Gray's time as to what constituted valid publication but we now have the ICBN with its more precise specifications. Pringle's declaration (1965, p. 45) that Muhlenberg's description of *G. alba* was the earliest valid publication is not substantiated by examination of the original publication.

In the soon-to-appear ICBN resulting from the fourteenth International Botanical Congress meeting in Berlin in 1987, it is made even clearer that names appearing in such works of Muhlenberg's Catalogue are not validly published. The example chosen to clarify this sometimes debated issue is to appear as an example under Article 32.1. It is expected to read as follows:

Example 3. In Sweet's Hortus Britannicus, ed. 3 (1839), for each listed species the flower colour, the duration of the plant, and a translation into English of the specific epithet are given in tabular form. In many genera the flower colour and duration may be identical for all species and clearly their mention is not intended as a validating description. New names appearing in that work are therefore not validly published, except in some cases where reference is made to earlier descriptions or to validly published basionyms.

Although the Rapporteur statement (Taxon 36: 214. 1987) that the names in Muhlenberg's Catalogue "have been consistently treated as not validly published" is surely an overstatement as to the consistency of American usage, it does provide an authoritative opinion on the non-validity of names first appearing in Muhlenberg's Catalogue.

For both of these points, I am very grateful to Dr. Dan H. Nicolson who provided references or copies of these recent rulings on such names in his most helpful review of this note.

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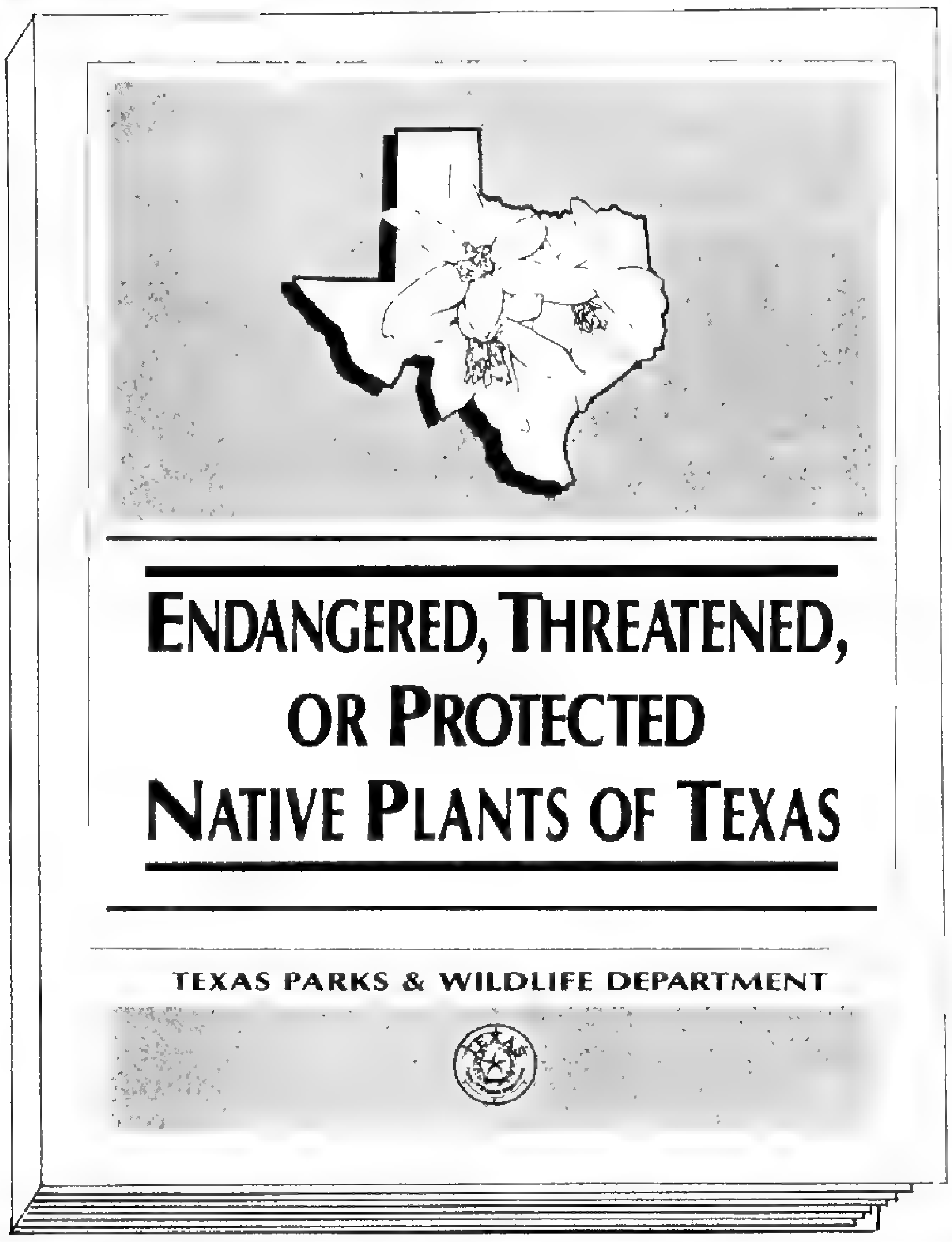

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LECTOTYPIFICATION OF *AZALEA ROSEA* LOISEL. (ERICACEAE) AND A NEW COMBINATION IN *RHODODENDRON PERICLYMENOIDES* (MICHX.) SHINNERS

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ABSTRACT

Azalea rosea Loisel. is lectotypified from heterogeneous elements and restored as basionym of *Rhododendron roseum* (Loisel.) Rehder. A new combination for the glandular forma of *R. periclymenoides* (Michx.) Shinners is proposed.

Shinners (1962) stated incorrectly that the binomial *Azalea rosea* Loiseleur-Deslongchamps in Duhamel, Traité Arb. Arbust. ed. 2, 5:224, t. 64. 1812 is illegitimate because the author cited the earlier *A. canescens* Michx. (1803) as a synonym. He rejected as immaterial that Rehder (1921), who held that *Azalea rosea* is the basionym for the species, saw the Loiseleur figure and concluded it represented a different species from *A. canescens*. Shinners (l.c.) admitted he did not see the Loiseleur figure; nevertheless he concluded that this taxon required the next available name, *Azalea prinophylla* Small, better known as *Rhododendron prinophyllum* (Small) Millais.

Under present rules, Rehder (1921) would probably have selected the Loiseleur figure as the lecotytpe of *Azalea rosea*. I have obtained a high resolution color transparency of the Loiseleur figure and its associated textual material copied from the Duhamel volume in the Gray Herbarium Library. I have also examined the microfiche photograph of the type of *Azalea canescens* (Inter Documentation Company, AG, 6211, 1967, Aug, Switzerland) and am as convinced as Rehder (l.c.) that the Loiseleur figure represents a heterogeneous element in the synonymy of *A. canescens*. The Loiseleur name may thus be lectotypified, as I do below.

I wish I could publish the color rendition of *Azalea rosea*: the bright rose-pink of the corolla comes through wonderfully. The figure is a meticulous drawing: an enlarged corolla shows the glands on the tube. I am publishing a black and white print (Fig. 1) to make a good representation generally available as the original is rare and requires special arrangements to consult.

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FIG. 1. Lectotype plate of *Azalea rosea* Loisel. Furnished by Gray Herbarium Library. Original in color, the corolla rose-pink.

The synonymy of this taxon thus becomes the following:

RHODODENDRON ROSEUM (Loisel.) Rehder, Publ. Arnold Arbor. 9:138. 1921. *Azalea rosea* Loisel. in Duhamel, Traité Arb. Arbust. ed. 2, 5:224, t. 64. 1812. (Photo!) (LECTOTYPE: here designated). Not *A canescens* Michx.

Azalea prinophylla Small, N. Amer. Fl. 29:42. 1914.
Rhododendron prinophyllum (Small) Millais, Rhodod. 229. 1917.

The changing of the name *Rhododendron nudiflorum* (L.) Torr. to *R. periclymenoides* (Michx.) in 1962 by Shinners (1962) was necessary because the latter is the first available name if azaleas are to be maintained in *Rhododendron* L., as seems to be present common acceptance.

There is a well defined forma of *Rhododendron periclymenoides* in which the normally hirsute corolla tube bears numerous stipitate glands. It is not uncommon and seems to grow in places where the possibility of hybridization with glandiferous-tubed species seems remote. Because of change of the species name, the following new combination is required:

RHODODENDRON PERICLYMENOIDES f. glandiferum (Porter) Uttal, **comb. nov.** *Azalea nudiflora var. glandifera* Porter, Bull Torrey Bot. Club 27:508. 1900. *Rhododendron nudiflorum* var. *glandiferum* (Porter) Rehder, Publ. Arnold Arbor. 9:138. 1921. *R. nudiflorum* f. *glandiferum* (Porter) Fern., Rhodora 43:619. 1914.

ACKNOWLEDGEMENTS

Thanks are rendered H.G. Bedell of Gray Herbarium Library for furnishing me the photographs of the Loiseleur figure of *Azalea rosea* and for transmitting me text of that binomial's diagnosis and comments. I thank D.M. Porter for reading this manuscript and offering useful comments.

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Deaths

On behalf of the Department of Botany of Bishop Museum, it is my sad duty to inform you of the death of

Dr. Horace F. Clay

Resident Research Associate at the Bishop Museum, who passed away on November 18, 1988 after a valiant fight with cancer.

Dr. Clay was a well-known horticulturist whose extensive work with ornamental plants in Hawai'i endeared him to gardeners. During his work in Hawai'i he introduced over 200 species of cultivated plants. His extensive travels and teaching experience had brought him recognition and friends all over the world.

At the time of his death, Dr. Clay was working with the Bishop Museum on a revision of Marie Neal's *In Gardens of Hawai'i*. The Museum intends to continue his efforts. He will be sorely missed.

Dr. S.H. Sohmer
Bishop Museum
P.O. Box 19000-A
Honolulu, HI 96817-0916

The SMU Herbarium has just received word of the death of

Dr. Russell Lee Kologiski

b - 19 Aug 1946
d - 4 Dec 1988

Adjunct Professor, Department of Biology, University of North Carolina at Charlotte; Environmental Consultant for the University; Lecturer for the Math & Science Education Center.

A field trip fund has been established in his honor and contributions should be sent to the Russell L. Kologiski Field Trip Fund, Department of Biology, University of North Carolina at Charlotte, UNCC Sta., Charlotte, NC 28223.

A biographical sketch is forthcoming.

Wm. F. Mahler
SMU Herbarium
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CAREX EXILIS DEWEY (CYPERACEAE) IN MISSISSIPPI BOGS

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ABSTRACT

Mississippi was surveyed for the presence of *Carex exilis*. The species was detected in the six southernmost counties. The floristic associates, habitat characteristics, and distribution are provided for *C. exilis* in Mississippi.

INTRODUCTION

As a member of *Carex* section *Stellulatae, C. exilis* Dewey is distinctively isolated from other sectional taxa which lack solitary spikes, involute leaves and large anthers (Reznicek and Ball 1980). The primary north temperate-boreal range includes fens and bogs from Delaware and Maryland north along the coast to Newfoundland, and inland from New York to Minnesota and northwestern Ontario. Phytogeographically, Reznicek and Ball (1980) have also noted the remarkable occurrence of two southern disjunct populations. In the south, they interpreted the two isolated stations in the coastal plain at Moore County, North Carolina and George County, Mississippi as relic populations from a former wider distribution during glacial maxima. In this study, we evaluated the distribution and general ecology of *Carex exilis* from the southernmost disjunct area in Mississippi.

MATERIALS AND METHODS

We examined a variety of known bogs with ecologically similar and dissimilar profiles in comparison to the locality where Ken Rogers first collected *Carex exilis* (*Rogers 2919*, 12 April 1970, MISS, NCU, VDB) in George County, Mississippi. These other sites were identified from high

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altitude infrared photography. At each site we recorded population size, habitat type, and associated species. Specimens of *C. exilis* were deposited in the following herbaria: ctb (personal herbarium of Charles T. Bryson), IBE, MICH, MISS, MMNS (Mississippi Museum of Natural Science), NLU, TENN, UARK, VDB and WARM. Additional duplicates will be distributed later.

RESULTS AND DISCUSSION

Our field survey has identified *Carex exilis* from a total of 16 populations in six Mississippi counties (Fig. 1). Compositional variation within and among these bog communities is often quite variable depending upon the interaction between fire history and soil hydroperiod. Nevertheless, *C. exilis* consistently occupies a distinctive niche situated at the extreme ends of an ecological gradient across fire frequency, soil moisture, and organic matter.

Without exception, populations are restricted to strongly acid, permanently saturated, deep organic muck (quaking bogs). Although soil surveys are not available for all sites, the typical soil appears to be the Dorovan Series; a dysic, thermic, Typic Medisaprist (e.g. Nichols et al. 1983). The organic muck horizon may range from one to three meters in depth, and the entire pedon at one site has been reported to exceed six meters. Populations are further confined within these bogs to sites where the frequency of fire, in combination with the extreme edaphic parameters, prohibits woody plant succession. Populations are usually centered on the deepest muck located near small intermittent or perennial surface drainageways of open bogs. With few exceptions, *C. exilis* appears to dominate the microhabitat in terms of individual number as well as above and below ground biomass. Populations range in size from several hundred to several thousand plants, but several sites are characterized by low population vigor which is variably due to infrequent fire, successional encroachment of a woody plant community, and the scarcity of adequate microhabitat.

In a strict sense, only two species are consistently associated with *Carex exilis* or its microhabitat. By this definition of association, we recognize the compositional heterogeneity among and within bog communities and emphasize the relative homogeneity of the *C. exilis* microhabitat. The first associate, *Lindera subcoriacea* Wofford (bog spice bush, Lauraceae), is a woody component of the open, highly organic, and predominantly herbaceous bog community as well as the early seral evergreen shrub phase. Of 17 populations of *L. subcoriacea* in Mississippi (Gordon et al. 1986), *C.*

FIG. 1. Distribution of *Carex exilis* Dewey in Mississippi.

exilis is an associate at 14 sites. Although both taxa may coexist in the open bog, *C. exilis* is absent where bog spice bush occurs within or along the border of a shrubby complex which includes *Cliftonia monophylla* (Lam.) Britton ex Sarg., *Cyrilla racemiflora* L., *Ilex coriacea* (Pursh) Chapman, *Persea palustris* (Raf.) Sarg., *Magnolia virginiana* L., *Smilax laurifolia* L., and *Hypericum brachyphyllum* (Spach) Steudel. Despite the relative tolerance of *L. subcoricea* to a partial overstory, fire is critically required for viable populations of both associates.

The second associate, *Carex turgescens* Torr., does not exhibit the habitat fidelity of *L. subcoriacea*. *Carex turgescens* is known from wet depressions in other communities of the lower coastal plain such as pine flatwoods, savanna, and cypress-tupelo gum margins. *Carex turgescens* may also occur without *C. exilis* along narrow bog drainages of siliceous and low organic soils. However, the within bog distribution pattern of *C. turgescens* is highly correlated with *C. exilis*. The preference of *C. turgescens* for hydric soils corresponds to the conditions present in the deep organic muck where *C. exilis* occurs. *Carex turgescens* is an associate in all 16 populations of *C. exilis*.

Other taxa which may occur among populations of *C. exilis* also occupy a variety of other edaphic and fire regimes. These species include *Sarracenia alata* (Wood) Wood, *S. psittacina* Michx., *Oxypolis filiformis* (Walt.) Britt., *Lophiola americana* (Pursh) Wood, *Zigadenus densus* (Desr.) Fern., *Rhexia alifanus* Walt., *Panicum spretum* Schult., *Rhynchospora rariflora* (Michx.) Ell., *R. chapmanii* M. A. Curtis, and *Scleria baldwinii* (Torr.) Steud. Rare species (Ms. Natural Heritage Program 1987) which have been found with *C. exilis* are *Panicum nudicaule* Vasey, *Rhynchospora macra* (C. B. Clarke) Small, *Xyris scabrifolia* Harper, *X. drummondii* Malme., *Lachnocaulon digynum* Korn., *Pinguicula primuliflora* Wood and Godfrey, and *Calopogon barbatus* (Walt.) Ames.

In the short time since Wofford (1983) described *Lindera subcoriacea* as a new taxon from Mississippi and Louisiana, botanists in other southeastern states have discovered additional isolated populations of this rare shrub (Cary Norquist, Botanist, U.S. Fish and Wildlife Service, Jackson Field Office, Jackson, MS, pers. comm.) To the extent that *L. subcoricea* and *Carex exilis* are ecologically associated in Mississippi, we predict that additional southeastern records for this sedge will likely be made in other permanently saturated, highly organic, and fire dependent bogs occupied by *L. subcoriacea*.

For reasons somewhat similar to *Lindera subcoriacea, Carex exilis* may have been overlooked because of its early spring phenology; peak flower and achene production ranges from early March to late April. However, *C. exilis* is unquestionably rare by virtue of its habitat. These deep peat bogs comprise an extremely small portion of the "pitcher plant" communities in Mississippi which are universally threatened by drainage, fire exclusion, silvicultural practices, and urbanization.

Specimens examined and collected by county are as follows: MISSISSIPPI. **George Co.**: 12 Apr 1970, *Rogers 2919* (MISS, NCU, VDB); 5 Apr 1972, *Rogers 7935* (VDB); 5 Apr 1972, *Rogers 7937* (NCU, TENN); 16 Apr 1983, *Wofford & Murrell 83-1* (VDB); 27 Mar 1986, *Gordon, Jones & Wiseman 3146 & 3147* (ctb, MMNS); 15 Apr 1986, *Bryson & McDearman 4165* (ctb, MMNS); 15 Apr 1986, *Bryson & McDearman 4162* (ctb, IBE, MICH, MINN, MMNS, NLU, TENN, UARK, VDB, WARM). **Greene Co.**: 11 Apr 1979, *Gordon 1006* (MMNS); 19 Mar 1982, *Gordon & Burris 2758* (ctb, MMNS). **Harrison Co.**: 16 Apr 1986, *Bryson & McDearman 4177* (ctb, MMNS), *Bryson & McDearman 4180* (ctb, MMNS); 22 Apr 1986, *McDearman 4001* (MMNS); 22 Apr 1986, *McDearman 4003*;

22 April 1986, *McDearman 4003* (MMNS); 24 Apr 1986, *Gordon, Jones & Wiseman 3162* (ctb, MMNS), 2 May 1986, *McDearman 4009* (MMNS). **Jackson Co.**: 12 Mar 1985, *Gordon, Jones & Wiseman 3090 & 3091* (ctb, MMNS); 10 Apr 1986, *Gordon, Jones & Wiseman 3157* (ctb, MMNS); 16 Apr 1986, *Bryson & McDearman 4175* (ctb, MMNS). **Pearl River Co.**: 22 Apr 1986, *McDearman 4007* (MMNS); 24 Apr 1986, *Gordon 3167A* (ctb, MMNS). **Stone Co.**: 8 Apr 1986, *Gordon & Jones 3152 & 3153* (ctb, MMNS).

ACKNOWLEDGEMENTS

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NOTEWORTHY VASCULAR PLANTS FROM GRENADA COUNTY, MISSISSIPPI

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ABSTRACT

A floristic study of Grenada County, Mississippi, in 1986 and 1987, documented 996 species of vascular plants. Of these, four taxa are new records for the state: *Equisetum arvense* L., *Dryopteris* × *australis* (Wherry) Small, *Cyperus lancastriensis* Porter, and *Angelica atropurpurea* L. In addition, species that represent significant range extensions and species considered rare or threatened in Mississippi are reported from Grenada County.

INTRODUCTION

Grenada County is located in north central Mississippi about 160 km north of Jackson, MS, and about 160 km south of Memphis, Tennessee. The topography is highly varied with three physiographic regions: the nearly flat alluvial plain in the western part of the county known as the Delta; the Loess Bluffs, a long north-south line of hills arising abruptly at the eastern edge of the Delta; and the North Central Plateau, an ancient, eroded plateau in the eastern part of the county (Lowe 1921). In addition the Yalobusha River flows east to west through the north central part of the county forming a floodplain in each physiographic region with the resultant topography even more heterogeneous. One of the first surveys done in northern Mississippi included areas north and south of Grenada County, but did not include any part of the Yalobusha River Basin (Harper 1913). Other than the Upper Pearl River Basin (McDaniel 1983, Smith 1985), few drainage systems in the northern half of Mississippi have been thoroughly investigated.

Soils in the study area are of three physiographic regions and are quite diverse. The soils of the Delta Region are primarily of the Alligator-Forestdale association and are fine-textured and poorly drained. Soil associations of the Loess Bluff Region are the Memphis, Memphis-Guin, Memphis-Loring, and Providence-Loring-Ruston, which are silty, sandy or gravelly soils that are generally non-acid. The main soil associations of the North Central Plateau Region are the Ruston-Cuthbert-Providence, Tippah-Boswell-Dulac, and Ruston-Providence, which are upland sandy, clayey, or silty soils that tend to have a low pH and are poorly to well drained (Thomas and Bowen, 1967).

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Herbarium specimens cited below are at IBE, MISSA, MISS, ctb (personal herbarium of Charles T. Bryson), mwm (personal herbarium of M. Wayne Morris), and SWSL (Southern Weed Science Lab, Stoneville, MS). Specimens collected by the author were deposited in IBE, DSC, MICH, MISSA, MMNS, NLU, SWSL, TENN, VDB, and other herbaria.

NOTEWORTHY VASCULAR PLANTS

EQUISETACEAE. **Equisetum arvense** L. LOESS BLUFF REGION: ca 6 mi S of Holcomb, locally abundant in sand washed down from N-facing bluffs along Black Creek, plants usually beneath an overstory of *Populus, Salix, Carpinus, Platanus,* and *Ulmus* and occasionally on open sandbars, sterile plants far outnumber fertile individuals, *Equisetum hyemale* also at this locality, 28 Mar 1986, *Morris 590* (IBE, DSC, MISSA, MMNS). This is the first documentation of *E. arvense* in Mississippi.

LYCOPODIACEAE. **Lycopodium appressum** (Chapman) Lloyd and Underwood. NORTH CENTRAL PLATEAU REGION: ca 4 mi SE of Gore Springs, in an open sandy bog with *Drosera* and *Xyris*, 30 Apr 1987, *Morris 2803* (IBE). This marks the northernmost occurrence of the species in Mississippi. The nearest known locality is in the Interior Flatwoods Region of Oktibbeha County, about 80 km SE of Grenada County.

ASPIDIACEAE. **Dryopteris × australis** (Wherry) Small. LOESS BLUFF REGION: ca 3 mi NW of Holcomb, around the edge of a spring grading into a small swamp forest and at the base of a S-facing bluff in close proximity to the Delta, population of about 15 individuals, 3 Jul 1987, *Morris 2910* (IBE, MICH, MMNS, SWSL). A rare fern known only in a few localities in its range limited to the southeastern United States, *D. X australis* is reported for the first time in Mississippi and is now the only member of the genus known in the state. Neither of the parent species, *D. celsa* nor *D. ludoviciana*, is known in Mississippi (Werth et al. in press).

Thelypteris noveboracensis (L.) Niewland. NORTH CENTRAL PLATEAU REGION: ca 4 mi SE of Gore Springs, population of about 200 plants on a seepage slope and in a boggy springhead with *Osmunda, Woodwardia, Athyrium,* and *Isotria verticillata*, 21 Jun 1987, *Morris 2896* (IBE). *Thelypteris noveboracensis* was previously known in Mississippi only from the Tennessee River Hills Region in the extreme northeastern part of the state. The following is one of the localities: Monroe County, ca 5.5 mi NE jct MS 8 & US 45, boggy woods with *Magnolia virginiana*, 28 Apr 1987, *McDaniel 29325* (IBE).

CYPERACEAE. **Carex decomposita** Muhl. DELTA REGION: ca 2 mi W of Holcomb, epiphytic on *Taxodium* in a bald cypress-water tupelo swamp, several clumps seen, 12 May 1987, *Morris 2837* (ctb, IBE). Grenada is only the ninth county in Mississippi where this relatively rare and unusual sedge has been documented.

Carex grayi Carey. DELTA REGION: ca 6 mi SW of Holcomb, scattered population in a bottomland hardwood forest near an oxbow lake, plants densely cespitose, 30 Apr 1987, *Morris 2790* (ctb, IBE, SWSL); *Morris 2869* (ctb, IBE, MICH, NLU, TENN). This is an uncommon sedge in northern Mississippi, and this collection is the first from the Delta Region. Other populations are mainly in areas drained by the Tombigbee River, especially in the Black Prairie Region, about 128 km due E.

Carex stricta Lam. NORTH CENTRAL PLATEAU REGION: ca 5 mi SE of Gore Springs in a sphagnous bog that grades into a beaver pond, forming large tussocks in standing water and also in the bog proper with the other sedges *Carex atlantica, C. laevivaginata, C. styloflexa, C. leptalea, C. crinita*, and *C. lurida*, 20 Apr 1987, *Morris 2775* (ctb, IBE). *Carex stricta* is a rare plant in Mississippi, Grenada being the fifth and southwesternmost county where it has been documented. It was first collected in Tishomingo County and later in the North Central Plateau Region in Oktibbeha County (Bryson 1984) and Lafayette County (Charles T. Bryson, pers. comm. 1987).

Cyperus haspan L. NORTH CENTRAL PLATEAU REGION: ca 1 mi NNW of Gore Springs, locally common in a sphagnous seepage bog with *Xyris, Fuirena, Rhynchospora, Gratiola pilosa, Eryngium integrifolium, Juncus canadensis*, and *Thelypteris palustris*, 3 Sep 1987, *Morris 3015* (IBE). This is the northernmost record of *C. haspan* in Mississippi. The nearest known population is in Kemper County (7 Oct 1967, *McDaniel 9903*, IBE), which is about 160 km SE of the Grenada County site.

Cyperus lancastriensis Porter. LOESS BLUFFS-NORTH CENTRAL PLATEAU TRANSITION AREA: ca 1 mi E Tie Plant, in sandy soil in mixed pine-hardwoods on a bluff overlooking the Batupan Bougue, occurring with *Cyperus plukenetii, Commelina erecta*, and *Bonamia humistrata*, 12 Jul 1986, *Morris 2285* (IBE). This represents the first collection of the species in Mississippi. In 1987 the species has been reported from three additional counties: Lee (Bishop 1987), Itawamba, and Tishomingo (Charles T. Bryson, pers. comm. 1987) in the Tennessee River Hills Region, about 120-144 km due northeast. *Cyperus lancastriensis* is reported as mainly occurring in the mountains and piedmont in the Carolinas (Radford et al. 1968). These Mississippi populations are evidently some of the few outliers that occur in the coastal plain.

Eleocharis tenuis (Willd.) Schultes. NORTH CENTRAL PLATEAU REGION: ca 4 mi SE of Gore Springs, along a spring branch underneath a thicket of *Viburnum nudum, Pyrus arbutifolia, Ilex verticillata*, and *Rhododendron canescens* and in an open sandy bog adjacent to the spring branch with *Drosera, Xyris*, and *Lycopodium*, 30 Apr 1987, *Morris 2804* (IBE). This sedge was not previously known from the North Central Plateau, and it appears to be most common in the Interior Flatwoods, about 45 km due east.

Eleocharis tuberculosa (Michx.) R. & S. NORTH CENTRAL PLATEAU REGION: ca 5 mi SE of Gore Springs, in a sphagnous bog at the edge of a pond, associated with *Fuirena squarrosa, Gentiana saponaria*, and *Bartonia paniculata*, 11 Oct 1986, *Morris 2686* (IBE). This population represents the most northern occurrence of *E. tuberculosa* known in Mississippi. The sedge is mainly found south of a line from Jackson to Meridian with another peripheral population in Winston County, about 90 km SE of Grenada County (Randy Warren, Graduate Student, Department of Biological Sciences, Mississippi State University, Mississippi State, MS, pers. comm. 1986).

Rhynchospora miliacea (Lam.) Gray. LOESS BLUFF REGION: ca 3 mi NW of Holcomb, in a swamp forest at the base of a S-facing bluff in close proximity to the Delta, locally abundant, 24 May 1986, *Morris 1049* (IBE). Populations in Grenada County are the only ones in the state north of Jones County (Morgan 1979), which is about 230 km due SSE.

Scirpus lineatus Michx. LOESS BLUFF REGION: ca 4 mi SW of Holcomb, in a wet meadow at the base of a S-facing bluff, associated with *Rudbeckia fulgida, Aster novae-angliae*, and *Silphium perfoliatum*, 12 May 1987, *Morris 2830* (IBE). This collection constitutes the first record of the species from the Loess Bluffs. The nearest known locality for *S. lineatus* is about 120 km due ESE in the calcareous Black Prairie Region in Oktibbeha County (15 May 1982, *Carter 3010*, IBE).

Scleria reticularis Michx. NORTH CENTRAL PLATEAU REGION: ca 4 mi SE of Gore Springs, in an open boggy springhead, rare, 3 Oct 1986, *Morris 2664* (IBE). *Scleria reticularis* is found mainly in the savannas and pitcher-plant bogs of south Mississippi. The closest record in the state is about 280 km due SSE in Greene County (4 Sep 1979, *Gordon 1443*, IBE).

LILIACEAE. **Melanthium virginicum** L. NORTH CENTRAL PLATEAU REGION: ca 7.5 mi NNE of Gore Springs, population of about 25 individuals in mucky soil along a spring branch with *Viburnum nudum, Ilex verticillata, Platanthera clavellata*, and *Oxypolis rigidior*; few plants flowering, 15 Jul 1987, *Morris 2930* (IBE). This member of the lily family is relatively rare in Mississippi. The nearest known populations are in the Tennessee River Hills and the Longleaf Pine Belt in extreme northeastern and southern Mississippi, respectively.

ORCHIDACEAE. **Calopogon tuberosus** (L.) BSP. NORTH CENTRAL PLATEAU REGION: at the edge of a large mat of *Sphagnum* in an open sandy bog with *Xyris torta, Rhynchospora globularis, Solidago patula, Chasmanthium laxum, Pyrus arbutifolia*, and *Rhododendron canescens*, local, 14 June 1987, *Morris 2888* (mwm). A fairly common species in the savannas and pitcher-plant bogs in the southern part of the state, *C. tuberosus* becomes very rare and local northward in Mississippi. There are two other known localities for this orchid in the North Central Plateau: Lafayette County, about 70 km NNE of the Grenada County population (7 Jul 1958, *Temple s.n.*, MISS), and in Winston County, which is about 90 km due southeast.

Cypripedium pubescens Willd. LOESS BLUFF REGION: about 20 plants, in rich ravines and on steep slopes, associated with *Magnolia acuminata, Acer barbatum, Ulmus rubra, Fagus, Liriodendron, Uvularia grandiflora, Trillium recurvatum, Phlox divaricata, Panax quinquefolium*, and *Cynoglossum virginianum*, 9 Apr 1987, *Morris 2750* (IBE). This orchid is rare and local throughout its range in northern Mississippi.

Platanthera cristata (Michx.) Lindley. NORTH CENTRAL PLATEAU REGION: population of about 15 individuals, in a sphagnum bog at the edge of a beaver pond, associated with *Pyrus arbutifolia, Viburnum nudum, Bartonia paniculata, Fuirena squarrosa*, and *Xyris torta*, 31 Jul 1986, *Morris 2405* (IBE). Considered rare, *P. cristata* is primarily found in the southern part of the state, occurring as isolated populations in the northern part of the state.

Platanthera lacera (Michx.) G. Don. NORTH CENTRAL PLATEAU REGION: along a stream, in rich deciduous woods in partial sun, rare, 19 May 1986, *Morris 996* (mwm). *Platanthera lacera* was previously known in the state only from Webster County (Travis Salley, Cleveland, MS, pers. comm. 1986), also located in north central Mississippi.

Platanthera peramoena Gray. LOESS BLUFFS-NORTH CENTRAL PLATEAU TRANSITION AREA: in the Yalobusha River floodplain in low, wet woods with *Acer rubrum, Salix nigra*, and *Fraxinus pensylvanica* in the overstory, local population of 9 individuals, 3 Jul 1987, *Morris 2913* (IBE). This rare orchid is found at scattered localities in northern Mississippi.

Spiranthes ovalis Lindley. DELTA REGION: on a natural levee above a bayou in well-drained bottomland hardwoods, uncommon, 21 Sep 1986, *Morris 2634* (IBE). NORTH CENTRAL PLATEAU REGION: in rich deciduous woods on terraces along a stream, scattered locally, 7 Oct 1986, *Morris 2677* (IBE). This species is listed as rare in the state, and the record from the North Central Plateau is the first for that land resource area.

POACEAE. **Oplismenus setarius** (Lam.) R. & S. LOESS BLUFFS -

DELTA TRANSITION AREA: ca 0.75 mi NW of Holcomb, in low, rich woods near a bald cypress-water tupelo swamp in the Yalobusha River floodplain, local population of about 50 individuals, 17 Sep 1987, *Morris 3046* (IBE). This is the most northern record of the species in Mississippi.

Sporobolus junceus (Michx.) Kunth. NORTH CENTRAL PLATEAU REGION: ca 1.5 mi N of Gore Springs, in sandy soil in upland mixed pine-hardwoods, associated with *Aster concolor, Chrysopsis graminifolia*, and *Andropogon ternarius*, 7 Oct 1986, *Morris 2670* (IBE). This species primarily occurs in pinelands and on sandhills in the southern part of the state with very scattered populations northward to Tishomingo (25 Oct 1970, *Thompson 71*, MISS), and Grenada counties.

Trisetum pensylvanicum (L.) P. Beauv. ex R. & S. NORTH CENTRAL PLATEAU REGION: ca 2.5 mi NNW of Gore Springs, in a boggy springhead with much *Sphagnum*, 16 Apr 1986, *Morris 739* (IBE). *Trisetum pensylvanicum* is uncommon in sphagnum bogs and along spring branches of northern Mississippi. The nearest known population is in Lafayette County (27 Apr 1966, *Pullen 66161*, MISS), about 70 km NNE of the Grenada County population.

XYRIDACEAE. **Xyris difformis** Chapman var. **curtissii** (Malme) Kral. NORTH CENTRAL PLATEAU REGION: ca 1 mi NNW of Gore Springs, in a sphagnous seepage bog, at least fifty plants seen, associated species include *Xyris torta, Gratiola pilosa, Eryngium integrifolium, Hypericum crux-andreae*, and *Thelypteris palustris*, 3 Sep 1987, *Morris 3016* (IBE, VDB). This is the northernmost documented population of *X. difformis* var. *curtissii* in Mississippi.

APIACEAE. **Angelica atropurpurea** L. LOESS BLUFF REGION: ca 3 mi NW of Holcomb, scattered throughout a low, wet woods at the base of a S-facing bluff in close proximity to the Delta, associated with *Rudbeckia fulgida, Scirpus lineatus, Carex bromoides, Platanthera flava, Hypericum walteri, Dasistoma macrophylla,* and *Impatiens capensis*, 1 Aug 1986, *Morris 2408* (IBE). This member of the Apiaceae was not known in Mississippi prior to 1986. It is now also known from Tallahatchie County (Robert Stewart, Prof. of Biol. Sci., Delta State University, Cleveland, MS, pers. comm. 1986; Phillip Barbour, Sidon, MS, pers. comm. 1986), which borders Grenada County to the northwest.

ASCLEPIADACEAE. **Asclepias purpurascens** L. DELTA REGION: ca 6 mi W of Holcomb, in well-drained bottomland hardwoods, local, 29 Jul 1986, *Morris 2380* (IBE). Previously only documented twice in northwestern Mississippi, *A. purpurascens* was reported by Lowe (1921) from DeSoto County, and it is also known from Washington County (May

1985, *Saucier s.n.*, SWSL). This latter population is probably extirpated.

ASTERACEAE. **Aster puniceus** L. NORTH CENTRAL PLATEAU REGION: ca 2.5 mi NNW of Gore Springs, in a boggy springhead with much *Sphagnum*, 7 Oct 1986, *Morris 2679* (IBE, VDB). This species was previously known only in the state from Lauderdale County in east central Mississippi (14 Oct 1978, *McDaniel 22172*, IBE), about 170 km due SE. These stations represent southern range extensions of the species' more northern general range.

Aster sericocarpoides (Small) Schumann. NORTH CENTRAL PLATEAU REGION: ca 4 mi SE of Gore Springs, in an open sandy bog and along the adjacent spring branch, associated with *Platanthera ciliaris, Xyris torta, Solidago patula, Oxypolis rigidior, Pyrus arbutifolia,* and *Ilex verticillata*, 13 Aug 1987, *Morris 2972* (IBE). *Aster sericocarpoides* is known primarily from boggy situations in southern Mississippi, extending locally into the North Central Plateau and Tennessee River Hill Regions (Itawamba County, *Bailey s.n.*, MISS) farther north.

Vernonia texana (Gray) Small. LOESS BLUFFS-NORTH CENTRAL PLATEAU TRANSITION AREA: ca 1 mi E of Grenada, in dry upland pine-oak-hickory woods near clearcut areas, associated with *Liatris aspera, Asclepias amplexicaulis, Aureolaria flava, Lespedeza hirta, Aster concolor,* and *Agave virginica*, 22 Aug 1987, *Morris 2994* (IBE). This species was known previously from dry uplands in the southwestern part of the state north to Warren County, about 190 km due SW. Another peripheral population is known from the North Central Plateau Region (Calhoun County, 16 Aug 1967, *Temple 6463*, MISS).

BUXACEAE. **Pachysandra procumbens** Michx. LOESS BLUFF REGION: large population of over 5,000 individuals on a NW-facing slope in upland mesophytic forest, profusely flowering, 26 Mar 1986, *Morris 969*, (IBE). *Pachysandra procumbens* is a relatively rare and local species in Mississippi, and most populations infrequently flower or have few individuals that undergo anthesis.

CAMPANULACEAE. **Lobelia appendiculata** A. DC. DELTA REGION: ca 6 mi SW of Holcomb, at edge of bottomland hardwoods in silty soil, rare, 13 May 1986, *Morris 969* (IBE). This represents the first collection of this uncommon lobelia from the Delta Region in Mississippi.

CELASTRACEAE. **Celastrus scandens** L. LOESS BLUFF REGION: ca 1 mi E of Tie Plant, in the transition area between the Loess Bluffs and the North Central Plateau, woody vines climbing 20 ft. into the trees in rich deciduous woods on a NW-facing slope, plants sterile, 27 Sep 1986, *Morris 2654* (IBE). This woody vine is rare and found at scattered localities in the northern part of the state. It was previously collected from the Loess Bluffs in DeSoto County, about 115 km N of Grenada County (28 Sep 1978, *Rogers 46048*, (IBE, MISS).

DROSERACEAE. **Drosera brevifolia** Pursh. NORTH CENTRAL PLATEAU REGION: ca 4 mi SE of Gore Springs, in an open sandy bog with *Xyris* and *Lycopodium*, scape glandular-pubescent, corolla pink, 30 Apr 1987, *Morris 2802* (IBE). This sundew is of very local occurrence in sandy bogs and seepages in the northern part of the state, becoming more frequent toward the coast.

FAGACEAE. **Quercus hemisphaerica** Bartram. LOESS BLUFFS-NORTH CENTRAL PLATEAU TRANSITION AREA: ca 0.25 mi E of Grenada, trees about 60 ft high in sandy soil in the Batupan Bogue creek bottom, other individuals also on the bluffs immediately E of the Batupan Bogue, associated with *Celtis georgiana, Castanea pumila*, and *Carya pallida*, 17 Sept 1987, *Morris 3047* (IBE). This is the northernmost station in Mississippi for *Q. hemisphaerica*. The nearest populations are in Leake, Lowndes, and Neshoba counties, each at least 115 km distant.

JUGLANDACEAE. **Juglans cinerea** L. LOESS BLUFF REGION: ca 2 mi S of Holcomb, six trees on a N-facing slope above Cane Creek, most individuals about 50 ft. high, associated with *Acer barbatum, Magnolia acuminata, Fagus, Liriodendron, Quercus muehlenbergii, Rhamnus caroliniana, Osmorhiza longistylis*, and *Circaea lutetiana*, 6 Jun 1986, *Morris 2006* (IBE).

LYTHRACEAE. **Cuphea carthagensis** (Jacquin) Macbride. LOESS BLUFFS-NORTH CENTRAL PLATEAU TRANSITION AREA: ca 0.75 mi E of Tie Plant, in wet meadows at the margins of bottomland woods along the Batupan Bogue, 12 Jul 1986, *Morris 2283* (IBE). This population is apparently disjunct. *Cuphea carthagensis* usually occurs in south Mississippi, at least 230 km due SSE (Morgan 1979).

OLEACEAE. **Fraxinus profunda** (Bush) Bush. LOESS BLUFF REGION: ca 3 mi NW of Holcomb, in low, wet woods at the base of a S-facing bluff in close proximity to the Delta, associated with *Taxodium distichum, Populus heterophylla, Itea virginica*, and *Sabal minor*, 1 Aug 1986, *Morris 2407* (IBE). This collection represents the first record of *F. profunda* from the Loess Bluffs in Mississippi. It is known from low woods in Lowndes County, (6 Jun 1970, *McDaniel 13477*, IBE), and the western part of the Delta Region (Gunn et al. 1980).

SAXIFRAGACEAE. **Saxifraga virginiensis** Michx. LOESS BLUFF REGION: ca 2 mi W of Grenada, plants on a steep NW-facing slope among moss-covered rocks and at the bases of large trees, 26 Mar 1986, *Morris 567* (IBE). This is the first documentation of the species from the Loess Bluff

Region. The nearest known population is in the Pontotoc Ridge in Clay County (19 Mar 1968, *McDaniel 10387*, IBE), about 85 km due east.

SCHISANDRACEAE. **Schisandra glabra** (Brickell) Rehder. LOESS BLUFF REGION: ca 5.5 mi SSW of Holcomb, woody vines in a rich wooded ravine climbing at least 40 ft. into the trees in filtered and partial light, profusely flowering, occurring with *Acer barbatum, Magnolia acuminata, Fagus, Liriodendron, Adiantum pedatum, Listera australis, Actaea pachypoda*, and *Uvularia grandiflora*, locally frequent, 6 Jun 1986, *Morris 2003* (IBE). A species considered rare throughout its range in the southeastern United States, *S. glabra* grows exceptionally well in minimally disturbed woods in the Loess Bluffs. It has been collected in sterile condition about 45 km northward in Tallahatchie County (13 May 1980, *Stewart 942*, IBE).

SCROPHULARIACEAE. **Chelone glabra** L. NORTH CENTRAL PLATEAU REGION: ca 2 mi N of Gore Springs, in a boggy springhead with much *Sphagnum*, population of about ten individuals, associated species include *Gentiana saponaria, Osmunda* spp., *Eryngium integrifolium, Cacalia lanceolata, Orontium aquaticum*, and *Oxypolis rigidior*, 19 Sept 1986, *Morris 2620* (IBE). Considered rare in Mississippi, *C. glabra* inhabits seeps, springs, and bogs at widely scattered localities in the North Central Plateau, the Pontotoc Ridge, and the Tennessee River Hills in northern Mississippi.

STAPHYLEACEAE. **Staphylea trifolia** L. LOESS BLUFF REGION: ca 3 mi SW of Holcomb, shrubs usually 5 to 10 ft. high, on terraces along a stream that has cut a ravine and narrow bottom in a "finger" of Loess Bluffs that extend out into the Delta and also on the steep slopes of the ravine, locally abundant in the understory with *Aesculus pavia* and *Lindera benzoin*, herbaceous associates include *Dentaria laciniata, Geranium maculatum, Laportea canadensis*, and *Lobelia siphilitica*, many individuals at anthesis and some with persistent capsules from the previous year, 6 Apr 1987, *Morris 2749* (IBE). This is the first report of *S. trifolia* from the Loess Bluffs in Mississippi. It is considered rare within the state. The nearest known locality is about 90 km due E on calcareous bluffs of the Pontotoc Ridge in Chickasaw County (24 Apr 1980, *Gordon 1653*, IBE).

ULMACEAE. **Ulmus serotina** Sarg. LOESS BLUFF REGION: ca 3 mi NNW of Holcomb, in upland primarily deciduous woods with a few individuals each of *Pinus* and *Juniperus*, most trees about 25-40 ft. high, infrequent, 19 Sep 1986, *Morris 2629* (IBE). This is the first record of *U. serotina* from the northern Loess Bluffs in the state. This elm is most common in the Pontotoc Ridge and Black Prairie Regions in northeastern Mississippi.

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GENERA OF MESOAMERICAN PANICEAE (POACEAE: PANICOIDEAE)

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ABSTRACT

A taxonomic study of generic concepts and evaluation of characters is presented for the Paniceae of Mesoamerica. An original set of data, consisting of 305 characters recorded for 37 genera, were collected and analyzed to produce English and Spanish bracketed keys to the recognized genera. An appropriate subset of characters was selected for inclusión in a Spanish synoptic key. These characters are also presented in a set of comparative English descriptions for the genera not occurring in North América. Diagnostic characters essential for identification are highlighted within each description. Remarks on the morphology and relationships of each genus are also given.

RESUMEN

Se presenta un estudio taxonómico de evaluación de caracteres y conceptos a nivel género para las Paniceae de Mesoamérica. Un conjunto particular de datos, consistente en 305 caracteres se registró para 37 géneros, éstos fueron reunidos y analizados para producir claves dicotómicas en inglés y español para los géneros reconocidos. Un subconjunto adecuado de caracteres fue seleccionado para elaborar una clave sinóptica en español. Estos caracteres están también presentados en un grupo de descripciónes comparativas en inglés para los géneros que no se distribuyen en Norteamérica. Caracteres diagnósticos escenciales para la identificaci"n están resaltados en cada descripci"n. Observaciones sobre la morfolog!a y relaciones de cada género son también presentados.

INTRODUCTION

This paper is the third in a series of studies designed to give a detailed account of the variation, generic concepts, and relationships among the genera of the Paniceae. These studies will conclude in a phenetic and cladistic analysis of the ca. 100 recognized genera of this tribe, which will be used as a basis for an evaluation of the classification of the group on a worldwide basis. Webster (1987) presented a reappraisal of the 45 genera

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of the Paniceae occurring in Australia. Webster (1988) provided a general taxonomic review of generic concepts for the North Américan (north of Mexico) genera of the Paniceae, gave a brief history to the taxonomy of the group, and discussed the methods employed and concepts of characters and character states. In that study, certain computer software (Dallwitz 1974 & 1980; Pankhurst & Aitchison 1975), which directly or indirectly read and analyze DELTA format, was applied in the production of a bracketed key, synoptic key, and a set of comparative descriptions for the 25 recognized genera. The introduction, methods, terminology, and character concepts explained in Webster (1988) are directly applicable to the present study and need not be repeated; however, it seems important to provide an elaboration of the methods most relevant to the present study.

The objective of this study is to present a taxonomic account of the genera of the Paniceae occurring in Mesoamerica (Mexico, Central América, and the West Indies). An ordered sequence of 305 characters was compiled accounting for variation in the Paniceae. This represents a major modification and reordering of the characters used in Webster (1988). Data for these characters were recorded for the 38 recognized genera based on observations of representative specimens of species in each genus. The data were analyzed by the key generating program, KEY, to produce a bracketed key which satisfied our concepts of character importance and key design, and fulfilled the programs requirements of efficiency and correctness. The same data and procedures were used to produce a bracketed key in Spanish. Our concepts of the taxonomic reliability for each character used in the production of the keys were incorporated in an ONLINE information retrieval analysis for the selection of an appropriate subset of characters for inclusión in the descriptions and synoptic key. A synoptic key, also in Spanish, is presented here and includes an alphabetic list of the numbered genera and a list of the 57 characters selected in the ONLINE analysis. Each character listed in the synoptic key consists of a feature followed by its character states as defined in the character file and ONLINE conversion. After each character state the genera exhibiting that state are indicated by their associated numbers. Character weights or reliabilities (9 being the highest and 5 the lowest) are also indicated in parenthesis following each feature. For example, character 1 (plants annual or perennial) was given a relative weight of "7" in the production of the bracketed keys and selection of characters for the synoptic key and descriptions. Descriptions, incorporating the 57 characters selected in the ONLINE analysis, were produced via CONFOR for the genera not covered in Webster (1988). Associated with each description are pertinent nomenclatural information and remarks on the morphology and relationships of the genus.

ENGLISH KEY TO THE MESOAMERICAN GENERA OF THE PANICEAE

1(0). Disarticulation above the lower glume or at the spikelet base . . . 2
Disarticulation at the base of the primary branches or at the nodes of the primary branches 51
2(1). Rachis terminating in a spikelet 3
Rachis terminating in an unmodified naked point or terminating in a bristle 46
3(2). Inflorescence a panicle 4
Inflorescence a raceme 43
4(3). Lower lemma with a central longitudinal groove . . . . *Thrasya*
Lower lemma lacking a central longitudinal groove 5
5(4). Primary branches with appressed secondary branches or reduced to a fascicle of spikelets 6
Primary branches with spreading secondary branches 29
6(5). Lemma of upper floret with flat margins 7
Lemma of upper floret with involute margins 18
7(6). Second glume saccate or gibbose 8
Second glume neither saccate nor gibbose 9
8(7). Lemma of lower floret with a hyaline area at the base; spikelets laterally compressed; second glume indumentum uncinate; internodes solid or spongy . . . . *Pseudechinolaena*
Lemma of lower floret consistent in texture; spikelets dorsiventrally compressed or planoconvex; second glume indumentum not uncinate; internodes hollow . . . . *Sacciolepis*
9(7). Primary branches with secund or distichous spikelets 10
Primary branches with spikelets neither secund nor distichous . . 17
10(9). Ligule a membrane or a ciliate membrane 11
Ligule a fringe of hairs 14
11(10). First glume present 12
First glume absent 13
12(11). Spikelets adaxial; internodes solid or spongy; first glume encircling the spikelet base; lemma of upper floret with margins of the same texture as the body . . . . *Hymenachne*
Spikelets abaxial; internodes hollow; first glume not encircling the spikelet base; lemma of upper floret with margins thinner in texture than the body . . . . *Digitaria*
13(11). Spikelets adaxial . . . . *Axonopus*
Spikelets abaxial . . . . *Digitaria*
14(10). First glume present; primary branches with loosely arranged spikelets 15
First glume absent; primary branches with closely arranged spikelet . . . . *Axonopus*
15(14). First glume muticous; first glume encircling the spikelet base; second glume muticous . . . . *Scutachne*
First glume awned; first glume not encircling the spikelet base; second glume awned 16
16(15). Spikelets laterally compressed; lemma of upper floret hyaline to membranous; stamens 2; callus not differentiated . . . . *Reynaudia*

Spikelets dorsiventrally compressed; lemma of upper floret cartilaginous; stamens 3; callus differentiated . . . . *Chaetium*

17(9). First glume muticous; spikelets dorsiventrally compressed; main axis with distichous primary branches; pedicels truncate; second glume muticous . . . . *Triscenia*

First glume awned; spikelets laterally compressed; main axis with quaquaversal primary branches; pedicels discoid; second glume awned . . . . *Arthropogon*

18(6). Lemma of upper floret differentiated at the apex 19

Lemma of upper floret not differentiated at the apex 20

19(18). Internodes solid or spongy; leaf blades with an incised base; pedicels discoid; upper lemma becoming membranous at the apex . . . . . . *Echinochloa*

Internodes hollow; leaf blades truncate to rounded at the base; pedicels truncate; upper lemma conduplicate at the apex . . . . *Acroceras*

20(18). Lemma of upper floret smooth, scabrous, striate, pitted, or papillate 21

Lemma of upper floret rugose 28

21(20). Lemma of upper floret with basal scars or appendages; rachilla pronounced between the florets 22

Lemma of upper floret without basal modifications; rachilla not pronounced between the florets 23

22(21). Spikelets pectinate or tightly spaced on the primary branches; first glume with bulbose-based setaceous hairs; pedicels discoid; pedicels flat to convex at the apex . . . . *Echinolaena*

Spikelets neither pectinate nor distinctly tightly spaced on the primary branches; first glume lacking bulbose-based setaceous hairs; pedicels cupuliform; pedicels concave at the apex . . . . *Ichnanthus*

23(21). First glume present and awned . . . . *Oplismenus*

First glume present or absent but not awned 24

24(23). Pedicels concave at the apex; spikelets adaxial 25

Pedicels flat or convex at the apex; spikelets abaxial . . . . *Paspalum*

25(24). Ligule a membrane or a ciliate membrane 26

Ligule a fringe of hairs 27

26(25). First glume present . . . . *Panicum*

First glume absent . . . . *Axonopus*

27(25). First glume present; internodes hollow; main axis with distichous or secund primary branches . . . . *Brachiaria*

First glume absent; internodes solid or spongy; main axis with quaquaversal primary branches . . . . *Axonopus*

28(20). First glume fused with the callus to form a cuplike structure . . . . *Eriochloa*

First glume not fused with the callus . . . . *Urochloa*

29(5). Lemma of upper floret with flat margins 30

Lemma of upper floret with involute margins 39

30(29). Primary branches with secund or distichous spikelets 31

Primary branches with spikelets neither secund nor distichous . . 35

31(30). First glume muticous 32

First glume awned 34

32(31). Ligule a membrane or a ciliate membrane 33

Ligule a fringe of hairs . . . . *Scutachne*

33(32). Spikelets laterally compressed; rachilla pronounced between the florets; second glume indumentum uncinate; lemma of lower floret with a hyaline area at the base . . . . *Pseudechinolaena*
Spikelets planoconvex; rachilla not pronounced between the florets; second glume indumentum not uncinate; lemma of lower floret consistent in texture . . . . *Digitaria*

34(31). Ligule a membrane; rachilla pronounced between the florets; second glume gibbose; second glume indumentum uncinate; lemma of lower floret with a hyaline area at the base . . . . *Pseudechinolaena*
Ligule a fringe of hairs; rachilla not pronounced between the florets; second glume neither saccate nor gibbose; second glume indumentum not uncinate; lemma of lower floret consistent in texture . . . . *Reynaudia*

35(30). First glume present; sheaths rounded 36
First glume absent; sheaths laterally compressed . . . . *Anthaenantia*

36(35). First glume muticous; second glume less than or equal to the length of the lower floret 37
First glume awned; second glume greater than the length of the lower floret . . . . *Arthropogon*

37(36). Ligule a membrane; spikelets dorsiventrally compressed; lemma of upper floret with margins thinner in texture than the body . . . . . *Homolepis*
Ligule a fringe of hairs; spikelets laterally compressed; lemma of upper floret with margins of the same texture as the body 38

38(37). Second glume 5-nerved; main axis with distichous primary branches; internodes neither viscid nor glaucous . . . . *Rhynchelytrum*
Second glume 7-nerved; main axis with quaquaversal primary branches; internodes viscid . . . . *Melinis*

39(29). Rachilla pronounced between the florets 40
Rachilla not pronounced between the florets 41

40(39). Rachilla with lateral appendages; primary branches with secund spikelets; lemma of upper floret with basal scars or appendages; spikelets adaxial; first glume encircling the spikelet base . . . . *Ichnanthus*
Rachilla lacking lateral appendages; primary branches with spikelets neither secund nor distichous; lemma of upper floret without basal modifications; spikelets abaxial; first glume not encircling the spikelet base . . . . *Isachne*

41(39). Spikelets dorsiventrally compressed or planoconvex; lemma of upper floret not differentiated at the apex; spikelets not divergent from the axis; first glume not inflated at the base 42
Spikelets terete; lemma of upper floret differentiated at the apex; spikelets divergent from the axis; first glume inflated at the base . . . *Lasiacis*

42(41). Ligule a membrane or a ciliate membrane; lemma of upper floret smooth, striate, or papillate; pedicels cupuliform . . . . *Panicum*
Ligule a fringe of hairs; lemma of upper floret rugose; pedicels discoid . . . . *Urochloa*

43(3). Lower lemma with a central longitudinal groove; pedicels flat or convex at the apex; lemma of upper floret with involute margins . . . . . *Thrasya*
Lower lemma lacking a central longitudinal groove; pedicels concave at the apex; lemma of upper floret with flat margins 44

44(43). Lemma of upper floret with basal scars or appendages; pedicels flat to convex at the apex . . . . *Echinolaena*
Lemma of upper floret lacking basal scars or appendages; pedicels concave at the apex 45
45(44). Lemma of lower floret with the area between the central nerve and the first lateral nerve thinner in texture than the rest of the structure; pedicels oblique to the spikelet base; main axis with distichous primary branches; second glume muticous . . . . *Mesosetum*
Lemma of lower floret consistent in texture; pedicels perpendicular with the spikelet base; main axis with quaquaversal primary branches; second glume awned . . . . *Arthropogon*
46(2). Lower lemma with a central longitudinal groove; spikelets adaxial; main axis winged . . . . *Thrasya*
Lower lemma lacking a central longitudinal groove; spikelets abaxial; main axis not winged 47
47(46). Lemma of lower floret with a hyaline area at the base; second glume chartaceous to indurate; second glume 13 – 23-nerved . . . . *Setariopsis*
Lemma of lower floret consistent in texture; second glume hyaline to membranous; second glume less than 13-nerved 48
48(47). Palea of lower floret with nerves pronounced but not winged; bristles scabrous; lemma of lower floret not keeled 49
Palea of lower floret with nerves pronounced into obvious wings; bristles smooth; lemma of lower floret keeled . . . . *Ixophorus*
49(48). Pedicels concave at the apex; lemma of upper floret rugose; first glume encircling the spikelet base 50
Pedicels flat or convex at the apex; lemma of upper floret smooth, striate, or papillate; first glume not encircling the spikelet base . . . . *Paspalum*
50(49). Main axis with distichous primary branches . . . . *Paspalidium*
Main axis with quaquaversal primary branches . . . . *Setaria*
51(1). Second glume present; stamens 3; inflorescence linear or oblong . . . 52
Second glume absent; stamens 2; inflorescence lanceolate or ovate . . *Reimarochloa*
52(51). Second glume more than 0.1 times spikelet length; pedicels with glabrous apices; cleistogamous inflorescence absent; lemma of upper floret dull 53
Second glume less than 0.1 times spikelet length; pedicels with hairy apices; cleistogamous inflorescence present; lemma of upper floret shiny . . . . *Paratheria*
53(52). Fascicles with 1 – 6 spikelets; spikelets not obviously opposite a flared bract 54
Fascicles with 4 spikelets; spikelets opposite a flared bract . . . . *Anthephora*
54(53). Disarticulation at the nodes of the main axis or at the base of the inflorescence; main axis with distichous or secund primary branches; leaf blades acute to rounded at the apex . . . . *Stenotaphrum*
Disarticulation at the base of the primary branches; main axis with quaquaversal primary branches; leaf blades caudate to acuminate at the apex 55
55(54). Callus flared to form a discoid receptacle . . . . *Cenchrus*
Callus not flared to form a discoid receptacle . . . . *Pennisetum*

SPANISH KEY TO THE MESOAMERICAN GENERA OF THE PANICEAE

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17(9). Primera gluma mutica; espiguillas comprimidas dorsiventralmente; eje principal con las ramificaciones primarias disticas; pedicelos truncados; segunda gluma mútica . . . . *Triscenia*

Primera gluma aristada; espiguillas comprimidas lateralmente; eje principal con las ramificaciones primarias ni disticas ni secundifloras; pedicelos discoides; segunda gluma aristada . . . . *Arthropogon*

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23(21). Primera gluma presente; primera gluma aristada . . . . *Oplismenus*

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Primera gluma ausente . . . . *Axonopus*

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Primera gluma ausente; entrenudos sólidos o esponjosos; eje principal con las ramificaciones primarias ni dísticas ni secundifloras . . . . *Axonopus*

28(20). Primera gluma fusionada con el callo para formar un anillo hinchado . . . . *Eriochloa*

Primera gluma no fusionada con el callo . . . . *Urochloa*

29(5). Lema del flósculo superior con márgenes planos 30

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33(32). Espiguillas comprimidas lateralmente; raquilla prolongándose entre los flósculos; segunda gluma con indumento uncinado; lema del flósculo inferior con un área hialina en la base . . . . *Pseudechinolaena*

Espiguillas planoconvexas; raquilla no prolongándose entre los flósculos; segunda gluma con indumento no uncinado; lema del flósculo inferior consistente en textura . . . . *Digitaria*

34(31). Ligula una membrana; raquilla prolongándose entre los flósculos; segunda gluma gibosa; segunda gluma con indumento uncinado; lema del flósculo inferior con un área hialina en la base. . . . *Pseudechinolaena*

Ligula una fimbria de pelos; raquilla no prolongándose entre los flósculos; segunda gluma no sacciforme ni gibosa; segunda gluma con indumento no uncinado; lema del flósculo inferior consistente en textura . . . . *Reynaudia*

35(30). Primera gluma presente; vainas redondeadas 36

Primera gluma ausente; vainas comprimidas lateralmente . . . . *Anthaenantia*

36(35). Primera gluma mutica; segunda gluma hasta 1 vez la longitud del flósculo inferior 37

Primera gluma aristada; segunda gluma 1.1 veces la longitud del flósculo inferior o más . . . . *Arthropogon*

37(36). Ligula una membrana; espiguillas comprimidas dorsiventralmente; lema del flósculo superior con márgenes más delgados en textura que el cuerpo . . . . *Homolepis*

Ligula una fimbria de pelos; espiguillas comprimidas lateralmente; lema del flósculo superior con márgenes no más delgados en textura que el cuerpo 38

38(37). Segunda gluma 5-nervada; eje principal con las ramificaciones primarias dísticas; entrenudos no viscidos . . . . *Rhynchelytrum*

Segunda gluma 7-nervada; eje principal con las ramificaciones primarias ni dísticas ni secundifloras; entrenudos viscidos . . . . *Melinis*

39(29). Raquilla prolongándose entre los flósculos 40

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Raquilla sin apéndices laterales; ramificaciones primarias con espiguillas ni secundifloras ni dísticas; lema del flósculo superior sin modificaciones basales; espiguillas con orientacíon abaxial; primera gluma no encerrando la base de la espiguilla . . . . *Isachne*

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42(41). Lígula una membrana o una membrana ciliada; lema del flósculo superior lisa, estriada, o papilosa; pedicelos cupuliformes .... *Panicum*
Lígula una fimbria de pelos; lema del flósculo superior rugosa; pedicelos discoides .... *Urochloa*

43(3). Lema inferior con una cavidad central longitudinal; pedicelos con el ápice plano o convexo; lema del flósculo superior con márgenes involutos .... *Thrasya*
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44(43). Lema del flósculo superior con una cicatriz o apendices basales; pedicelos con depresion plana o convexa en el ápice .... *Echinolaena*
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45(44). Lema del flósculo inferior con un área entre el nervio central y el primer nervio lateral más delgada en textura; pedicelos oblicuos a la base de la espiguilla; eje principal con las ramificaciones primarias dísticas; segunda gluma mutica .... *Mesosetum*
Lema del flósculo inferior consistente en textura; pedicelos perpendiculares con la base de la espiguilla; eje principal con las ramificaciones primarias ni dísticas ni secundifloras; segunda gluma aristada . . . *Arthropogon*

46(2). Lema inferior con una cavidad central longitudinal; espiguillas con orientacíon adaxial; eje principal alado .... *Thrasya*
Lema inferior sin una cavidad central longitudinal; espiguillas con orientacíon abaxial; eje principal no alado 47

47(46). Lema del flósculo inferior con un área hialina en la base; segunda gluma cartácea a endurecida; segunda gluma 13-23-nervada .... *Setariopsis*
Lema del flósculo inferior consistente en textura; segunda gluma hialina a membranosa; segunda gluma hasta 13-nervada 48

48(47). Palea del flósculo inferior con nervios pronunciados pero no alados; cerdas escabrosas; lema del flósculo inferior no aquillad 49
Palea del flósculo inferior con nervios pronunciados hasta alados; cerdas lisas; lema del flósculo inferior aquillada .... *Ixophorus*

49(48). Pedicelos con el ápice cóncavo; lema del flósculo superior rugosa; primera gluma encerrando la base de la espiguilla 50
Pedicelos con el ápice plano o convexo; lema del flósculo superior lisa, estriada, o papilosa; primera gluma no encerrando la base de la espiguilla .... *Paspalum*

50(49). Eje principal con las ramificaciones primarias dísticas .... *Paspalidium*
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52(51). Segunda gluma 0.1 veces la longitud de la espiguilla o más; pedicelos con ápices glabros; inflorescencia con espiguillas cleistógamás ausentes; lema de flósculo superior opaca 53

Segunda gluma hasta 0.1 veces la longitud de la espiguilla; pedicelos con ápices pilosos; inflorescencia con espiguillas cleistógamás presentes; lema del flósculo superior brillante . . . . *Paratheria*

53(52). Fascículos con 1-6 espiguillas; espiguillas no obviamente opuestas a una bráctea ensanchada 54

Fascículos con 4 espiguillas; espiguillas opuestas a una bráctea ensanchada . . . . *Anthephora*

54(53). Desarticulacion en los nudos del eje principal o en la base de la inflorescencia; eje principal con la ramificacion primaria dística o secundiflora; limbos agudos a redondeados . . . . *Stenotaphrum*

Desarticulacion en la base de la ramifación primaria; eje principal con las ramificaciones primarias ni dísticas ni secundifloras; limbos caudados a acuminados 55

55(54). Callo ensanchado hasta formar un receptáculo discoide . . . . *Cenchrus*

Callo no ensanchado hasta formar un receptáculo discoide . . . . *Pennisetum*

SYNOPTIC KEY TO THE MESOAMERICAN GENERA OF THE PANICEAE

Recognized genera

1. *Acroceras* Stapf
2. *Anthaenantia* P. Beauv.
3. *Anthephora* Schreb.
4. *Arthropogon* Nees
5. *Axonopus* P. Beauv.
6. *Brachiaria* (Trin.) Griseb.
7. *Cenchrus* L.
8. *Chaetium* Nees
9. *Digitaria* Haller
10. *Echinochloa* P. Beauv.
11. *Echinolaena* Desv.
12. *Eriochloa* Kunth
13. *Homolepis* Chase
14. *Hymenachne* P. Beauv.
15. *Ichnanthus* P. Beauv.
16. *Isachne* R. Br.
17. *Ixophorus* Schlecht.
18. *Lasiacis* (Griseb.) A. Hitchc.
19. *Melinis* P. Beauv.
20. *Mesosetum* Steud.
21. *Oplismenus* P. Beauv.
22. *Panicum* L.
23. *Paratheria* Griesb.
24. *Paspalidium* Stapf
25. *Paspalum* L.
26. *Pennisetum* Rich.
27. *Pseudechinolaena* Stapf
28. *Reimarochloa* A. Hitchc.
29. *Reynaudia* Kunth
30. *Rhynchelytrum* Nees
31. *Sacciolepis* Nash
32. *Scutachne* A. Hitchc. & Chase
33. *Setaria* P. Beauv.
34. *Setariopsis* Scribn. & Millsp.
35. *Stenotaphrum* Trin.
36. *Triscenia* Griesb.
37. *Thrasya* Kunth
38. *Urochloa* P. Beauv.

Characters

1. plantas (7)
   1. anuales: 1 3 5 – 7 9 – 12 15 – 16 19 – 27 30 – 31 33 – 35 38

   2. perennes: 1 – 5 7 – 22 24 – 26 28 – 33 35 – 38
2. entrenudos (7)
   1. sólidos o esponjosos: 2 4 – 5 7 – 8 10 14 17 – 19 21 – 22 25 – 27 29 – 30 33 35
   2. huecos: 1 – 4 6 9 11 – 13 15 – 16 18 20 23 – 25 28 30 – 34 37 – 38
3. entrenudos (7)
   1. víscidos: 19
   2. glaucos: 15 25 – 26
   3. no víscidos ni glaucos: 1 – 18 20 – 38
4. ligula (8)
   1. una membrana o una membrana ciliada: 1 – 5 7 9 11 – 15 17 – 18 21 – 28 31 33 – 35 37
   2. una fimbria de pelos: 2 4 – 8 10 – 12 15 – 16 19 – 20 25 – 26 28 – 30 32 – 33 36 38
   3. ausente: 10 16
5. inflorescencia (9)
   1. panícula: 1 – 19 21 – 38
   2. racimo: 4 11 20 37
6. eje principal (7)
   1. recto: 1 – 2 4 – 38
   2. ondulado: 3 7 20 – 21 35
7. eje principal (7)
   1. con las ramificaciones primarias dísticas o secundifloras: 6 10 – 12 20 – 21 24 27 – 28 30 35 – 37
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    3. terminando en una cerda: 3 7 17 23 – 24 26 33 – 34
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    1. distintamente aplanadas: 3 7
    2. no distintamente aplanadas: 7 17 23 – 24 26 33 – 34
13. cerdas (8)
    1. lisas: 17

2. escabrosidad: 3 7 23 − 24 26 33 − 34

14. pedicelos (8)
    1. presentes: 1 − 2 4 − 6 8 − 38
    2. ausentes: 3 7 26 35
15. pedicelos (7)
    1. truncados: 1 5 9 13 18 27 − 28 35 − 36
    2. discoides: 4 − 6 9 − 12 14 17 19 21 24 − 25 27 29 − 34 37 − 38
    3. cupuliformes: 2 9 13 15 18 22
16. pedicelos (8)
    1. perpendiculares con la base de la espiguilla: 1 − 7 9 − 19 21 − 38
    2. oblicuos a la base de la espiguilla: 8 13 20 29
17. pedicelos (8)
    1. con el ápice cóncavo: 1 − 2 4 − 6 9 − 10 12 − 15 17 − 20 22 24 27 29 − 36 38
    2. con el ápice plano o convexo: 8 11 13 − 14 21 25 29 37 − 38
18. desarticulación (9)
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    2. en la base de la ramificación primaria o en la base de la inflorescencia: 3 7 23 26 28 35
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    1. diferenciado: 3 − 4 7 − 8 10 12 20 23 26 30 37 − 38
    2. no diferenciado: 1 − 2 5 − 6 9 − 11 13 − 22 24 − 38
20. callo (7)
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    2. no fusionada con el callo: 1 − 11 13 − 38
27. primera gluma (8)
    1. presente: 1 4 6 − 27 29 − 38
    2. ausente: 2 − 3 5 7 9 12 25 − 26 28 37
28. primera gluma (7)

   1. hasta 0.5 veces la longitud de la espiguilla: 1 6 – 7 9 – 10 15 17 – 19 21 23 – 26 30 – 38
   2. 0.51 – 0.89 veces la longitud de la espiguilla: 1 10 15 – 16 18 20 – 21 24 – 25 29 32 – 33 37 – 38
   3. 0.9 veces la longitud de la espiguilla o más: 4 8 11 13 15 20 27

29. primera gluma (7)
   1. encerrando la base de la espiguilla: 1 6 10 11 14 – 15 18 22 24 27 32 – 34 36 38
   2. no encerrando la base de la espiguilla: 4 7 – 9 13 16 – 17 19 – 21 23 25 – 26 29 – 31 35 37
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   2. no prolongándose debajo de la segunda gluma: 1 – 7 9 – 11 13 15 17 – 31 33 – 38
32. raquilla (8)
   1. prolongándose entre los flósculos: 1 11 13 15 – 16 27 30 – 31
   2. no prolongándose entre los flósculos: 1 – 10 12 – 14 17 – 26 28 – 38
33. raquilla (9)
   1. con apéndices laterales: 11 15
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34. segunda gluma (9)
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42. lema del flósculo inferior (7)
    1. caudada a acuminada: 3 5 7 – 15 17 20 – 21 23 – 26 28 31 – 32 35 – 37
    2. aguda a truncada: 1 – 7 9 – 13 15 – 18 20 – 21 24 – 28 30 – 31 33 – 35 37 – 38
    3. emarginada a bífida: 4 19 29
43. lema del flósculo inferior (7)
    1. mútica a apiculada: 1 – 7 9 – 18 20 – 21 23 – 38
    2. aristada: 4 8 10 12 14 19 21 26 28 – 30
44. palea del flósculo superior (8)
    1. con nervios no pronunciados o con nervios pronunciados pero no alados: 1 – 16 18 – 38
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    1. hasta 0.49 veces la longitud del flósculo inferior: 31
    2. 0.5 – 0.8 veces la longitud del flósculo inferior: 4 – 6 9 11 – 12 15 – 17 19 – 21 24 26 – 27 30 – 31 34 36 38
    3. 0.81 veces la longitud del flósculo inferior a más: 1 – 16 18 – 26 28 – 29 31 – 35 37 – 38
46. lema del flósculo superior (7)
    1. hialina a membranosa: 4 14 19 29 – 30 36
    2. cartácea a cartilaginosa: 2 – 3 5 – 9 11 – 17 20 – 24 26 – 28 30 – 33 35 37 – 38
    3. endurecida: 1 10 12 18 24 – 25 33 – 34 38
47. lema del flósculo superior (8)
    1. lisa o escabrosa: 1 – 7 9 – 11 13 – 16 18 – 23 25 – 32 35 – 36
    2. estriada, muricada, punteada, o papilosa: 5 7 – 9 16 20 22 25 35 37
    3. rugosa: 12 17 24 32 – 34 38
48. lema del flósculo superior (6)
    1. brillante: 5 – 6 10 – 11 13 20 – 21 23 27 31
    2. opaca: 1 – 5 7 – 10 12 – 20 22 24 – 26 28 – 30 32 – 38
49. lema del flósculo superior (8)
    1. con márgenes planos: 2 – 5 7 – 9 13 – 14 19 – 20 23 26 – 27 29 – 32 35 – 36
    2. con márgenes involutos: 1 5 – 6 10 – 12 15 – 18 21 – 22 24 – 26 28 33 – 35 37 – 38
50. lema del flósculo superior (7)
    1. con márgenes más delgados en textura que el cuerpo: 2 – 5 7 9 13 23 26
    2. con márgenes no más delgados en textura que el cuerpo: 1 4 – 8 10 – 12 14 – 22 24 – 38
51. lema del flósculo superior (8)
    1. con una cicatriz o ápendices basales: 11 15
    2. estrecha en la base: 1 7 18 24 – 25 33
    3. sin modificaciones basales: 1 – 10 12 – 14 16 – 38
52. lema del flósculo superior (8)
    1. diferenciada en el ápice: 1 – 2 10 18 37 – 38
    2. no diferenciada en el ápice: 2 – 9 11 – 17 19 – 38
53. lema del flósculo superior (7)
    1. con el ápice hialino y ensanchado: 2
    2. con el ápice membranoso: 10
    3. el ápice con un penacho de pelos: 18
    4. con un ápice crestado: 18

  5. con un ápice conduplicado: 1 38
54. estambres (7)
  1. 2: 28−29
  2. 3: 1−27 30−38
55. sea C−3 o C−4 (9)
  1. C−4: 2−10 12 17 19−20 22−30 32−35 37−38
  2. C−3: 1 11 13−16 18 21−22 31 36
56. sea XyMs+ o XyMs− (8)
  1. XyMs+: 1 6 11−16 18−19 21−22 30−32 36 38
  2. XyMs−: 2−5 7−10 17 20 22−29 33−35 37
57. numero básico de cromosomás (7)
  1. hasta 9: 1 3 6−7 9−12 18−22 24 26 28 30−31 33 35 38
  2. 10 a más: 5 7 13−16 21−22 25 33 37−38

ACROCERAS Stapf, Fl. Trop. Afr. 9:621. 1920. TYPE SPECIES: *A. zizanioides* (Kunth) Dandy.

Commelinidium Stapf, Fl. Trop. Afr. 9:627. 1920. TYPE SPECIES: *C. gabonense* Stapf.
Neohusnotia A. Camus, Bull. Mus. Hist. Nat. 26:664. 1921. TYPE SPECIES: *N. tonkinensis* (Bal.) A. Camus.

Plants annual or perennial. Internodes hollow (somewhat lignified); neither viscid nor glaucous. Ligule a membrane or a ciliate membrane. Inflorescence a panicle. Main axis straight; with quaquaversal primary branches. Primary branches spreading; with appressed secondary branches (slightly spreading); with secund spikelets. Rachis terminating in a spikelet. Pedicels present; truncate (approaching discoid); perpendicular with the spikelet base; concave. Disarticulation at the spikelet base. Callus not differentiated. Cleistogamous inflorescence absent. Spikelets paired; adaxial; dorsiventrally compressed (approaching lateral compression). First glume not fused with the callus; present; 0.5 − 0.8 times spikelet length; encircling the spikelet base; muticous. Rachilla pronounced or not pronounced below the second glume; pronounced or not pronounced between the florets; lacking lateral appendages. Second glume present; 1 times spikelet length; neither saccate nor gibbose; 5−nerved; indumentum not uncinate. Lemma of lower floret membranous to chartaceous; consistent in texture; lacking a central longitudinal groove; acute; muticous. Palea of lower floret with nerves pronounced but not winged. Upper floret 0.9 − 1 times the length of the lower floret. Lemma of upper floret indurate; *smooth*; dull; with involute margins; with margins of the same texture as the body; constricted at the base or without basal modifications; differentiated at the apex; *conduplicate at the apex*. Stamens 3. C−3. XyMs+. Base chromosome number, x=9.

Remarks: *Acroceras* consists of about 20 species. Most are endemic to Madagascar, and others occur in the tropics of Asia, Africa, and the Americas. The genus is characterized by the conduplicate differentiated apex of the upper lemma. This morphologically differs from the crested apex of the upper floret in the Asian genus *Cyrtococcum* Stapf. Additional important characteristics of *Acroceras* include the relatively long first glume, smooth upper floret, C − 3 photosynthetic pathway, and presence of a rachilla internode in some taxa. The closest relative may be *Ichnanthus*. One species, *A. zizanioides* (Kunth) Dandy, is widespread in the tropics of Asia, Africa, and the Americas. Clayton and Renvoize (1982) describe African specimens of this species as lacking a rachilla between the glumes; however, American specimens possess a distinct rachilla between the glumes and at the base of the upper floret. The New World specimens may be incorrectly placed in this species; however, a detailed systematic study of *A. zizanioides* is required to be certain.

Acroceras paucispicatum (Morong) Henr., a South America species, has the conduplicate apex of the upper floret which is diagnostic for *Acroceras*; however, it is C − 4 subtype PcK and the upper floret is rugose. Therefore, this species is improperly assigned to *Acroceras*, but fits within the generic concept of *Urochloa* as outlined and discussed by Webster (1987 & 1988).

ARTHROPOGON Nees, Agrost. Bras. 319. 1829. TYPE SPECIES: *A. villosus* Nees.

Achlaena Griseb., Cat. Pl. Cub. 228. 1866. TYPE SPECIES: *A. piptostachya* Griseb.

Plants perennial. Internodes spongy or hollow; neither viscid nor glaucous. Ligule a ciliate membrane or a fringe of hairs. Inflorescence a panicle or a raceme. Main axis straight; with quaquaversal primary branches. Primary branches appressed to the main axis or spreading; with appressed or spreading secondary branches; with spikelets neither secund nor distichous. Rachis terminating in a spikelet. Pedicels present; discoid; perpendicular with the spikelet base; concave. Disarticulation at the spikelet base. *Callus differentiated*; prolonged or not prolonged into a stipe; not flared to form a discoid receptacle. Cleistogamous inflorescence absent. Spikelets solitary; adaxial; laterally compressed. First glume not fused with the callus; present; 1 − 6 times spikelet length; not encircling the spikelet base; *awned*. Rachilla not pronounced below the second glume; not pronounced between the florets. Second glume present; 1 times spikelet length; neither saccate nor gibbose; 3 or 5-nerved; indumentum not uncinate. Lemma of lower floret chartaceous to cartilaginous; consistent in texture; lacking a central longitudinal groove; acute or bifid; muticous or awned. Palea of lower floret with nerves pronounced but not winged.

Upper floret 0.7 – 1 times the length of the lower floret. Lemma of upper floret *hyaline to membranous*; smooth; dull; with flat margins; with margins thinner in texture or of the same texture as the body; without basal modifications; not differentiated at the apex. Stamens 3. C–4. XyMs-.

Remarks: Filgueiras' (1982) revision of *Arthropogon* recognized six species. One species, *A. piptostachyus* (Griseb.) Pilger, occurs in Cuba and Jamaica, the remaining species being native to Brazil. This genus and *Reynaudia* are the only members of the subtribe Arthropogonineae Butzin. Diagnostic characteristics of *Arthropogon* include lateral compression of the spikelets, a differentiated callus, awned glumes, dense-textured glumes, a thin-textured upper floret, and an emarginate or bifid second glume and lower lemma. Additional interesting features include the racemose inflorescence of *A. xerachne* Ekman, whorled primary branches, hairy axils, and a first glume that is reduced to a setaceous awn.

Recent treatments (Filgueiras 1982; Clayton & Renvoize 1986) of *Arthropogon* place *Achlaena* Griseb. in synonomy. *Achlaena* was described in 1866 with one species, *A. piptostachya* Griseb. Hitchcock (1936) recognized *Achlaena* but indicated that it was closely related to *Arthropogon*. Anatomical evidence linking these genera was provided by Tateoka (1963). Significant characteristics of *Arthropogon piptostachyus* which differentiate it from other taxa of *Arthropogon* include presence of a prolonged stipitate callus lacking long setaceous hairs, pedicel apex not distinctly discoid, secondary inflorescence branches appressed, spikelets not obviously laterally compressed, second glume not emarginate nor bifid, and finally, its isolated distribution in Cuba and Jamaica. These characteristics support the recognition of *Achlaena* as a monotypic genus; however, until more detailed studies are made we have decided to follow the concepts proposed by Filgueiras (1982).

CHAETIUM Nees, Agrost. Bras. 269. 1829. TYPE SPECIES: *C. festucoides* Nees.

Berchtoldia Presl, Rel. Haenk. 1:323. 1830. TYPE SPECIES: *B. bromoides* Presl.

Plants perennial. Internodes spongy; neither viscid nor glaucous. Ligule a fringe of hairs. *Inflorescence a panicle.* Main axis straight; with quaquaversal primary branches. Primary branches appressed to the main axis; with appressed secondary branches; with secund spikelets (but not obvious). Rachis terminating in a spikelet. Pedicels present; *oblique to the spikelet base*; flat. Disarticulation at the spikelet base. *Callus differentiated* (oblique at the base and ca 0.5 mm long); prolonged into a pronounced stipe; not flared to form a discoid receptacle. Cleistogamous inflorescence absent. Spikelets solitary or paired; adaxial; dorsiventrally compressed.

First glume not fused with the callus; present; 1 – 1.1 times spikelet length; not encircling the spikelet base; awned. Rachilla pronounced below the second glume; not pronounced between the florets. Second glume present; 1 times spikelet length; neither saccate nor gibbose; 3, 5, or 7-nerved; indumentum not uncinate. Lemma of lower floret hyaline to membranous; consistent in texture; lacking a central longitudinal groove; acuminate; awned. Palea of lower floret with nerves pronounced but not winged. Upper floret 0.9 – 1 times the length of the lower floret. Lemma of upper floret cartilaginous; striate to muricate; dull; with flat margins; with margins of the same texture as the body (with a thin hyaline margin); without basal modifications; not differentiated at the apex. Stamens 3. C – 4. XyMs-.

Remarks: *Chaetium* is a New World genus of three species, which occur in the West Indies, Mexico, and Central and South America. Some agrostologists have suggested that the closest relative of *Chaetium* is *Echinochloa*; however, we find little or no evidence to support that concept. The relationship of *Chaetium* in the Paniceae is presently unclear. Taxonomically significant characteristics of *Chaetium* include the flat and oblique pedicel apex, presence of a prolonged callus, and development of the floral bracts. The base of the spikelet at the point of disarticulation is prolonged, hairy, and oblique.

In *C. bromoides* (Presl) Hemsl. the first glume is relatively large, awned, and coarse in texture, whereas the lower lemma is relatively thin in texture. In *C. festucoides* Nees the first glume is reduced to an awn and the lower lemma is somewhat coarser in texture.

ECHINOLAENA Desv., J. Bot. Agr. 1:75. 1813. TYPE SPECIES: *E. hirta* Desv.

Chasechloa A. Camus, Bull. Soc. Bot. France 95:330. 1949. TYPE SPECIES: *C. madagascariensis* (Baker) A. Camus.

Plants annual or perennial. Internodes hollow; neither viscid nor glaucous. Ligule a ciliate membrane or a fringe of hairs. Inflorescence a raceme or panicle. Main axis straight; with secund or quaquaversal primary branches. Primary branches appressed to the main axis to divaricate; with appressed secondary branches; with secund spikelets. Rachis terminating in a spikelet. Pedicels present; discoid (not obvious); perpendicular with the spikelet base; *flat to convex*. Disarticulation at the spikelet base (with a secondary point at the base of the primary branch). Callus not differentiated. Cleistogamous inflorescence absent. Spikelets solitary or paired; adaxial or abaxial; dorsiventrally compressed. First glume not fused with the callus; present; 0.9 – 1.7 times spikelet length; encircling the spikelet base; muticous or awned. Rachilla not pronounced below the second glume; pronounced between the florets; with lateral appendages or lacking lateral appendages. Second glume present; 0.5 – 0.9 times spikelet length; neither saccate nor gibbose; 5- or 7-nerved; indumentum not uncinate. Lemma of lower floret membranous; consistent in texture; lacking a central longitudinal groove; acuminate to acute; muticous. Palea of lower floret with nerves pronounced but not winged. Upper floret 0.7 – 1 times the length of the lower floret. Lemma of upper floret cartilaginous; smooth; shiny; with involute margins; with margins of the same texture as the body; *with basal scars or appendages*; not differentiated at the apex. Stamens 3. C – 3. XyMs + . Base chromosome number, x = 9.

Remarks: *Echinolaena* consists of about eight species which occur from Madagascar and Africa to the tropics of New World. One species, *E. gracilis* Swallen, extends into the Mesoamerican region. *Echinolaena* is closely related to *Ichnanthus*. *Echinolaena minarum* (Nees) Pilger is intermediate bewteen these genera.

HOMOLEPIS Chase, Proc. Biol. Soc. Wash. 24:146. 1911. TYPE SPECIES: *H. aturensis* (Kunth) Chase.

Plants perennial. Internodes hollow; neither viscid nor glaucous. Ligule a membrane. Inflorescence a panicle. Main axis straight; with quaquaversal primary branches. Primary branches appressed to the main axis or spreading; with spreading secondary branches; with spikelets neither secund nor distichous (or not obviously secund). Rachis terminating in a spikelet. Pedicels present; truncate to cupuliform; perpendicular or oblique to the spikelet base; concave to flat. Disarticulation at the spikelet base. Callus not differentiated. Cleistogamous inflorescence absent. Spikelets solitary or paired; adaxial; dorsiventrally compressed. First glume not fused with the callus; present; *0.9 – 1.1 times spikelet length*; not encircling the spikelet base; *muticous* (slightly apiculate in *H. glutinosa*). Rachilla pronounced or not pronounced below the second glume; pronounced or not pronounced between the florets; *lacking lateral appendages*. Second glume present; 0.9 – 1 times spikelet length; neither saccate nor gibbose; 5, 7, or 9-nerved; *indumentum not uncinate*. Lemma of lower floret membranous; consistent in texture; lacking a central longitudinal groove; acuminate to acute; muticous. Palea of lower floret with nerves pronounced but not winged. Upper floret 1 – 1.1 times the length of the lower floret. Lemma of upper floret chartaceous to coriaceus; smooth; shiny or dull; with flat margins; with margins thinner in texture than the body; without basal modifications; not differentiated at the apex. Stamens 3. C – 3. XyMs + . Base chromosome number, x = 10.

Remarks: The presence of subequal glumes was the primary character used by Chase (1911) to distinguish *Homolepis* from related genera. In addition, for all taxa except *H. glutinosa* (Sw.) Zul. & Sod. the glumes are longer than other spikelet parts. Zuloaga and Soderstrom (1985) revised the genus and recognized five species occurring from Mexico to Brazil. Two new species were named in that study; however, the authors do not provide an anatomical evaluation of the taxa, which is critical in *Homolepis*. Watson et al. (1986) reports that all species, except *H. longispicula* (Doell) Chase, have well-developed fusoid cells in the leaves, a characteristic of bambusoid grasses. Additional significant features of *Homolepis* include the relatively thin upper lemma with flat hyaline margins, presence of a pronounced rachilla between the glumes, and paired spikelets both with relatively long pedicels at the lower inflorescence axils. This last character appears to be a primative condition. The pedicel apex is perpendicular to the spikelet in all taxa except *H. glutinosa*, in which it is oblique. The nervation pattern and pubescence of the second glume and lower lemma in *H. longispicula* is very similar to that found in many species of *Digitaria*.

ICHNANTHUS P. Beauv., Ess. Agrost. 56. 1812.—*Panicum* L. sect. *Ichnanthus* (P. Beauv.) Trin., Mém. Acad. Imp. Sci. St.-Ptersbourg, Sr. 6, Sci. Math. 1:195. 1834. TYPE SPECIES: *I. panicoides* P. Beauv.

Navicularia Raddi, Agrost. Bras. 38. 1823. TYPE SPECIES: *N. lanata* Raddi.

Plants annual or perennial. Internodes hollow; glaucous, or neither viscid nor glaucous. Ligule a membrane, a ciliate membrane, or a fringe of hairs. Inflorescence a panicle. Main axis straight; with quaquaversal primary branches. Primary branches spreading; with appressed or spreading secondary branches; with secund spikelets. Rachis terminating in a spikelet. Pedicels present; cupuliform (approaching truncate in some taxa); perpendicular with the spikelet base; concave. Disarticulation at the spikelet base. Callus not differentiated. Cleistogamous inflorescence absent. Spikelets solitary or paired; adaxial; laterally or dorsiventrally compressed. First glume not fused with the callus; present; 0.5 – 1 times spikelet length; encircling the spikelet base; muticous or apiculate. Rachilla pronounced or not pronounced below the second glume; pronounced between the florets; with lateral appendages. Second glume present; 1 times spikelet length; neither saccate nor gibbose; 3, 5, or 7-nerved; indumentum not uncinate. Lemma of lower floret membranous; consistent in texture; lacking a central longitudinal groove; acuminate to acute; muticous. Palea of lower floret with nerves not pronounced. Upper floret 0.7 – 1 times the length of the lower floret. Lemma of upper floret cartilaginous; smooth; dull; with involute margins; with margins of the same texture as the body; *with basal scars or appendages; not differentiated at the apex. Stamens 3. C − 3. XyMs+.* Base chromosome number, x = 10.

Remarks: Ichnanthus consists of thirty species. All occur in the tropics of the New World except *I. pallens* var. *major* (Nees) Stieber, which is widespread in Africa, Asia, and Australia. Comprehensive revisions of the two recognized sections of *Ichnanthus* were published by Stieber (1982 & 1987). The most diagnostic feature of the genus is the presence at the base of the upper floret of a prolonged rachilla with obvious appendages or sclerified tissue. Shaw and Webster (1983) provided a comparative study of the upper floret for the species of *Ichnanthus.* Lazarides and Webster (1984) proposed a new genus, *Yakirra* Lazarides & R. Webster, for the Australian C − 4 species previously placed in *Ichnanthus.*

Previous authors (including Webster) have referred to the stipitate prolongation at the base of the upper floret as a rachilla, which is by definition, the axis of the spikelet. The term, rachilla, has probably, if not certainly, been misapplied in *Ichnanthus.* The prolongation may represent what Webster (1988) refers to as a callus, that is any modification on the disseminule at the point of disarticulation. This consideration is supported by two observations. First, in the Paniceae when there is a secondary point of disarticulation above the spikelet base, it is never at the base of a rachilla internode but always at the apex of a rachilla internode. It is not uncommon in the Paniceae to find a secondary point of disarticulation at the base of the upper floret. Second, the membranous appendages characteristic of this genus are continuously attached to the prolongation and upper lemma, suggesting that they are a part of the same structure. This concept is important to the systematics of the Paniceae because the prolongation in *Homolepis, Yakirra, Ichnanthus*, and *Phanopyrum* may not be analagous to the prolongation in *Isachne* or *Arthragrostis* Lazarides.

ISACHNE R. Br., Prodr. Fl. Nov. Holl. 196. 1810. TYPE SPECIES: *I. australis* R. Br.

Plants annual or perennial. Internodes hollow; neither viscid nor glaucous. Ligule a fringe of hairs or absent. Inflorescence a panicle. Main axis straight; with quaquaversal primary branches. Primary branches spreading; *with spreading secondary branches*; with spikelets neither secund nor distichous (or not obviously secund or distichuous). Rachis terminating in a spikelet. Pedicels present; perpendicular with the spikelet base. Disarticulation above the lower glume. Callus not differentiated. Cleistogamous inflorescence absent. Spikelets solitary; abaxial; dorsiventrally compressed. First glume not fused with the callus; present; 0.8 times spikelet length; not encircling the spikelet base; muticous. Rachilla pronounced below the second glume; *pronounced between the florets; lacking lateral appendages*. Second glume present; 0.7 – 0.95 times spikelet length; neither saccate nor gibbose; 5, 7, or 9-nerved; indumentum not uncinate. Lemma of lower floret cartilaginous (membranous to chartaceous in *I. polygonoides*); consistent in texture; lacking a central longitudinal groove; rounded; muticous. Palea of lower floret with nerves pronounced but not winged. Upper floret 0.7 – 1 times the length of the lower floret. Lemma of upper floret cartilaginous; smooth or striate; dull; *with involute margins*; with margins of the same texture as the body; without basal modifications; not differentiated at the apex. Stamens 3. C – 3. XyMs + . Base chromosome number, x = 10.

Remarks: *Isachne* is commonly placed in the Isachinae Benth., a tribe of five genera characterized by the number of fertile florets (2), method of disarticulation, and certain unique anatomical characters; however, it is occasionally included in the Paniceae subtribe Isachninae Stapf. About 100 species are currently recognized in *Isachne*; most occur in the Old World tropics, a few occur in South America, and seven species (Hitchcock 1920) in Mesoamerica.

Diagnostic features of *Isachne* include the non-indurate texture of the upper floret, spreading secondary inflorescence branches, presence of two morphologically similar florets (except in *I. polygonoides* (Lam.) Doell), and disarticulation above the glumes. Presence of two homomorphic fertile florets is characteristic of *Dissochondrus* (Hillebr.) Kuntze, a monotypic genus endemic to Hawaii. However, this genus has bristles subtending the spikelets and a rugose upper floret, and is obviously closely related to *Setaria*. Perhaps the most significant characteristic of *Isachne* is the method of disarticulation and morphology of the pedicel apex. The glumes are separated by a well-developed rachilla and the primary point of disarticulation is at the base of the florets. The glumes fall off later, but the associated internode is persistent on the pedicel apex. In other members of the Paniceae with a rachilla pronounced between the glumes, the rachilla is not persistent on the pedicel. Therefore, in *Isachne* the pedicel apex is not truncate, discoid, cupuliform, or otherwise differentiated as in other members of the Paniceae.

Additional significant characteristics of *Isachne* expressed in some or all of the species include the presence of a pronounced filiform rachilla between the florets, a hairy upper floret, and distichous leaves. As previously stated, the florets are morphologically similar; however, the upper floret is usually slightly smaller. A final interesting feature of *Isachne* is the relatively small spikelet size, with the average length being ca. 1.9 mm with a maximum of ca. 2.5 mm. This is relatively small for such a numerically large tropical genus.

IXOPHORUS Schlecht., Linnaea 31:420. 1861. TYPE SPECIES: *I. unisetus* (Presl) Schlecht.

Plants perennial. Internodes solid; neither viscid nor glaucous. Ligule a membrane. Inflorescence a panicle. Main axis straight; with quaquaversal primary branches. Primary branches spreading; with appressed secondary branches; with secund spikelets. Rachis terminating in a bristle. Bristles not distinctly flattened; smooth (and viscid). Pedicels present; discoid; perpendicular with the spikelet base; concave. Disarticulation at the spikelet base. Callus not differentiated. Cleistogamous inflorescence absent. Spikelets solitary; abaxial; dorsiventrally compressed. First glume not fused with the callus; present; 0.22 – 0.32 times spikelet length; not encircling the spikelet base; muticous. Rachilla not pronounced below the second glume; not pronounced between the florets. Second glume present; 1 times spikelet length; neither saccate nor gibbose; 9 or 11-nerved; indumentum not uncinate. Lemma of lower floret membranous; consistent in texture; lacking a central longitudinal groove; acuminate to acute; muticous. *Palea of lower floret with nerves pronounced into obvious wings*. Upper floret 0.7 – 0.76 times the length of the lower floret. Lemma of upper floret cartilaginous; faintly rugose; dull; with involute margins; with margins of the same texture as the body; without basal modifications; not differentiated at the apex. Stamens 3. C – 4. XyMs-.

Remarks: *Ixophorus* is monotypic and occurs in Mexico, Central America, and the Caribbean. Presence of bristles, disarticulation at the base of the spikelet, and a rugose upper floret indicate that *Ixophorus* is closely allied to *Setaria*. The primary inflorescence branches of *Ixophorus* are simple with solitary spikelets subtended by a single purple bristle. The bristle of this genus is unique within the Paniceae in being smooth and viscid, whereas other bristle-bearing genera have scabrous or hairy bristles that are not viscid. The bristle of *Ixophorus* is morphologically similar to the awn of the first glume in *Oplismenus*. At maturity the lower palea is distinctly winged on the nerves. Another unique and interesting characteristic of this genus is the presence of a small flange of tissue at the base of the second glume.

MESOSETUM Steud., Syn. Pl. Glum. 1:118. 1854. TYPE SPECIES: *M. cayennense* Steud.

Panicum sect. *Bifaria* Hack., Oest. Bot. Zeitschr. 47:75. 1897.—*Bifaria* (Hack.) Kuntze, Rev. Gen. Pl. 3:359. 1898. TYPE SPECIES: *P. bifarium* Hack.

Peniculus Swallen, Amer. J. Bot. 19:581. 1932. TYPE SPECIES: *P. angustifolius* Swallen.

Plants annual or perennial. Internodes hollow; neither viscid nor glaucous. Ligule a fringe of hairs. *Inflorescence a raceme.* Main axis straight or wavy; with secund primary branches. Rachis terminating in a spikelet. Pedicels present; oblique to the spikelet base; concave. Disarticulation at the spikelet base. Callus differentiated or not differentiated; prolonged into a pronounced stipe; not flared to form a discoid receptacle. Cleistogamous inflorescence absent. Spikelets solitary; adaxial; laterally compressed to dorsiventrally compressed. First glume not fused with the callus; present; 0.6 – 1.3 times spikelet length; not encircling the spikelet base; muticous or awned. Rachilla pronounced or not pronounced below the second glume; not pronounced between the florets. Second glume present; 0.7 – 1 times spikelet length; neither saccate nor gibbose; 3 or 5-nerved; indumentum not uncinate. Lemma of lower floret membranous; *with the area between the central nerve and the first lateral nerve thinner in texture than the rest of the structure; lacking a central longitudinal groove;* acuminate to rounded; muticous or apiculate. Palea of lower floret with nerves pronounced but not winged. Upper floret 0.8 – 1 times the length of the lower floret. Lemma of upper floret chartaceous to cartilaginous; smooth or striate; shiny or dull; with flat margins; with margins of the same texture as the body; without basal modifications; not differentiated at the apex. Stamens 3. C – 4. XyMs-. Base chromosome number, x = 8.

Remarks: *Mesosetum* was revised by Swallen (1937) who recognized 33 species and grouped these into 6 sections. Most species are native to South America but a few extend into Central America, Mexico, and the Caribbean. The most striking feature of this genus is the strictly racemose inflorescence with very short appressed pedicels. The lowermost inflorescence node is not differentiated as it is in *Thrasya,* which has the same inflorescence form. Additional significant characteristics of *Mesosetum* include oblique pedicel apices, a relatively long second glume, the hyaline central area of the lower lemma, and presence of a pronounced callus in some taxa (e.g., *M. compressum* Swallen). In many taxa, the first glume is differentiated from the second glume in color, shape, vestiture, and texture.

PARATHERIA Griseb., Cat. Pl. Cub. 236. 1866. TYPE SPECIES: *P. prostrata* Griseb.

Plants annual (but persisting for more than one year). Internodes hollow; neither viscid nor glaucous. Ligule a ciliate membrane (the membranous part only about 0.2 mm long). Inflorescence a panicle. Main axis straight; with quaquaversal primary branches (possibly distichous but difficult to determine). Primary branches appressed to the main axis; with appressed secondary branches. Rachis terminating in a bristle. Bristles not distinctly flattened; antrorsely scabrous. Pedicels present; perpendicular with the spikelet base. Disarticulation at the base of the primary branches. Callus differentiated; prolonged into a pronounced stipe (ca 3 mm long); not flared to form a discoid receptacle. Cleistogamous inflorescence present. Spikelets solitary; with lateral orientation or abaxial; dorsiventrally compressed. First glume not fused with the callus; present; 0.05 – 0.07 times spikelet length; not encircling the spikelet base; muticous. Rachilla not pronounced below the second glume; not pronounced between the florets. Second glume present; *0.05 – 0.07 times spikelet length*; neither saccate nor gibbose; nerveless; indumentum not uncinate. Lemma of lower floret membranous; consistent in texture; lacking a central longitudinal groove; acuminate; mucronate. Palea of lower floret with nerves pronounced but not winged. Upper floret 1 times the length of the lower floret. Lemma of upper floret chartaceous; smooth; shiny; with flat margins; with margins thinner in texture than the body; without basal modifications; not differentiated at the apex. Stamens 3. C – 4. XyMs-.

Remarks: *Paratheria* consists of two species which inhabit wet tropical areas. *Paratheria prostrata* occurs in West Africa and Central and South America, whereas *P. glaberrima* C. E. Hubb. is restricted to Sierra Leone. Primary branches of the inflorescence in *Paratheria* are reduced to a single spikelet subtended by a pronounced bristle. Disarticulation is at the base of the primary branch, which has a pronounced callus. The callus is prolonged and oblique to the main axis. These unusual characteristics are identical to those found in the monotypic Australian genus, *Chamaeraphis* R. Br. The second glume is reduced to a small, hyaline, and nerveless scale less than 0.1 times spikelet length. An inflorescence consisting of a solitary cleistogamous spikelet is occasionally present in the lower leaf sheaths. The cleistogamous spikelets are morphologically similar to the chasmogamous spikelets. Additional interesting features include flat hyaline margins on the upper lemma and presence of a ring of hairs on the pedicel apex and spikelet base.

PSEUDECHINOLAENA Stapf, Fl. Trop. Afr. 9:494. 1919. TYPE SPECIES: *P. polystachya* (Kunth) Stapf.

Perulifera A. Camus, Bull. Soc. Bot. France 74:889. 1928. Type species: *P. madagascariensis* A. Camus.

Plants annual. Internodes solid; neither viscid nor glaucous. Ligule a membrane. Inflorescence a panicle. Main axis straight; with distichous primary branches. Primary branches spreading; with appressed or spreading secondary branches; with distichous spikelets. Rachis terminating in a spikelet. Pedicels present; truncate or discoid (not easily determined); perpendicular with the spikelet base; concave. Disarticulation above the lower glume or at the spikelet base. Callus not differentiated. Cleistogamous inflorescence absent. Spikelets solitary or paired (the lower spikelet commonly reduced); adaxial or abaxial (depending on the development of the lower spikelet); laterally compressed. First glume not fused with the callus; present; 0.9 – 1.1 times spikelet length; encircling the spikelet base; muticous, mucronate, or awned. Rachilla not pronounced below the second glume (or minute); pronounced between the florets (minute and positioned on the adaxial side of the spikelet); lacking lateral appendages. Second glume present; 0.95 – 1 times spikelet length; gibbose; 7-nerved; *indumentum uncinate*. Lemma of lower floret chartaceous; with a hyaline area at the base; lacking a central longitudinal groove; acute; muticous. Palea of lower floret with nerves not pronounced. Upper floret 0.65 – 0.75 times the length of the lower floret. Lemma of upper floret cartilaginous; smooth; shiny; with flat margins; with margins of the same texture as the body; without basal modifications; not differentiated at the apex. Stamens 3. C – 4. XyMs-.

Remarks: Bosser (1975) revised *Pseudechinolaena* and recognized six species, 5 restricted to Madagascar and one, *P. polystachya* (Kunth) Stapf, occurring in tropical America, Africa, and Asia. The vegetative features of this genus are similar to those of *Oplismenus*, with trailing culms and lanceolate to ovate leaves. The spikelets are usually paired but the lower spikelet is commonly reduced. The first glume is relatively long and smooth to scabrous or rarely with strigose hairs. The second glume is distinctly gibbose with well-developed setaceous uncinate hairs which are best expressed at maturity. Uncinate spikelet hairs also occur in *Ancistrachne* S.T. Blake, a genus of 4 species native to Asia and Australia. These genera, *Ancistrachne* and *Pseudechinolaena*, also have obliquely attached spikelets, but are otherwise morphologically dissimilar and unrelated.

The most distinctive structure of *Pseudechinolaena* is the lower lemma. Important characteristics are a relatively dense texture, papillate surface ornamentation, presence of a distinct hyaline area at the base, light-colored margins, and an apex differentiated in texture and color. The upper floret is similar to that found in *Oplismenus* in being relatively small and shiny, with a minute flat rachilla; however, the upper floret is slightly, obliquely attached with flat overlapping margins as in *Digitaria*. Interesting features of Madagascar species include the presence of an awned first glume in *P.*

madagascariensis (A. Camus) Bosser and a winged second glume in *P. camusiana* Bosser. The closest relative of *Pseudechinolaena* is probably either *Alloteropsis* or *Oplismenus*.

REYNAUDIA Kunth, Rév. Gram. 1:195. 1830. TYPE SPECIES: *R. filiformis* (Schult.) Kunth.

Plants perennial. Internodes solid; neither viscid nor glaucous. Ligule a fringe of hairs. Inflorescence a panicle. Main axis straight; with quaquaversal primary branches. Primary branches appressed to the main axis or spreading; with appressed or with spreading secondary branches; with secund spikelets (but not obvious). Rachis terminating in a spikelet. Pedicels present; discoid; perpendicular or oblique to the spikelet base (on the terminal spikelets); concave to flat. Disarticulation at the spikelet base. Callus not differentiated. Cleistogamous inflorescence absent. Spikelets solitary; adaxial; laterally compressed. First glume not fused with the callus; present; 0.68 − 0.8 times spikelet length; not encircling the spikelet base; *awned* (from between the lobes). Rachilla not pronounced below the second glume; not pronounced between the florets. Second glume present; 1 times spikelet length; neither saccate nor gibbose; 5 or 7-nerved; indumentum not uncinate. Lemma of lower floret hyaline to membranous; consistent in texture; lacking a central longitudinal groove; emarginate to bifid (the lobes ca 0.3 mm long, acute); mucronate to awned. Palea of lower floret with nerves pronounced but not winged. Upper floret 0.9 times the length of the lower floret. Lemma of upper floret hyaline; smooth; dull; with flat margins; with margins of the same texture as the body; without basal modifications; not differentiated at the apex. *Stamens* 2. C − 4. XyMs-.

Remarks: *Reynaudia* is monotypic, occurs in the West Indies, and probably closely related to *Melinis* and *Rhynchelytrum*. Few collections are available, and it is assumed to be relatively rare. Significant characteristics include lateral compression of the spikelets, awned and bifid glumes and lower lemma, upper lemma thinner in texture than the glumes, and absence of a well-developed upper palea. In addition, the terminal spikelet of a group is obliquely attached to the pedicel. A very interesting feature of this genus is the presence of a purple ring of tissue (most obvious at maturity) on the adaxial surface of the pedicel and surrounding the rachis immediately below the attachment of the pedicel. It seems possible that these areas are responsible for secreting a chemical which either attracts or repels insects, thereby protecting the spikelets or assisting in dispersal.

SCUTACHNE A. Hitchc. & Chase, Proc. Biol. Soc. Wash. 24:148. 1911. TYPE SPECIES: *S. dura* (Griseb.) A. Hitchc. & Chase.

Plants perennial. Internodes hollow; neither viscid nor glaucous. *Ligule a fringe of hairs*. Inflorescence a panicle. Main axis straight; with quaquaversal primary branches. Primary branches appressed to the main axis or spreading; with appressed or spreading secondary branches; *with secund spikelets. Rachis terminating in a spikelet*. Pedicels present; discoid; perpendicular with the spikelet base; concave. Disarticulation at the spikelet base. Callus not differentiated. Cleistogamous inflorescence absent. Spikelets paired; adaxial; laterally to dorsiventrally compressed. First glume not fused with the callus; present; 0.5 – 0.7 times spikelet length; encircling the spikelet base; *muticous*. Rachilla pronounced below the second glume; not pronounced between the florets. Second glume present; 0.8 – 0.9 times spikelet length; neither saccate nor gibbose; 5 or 7-nerved; indumentum not uncinate. Lemma of lower floret membranous to chartaceous; consistent in texture; lacking a central longitudinal groove; acuminate (conduplicate); muticous. Palea of lower floret with nerves pronounced but not winged (slightly thickened). Upper floret 0.95 – 1 times the length of the lower floret. Lemma of upper floret cartilaginous; smooth or rugose; dull; *with flat margins* (somewhat involute in *S. dura*); with margins of the same texture as the body; without basal modifications; not differentiated at the apex. Stamens 3. C-4. XyMs+.

Remarks: Chase (1911) distinguished *Scutachne* from related genera based on the relatively coarse-textured second glume and lower lemma, subindurate upper floret, flat margins of the upper lemma, and the apex of the upper palea not enclosed by the upper lemma. The two recognized species, *S. dura* (Griesb.) A. Hitchc. & Chase and *S. amphistemon* (Wright) A. Hitchc. & Chase, were placed in *Alloteropsis* by Hitchcock (1909). *Scutachne* appears to be closely related to *Urochloa* (sensu Webster 1987 & 1988). Clayton and Renvoize (1986) used the non-racemose primary inflorescence branches to distinguish *Scutachne* from *Brachiaria* and *Urochloa*; however, this character has limited value when the variation in *Pseudobrachiaria* Launert, a synonym of *Urochloa*, is considered.

There are a number of important characteristics which serve to distinguish *Scutachne* from related genera; however, some of these are not well-expressed in some specimens. The lower part of the first glume is noticeably fused and the rachilla between the glumes is frequently pronounced, but these features are also found in some species of *Urochloa*. The second glume and lower lemma are relatively coarse textured, but it would be difficult to use this as a primary character for distinguishing the genera. The most important aspect of the second glume and lower lemma is the acuminate and conduplicate apices. In addition, these structures are slightly, laterally compressed. The upper lemma of *S. dura* is rugose, as expected for a C − 4 PcK genus; however, in *S. amphisetemon* it is smooth. The upper floret is relatively thin in texture with flat margins, but the latter feature is not clearly expressed in some specimens of *S. dura*. Finally, the palea apex of the upper floret is not enclosed by the upper lemma.

The range of variation at species level is not well-understood. One form of *S. dura* has linear leaf blades, spreading primary inflorescence branches, and spreading secondary branches. In another form, the leaf blades are narrow to filiform, the primary branches are reduced and appressed to the main axis, and the secondary branches are also appressed. Additional studies may show that this form is worthy of formal recognition at species level. *Scutachne amphistemon* is obviously distinct from *S. dura*; however, more collections are needed to determine the full range of variation for these species.

SETARIOPSIS Scribn. & Millsp., Publ. Field Mus. Bot. Ser. 1:288. 1896.
TYPE SPECIES: *S. latiglumis* (Vasey) Scribn. & Millsp.

Plants annual. Internodes hollow; neither viscid nor glaucous. Ligule a ciliate membrane. Inflorescence a panicle. Main axis straight; with quaquaversal primary branches. Primary branches appressed to the main axis; with appressed secondary branches; with secund spikelets. *Rachis terminating in a bristle.* Bristles not distinctly flattened; antrorsely scabrous. Pedicels present; discoid; perpendicular with the spikelet base; concave. Disarticulation at the spikelet base. Callus not differentiated (but with a minute fused part at the base of the first glume). Cleistogamous inflorescence absent. Spikelets solitary; abaxial; dorsiventrally compressed. First glume not fused with the callus; present; 0.3 − 0.4 times spikelet length; encircling the spikelet base; muticous. Rachilla not pronounced below the second glume; not pronounced between the florets. Second glume present; 0.85 − 1 times spikelet length; neither saccate nor gibbose; *13 − 23-nerved*; indumentum not uncinate. Lemma of lower floret membranous to chartaceous, or cartilaginous (at the basal margins); with a hyaline area at the base (developing at maturity); lacking a central longitudinal groove; acute; muticous. Palea of lower floret with nerves pronounced but not winged. Upper floret 0.65 − 0.85 times the length of the lower floret. Lemma of upper floret indurate; rugose; dull; with involute margins; with margins of the same texture as the body; without basal modifications; not differentiated at the apex. Stamens 3. C − 4. XyMs-.

Remarks: *Setariopsis* consists of two species which occur in Mexico and may extend south to Colombia. The two species, *S. latiglumis* (Vasey)

Scribn. & Millsp. and *S. auriculata* (Fourn.) Scribn. & Millsp., are easily distinguished on vegetative and spikelet characteristics. The presence of bristles, disarticulation at the base of the spikelet, rugose upper floret, and quaquaversal primary inflorescence branches ally *Setariopsis* with *Setaria*. *Setariopsis* has unique modifications of the glumes and lower lemma which serve to distinguish it from *Setaria*. The first glume is many nerved with the apex transversely involute, and the whole structure is reflexed at maturity. The second glume is relatively dense in texture, many nerved, and the outer portion becomes expanded and flared at maturity. In addition, the margins are swollen and apparently glandular. The lower lemma has a hyaline area at the base similar to that found in *Alloteropsis*. In addition, the lower lemma has a central groove, swollen dense-textured areas at the base, and is fused to the vestigial lower palea. All the previous characteristics are pronounced in *S. latiglumis*, whereas *S. auriculata* is intermediate with *Setaria*.

TRISCENIA Griseb., Mem. Amer. Acad. Art. ser. 2(8):534. 1863. TYPE SPECIES: *T. ovina* Griseb.

Plants perennial. Internodes neither viscid nor glaucous. Ligule a fringe of hairs. Inflorescence a panicle. Main axis straight; with distichous primary branches. Primary branches appressed to the main axis or spreading; *with appressed secondary branches*; with spikelets neither secund nor distichous. Rachis terminating in a spikelet. Pedicels present; truncate; perpendicular with the spikelet base; concave. Disarticulation at the spikelet base. Callus not differentiated. Cleistogamous inflorescence absent. Spikelets solitary or paired; adaxial; dorsiventrally compressed. First glume not fused with the callus; present; 0.4 – 0.5 times spikelet length; encircling the spikelet base; *muticous*. Rachilla not pronounced below the second glume; not pronounced between the florets. Second glume present; 1.1 times spikelet length; neither saccate nor gibbose; 3 or 5-nerved; indumentum not uncinate. Lemma of lower floret membranous; consistent in texture; lacking a central longitudinal groove; acuminate; muticous. Palea of lower floret with nerves pronounced but not winged. *Upper floret 0.68 – 0.72 times the length of the lower floret*. Lemma of upper floret *hyaline to membranous*; smooth; dull; with flat margins; with margins of the same texture as the body; without basal modifications; not differentiated at the apex. Stamens 3. C – 3. XyMs + .

Remarks: *Triscenia* is a monotypic genus occurring in mountainous and riparian areas of Cuba. General form of the culm and inflorescence is unusual. The internodes are compacted and not elongate, therefore the leaves originate from the base of the plant and the peduncle at ground level. The peduncle and main axis are relatively long, flexuous, and with few widely spaced distichous primary branches. The leaves are unusual in that the sheaths are relatively short and flared, whereas the blades are filiform and conduplicate. Important characteristics of the spikelet include absence of the lower palea, hyaline to membranous texture of the upper floret, and the flat margins of the upper lemma. These characteristics indicated that *Triscenia* is closely allied with *Reynaudia, Rhynchelythrum* and *Hymenachne.*

THRASYA Kunth, Nov. Gen. Sp. 1:120. 1816. TYPE SPECIES: *T. paspaloides* Kunth.

Tylothrasya Doell in Mart., Fl. Bras. 2:295. 1877. TYPE SPECIES: *T. petrosa* (Trin.) Doell.

Plants perennial. Internodes hollow; neither viscid nor glaucous. Ligule a membrane. Inflorescence a panicle or a raceme. Main axis straight; with secund primary branches. Primary branches appressed to the main axis; with appressed secondary branches; with secund spikelets. Rachis terminating in a spikelet, or in an unmodified naked point. Pedicels present; discoid; perpendicular with the spikelet base; flat or convex. Disarticulation at the spikelet base. Callus differentiated or not differentiated; prolonged or not prolonged into a stipe; not flared to form a discoid receptacle. Cleistogamous inflorescence absent. Spikelets solitary or paired; adaxial; dorsiventrally compressed to planoconvex. First glume fused with the callus to form a cuplike structure or not fused with the callus; present or absent; 0.05 – 0.7 times spikelet length; not encircling the spikelet base; muticous. Rachilla not pronounced below the second glume; not pronounced between the florets (slightly developed in some species, 0.1 – 0.2 mm long). Second glume present; 0.7 – 1.2 times spikelet length; neither saccate nor gibbose; 3, 5, or 7-nerved (the midnerve occasionally absent); indumentum not uncinate. Lemma of lower floret membranous; with a hyaline area at the base or with the area between the central nerve and the first lateral nerve thinner in texture than the rest of the structure; *with a central longitudinal groove*; acuminate to acute; muticous. Palea of lower floret with nerves pronounced but not winged. Upper floret 0.9 – 1 times the length of the lower floret. Lemma of upper floret cartilaginous; striate or muricate; dull; with involute margins; with margins of the same texture as the body; without basal modifications; differentiated (hairy in some species) or not differentiated at the apex. Stamens 3. C – 4. XyMs-. Base chromosome number, $x = 10$.

Remarks: *Thrasya* is a New World genus comprising about 20 species occurring from Mexico to South America. The unusual convex pedicel apex characteristic of *Paspalum* is clearly expressed in *Thrasya*. In addition, the winged rachis extends beyond the terminal spikelet in some taxa of both genera. *Paspalum* and *Thrasya* are clearly, closely related but differ in many significant characteristics. *Thrasyopsis* Parodi, a South American genus of two species, differs from *Thrasya* only in the number of nerves on the second glume, and the distinction between these genera is rather arbitrary. Important morphological features expressed in *Thrasya* are discussed in the following paragraphs.

The inflorescence is reduced to a single racemose, winged branch. As a result, the inflorescence main axis is winged with secund spikelets. In some taxa, the wing is pronounced and tends to close around the spikelets, which occur on short pedicels. In most species, the base of the main axis is differentiated by the presence of hairs and/or bracts. These bracts may be only 0.3 mm long and probably represent remnants of reduced inflorescence branches. Arrangement of the spikelets on the rachis is unusual in *Thrasya*. For a few species (e.g., *T. cultrata* Nees), the spikelets are obviously paired and occur in long-short pedicel combinations, and the pairs alternate on one side of the rachis. In most species, the spikelets appear solitary, form a single row on one side of the rachis, and appear to alternate between abaxial and adaxial orientation. Various authors have used this feature as a key diagnostic character for *Thrasya*. Our observations of the species appearing to possess solitary spikelets, have shown that the spikelets are actually paired, the pedicels are fused to the rachis midrib, and the spikelet pairs alternate on one side of the rachis. Therefore, the spikelets do not alternate between adaxial and abaxial orientation.

A callus at the spikelet base occurs in *Thrasya*, but is poorly developed in most species. It is well-developed in *T. petrosa* (Trin.) Chase where it is about 0.9 mm long, white, glabrous, and bulbose. In some specimens the callus is similar to that found in *Eriochloa*. The first glume of *Thrasya* is present or absent. In *T. cultrata*, the first glume of the lower subsessile spikelet is lanceolate and about 3 mm long, whereas on the pedicellate spikelet it is ovate, rounded at the apex, and about 0.8 mm long. Therefore spikelet heteromorphism, a rare characteristic in the Paniceae, occurs in this genus. Morphology of the lower floret is taxonomically significant in *Thrasya*. The lower lemma is relatively dense in texture and has a central longitudinal groove, and this central area is hyaline or relatively thin in texture. At maturity, the lower lemma splits along the central groove. Presence of a centrally grooved lower lemma associated with reduced texture occurs elsewhere in the Paniceae and is correlated with the presence of well-developed stamens in the lower floret. Such well developed stamens are characteristic of *Thrasya*. The palea of the lower floret is hyaline in the central area but has indurate, pronounced marginal nerves.

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NOTEWORTHY DICOTS OF MOBILE AND BALDWIN COUNTIES, ALABAMA.

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ABSTRACT

An annotated list of 70 noteworthy dicots of Mobile and Baldwin counties, Alabama is presented. Fifty-four taxa are thought to represent new county records and the following three species may represent first reports for the state: *Crotalaria pallida, Indigofera hirsuta,* and *Mikania cordifolia.*

Noteworthy collections of vascular plants have recently been made in Mobile and Baldwin counties. Kral (1973, 1976, 1981) reported over 40 new or noteworthy taxa from these two counties. Lelong (1977) reported some 100 noteworthy species or varieties occurring in west Mobile and (Lelong 1987) 44 additional noteworthy monocots of Mobile and Baldwin counties. It seems appropriate at this time to report recent collections of noteworthy dicots of the Mobile region.

The taxa in the following list are arranged alphabetically by genus with mention of synonyms used by Mohr (1901) indicated by "M," and those used by Small (1933) indicated by "S" when appropriate. Frequent references are made to the major works of Mohr (1901) and of Small (1933); therefore mention of the dates in parenthesis after those two authors is omitted in the rest of this paper. Specimens of reported plants are at USAM; when available, duplicates were sent or will be sent to the herbaria of VDB and NCU. The names of 54 species thought to represent first county records are preceded by an asterisk. The names of the three species which may represent first reports for Alabama are preceded by two asterisks.

*ACANTHOSPERMUM AUSTRALE (Loefl.) Kuntze. ASTERACEAE.— **Baldwin Co.**: open sandy area in front of Pirate's Cove Marina; mouth of Roberts Bayou along N shore of Arnica Bay, 15 Sep 1980, *Lelong 11513.* **Mobile Co.**: open waste place along foot path between Westfield Ave. and Shenandoah Road, ca 200 yards N of intersection of Westfield Ave. and Bit & Spur Terr., west Mobile, 29 Jul 1974, *Lelong 8067*; open sandy roadside along Ziegler Blvd. near its eastern end at Springhill Ave. E boundary of Mobile municipal park, 29 Jul 1979, *Lelong 10896.*

SIDA 13(2):223–240. 1988.

Although Mohr reported this tropical American plant as a frequent ballast weed in Mobile County before the turn of the century, it seems to be uncommon enough at present in south Alabama to deserve mention.

*ALCHEMILLA MICROCARPA Boiss. & Reut. (*Aphanes australis* Rydb.—S). ROSACEAE.—**Mobile Co.**: open grassy median along Airport Blvd., ca one block E of Sage Ave. intersection, west Mobile, 11 Mar 1982, *Lelong 12487*.

The range of this diminutive European weed was said by Small to extend from Georgia to Tennessee and Washington, D.C. Radford et al. (1968) reported its occurrence throughout the Carolinas, especially in the Piedmont and in five other southeastern States including Alabama. It is apparently uncommon in south Alabama.

ALTERNANTHERA POLYGONOIDES (L.) R. Br. (*Achyranthes repens* L.—S). AMARANTHACEAE.—**Mobile Co.**: weed in shady lawn on W side of Basic Medical Sciences Bldg., University of South Alabama campus, 16 Apr 1975, *Lelong 8328*.

Mohr noted that this tropical American weed was adventive on ballast in Mobile County from 1886 to 1895. Small stated that it occurred generally from Florida to Texas and South Carolina in the Southeast.

*ALYSICARPUS OVALIFOLIUS (Schum. & Thonn.) J. Leonard. FABACEAE.—**Baldwin Co.**: open grassy roadside along State Hwy 225, ca 2.5 miles N of its junction with U.S. Hwy 90, 23 Oct 1973, *Lelong 7391*. **Mobile Co.**: open sandy roadside SE of east Lake, Langan municipal park, west Mobile, 29 Oct 1980, *Lelong 11799*.

Kral (1973) reported this species as new to Alabama on the basis of a 1969 collection from Baldwin County, noting that there are published reports of it from Florida to Louisiana. As noted by Wunderlin, Hansen and Hall (1985), this is the correct name for this plant, replacing *A. vaginalis* (L.) DC. which has been misapplied.

*AMARANTHUS LIVIDUS L. AMARANTHACEAE.—**Mobile Co.**: weed in shaded lawn along W side of Basic Medical Sciences Bldg., University of South Alabama campus, 4 Sep 1975, *Lelong 8678*.

Neither Mohr nor Small list this species in their books. Radford et al. (1968) noted its occurrence in Beaufort and Durham cos., North Carolina. Recently, Anderson (1986) reported this species as new to the Florida panhandle.

ARTEMISIA VULGARIS L. ASTERACEAE.—**Mobile Co.**: roadside ditch along McGregor Ave., one block N of its intersection with Old Shell Road, west Mobile, 14 Apr 1976, *Lelong 9088*; moist, open roadside along road to Louisiana Land and Development Company, ca 200 yards E of A.T. & N. RR tracks and State Hwy 43 intersection, Saraland, 11 Aug 1978, *Lelong 10434*.

This european species was reported by Mohr as fugitive on ballast in Mobile County in July 1894 and 1895. Small indicated its presence in various provinces from Georgia to Alabama. It seems to be spreading in the Mobile region, forming extensive colonies in recently cleared areas.

*ASTER PRAEALTUS Poir. (*A. salicifolius* Lam. var. *subasper* (Lindl.) Gray—M,S). ASTERACEAE.—**Baldwin Co.**: roadside ditch along Ct Rd 64, 4.2 mi S of its junction with State Hwy 112, possibly escaped from cultivation, 16 Oct 1976, *Lelong 9623*.

Mohr reported this plant as infrequent in the Mountain region and Coast Plain of Alabama, mentioning a collection from Mobile County. Small gave its distribution in the Southeast as extending from Mississippi to Texas. Cronquist (1980) indicated its occurrence in Texas, Kentucky, northern Georgia, and Louisiana, noting that it was possibly disjunct in the Florida panhandle.

*BACOPA CAROLINIANA (Walt.) Robins. SCROPHULARIACEAE. —**Baldwin Co.**: extensive submerged colony in stagnant pond-like meander of Barner Branch, ca 500 ft E of its confluence with Fish River, 27 Jun 1980, *Lelong, Dowling & Powers 11220*.

Mohr stated that this species was rare in the Central prairie region, mentioning a collection from Eufaula in Barbour County. Small indicated its distribution as extending generally from south Florida to east Texas and Virginia. It seems to be uncommon in extreme south Alabama, possibly due to lack of suitable calcareous sites.

*BOWLESIA INCANA Ruiz & Pavon. APIACEAE. —**Mobile Co.**: shady woodland along stream NE of Brookley Center of University of South Alabama, W of Old Bay Front Road, 10 Apr 1974, *Lelong 7568*; open, grassy roadside along Springhill Ave. at intersection with Lafayette Str., Mobile, 6 Mar 1976, *Lelong 8982*.

Although Small indicated that the distribution of this species extends from Louisiana to California, the first verifiable Louisiana collection seems to be *Kral 8226*, 5 Mar 1959, Monroe (Thomas 1967).

*CALLITRICHE DEFLEXA A. Braun (*C. austinii* Engelm. in Gray—M,S). CALLITRICHACEAE. —**Mobile Co.**: moist grassy playing field NE of intersection between Old Shell Road and Circle Road, west Mobile, 19 Mar 1976, *Lelong 9001*. Mohr reported this species as rare in Franklin and Lee counties. Small noted that it occurred generally in various provinces from Alabama to Texas but rarely on the Coastal Plain.

CARDAMINE DEBILIS D. Don. BRASSICACEAE. —**Mobile Co.**: weed in flower bed along N side of Student Union Bldg., University of South Alabama campus, west Mobile, 16 Oct 1975, *Lelong 8847*.

Small reported this plant only for Florida. Kral (pers. comm.) collected it also along the Causeway between Mobile and Baldwin counties.

*CARDIOSPERMUM HALICACABUM L. SAPINDACEAE. —**Mobile Co.**: Among rocks and debris along seawalk bordering Mobile Bay at Battleship Park, S of U.S. Hwy 90 (Causeway), 22 Sep 1973, *Lelong 7303*.

Mohr noted that this tropical American vine had escaped from cultivation in the northern part of Alabama and in the Central Pine Belt. It is fairly uncommon in the southern part of the state, becoming more common northward especially in marshy river floodplains.

*CHENOPODIUM PUMILIO R. Br. CHENOPODIACEAE. —**Mobile Co.**: weed along path at Patterson lumber yard, E of intersection of Dauphin Str. and G.M. & O. RR tracks, west Mobile, 10 Sep 1970, *Lelong 5602*. Kral noted on the label that one of the specimen on the sheet exhibited a peculiar blend of morphological traits of *C. pumilio* and of the common *C. ambrosioides*.

This relatively recent introduction from Australia was not listed by Mohr or by Small. Correll and Johnston (1970) include it in their Texas flora and note its occurrence in California, Massachusetts, New York, Missouri, New Jersey, and D.C. Rogers (1977) reports it in south Mississippi.

*CORCHORUS HIRTUS L. (*C. orinocensis* H.B.K.—S). TILIACEAE. —**Baldwin Co.**: weed along logging trail along W bank of Mobile River, ca 0.5 mi S of confluence of Alabama and Tombigbee Rivers, 25 Oct 1980, *Lelong 11777*. **Mobile Co.**: recently cleared area along Three-Mile Creek, NE of University of South Alabama, west Mobile, 5 Nov 1980, *Lelong 11845*.

Mohr indicated that this tropical American species was not rare from the Central Pine belt to the Coast Plain and Small reported it as occurring generally from Florida to Texas and Arizona. However, it seems to be relatively uncommon at present in south Alabama and worthy of inclusion in this report.

*CROTALARIA BREVIDENS Benth. var. INTERMEDIA (Kotschy) Polhill (*C. intermedia* Kotschy—R). FABACEAE. —**Baldwin Co.**: moist roadside along dirt road bordering Bon Secour Bay, Bon Secour, 19 Nov 1967, *Lelong 3970*. **Mobile Co.**: roadside ditch along University Blvd., University of South Alabama campus, west Mobile, 20 Sep 1967, *Lelong 4727*; vacant lot along Quincy Road, ca 200 ft E of its junction with Arnold Road, Mobile, 26 Sep 1973, *Lelong 7309*.

As noted by Wilbur (1963), this Old World legume has recently been introduced and has spread in the Southeast. Radford et al. (1968) noted its presence in Georgia and Florida as well as in the Carolinas. It is well established in the Mobile region.

*CROTALARIA LANCEOLATA E. Meyer. FABACEAE. —**Mobile Co.**: dry disturbed roadside along Ct Rd 56, ca 5 mi W of Mobile municipal airport, 25 Jul 1980, *Mac Stewart s.n.*; roadside along recently widened portion of University Blvd. at Airport Blvd. intersection, west Mobile, 11 Sep 1975 *Lelong 8683*.

This Old World legume is very similar to the preceding species but has conspicuously smaller flowers. Kral (1973) reported it first from Alabama on the basis of one of his collections from Baldwin County, noting that it had previously been reported from Florida and Georgia. Radford et al. (1968) reported it from three counties in South Carolina.

CROTALARIA PALLIDA Ait. (*C. brownei* Bertero—M; *C. striata* DC—S; *C. mucronata Desv.—R). FABACEAE.* —Mobile Co.**: dry open sandy area between W levee along ADDSCO disposal area and U.S. Hwy 90, W of Polecat Bay, 1 Sep 1981, *Lelong 12262*.

This pantropical legume was listed by Mohr as adventive with ballast (presumably in Mobile) from 1890 to 1895. Small noted its occurrence in peninsular Florida. Radford et al. (1968) documented its presence in the Coastal Plain of the Carolinas and in Georgia. To my knowledge, this is the first collection of this plant in Alabama.

*DECODON VERTICILLATUS (L.) Ell. LYTHRACEAE. —**Baldwin Co.**: margins of Beaver Pond on Baptizing Creek, NE of Blakeley historical site, T3S, R2E, Section 44, 15 May and 19 Sep 1976, *Lelong 9222* and *9500*. **Mobile Co.**: margins of small pond along RR tracks and U.S. Hwy 43, directly N of intersection with Industrial Parkway, Saraland, 21 Oct 1978, *Lelong 10609*.

Mohr noted that this species was not frequent in the Central Pine belt of Alabama, mentioning collections from Bibb and Tuscaloosa counties. Jones (1975) in his floristic account of aquatic dicot families of Mississippi reported this plant only from Lauderdale County in east-central Mississippi. It is apparently uncommon in the lower Coastal Plain of Alabama.

*DRACOPIS AMPLEXICAULIS (Vahl) Cass. (*Rudbeckia amplexicaulis* Vahl—M). ASTERACEAE. —**Baldwin Co.**: open area along marshy NE shore of Grand Bay, T3S, R1E, W part of Section 28, Mobile Delta, 15 May 1970, *Lelong 5370*.

Mohr reported this species in the central prairies with *Gaillardia pulchella* and other prairie plants and in Mobile County as adventive from the Southwest. It is uncommon enough in the Mobile region to be worthy of mention.

*DYSSODIA TENUILOBA (DC.) B.L. Robins. ASTERACEAE. —**Mobile Co.**: weed in sidewalk crack in front of Rodeway Inn Motel restaurant, Michigan Ave. directly W of I-10, Mobile, 23 Mar 1976, *Sargent & Lelong 9008*.

This western species is adventive in Florida and southern Mississippi according to Cronquist (1980). F.H. Sargent, one of the most active and discerning field botanists in our region, also collected this plant in 1974 in Gulfport (Harrison County), Mississippi. Kral (1976) first reported the closely related *Dyssodia aurea* (Gray) A. Nelson for Alabama on the basis of one of his 1973 collection from Mobile.

EUPHORBIA HETEROPHYLLA L. (*Poinsettia heterophylla* (L.) Small—S). EUPHORBIACEAE. —**Baldwin Co.**: grassy roadside between State Hwy 59 and L.& N. RR tracks, ca 5.5 mi N of Foley, 11 Oct 1980, *Lelong 11651*. **Mobile Co.**: dry sandy hillside, N of Three-Mile Creek swamp, University of South Alabama campus, west Mobile, 11 Oct 1968, *Lelong 4829*.

This tropical American species was not included by Mohr in his "Plant Life of Alabama." It has since become increasingly more widespread at least in the Coastal Plain.

*EUSTOMA EXALTATUM (L.) Griseb. GENTIANACEAE. —**Baldwin Co.**: marshy area along SW shore of Chacaloochee Bay, N of U.S. Hwy 90, ca 500 ft W of its intersection with I-10, 23 Aug 1980, *Lelong 11343*. **Mobile Co.**: dry open sandy area between W levee of ADDSCO disposal area and U.S. Hwy 90, W of Polecat Bay, 1 Sep 1981, *Lelong 12261*.

Kral (1976) made the first report of this predominantly tropical American species for Alabama on the basis of a 1973 collection from another site in Mobile.

*HELIANTHEMUM ROSMARINIFOLIUM Pursh. CISTACEAE. —**Baldwin Co.**: dry open roadside between U.S. Hwy 31 and RR tracks, 2.6 mi N of Stapleton, 15 Jun 1974, *Lelong 7861*.

Mohr mentioned that this species occurred in the Central Prairie belt of Alabama, noting a 1899 collection from Dallas County, near Selma. Daoud and Wilbur (1965) did not report any specimen of this plant from Alabama in their revision of the North American species of *Helianthemum*.

*HELIANTHUS MICROCEPHALUS Torr. & Gray. ASTERACEAE. —**Baldwin Co.**: dry upland pine-oak woods along SW shore of Baptizing Branch, N of Blakeley historical site, 19 Sep 1976, *Lelong 9486*.

Mohr notes the occurrence of this plant from the Mountain region to the Central Pine belt. Small states that its range extends from Georgia to Kentucky and Pennsylvania. Recently Cronquist (1980) included Alabama within the range of this species but it seems to be uncommon enough in extreme south Alabama to be worthy of mention.

*HELIANTHUS STRUMOSUS L. ASTERACEAE. —**Mobile Co.**: open roadside along State Hwy 162, 1.6 mi S of Fowl River bridge, 10 Aug 1974, *Lelong 8132*.

Mohr states that it is rare in the Mountain region of Alabama, citing a collection from Auburn, Lee County. Cronquist (1980) notes that it is widespread in the eastern United States, including Alabama but like the preceding one, it seems to be uncommon in the extreme southern part of the state. Some of our specimens of this species have unusually small heads, resembling *H. microcephalus*.

*HIBISCUS COCCINEUS Walter. MALVACEAE. —**Mobile Co.**: extensive marsh dominated by Alligator weed, *Sagittaria falcata, Peltandra virginica* and *Typha latifolia*, along Dog River, directly NE of mouth of Robinson Bayou, Mobile, *18 Aug 1980, Lelong 11322.*

Mohr did not include this species in his treatment of Alabama plants. Small noted that it occurred generally in swamps near the coasts in Florida, Georgia, and Alabama. Freeman et al. (1979) reported it as an endangered species in Alabama, collected only in Covington County by Kral.

*HYPOCHAERIS BRASILIENSIS (Less.) Hook & Arn. (*Crepis foetida* L.—S; *Hypochaeris elata* (Wedd.) Griseb.—R). ASTERACEAE. —**Baldwin Co.**: Disturbed roadside along U.S. Hwy 90, ca 1 mi W of junction with State Hwy 59 at Robertsdale, 27 Apr 1974, *Lelong 7679*. **Mobile Co.**: dry, sandy open roadside along Hillsdale Road, W of University of South Alabama campus, west Mobile, 23 May 1974, *Lelong 7755*.

Mohr did not report this species for the state. Small noted that it occurred along roadsides in fields and dunes on coastwide islands of NE Florida and Georgia; Radford et al. (1968) also noted its presence in Georgia and Florida. This Eurasian plant seems to be a relatively recent introduction in south Alabama but it is fast becoming one of the most common weeds in the area.

*HYPOCHAERIS RADICATA L. ASTERACEAE. —**Mobile Co.**: common weed in lawn near bookstore, University of South Alabama campus, west Mobile, 6 Apr 1976, *Lelong 9084*.

Mohr did not report this plant for the state. Small stated that it occurred generally from S. Carolina to Texas. Radford et al. (1968) reported its occurrence throughout N. Carolina and northern S. Carolina as well as Virginia and Georgia. Kral sent me a specimen (*Kral 38798*) of this species which he collected in April 1970 in a sandy area at Malbis Nursery grounds in Baldwin County. Although possibly somewhat less common than the preceding species, this Eurasian weed is also spreading rapidly throughout our area.

*HYPTIS MUTABILIS (L. Richard) Briq. LAMIACEAE. —**Baldwin Co.**: moist, open roadside ditch along State Hwy 59, ca 0.5 mi S of Intracoastal Waterway bridge, Gulf Shores, 12 Sep 1967, *Lelong 3760*. **Mobile Co.**: wooded slope along Spring Hill Ave. Extension, S of Main Lake and E of

Art Center, Mobile municipal park, west Mobile, 14 Nov 1968, *Lelong 4983*.

This tall strongly-scented tropical American mint, reported by Small for Florida is becoming increasingly more common in the Mobile region as urban and industrial development proceed. Kral (1973) first reported it in Baldwin County, where it has become a very common roadside weed. It seems to be spreading rapidly westward.

ILEX AMELANCHIER M.A. Curtis ex Chapman. AQUIFOLIACEAE. —**Baldwin Co.**: Tall shrub along shady border of small pond in depression N of Styx River at Ct Rd 64 bridge, 16 Oct 1976, *Lelong 9625*.

This shrub was not reported by Mohr for the state and Small noted its presence only in the sandy swamps of the Coastal Plain of South Carolina. Its occurrence in Mobile and Washington cos., Alabama, is reported in the 1979 list of endangered species of the state, probably on the basis of Kral's collections. I have also collected it in adjacent coastal Mississippi (Jackson and George cos.). Kral (pers. comm.) has specimens of this rare species from four Alabama counties, including Baldwin and Mobile counties

INDIGOFERA HIRSUTA Harv. FABACEAE. —Mobile Co.**: Sunny, disturbed grassy area recently established along parking lot E of eastern entrance of Bel Air Mall shopping center, SE of intersection of Airport Blvd. and I-65, west Mobile, 18 Sep and 6 Oct 1976, *Lelong 9509* and *9572*.

This prostate perennial herb was recently introduced from Africa to Florida as a cover plant. Neither Mohr nor Small listed it in their works. Kral verified the identity of my specimen in 1978, noting then that he had not yet collected this plant in Alabama.

IPOMOEA MACRORHIZA Michx. CONVOLVULACEAE. —**Mobile Co.**: wooded roadside along Bit and Spur Road, one block E of its junction with University Blvd, west Mobile, 5 Sep 1974, *Lelong 8175*.

Although Mohr reports this tropical American perennial vine as "frequently cultivated and rarely escaped to waste places and hedge rows" in Mobile County, it is uncommon enough in this county to deserve mention.

*IPOMOPSIS RUBRA (L.) Wherry (*Gilia coronifolia* Pers.—M; *Gilia rubra* (L.) Heller—S). POLEMONIACEAE. —**Mobile Co.**: low sand dunes interspersed with shell deposits along Dauphin Island Bay, SE of Bayou Matagua, Little Dauphin Island, 9 Oct 1970, *Lelong 5618*.

This attractive western plant is uncommon in the Mobile region. Mohr reported it from Bibb County, Alabama and Small indicates generally its occurrence from Florida to Texas in the Coastal Plain and adjacent provinces. It is not listed by Deramus (1970) for Dauphin Island.

*Iresine rhizomatosa Standley. AMARANTHACEAE. —**Baldwin Co.**: base of large Indian Mound. Indian Mound Island, W of Bottle Creek, Mobile Delta, T1N, R1E, near center of Section 54, 15 Nov 1980, *Lelong 11874*. **Mobile Co.**: low woods at base of large Indian Shell Mound (State Park), directly S of State Seafood Laboratory, Dauphin Island, 20 Oct 1973, *Lelong 7410*.

Mohr does not report this plant for Alabama. Small indicates its presence in "various provinces" of the state, "north of the Coastal Plain." Deramus (1970) does not include it in her list of Dauphin Island plants.

Iva annua L. ASTERACEAE. —**Mobile Co.**: open, weedy area along parking lot at Kingswood shopping center, University Blvd., ca 1 block S of Old Shell Road, west Mobile, 2 Nov 1974, *Lelong 8224*.

Mohr noted that this annual herb occurred as an "adventive with grain seed from the West in cultivated fields" before the turn of the century. Kral (1973), reporting it from Tennessee, indicates that it is scattered east of the Mississippi, except in the Black Belt. Although it seems to be recently spreading in south Alabama, it is still fairly uncommon there except in floodplains.

*Lespedeza bicolor Turcz. FABACEAE. —**Baldwin Co.**: open roadside along State Hwy 225, bordered by dry, hilly pine-oaks woodland, ca 3.5 mi N of intersection of State Hwys 31 and 225, 23 Oct 1971, *Lelong 6467*. **Mobile Co.**: open, disturbed roadside along dirt road connecting Ct Rds 56 and 11 to Grand Bay, ca 0.2 mi S of road 56, 3 Aug 1974, *Lelong 8081*.

According to Clewell (1966), this shrubby Lespedeza was "introduced from Japan and is extensively planted in the Southeast since about 1940 as food for wildlife, especially quail," it is also used somewhat as an ornamental shrub and escapes occasionally from cultivation. Small notes its occurrence from Florida to North Carolina.

*Lilaeopsis carolinensis Coult. & Rose. APIACEAE. —**Baldwin Co.**: common along margin of pond in front of Grand Hotel, Point Clear, 11 May 1980, *Lelong 11065*.

Mohr did not include this aquatic species in his account of Alabama plants. Small noted that it occurred on the Coastal Plain from Florida to North Carolina. Godfrey and Wooten (1981) record its presence generally from Virginia to northern Florida and westward to Louisiana. It is rare in south Alabama.

*Lindernia crustacea (L.) F. Mueller. SCROPHULARIACEAE. —**Mobile Co.**: weed in flower bed north of Student Union Center, University of South Alabama campus, west Mobile, 15 Aug 1975, *Lelong 8615*.

Godfrey and Wooten (1981) noted that this small annual weed native of Indo-Malaya was widely naturalized in tropical and subtropical areas. They indicated that it occurred sporadically in the southeastern Coastal Plain of S. Carolina and Florida and in southeast Alabama. The Alabama report is probably based on Kral's 1971 collection from Escambia County, the first record of this plant for Alabama (Kral 1973). He indicated that it had been reported also from Mississippi.

LUDWIGIA LINIFOLIA Poiret. ONAGRACEAE. —**Baldwin Co.**: bog at eastern end of Ct Rd 4E, ca 2.5 mi E of its junction with State Hwy 59, N of Gulf Shores, 22 Aug 1979, *Lelong 10939.* **Mobile Co.**: pine savannah along Ct Rd 188 between Alabama Port and Coden, ca 1000 ft W of junction with Ct Rd 59, 27 Jul 1981, *Lelong 12190.*

Mohr reported that this species was rare in Mobile County. Indeed, it seems to be one of the least common of some twenty species of *Ludwigia* occurring in south Alabama.

LUDWIGIA PERUVIANA (L.) Hara (*Jussiaea peruviana* L.—M,S). ONAGRACEAE. —**Mobile Co.**: moist roadside ditch along U.S. Hwy 90 at its junction with exit road E of I-65, 3 Sep 1974, *Lelong 8170.*

This robust tropical American weed is becoming increasingly more common in the Mobile region. Mohr recorded its presence from one site on the banks of Mobile River with *Jussiaea suffruticosa* L. Godfrey and Wooten (1981) noted that it was common and abundant in central and southern Florida, and sporadic elsewhere in Florida and south Georgia.

*LUDWIGIA SPATHULATA T. & G. (*Isnardia spathulata* (T. & G.) Small—S). ONAGRACEAE. —**Mobile Co.**: wet, sandy SW shore of Big Creek Lake, University of South Alabama research station, Tanner Williams, T4S, R4W, NW corner of Section 1, 10 Oct 1977, *Lelong 9941.*

This small creeping species was first collected in Alabama (Geneva County) by McDaniel in 1966. It was also collected by Kral (1973) in Baldwin, Barbour and Covington counties in 1968 and 1969.

*LYCOPUS AMPLECTENS Raf. (*L. pubens* Britton, *L. sessilifolius* Gray—S). LAMIACEAE. —**Mobile Co.**: along S shore of Big Creek Lake, N of Ct Rd 70 to Tanner-Williams and dam spillway, 4 Oct 1974, *Lelong 8202.*

As noted by Kral (1981), Henderson (1962) did not include Alabama in the range of this plant in his monograph of the genus. Kral reported this plant from Barbour Country.

*MERREMIA DISSECTA (Jacq.) Hallier f. (*Ipomoea dissecta* (Jacq.) Pursh, *I. sinuata* Ort.; *Operculina dissecta* (Jacq.) House—S). CONVOLVULACEAE. —**Baldwin Co.**: cut-over bluff along E shore of Mobile Bay at W end of

Belrose Ave., Daphne, 16 Dec 1980, *Lelong 11935*.

This tropical American morning glory species, probably escaped from cultivation at this site, was not reported by Mohr for the state.

*MENTHA ROTUNDIFOLIA (L.) Huds. LAMIACEAE. —**Mobile Co.**: roadside ditch along U.S. Hwy 98 (Moffat Road), ca 200 ft W of bridge over Three-Mile Creek, west Mobile, 5 Jul 1976, *Lelong 9269*.

Mohr noted that this aromatic herb, used then as a substitute for catnip, occurred commonly in low damp places and ditches in Mobile County at the turn of the century. It is apparently much less common at present in the Mobile region. Radford et al. (1968) do not indicate its occurrence in Alabama. Kral (pers. comm.) stated that he had seen this plant only once in the state, that in the Black Belt. Anderson (1986) reported this species as new to Florida panhandle based on his collection from Apalachicola, Franklin County.

MIKANIA CORDIFOLIA (L.f.) Willd. ASTERACEAE. —Baldwin Co.**: small shell mound along SE shore of Tensaw River, directly N of its confluence with Apalachee River, T4S, R1E, NE corner of Section 43, 21 Oct 1977, *Lelong 9987*.

Small (1933) reported it only from hammocks in southern peninsular Florida and the Keys. In his recent treatment of the genus, Holmes (1981) noted that the distribution of this species in the United States extends further inland and appears to be somewhat disjunct, citing numerous collections from south Louisiana, south Mississippi, and peninsular Florida. He states also that "its known distribution suggests that it should also occur in western Florida, southern Alabama, and possibly southern Georgia." Its apparent paucity in southern Alabama may be due partly to the relative lack of suitable calcareous sites besides shell mounds.

NEPTUNIA PUBESCENS Benth. (*N. lutea* (Leavenw.) Benth.—M,S). FABACEAE. —**Mobile Co.**: wooded shell mound and adjacent marsh along West Fowl River, directly S of bridge (State Hwy 188), 17 Jun 1980, *Lelong 11157*.

Mohr noted that this plant was infrequent in the central prairies and on the Coastal Plain of Alabama, citing a collection from Greene County and one from Portersville, West Fowl River, Mobile County, near the location of our collection. Again, the rarity of this plant in the Mobile region is probably due to the relative lack of appropriate calcareous sites.

NICOTIANA LONGIFLORA Cav. SOLANACEAE. —**Mobile Co.**: railroad tracks S of L & N station, near intersection of Eslava and Water streets, downtown Mobile, 30 May 1971, *Lelong 5720*.

Mohr noted that this tropical American annual herb occurred occasionally on ballast in Mobile County near the turn of the century. Numerous other ballast weeds are mentioned by Mohr for Mobile but most of them have failed to establish themselves or to spread in our area. Some ten years ago, Kral mentioned that he had not yet collected this plant in the state. *Nicotiana glauca,* another tropical tobacco fugitive on ballast, was reported by Mohr from Navy Cove, Baldwin County; it does not seem to have become established in south Alabama.

*OROBANCHE UNIFLORA L. (*Thalesia uniflora* (L.) Britton—M,S). OROBANCHACEAE. —**Mobile Co.**: moist open area along swamp forest bordering Three-Mile Creek. University of South Alabama, west Mobile, 9 Apr 1968, *Lelong 4312*.

Mohr reported this small parasitic herb as rare on dry gravelly hillsides of his Mountain region (Cullman County). Small noted its occurrence in rich woods in various provinces but rarely on the Coastal Plain from Georgia to Texas. It is still quite uncommon in south Alabama. The site of my 1968 collection has unfortunately been cleared in the expansion of the University campus.

PARONYCHIA BALDWINII (T. & G.) Fenzl. (*Anychiastrum baldwinii* (T. & G.) Small—S). CARYOPHYLLACEAE. —**Baldwin Co.**: pine woodland along E shore of Bon Secour Bay, ca 0.5 mi S of Weeks Bay entrance, 2 Sep 1980, *Lelong 11394*.

Mohr noted that this plant was rare in sandy areas along Fish River Bay (now Weeks Bay) at the turn of the century. At present, it seems to occur fairly commonly along the still undeveloped wooded shore of Bon Secour Bay from Weeks Bay to Bon Secour River.

*PETUNIA PARVIFLORA Juss. SOLANACEAE. —**Baldwin Co.**: margin of marsh along U.S. Hwy 90, ca 1 mi E of Tensaw River bridge, 15 Jun 1974, *Lelong 7829*. **Mobile Co.**: weed in crack of asphalt parking lot N of Hartwell field, SE of intersection between Virginia and Ann strs., Mobile 7 Jul 1972, *Lelong 6636*; grassy median along Airport Blvd., ca 1 block E of Arnold road, west Mobile, 4 Nov 1979, *Lelong 11026*.

Mohr reported this plant as not infrequent in waste ground and ballast in Mobile County. Kral has also collected it in Mobile. It seems to be still relatively uncommon at present in the Mobile region.

*POLYGONUM AVICULARE L. POLYGONACEAE. —**Baldwin Co.**: roadside between U.S. Hwy 90 and marshes along SE shore of Chacaloochee Bay, E of Mobile, 6 Aug 1976, *Lelong 9356*.

Mohr noted that this eurasian weed occurred throughout Alabama but was rare near the coast. It is indeed still uncommon in coastal Alabama.

*POLYGONUM ERECTUM L. POLYGONACEAE. —**Mobile Co.**: recently cleared area along University Drive North, ca 100 ft W of its junction with University Blvd., NE part of University of South Alabama campus, west Mobile, 4 Jun 1974, *Lelong 7794*; grassy disturbed area next to ball park, NE of intersection of Airport Blvd. and Sage Ave., west Mobile, 9 May 1980, *Lelong 11073*.

Mohr stated that this plant occurred uncommonly in the Central Pine belt and the Central Prairie region of the state. Small indicated that its southern distribution extended from Georgia to Arkansas. Its occasional occurrence in coastal Alabama is worthy of mention.

*PSORALEA LUPINELLUS Michx. (*Rhitidomene lupinellus* (Michx) Rydb.—S). FABACEAE. —**Mobile Co.**: dry sand ridge along swamp, ca 1 mi N of Black Bayou and 500 ft E of Southern RR tracks, Louisiana Land & Exploration Company, Saraland, 23 Jun 1978, *Lelong 10391*.

Kral (1981) first reported this Coastal Plain sandhill species for Alabama based on one of his 1979 collections from Autauga County near the center of the state. I am not aware of other collections of this plant in Alabama besides these two.

*SAGERETIA MINUTIFLORA (Michx.) Mohr. RHAMNACEAE. —**Baldwin Co.**: small elongate shell mound in swamp forest along E shore of Tensaw River, directly N of its confluence with Blakeley River, lower Mobile delta, 1 Jul 1977, *Lelong 9892*. **Mobile Co.**: low sand dunes along SW shore of Mobile Bay, near center of Little Dauphin Island, 30 Sep 1970, *Lelong 5617*.

Mohr noted that this shrub grew on dry exposed sites and on the borders of low rich woods in Mobile. Most recent collections of this plant in the Mobile region were made in the large wooded indian shell mounds in the east part of Dauphin Island where it still occurs sporadically. It is much more abundant on Little Dauphin Island which is now accessible only by boat. This calciphilic plant is consistently found on shell mounds and middens in our area.

*SAPINDUS MARGINATUS Willd. SAPINDACEAE. —**Baldwin Co.**: small elongate shell mound in swamp forest along E shore of Tensaw River, directly N of its confluence with Blakeley River, lower Mobile delta, 21 Oct 1977, *Lelong 9992*.

Mohr cited a collection of this tree "near an old place in the pine hills" at Mobile, "most probably an escape from cultivation." He also reported a collection from Gallion, Hale County in the Black Belt region. I am unaware of any recent collection of this species from south Alabama. Like *Sageretia*, it prefers calcareous sites, growing in association with plants such as *Celtis laevigata*, *Bumelia lanuginosa*, and *Arenaria lanuginosa*.

*SATUREJA GEORGIANA (Harper) Ahles (*Clinopodium carolinianum* (Walt.) Kuntze—M; *C. georgianum* Harper—S). LAMIACEAE. —**Baldwin Co.**: dry sandy woods along N bank of Majors Creek, ca 2.5 mi

S of Tensaw along State Hwy 59, 6 Oct 1973, *Lelong 7339*; dry pine-oak woods along State Hwy 112, 1.9 mi NW of Perdido River (Alabama-Florida state line), 15 Jun 1974, *Lelong 7903*.

Mohr described this species as infrequent in Alabama from the Central region to Coast Pine belt. He cited one collection from dry pine woods in Mobile County. Shinners (1962) treated this species as *Calamintha georgiana* and did not cite Alabama specimens of it. This shrubby mint is uncommon at least in extreme south Alabama.

SCUTELLARIA LATERIFLORA L. LAMIACEAE. —**Mobile Co.**: margin of brackish marsh along W shore of Mobile Bay, ca 0.25 mi N of mouth of Dog River, south Mobile, 13 Oct 1975, *Lelong 8842*.

This mint was said by Mohr to occur uncommonly throughout Alabama. He also cited a collection of it from the bank of Mobile River. In my experience, it is one of the least common subaquatic plants in south Alabama. I have yet to collect it in Baldwin County.

*SCUTELLARIA OVATA Hill (*S. cordifolia* Muhl.—M). LAMIACEAE. —**Mobile Co.**: mesic woods on Shell Mound at State Park, east Dauphin Island, 15 May 1973, *Lelong 6500*; shady roadside along State Hwy 188, directly N of dirt road to Little River, 10 Jun 1980, *Lelong 11103*; roadside mound in slash pine woodland, at junction of two dirt roads, ca 1 mi N of Point aux Pins, 16 Jun 1980, *Lelong 11125*.

Mohr indicated that this plant grew from the Mountain region to the lower hills in the northern part of the state. The southernmost collection cited by him was from Tuscaloosa County. Deramus (1970) did not list it for Dauphin Island. Burkhalter (1984) reported a collection from Pensacola, Escambia County, Florida, citing also a specimen which he collected in adjacent Baldwin County, Alabama. This plant is occasionally and locally abundant in the Mobile region, especially on calcareous substrate.

*SCUTELLARIA RACEMOSA Pers. LAMIACEAE. —**Mobile Co.**: marshy S shore of middle lake, Langan municipal park, west Mobile, 25 Nov 1977, *Lelong 10086*; dried up pond bordering Three-Mile Creek swamp, east part of State Fish Hatchery, west Mobile, 2 May 1981, *Lelong 11987*.

Kral (1973) made the first report of this Central and South American species on the basis of one of his 1971 collections from Baldwin County. Although Jones (1976) did not report it for Mississippi, Clewell (1985) reported it from Escambia, Gulf and Leon counties, Florida. It appears to be spreading rapidly in marshy areas throughout the Gulf Coast.

*SPHENOCLEA ZEYLANICA Gaertn. CAMPANULACEAE. —**Baldwin Co.**: marsh along SE shore of Chacaloochee Bay, N of U.S. Hwy 90, lower Mobile Delta, 6 Aug 1976, *Lelong 9355*.

This aquatic weed from the Old World Tropics was first reported for

Alabama by Kral (1981) based on one of his 1975 collections from Mobile County. In the Mobile region, it is especially common in wet muddy shores of the numerous rivers and streams of the Mobile delta.

*Stachys crenata Raf. (*S. agraria* Cham. & Schlecht—M,S). LAMIACEAE. —**Baldwin Co.**: grassy roadside ditch along State Hwy 59, ca 0.5 mi S of intracoastal waterway bridge, 12 Sep 1967, *Lelong 3760.* **Mobile Co.**: sandy bank along Three-Mile Creek, N of Basic Medical Sciences Bldg., University of South Alabama campus, west Mobile, 22 Apr 1976, *Lelong 9136.*

Mohr reported this plant as fugitive on ballast in Mobile County. Nelson (1981) stated that in the Southeast it was restricted to south Mississippi and Louisiana, ranging outside our area along the coast of Texas. Clewell (1985) noted its occurrence in Gadsden County in the Florida panhandle. The recent collections in the Mobile region were possibly derived from the sources identified by Mohr or they may represent more recent reintroductions. This small weedy mint is extremely agressive, having the potential of becoming nearly as ubiquitous and troublesome in south Alabama as its congener *S. floridana,* also fairly recently introduced in our area.

Stachys tenuifolia Willd. var. tenuifolia (*S. aspera* Michx.—M). LAMIACEAE. —**Baldwin Co.**: bottomland woods surrounding large Indian mound between Bottle Creek and Dominic Creek, T1N, R1E, near center of Section 55, Indian Mound Island, 7 Jul 1980, *Lelong 5453*; moist thicket at northern end of Gravine Island, lower Mobile Delta, 13 Dec 1980, *Lelong 11929.*

Mohr indicated that this mint grew in the Central Pine belt (Tuscaloosa County). Nelson (1981) noted its occurrence only in Baldwin County within Alabama but did not cite a specimen. It is uncommon enough in the Mobile region to deserve mention.

*Trifolium arvense L. FABACEAE. —**Mobile Co.**: grassy roadside along south side of Airport Blvd., ca 1 block W of Downtowner Blvd., west Mobile, 9 Jun 1981, *Lelong 12055.*

Mohr did not list this species for Alabama; Small indicates its occurrence generally from Florida to Missouri. It is rarely encountered in the Mobile region.

*Trifolium nigrescens Viv. FABACEAE. —**Mobile Co.**: moist grassy roadside along Ziegler road extension, ca 0.5 mi W of its intersection with Cody road, west Mobile, 6 May 1978, *Lelong 10145.*

Mohr did not report this annual european clover. Small noted its occurrence with *I. resupinatum* in Snow Hill (Wilcox County), Alabama. Presently, it is becoming increasingly more common along the Gulf Coast.

*Trifolium vesiculosum Savi. FABACEAE. —**Mobile Co.**: grassy median along I-10, 4.3 mi W of Theodore-Dawes exit, SW of Mobile, 7 Jun 1982, *Lelong 12559*.

This large european clover is used increasingly as a roadside cover in the Southeast. It was not listed by Mohr nor by Small, nor even by Hermann (1953) in his synopsis of some twenty clovers cultivated in the United States. Kral (1973) first reported it for the state based on a 1968 collection from Montgomery County. In 1976, he noted its occurrence in four other Alabama counties.

*URTICA CHAMAEDRYOIDES Pursh. URTICACEAE. —**Mobile Co.**: weed in flower bed at home along Ct Rd 22, ca one block W of State Hwy 163, S of Mobile, 19 Feb 1982, *Lelong 12483*.

Mohr indicated that this nettle was rare in the Central Pine Belt of the state, citing a collection from Tuscaloosa County. As many other calciphilic plants in our area, it occurs only rarely and locally in south Alabama.

*UTRICULARIA RADIATA Small. LENTIBULARIACEAE. —**Mobile Co.**: Floating in small pond in pine savannah along U.S. Hwy 90, 0.5 mi E of Alabama-Mississippi line, 24 Mar 1976, *Lelong 9061*; floating in small side branch along W shore of Gunnison Creek, NE of Satsuma, T2S, R1W, SE 1/4 of Section 13, 24 Jun 1981, *Lelong 12103*.

Mohr did not list this taxon, possibly including it in his *U. inflata*, which he reports as not frequent on the Coastal Plain. This species, treated by some as *U. inflata* var. *minor*, is still relatively infrequent in south Alabama. As pine savannahs are being drained and cleared to accommodate urban growth and industrial development, it is becoming even less common in the region.

*VERBENA BONARIENSIS L. VERBENACEAE. —**Baldwin Co.**: marshy roadside along U.S. Hwy 90, ca 1 mi E of Tensaw River bridge, 15 Jun 1974, *Lelong 7840*; roadside ditch along dirt road to Fish River fishing camp at intersection with U.S. Hwy 98, ca 5 mi W of Foley, 29 Jun 1974, *Lelong 7989*. **Mobile Co.**: Weedy roadside along Ct Rd 5, 2.3 mi S of Tanner-Williams road, 3 Aug 1974, *Lelong 8078*.

Mohr noted that he first observed this coarse South American vervain in 1893 on ballast in Mobile, and subsequently on roadsides. Unlike the similar *V. brasiliensis* which is one of the most common roadside weeds in our area, *V. bonariensis* is presently uncommon in the Mobile region.

*VERONICA POLITA Fries. SCROPHULARIACEAE. —**Baldwin Co.**: weed in moist lawn of private camp along NE shore of Grand Bay, lower Mobile Delta, 15 May 1970, *Lelong 5374*; disturbed lawn at camp site on NW shore of Chacaloochee Bay, 3 May 1980, *Lott 40*.

I originally misidentified this plant as *V. agrestis* L. reported by Mohr as a rare ballast weed at the turn of the century. *Veronica polita* was not listed by Mohr but Small indicated that its range extends generally from Florida to Texas and New York. However, it is uncommon enough in south Alabama to deserve mention. Anderson (1986) reported this species as new to the Florida panhandle.

*VICIA LUDOVICIANA Nutt. subsp. LUDOVICIANA. FABACEAE. —**Baldwin Co.**: weed in moist lawn of private camp along NE shore of Grand Bay, lower Mobile delta, 15 May 1970, *Lelong 5375*, annotated by J.S. Lassetter as race 1. **Mobile Co.**: Indian Mound State Park, Dauphin Island, 15 May 1972, *Lelong 6495*; grassy area along seawall bordering Portersville Bay, S of Coden, next to city park and small zoo, 23 Mar 1974, *Lelong 7459*.

Mohr reported that this species was not frequent in Mobile County occurring in rich damp soil; it is apparently still uncommon in south Alabama, possibly because of its affinity for calcareous substrates.

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DOCUMENTED PLANT CHROMOSOME NUMBERS 1988: 1. CHROMOSOME COUNTS FOR NORTH AMERICAN PLANTS—I.

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ABSTRACT

Chromosome numbers are presented for 104 populations of tracheophytes representing 78 species in 21 families. First reports include *Isoetes butleri* Engelm., $2n = 22$; *Penstemon eatonii* A. Gray subsp. *undosus* (M. E. Jones) Keck, $n = 8$; *P. linarioides* A. Gray subsp. *linarioides*, $n = 8$; and *P. wrightii* Hook., $n = 8$.

The chromosome numbers reported herein are the incidental result of field work and general collecting conducted throughout North America over the past several years. They are reported here to make them available to individuals engaged in systematic research. Although most counts come from taxa with numbers reported earlier by other researchers, many counts are from poorly sampled taxa or from parts of the range that have received little attention.

MATERIALS AND METHODS

Buds for meiotic counts were collected in the field, fixed in Carnoy's solution (3 EtOH: 1 glacial acetic acid, v/v) or modified Carnoy's solution (4 chloroform: 3 EtOH: 1 glacial acetic acid, v/v/v) and subsequently refrigerated in the fixative until used. Counts were made from microsporocytes using the standard aceto-carmine squash technique (Radford et al. 1974).

In a few instances, mitotic counts were obtained from root tips of seedlings germinated from field-collected seeds. Seeds were placed on moist filter paper in petri dishes at room temperature until germination occurred. Root tips were then excised and submerged in a saturated aqueous solution of paradichlorobenzene for 90 minutes at room temperature, fixed in Carnoy's solution, and squashed in aceto-orcein (Radford et al. 1974)

Camera lucida drawings or photographs were made for all counts using

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either a Zeiss Universal or Olympus BH-2 microscope. Voucher specimens for counts are deposited in the herbaria designated after the voucher citation. The following abbreviations are used for collectors: B = R. E. Brooks; BCF = T. M. Barkley, A. Cronquist & D. Frame; BK = R. E. Brooks & C. Kuhn; BKF = R. E. Brooks, C. Kuhn & C. C. Freeman; BM = R. E. Brooks & R. McGregor; BS = R. E. Brooks & G. Seiler; F = C. C. Freeman; FF = C. C. Freeman & J. A. Freeman; FW = C. C. Freeman & M. A. Wetter; M = M. McCarty; S = S. Stephens; SG = G. Seiler.

RESULTS

Chromosome number determinations and vouchers are presented below. Taxa are arranged alphabetically by family. All collections are from the United States unless otherwise specified.

APIACEAE

CHAEROPHYLLUM PROCUMBENS Hook. $2n$ = 11II. Kansas. Riley Co.: Wild Cat County Park, ca 4 mi NW of jct Riley Co 412 & KS 113, *F 2206* (KANU, KSC, NY).

ASTERACEAE

ASTER NOVAE-ANGLIAE L. $2n$ = 5II. Iowa. Allamakee Co.: ca 50 meters E of jct Allamakee Co X42 & X52 at edge of Harpers Ferry, *F 2257* (ISC, KSC, MO, WET).

CACALIA PLANTAGINEA (Raf.) Shinners n = 27. Kansas. Riley Co.: tributary to Kings Creek on Konza Prairie, S of Manhattan, *F 2030* (KSC, MEXU, NY).

CARDUUS NUTANS L. subsp. LEIOPHYLLUS (Petrovic) Stoy. & Stef. n = 8. Kansas. Jefferson Co.: 7.5 mi E, 1 mi S of Williamstown, *B 17276* (KANU).

CARDUUS NUTANS L. subsp. MACROCEPHALUS (Desf.) Nyman n = 8. Montana. Gallatin Co.: near Belgrade, *M 24-5* (KANU).

COREOPSIS TINCTORIA Nutt. $2n$ = 12II. Kansas. Riley Co.: NW Manhattan in Cico Park, *F 2232* (KSC, NY).

ENGELMANNIA PINNATIFIDA A. Gray ex Nutt. n = 9. Oklahoma. Major Co.: OK 15, 2.2 mi E of the Woodward Co line, *FW 2023* (KSC). Texas. Brewster Co.: TX 118, 9.7 mi NW of jct TX 118 & 273, *FW 2001* (KSC); $2n$ = 9II, Howard Co.: Farm Rd 669, 3.1 mi S of jct Farm Rds 669 & 1785, *FW 2006* (KSC).

EUPATORIUM PURPUREUM L. n = 10. Iowa. Allamakee Co.: 1.5 mi N of jct Allamakee Co X52 & X42 and 3.5 mi E, *F 2253* (KSC).

GRINDELIA SQUARROSA (Pursh) Dunal var. SQUARROSA $2n$ = 6II.

Kansas. Riley Co.: Kimball Ave, 0.5 mi E of jct Kimball Ave & Denison Ave in Manhattan, *F 920* (KSC). Texas. Brewster Co.: US 90, 0.8 mi E of jct US 90 & 385, *FW 2005* (KSC).

HAPLOPAPPUS CILIATUS (Nutt.) DC. $2n$ = 6II. Kansas. Riley Co.: SW of Keats along Reservation Rd, *F 2258* (KSC, NY).

HAPLOPAPPUS SPINULOSUS (Pursh) DC. $2n$ = 8. Kansas. Cloud Co.: US 24, 9.0 mi E of jct US 24 & 81, *F 972* (KSC).

HYMENOPAPPUS SCABIOSAEUS L'Her. var. CORYMBOSUS (Torrey & A. Gray) B. Turner n = 17. Kansas. Riley Co.: Kimball Ave, 0.5 mi W of Little Kitten Creek, *F 2270* (KSC, WET).

KUHNIA EUPATORIOIDES L. var. CORYMBULOSUS Torrey & A. Gray $2n$ = 9II. Kansas. Riley Co.: Riley Co 412, 2.4 mi WNW of jct Riley Co 412 & 113, *F 2245* (KSC, MO, NEB, NY).

LYGODESMIA GRANDIFLORA (Nutt.) Torrey & A. Gray $2n$ = 9II. Colorado. Montrose Co.: CO 141, 14.6 mi SE of Mesa Co line, *FW 1816* (KANU, KSC, MEXU, NY).

MALACOTHRIX TORREYI A. Gray $2n$ = 7II. Utah. Wayne Co.: UT 24, 3.9 mi N of Dirty Devil River, NE of Hanksville, *FW 1831* (KANU, KSC, MEXU, NY).

PALAFOXIA SPHACELATA (Nutt.) Cory n = 12. Kansas. Cheyenne Co.: 15 mi N, 12 mi W of St. Francis, *B 11294* (KANU).

PINAROPAPPUS ROSEUS (Less.) Less. var. MACULATUS McVaugh n = 9. MÉXICO. Nuevo León: gravel rd to 18 de Marzo, 8.7 mi E of jct with México 57, N of Cerro Potosí, *FW 2057* (KANU, KSC, MEXU, NY).

POLYMNIA CANADENSIS L. $2n$ = 15II + 1 supernumerary. Iowa. Allamakee Co.: bluffs SW of jct of Allamakee Co X52 & X42, SW of Harpers Ferry, *F 2255* (ISC, KSC, MO, WET).

PRENANTHES ALBA L. $2n$ = 16II. Iowa. Allamakee Co.: 2.2 mi N of jct of Allamakee Co X52 & X42, 2.9 mi E along gravel rd, *F 2250* (ISC, KSC, MO).

PRENANTHES ASPERA Michaux $2n$ = 8II. Kansas. Riley Co.: 0.1 mi N of Pillsbury Crossing, ca 2 mi SSW of Zeandale, *F 1152* (KSC).

PRENANTHES RACEMOSA Michaux $2n$ = 8II. Iowa. Bremer Co.: 2 mi S & 0.4 mi W of jct US 218 & IA 3, SSW of Waverly, *F 800* (KSC).

PYRRHOPAPPUS CAROLINIANUS (Walter) DC. $2n$ = 12. Kansas. Osage Co.: ca 3 mi NW of Lake Pomona dam, *F 818* (KSC).

PYRRHOPAPPUS GRANDIFLORUS (Nutt.) Nutt. $2n$ = 24. Kansas. Barber Co.: US 281, 2 mi S of Sawyer, *FF 91* (KSC).

PYRRHOPAPPUS ROTHROCKII A. Gray $2n$ = 6II + 1 supernumerary. MÉXICO. Durango: México 45, 16.4 mi S of jct México 45 & 39, *FW 2126* (KSC, MEXU, NY).

Rudbeckia hirta L. var. pulcherrima Farw. *n* = 19. Kansas. Marshall Co.: KS 99, 6.9 mi S of jct KS 99 & US 36, *F 2027* (KSC); Morris Co.: US 56, 0.1 mi W of Lyon Co line, *F 2026* (KSC); 2n = 19II, Nemaha Co.: US 36, 7.4 mi E of Seneca, *F 2029* (KSC).

Senecio arizonicus E. Greene *n* = 20. Arizona. Coconino Co.: US Alt 89, 11.1 mi N of jct US Alt 89 & AZ 179, *FW 1960* (KANU, KSC, MEXU, NY).

Senecio douglasii DC. var. douglasii 2*n* = 20II. California. San Benito Co.: CA 152 at Pacheco Pass, NE of Hollister, *FW 1907* (KANU, KSC, NY).

Senecio douglasii DC. var. longilobus (Benth.) L. Benson 2*n* = 20II. Arizona. Apache Co.: US 180, 1.3 mi SE of jct US 180 & 180A, *FW 2146* (KANU, KSC, NY). New Mexico. Catron Co.: NM 90, 7.8 mi E of jct NM 90 & 27, *FW 2135* (KANU, KSC, NY); NM 90, ca 3 mi W of jct NM 90 & 27, *FW 2136* (KANU, KSC, NY).

Senecio douglasii DC. var. monoensis (E. Greene) Jepson 2*n* = 20II. Arizona. Mohave Co.: US 93, ca 200 meters S of jct US 93 & I-40, *FW 1946*, (KANU, KSC, NY). *n* = 20. Yavapai Co.: Fh 9 E of Camp Verde, 15.5 mi NW of jct of Fh9 & AZ 87, *FW 1964* (KSC). 2*n* = 40, New Mexico. Hidalgo Co.: US 70, 8.3 mi E of the AZ state line, *FW 1981* (KANU, KSC, MEXU, NY, WIS).

Senecio eremophilis Richardson var. macdougalii (A. A. Heller) Cronq. *n* = 20. Arizona. Coconino Co.: San Francisco Mts, N of Flagstaff, *FW 2150* (KANU, KSC, MEXU, NY).

Senecio integerrimus Nutt. var. exaltatus (Nutt.) Cronq. *n* = 40. Colorado. Montezuma Co.: US 160, 0.9 mi E of entrance to Mesa Verde National Park, *FW 1790* (KANU, KSC, MEXU, NY).

Senecio jacobaea L. *n* = 20. California. Mendocino Co.: CA 20, 8.2 mi E of jct CA 20 & 1, *FW 1896* (KSC, MO, NEB, NY); 2*n* = 20II, CA 20, 7.9 mi E of jct CA 20 & 1, *FW 1898* (KSC).

Senecio toluccanus DC. *n* = 20. MÉXICO. Puebla.: México 190 Libre, ca 40 km W of Huejotzingo, ca 3 km E of the México state line, *BCF 2999* (KSC).

Silphium integrifolium Michaux var. laeve Torrey & A. Gray 2*n* = 7II. Kansas. Riley Co.: Riley Co 412, 3.25 mi WNW of jct Riley Co 412 & KS 113, *F 2247* (KSC, NEB, NY, TEX).

Silphium perfoliatum L. 2*n* = 7II. Kansas. Pottawatomie Co.: Cedar Creek, ca 100 meters SSW of KS 13 bridge across creek, *F 2238* (KSC, NEB).

Solidago rigida L. var. humilis C. Porter 2*n* = 9II. Kansas. Riley Co.: Riley Co 412, 2.35 mi WNW of jct Riley Co 412 & KS 113, *F 2246*

(KSC, MO, NEB, NY).

SOLIDAGO SPECIOSA Nutt. var. RIGIDIUSCULA Torrey & A. Gray $n = 9$. Kansas. Marshall Co.: KS 99, 6.45 mi S of jct KS 99 & US 36, *F 2248* (KSC, MO, NEB, WET).

XANTHISMA TEXANUM DC. subsp. DRUMMONDII (Torrey & A. Gray) Semple $2n = 4II$. Texas. Garza Co.: TX 207, 12.5 mi N of jct TX 207 & US 280, *FW 2016* (KANU, KSC, MEXU, NY).

BORAGINACEAE

LITHOSPERMUM ARVENSE L. $n = 14$. Kansas. Riley Co.: Dickens Rd in W Manhattan, *F 13* (KSC).

BRASSICACEAE

CARDAMINE BULBOSA (Schreber) B.S.P. $2n = 16II$. Iowa. Bremer Co.: 2 mi S & 0.5 mi W of jct US 218 & IA 3, SSW of Waverly, *FF 2265* (KSC, WET).

CHORISPORA TENELLA L. $2n = 7II$. Kansas. Riley Co.: E side of Throckmorton Hall, Kansas State University campus, Manhattan, *F 1735* (KSC).

THLASPI ARVENSE L. $n = 7$. Kansas. Riley Co.: E side of Throckmorton Hall, Kansas State University campus, Manhattan, *F 1734* (KSC).

CAMPANULACEAE

LOBELIA CARDINALIS L. $n = 7$. Kansas. Pottawatomie Co.: Cedar Creek, ca 100 meters SSW of KS 13 bridge across the creek, *F 2236* (KSC).

CANNABACEAE

HUMULUS JAPONICUS Siebold & Zucc. $2n = 14 + 3$ heteromatic chromosomes. Kansas. Riley Co.: E Manhattan between US 24 & McCall Rd, *F 1725* (KSC).

CUSCUTACEAE

CUSCUTA GLOMERATA Choisy $n = 15$. Kansas. Pottawatomie Co.: Cedar Creek, ca 100 meters SSW of KS 13 bridge across the creek, *F 2235* (KSC).

CYPERACEAE

CAREX INOPS L. Bailey subsp. HELIOPHILA (Mack.) Crins. $n = 18$. Kansas. Ellsworth Co.: E 1/2, SE 1/4 sec 8, T16S, R6W, *B 17048a* (KANU).

Carex microrhyncha Mack. $n = 16$. Kansas. Bourbon Co.: 1.75 mi W of Garland, *B 17091* (KANU); Douglas Co.: 3 mi W of Lawrence, *B 15860* (KANU); Linn Co.: 1 mi N, 1.5 mi E of Pleasanton, *B 16574* (KANU). Missouri. Bates Co.: 1.5 mi S of Amoret, *B 17305* (KANU). Oklahoma. Ottawa Co.: 3.75 mi N, 1 mi E of Peoria, *BK 17325* (KANU).

Eleocharis compressa Sulliv. $2n = 10\text{II}$. Kansas. Kingman Co.: 4 mi W, 0.5 mi N of Kingman, *B 17018a* (KANU).

EQUISETACEAE

Equisetum laevigatum A. Braun $2n = 108\text{II}$. Kansas. Pottawatomie Co.: KS 13, 2.3 mi NE of jct KS 13 & rd to Spillway State Park, NE of Manhattan, *F 2228* (KANU, KSC, NY, WET).

HIPPOCASTINACEAE

Aesculus glabra Willd. var. arguta (Buckley) Robins. $2n = 20\text{II}$. Kansas. Riley Co.: N side of I-70, 4 mi E of jct I-70 & KS 177, *F 1745* (KSC).

HYDROPHYLLACEAE

Hydrophyllum virginianum L. $2n = 18$. Iowa. Bremer Co.: Cedar Bend Conservation Park, ca 1 mi NW of Waverly, *FF 2263* (KSC, WET).

ISOETACEAE

Isoetes butleri Engelm. $2n = 22$. Kansas. Franklin Co.: 2 mi N, 1 mi W of Homewood, *BKF 18986* (KANU).

KRAMERIACEAE

Krameria lanceolata Torrey $2n = 6\text{II}$. Texas. Garza Co.: TX 207, 12.5 mi N of jct TX 207 & US 380, *FW 2013* (KSC).

MONOTROPACEAE

Pterospora andromedea Nutt. $2n = 24\text{II}$. New Mexico. Taos Co.: NM 3, 3.1 mi SSE of Sipapu Ski Area Ski Lodge, *FW 2165* (KSC, NY).

ONAGRACEAE

Stenosiphon linifolius (Nutt.) Heynh. $2n = 7\text{II}$. Kansas. Riley Co.: Riley Co 412, 2.35 mi WNW of jct Riley Co 412 & KS 113, *F 2244* (KSC, MO, NEB, NY).

OXALIDACEAE

Oxalis violacea L. $n = 14$. Kansas. Riley Co.: Riley Co 911, 0.9 mi S of jct Riley Co 911 & I-70, *FF 2210* (KANU, KSC, MEXU, NY).

POACEAE

ELYMUS SUBMUTICUS (Hook.) Smyth *n* = 14. Kansas. Jefferson Co.: 2 mi W, 2 mi N of Perry, *B 3631* (KANU). Nebraska. Dodge Co.: 0.5 mi E of Waterloo, *S 51891* (KANU). South Dakota. Brown Co.: 5 mi W, 4.5 mi N of Groton, *S 52228* (KANU).

ELYMUS VIRGINICUS L. var. GLABRIFLORUS (Vasey) Bush *n* = 14. Arkansas. Crawford Co.: 1.5 mi N of Figure Five, *S 52130* (KANU). Kansas. Douglas Co.: Baldwin City Lake, *SG 5695* (KANU).

ELYMUS VIRGINICUS L. var. VIRGINICUS *n* = *14*. Kansas. Franklin Co.: 0.5 mi N of Ottawa, *BS 4485* (KANU). Nebraska. Burt Co.: 1 mi W of Oakland, *S 51864* (KANU). Oklahoma. Texas Co.: 2 mi N of Guymon, *S 52069* (KANU). South Dakota. Miner Co.: 2.5 mi E of Roswell, *S 51546* (KANU).

POLEMONIACEAE

GILIA AGGREGATA (Pursh) Sprengel var. MACULATA M. E. Jones 2*n* = 14II. MÉXICO. Nuevo León: gravel rd to 18 de Marzo, 8.7 mi E of jct with México 57, N of Cerro Potosí, *FW 2058* (KANU, KSC, MEXU, NY).

PHLOX DIVARICATA L. subsp. LAPHAMII (Alph. Wood) Wherry 2*n* = 7II + 0-1 supernumeraries. Iowa. Bremer Co.: 4.5 mi SE of Waverly, *F 910* (KSC). 2n = 7II + 0-3 supernumeraries. Kansas. Riley Co.: N side of I-70, 4 mi E of jct I-70 & KS 113, *F 1732* (KSC).

PRIMULACEAE

ANDROSACE OCCIDENTALIS Pursh *n* = 10. Kansas. Pottawatomie Co.: Carnahan Creek Recreation Area, ca 6 mi NNW of US 24 & KS 13, *F 1737* (KSC); Riley Co.: Cico Park in NW Manhattan, *F 1733* (KSC).

RANUNCULACEAE

CLEMATIS FREMONTII S. Watson *n* = 8. Kansas. Osborne Co.: ca 5 mi S of Covert, *BM 17065* (KANU).

RANUNCULUS ABORTIVUS L. 2*n* = 8II. Kansas. Riley Co.: Wild Cat County Park, ca 4 mi NW of jct Riley Co 412 & KS 113, *F 2205* (KSC).

RANUNCULUS HISPIDUS Michaux var. HISPIDUS 2*n* = 8II. Kansas. Riley Co.: Cico Park in NW Manhattan, *F 2215* (KANU, KSC).

RANUNCULUS SCELERATUS L. var. SCELERATUS 2*n* = 16II. Kansas. Riley Co.: Cico Park in NW Manhattan, *F 2216* (KSC).

SCROPHULARIACEAE

Castilleja sessiliflora Pursh $2n$ = 12II. Kansas. Lincoln Co.: KS 181, 3.1 mi S of Sylvan Grove, *FF 1742* (KSC).

Digitalis purpurea L. n = 28. California. Mendocino Co.: CA 20 between Willits and Ft. Bragg, 14.1 mi E of jct CA 20 & 1, *FW 1895* (KANU, KSC, NY).

Penstemon albidus Nutt. $2n$ = 8II. Texas. Briscoe Co.: TX 207 SE of Mackenzie Reservoir, 4.7 mi SE of jct TX 207 & Farm Rd 3300, *FW 2018* (KSC, NY).

Penstemon ambiguus Torrey var. ambiguus n = 8. Texas. Garza Co.: TX 207, 12.8 mi N of jct TX 207 & US 380, *FW 2018* (KSC, NEB).

Penstemon ambiguus Torrey var. laevissimus (Keck) N. Holmgren $2n$ = 8II. MÉXICO. Chihuahua: México 45, 26.4 mi S of jct México 45 & 2, *FW 2132* (KANU, KSC, MEXU, NY).

Penstemon cobaea Nutt. var. cobaea n = 8. Oklahoma. Major Co.: OK 15, 12.2 mi E of Woodward Co line, *FW 2022* (KSC, NEB).

Penstemon eatonii A. Gray subsp. undosus (M. E. Jones) n = 8. Colorado. Montrose Co.: CO 141, 1.0 mi S of Uravan at San Miguel River, *FW 1813* (KANU, KSC, MEXU, NY).

Penstemon inflatus Crosswh. n = 8. New Mexico. Taos Co.: NM 3, 3.1 mi SSE of Sipapu Ski Area Ski Lodge, *FW 2164* (KANU, KSC, MEXU, NY).

Penstemon laetus A. Gray var. laetus $2n$ = 8II. California. Kern Co.: I-58, 11.3 mi NW of jct I-58 & CA 202, *FW 1922* (KANU, KSC, MEXU, NY).

Penstemon linarioides A. Gray subsp. linarioides n = 8. New Mexico. Catron Co.: US 180, 11.0 mi N of Grant Co line, *FW 2140* (KANU, KSC, NY).

Penstemon moffatii Eastw. subsp. moffatii n = 8. Utah. Grand Co.: I-70, 2.1 mi E of Thompson Exit, *FW 1825* (KANU, KSC, MEXU, NY).

Penstemon ophianthus Pennell n = 8. Colorado. San Miguel Co.: CO 141 in Dolores River Canyon, 0.1 mi S of Slick Rock, *FW 1808* (KANU, KSC, MEXU, NY).

Penstemon palmeri A. Gray var. palmeri n = 8. California. San Bernardino Co.: I-15, ca 5 mi W of jct I-15 & CA 68, *FW 1937* (KANU, KSC, NY).

Penstemon secundiflorus Benth. ex DC. n = 8. Colorado. Pueblo Co.: I-25, 0.7 mi S & 0.5 mi W of Graneros Gorge Exit, *FW 1781* (KSC).

Penstemon strictus Benth. subsp. strictus $2n$ = 8II. New Mexico. Taos Co.: NM 3, 3.1 mi SSE of Sipapu Ski Area Ski Lodge, *FW 2159* (KANU, KSC, MEXU, NY).

PENSTEMON TUBAEFLORUS Nutt. var. TUBAEFLORUS $n = 16$. Kansas. Douglas Co.: Baldwin City Cemetery, 1 mi S of Baldwin City, *F 969* (ISC, KSC, NEB).

PENSTEMON WRIGHTII Hook. $n = 8$. Texas. Jeff Davis Co.: TX 166, 8.9 mi W of jct TX 166 & 17 at Point of Rocks, *FW 1996* (KSC, MO, NEB, NY).

RESULTS AND DISCUSSION

Chromosome counts for 104 populations representing 78 species are reported, most from the Asteraceae and Scrophulariaceae. First reports are included for the following taxa: *Isoetes butleri* Engelm., $2n = 22$; *Penstemon eatonii* subsp. *undosus* (M. E. Jones) Keck, $n = 8$; *Penstemon linarioides* A. Gray subsp. *linarioides*, $n = 8$; *Penstemon wrightii* Hook., $n = 8$.

The number obtained for *Isoetes butleri* is consistent with numbers obtained for other species in the genus (Hickey 1984). The count for *Penstemon eatonii* subsp. *undosus* agrees with the number for subsp. *exertus* (A. Nels.) Keck reported by Nisbet & Jackson (1960). Similarly, the count of $n = 8$ for *P. linarioides* subsp. *linarioides* is the same as reported for subsp. *coloradoensis* (A. Nels.) Keck (Nisbet & Jackson 1960) and subsp. *compactifolius* Keck (Morefield & Schaack 1985). The count reported for *P. wrightii* fits the cytological trend of strict diploidy observed in Subsection *Centrathifolii* of *Penstemon*.

Most of the counts are in agreement with previously reported numbers for the taxa, however, two discrepant counts were noted. Bakshi (1959) reported a number of $2n = 16$ for *Pterospora andromedea*. A single New Mexico population counted was found to be $2n = 48$, suggesting the possibility of intraspecific polyploidy. The only other count which deviates from earlier reports is that for *Ranunculus hispidus* var. *hispidus*. Duncan (1980) reported a number of $n = 16$ for this taxon. A count from a single Kansas populations was found to be $n = 8$. A count of $n = 20$ was erroneously reported for *Carex inops* (Brooks 1985) due to a typographical error. The correct count for the population, included in this report, agrees with previous counts for the taxon.

Supernumeraries were observed in three species; *Polymnia canadensis*, *Phlox divaricata* subsp. *laphamii*, and *Pyrrhopappus rothrockii*. In *Polymnia* and *Pyrrhopappus* the number of supernumerary chromosomes observed was consistently one, however, in *Phlox*, numbers varied from $0-1$ in one population and $0-3$ in a second population.

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NOTES

THE TAXONOMIC PLACEMENT INTO SECTION OF TWO MEXICAN SPECIES OF *ASTRAGALUS* (FABACEAE)—At the completion of his revision of North American *Astragalus*, Barneby (1964, pp. 1156 – 1158) was compelled to leave seven binomials as "doubtful and imperfectly known species." Two of these, *Astragalus daleae* Greene and *Astragalus hartmanii* Rydb., were considered by Barneby to represent "good" species and were described with the detail of the others in his treatment. However, because the fruit is essential for subgeneric alignment of *Astragalus* species, and specimens available to Barneby were only in flower or in early fruit, he was obliged to omit the species from his subgeneric classification, to append them at the end of the taxonomic revision, and to simply suggest their probable close relatives. Recent collections from the northern Sierra Madre in Chihuahua and Durango, Mexico, now allow the descriptions of *A. daleae* and *A. hartmanii* to be completed, and the species to be subgenerically classified.

ASTRAGALUS DALEAE. Two collections have pods that are mature. The first is from the vicinity of the type locality: *Ripley & Barneby 14,187*, Durango, 20 mi W of El Salto, 8600 ft elev, 18 Oct 1965 (NY). The second extends the known range about 210 km northward: *Spellenberg & Zimmerman 6715*, Durango, 111 road mi NW of Santiago Papasquiaro, 2420 m elev, 19 Sep 1982 (ESAHE, ID, MEXU, NMC, NY).

The deflexed, tardily disjointing pods are narrowly lanceolate or linear-oblong in profile, from straight to evenly curved through 45° along the ventral suture, 7 – 12 mm long, about 2 mm in diameter, rounded at the base, contracted at the apex into a short, erect, cusp-like beak, triquetrously compressed, carinate ventrally by the ventral suture, sulcate dorsally, the lateral faces gently convex, the lateral angles abruptly rounded, the thin, pale green, white- or partly black-strigulose valves becoming stiffly papery, at first stramineous, but eventually darkening to almost black, inflexed as a complete septum; dehiscence apical and downward through the ventral suture, and ultimately through the septum. Seeds olive-brown, 1.5 – 1.6 mm long, smooth, sublustrous.

Barneby suggested that the relationship of *A. daleae* was with section *Micranthi*, and compared it directly with central Mexican *Astragalus hartwegii* Benth. The pods of *A. daleae* substantiate this relationship, but in size and shape they are more similar to those of *Astragalus vaccarum* A. Gray (also section *Micranthi*), a species occurring mostly at lower elevations to the east and north of Durango. The strong similarity of *A. daleae* to both these species readily places it in section *Micranthi*, where it differs from its congeners primarily by its comparatively large, herbaceous floral bracts.

Astragalus hartmanii. This species is distinctive by its large, narrow, ascending flowers. Until recently it was known from a single collection with only flowers made in 1891 near the San Diego Ranch by Hartman, a collector associated with the Lumholtz Archeological Expedition to northwestern Mexico. Based on Lumholtz's journals and present day maps, the type locality was estimated by Barneby (pers. comm.) to be a few miles southwest of present-day Viejo Casas Grandes, Chihuahua.

The species was rediscovered 21 kilometers upstream from the now delapidated Hacienda San Diego mansion on the Río Piedras Verdes in 1979 by an ornithology student, Wm. Baltosser, who was studying feeding habits of hummingbirds. He documented his work with voucher specimens, and among them was an *Astragalus* that had flowers only. It was misidentified as the closely related *A. giganteus* S. Wats., a species common in the region. The specimen was filed with that species at NMC until the error was discovered in 1986. This and more recent collections are: *Baltosser, s.n.*, Chihuahua, 2.4 km nw Colonia Juárez, 20 Apr 1979 (NMC); *Spellenberg, Corral, Muldavin, Brunt 9163*, 5 km nw of Colonia Juárez on the Río Piedras Negras, 8 Jun 1987 (BYU, ENCB, ESAHE, ISC, MEXU, NMC, NY); *Spellenberg et al. 9178*, 46 air km sw of Casás Grandes on the Río Piedras Verdes, 9 Jun 1987 (ENCB, ESAHE, MEXU, NMC, NY, RSA) (cytological voucher, $n = 11$) (ESAHE represents the institution of Corral).

As far as is known, *A. hartmanii* is restricted to the drainage of the Río Piedres Verdes, where it grows under riparian vegetation of *Populus, Juglans, Fraxinus, Platanus* and *Salix* and on slopes along the river among *Quercus* and *Pinus*. This river flows past the old Hacienda San Diego, now part of a communal *ejido*, and the vegetation in area is very disturbed by domestic livestock. The only *Astragalus* found was the weedy *A. wootoni* Sheld. The river was used for access to the Sierra Madre by the Lumholtz Expedition, and the Hartman collection may have originated somewhat upstream from the hacienda headquarters. Much farther upstream, near the location documented by the collection *Spellenberg et al. 9178*, is the village known locally as "El Huili," but mapped as the *ejido* Ignacio Zaragoza. *Astragalus hartmanii* also occurs there as an occasional robust, ungrazed weed along the otherwise barren dirt streets.

The corolla of *A. hartmanii* is lemon-yellow, rather than "apparently whitish" as surmised by Barneby from the old Hartman collection (GH, K, NY!). According to the label on the Baltosser specimen, the ascending flowers supply nectar to black-chinned hummingbirds. The flowers on the modern collections are about 85% the length of those on the Hartman collection, but the species will still key correctly in Barneby (1964) if lead 12 (p. 89) is modified slightly to read, "Flowers large, ascending, the banner ± 3.2 cm long, the petals yellowish." Plants attain 20 – 45 cm in height. The first peduncles form only 10 – 15 cm from the ground.

The heavy, developing pods of *A. hartmanii* often cause the raceme to lie on the ground, the humistrate pods then twisting on the thickened pedicel so that the tips are oriented upward. The pods were dry and still attached to the peduncles when we revisited the Colonia Juárez population in July. Pods are sessile, 15 – 35 mm long, 12 – 18 mm broad, and 8 – 10 mm deep, in profile varying from plumply ovoid to oblong, convex on the ventral surface when short, incurved through 40° when longer, rounded at the base, contracted distally into a short, triangular-cuspidate, laterally compressed, unilocular beak, otherwise bladdery-turgid, dorsiventrally compressed, shallowly sulcate dorsally, more openly sulcate ventrally, the sides rounded. The green valves are at first about 1 mm thick, lined on the inside with glistening hairs, drying to become at first very stiffly leathery, stramineous, faintly cross-reticulate and wrinkled perpendicular to the suture, and finally stiffly papery and blackish, lined within with an open white reticulum of collapsed cells, inflexed below the beak as a complete septum about 5 mm wide. Dehiscence is very tardy, the beak splitting and gaping slightly. Seeds are 2.7 – 2.8 mm long, brownish-black, smooth, dull.

Working only with Hartman's flowering material, Barneby (1964) proposed that the alliance of *A. hartmanii* was either with the sections *Sarcocarpi* because of the resemblance of the flower to *A. sanguineus* Rydb. or with the section *Mollissimi* because of habit and nature of pubescence (p. 1157). He also wrote (p. 750) that his monotypic section *Gigantei* may need expansion to include *A. hartmanii*, the two species being "somewhat similar in character." The three sections are sequential in his text and closely related, the *Sarcocarpi* differing from the others by pods that are usually very thick-walled and by the nature of the pubescence on the herbage. The large stature, the reflexed flowers, and the pods persistent upon the pedicels differentiate the *Gigantei* from the *Mollissimi*. As far as is known, a chromosome number of $2n = 22$ occurs consistently in all three

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sections (Spellenberg 1976); the number reported herein for *A. hartmanii* is consistent with this, but $2n = 22$ also is found in many other North American sections and, therefore, in this instance is not a definitive indication of relationship.

The stiffly papery pod that lacks a well defined endocarp lining a thickly spongy mesophyll, combined with the pubescence of short curly hairs intermixed with a few longer straight ones, exclude *A. hartmanii* from the *Sarcocarpi*. However, the assignment of *A. hartmanii* to either of the other two sections is made with some difficulty, for the species combines several features from each. It tends to be mesophytic, and have a robust, leafy habit like *A. giganteus*, but it has the tendency to initiate peduncles near the ground, more characteristic of the *Mollissimi*. Its large, tumid, spreading-ascending, and often humistrate pods, stiffly papery at maturity, have more in common with the fruits of the *Mollissimi* (especially those of the *A. helleri* Fenzl in the subsection *Orthanthi)* than with the erect, leathery ones of the *Gigantei*, even though they are glabrous, mature to blackish, and tend to persist on the pedicel as in the *Gigantei*. The loosely-flowered racemes of 10 – 30 ascending flowers are also more similar to those of the *Mollissimi* than to the denser racemes of more numerous, declined flowers of the *Gigantei*. Within the section *Mollissimi, A. helleri* is also a robust plant with long, ascending (but red) flowers, and is probably hummingbird-visited. Features of its distinct flowers served to delineate the monotypic subsection *Orthanthi* (Barneby 1964, p. 747) from the also monotypic subsection *Mollissimi*, which contains only the widespread and variable *A. mollissimus*.

It is our belief that *A. hartmanii* by characteristics of its flowers, pubescence, and pods, belongs in the section *Mollissimi*. It then is placed somewhat less certainly as the second species in the subsection *Orthanthi*, the technical description of the section necessarily needing expansion to include yellow flowers. It is unlikely that the two species have an exact common ancestor subsequent to the radiation of section *Mollissimi*, for *Astragalus helleri* occurs only on Mt. Orizaba in central Mexico. Compared to it, *A. hartmanii* may be viewed as a parallel modification from ancestral types akin to less specialized forms now in the variable subsection *Mollissimi*, differing conspicuously from *A. helleri* by its much sparser pubescence, yellow flowers, and glabrous pod.

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CYPERUS DIFFORMIS L. (CYPERACEAE) NEW TO TEXAS—*Cyperus difformis* L. is a weedy annual sedge, native to Eurasia, that is now widespread in Central and North America. Lipscomb (1980) discussed the distributional history of this species in the New World and listed its occurrence in California, Arizona, Oklahoma, Louisiana, Alabama, Virginia and North Carolina as well as in Mexico and Nicaragua. Webb and Dennis (1981) have since reported it from Tennessee, and Lemaire (1970) listed an unusual occurrence from Nebraska.

Cyperus difformis was first collected in Texas in 1981 and is now known from about twenty sites in the Austin-Round Rock area of Travis and Williamson counties. At many of these sites, *C. difformis* occurs in perennially wet mud in very shallow water over limestone or dolomite in unshaded creek beds, especially where these streams have been recently channelized or otherwise disturbed; it occurs less frequently on creek banks and lake shores, and has also been collected from a small drainage ditch, a wet lawn, and from the cracks in an asphalt parking lot. Since *C. difformis* turned up in 1988 at several sites where it was sought and not found in earlier years, and since it is now present in two major Texas river systems (the Brazos and the Colorado), this aggressive sedge can be expected to spread to disturbed wet habitat in other parts of Texas and to remain as a persistent member of the state flora.

Specimens collected: TEXAS: Travis Co.: Colorado River at US Rt. 183, 1 Oct 1981, *Carr 3437* (TEX), 26 Oct 1981, *Carr 3604* (SMU, TAMU); Bull Creek N of Loop 360, 0.6 mi NE of Lakewood Dr., 9 Oct 1981, *Carr 3511* (TAMU), 13 Aug 1982, *Carr 4207*; 5 Sep 1982, *Carr 4282* (SMU, TAMU); Town Lake at Loop 1, 6 Sep 1982, *Carr & Wade 4293* (SMU); Bull Creek, Lakewood Dr. at Loop 360, 21 Sep 1986, *Carr & Price 7840* (TAMU); 1 Aug 1988, *Carr & Price 9099*; roadside ditch and parking lot, Krieg Fields, Austin, 16 Sep

1987, *Carr 8727*, 17 Aug 1988, *Carr & Brown 9125* (TEX); Colorado River at Hornsby Bend, 28 Aug 1988, *Carr & Price 9186*; Shoal Creek S of W 34th St., Austin, 2 Sep 1988, *Carr 9195*; Shoal Creek N of W 38th St., Austin, 2 Sep 1988, *Carr 9200*; Shoal Creek S of W 29th St., Austin, 2 Sep 1988, *Carr 9205* (TEX); Shoal Creek N of Greenlawn Pkwy, Austin, 5 Sep 1988, *Carr & Price 9211* (TEX); tributary of Bull Creek, N of Floral Park Dr., Austin, 7 Sep 1988, *Carr & Price 9214* (TEX); slough, E side Lake Austin 1 mi N of Tom Miller Dam, Austin, 11 Sep 1988, *Carr 9236* (TEX); Onion Creek at mouth of Williamson Creek, Austin, 12 Sep 1988, *Carr & Brown 9238* (TEX); Onion Creek at Wm Cannon Dr., Austin, 12 Sep 1988, *Carr & Brown 9239*; Wells Branch at Walnut Creek Metro Park, Austin, 13 Sep 1988, *Carr 9245* (TEX); Tannehill Branch at Bartholomew Park, Austin, 14 Sep 1988, *Carr & Brown 9246* (TEX); Little Walnut Creek at Dottie Jordan Park, Austin, 14 Sep 1988, *Carr & Brown 9247* (TEX).

Williamson Co.: roadside ditch, 13200 Pond Springs Rd., 8 Sep 1988, *Carr & Brown 9216* (TEX); Lake Creek at US Rt. 183, 9 Sep 1988, *Carr & Brown 9224* (TEX); Brushy Creek at IH-35, Round Rock, 10 Sep 1988, *Carr 9235* (TEX).

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RANGE EXTENSION OF *ANTENNARIA AROMATICA* EVERT (ASTERACEAE: INULEAE)—Evert (1984) stated that *Antennaria aromatica* Evert was apparently not abundant in nature, reporting that the species occurred in three counties in Montana (Carbon, Cascade, and Gallatin) and seven localities in Park County, Wyoming. The species tends to be associated with limestone, talus, and xeric habitats at elevations between 1372 and 2928 m.

Bayer (1987) included only eight specimens of the 'narrowly restricted endemic' *A. aromatica* in a morphometric analysis of western dioecious *Antennaria*. He concluded that although *A. aromatica, A. media* Greene, and *A. umbrinella* Rydb. are morphologically similar and tend to intergrade into one another that *A. aromatica* was perhaps the most distinct. Based on our studies of western North American *Antennaria* (Chmielewski and Chinnappa 1988A, B, C, D) we consider this species to be distinct

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SIDA 13(2):256. 1988.

from all others. *Antennaria aromatica* is differentiated from other species of *Antennaria* by its dark brownish-green phyllaries, copious and persistent glandulosity, widely cuneate-spatulate basal leaves, and distinctive citronella-like odor (Evert 1984). In contrast to Evert (1984) and Bayer (1987) our observation of herbarium specimens does not support the contention that the species is restricted to southwestern Montana and adjacent parts of Idaho and Wyoming. We include the following list of locations to complement those previously reported by Evert (1984).

CANADA. **Alberta**, 25.7 km SSW of Lundbreck, Table Mountain, 49°-21'N, 114°-18'W, Oldman River Watershed, 1676-1829 m, limestone, 20 Jul 1972, *C. D. Bird & T. Koponen 28669* (UAC 25322). **British Columbia**, Relay Creek Cabin, E of Small Lake, 51-12'N, 122°-57'W, 2075 m, convex SE facing gentle slope below rocky cliff, primarily lichen covered rock with some juniper, scrubby *P. albicaulis*, *Abies* and *Dryas*, alpine, fellfield W of saddle, 17 Jul 1978, *C. Selby 289* (UBC V168983).

U.S.A. **California. Mono Co.**: 1.0 km N, 1.0 km W of the summit of Wheeler Peak, Sweetwater Range, approximately 3445 m, steep, turfy slope, rocky soil on an east facing slope, probably under winter snow, 22 Jul 1977, *K. L. Bell & R. E. Johnson* 766 (WS 283425). **Montana. Carbon Co.**: Quad Cr., 37 km SW of Red Lodge, 2896 m, coarse talus, 7 Aug 1955, *A. Cronquist 8092* (DAO 466067, 466065; UBC V51550); NE end of Beartooth Plateau, below Hwy 212, steep rock slope, wind blown, west facing slope, 22 Aug 1983, *B. Neely & F. Smith 1665* (RM 362205). **Cascade Co.**: King's Hill, 72 km SSE of Great Falls, alpine zone, 24 Jul 1948, *R. F. Daubenmire 48231* (WS 181768). **Gallatin Co.**: Wallrock Basin, approximately 19 km NW of Wilsall, 8 Jul 1921, *W. N. Suksdorf 1063* (WS 134519); Bridger Mountains, Frazier Lake Area, E of Hardsrabble Peak, 29 Jun 1977, *Frank Forcella* (MONT 69298).

The most significant of these collections are from Alberta, British Columbia, and California. Each of these represents new reports for the respective regions and extend the range of the presumed endemic approximately 350 km to the NNW, 850 km to the NW, and 1100 km to the SW. With the inclusion of these specimens the habitat requirements of the species still appear to be fairly specific, the species occurring predominantly on limestone or talus. One minor additional difference is that a single collection was reported from approximately 3445 m elevation, whereas previously (Evert 1984) the species was reported from elevations up to 2928 m.—*J. G. Chmielewski, Department of Biology, University of Waterloo, Waterloo, Ontario, N2L 3G1, and C. C. Chinnappa, Department of Biological Sciences, University of Calgary, Calgary, Alberta, T2N 1N4, CANADA.*

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HIERACIUM UMBELLATUM (ASTERACEAE) IN WEST VIRGINIA AND QUEBEC.—On Sep 1985 I collected a specimen of the circumboreal hawkweed, *Hieracium umbellatum* L., from a small patch in the disturbed clearing about the communications tower near the summit of Spruce Knob, Pendleton County, West Virginia (*Uttal 14048*; VPI). Interestingly, another specimen from the same site was independently collected and identified five days later (*E. E. Hutton s.n.*; VPI). These collections constitute a new record for West Virginia and the southeastern United States. Considering the long history of abundant botanizing by competent botanists on Spruce Knob, the species may well be a recent adventive at this site or it would have been detected before. The plant should be watched for at other high elevation sites elsewhere in the Appalachian system.

Recent manuals aver that *Hieracium umbellatum* does not occur in North America south of Ontario and northern Michigan. In 1898, the first edition of the Britton and Brown Illustrated Flora (III:268) stated that the species occurs in Ontario in the lower St. Lawrence River area. In the second edition of this flora (1936, III:330), the St. Lawrence report was stated to be an "apparent error." Subsequently, the species was excluded in North America east of Michigan. In the latter work the species is listed as *Hieracium scabriusculum* Schwein.

Contradictorily, we have three specimens from the St. Lawrence drainage in southwestern Quebec in VPI: Chambord, comté de Roberval, 12 août 1974 (*R. Cayouette 10604 et al.*); Mistassini, comté de Roberval, 12 août 1963 (*J. Cayouette s.n. et.*); Sainte-Placide, comté de Charlevoix, 27 août 1971 (*J. Cayouette s.n.*). All are from ruderal sites. The first two are from the Lac St. Jean area, which drains into a tributary of the St.

Lawrence, but the third is from Lac des Deux-Montagnes, an embayment of the lower St. Lawrence, 70-80 km west of Montreal. All were originally determined as *Hieracium scabriusculum* by R. Cayouette of QUE, and annotated *H. umbellatum* by myself. Thus *H. umbellatum* definitely occurs in the lower St. Lawrence River area. The species should be watched for in boreal ruderal sites farther east in Canada and in the adjacent United States.

American specimens of *Hieracium umbellatum* tend to have somewhat more dentate leaves than do Eurasian ones, and have been determined as *H. umbellatum* var. *scabriusculum* (Schwein.) Farw. by botanists who desire to distinguish them from the nominate Eurasian variety.—*Leonard J. Uttal, Department of Biology, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061.*

FOUR NEW RECORDS OF *CYPERUS* (CYPERACEAE) IN ARKANSAS—*Cyperus haspan, C. oxylepis, C. brevifolioides,* and *C. sesquiflorus* are recorded as new to the flora of Arkansas. Voucher specimens are deposited in herbaria as cited..

CYPERUS HASPAN L. Calhoun Co.: gravel roadside, 3 mi SE of Hampton, common in seepage area, edge of cutover sweet bay magnolia thicket, stems weak and supported on adjacent marshy vegetation, 3 Sep 1987, *Sundell, Amason & Etheridge 7854* (NLU, UAM, UARK).

Away from the larger rivers, permanently wet habitats are rare in southern Arkansas. *Cyperus haspan* was collected at the margin of a disturbed, largely cleared *Magnolia virginiana* swamp. Noteworthy associates were *Lorinseria areolata, Smilax laurifolia, Itea virginica, Aronia arbutifolia, Lyonia ligustrina*, and *Viburnum nudum*. Orzell and Bridges (1987) recorded several other taxa from Arkansas that represent similar Gulf Coastal Plain-Calhoun County disjunctions.

CYPERUS OXYLEPIS Nees ex Steud. Union Co.: beside County Road 25, 1 mi N of Urbana, near a branch of Richmond Creek, Sec 10, T18S, R13W, edge of vegetation-less area in salty runoff area from oil wells, 22 Oct 1987, *Thomas 103,096* (NLU, UAM).

Unlike *Scirpus robustus*, another coastal plain disjunct of the Union County salt marshes, *Cyperus oxylepis* is not always associated with brackish soils. A specimen is recorded by MacRoberts (1979) from Caddo Parish, Louisiana, bordering southwest Arkansas.

Cyperus brevifolioides Delahoussaye & Thieret. Garland Co.: 2 mi E of Hot Springs, Cedar Creek at Hwy 70, small colony on gravel bar, 10 Oct 1987, *Sundell 8010* (NLU, UAM, UARK). [= *Kyllinga brevifolioides* (Delahoussaye & Thieret) G. Tucker].

This is an Asiatic species only recently recorded in the New World by Delahoussaye and Thieret (1967). Out of some 1200 specimens examined for their study of *Cyperus* subgenus *Kyllinga* in the continental United States, those authors found only nine sheets of *C. brevifolioides*, sporadically introduced in four eastern states: Connecticut, Pennsylvania, Virginia, and North Carolina. All specimens except one had been misidentified as the similar, more common, and pantropic *C. brevifolius*, especially prevalent in the southeast on the Gulf Coastal Plain. Neither species is recorded for Arkansas; however, Delahoussaye and Thieret map a single outlying collection of *C. brevifolius* from the southeast corner of Oklahoma, and reports for northern Louisiana include the two Arkansas border parishes, Morehouse in the northeast (Thomas et al. 1980) and Caddo in the northwest (MacRoberts 1979).

The Arkansas plants in question have round (not oval or rectangular) inflorescences, spikelets averaging four mm in length (rather than three), smooth (not denticulate) scale keels, two stamens (rather than one) per floret, and obovate achenes 1.30 – 1.45 mm long (stipe-like base included). In all but achene length, which is intermediate, the character states fit Delahoussaye and Thieret's concept of *Cyperus brevifolioides*. In a discussion of taxonomically useful characters in *Kyllinga*, Tucker (1987) reports that "...such characters as number of stamens and presence of spinulose prickles on the keels of the scales...frequently vary within individuals of the same species and sometimes within spikes of a single plant." More reliable characters for *C. brevifolius* (Tucker 1984) are anther length (0.8 – 1.1 mm) and the erect disposition of the longest inflorescence bract. (*C. brevifolioides* does not occur in Mexico and Central America, the geographic focus of Tucker's 1984 revision.) In the Arkansas material, dried anthers measure 0.5 – 0.7 mm and the bract varies from erect to horizontal. Without resorting to the Asian literature, the best determination of the specimens in question is *C. brevifolioides*.

Cyperus sesquiflorus (Torr.) Mattf. & Kukenth. in Engl. Drew Co.: Monticello, low, seasonably moist wood margin, 16 Aug 1987, *E. Sundell 7816* (UAM). [= *Kyllinga odorata* Vahl].

This species was cited for southeastern Arkansas by Godfrey & Wooten (1979); however, Smith (1978, 1980 Supplement) has seen no voucher

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material and was not able to provide a geographic locality within the state.

Cyperus sesquiflorus is readily distinguished from the morphologically and ecologically similar *C. tenuifolius* (Steud.) Dandy in Exell. only by the mature achenes which are black rather than yellow to brown and possess a broad, whitish callus-like stipe. Tucker (1984) states that achenes are "less important to the taxonomy of *Kyllinga* than in any genus of Cyperaceae" with which he is familiar. However, he agrees with Delahoussaye and Thieret (1967) that the dark achenes with paler bases are indeed distinctive of this species. The latter authors record *C. sesquiflorus* from several locations in northern Louisiana and Oklahoma, and the species will most likely prove to be rather common in southern Arkansas as new collections with mature achenes are critically examined and as collections determined *C. tenuifolius* are reexamined.—*Eric Sundell, Dept. of Natural Sciences, Univ. of Arkansas at Monticello, Monticello, AR 71655, U.S.A. and R. Dale Thomas, Dept of Biology, Northeast Louisiana Univ., Monroe, LA 71209, U.S.A.*

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CAREX SYCHNOCEPHALA (CYPERACEAE), NEW TO MISSOURI—In the course of a Missouri Department of Conservation supported survey of Little Bean Marsh, Platte County, Missouri, *Carex*

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sychnocephala Carey was found growing on the shores of the Little Bean Lake portion of the Little Bean Marsh Natural Area. *Carex sychnocephala* is most often found in hydric habitats from Ontario and New York west to Alberta, Washington, and Colorado (Hermann 1970). The nearest reported occurrence is approximately due north about 150 mi in Monona County. Iowa (Gr. Plains Fl. Assoc. 1977). It is also reported in several counties along Iowa's northern border with Minnesota (Gilly 1946; Gr. Plains Fl. Assoc. 1977). Little Bean Marsh lies on the bed of an old Missouri River meander and is subject to repeated flooding. *Carex sychnocephala* is the third member of the Cyperaceae newly found in Missouri from the marsh: *Eleocharis atropurpureus* and *Scirpus saximontanus* were recently reported from similar habits by Castaner (1985).

Voucher *Castaner 10089* (WARM, MO) is briefly described: Height, including raised inflorescence bracts, to 30 cm; flowering culms themselves to 15 cm; vegetative leaves 11 – 20 cm long, to 1.5 mm wide; head of 1-several congested spikes, 1.5 – 2 cm long; inflorescence bracts to 15 cm long; perigynia 5 – 6 x 0.5 – 1 mm.—*David Castaner, Biology Dept., Central Missouri State Univ., Warrensburg, MO 64093 – 5053, U.S.A.*

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NOTEWORTHY RANGE EXTENSIONS FOR *JUGLANS CINEREA* (JUGLANDACEAE) AND *ELEOCHARIS ERYTHROPODA* (CYPERACEAE) IN MISSISSIPPI—White walnut, *Juglans cinerea* L., is known from the Tennessee River Hills, the North Central Plateau, the Pontotoc Ridge and the Loess Bluff regions of Mississippi. Its southwestern occurrence in the state was reported by Little (1971) in Carroll County. On June 15, 1988, the authors located two specimens of *J. cinerea* on a rich, calcareous loess bluff drained by Ballground Creek in Warren County, Mississippi (*Bryson & Morris 8075*, SWSL - Southern Weed Science Laboratory herbarium, Stoneville, MS, duplicates to be dis-

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tributed; *Morris & Bryson 3131*, SWSL). The Warren County station for *J. cinerea* is not only a range extension of about 115 km southwest in Mississippi, but it may also represent the southernmost station for this species in the United States.

Eleocharis erythropoda Steudel is a rhizomatous species known from as far south as North Carolina (Radford et al. 1968), Arkansas, and Tennessee (Steyermark 1977). The first records of its occurrence in Mississippi are based on collections from Oktibbeha County, 2 mi NE Clayton Village, on a low area below a chalk outcrop, 2 May 1981 (*Bryson 3146*, ctb - Charles T. Bryson personal herbarium, IBE) and 4 mi NW Starkville, near Trim Cane Creek, in an open area subject to periodic inundation, 6 May 1981 (*McDaniel 25,026*, ctb, IBE). The authors discovered a colony of *E. erythropoda* in Warren County, 0.9 mi N Redwood in a low, open area near the base of a calcareous loess bluff, on heavy clay soil, with limestone fragments, 15 June 1988 (*Bryson & Morris 8025*, ctb, SWSL, duplicates to be distributed; *Morris & Bryson 3125*, SWSL). The Warren County station is about 210 km southwest of the two locations in Oktibbeha County.—*Charles T. Bryson, USDA-ARS, Southern Weed Science Laboratory, Stoneville, MS, 38776, U.S.A. and M. Wayne Morris, Botany Department, The University of Florida, Gainesville, FL, 32611, U.S.A.*

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CORRECTION—Due to faulty proofreading on my part an error appeared in my paper "Lectotypification and status of *Vaccinium margarettae* Ashe (Ericaceae)" (Sida 13:65 – 66. 1988) which confuses the sense of the paper and therefore needs correction. At present, the lead sentence in the first paragraph reads "Ashe (1918) described *Vaccinium margarettae* from Rabun County *South Carolina with* designation of holotype." Corrected, this sentence should read with the italicized words reading "*Georgia without*."

The author apologizes for this error and appreciates the editor printing this correction.—*Leonard J. Uttal, Department of Biology, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061, U.S.A.*

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TWO NEW SPECIES OF *VALERIANA* (VALERIANACEAE) FROM CERRO DE TEOTEPEC, GUERRERO, MÉXICO

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ABSTRACT

Two new species, **Valeriana bryophila** and **Valeriana gallinae**, from Cerro de Teotepec in Guerrero, are described. *Valeriana gallinae* is closely related to *V. pilosiuscula*, differing most obviously in having fruits that are glabrous and lanceolate, rather than hirsute or pilose and ovate. The relationships of *V. bryophila* are less obvious; characters of the inflorescence and fruits suggest a possible relationship with *V. pulchella*, a species that is perennial rather than biennial, and in which the basal leaves are compound rather than simple.

RESUMEN

Se describen dos especies nuevas de Cerro Teotepec, Guerrero, México. *Valeriana gallinae* asemeja a *V. pilosiuscula* Mart. & Gal., pero se distingue por frutos lanceolados y glabros en lugar de frutos ovados y pilosos o hirsutos. Las relaciones de *V. bryophila* son ms enigmticas; parece superficialimente a *V. pulchella*, una especie perene con hojas compuesta. Al obstante la especie nueva es bianual y presenta hojas basales simples.

During the course of field work for a revisionary study of the *Valeriana* of México and Central America (Barrie 1989), two new species were discovered in the fir forest on Cerro de Teotepec in the state of Guerrero, México.

Cerro de Teotepec (17°27′N; 100°10′W; elevation 3550 m) is the highest peak in the southern Pacific coastal state of Guerrero. Elevations between 2800 and 3300 m are dominated by *Abies religiosa* (Kunth) Schlecht. & Cham. At the highest elevations, the firs are replaced by *Pinus hartwegii* Lindl.

According to Rzedowski (1978), fir forests in México occur as insular patches of vegetation on steep slopes at elevations of 2400 – 3600 m. They require cool, moist conditions with upwards of 1000 mm of precipitation per year and dry seasons of less than four months duration. The fir forest of Cerro de Teotepec is quite isolated. While there may be scattered small stands closer, the nearest fir forest of appreciable size grows in the mountains north of Cuernavaca, Morelos, some 225 kilometers distant.

The two species described in this paper were discovered growing in the fir forest near the road that runs east from the village of Puerto del Gallo

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SIDA 13(3):265 – 272. 1989.

towards Chilpancingo. They dropped out when the road descended into the pine-oak-alder forest below 2800 m. Whether they occur above the fir forest, in the *Pinus hartwegii* zone, is unknown.

Valeriana **bryophila** Barrie, sp. nov. Fig. 1.

Herba biennis, gynodioecia, ad 30 – 60 cm alta; glabra vel glabrata; purpureo-maculata. *Folia inferiora simplicia, ad 3.5 – 10.0 cm longa; petioli gracili, 1.7 – 8.5 cm longi; laminae reniformis vel late ovatae; folia superiora plerumque ternata, pinnata raro; 1.6 – 7.5 cm longa. Inflorescentia apicalis, dichotoma.* Bracteae lineares vel oblancolatae, 3.0 – 10.0 (20.0) mm longae, 0.4 1.0 (4.0) mm latae; basis descreta vel connata. Bracteolae fructus aequantes quam paulo superantes; linearae, bases connates. Calyx 9 – 11-fidus; limbi plumosi, 2.0 – 2.5 longi in fructu. Corolla florum hermaphroditicorum 3.5 – 4.8 mm longa; corolla florum femineorum 1.6 – 2.2 mm longa. Stamina et stylus exserti. Cypsela 1.8 – 2.8 mm longa, 0.8 – 1.2 mm lata; ovata, glabra. *Habitat in tegibus muscorum fonticulisque.*

Biennial, gynodioecious herbs, 30 – 60 cm tall, stem, leaves, and inflorescence purple-maculate. ROOT tuberous; simple or bifurcate; 1.5 – 4.0 cm long, 1.0 – 1.5 cm wide; fusiform. STEM 15 – 45 (85) cm long, 2 – 3 mm wide; glabrous, or puberulent at the nodes only. LEAVES basal and cauline; the basal and lowest pairs of cauline leaves simple, long-petiolate; 3.5 – 10.0 (22.5) cm long; the petioles slender, 1.7 – 8.5 (20.0) cm long, 1 mm wide, base free or connate; the blades 0.7 – 2.5 cm long, 0.8 – 4.3 cm wide, ovate to oblate or reniform, base cordate, less commonly cuneate or truncate, apex rounded to acute, margin irregularly dentate or lobed; glabrous; the upper cauline leaves ternate, rarely pinnate, 1.6 – 7.5 cm long; the petiole 0.5 – 4.0 cm long, 1.0 mm wide, base connate; blades 1.2 – 5.2 cm long, 1.4 – 2.8 cm wide, elliptic to deltoid; the terminal leaflet 11 – 30 mm long, 5 – 15 mm wide, the lateral leaflets smaller, 6 – 17 mm long, 1 – 8 mm wide, elliptic to ovate, base cuneate, apex acute, margins and vestiture as in simple leaves. INFLORESCENCE terminal, often with lateral inflorescences arising from the lowest pair of leaf nodes; dichotomous throughout; in flower 2.5 – 10.0 cm long, 3.0 – 10.0 cm wide; in fruit 10 – 16 cm long, 10 – 14 cm wide; glabrous, or puberulent at the nodes only. BRACTS 3 – 10 (20) mm long, 0.4 – 1.0 (4.0) mm wide; linear to oblanceolate; base free or connate; apex acute; margins entire. BRACTLETS equal to or slightly longer than mature fruits, 1.9 – 3.0 mm long, 0.2 – 1.0 mm wide, linear, base connate, apex acute, margin scarious. CALYX 9 – 11-fid, the plumose segments 2.0 – 2.5 mm long on the mature fruit. COROLLA white to pink; infundibular; pilose within, glabrous without; corollas of hermaphroditic flowers 3.5 – 4.8 mm long; the tube 2.2 – 3.2 mm long, 0.9 – 1.2 mm wide; the lobes 1.3 – 1.6 mm long, 0.7 – 1.4 mm wide; apices rounded;

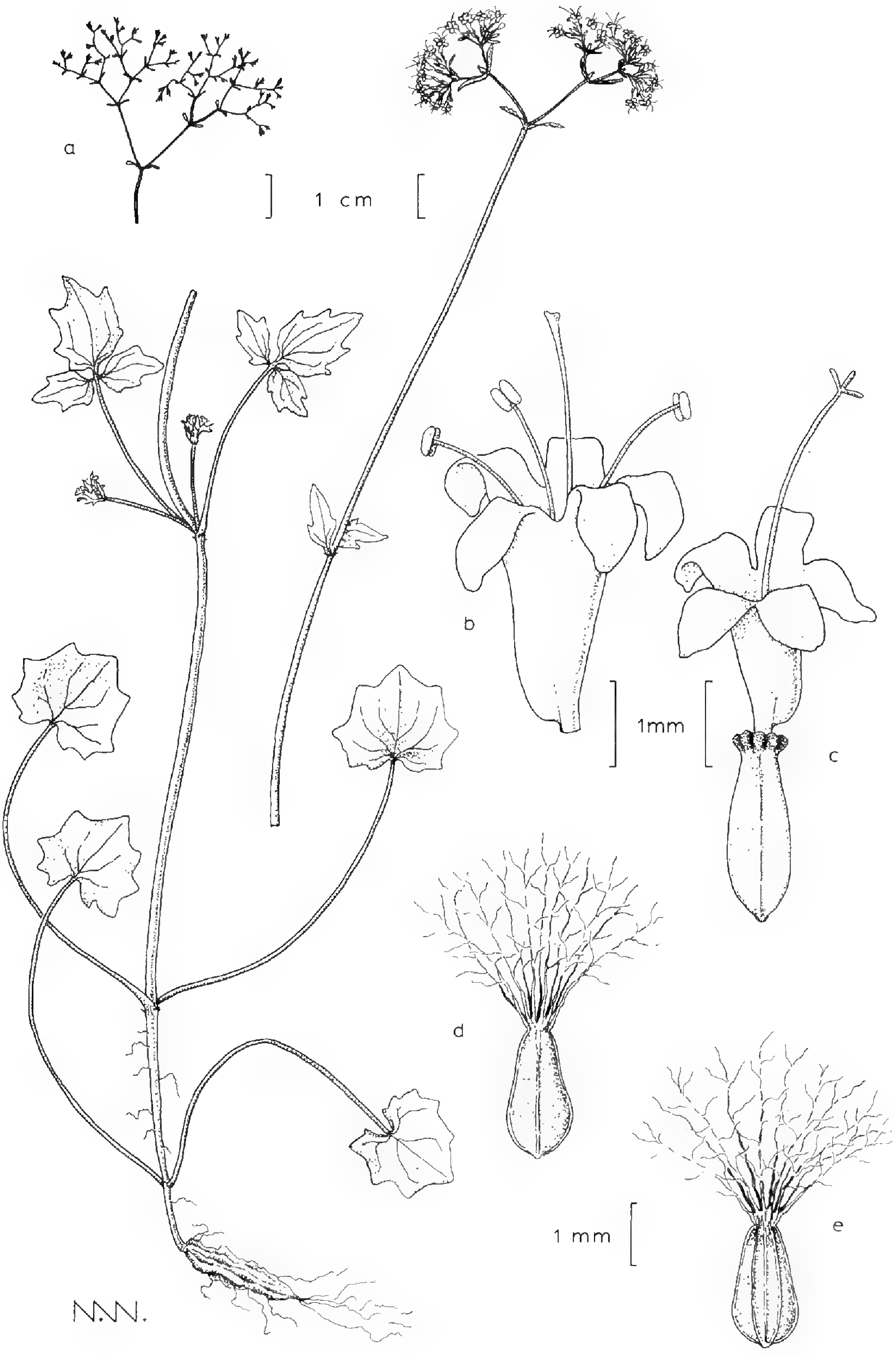

FIG. 1. *Valeriana bryophila*, from holotype. a. terminal branchlet of infructescence; b. corolla, anthers and immature style, hermaphroditic flower; c. female flower; d. cypsela, adaxaial surface; e. cypsela, abaxial surface.

the tube of female flowers 1.6 – 2.2 mm long, 0.6 – 1.8 mm wide; the lobes 0.7 – 1.2 mm long, 0.5 – 1.0 mm wid; apices rounded. STAMENS strongly exserted, 2.5 – 3.7 mm long, the filaments 2.2 – 3.4 mm long, adnate to the tube for 1/2 – 3/4 of its length; anthers 0.5 – 0.7 mm long. STYLE of hermaphrodites 4.4 – 5.2 mm long; that of females 3.8 – 4.5 mm; stigmas linear, 0.2 mm long. CYPSELA green to purple-maculate; 1.8 – 2.8 mm long, 0.8 – 1.2 mm wide; ovate; veins simple, the abaxial lateral veins parallel with the margin; glabrous. Chromosome number unknown.

PHENOLOGY: Flowering and fruiting Aug-Dec.

DISTRIBUTION: In wet seeps and moss mats, in *Abies* forest, Cerro de Teotepec, 2800 – 3400 m. Also on Cerro Alquitrán, south of Chilpancingo, Guerrero.

TYPE: MEXICO. GUERRERom E of Puerto del Gallo on the road to Filo del Caballo, 24 Aug 1984, *Fred R. Barrie 954* (HOLOTYPE: TEX; ISOTYPES: MEXU, MICH, US).

Other specimens examined: MEXICO. GUERRERO: 14.5 km E of Puerto del Gallo on the road to Filo de Caballo, 23 Nov 1983, *Barrie 694* (MEXU, TEX); 19 km E of Puerto del Gallo, 23 Nov 1983, *Barrie 700* (MEXU, TEX); 17 km E of Puerto del Gallo, 24 Aug 1984, *Barrie 956* (MEXU, TEX); steep slopes near summit of Cerro de Teotepec, 12 Nov 1973, *Breedlove 36076* (MEXU); Cerro de Teotepec, 5 Dec 1963, *Feddema 2928* (MICH); plantas cultivada en la ciudad de México, procedentes de la cumbre del Cerro Alquitrán, 28 Jun 1967, *anonymous, s.n.* (ENCB).

The combination of simple, long-petiolate basal and lower cauline leaves with the upper leaves compound, ovate fruits, biennial habit and inflorescence which is dichotomously branched throughout easily distinguishes *V. bryophila* from any other Mexican valerian. It is most similar in appearance to *V. pulchella* Mart. & Gal., a perennial herb found in the fir forests of the Sierra de Juare'z and Sierra San Felipe of northern Oaxaca. *Valeriana pulchella* has compound basal leaves and roots which are 6 – 12 cm long and commonly in fascicles of 3 – 5 lobes. The only other valerian in Guerrero with simple leaves is the widespread *V. urticifolia* Kunth, which is also biennial. In that species, however, all of the leaves are simple, short-petiolate and dentate rather than lobed, the fruits are more elliptic than ovate, with a reinforced margin that is noticably thicker than the body, and the first order of branching in the inflorescence is decussate, not dichotomous.

Valeriana bryophila is apparently restricted to wet seeps and moss mats with continuously running water. The type itself was collected from a moss mat growing over bare, gently sloping granitic rock which had water flowing along its surface. My other collections were from moss-covered seeps with rich, black soil. Under these conditions this species grows in dense populations of several hundred individuals.

With the exception of one specimen grown in cultivation in Mexico City, all of the specimens cited above were collected in the fir zone on Cerro de Teotepec. The cultivated specimen was grown from material collected on Cerro Alquitrán, south of Chilpancingo and 60 km east of Teotepec. It may be that *V. bryophila* occurs on several of the peaks in this section of the Sierra Madre del Sur, where local conditions are suitable for it.

VALERIANA **gallinae** Barrie sp. nov. Fig. 2.

Valeriana pilosiuscula Martens et Galeotti affinis, a qua imprimis differt lobis corollae tubo 3 – 4-plo breviora et fructibus glabris et lancolatis vel anguste ellipticis.

Erect, perennial, gynodioecious herb to 1 m tall. ROOT tuberous, fusiform, simple or fasciculate; the lobes 5 – 20 cm long, 1 – 3 cm wide; reproducing vegetatively by fragmentation of the fascicles. STEM green to purple-maculate; 60 – 80 cm tall, 5 – 13 mm wide; glabrous or hirtellous distally. LEAVES basal and cauline, imparipinnate, 6 – 31 cm long; the petiole free or connate, 1 – 18 cm long, 1 – 4 mm wide, hirtellous above, the hairs 0.2 – 0.3 mm long; the blade 4.5 – 18.0 cm long, 4.0 – 12.0 cm wide; glabrous or with scattered hairs along the veins abaxially; the terminal leaflet larger than the laterals, 3.5 – 8.0 cm long, 1.5 – 5.8 cm wide; ovate to widely depressed-ovate or oblate, base truncate or cuneate, apex rounded to acute; the lateral leaflets in 1 – 3 pairs, disposed oppositely or subequally along the rachis and increasing in size distally; 1.0 – 6.9 cm long, 0.8 – 4.5 cm wide; elliptic to ovate or broadly ovate; base cuneate; apex acute; margins crenate to dentate; surfaces glabrous. INFLORESCENCE an aggregate dichasium; 12 – 24 cm long, 9 – 13 cm wide in flower and fruit; lateral branches ascending; 3 – 4 pairs; 2.5 – 11 cm long; terminal branching scorpioid, bearing 2 – 4 flowers or fruits; branches puberulent, pubescent to velutinous at the nodes. BRACTS green to purple-maculate; 2 – 20 mm long, 0.5 – 3 mm wide; tri-lobed or lanceolate; base free or connate; apex acute; margin entire to scarious. BRACTLETS green to purple-maculate; 1/3 to 1/2 as long as the mature fruits; 1.5 – 2.1 mm long, 0.4 – 0.6 mm wide, ovate to elliptic, base connate, apex acute to acuminate, margin scarious. CALYX 11 – 13-fid, the segments 3.5 – 6.5 mm long at maturity. COROLLA white to pale pink; infundibular; gibbous; glabrous without, pilose, the hairs 0.3 – 0.5 mm long, within; corolla of hermaphrodites 4.5 – 6.2 mm long, the tube 3.5 – 4.6 mm long, 1.0 – 1.6 mm wide; the lobes 1.0 – 1.6 mm long, 0.5 – 1.2 mm wide, apices rounded; corolla of females 2.4 – 2.6 mm long, the tube 1.8 – 2.0 mm long, 0.8 – 1.2 mm wide; the lobes 0.5 – 0.6 mm long, 0.5 – 0.6 mm wide, apices rounded. STAMENS exserted, 3.2 – 4.0 mm long; the filaments 2.8 – 3.5 mm long; adnate 2/

3 – 4/5 length of the tube; anthers 0.7 – 0.9 mm long. STYLE of hermaphrodites 5.6 – 6.8 mm long; that of females 3.5 – 4.2 mm long; stigmas linear, 0.2 mm long. CYPSELA green or purple-maculate, 2.8 – 4.0 mm long, 1.0 – 1.3 mm wide; lanceolate to narrowly elliptic; veins simple; the abaxial lateral veins parallel to midvein, margin slightly revolute; glabrous throughout. Chromosome number, n = 16 (*Barrie* 693).

PHENOLOGY: Flowering and fruiting Jul-Dec.

DISTRIBUTION: Shallow soil in fractured rock surfaces, *Abies* forest, Cerro de Teotepec, 2800 – 3000 m.

TYPE: MEXICO. GUERRERO: 5 km E of Puerto del Gallo on the road to Filo del Caballo, 24 Aug 1984, *Fred R. Barrie 951* (HOLOTYPE: TEX; ISOTYPES: ENCB, MEXU, MICH, UC, US).

Other specimens examined: 5 km E of Puerto del Gallo on the road to Filo de Caballo, 23 Nov 1983, *Barrie* 693 (MEXU, TEX); 30 km E of Puerto del Gallo, 23 Nov 1983, *Barrie 703* (MEXU, TEX); Teotepec, 16 Jul 1939, *Hinton 14443* (ENCB, F, GH, NY, UC, US).

The epithet refers to the village of Puerto del Gallo, near which the type was collected.

This species is closely related to *Valeriana pilosiuscula* Mart. & Gal., from which it differs most obviously in having lanceolate to narrowly elliptic, glabrous fruits as opposed to ovate and pilose or hirsute. In *V. gallinae*, the margins of the fruit are revolute, with the marginal veins appearing to be on the adaxial surface. Unlike *Valerianella*, where genetically-controlled, infrapopulational fruit polymorphism is common (Eggars Ware 1983), fruit morphology in species of *Valeriana* is fairly stable and significant differences are usually reliable indicators of divergence. In this species, the fruit characters are associated with differences in characters of the leaves and flowers. The blades of the leaves in *V. gallinae* are glabrous, or rarely with scattered hairs along the veins below. In V. pilosiuscula the leaves commonly have scattered hairs, particularly on the upper surface. Although the overall length of the corolla in the two species is similar, *V. gallinae* has narrow tubes with lobes that are one-fifth to one-fourth of the corolla length. The tubes of *V. pilosiuscula* expand more distally, and the lobes are one-third to one-half of the corolla length. Both species reproduce vegetatively by fragmentation of the rootstocks.

Valeriana gallinae grows in shallow soil in fractured rock faces and rock falls. The type collection was made in a rock fall that appeared to be flooded periodically. While it can be found on sites within a few meters of *V. bryophila*, it does not grow in the saturated soils to which that species is restricted. In contrast to the large populations of the former, *V. gallinae* grows in stands of 2 – 8 individuals, any or all of which may be ramets from an original mother plant.

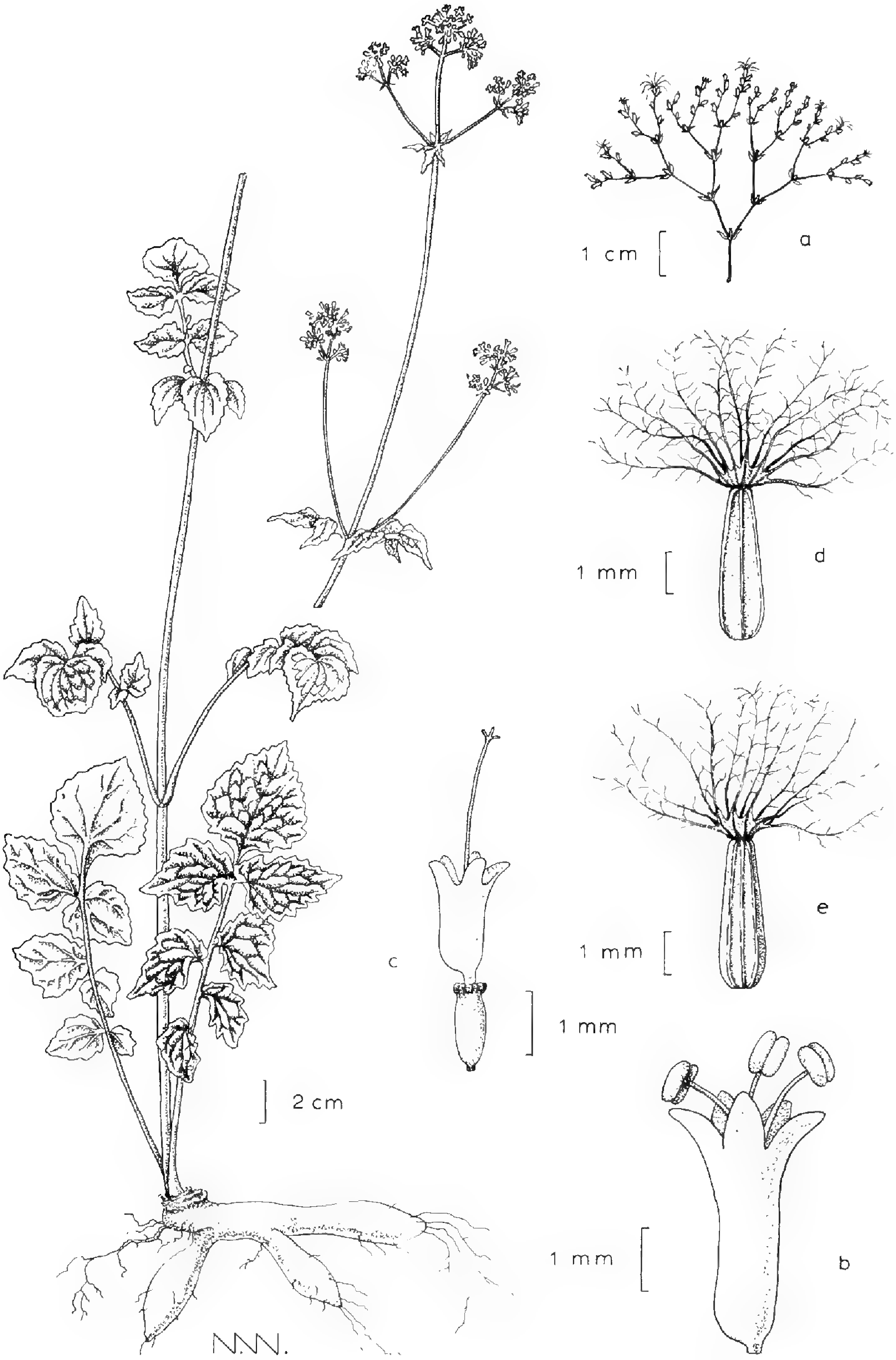

FIG. 2. *Valeriana gallinae*, from greenhouse specimen collected at the type locality. a. Terminal branchlet of infructescence (from isotype); b. corolla, hermaphroditic flower (from isotype); c. female flower (from holotype); d. cypsela (from holotype), adaxial surface; e. cypsela, abaxial surface.

Both *V. gallinae* and *V. pilosiuscula* are related to *V. densiflora* Benth. In his revision of the Valeriana of North America, Meyer (1951) cited Hinton 14443 under *V. densiflora* var. *densiflora*; *V. pilosiuscula* he treated as a synonym of it. However, the three taxa are distinct, distinguished by several morphological characters as well as their habitat requirements. *Valeriana densiflora* and *V. pilosiuscula* share the characters of ovate, pubescent to velutinous fruits. *Valeriana densiflora* has corollas of similar shape and proportion to those of *V. pilosiuscula*, but they are larger, those of perfect flowers being 5 – 6 mm long vs. 3 – 5 mm in the latter species, while those of pistillate flowers are 3 – 4 mm vs 2 – 3 mm long. *Valeriana densiflora* is more diminutive than either of the other species, not exceeding 50 cm in height. Unlike both *V. gallinae* and V. pilosiuscula, it lacks basal leaves and the size differential between the terminal and lateral leaflets of the cauline leaves is much greater.

Valeriana pilosiuscula grows in the pine-oak forests, at elevations of 1200 – 2800 m, from Durango to Puebla and Guerrero. *Valeriana densiflora* is restricted to the fir and *Pinus hartwegii* zones on the mountains surrounding the southern half of the Valley of Mexico, as well as locally in similar habitats on peaks in western Mexico state and eastern Michoacan, and replaces the former where the pine-oak and fir zones meet. This stratification of the distribution of the two species is similar to that which occurs between *V. pilosiuscula* and *V. gallinae* in Guererro. Although *V. gallinae* has not been collected other than on Cerro de Teotepec, it may be that, like *V. bryophila*, it will be found on other peaks in the region, if the local conditions are suitable.

ACKNOWLEDGMENTS

I'd like to thank Nancy Webber for the illustrations, Andrew McDonald for the Spanish abstract and B.L. Turner for reviewing the manuscript.

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A NEW SPECIES OF *PRUNUS* SUBGENUS *AMYGDALUS* (ROSACEAE) FROM COAHUILA, MÉXICO

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ABSTRACT

Prunus cercocarpifolia (subgenus *Amygdalus*) is described and illustrated from southern Coahuila. It is closely related to *P. microphylla* (H.B.K.) Hemsl. but differs from it in leaf and floral characters.

Four species of *Prunus* subgenus *Amygdalus* are known from México, *P. fasciculata* (Torr.) Gray and *P. fremontii* Wats. from the Sonoran Desert, *Prunus havardii* (W. Wight) W. Wight from the Chihuahuan Desert, and *P. microphylla* (H.B.K.) Hemsl. from central México. This new species adds one more to the Chihuahuan Desert area (See Standley 1922, and Rzedowski and Rzedowski 1979).

PRUNUS **cercocarpifolia** J. A. Villarreal, sp. nov. Fig. 1.

Prunus microphylla similis sed foliis elliptico-ovatis coreaceis, marginibus dentatis leviter revolutis, floribus minoribus et petalis orbicularibus differt.

Rhizomatous shrubs, 6 – 12 dm high; stems reddish-brown, somewhat zigzagged, young twigs closely tomentose-pubescent with crinkly trichomes, older stems glabrate, internodes 6 – 12 (-15) mm long, short-shoot spurs 3 – 10 mm long; stipules linear-subulate, 3 – 5 mm long; leaves with petioles 2 – 5 mm long, leaf-blades coriaceous, elliptic-ovate to elliptic-oblanceolate, 10 – 20 mm long, 6 – 18 mm wide, apex rounded, base cuneate, margins dentate, slightly revolute, with 5 – 10 apiculate teeth per side, lower margin entire, lamina hirtellous with short erect hairs at the base, strigose-hispidulous on the upper surface, and longer appressed hairs on the under surface, veins impressed above and prominently raised beneath; flowers unisexual, subsessile, solitary or few at the nodes; hypanthium glabrate, campanulate-obdeltate, 1.5 – 2 mm long with 5 deltate lobes; petals white, orbicular, 2 mm long, short-clawed; stamens 15 in 3 series; fruit elliptic, 12 – 15 mm long, 8 – 12 mm wide, brown-yellowish, highly pubescent, mesocarp thin.

TYPE: MÉXICO. COAHUILA: Mpio. Saltillo, Rancho Los Angeles, Potrero # 1, 48 km al S de Saltillo, carr. 54, 26°06′N, 101°06′W, 1900 m Partes bajas de la Sierra, pastizal de *Stipa* y *Bouteloua*, Jun 1987, *H. Gonzales 046* (HOLOTYPE: MEXU; ISOTYPES: ANSM, TEX).

SIDA 13(3):273 – 275. 1989.

FIG. 1. *Prunus cercocarpifolia* Villarreal. A. Habit; B. Leaf; C. Flower; D. Fruit.

Additional collections examined: Type locality, 7 Sep 1987, *J. A. Villarreal 4185* (ANSM); 18 Jun 1988, *I. Cabral 1063* (ANSM).

Prunus cercocarpifolia grows in colonies in the lower slopes of a small sierra on calcareous soils commonly mixed with grasses and other shrubs. The flowering time is in March-April, the flowers appearing before the leaves. The leaves are similar to those of some species of *Cercocarpus*, with which it was originally confused. Therefore, I name the species for this resemblance. The fruits mature and fall in August; they are generally perforated by some insect larvae. Little wasps of the family Eupelmidae were found inside the stones.

Prunus cercocarpifolia is most closely related to *P. microphylla* (H.B.K.) Hemsl., which it keys to in Standley (1922). The differences are that *P.*

cercocarpifolia possesses young twigs with crinkly trichomes, leaves more coriaceous, somewhat rugose above, blades from elliptic-oblanceolate to ovate with teeth more prominent and glands occasionally present in the lower teeth. Further, the flowers of *P. cercocarpifolia* are smaller and have orbicular cucullate petals.

Prunus microphylla (H.B.K.) Hemsl., is known from the states of San Luis Potosi, Hidalgo, México, and Distrito Federal in central México. It possesses young twigs with straight trichomes, leaves not coriaceous nor rugose, blades from elliptic to oblanceolate with teeth smaller and glandular. The flowers are 2.5 – 3 mm long and have obovate petals. (Examined specimens: ANSM, MEXU and TEX).

The two related species can be separated by the key that follows:

1. Young twigs closely tomentose-pubescent with crinkly, irregularly oriented trichomes; leaves broadly elliptic to elliptic-oblanceolate or elliptic-ovate, somewhat coriaceous, slightly rugose above with the lateral veins impressed, the teeth eglandular or the lower teeth occasionally with glands, the upper surface sparsely to moderately hispidulous or strigose-hispidulous with prominent, slender trichomes 0.2 – 0.4 mm long; body of the hypanthium 1.5 – 2 mm long, obdeltate . . . . *P. cercocarpifolia*

1. Young twigs with straight, retrorse-spreading trichomes; leaves narrowly elliptic to broadly elliptic-oblanceolate, thick but not coriaceous, smooth above, the midvein impressed but not the laterals, all teeth with glandular tips, the upper surface glabrous or very sparsely pubescent with barely noticeable trichomes; body of the hypanthium 2 – 2.5 mm long, campanulate . . . . . *P. microphylla*

ACKNOWLEDGEMENTS

I thank Dr. Marshall C. Johnston for providing the Latin diagnosis and Dr. G. Nesom for comments on the manuscript. I also thank Miguel A. Carranza for preparing the illustration and to H. Gonzales M., J. Frias and R. Canales for showing me the locality.

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REVIEWS

BENNY J. SIMPSON. 1988. A Field Guide to Texas Trees. Texas Monthly Press, P. O. Box 1569, Austin, TX 78767. $24.95; paperback $16.95. 372 pp., + xi, + 113 colored plates (maps and photographs) inserted between pages 180 and 181.

The Introduction discusses the philosophy of trees and shrubs, native, introduced, etc. and 7 Tables list the entities in different perspectives. A chapter on the Vegetational Areas of Texas with brief descriptions of each are followed by the text "The Native Trees of Texas," alphabetized by genus. Table 8 is inserted with *Crataegus* and lists the series and species with synonyms and possible synonyms.

This book is not the typical field guide that possesses keys and technical descriptions. The discussion of each taxon includes history, utilization, folklore, and pertinent characteristics relating to that taxon. The species are mapped by county with a state map to the right of the title and vernacular names. The plates are inserted between the pages 180 and 181. The first 15 plates are maps with multicolored dots or areas. The other plates are colored photographs of habit, flowers, fruit, and/or foliage,

This is a very good nontechnical treatment of the trees of Texas and is recommended for its readable content that differs from the typical identification manual.

ROBERT K. GODFREY. 1988. Trees, Shrubs, and Woody Vines of Northern Florida and Adjacent Georgia and Alabama. The University of Georgia Press, Athens, GA 30602. $50.00 (hardback). 734 pp., + ix, + 355 figures (illustrations of taxa) inserted within the text.

"The geographical coverage for Florida includes all of northeastern Florida north of a line from Flagler Beach, Flagler County, on the Atlantic Coast to Horseshoe Beach on the Gulf Coast and all of the Florida Panhandle. The arbitrary boundary approximates the northern boundary for the geographic coverage of *Trees of Central Florida* by Lakela and Wunderlin" (1980, Miami, Banyan Books).

ASTER SAXICASTELLII (ASTERACEAE), A NEW SPECIES FROM THE ROCKCASTLE RIVER BARS IN SOUTHEASTERN KENTUCKY

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ABSTRACT

A new species is described, *Aster saxicastellii* Campbell & Medley. It is closely related to the northeastern *A. radula* Aiton, but differs in its chromosome number ($2n = 54$); leaf-shape (broader, petioled, and more coarsely serrate); flowers (generally larger and paler); and cypselas (larger, pubescent, and with a white pappus). It has been found in only one locality, about 100 miles west of the most southern known station for *A. radula*. It grows on boulder-cobble bars along about three miles of the Rockcastle River in Pulaski and Laurel counties, Kentucky. It is concentrated in the shrubby transition from the open grassy bars to the adjacent forested terraces or slopes. This unusual vegetation is described.

During an inventory of rare species and natural communities in the Somerset District of Daniel Boone National Forest (Palmer-Ball et al. 1988), a new species of *Aster* was discovered along the Rockcastle River in Laurel and Pulaski counties of southeastern Kentucky. This paper describes the species and its special habitat, at the back edge of open rocky river bars. It appears most closely related to *Aster radula* Aiton, a wetland species of the northeastern Appalachians and the adjacent Atlantic Coastal Plain. Differences were determined from examination of over 200 herbarium specimens of *A. radula* (mostly from MO and GH) and from descriptions in various manuals (e.g., Fernald 1950, Strausbaugh & Core 1964, Cronquist 1980). Nomenclature for other vascular plants listed in this paper follows Kartesz & Kartesz (1980).

DIAGNOSIS

Aster saxicastellii Campbell & Medley, sp. nov. (Figure 1).

Ex affinitate *Aster radula* Aiton, sed folia medicaulina late lanceolata, (3) 4 – 5 (6) cm lata et (7) 9 – 14 cm longa, lamina grosse serrata dentibus projectis 1 – 4 mm ex sino, supra glabrata vel versus marginem scabrida, basis angustata cum petiolo alato 0.5 – 3 cm longo;

capitula 1 – 10, 13 – 16 mm longa (ad termino pappi); bracteae involucrales 1 – 2 mm latae fimbriatae cum cilia 0.2 – 0.5 mm longa ad margine, apices bractearum atrovirentes, obtusati vel subacuti; ligulae radii 1.5 – 2 mm latae, albae vel sublazulinae; cypselae pubescentiae, 4 – 7 mm longae; pappus albus; chromosomae, $2n = 54$.

TYPE: KENTUCKY. **Laurel Co.**: (Ano 7.5′ Quadrangle), open brushy area with sand over cobbles on the back edge of the boulder-cobble bar complex at the mouth of Pine Island Branch, 14 Oct 1987, *Medley & Campbell 18663-87* (HOLOTYPE: KY; ISOTYPES: EKY, GH, ILL, NY, SMU, US).

Other collections: KENTUCKY. **Laurel Co.**: (Ano 7.5′ Quadrangle), boulder-cobble bars on the the bank of the Rockcastle River at Beech Narrows, 2 Oct 1987, Medley, Campbell & Wooley 18546-87 (EKY, KY). **Pulaski Co.**: (Ano 7.5 – Quadrangle), boulder-cobble bars on the bank of the Rockcastle River at Beech Narrows, 2 Oct 1987, *Medley, Campbell & Wooley 18513-87* (EKY, KY).

The specific epithet *saxicastellii*, meaning "rockcastle," refers to the Rockcastle River where this species was discovered. It is suggested that common name of this species be the "Rockcastle Aster."

GENERAL DESCRIPTION

Plants herbaceous, perennial, colonial with long running rhizomes. Stems usually single, generally 4 – 12 dm tall, branching in the inflorescence, glabrous except for some pubescence in the inflorescence. Lower leaves broadly lanceolate to obovate, deciduous before flowering; mid-stem leaves broadly lanceolate with an acuminate apex and an angustate base, (3) 4 – 5 (6) cm wide and (7) 9 – 14 cm long, the winged petiole 0.5 – 3 cm long, the blade with 4 – 5 pairs of impressed primary veins, coarsely serrate except towards the apex and the base, with the teeth projecting 1 – 4 mm out from the sinuses, glabrous above or somewhat scabrous towards the margin, sparsely pubescent below; upper leaves reduced and usually entire. Inflorescence leafy, corymbiform, 2 – 10 cm wide, 3 – 20 cm long, with 1 – 10 heads. Heads each 13 – 16 mm long at maturity (to pappus tips). Involucre campanulate, 7 – 11 mm long; the phyllaries 1 – 2 mm wide, glabrous except for fimbriate cilia 0.3 – 0.5 mm long at the thin hyaline margins, their tips dark green, obtuse or subacute (with an angle of about 90°), often slightly squarrose. Ray florets 10 – 30, white or pale blue, with ligules 10 – 15 mm long and 1.5 – 2 mm wide; disk florets 10 – 20, yellow at first, turning pinkish. Cypselas (4) 5 – 6 (7) mm long, fusiform-cylindric with 7 – 11 ribs, pubescent; pappus white, with bristles 5 – 7 mm long. Flowering mid-Aug. to early Oct. (Aug. only observed in cultivation). Chromosome number, $2n = 54$.

COMPARISON WITH *ASTER RADULA*

Aster saxicastellii is in subgenus *Aster*, section *Aster* (Jones 1980, Semple

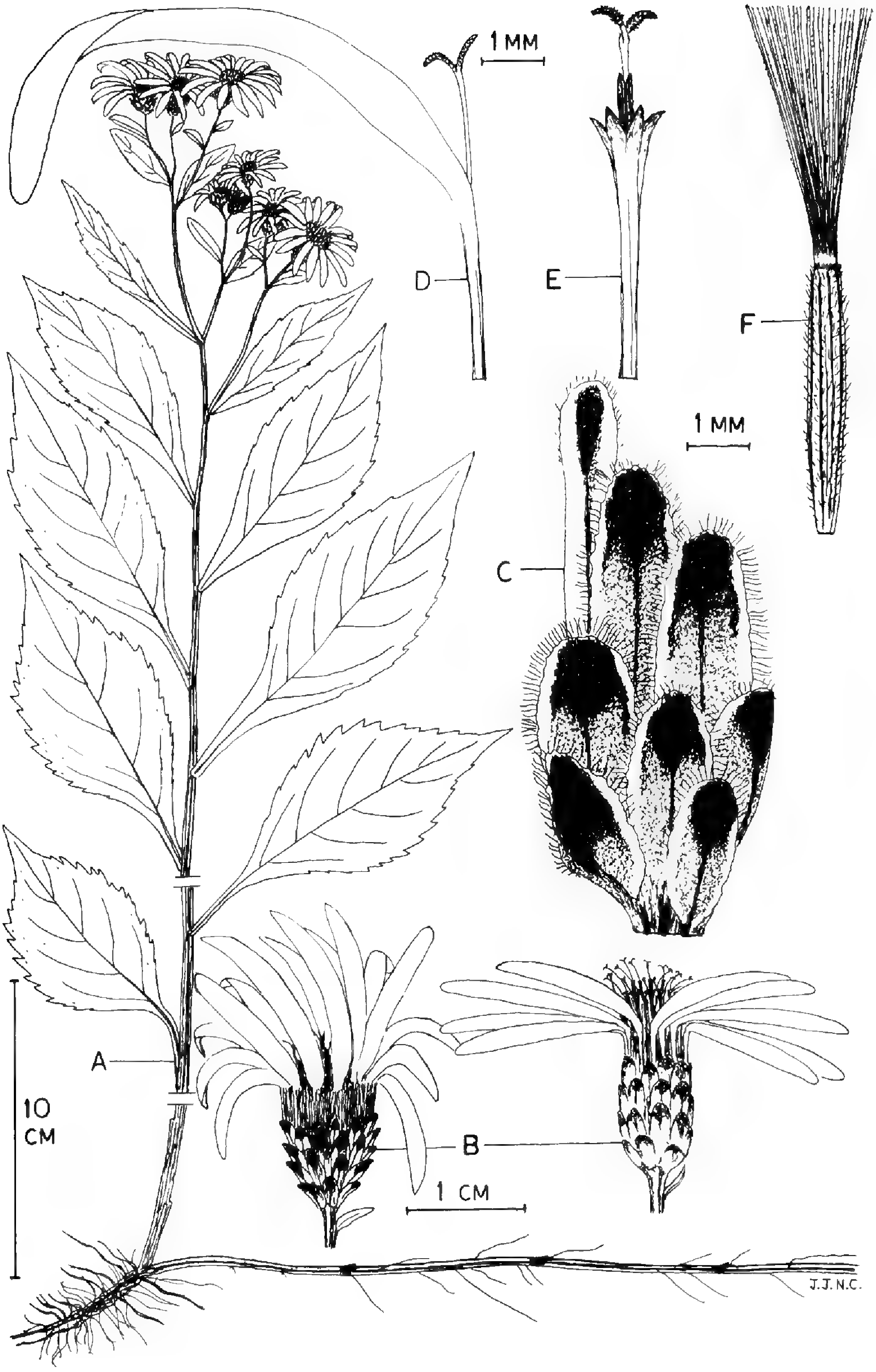

FIG. 1. Illustration of *Aster saxicastellii*, based on collections and photographs from the Rockcastle River. A: entire plant. B: flower heads, fresh (right) and in fruit (left). C: part of the involucre. D: Ray floret with ligule. E: disk floret. F: achene with pappus.

& Brouillet 1980), and is closely related to *A. radula*. It differs in its chromosome number, several morphological characters (Table 1), its range and its habitat. The chromosome number of *A. radula* is $2n = 18$ (Semple et al. 1983), whereas that of *A. saxicastellii* is $2n = 54$ (W.F. Lamboy & A.G. Jones, pers. comm.). This hexaploid number in *A. saxicastellii* accords with its generally larger dimensions. The morphological differences in *A. saxicastellii* can be summarized as follows: the leaves are larger, distinctly petiolate (vs. sessile or subsessile in *A. radula*), more coarsely serrate and less scabrous above; the flower heads are larger in most respects, but generally less numerous; the phyllaries have longer cilia; the ligules are fewer and paler; the cypselas are larger, pubescent, and have white (vs. pale brown) pappus. The most pronounced differences are in the leaves and the cypselas, whereas inflorescence characters generally overlap (Table 1). The mid-stem leaves of *Aster radula* decrease in average width and length towards the north, where a narrow-leaved form has been described as var. *strictus* (Pursh) Gray, but there is no bimodality in leaf-width within this species. In contrast, there is virtually no overlap in leaf-width between *A. radula* and *Aster saxicastellii*. Also, the margins and bases are consistently different. The cypselas have virtually no overlap in mature length, and the differences in pubescence and pappus color are clearcut.

Aster saxicastellii was found near the western edge of the Appalachian Plateau (Figure 2) at an elevation of 250 – 260 m, about 180 km (100 miles) to the west of the most southern record of *A. radula*, It occurs at the back edge of boulder-cobble bars that are often flooded but dry in the summer. *A. radula* is a true wetland species, occurring in bogs, wet meadows and streamsides of the northeastern Appalachians and the adjacent Atlantic Coastal Plain, from Virginia to Labrador. Its nearest known records are from higher mountains of the Ridge and Valley Province in Virginia (Harvill et al. 1986) and West Virginia (Strausbaugh & Core 1964), at an elevation of about (600) 1000 – 1500 m. It seems likely that *A. radula* extended further south during glacial periods, and that *A. saxicastellii* is a polyploid derivative from a relict population of *A. radula* that has now disappeared.

We have no reservation in describing our new species as distinct from *Aster radula*, after considering the nature of the differences in relation to similar patterns of speciation generally documented in flowering plants (Stebbins 1950). The differences seen here are typical of those that distinguish other species in the genus. They include differences in leaf shape and margination, and floral and fruit characters, not just differences in overall size, pubescence and other characters that can be affected more directly by

Table 1. Differences between *Aster saxicastellii* and *A. radula*.

CHARACTER		*SAXICASTELLII*	*RADULA*
Mid-stem leaves:	width	(3) 4 – 5 (6) cm	0.5 – 2.5 (3) cm
	length	(7) 9 – 14 cm	(3) 5 – 8 (10) cm
	serrations	extending 1 – 4 mm from sinuses	extending 0.5 – 1.5 mm from sinuses
	upper surface	glabrous or marginally scabrous	scabrous or rarely glabrescent
	base	angustate with winged petiole 0.5 – 3 cm long	cuneate and sessile or subsessile
Flower heads:	number/stem	1 – 10	1 – 15 (40)
	mature length (to pappus tips)	13 – 16 mm	8 – 11 mm
	involucral length	7 – 11 mm	(4) 5 – 10 (12)
Phyllaries:	width	1 – 2 mm	1 – 1.5 mm
	cilia length	0.2 – 0.5 mm	0.1 – 0.2 mm
	apex	obtuse/subacute	generally acute
Ray ligules:	number	10 – 30	(15) 20 – 30 (40)
	width	generally 1.5 – 2 mm	generally 1 – 1.5 mm
	color	white or pale blue	pale violet
Cypselas:	surface	pubescent	glabrous
	length	(4) 5 – 6 (7) mm	2 – 4 mm
	pappus	white	pale brown or rarely whitish
Chromosome number:		$2n = 54$	$2n = 18$

the environment. Stebbins (1950) pointed out that the former characters usually vary more at the species level within genera, than at the variety level within species.

ECOLOGICAL NOTES

Aster saxicastellii has been found only on sandstone boulder-cobble bars along the Rockcastle River. These bars are geomorphically stable, about 10 – 30 m wide and 30 – 100 m or more long, and dominated by grasses, forbs, shrubs and stunted trees. The lack of forest canopy is probably caused by the scouring of flash floods and by the summer drought stress on this well-drained coarse-textured substrate. Several patches of *A. saxicastellii* are scattered along about three river-miles, from Beech Narrows to Pine Island. The plants form clones, with long stolons growing

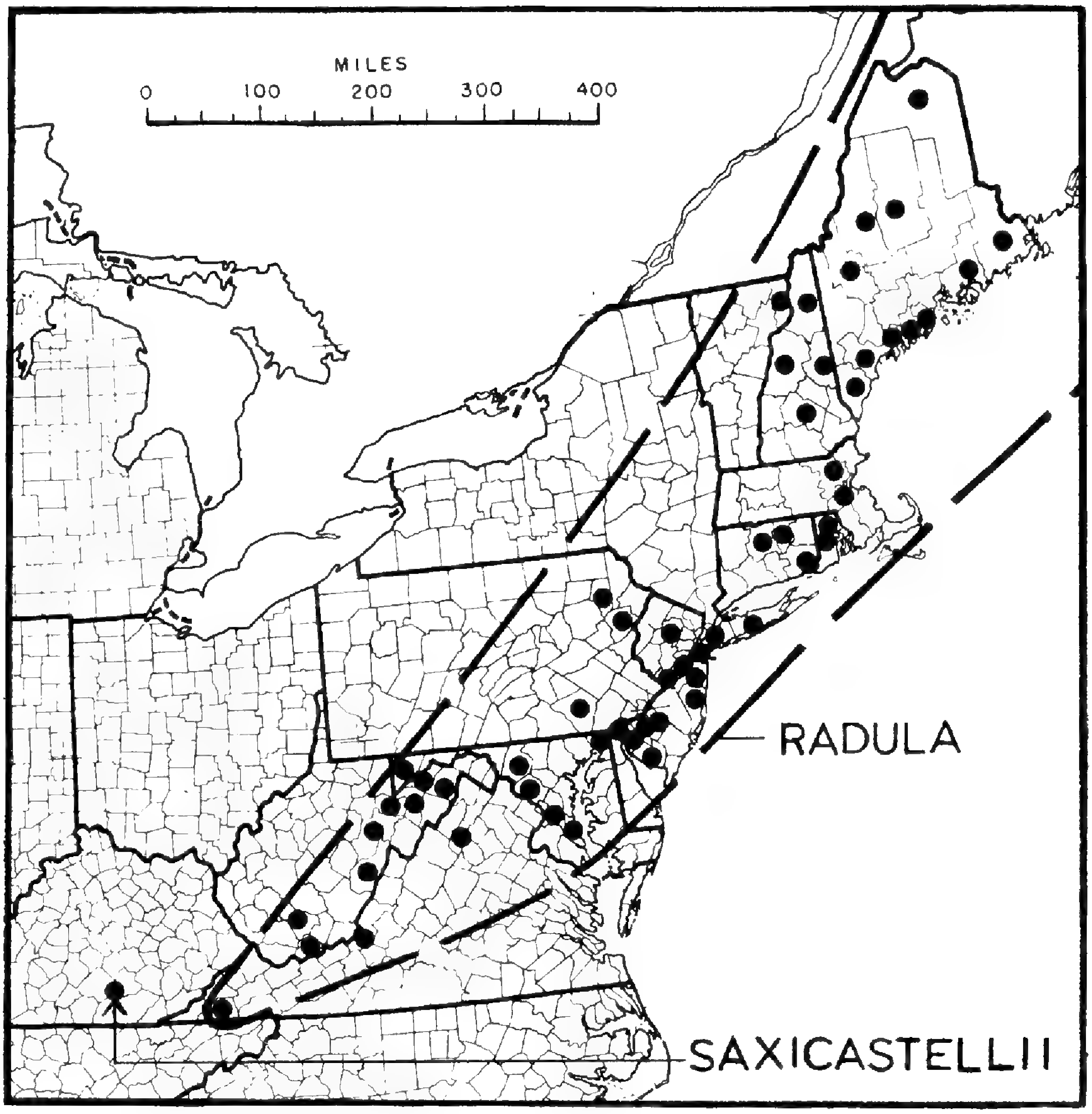

FIG. 2. Map of northeastern U.S.A. showing location of *Aster saxicastellii* and the southern range of *A. radula* (which also occurs in Quebec, New Brunswick, Nova Scotia, Newfoundland and Labrador). Dots represent county records.

through the sandy alluvium that overlies the boulders and cobbles. Most patches are in a shrubby transitional zone, about 3 – 5 m wide, between the open grassy vegetation on the river-bars and the adjacent forests on terraces or slopes. However, the largest patch found, approximately 50 m × 10 m in area, is in a shrubby area at the back of Pine Island, which is a river bar complex separated from the banks by a high-water channel of the river and by the mouth of Pine Island Branch. The substrate at this site is a jumble of cobbles covered with about 5 – 25 cm of alluvial sand.

The open grassy vegetation on these bars is typically dominated by *Andropogon gerardii* or *Schizachyrium scoparium*, while the adjacent forest is typically dominated by *Tsuga canadensis*, *Fagus grandifolia* or *Liriodendron* *tulipifera*. In the transitional thickets where *Aster saxicastellii* is concentrated, *Alnus serrulata* and *Xanthorhiza simplicissima* are often abundant woody species, together with *Liquidambar styraciflua, Betula nigra, Carpinus caroliniana, Rhododendron arborescens, Hamamelis virginiana, Chionanthus virginicus, Viburnum* spp., *Rhus radicans* and others. However, on Pine Island, the most frequent woody plants with *A. saxicastellii* are *Cornus obliqua, Betula nigra, Hypericum prolificum* and *Viburnum cassinoides*. The most frequent herbaceous associates, based on notes from several patches, include *Osmunda regalis, Apios americana, Desmodium perplexum, Aruncus dioicus, Lysimachia ciliata, Collinsonia canadensis, Rudbeckia laciniata, Solidago rugosa, Aster umbellatus* and *Senecio aureus*. On Pine Island, additional common associates are *Chasmanthium latifolium* and *Silphium perfoliatum*. Other associates include most of the remaining species typical of forest edges along these rocky banks (Palmer-Ball et al. 1988).

Similar vegetation occurs on boulder-cobble bars along median gradient sections of streams elsewhere in the southern Appalachain region. This is the habitat of several disjunct plant species and endemics (e.g., *Conradina verticillata*) that are important to the biogeography of the southeastern United States (M.E. Medley, in preparation). However, this vegetation has received little intensive botanical study. Much has already been eliminated by impoundments. The unimpounded State Wild River Corridor along the Rockcastle River has one of the most remarkable concentrations of rare species known in Kentucky (Palmer-Ball et al. 1988), including some that are disjunct from northern or montane ranges, i.e., *Comptonia peregrina, Magnolia fraseri, Oxalis montana, Scutellaria elliptica, Spiraea virginiana* and *Solidago spathulata* ssp. *randii* (a form with large pale glabrous cypselas).

The discovery of *Aster saxicastellii* underscores the need for further botanical exploration along southern Appalachian rivers. Another new species, *Cypripedium kentuckiense*, was recently described from stream bottoms in eastern Kentucky (Reed 1981), and this occurs near *A. saxicastellii* along the Rockcastle River. It is likely that other important botanical discoveries remain to be made along these rivers. However, in the absence of any further known localities with *A. saxicastellii*, it is currently prudent to consider it for official endangered status.

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SILPHIUM WASIOTENSIS (ASTERACEAE), A NEW SPECIES FROM THE APPALACHIAN PLATEAUS IN EASTERN KENTUCKY

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Knowledge of the presence of an anomalous *Silphium* in the Unglaciated Appalachian Plateaus of eastern Kentucky has existed for over fifty years. This plant was first reported by E. Lucy Braun (1936, 1937) from Clay County, Kentucky as *S. brachiatum* Gattinger. She subsequently compared her specimen with the type collection of *S. incisum* Greene and reinterpreted it as that species (Braun 1940, 1943). *Silphoum incisum* has since been regarded as an aberrant specimen of *S. dentatum* Ell. (Perry 1937); *S. asteriscus* L. ssp. *dentatum* (Ell.) T.R. Fisher & Speer, comb. ined. (Speer 1966) and as *S. mohrii* Small (Cronquist 1980).

Subsequent work in eastern Kentucky has resulted in the location of several populations of the anamalous *Silphium* in Clay, Perry and Pike counties.

Comparison of this Kentucky material with authentic specimens of *S. brachiatum, S. dentatum, S. mohrii* and the type specimen of *S. incisum* indicates that they do not belong with any of those taxa. I am unsure of the correct disposition for *S. incisum* however it is not *S. dentatum* and I am inclined to agree with its interpretation by Cronquist as belonging to *S. mohrii*.

Six years of herbarium and field work have shown that the Kentucky material can be readily separated from similar species by several morphological features including leaf shape, indument, phyllaries, and cypsala characters (Fig. 2). Further it has a disjunct geographical range and a different habitat and geologic substrate from *S. brachiatum* and *s. mohrii*. Hence it is best treated as a new species localized and disjunct from its nearest relatives suggesting that it is a relict. Accordingly the status of endangered is proposed.

SILPHIUM **wasiotensis** M.E. Medley sp. nov. (Fig. 1).

Ex affinitate *Silphium brachiatum*. Caules hispidi; folia opposita, late ovata, grosse dentata, cordata vel subcordata; cypselae laeves angustialatae et cum vel sine incisurae apicales.

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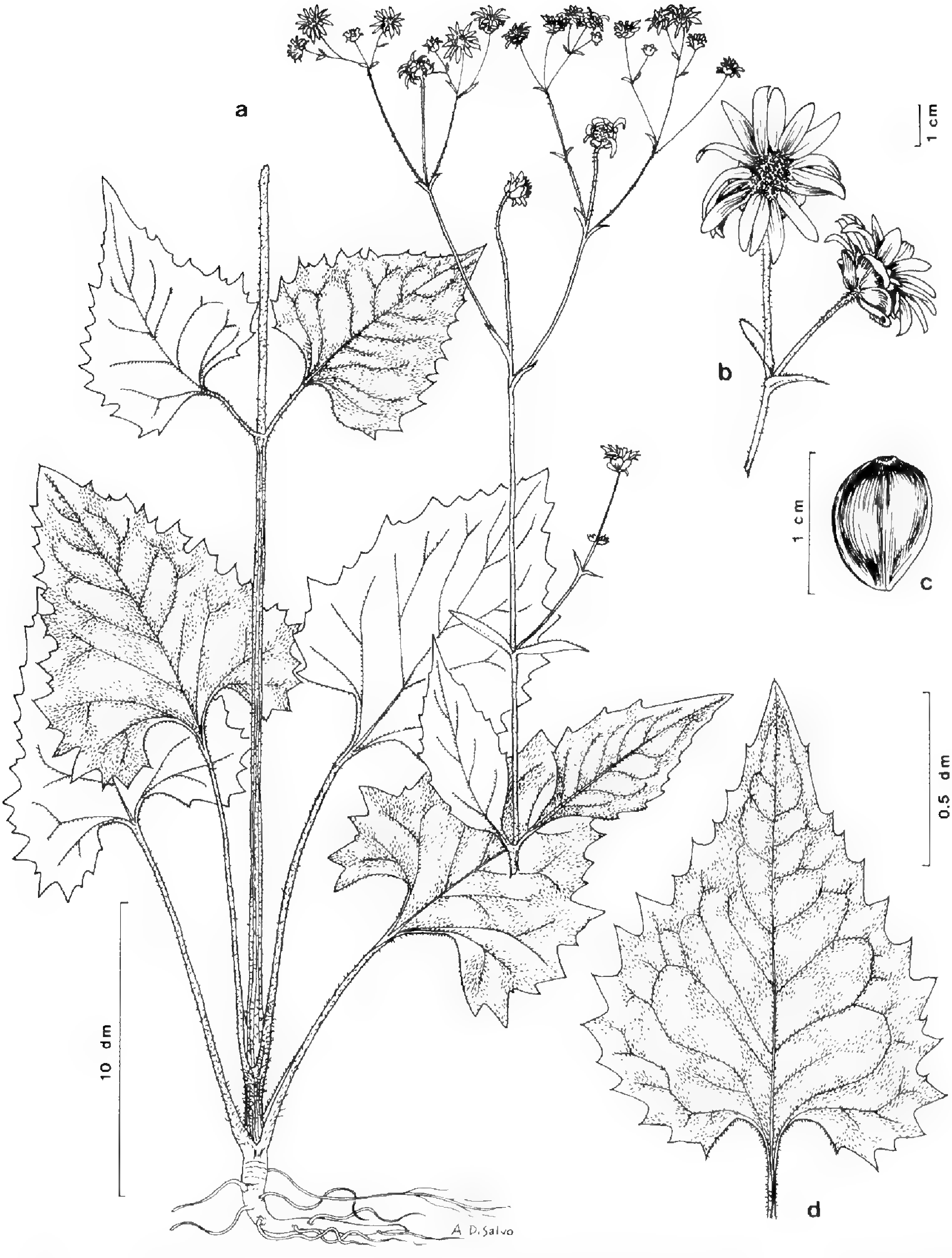

FIG. 1. *Silphium wasiotensis* M.E. Medley. a. Entire plant, b. Flowers, c. Cypsela, d. Lower mid-stem leaf.

Perennial herb, stems erect, 6 – 12 dm tall, hispid, the hairs ca 2 – 3 mm long on the stem base (breaking off with age) and reduced to short stiff hispidulous hairs 1 mm long on the branches of the inflorescence. Leaves simple, opposite, broadly ovate, dentate with large acute teeth, acute apically and with a long-petioled, truncate-cordate base, the two basal pairs 10 – 20 cm wide and 13 – 25 cm long, reduced upwards, and hispid on the petiole (3 – 4 mm on the basal pairs). Inflorescence a brachiate, corymbose panicle; pedicels short-hispidulous, the hairs 1 mm long. Phyllaries glabrous, obtuse, 5 – 10 mm long and 4 – 6 mm wide. Ligules 10 – 15, sunflower yellow (not pale sulfur yellow as in *Silphium mohrii*), 10 – 13 mm long and 1.5 – 2 mm wide. Disk yellow. Cypselas dark, glabrous, narrowly winged (occasionally wingless) and lacking an apical notch or occasionally notched. Plants rhizomatous, with vigorous offshoots forming at the end of rhizomes up to 12 dm long. Flowering in late September.

Since the preparation of the illustration and the initial manuscript I have discovered that in at least a few instances the cypselas have slightly broader wings and a very small apical notch.

TYPE: UNITED STATES. KENTUCKY: **Pike Co.**: Meta 7.5′ Quad., mixed mesophytic forest at head of ravine of Open Fork ca. 0.25 mi E of Meta and then 1 mi SE to end of Open Fork Road, 3 Oct 1984. *Medley 12334-84* (HOLOTYPE and ISOTYPE in the author's herbarium).

Representative Specimens: UNITED STATES. KENTUCKY: **Clay Co.**: opening in dry oak woods at top of steep south – facing ridge, Peabody, *Braun 586* (US). **Perry Co.**: Noble 7.5′ Quad, road bank on KY 476, 0.1 mi S of Rowdy (Stacy), KY at jct. of KY 476 and KY 276, *Medley 11865-84* (EKY, SMU, US).

COMPARISON WITH OTHER SPECIES

Silphium wasiotensis differs from related species in several morphological characters (Fig. 2, Table I). It appears to be closely related to *S. brachiatum* but can be separated by its hispid rather than glabrous stems, leaves more broadly ovate, and short-strigose rather than glabrous, leaf margins with more and much larger teeth, hispidulous rather than glabrous pedicels and shorter branches of the inflorescence. Also, by its larger involucre, larger, obtuse phyllaries and smaller, narrowly winged (or rarely wingless) cypselas, usually lacking an apical notch.

It likewise contrasts with *S. mohrii* which has a densely hispid stem vestiture, alternate, ovate to lance-elliptic, sparsely denticulate to entire, densely long-hispid leaves with obtuse to cuneate bases, densly hispid (2 mm long) rather than hispidulous pedicels and an even broader involucre with hispid, long acuminate, non reflexed phyllaries. Also *S. mohrii* has pale sulfur yellow rather than sunflower yellow ligules and its broadly winged cypselas with an apical notch between two sharp pointed lobes.

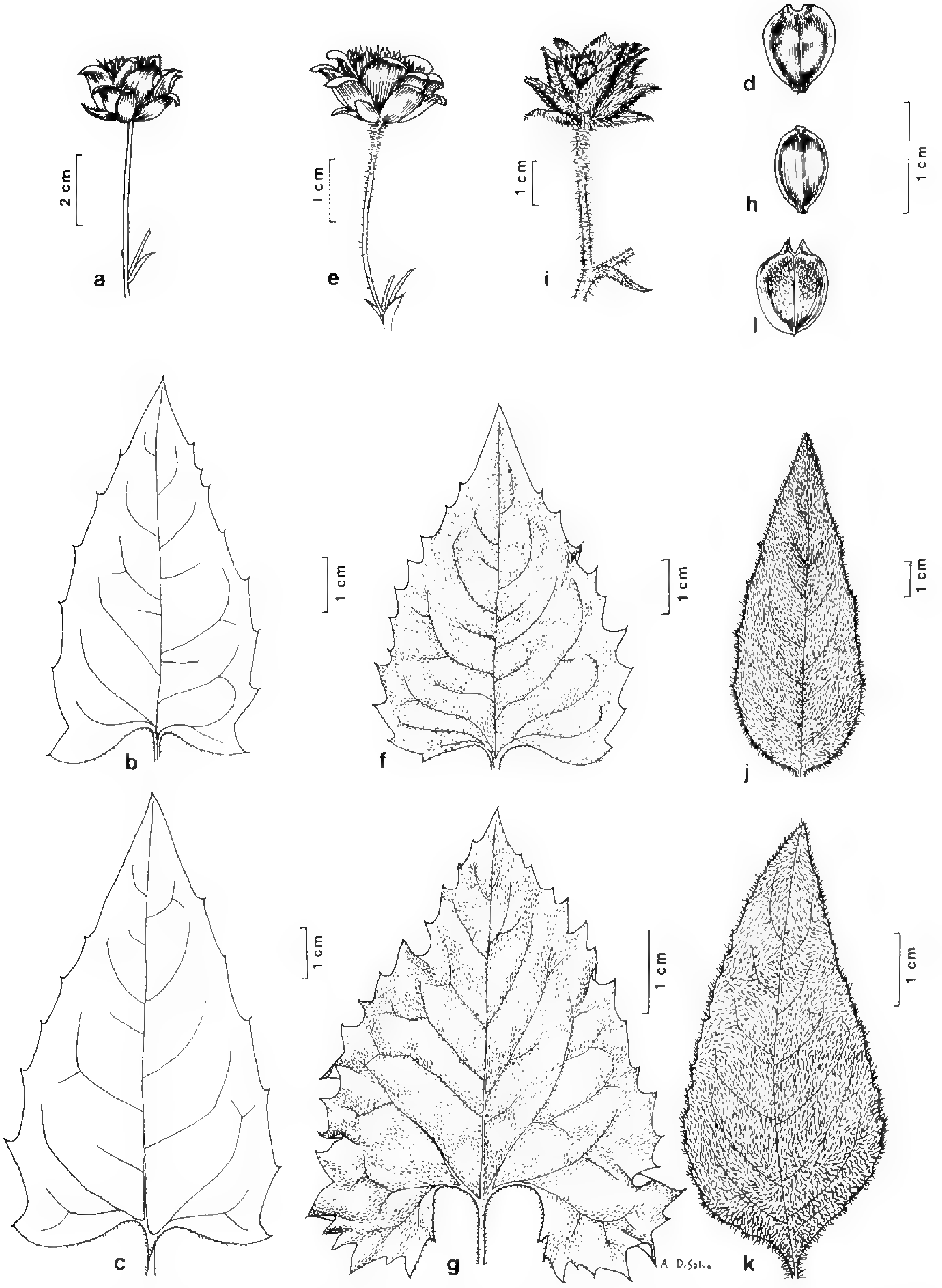

FIG. 2. *Silphium brachiatum*: a. Involucre, b. Mid-stem leaf, c. Basal leaf, d. Cypsela. *Silphium wasiotensis*: e. Involucre, f. Mid-stem leaf, g. Basal leaf, h. Cypsala. *Silphium mohrii*: i. involucre, j. Mid-stem leaf, k. Basal leaf, l. Cypsela.

TABLE 1. Character comparisons of three species of *Silphium*

	S. brachiatum	*S. wasiotensis*	*S. mohrii*
Stem	glabrous	hispid	thickly long hispid
Leaf shape	ovate	broad ovate	ovate-lance elliptic
Leaf base	truncate-sagittate	subcordate-cordate	obtuse to cuneate
Leaf margin	teeth few, small	teeth many, large	teeth few to entire
Leaf surface	glabrous	short strigose	long hispid
Pedicels	glabrous	hispidulous, 1 mm hairs	hispid, 2mm hairs
Phyllaries	glabrous, acute	glabrous, obtuse	hispid, acuminate
Ligules	sunflower yellow	sunflower yellow	pale, sulphur yellow
Cypselas	winged; blunt-lobed apical notch	narrowly winged; usually without apical notch	winged, sharp-lobed apical notch

Silphium dentatum, which is not considered as closely related to S. wasiotensis, differs by having a glabrous, almost glaucous stem, cauline leaves that are similar to the lower ones and not strongly reduced above, the basal leaves often absent at anthesis, and eglandular chaff which is ciliate to pubescent only on the apex. *Silphium dentatum* also has a fewer-flowered, short-branched inflorescence with larger involucres.

HABITAT AND DISTRIBUTION

Silphium wasiotensis is a species of open dry-mesic forest with a sparse shrub layer to mixed mesophytic forest with typical shrub layer and closed canopy. This contrasts with *S. brachiatum* which prefers dry, open, oak-hickory forests and with *S. mohrii* which is found in open dry to seasonally wet barrens and in open oak forest and rocky glades.

Most of the populations of *S. wasiotensis* occur in open to semi-open, dry-mesic mixed hardwood forest with shrubs and herbaceous plants typical of such forests; which sometimes show evidence of past fires. However, one site in Perry County had a mixture of dry and wet mesic species in all vegetative layers of the open forest, and another large population at the type locality in Pike County grows in mixed mesophytic forest with closed canopy in the head of a large, moist ravine.

Silphium wasiotensis is currently known from 13 scattered populations in Clay, Perry, and Pike counties in the Appalachian Plateaus of Kentucky (Fig. 3) on Breathitt (Pennsylvanian) sandstone and shales. Large areas of unpopulated, apparently suitable, habitat occur between the populations. The species will probably eventually be discovered in adjacent Virginia and West Virginia.

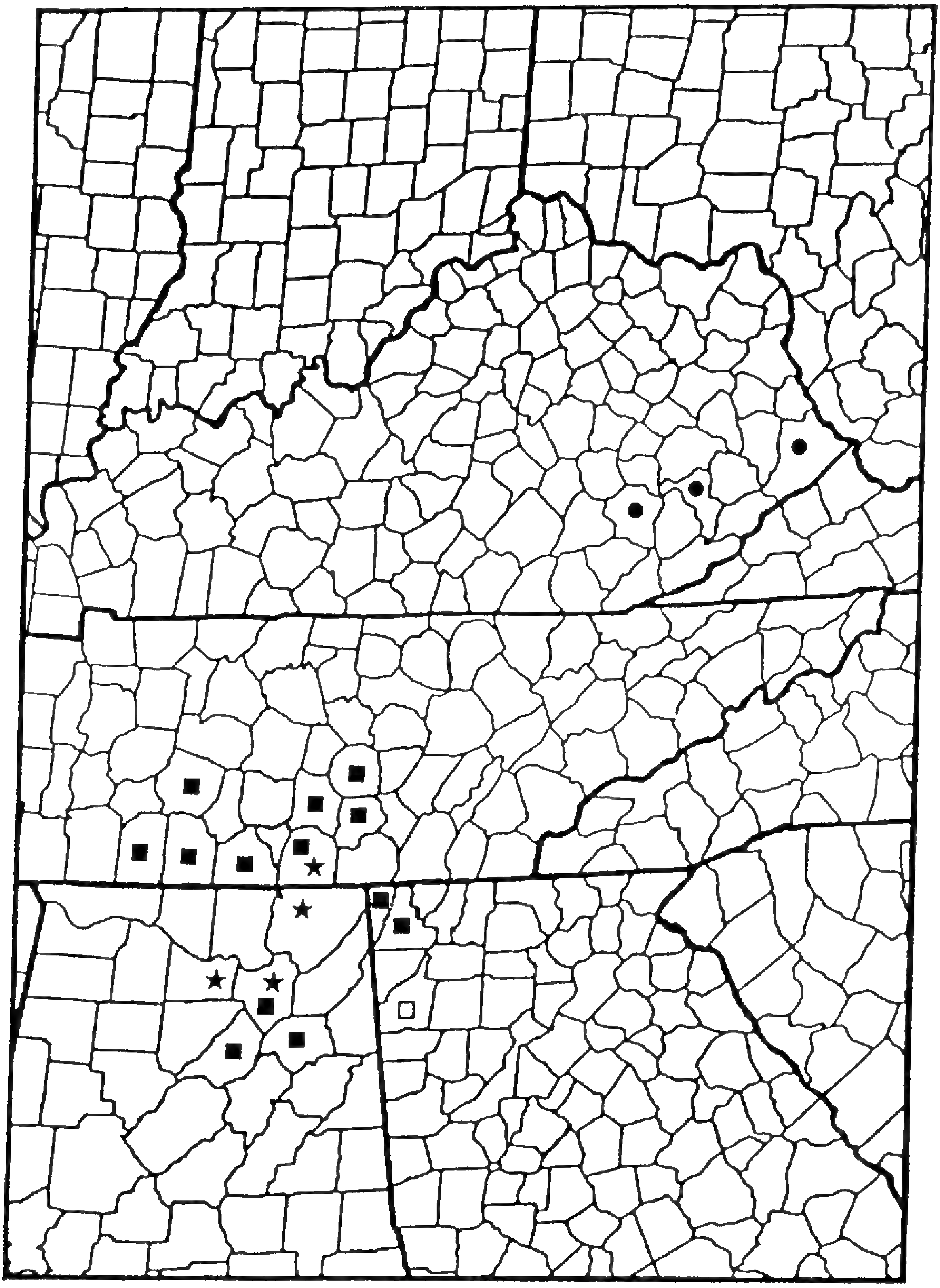

FIG. 3. Distribution of three species of *Silphium* in the southeastern United States. a. *S. brachiatum*, ★ b. *S. mohrii*, ■ c. S. mohrii (*S. incisum*), d. *S. wasiotensis*. ●

The distribution of *S. brachiatum* (Fig. 3) is strongly disjunct southward, on Mississippian limestones of the western margin of the Cumberland Plateau of Alabama and Tennessee. *Silphium mohrii* sensu stricto (Fig. 3) is slightly more widespread in the Southeast over snadstone and limestone occurring in the Ridge and Valley and Appalachian Plateaus provinces and in the Highland Rim Section of the Interior Low Plateaus Province.

The epithet *wasiotensis* is derived from an Indian name (Wasioto) for the general region of the Unglaciated Appalachian Plateaus in Kentucky, West Virginia, Virginia and Tennessee. For those who wish to use a common name, Cumberland Rosinwee is proposed.

The scattered populations, in geologically and geographically restricted ares suggest that *S. brachiatum* and *S. wasiotensis* are relict species, survivors from once wider distributions. The rarity and highly restricted range of *S. wasiotensis* indicates that a formal status of endangered would be appropriate.

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WM. A. WEBER. 1987. Colorado Flora: Western Slope. Colorado Associated University Press, 1338 Grandview Ave., Box 480, University of Colorado, Boulder, CO 80309. $19.50; paperback $14.50. 530 pp., + xvii, + 107 figures, + 64 colored plates (photographs) in units of 16 in four sections of the text.

An excellent discussion of the values associated with floras is given in the Preface and Introduction and should be required reading for all amateurs and professionals.

BONNIE B. AMOS and FRED R. GEHLBACH (Eds.). 1988. Edwards Plateau Vegetation, Plant Ecological Studies in Central Texas. Baylor University Press, Waco; available from Book Department, Baylor Book Store, P. O. Box 6325, Waco, TX 76706-6325. 145 pp. A collection of 8 papers arising from a symposium sponsored by the Southwestern Association of Naturalists conducted at Junction, Texas in April 1984.

The subject titles are: An Introduction to Environment and Vegetation, Vegetation Before 1860, Floristic Geography of Woody and Endemic Plants, Woody Vegetation of the Southeastern Escarpment and Plateau, Forests and Woodlands of the Northeastern Balcones Escarpment, Determination of Community Structure by Fire, Grasslands, Nurse Trees, and Coexistence, and Long-Term Change in a Semiarid Grassland.

ADDITIONS AND CORRECTIONS TO THE POACEAE OF PUERTO RICO

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ABSTRACT

This paper reports on the occurrence of nine species of grasses (Poaceae) not previously reported for Puerto Rico (Britton & Wilson 1924, Liogier & Martorell 1982): *Aristida suringari Henrard, Brachiaria arrecta* (Dur. & Schinz) Stent, *Imperata brasiliensis* Trin., *Microstegium vimineum* (Trin.) A. Camus, *Panicum venezuelae* Hack., *Paspalum macrophyllum* Kunth, *Paspalum pulchellum* Kunth, *Sorghastrum stipoides* (Kunth) Nash, and *Tricholaena repens* (Willd.) Hitchc.

RESUMEN

Este articulo trata sobre la presencia de nueve especies herbaces (Poaceae) de Puerto Rico que no han sido descritas previamente (Britton & Wilson 1924, Liogier & Martorell 1982): *Aristida suringari* Henrard, *Brachiaria arrecta* (Dur. & Schinz) Stent, *Imperata brasiliensis* Trin., *Microstegium vimineum* (Trin.) A. Camus, *Panicum venezuelae* Hack., *Paspalum macrophyllum* Kunth, *Paspalum pulchellum* Kunth, *Sorghastrum stipoides* (Kunth) Nash, *y Tricholaena repens* (Willd.) Hitchc.

ARISTIDA SURINGARI has been reported from St. Croix and St. Thomas and through the Netherlands Antilles (Henrard 1926, 1932, Lindeman & Stoffers 1963). The only record of *A. suringari* for Puerto Rico is a specimen collected from a limestone plateau on Mona Island, 3 March 1944 by C.E. Chardon and J.I. Otero (*Chardon and Otero 819* SJ!). This specimen, how-

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ever, was previously identified erroneously as *A. adscensionis* L. (Woodbury et al. 1977:13). Correct identification was made by comparing the specimen with type material of *A. suringari* and with material from all species of the genus native to Puerto Rico and the Virgin Islands (i.e., *A. adscensionis*, *A. chaseae* Hitchcock, *A. cognata* Trin. et Rupr., *A. portoricensis* Pilger, *A. refracta* Griseb., and *A. spiciformis* Elliott).

BRACHIARIA ARRECTA is indigenous to tropical Africa (Wells et al. 1986). It has been cultivated under the name of "Tanner grass", and although it has been reported to have been introduced into the West Indies (letter, J. Blewett, Royal Botanical Gardens, KEW, Richmond Surrey, Great Britian, 11 October 1988), we can find no reference of its introduction into the New World. On 27 September 1987, McKenzie and Proctor collected this species along a small tributary of Rio Saliente of the Torro Negro Range in central Puerto Rico (Municipio: Jayuya; Barrio: Saliente; elev. ca. 900 m; *McKenzie 747* KEW, LSU, MO, SJ, US). The habitat is similar to the "... terrestrial, moist, streambank moisture regime", listed for the species in southern Africa (Wells et al. 1986). It has been cultivated for cover and as a soil binder, but it has apparently become a problematic weed in the Republic of South Africa and Botswana (Wells et al. 1986).

The range of IMPERATA BRASILIENSIS extends from Louisiana to Florida, the Bahamas, West Indies, southern Mexico, Guatemala, Costa Rica to Brazil (Hitchcock 1909, 1913, 1927, 1930, 1936, Chase 1951, Acosta-Solis 1969, Adams 1972, Correll and Correll 1982). This species was collected by McKenzie in the Maricao State Forest in western Puerto Rico on 23 April 1987 (Municipio: Maricao; Barrio: Maricao Afuera; *McKenzie 601* FLAS, LSU, MO, SJ, US). The grass was growing in lanes cut for Caribbean Pine (*Pinus caribaea* Morelet) seedlings, on exposed banks of a recently cleared ash (*Fraxinus* sp.) plantation. This habitat is similar to the "open rather dry ground" reported for the species in the West Indies (Hitchcock 1936).

MICROSTEGIUM VIMINEUM has been introduced from Asia and is established in eastern and southeastern regions of the United States (Chase 1951). The species was collected by J. A. Edmisten on 24 October 1966 on the El Verde Experiment Station, ca. 16 km south of Rio Grande, in northeastern Puerto Rico. Because the specimen was lacking an inflorescence, Edmisten apparently forwarded the plant to W. H. Duncan, who cultivated it until the grass flowered and fruited. A specimen was then sent by Duncan to T. R. Soderstrom at the U.S. National Herbarium who identified the grass (*Duncan s.n.* LSU!).

PANICUM VENEZUELAE has previously been reported from Cuba, Dominican Republic, Guatemala, Venezuela and Brazil (Hitchcock and

Chase 1915, Hitchcock 1936, Pittier et al. 1945, Swallen 1955). This species was discovered on 4 February 1987 by Proctor, on the east peak of Las Tetas de Cayey, in south-central Puerto Rico (Municipio: Salinas; Barrio: Lapa; at elev. 820-830 m; *Proctor 42997* IJ, SJ, US). The grass was growing on stony slopes and exposed rock crevices, a habitat identical to that reported for other localities (Hitchcock and Chase 1915, Hitchcock 1936, Swallen 1955).

PASPALUM MACROPHYLLUM is known from the Andean mountains of Colombia, Ecuador, and Venezuela, where it occurs in "marshy savannas, wood borders, edges of clearings, and moist shady places," at elevations between 1200 and 1950 meters (Hitchcock 1927, Pittier et al. 1945, Acosta-Solis 1969). On 20 June 1987, McKenzie collected this species at the border of moist woods ajacent to the Maricao River and along the entrance road to the Viverous Fish Hatchery at Maricao (Muncipio: Maricao; Barrio: Maricao Afuera; *McKenzie 670* LSU). It was subsequently collected at the same location on 5 July 1987 (*McKenzie and Proctor 681* FLAS, LSU, MO, TAES, SJ, US). A third collection was made on 6 November 1987 on the campus of the University of Puerto Rico at Mayaguez (Municipio: Mayaguez; Barrio: Rio Hondo; *McKenzie 812* LSU.).

Positive identification of this species was made by comparing the above mentioned collections with type material (US! hrbr. nr. *2855795*). Previous collections of *Paspalum macrophyllum* in Puerto Rico have been erroneously identified as *Paspalum maritimum* Trin. (see Liogier and Martorell 1982). *Paspalum macrophyllum* was imported into Mayaguez, Puerto Rico in 1940 by Dr. Ovido Garcia-Molinari of the Institute of Tropical Agriculture, University of Puerto Rico, Mayaguez. The species was collected by Garcia-Molinari in Venezuela near Monte Choroni of the Andean mountain range and was introduced for livestock forage and soil erosion control (Garcia-Molinari 1946).

Paspalum macrophyllum apparently escaped from research plots at Mayaguez and recent collections near Maricao suggest that the species is expanding its range in Puerto Rico. Its habitat along the Maricao River is apparently similar to the "wood borders and moist shady places" described by Hitchcock (1927). Interestingly, Garcia-Molinari (1946) reported that the species was ". . .well adapted to dry, poor soil on steep slopes . . .", where it offered ". . .an excellent protection against soil erosion." Because we can find no evidence that *Paspalum macrophyllum* has previously been illustrated, a complete illustration is provided in Figures 1 and 2.

The range of PASPALUM PULCHELLUM has been reported from British Honduras (now Belize), Guatemala, Costa Rica, and British Guiana (now Guyana), to Brazil, Cuba, Hispaniola, and Trinidad (Hitchcock 1909,

FIG. 1.—*Paspalum macrophyllum* Kunth habit (scale: 4 cm).

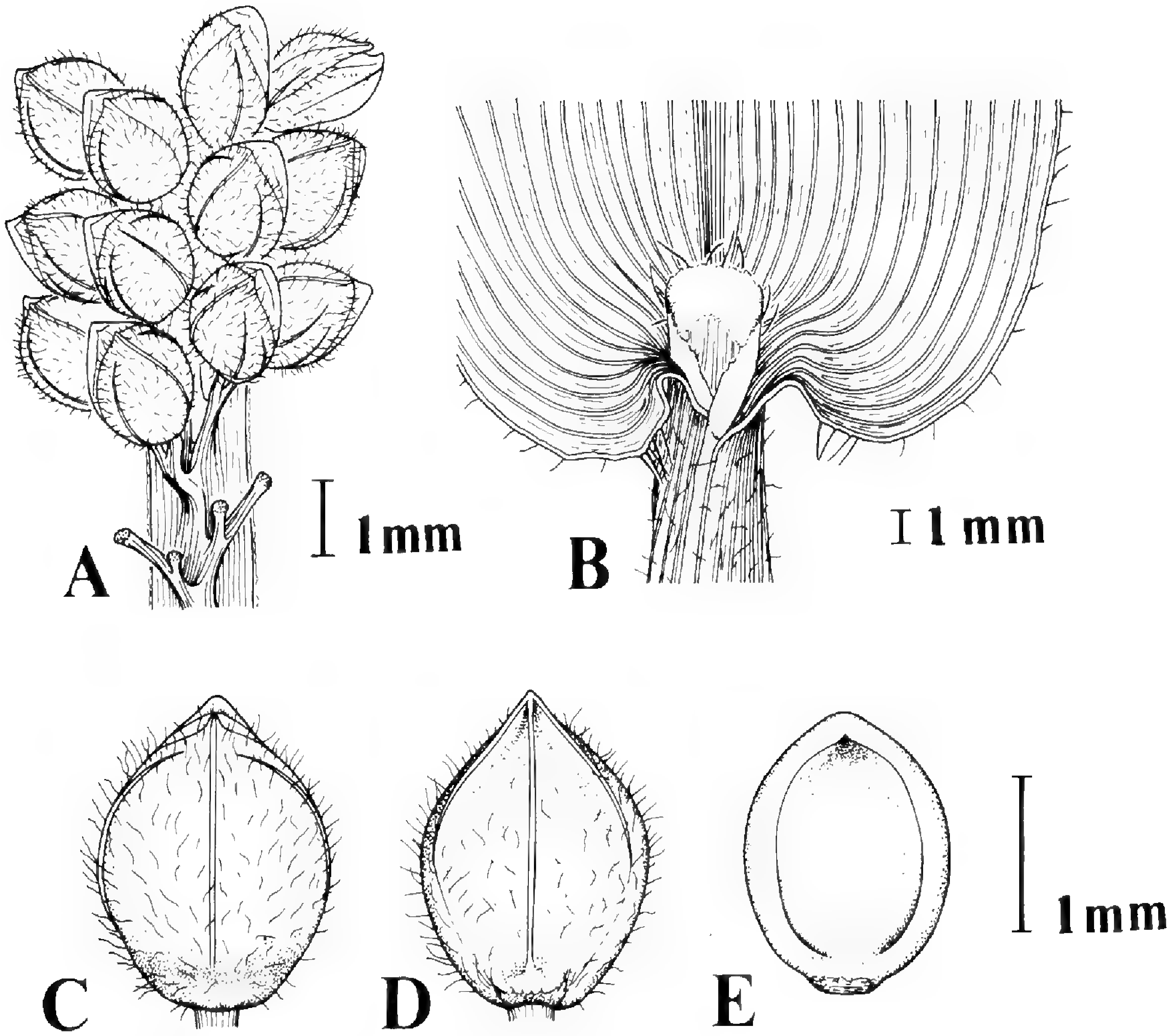

FIG. 2.—*Paspalum macrophyllum* Kunth—A: inflorescence branch; B: ligule, leaf base, and upper part of the sheath; C: spikelet with view of second glume; D: spikelet with view of sterile lemma; E: view of fertile lemma (scale for A through E: 1 mm).

1922, 1930, 1936, Chase 1929, Standley and Record 1936, Moscosco 1943, Swallen 1955, Pohl 1980). On 2 August 1987, McKenzie discovered this species growing in recently disturbed soil, on red clay slopes of Cerro Las Mesas at Mayaguez (Municipio: Mayaguez; Barrio: Juan Alonso; at elev. ca. 340 m; *McKenzie 711* FLAS, LSU, MO, TAES, SJ, US). On 7 September 1988, the species was subsequently collected at the same locality by McKenzie (*McKenzie 1011* LSU, US) and Proctor (*Proctor 44998* SJ). The habitat on Cerro Las Mesas is unlike the "sandy mostly moist savannas and pinelands" (Hitchcock 1936) reported from other localities.

Sorghastrum stipoides is known from Cuba (Hitchcock 1936, Leon 1946) and South America (Colombia, Bolivia, and Ecuador to Argentina: Hitchcock 1927, 1936; Acosta-Solis 1969). On 24 September 1988, Proctor collected this species in dry, silica sand, near Laguna Tortugero in north central Puerto Rico (Municipio: de Vega Baja; Barrio: Algarrobo; *Proctor*

45036 IJ, LSU, SJ, US). The late discovery of this species in Puerto Rico is probably due to its close resemblance to *Sorghastrum setosum* (Griseb.) Hitchc., which has been collected near the same locality (*Chase 6421* US: see Hitchcock 1936:410). *Sorghastrum stipoides*, however, can be easily distinguished from *Sorghastrum setosum* by its longer awns (10-15 mm) that are geniculate and strongly twisted at the base. In *Sorghastrum setosum* the awns are straight and ca. 2 mm long (to ca. 5 mm long on cultivated specimens).

Tricholaena Schrader and *Rhynchelytrum* Nees ". . . are names applied to two closely related groups of panicoid grasses widely distributed in Africa and Arabia" (Fosberg 1981). Many taxonomists have considered the two genera as distinct (e.g., Hutchinson and Dalziel 1936, Phillips 1951). This decision is apparently based on the authority of C. E. Hubbard who failed to publish his evaluations (Fosberg 1981). Fosberg (1981) believed that characters used by Hubbard to separate *Tricholaena* and *Rhynchelytrum* were too weak to warrant distinct generic status. Consequently, he chose to recognize only *Tricholaena*, the older name.

TRICHOLAENA ROSEA Nees is an attractive perennial, or occasionally annual grass native to Africa. It has been introduced as an ornamental and has become a common weed in Puerto Rico and other tropical and subtropical regions of the Americas (Hitchcock 1936, Chase 1951, Lindeman and Stoffers 1963, Gooding et al. 1965, Gould 1975, Liogier and Martorell 1982). *Tricholaena repens* (Willd.) Hitchc. is apparently an annual species native to West Africa (Fosberg 1981). Although Fosberg (1981) provided information suggesting that *Tricholaena rosea* was specifically distinct from *Tricholaena repens*, the two species have often been confused. Suggestively, Chase (1951:947) agreed with the assessment of Fosberg (1981) and stated that the species introduced into the United States (*Tricholaena rosea*) had been confused with the annual species from West Africa (*Tricholaena repens*).

Woodbury et al. (1977) listed *Rhynchelytrum repens* for Mona Island and stated, "Introduced by the Insular Experiment Station at Rio Piedras in 1922, now naturalized in many areas of Puerto Rico and nearby islands including Desecheo. Native to Tropical Africa. This grass has been confused at times with its allied species *Rhynchelytrum roseum* (Nees) Stapf. and Hubbard, also native to Africa." Although Woodbury et al. (1977) acknowledged that *Tricholaena rosea* was specifically distinct from *T. repens*, they apparently confused the two and listed the wrong species for Mona Island. The *Tricholaena* on Mona Island has distinct rose or purplish spikelets and is thus *T. rosea* and not *T. repens*.

Due to such confusion and the failure of some authors to recognize that the two species are distinct (e.g., Liogier and Martorell 1982), the following names have been misapplied to *Tricholaena rosea: Rhynchelytrum roseum*

(Nees) Stapf & Hubb.: Chase (1951), Swallen (1955); *Rhynchelytrum repens* (Willd.) C.E. Hubb.: Gooding et al. (1965), Acosta-Solis (1969), Gould (1975); and *Tricholaena repens*: Hitchcock (1936), Moscosco (1943), Garcia-Molinari (1952), Lindeman and Stoffers (1963).

Proctor discovered TRICHOLAENA REPENS growing in white sand at Laguna Tortugero, northwestern Puerto Rico (Municipio: Manati, Barrio: Tierras Nuevas Saliente) on 28 November 1986 (*Proctor* 42684 SJ, US). The species was subsequently collected at the same locality by McKenzie on 23 July 1987 (*McKenzie* 700, FLAS, LSU, US). Additional voucher specimens from Laguna Tortugero include: (*Proctor* 44037, HAJB, IJ, NY, SJ, US). On a recent collecting trip to Cuba, Proctor noted that *Tricholaena repens* also inhabits white sand there.

At Laguna Tortugero, *Tricholaena rosea* and *Tricholaena repens* occur sympatrically and are usually easily separated. Young and median-aged specimens of *Tricholaena rosea* can be distinguished from *Tricholaena repens* by their rosy red to purplish and larger spikelets (measured from the base of the spikelet to the tip of the awn of the sterile lemma: 3.5-5.0 mm, vs. 2.5-3.2 mm, respectively), their habit of often having nodding panicles, and their lack of conspicuous, purplish, aerial roots on the lower nodes. *Tricholaena repens* is characterized by its smaller, paler spikelets, its more erect panicles, and the presence of conspicuous, purplish, aerial roots on the lower nodes. Because old, faded spikelets of *Tricholaena rosea* are often pale (Fosberg 1981), identification between mature specimens of the two species can be difficult. Thus, for such specimens, spikelet size, panicle shape, and presence or absence of purplish aerial roots on the lower nodes should be the major criteria used for correct identification. Under magnification, *Tricholaena rosea* can be further distinguished from *Tricholaena repens* thusly: in *Tricholaena repens*, hairs on the spikelets are uniformly spreading and the hair bases of the second glume and lemma of the lower floret are conspicuously tuberculate, whereas in *Tricholaena rosea*, hairs on the spikelets are not uniformly spreading but oriented toward the apex, and the hair bases of the second glume and lemma of the lower floret are not conspicuously tuberculate.

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AN ANALYSIS OF MORPHOLOGICAL VARIATION IN *MUHLENBERGIA CAPILLARIS* (POACEAE) AND ITS ALLIES IN THE SOUTHEASTERN UNITED STATES

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ABSTRACT

Muhlenbergia capillaris and its allied species, *M. expansa* and *M. filipes* have been variously classified in the past as three distinct species or a single species with three varieties. A numerical analysis was performed on data taken from herbarium specimens collected throughout the geographic distribution of these taxa. Analysis of variance, principal components analysis, cluster analysis, and discriminate analysis indicate there is a continuum of morphological variation present. A single species with three varieties (var. *capillaris* var. *filipes* and var. *trichopodes* is recognized. A key to the varieties and descriptions of each are presented.

INTRODUCTION

Muhlenbergia capillaris (Lam.) Trin. and its related taxa, *M. filipes* M. A. Curtis and *M. expansa* (DC.) Trin., are common species found along rocky or sandy woodlands, pine barrens, and coastal sand dunes throughout the southeastern United States. This group can readily be identified in the field by the large bunchgrass appearance, long leaf blades (flat or involute), large wide spreading panicle, and long narrow (usually purple) spikelets with a single floret.

In the extremes of their variation, each taxon appears to be a well defined species. The primary characters which have been used to separate them are the length of the lemma awn and glume awns, relative length of the glumes to the floret, and the degree to which the leaf blade is involute. Several authors have noted a large amount of variation within each taxon. Vasey (1892) reduced *M. expansa* to a variety of *M. capillaris* (var. *trichopodes* based on *M. trichopodes* Chapm.). However, Hitchcock (1935) did not follow this treatment and maintained *M. expansa* as a distinct species. More recent taxonomists have followed this treatment (Fernald 1950; Hitchcock

SIDA 13(3):303–314. 1989.

1951; Gleason and Cronquist 1963; Radford,et al. 1968; Reeder 1975) with few dissenters (Correll and Johnston 1970). Reeder (1975) suggested a possible distinction between *M. capillaris* and *M. expansa* noting the basal leaves of the latter often become fibrous at maturity. *Muhlenbergia filipes* was reduced to a variety of *M. capillaris* by Beal (1896) upon the suggestion of Chapman accompanied by no discussion. This treatment has been followed by most recent authors (Hitchcock 1935; Fernald 1950; Hitchcock 1951; Radford, et al. 1968; Correll and Johnston 1970). However, further morphological and phenological studies by Pinson and Batson (1971) suggested that this taxon deserved specific recognition. This has since been followed by Reeder (1975).

While preparing a treatment of the genus *Muhlenbergia* for the *Vascular Flora of the Southeastern United States* we examined many specimens that did not correspond to previously described morphological limits of the taxa in this complex. The purpose of this study was to perform a phenetic analysis of morphological data representing this complex to determine whether specific recognition of these taxa is warranted. The criteria used in making this determination will be based on the presense or absence of morphological discontinuities.

MATERIALS AND METHODS

Herbarium specimens from 25 herbaria located primarily in the southeastern United States were observed. Of these, 350 specimens were selected from across the geographic distribution of the complex and measured for 15 variable morphological characters. Spikelet measurements were made using a dissecting microscope with an ocular scale calibrated to 0.1 mm. Culm length and inflorescence length were measured separately such that culm length did not include inflorescence length. The plant base was recorded as a present or absent character: '1' if basal sheaths were fibrous, and '0' if not fibrous.

Two methods were used to analyze the variation present among the morphological characters. Statistical Analysis System, or SAS (Goodnight 1979) was used to provide basic statistical data and to perform discriminant analysis. The Numerical Taxonomy System of Multivariate Statistical Programs (NTSYS; Rohlf, et al. 1980) was utilized to provide principal components analysis (PCA) and cluster analysis of the data. Cluster analyses were performed with UPGMA and distance matrices.

RESULTS

Table 1 lists the range, mean, and standard deviation of the characters measured for each of the three taxa analyzed. Two analyses were run of both

Character	*capillaris*			*expansa*			*filipes*		
	range	mean	sd	range	mean	sd	range	mean	sd
Culm length•	12-110	51.0	17.4	22-100	54.0	16.6	23-92	54.0	17.3
Culm width*	0.7-3.2	1.6	0.4	0.9-3.3	1.6	0.4	1.1-3.4	2.2	0.5
Plant base	0-1	0.25	0.4	0-1	0.85	0.4	0-1	0.08	0.3
Leaf blade length•	11-80	28.0	11.1	10-47	24.0	8.7	14-75	36.0	15.2
Inflorescence length•	15-57	32.0	7.8	15-50	30.0	6.5	15-50	33.0	7.4
Inflorescence width•	5-25	13.0	4.0	3-41	9.0	4.5	6-23	12.0	3.4
Pedicel length*	3-46	19.4	7.2	2-37	14.0	6.6	8-48	20.3	8.5
Spikelet length*	2.5-4.6	3.4	0.4	2.7-5.1	3.8	0.6	2.4-4.8	3.7	0.5
First glume length*	0.3-2.3	1.3	0.4	1.1-3.6	2.5	0.5	0.5-1.7	1.0	0.3
First glume awn length*	0-3.2	0.2	0.5	0	0.0	0.0	0-10.3	3.3	2.6
Second glume length*	0.3-2.4	1.3	0.4	1.3-4.1	2.7	0.6	0.6-2.1	1.2	0.3
Second glume awn length*	0-5.0	0.6	1.0	0-0.6	0.0	0.1	1-25	11.2	6.0
Lemma length*	2.4-4.4	3.3	0.5	2.6-5.0	3.6	0.5	2.3-4.7	3.6	0.5
Lemma awn length*	0-17	6.6	3.5	0-4.0	0.7	0.7	8-33	17.7	4.3
Setaceous teeth length*	0-2	0.1	0.3	0-0.1	0.0	0.0	0-4.5	1.7	1.1

TABLE 1. Range, mean, and standard deviation (sd) for the three taxa for each characters used in the numerical analysis. An asterisk (*) indicates those characters measured in millimeters; a bullet (•) indicates those characters measured in centimeters.

the PCA and cluster analysis. The first analysis used all 15 characters, the second used only characters that had most of their variation explained by a significant principal component 1 or 2. In the first principal components analysis, principal component 1 identified first glume awn length, second glume awn length, lemma awn length, and length of setaceous teeth as the main characters contributing to the clustering, and principal component 2 identified spikelet length, first glume length, second glume length, and lemma length. However, the correlation for this analysis was quite low ($R = -0.37$) and the first two components accounted for only 48.6% of the variation. Results of the second PCA (Fig. 1) show a pattern similar to that of the first PCA although the pattern is more tightly clustered. As shown, the variation among specimens analyzed is continuous (Fig. 1). The correlation coefficient in this second analysis was much higher ($R = -0.73$) and the first two components accounted for 75% of the variation present.

The cluster analysis based on the eight characters identified by principal components 1 and 2 is presented as a distance phenogram in figure 2. Only the major groupings of the phenogram are presented. Six major groupings were identified (F_1, F_2, C + F, C, C + E, and E) with approximately 30% of the OTU's falling into mixed groups. It was possible by observation of the data set to determine what character states comprised each of the groups in the cluster analysis. For example, group F_1 is composed of specimens with glume awn length exceeding 15 mm, lemma awn length exceeding 20 mm, and setaceous teeth of the lemma 1.5 – 2.5 mm long, where in group F_2 the specimens have moderate length glume awns, variable to long lemma awns and setaceous teeth at least 3 mm long.

That a proportion of specimens were clustered into mixed groups was substantiated by a test of discriminant analysis. An *a priori* designation was assigned to each specimen to test the classification using discriminant analysis. Thirteen specimens were evaluated as misclassified, primarily from the *filipes* to *capillaris* or *expansa* to *capillaris* form. The classification for those specimens identified was modified and the test rerun with a similar result, 12 different specimens were evaluated as misclassified.

DISCUSSION

As shown in Table 1, there is an overlap in the morphological range of the diagnostic characters used in past treatments. Because of this variation, it is often difficult to identify specimens. Many specimens have several characters that may fit the range of different taxa. The resulting identification of such specimens can only be based on the subjective correlation of characters. The possibility also exists that these specimens represent putative hybrids.

Several of the characters warrant further elaboration. Reeder (1975) used basal sheaths becoming fibrous at maturity in *M. expansa* as an important distinguishing character. However, the results here indicate that 25% of *M. capillaris* and 8% of *M. filipes* specimens had fibrous basal sheaths at maturity. The degree to which the sheaths became fibrous varied considerably and specimens characteristic of *M. expansa* tended to have a more pronounced fibrous nature. However, there is little evidence to support this character in maintaining species boundaries.

The setaceous teeth of the lemma were identified as an important charac-

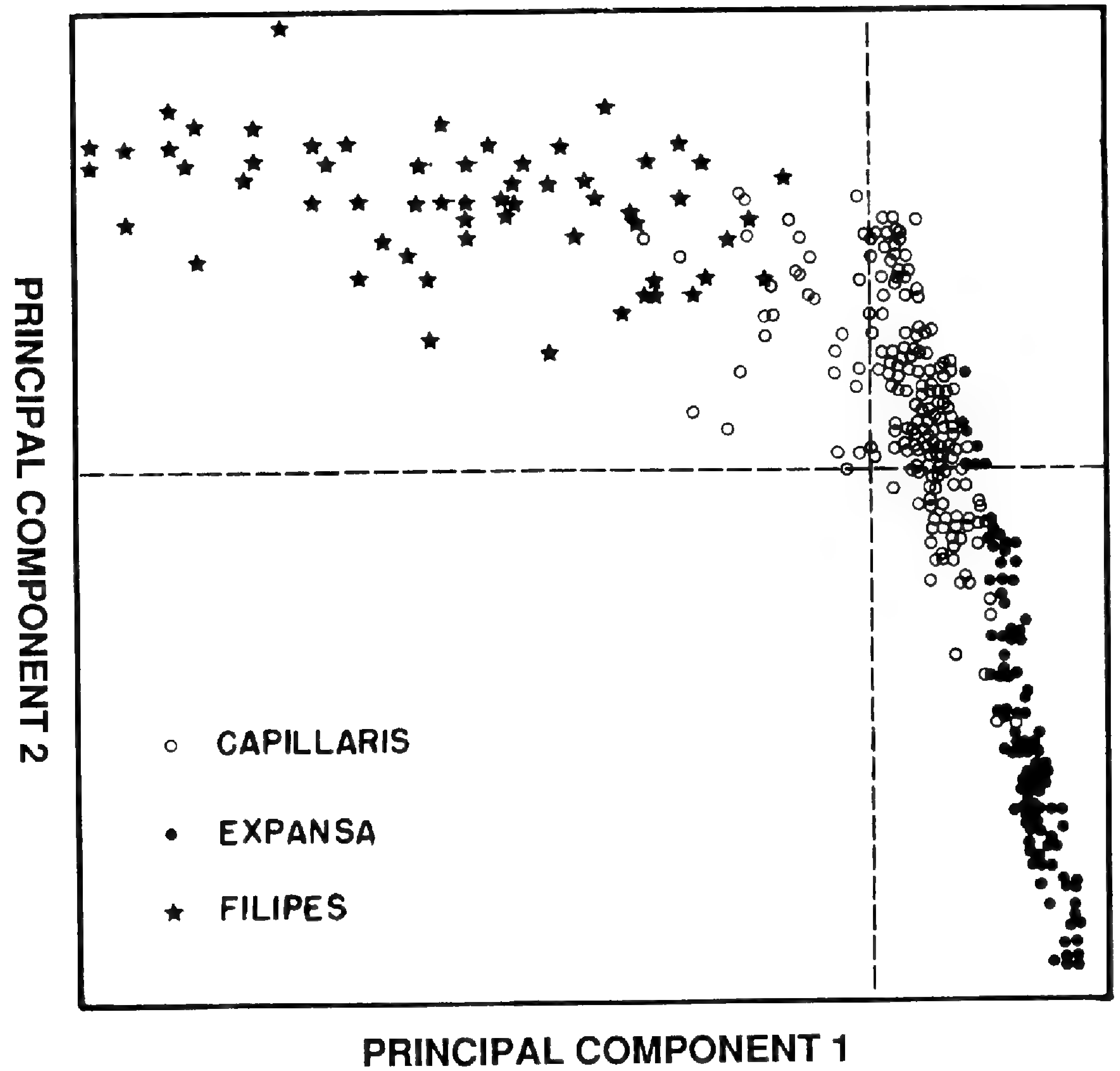

FIG. 1. Principal components analysis using eight characters identified by principal components 1 and 2 as significantly accounting for the variation present in initial analysis. R = -0.73, and components 1 and 2 accounted for 75% of the variation.

ter in separating *M. filipes* from *M. capillaris* by Pinson and Batson (1972). They reported that the lemma of *M. capillaris* did not have setaceous teeth, yet in this study specimens referable to *M. capillaris* based on glume and lemma awn length had setaeous teeth as long as 2 mm. This is by no means common within the complex, yet it does occur with enough frequency that it cannot be regarded as an occasional phenomenon. Also, examination of the type fragment of *Stipa capillaris* (US) reveals the presence of setaceous teeth to 0.8 mm long.

It is evident from these analyses that there is no clear separation of the taxa. Principal components analysis shows a continuum of morphological variation from one extreme to the other, and neither cluster analysis nor discriminant analysis could adequately separate the three taxa. Because of the lack of morphological discontinuity between the taxa it is our opinion that this complex is represented by a single species. However, because the statistical analyses were able to identify several broadly classified groups and some phenological differences between the forms has been previously noted (Pinson and Batson 1971), we recognize three varieties within this morphologically variable species.

Currently, no information is known concerning the chromosome number of these taxa and little is known regarding the anatomical variation present. Kearney (1900) compared the leaf cross sections of members of this complex and concluded that distinctions based on leaf anatomy were evident. Morden and Hatch (1987) have previously shown that distinctions among species based on anatomical differences are possible within some groups of species in *Muhlenbergia*. Future research with this group should be directed toward understanding the genetic relationships among these taxa in addition to the anatomical and epidermal variation that appears to be present.

TAXONOMY

MUHLENBERGIA CAPILLARIS (Lam.) Trin., Gram. Unifl. 191. 1824.

Densely caespitose perennial; culms simple, erect, 6 – 10 (15) dm tall, 0.7 – 3.4 mm diam., glabrous or puberulent below the nodes. Sheaths rounded, glabrous, basal sheaths often becoming fibrous at maturity. Ligule firm, strongly decurrent, 2 – 5 mm long on lower blades, up to 10 mm long on upper blades. Blades flat or involute, elongate, 10 – 80 mm long, 2 – 4 mm wide, curved outward at base, veins tan, midvein not prominent, abaxial surface glabrous or with infrequent pilose hairs, adaxial surface densely scabrous. Inflorescence an open panicle, base often included in the leaf sheath, 15 – 50 (60) cm long, 5 – 30 (40) cm wide, narrow when immature and spreading at maturity. Spikelets acuminate, 2.4 – 5.1mm long, purple or occasionaly green, brown, or yellowish, subsessile or on pedicels up to 5 cm long. Glumes subequal, acute, awned or awnless, first glume 1-nerved, second glume 1 – 3-nerved. Lemma awned or awnless, usually purple or green, 2.3 – 5.0 mm long, 3-nerved, nerves often obscure, apex acuminate, puberulent on callus, scabrous near apex. Palea shorter to slightly longer than lemma, 2.1 – 4.5 mm long, glabrous or scabrous between the nerves. Anthers purple, 1.5 – 2.0 mm long. Caryopsis 2 – 2.5 mm long, dark brown, narrowly elliptic. Embryo ca. 1/2 the length of the caryopsis.

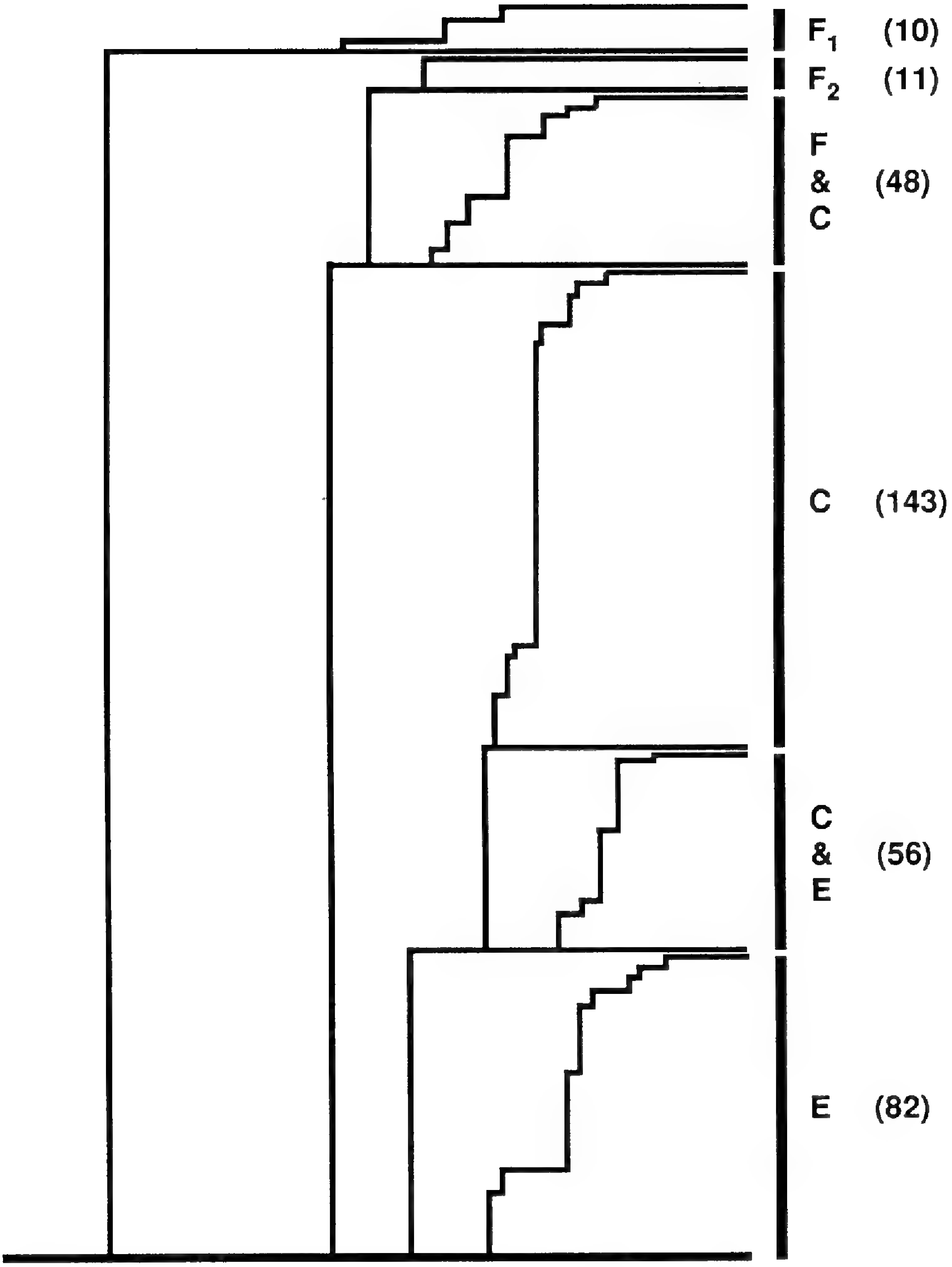

FIG. 2. Cluster analysis using eight characters identified by principal components 1 and 2 as significantly accounting for the variation present in initial analysis. C, E, and F represent forms which would be referred to the taxa *M. capillaris*, *M. expansa*, and *M. filipes*, respectively. The numbers in parenthesis represents the number of OTU's in each group.

KEY TO THE VARIETIES OF *Muhlenbergia capillaris*

Glumes less than 1/2 length of lemma; lemma awn longer than 3 mm, seldom awnless.
  Glume awns 0 – 4 mm long; lemma awn 2 – 13 (18) mm long; lemmas without conspicuous setaceous teeth .... 1. var. *capillaris*
  Glume awns 2 – 25 mm long, when less than 5 mm then lemma awn greater than 20 mm long; lemma awn 8 – 33 mm long; lemma with conspicuous setaceous teeth 1 – 5 mm long .... 2. var. *filipes*
Glumes greater than 1/2 length of lemma; lemma usually awnless or or with short awn to 3 mm long .... 3. var. *trichopodes*

1. var. CAPILLARIS

Stipa capillaris Lam., Tabl. Encycl. 1:158.1791. TYPE: Carolina, *Fraser s.n.* (P, US fragment!). *Podosemum capillare* (Lam.) Desv., Nouv. Bul. Soc. Philom. 2:188. 1810. *Trichochloa capillaris* (Lam.) DC., Cat. Hort. Monsp. 152. 1813. *Agrostis setosa* Willd. *ex* Trin., Acad. St. Petersb. Mem. VI Sci. Nat.4(1):300. 1841, as synonym of *Stipa capillaris*.

Stipa diffusa Walt., Fl. Carol. 78. 1788 (not *M. diffusa* Willd.)

Stipa sericea Michx., Fl. Bor. Amer. 1:54. 1803. TYPE: South Carolina, *Michx. s.n.* (P, US fragment!). *Agrostis sericea* (Michx.) Ell., Bot. S.C. and Ga. 1:135. 1816. *Polypogon sericeus* (Michx.) Spreng., Syst. Veg. 1:243. 1825. *Stipa cericea* Michx. *ex* Raf., Neogen. 4. 1825, error for *Stipa sericea*.

Tosagris agrostidea Beauv., Ess. Agrost. 29 (as *T. agrostidea*) pl.8, f. 3(as *T. agrostoidea*). 1812. TYPE: United States. *Podosemum agrostideum* (Beauv.) Beauv., Ess. Agrost. 176. 1812. *Podosaemon agrostideum* (Beauv.) Beauv. *ex* Spreng., Syst. Veg. 1:243. 1825.

Trichochloa polypogon DC., Cat. Hort. Monsp. 152. 1813. TYPE: Carolina, *Fraser s.n.* (P, US fragment!). *Muhlenbergia polypogon* (DC.) Kunth, Rev. Gram. 1:64. 1829.

Trichochloa purpurea Beauv., Ess. Agrost. 29. pl. 8. f. 2. 1812. TYPE: United States. *Podosemum purpureum* Beauv., Ess. Agrost. 176. 1812.

Trichochloa expansa DC., Cat. Hort. Monsp. 151. 1813. TYPE: Carolina, *Bosc s.n.* (P, US fragment!). *Agrostis rubicunda* Bosc ex DC., Cat. Hort. Monsp. 151. 1813, as synonym of *T. expansa* DC. *Muhlenbergia expansa* (DC.) Trin., Gram. Pan. 26. 1826.

Muhlenbergia caespitosa Chapm., Bot. Gaz. 3:18. 1878. TYPE: Florida. Apalachicola, *Chapman s.n.*

Basal sheaths often fibrous although not extensively so; glumes subequal, 1/4 – 1/2 the length of the spikelet, first glume awn 0 – 3 mm long, second glume awn 0 – 5 mm long; lemma occasionally with setaceous teeth at apex to 1 mm long, awn (0) 2 – 18 mm long; palea usually awnless. Common in rocky or sandy woodlands from Massachusetts to Illinois, south to Oklahoma and east Texas and Florida. Also reported from eastern Mexico and the West Indies. Flowering late August to November.

NOMENCLATURE.—A fragment of *Stipa capillaris* Lam. is at US and clearly shows the glumes with awns 2 – 4 mm long and setaceous teeth of the lemma 0.2 – 0.8 mm long. A fragment of *Stipa sericea* Michx., also at US, has written on the sheet "glumes minute, delicate awned as var. *filipes*" in Hitchcock's script. The spikelets, however, closely resemble that of *Stipa capillaris* Lam. except that the glumes are truncate or erose at the apex. The illustration of *Tosagris agrostidia* in Beauvois' Essai Agrostographie (1812) is var. *capillaris*. Beauvois' illustration of *Trichochloa purpurea*, long considered a synonym of var. *trichopodes*, is a form of var. *capillaris* with awnless glumes and short awns on the lemma, the glumes being less than 1/2 the length of the floret. A fragment of *Trichochloa expansa* DC. at US is also var. *capillaris*, the glumes ca. 1/3 the length of the floret and the lemma short awned. It is apparent that de Candolle and Poiret (for *Stipa expansa*) were describing two different specimens, both collected by Bosc in "Carolina." De Candolle (1813) doubtfully cited Poiret, stating that the spikelet of *T. expansa* had short glumes, whereas Poiret mentioned that the glumes almost equal the floret. De Candolle stated that there may have been a typographical error in Poiret's work. However, this is probably not the case. In transferring this taxon to *Muhlenbergia*, Trinius (1826) cited *Trichochloa expansa* DC. as the basionym and excluded as a synonym Poiret's name indicating he did not choose to recognize it. His Latin diagnosis also correlates with that of de Candolle's. See also nomenclature of *Stipa expansa* Poir. under var. *trichopodes*. A fragment of *Trichochloa polypogon* DC. at US is also a form of var. *capillaris* with glumes and lemma short awned. The description by Chapman (1878) of *Muhlenbergia caespitosa*, floret "...four times as long as oval, obtuse, or denticulate glumes and equalling the stout rough awn," clearly allies this with var. *capillaris*. The location of the type of *Stipa diffusa* Walt. is uncertain and Walter's (1788) description is vague. It has been placed in synonymy with var. *capillaris* by others (Hitchcock 1951), and we will retain it there until such time as the type can be observed.

2. var. FILIPES (M. A. Curtis) Chapm. *ex* Beal, Grasses N. Amer. 2:256. 1896.

> *Muhlenbergia filipes* M. A. Curtis, Amer. J. Sci. 44:83. 1843. TYPE: Sea Islands of North Carolina, *Curtis s.n.* (SYN: GH!, MO!, NY, US fragment!). *Podosemum filipes* (M. A. Bush, Amer. Midl. Nat. 7:29. 1921.

Basal sheaths rarely fibrous; glumes subequal, about 1/4 the length of the spikelet, conspicuously long-awned, first glume awn usually shorter than second, 0 – 10 mm long, second glume awn 3 – 25mm long; lemma with two setaceous teeth at apex, occasionally arising from the awn above the lemma, awns 10 – 35 mm long, rarely shorter; palea nerves often extending as awns up to 2 mm long. Sand dunes and coastal woodlands from North Carolina south to Florida and west to East Texas. This variety tends to be more robust in all characters. Flowering September to December, occasionally January.

Nomenclature.—The type of *M. filipes* M. A. Curtis at GH, MO, and US is long awned from the glumes, lemma, and palea. The setaceous teeth of the lemma are 1 – 2 mm long and appear to come off the awn column rather than the lemma apex.

3. var. TRICHOPODES (Ell.) Vasey, Contr. U.S. Natl. Herb. 3:66. 1892.

Stipa expansa Poir. in Lam., Encycl. Meth. 7:453. 1806. Type: Carolina, *Bosc s.n.* (P?).

Agrostis arachnoidea Poir. in Lam., Encycl. Suppl. 1:249. 1810. Type: Carolina, *Bosc s.n.* (P, US fragment!). *Vilfa arachnoidea* (Poir.) Beauv., Ess. Agrost. 147, 181. 1812. *Cinna arachnoidea* (Poir.) Kunth, Rev. Gram. 1:67. 1829. *Muhlenbergia arachnoidea* (Poir.) Trin. *ex* Kunth, Enum. Pl. 1:207. 1833. *Agrostis expansa* Poir. *ex* Steud., Nom. Bot. ed. 2. 1:40. 1840. *Agrostis longiflora* Willd. *ex* Steud., Nom. Bot. ed. 2. 1:41. 1840.

Agrostis trichopods Ell., Bot. S.C. and Ga. 1:135. pl. 8. f. 1. 1816. Type: Chatham Co.: near Charleston, Ga., *Baldwin s.n.* (CHARL). *Muhlenbergia trichopodes* (Ell.) Chapm., Fl. South. U.S.553. 1860. *Podosemum trichopodes* (Ell.) Bush, Amer. Midl. Nat. 7:30. 1921.

Basal sheaths very fibrous or not; glumes subequal, awnless or the second occasionally mucronate; lemma awnless or with a short awn to 3 mm long, setaceous teeth absent; palea awnless. Moist, sandy pine forest near the coast from Virginia south to Florida and west to East Texas. Flowering August to late October.

Nomenclature.—Weatherby (1942) indicated that the type of *Agrostis trichopodes* is still present in Elliott's herbarium although it was not available for this study. Elliott's description (1816), however, seems conclusive that it does represent this variety. Although the type of *Stipa expansa* Poir.is not available for examination, the written diagnosis is also clear that this is var. *trichopodes* (Lamarck 1806). Poiret's Latin diagnosis is unclear concerning the relative size of the spikelet structures. However, his French description mentions that the glumes are almost equal to the floret, which is typical of this variety. *Trichochloa expansa* DC. is based on a different specimen and is synonymous with var. *capillaris* (see also nomeclature under var. *capillaris).* A fragment of *Agrostis arachnoidea* Poir. at US is var. *trichopodes.*

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A NEW SPECIES OF *CROTALARIA* (FABACEAE) FROM THE FLORIDA CENTRAL RIDGE

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ABSTRACT

Crotalaria avonensis DeLaney & Wunderlin is described from the xeric white sand scrub habitat of Highlands County, Florida. It is compared with *C. rotundifolia*.

INTRODUCTION

Crotalaria is a genus of temperate, subtropical, and tropical plants comprising about 600 species, the majority of which are African. Eleven species have been known hitherto from Florida, but only three of these (*C. pumila* Ortega, *C. purshii* DC., and *C. rotundifolia* (Walt.) Gmelin) are native. Study of the flora of the Lake Wales Ridge in Highlands and Polk counties, Florida, an area well noted for its high endemism, resulted in the discovery of the following unifoliolate *Crotalaria* new to science.

CROTALARIA **avonensis** DeLaney & Wunderlin, sp. nov. (Figs. 1 – 5).

A *Crotalaria rotundifolia* (Walt.) J. Gmelin stipulis nullis, vexillo obovato, et stylis paulatim recurvatis differt.

Perennial, erect, virgate or slightly spreading herbs with taproot to 14 mm thick, to 40 cm long, sometimes branching abruptly into 2 to 8 stout, semi-radially disposed secondary roots to 7 mm thick, 14 cm long. Flowering stems 1 – 3 (-10), 2 – 10 (-18) cm long arising from the tap root from up to 10 cm below the surface, moderately sericeous, with ascending, loosely appressed, white or yellowish-white trichomes (0.3-) 0.6 – 1.4 mm long, the longest internodes 8 – 12 mm long. Stipules absent. Leaves broadly elliptic to orbicular, (5-) 8 – 19 mm long, (4-) 7 – 16 mm wide, at base rounded to broadly cuneate, at apex obtuse to emarginate, apiculate, somewhat succulent, both surfaces with white or yellowish-white, loosely appressed trichomes 0.3 – 1.2 mm long; petioles reddish- brown or green, relatively stout, 1.5 – 2.8 mm long. Racemes terminal on primary stem

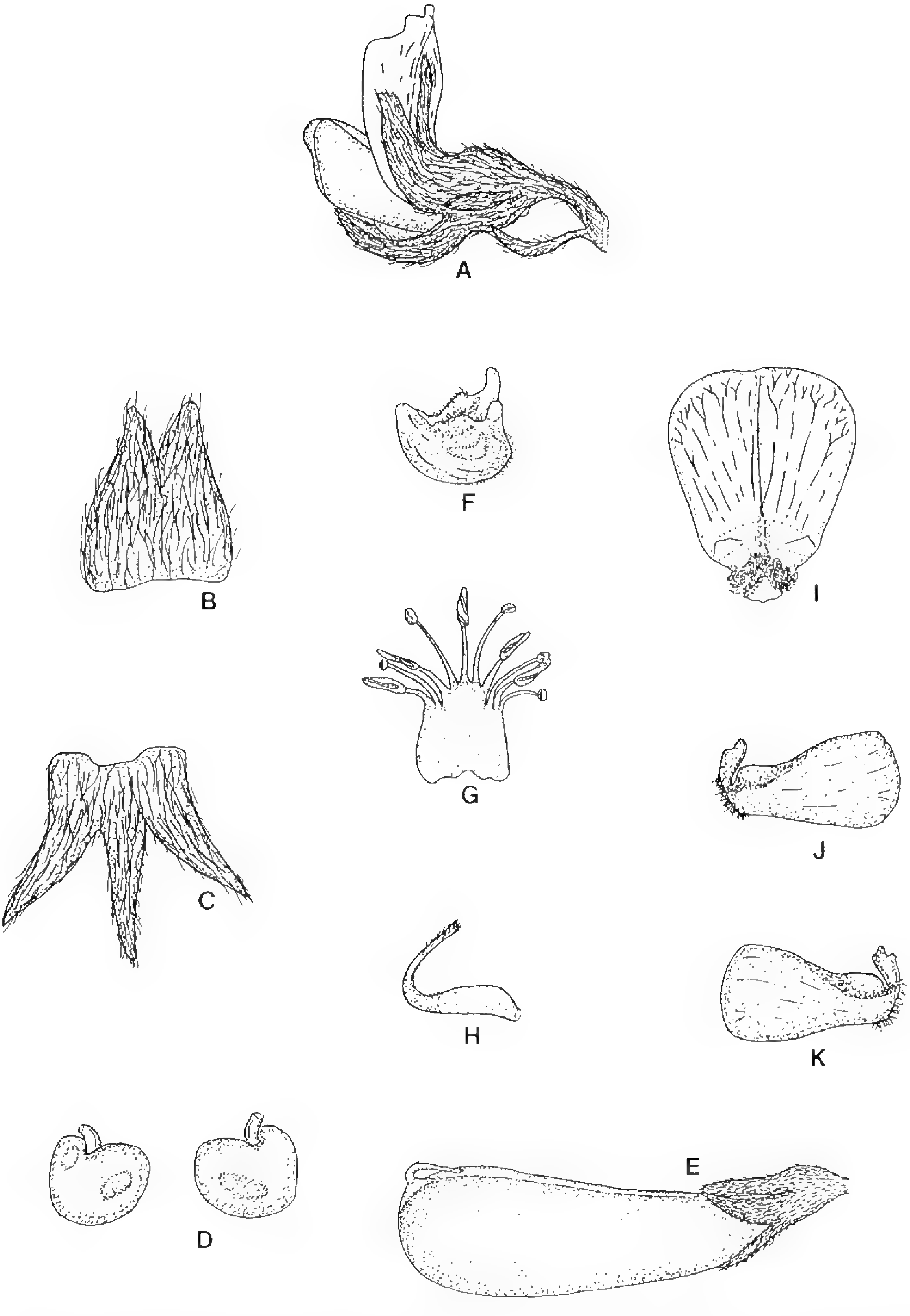

FIG. 1. *Crotalaria avonensis*: a) flower (4 ×); b) upper calyx lobes (4 ×); c) lower calyx lobes (4 ×); d) seeds (4 ×); e) fruit (2 ×); f) keel petals (4 ×); g) androecium (4 ×); h) gynoecium (4 ×); i) standard petal (4 ×); j k) lateral petals (4 ×).

FIG. 2. *Crotalaria avonensis*. Habit of flowering plant.
FIG. 3. *Crotalaria avonensis*. Habit of fruiting plant.

and on short leaf-opposed secondary branches; peduncles (1-) 10 – 17 (-33) mm long. Bracts petiolate, linear-elliptic, petiole ca. 0.5 mm long, blade 1.5 – 2.4 (-4.5) mm long, 0.2 – 0.3 (-0.7) mm wide. Pedicels 2 – 3 mm long; buds obliquely conical, angular. Calyces 7 – 8 mm long, tube 2 – 2.5 mm long, with ascending loosely appressed white or yellowish-white trichomes (0.3-) 0.6 – 1.2 mm long; bracteoles linear-elliptic, 1.6 – 2.0 (-2.6) mm long, 0.4 – 0.5 mm wide. Corollas yellow, standard variably brownish-red-lineolate, obovate, 8.0 – 8.7 (-10) mm long, 5.3 – 7.2 mm wide, 1 – 2.5 mm longer than upper calyx lobes, the blade at apex rounded, truncate, sometimes emarginate, each half with a thickened fleshy area near its base, woolly, sometimes ciliate near base; appendages at base of blade triangular, bi-lobed, or absent; wings held above and at a slight angle to the keel, 6.8 – 8.3 (-9.0) mm long, 2.5 – 3.1 (-3.5) mm wide, narrowly obovate, transversely rugose on outer surfaces, usually ciliate at base below; keel ca. 4 mm long, smoothly incurved, beak ca. 1 mm long, with only a slight twist (less than 90°) at tip, slightly protruding into lower median groove of standard, upper and lower free edges slightly ciliate; elongate basifixed anthers ca. 1.2 – 1.4 mm long, short medifixed ones 0.3 – 0.5 mm long; ovaries 1.6 – 2.7 mm long, glabrous or with only a few short trichomes along dorsal suture near base of style, 0.8 – 1.1 mm wide, stipe ca. 1 mm long, style smoothly incurved below the middle, 3 – 3.5 mm long, barbellate on distal abaxial surface and around stigma, sometimes also on basal adaxial surface. Fruits inflated, tan to gray to maroon, glabrous or with only a few short trichomes along distal portion of dorsal suture, 14 – 25 mm long, 5.9 – 7.8 mm wide, stipe 1.5 – 2.0 mm long; seeds chestnut to maroon, up to 18 per pod, 3.4 – 3.8 mm long, ca. 2.4 – 2.6 mm wide.

TYPE: FLORIDA. Highlands Co.: sand pine scrub E of Grassy Pond in the "Big Scrub", ca. 4 mi SE of Avon Park, T33S, R29E, sect. 34, S 1/2, 25 Apr 1988 (fl, fr), *DeLaney 1623* (HOLOTYPE: USF; ISOTYPES: USF, others to be distributed).

PARATYPES: FLORIDA. Highlands Co.: E of Grassy Pond in the "Big Scrub", ca. 4 mi SE of Avon Park, T33S, R29E, Sect. 34, S 1/2, 18 Jun 1986 (st), *DeLaney 1361* (USF); sand pine scrub E of Grassy Pond, ca. 4 mi SE of Avon Park, T33S, R29E, Sect. 34, S 1/2, 20 Mar 1988 (fl), *DeLaney 1621* (USF); Altair Road near Xavier in Avon Park Lakes, 2.5 mi WNW of Avon Park, T33S, 28E, Sect. 7, 20 Mar 1988 (fl), *DeLaney 1622* (USF); W side of Avon park Lakes, ca. 2.5 mi WNW of Avon Park, T33S, R28E, Sect. 7, 12 May 1988 (fl), *DeLaney s.n.* (USF); W side of Avon Park Lakes, ca. 2.5 mi WNW of Avon Park, T33S, R28E, Sect. 7, 8 Apr 1988 (fl, y fr), *Wunderlin & DeLaney 10374* (USF); SE of Grassy Pond, ca. 4 mi SE of Avon Park, T33S, R29E, sect. 34, 8 Apr 1988 (fl, fr), *Wunderlin & DeLaney 10375* (USF); Sebring, 22 Jun 1950, *Garrett s.n.* (FLAS).

The earliest known collection of *Crotalaria avonensis* was made in 1950 by Ray Garrett, an Avon Park botanist. Garrett's specimen was determined as

Crotalaria maritima Chapman (= *C. rotundifolia*) by D. B. Ward in 1967. It was not seen by D. Windler (1974) for his monograph of the North American species. The species was not again collected until 1986 by the senior author. It is notable that Garrett also was the first to collect two other recently described central Florida endemics, *Ziziphus celata* Judd & Hall and *Dicerandra christmanii* Huck & Judd, both of which he recognized as possibly representing new taxa.

Crotalaria avonensis most closely resembles the widespread (Virginia to Florida, west to Louisiana, Mexico to Panama) *C. rotundifolia* (Walt.) Gmelin, one of a complex of 12 species of North American unifoliolate crotalarias (Windler 1974). The resemblance, however, is purely superficial, and the two can readily be separated by a number of characters (Table 1).

Although measurements of the individual floral parts generally are not of use because of the variability of *C. rotundifolia*, the length of the keel in relation to that of the wing petals (shorter in *C. avonensis* and as long or slightly longer in *C. rotundifolia*) is effective in separating the two species.

Crotalaria avonensis is placed in section *Calycinae* Wight and Arn., a section consisting of about 70 species, mostly of tropical Asia but extending to Australia, Africa, and the New World (Polhill 1982). This group includes the North American "Iocaulon" (= subg. *Iocaulon* Raf.) unifoliolates as treated by Windler (1974). This group is apparently of late origin, derived from east Asian progenitors (Polhill 1968). *Crotalaria avonensis* differs from the other native North American unifoliolates by having a curved (vs. geniculate) style (Fig. 5), and a keel with a short beak which is only slightly twisted distally (vs. beak elongated and spirally twisted distally). These characters are present in Old World species of the section but are rare.

Field observations of *Crotalaria avonensis* made over the past two years revealed that the plants are deciduous, typically dying back in the late fall or early winter, and overwintering as a dormant taproot hidden below the soil surface. Flowering begins in mid-March and proceeds into June. This condensed flowering period is characterized by profuse flowering. Some plants are extremely floriferous, producing congested racemes. The earlier flowering shoots are sometimes slender, bearing leaves that are somewhat reduced and widely separated. Single-stemmed plants are frequent, often found flowering at heights 2 to 4 cm. Following the brief flowering period, the plants enter a vegetative phase, often forming compact clusters of stems with crowded ascending leaves that obscure the internodes, giving a bushy, rosette-like appearance. Only an occasional flower appears during this phase of growth.

Crotalaria avonensis is restricted to two areas of sparsely vegetated, xeric,

FIG. 4. *Crotalaria avonensis*. Flower.

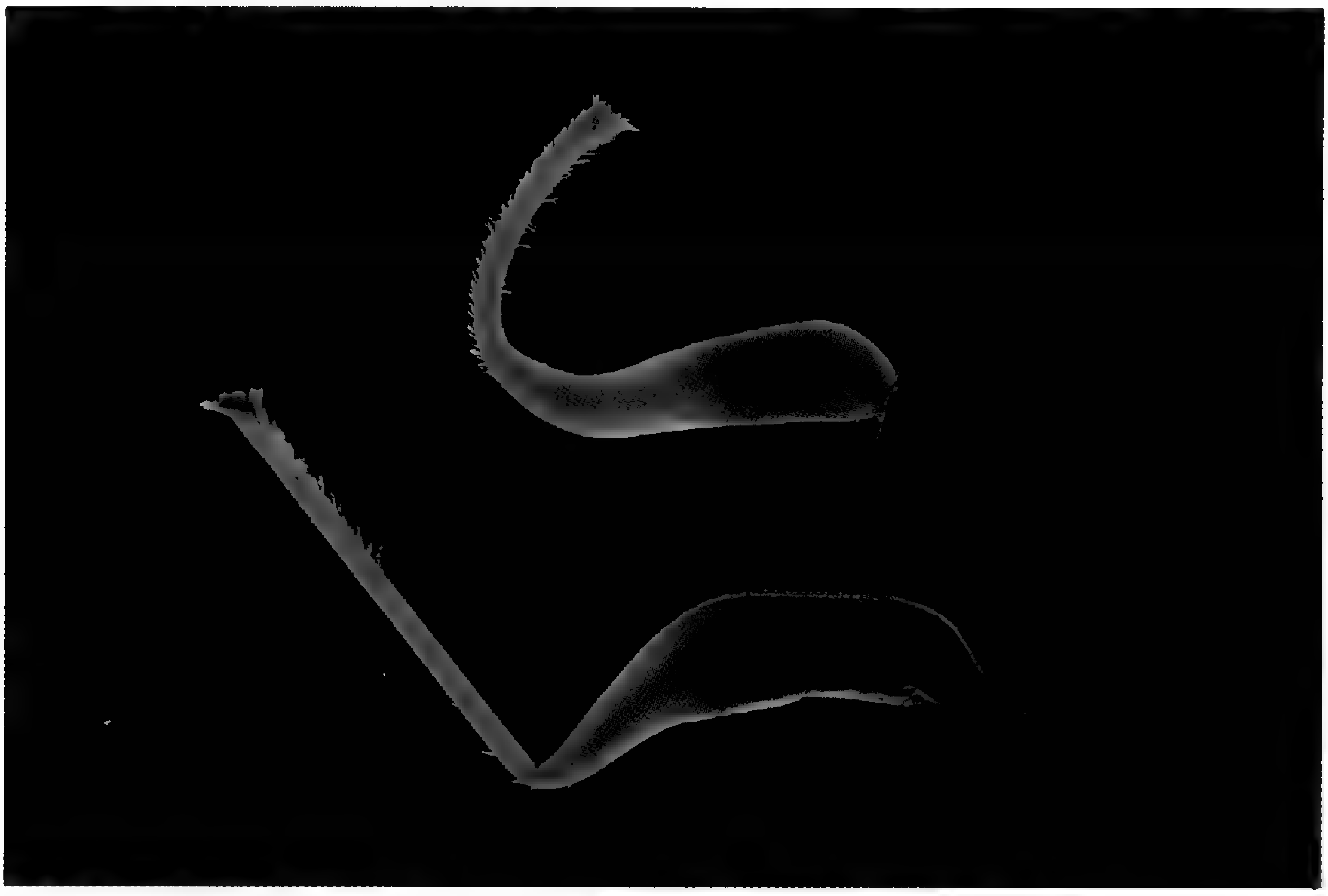

FIG. 5. *Crotalaria avonensis* (top) and *C. rotundifolia* (bottom). Gynoecia (darkfield, 50% transmitted light).

TABLE 1. Comparison of *Crotalaria avonensis* and *C. rotundifolia*.

CHARACTER	C. AVONENSIS	C. ROTUNDIFOLIA
Standard petal shape	obovate	orbicular
Style base shape	smoothly recurved	geniculate
Length of style	3–3.5 mm	4–6.9 mm
Style vesture	barbellate primarily on abaxial surface	barbellate primarily on on adaxial surface
Stipules	absent	present
Keel to wing petal length	shorter than wing petals	equalling or slightly longer than wing petals
Wing petal position	distal ends held above keel	distal ends enveloping keel
Blade of lateral petals	pubescent on lower surface	glabrous on lower surface
Claw of lateral petals	evidently ciliate on lower edge	eciliate or sparsely ciliate on lower edge
Habitat	white sand scrub (Archbold and Satellite soils)	sandhill, pine flatwoods, disturbed areas (various soils)
Habit	ascending	procumbent, decumbent, or ascending
Flowering period	March-June	throughout the growing season throughout most of the year
Keel beak	short; only slightly twisted distally; curved back to standard	elongate; spirally twisted distally; projected upward and outward
Mature fruit color	tan to gray to maroon	black

white sand scrub that exhibit an exceedingly high diversity and density of endemic species. All populations occur on well drained Archbold, or somewhat poorly drained Satellite, deep white sands, which contain extremely low clay and organic components. As with many other endemic species of the Lake Wales Ridge, plants of *C. avonensis* tend to occur more frequently along the man-disturbed white sand edges, where competition is much reduced. Although the majority grow in full sun, many occur in partial shade in and among other plants, particularly such Florida endemics as *Bonamia grandiflora*, *Calamintha ashei*, *Conradina canescens*, *Liatris ohlingerae*, *Paronychia chartacea*, *Polygonella basiramia*, *Polygonella myriophylla*, but also many other shrubby and herbaceous scrub plants. Plants often occur in association with, and emerge through and between, clumps of ground lichens: *Cladonia evansii* Abb., *C. leporina* Fr., and *C. subtenuis* (Abb.) Evans.

Crotalaria avonensis is known from only two localities on the Lake Wales Ridge, about 10 miles apart, in Highlands County. The Lake Wales Ridge is a narrow elevated area a few miles wide and about a hundred miles long, extending from southeastern Lake County to southern Highlands County. It's characteristic vegetation is xeric scrub dominated by sand pine (*Pinus clausa*) and various oak species (*Quercus*). The ridge scrub, especially the southern portion, is rich in endemics. A number of the species are of very limited distribution. For example *Dicerandra christmanii* Huck & Judd, *Dicerandra frutescens* Shinners, *Eryngium cuneifolium* Small, *Hypericum cumulicola, Liatris ohlingerae, Paronychia chartacea, Polygonella basiramia*, and *Ziziphus celata* Judd & Hall are limited to Highlands and/or Polk counties. About 33% of the species associated with *Crotalaria avonensis* are endemic or nearly endemic to the state (Table 2). Since the very narrow endemics *Dicerandra christmanii, Ziziphus celata,* and *Crotalaria avonensis* were all discovered during the last five years, further field work by experienced botanists in the scrub in Polk and Highlands counties is clearly needed.

Crotalaria avonensis appears well adapted to its xeric habitat by a deep, buried taproot, early and short blooming period, and compact growth habit. Its distinctive floral morphology suggests that it diverged very early, assuming that its progenitor was a *C. rotundifolia*-like species. It thus appears to be another Miocene relic species endemic to the southern Lake Wales Ridge.

The species is in imminent danger of extirpation. The type locality is contained within the now defunct Sebring Highlands development which is subdivided into ca. 1.25 acre tracts. The other population is confined to the east side of Avon Park Lakes development, which is subdivided into into ca. 0.25 acre tracts. Local use of the Avon Park Lakes site for off-road vehicles has already damaged parts of the population. Encroaching citrus farming, sod farming, and off-road vehicles threaten the Grassy Pond population. The natural plant communities of the Lake Wales region are rapidly being destroyed by expansion of the citrus industry and by urban development. It is estimated that less than 10% of the original Lake Wales scrub vegetation remains and that less than 3% of the total land of the region is protected from development. It therefore is increasingly urgent that intensive botanical studies are conducted in the Lake Wales region.

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TABLE 2. Taxa associated with *Crotalaria avonensis*. Voucher specimens deposited at USF. Taxa endemic or nearly endemic to Florida are indicated with an asterisk (*).

Aristida gyrans Chapm.
Asclepias curtissii A. Gray *
Asclepias tuberosa subsp. *rolfsii* (Britt.) Woods
Asimina obovata (Willd.) Nash *
Asimina reticulata Chapm. *
Balduina angustifolia (Pursh) Robins.
Befaria racemosa Vent.
Bonamia grandiflora (A. Gray) Heller *
Bulbostylis ciliatifolia (Ell.) Fern.
Bulbostylis warei (Torr.) Clarke
Bumelia tenax (L.) Willd.
Calamintha ashei (Weatherby) Shinners *
Ceratiola ericoides Michx.
Chamaecrista fasciculata (Michx.) Greene
Chapmannia floridana Torr. & Gray *
Chionanthus pygmaeus Small *
Clitoria fragrans Small *
Cnidoscolus stimulosus (Michx.) Engelm. & Gray
Commelina erecta L.
Conradina canescens (Torr. & Gray) A. Gray
Cuthbertia ornata Small *
Cyperus retrorsus Chapm.
Dalea feayi (Chapm.) Barneby
Eriogonum longifolium var. *gnaphalifolium* Gandg. *
Erythrina herbacea L.
Euphorbia inundata Torr. ex Chapm.
Galactia elliottii Nutt.
Galactia regularis (L.) BSP.
Galactia volubilis (L.) Britt.
Garberia heterophylla (Bartr.) Merr. & Harp. *
Gnaphalium falcatum Lam.
Helianthemum nashii Britt. *
Hypericum cumulicola (Small) P. Adams *
Hypericum reductum P. Adams
Ilex ambigua (Michx.) Torr.
Ilex glabra (L.) A. Gray
Ilex opaca var. *arenicola* (Ashe) Ashe *
Indigofera caroliniana Mill.
Lechea deckertii Small
Lechea minor L.
Liatris ohlingerae (Blake) Robins. *
Licania michauxii Prance
Linaria floridana Chapm.
Lupinus diffusus Nutt.
Lyonia fruitcosa (Michx.) Torr.
Lyonia lucida (Lam.) D. Don
Matalea pubiflora (Decne.) Woods.
Nolina brittoniana Nash *
Opuntia humifusa (Raf.) Raf.
Osmanthus megacarpus Small *
Palafoxia feayi A. Gray *
Paronychia americana (Nutt.) Fenzl ex Walp.
Paronychia chartacea Fern. *
Paronychia herniarioides (Michx.) Nutt.
Persea humilus Nash *
Physalis walteri Nutt.
Pinus clausa (Chapm. ex Engelm.) Vasey ex Sarg. *
Piptochaetium avenaceum (L.) Parodi
Pityopsis graminifolia (Michx.) Nutt.
Polanisia tenuifolia Torr. & Gray
Polygonella basiramia (Small) Nesom & Bates *
Polygonella gracilis (Nutt.) Meisn.
Polygonella myriophylla (Small) Horton *
Polygonella polygama (Vent.) Engelm. & Gray
Polygonella robusta (Small) Nesom & Bates *
Polypremum procumbens L.
Prunus geniculata Harper *
Pterocaulon pycnostachyum (Michx.) Elliott
Quercus chapmanii Sarg.
Quercus geminata Small
Quercus inopina Ashe *
Quercus myrtifolia Willd.
Rhynchelytrum repens (Willd.) C. E. Hubb.
Rhynchosia cinerea Nash *
Rhynchospora megalocarpa A. Gray
Sabal etonia Swingle ex Nash *
Schizachyrium niveum (Swallen) Gould *
Schrankia microphylla var. *floridana* (Chapm.) Isely
Selaginella arenicola Underw.
Serenoa repens (Bartr.) Small
Seymeria pectinata Pursh
Sisyrinchium xerophyllum E. Greene *
Smilax auriculata Walt.
Solidago odora var. *chapmanii* (A. Gray) Cronq.
Stillingia sylvatica L.
Stipulicida setacea Michx.
Stylisma abdita Myint *
Tephrosia spicata (Walt.) Torr. & Gray
Tillandsia recurvata (L.) L.
Tradescantia roseolens Small*
Tragia urens L.
Trichostema dichotomum L.
Vaccinium darrowii Camp.
Vaccinium myrsinites Lam.
Vitis aestivalis Michx.
Vitis munsoniana Simpson
Ximenia americana L.
Yucca filamentosa L.

of the color plate, and the curator of the Herbarium of the Florida Museum of Natural History for loan of the Garrett specimen.

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REDISCOVERY OF *ZIZIPHUS CELATA* (RHAMNACEAE)

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ABSTRACT

The rare Florida endemic *Ziziphus celata* (Rhamnaceae), last collected in 1955 and presumed extinct, was rediscovered in Highlands and adjacent Polk counties. The fruit is here described for the first time.

Ziziphus celata Judd & D. Hall (Rhamnaceae) was first collected by Ray Garrett (*Garrett s.n.*, FLAS) in 1948 near Sebring, Highlands County, Florida, but the specimen remained an enigma for nearly 40 years until recognized and published as a new species by Judd and Hall (1984). At the time of publication, only the single flowering specimen was known, but more recently a sterile collection made by Leonard Brass (*Brass 25333*) in 1955 was found in the Archbold Biological Station Herbarium. It is believed that the Brass specimen may have been collected at the same locality as Garrett's original collection and that Garrett may have taken Brass to the site (J. Beckner, pers. comm.). Since its publication in 1984, several experienced field botanists have searched for *Z. celata* without success until in July, 1987, the senior author discovered a small population in southern Polk County (SE of Frostproof, 31 Jul 1987, *DeLaney 1416*, USF; 5 Aug 1987, *Hansen et al. 11335*, USF). Subsequently, the authors visited the site and submitted a status report (Wunderlin et al. 1980) to the United States Fish and Wildlife Service Field Office for Endangered Species for possible listing of the species as endangered. The species has been proposed by the U.S. Fish & Wildlife Service and is undergoing review (Federal Register 58(188):37818 – 37822). In October 1988, after extensive searches by the senior author, a second population was discovered, this time in Highlands County (SE of Avon Park, 22 Oct 1988, *DeLaney 1901*, USF). The Polk County population is in relatively little disturbed scrub vegetation and the Highlands County site is partially improved pasture on a former scrub site. The condition of the plants at the Polk County site is very poor and apparently declining rapidly. Fortunately, the Highlands County population,

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although at an altered site, appears vigorous, indicating that some disturbance may have a stimulatory effect and possibly be essential to its survival. Comparative study of the two sites should yield important information concerning our understanding of the species' habitat requirements, hopefully leading to the development of a more effective management plan.

At the Polk County site, *Ziziphus celata* occurs in scrub vegetation dominated by several *Quercus* species (*Q. chapmanii, Q. geminata, Q. incana, Q. laevis*, and *Q. myrtifolia*), *Bumelia tenax, Sabal etonia*, and *Serenoa repens.* The species seems to prefer open sunny areas in the scrub. Although the Highlands County site has been modified, the associates are similar (table 1).

The southern Lake Wales Ridge, to which *Ziziphus celata* is restricted, is an area containing a relatively high number of Florida's endemics. Associates of *Z. celata* include 23 taxa endemic or near endemic (i.e. 90% of the populations occur in the state) to Florida, representing about one third of the total flora recorded at the site (Table 1). Five of these (*Bonamia grandiflora, Paronychia chartacea, Polygonella basiramia, Prunus geniculata,* and *Warea carteri*) are Federally protected species. A sixth, *Liatris ohlingerae*, is proposed as such and is presently being reviewed (Federal Register 58(188):37818 – 37822).

Having seen living material of *Ziziphus celata* and herbarium specimens of other *Ziziphus* taxa, we are in agreement with Judd and Hall (1984) that the species is correctly placed in the "*Condaliopsis* group" of *Ziziphus*, following Johnston (1962). It appears most closely related to *Z. parryi* Torrey, a species of arid habitats of northeastern Baja California and southern California. It shares three character states with *Z. parryi* which are not found in the other species in the *Condaliopsis* group: 1) pinnate, basally uninerved leaves; 2) entire leaf margins; 3) obovate or spatulate leaf shape. A forth unique character state of *Z. parryi*, that of seeds tightly held in the cell, could not be assessed because of the paucity of fruiting material of *Z. celata*. *Ziziphus celata* differs from *Z. parryi* essentially in the color of the floral cup (yellowish-green in *Z. celata* vs. purplish-green in *Z. parryi*) (fig. 3), leaves generally slightly broader and more emarginate (fig. 1), and the tendency toward paired unequal secondary thorns. There also appears to be differences in the length of the style (shorter than the stamens in *Z. celata* vs. subequalling or longer than the stamens in *Z. parryi*) and relative size of the flowers, those of *Z. celata* being slightly smaller, but these features could not be adequately assessed because of the paucity of flowering material of both species.

A single mature fruit (fig. 2) was found in the Polk County population and is here described for the first time for the species: ellipsoid, 1.6 cm

FIG. 1. *Ziziphus celata*: vegetative branch.
FIG. 2. *Ziziphus celata*: fruiting branch.

FIG. 3. *Ziziphus celata*: flower.

long, 1.1 cm wide, with several scattered, small, wartlike projections, the color apple green, flushed with plum, the style persistent as a beak, ca. 2 mm long, the pedicel 3 mm long. The fruit is nearly identical to that of *Ziziphus parryi.*

The exceptionally low seed set in the Polk County population, in spite of attempted hand pollination, is of concern. One possible explanation is that the plants within each population are somewhat self-incompatible because of genetic similarity. There are, however, observable morphological differences between the Highlands and Polk county populations (i.e., tendency toward greater development of paired secondary thorns and less emarginate leaves), and it is likely that these populations are somewhat genetically different. This may indicate an increasing probability of successful seed production resulting from crossing the two populations.

While most of peninsular Florida was inundated in the past, particularly in the Pleistocene, the southern Lake Wales Ridge on which *Ziziphus celata* occurs is believed to have been emergent and available for plant habitation since the late Miocene or early Pliocene (ca. 11 my B.P.). Scrub vegetation in some form has probably existed on the Ridge since that time. It is conceivable that some species currently present on the ridge have persisted since then. The fossil pollen records dating from 37,000 to 13,010 B.P.

Table 1. Taxa associated with *Ziziphus celata* (southern Polk Co. population). Voucher specimens are deposited at USF Taxa endemic or nearly endemic to Florida are indicated with an asterisk (*).

Asclepias curtissii A. Gray *
Asclepias tuberosa var. *rolfsii* (Britton) Woodson
Asimina obovata (Willd.) Nash *
Berlandiera subacaulis (Nutt.) Nutt *
Bonamia grandiflora (A. Gray) Heller *
Bulbostylis ciliatifolia (Ell.) Fern.
Bulbostylis warei (Torrey) C. B. Clarke
Bumelia tenax (L.) Willd.
Callicarpa americana L.
Carya floridana Sarg. *
Chamaecrista fasciculata (Michx.) E. Greene
Centrosema virginianum (L.) Benth.
Chapmannia floridana Torrey & A. Gray *
Chamaesyce cordifolia (Ell.) Small
Clitoria fragrans Small *
Cnidoscolus stimulosus (Michx.) Engelmann & A. Gray
Commelina erecta L.
Crataegus lepida Beadle *
Cyperus retrorsus Chapman
Dalea feayi (Chapman) Barneby
Dichanthelium aciculare (Desv. ex Poir.) Gould & Clark
Diodia teres Walter
Diospyros virginiana L.
Eriogonum longifolium var. *gnaphalifolium* Gandoger *
Eriogonum tomentosum Michx.
Erythrina herbacea L.
Euphorbia polyphylla Engelmann
Galactia striata (Jacq.) Urban
Ilex ambigua (Michx.) Torrey
Indigofera caroliniana Mill.
Krameria lanceolata Torrey
Lechea deckertii Small
Liatris ohlingerae (S. F Blake) B. Robinson *
Liatris tenuifolia Nutt.
Licania michauxii Prance
Linaria floridana Chapman
Lupinus diffusus Nutt.
Nolina brittoniana Nash *
Opuntia humifusa (Raf.) Raf.
Palafoxia feayi A. Gray *
Paronychia americana (Nutt.) Fenzl ex Walp.
Paronychia chartacea Fern. *
Paronychia herniarioides (Michx.) Nutt.
Phoebanthus grandiflorus (Torrey & A. Gray) S. F Blake *
Pinus palustris Mill.
Polanisia tenuifolia Torrey & A. Gray
Polygala lewtonii Small *
Polygonella robusta (Small) Nesom & Bates *
Polygonella polygama (Vent.) Engelmann & A. Gray
Prunus geniculata Harper *
Quercus chapmanii Sarg.
Quercus geminata Small
Quercus incana Bartram
Quercus laevis Walter
Quercus myrtifolia Willd.
Rhus copallina L.
Rhynchelytrum repens (Willd.) C. Hubbard
Rhynchosia cinerea Nash *
Sabal etonia Swingle ex Nash *
Schrankia microphylla var. *floridana* (Chapman) Isley
Selaginella arenicola L. Underw.
Serenoa repens (Bartram) Small
Seymeria pectinata Pursh
Sisyrinchium xerophyllum E. Greene *
Smilax auriculata Walter
Stillingia sylvatica L.
Stipulicida setacea Michx.
Stylisma abdita Myint *
Tephrosia chrysophylla Pursh
Tillandsia recurvata (L.) L.
Tradescantia roseolens Small *
Trichostema dichotomum L.
Vitis aestivalis Michx.
Warea carteri Small *
Ximenia americana L.
Yucca filamentosa L.

from Lake Annie in southern Highlands County indicate the presence of a dominant scrub community characterized by *Ceratiola ericoides* Michx., *Polygonella fimbriata* (Ell.) Horton (? = *P. robusta* (Small) Nesom & Bates), *Polygonella ciliata* Meisn., *Selaginella arenicola* Underw., *Quercus* spp., and various Asteraceae (Watts, 1975). These species still occur in the surrounding areas. The Lake Wales Ridge probably served as a refugium for plants and animals through the Pleistocene. In light of this, it is likely that the two extant populations of *Z. celata* are relictual.

Relatively little is known of the plant's habitat requirements and reproductive biology. Even such basic information as fruit morphology was unknown until early this year. Continued searching for additional populations and protection and study of the two extant colonies is imperative for the species' survival. The two known *Ziziphus celata* sites are privately owned, in areas of high agricultural development and/or adjacent to small residential areas. Acquisition of the property along with introduction of the species into protected areas is needed for this plant's continued existence.

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AZALEA ROSEA LOISELEUR IS A SUPERFLUOUS NAME

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ABSTRACT

The case for lectotypification of *Azalea rosea* Loiseleur fails on two major points. Primarily, because the only type included in Loiseleur's description of *Azalea rosea* is that of *Azalea canescens* Michaux (a previously validly published name) and secondly because the lectotype recently designated is in conflict with the protologue and the intent of the original author.

INTRODUCTION

Shinners (1962) was indeed correct in his determination that *Rhododendron roseum* (Loiseleur) Rehder is an illegitimate name since it was based upon *Azalea rosea* Lois., which was superfluous when published.

Uttal (1988) has disagreed and has lectotypified *A. rosea*, by designating plate #64 in Duhamel (1812) as the type.

DISCUSSION

Since Loiseleur cited *Azalea canescens* Michaux as a synonym of *A. rosea* he thus included the type of a previously validly published name (*A. canescens* Michaux), making *Azalea rosea* Lois. superfluous (Art. 63.2, ICBN; see also Shinners 1962; Wilbur 1976) Furthermore, Loiseleur neither implicitly nor explicitly excluded the type of *A. canescens* Michaux, since nowhere else in the Duhamel publication did he discuss or describe *A. canescens* as a distinct species from *A. rosea*; he did not make any such distinction within the protologue of *A. rosea*. The fact that a plate accompanied the description is no special indication that Loiseleur was describing a new species, since he also included a plate with the description of *A. pontica* (#63) in the same publication. No special reference to plate #64 is indicated, so only one type was cited.

The protologue includes a description of the native habitat of *A. rosea* Lois. as "au bord des ruisseaux dans la Caroline"[1]. While this is within the range and habitat of *R. canescens*, it is not within the distribution of *R. prinophyllum* (Small) Millais which is found north and west of the southern Blue Ridge mountains and has only been collected in two counties in ex-

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[1] "along the borders of streams in Carolina"

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treme western North Carolina during this century (see Kron 1987). Thus the protologue is in conflict with the lectotype designated by Uttal (1988; see Guide to determinination of types, T.4.d., ICBN). If the plant which Loiseleur discussed had come from the mountainous regions of North Carolina, he most certainly would have indicated it, as he had done in preceeding descriptions of azaleas within the Duhamel text. No special significance can definitely be placed on the use of the word "rose" in the protologue, as the same word is used in the description of *A. periclymenoides* on the previous page.

Therefore, Loiseleur undoubtably considered *Azalea canescens* Michaux and the plant he was illustrating to be conspecific (see also Rehder 1921). As such, he could not drop a previously validly published name and substitute a new one (see Wilbur 1976).

Lectotypification is only to be used when a type has not been cited. Loiseleur did include a type in his description: that of *A. canescens* Michaux by citing it as a synonym (Art. 63.2, ICBN) and therefore *A. rosea* is a superfluous name. In addition, the protologue does not contain any heterogeneous elements, only the plate appears to be what we now consider as distinct from *R. canescens*.

Since Loiseleur considered *Azalea rosea* as conspecific with *Azalea canescens* Michaux, his later name is superfluous, regardless of subsequent taxonomic decisions regarding species limitations. Therefore, the correct name for the roseshell azalea is *Rhododendron prinophyllum* (Small) Millais.

Rehder's (1921) publication of *R. roseum* (Lois.) Rehder as a new combination is invalid because a new combination cannot be based on a superfluous or invalid basionym (see Art. 45.1, ICBN). Therefore lectotypification of *Azalea rosea* Lois. is effectively the publication of a new species, which dates from 1988 (Uttal), or 1921, if Rehder's publication is accepted (see Art. 45.3, ICBN). Thus *Rhododendron prinophyllum* (Small) Millais is still the correct name for the roseshell azalea, since it is based on an earlier legitimate name (*Azalea prinophylla* Small, 1914. N. Amer. Fl. p. 42).

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SYSTEMATIC STUDY OF THE MONOTYPIC GENERA *MEXIANTHUS* AND *NEOHINTONIA* (ASTERACEAE: EUPATORIEAE)

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ABSTRACT

The generic relationships and subtribal placement of the monotypic genera *Mexianthus* and *Neohintonia* are discussed using macro and micromorphological characters as well as chromosome numbers reported here for the first time. *Neohintonia* ($x = 10$) is placed in synonymy as a species of *Koanophyllon* ($x = 10$). The discussion is appended with a key to the genera *Mexianthus* ($x = 16$), *Decachaeta* ($x = 16$), and *Koanophyllon*. Descriptions and distributions for *Mexianthus* and *Koanophyllon monanthum* are provided.

The remarkable resemblance between the monotypic genera *Mexianthus* B. L. Robinson and *Neohintonia* King & H. Robinson of the rugged volcanic mountains of western México has often been noted (Robinson 1928; King & Robinson 1971c, 1987; McVaugh 1984). Both genera possess single-flowered heads that are secondarily aggregated into "heads of heads" or synflorescences. Synflorescences are rarely found in the Asteraceae (see Stuessy 1978 for references) and are known in the Eupatorieae only in *Neohintonia* and *Mexianthus* (King & Robinson 1987). In contrast to recent workers (King & Robinson 1987), who believe that the genera are closely related, we feel the similarities between *Mexianthus* and *Neohintonia* have been independently derived. We present cytological and morphological evidence that supports a hypothesis that the two genera are allied to different genera belonging in separate subtribes of the Eupatorieae.

TAXONOMIC HISTORY

Mexianthus mexicanus was first described by B. L. Robinson (1928) and allied with his subtribe *Piqueriinae* by the presence of exappendiculate anthers. He noted a resemblance between his new genus and *Eupatorium monanthum* Schultz-Bip., but concluded that *Mexianthus* was distinct "not only specifically, but as to genus," by the possession of a fused scale-like pappus unlike the pappus of bristles found in *Eupatorium* L.

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King and Robinson (1971c) gave *Eupatorium monanthum* generic ranking as *Neohintonia* based largely upon the capitulescence of single-flowered heads in spherical clusters. The recognition of this taxon at the generic level has not been accepted in recent floristic work (McVaugh 1982). King and Robinson concluded that *Neohintonia* was closely related to, but not congeneric with *Mexianthus*, because of differences in the pappus (bristle-like vs scaley) and the achene (not constricted apically vs constricted). They placed both genera in their subtribe Critonieae (Robinson & King 1977, King & Robinson 1987) where they related *Mexianthus* and *Neohintonia* to *Koanophyllon* Arruda by the presence of broadly triangular corolla lobes with capitate glands, style branches with spatulate tips and reduced anther appendages.

DISCUSSION

Initial herbarium studies tended to support King and Robinson's view that *Mexianthus* and *Neohintonia* were closely related, so much so, that the first author made the new combination (by annotation) for *Neohintonia* in *Mexianthus* on specimens borrowed from various institutions. However, further morphological and cytological studies of *Mexianthus* and *Neohintonia*, made possible by the collection and cultivation of three populations (2 of *Neohintonia*), have forced us to reevaluate the close affinity of the two taxa originally proposed by King and Robinson and to question their subtribal placement of *Mexianthus*.

Chromosome counts obtained by the third author from the cultivated material proved to be an integral part of the study. No counts were obtained from field collected material due, in part, to the synchronous flowering of entire branches or plants in both genera. Under rather uniform greenhouse conditions, *Mexianthus* regularly bloomed from October to December while *Neohintonia* bloomed from February to April. The counts of $n = 16$ pairs for *Mexianthus* and $n = 10$ pairs for *Neohintonia* represent the first chromosome counts for each taxon. Examination of all macro and micromorphological characters in light of the chromosome counts supports the placement of *Neohintonia* in *Koanophyllon*, but does not support placement of *Mexianthus* near *Koanophyllon* or within the subtribe *Critoniinae* where chromosome numbers on a base of $x = 16$ are unknown. In general aspect, leaf arrangement, leaf shape, and chromosome number, *Mexianthus* has many affinities with members of the genus *Decachaeta* DC., which is placed by King and Robinson (1987) in their subtribe *Hebecliniinae*. Characteristics of these four taxa are presented in Table 1. It should be noted that the generic criteria and affinities apparent in Table 1 are not clarified by the "microcharacters" but are, in a large part, based upon gross vegetative features as well as chromosome number.

Table 1. Comparison of characters among the four genera: *Koanophyllon*, *Neohintonia*, *Mexianthus*, and *Decachaeta*.

CHARACTERS	**Koanophyllon**	**Neohintonia**	**Mexianthus**	**Decachaeta**
chromosome number	10	10	16	16
branching (predominant)	opposite	opposite below	alternate	alternate
petioles	distinct	distinct	winged	distinct or winged
leaf blade shape	ovate-lanceolate often deltate	deltate	ovate	elliptic/ovate or suborbicular
blade base	truncate/cordate	truncate/cordate	cuneate	acute/cuneate
receptacle vestiture	glabrous	glabrous	glabrous	pubescent
florets/head	5-20	1(-2)	1	4-30
corolla				
shape	funnelform or short campanulate	funnelform	short campanulate	funnelform
base	broadly expanded	not expanded	broadly expanded	not expanded
anther appendage	wider than long	wider than long	wider than long	wider than long
anther collar				
shape	cylindrical	cylindrical	cylindrical	cylindrical
ornamentation	annular or none	annular	none	none
stylar appendage	spatulate	spatulate	spatulate	spatulate
style base	not enlarged	not enlarged	not enlarged	not enlarged
pappus	setiferous	setiferous	broad scales	setiferous
achene shape	wedge-shaped	wedge-shaped	fusiform	wedge-shaped
carpopopodium presence	distinct	distinct	indistinct or minute	distinct & often procurrent
cell shape	subquadrate	subquadrate	subquadrate	subquadrate

GENERIC RELATIONSHIPS

The relationships of *Neohintonia* and *Mexianthus* with *Koanophyllon* were based primarily on four characters (King & Robinson 1971b, 1987): 1) corollas with broadly cylindrical bases, 2) broadly triangular glanduliferous corolla lobes, 3) slightly spatulate tips on the style branches, and 4) variously reduced anther appendages. *Neohintonia* was differentiated from *Mexianthus* on the basis of non-fusiform achenes and capillary pappus bristles, characters that were used to suggest a closer relationship between

Neohintonia and *Koanophyllon* (King & Robinson 1987). King and Robinson (1987) do not discuss possible relationships between *Decachaeta* and *Mexianthus*, *Neohintonia* or *Koanophyllon* (King & Robinson 1987) despite the fact that *Decachaeta* has the above-mentioned characters (King & Robinson 1969a) used by King and Robinson to establish relationships between *Neohintonia*, *Mexianthus* and *Koanophyllon*.

Mexianthus has many similarities with *Decachaeta* (chromosome number; broadly triangular, glandular, corolla lobes; slightly spatulate style branches and variously reduced anther appendages as well as leaf characteristics noted in Table 1). *Mexianthus* is readily distinguished from *Decachaeta* and other members of the *Hebecliniinae* by its fusiform achenes and pappus of broad scales, two characteristics that in combination with its synflorescences seem to warrant its generic recognition. Similar to *Erythradenia* (B. Robins.) King & H. Robinson, but unlike *Decachaeta*, *Mexianthus* has glabrous receptacles. In addition, King and Robinson (1969b) have used the character of unornamented anther collar cells and details of the anther appendage to confirm the relationship between *Decachaeta* and *Erythradenia* as well as to affirm their placement in the *Hebecliinae*. The anther collar cells of *Mexianthus* (observed on florets taken from an isotype) appear unornamented in contrast to reports by King and Robinson (1987) for this genus. Both *Koanophyllon* and *Neohintonia* have weakly ornamented anther collar cells in keeping with their placement in the *Critoniinae*.

Aside from the single-flowered heads of *Neohintonia*, the only differences between *Neohintonia* and *Koanophyllon*, noted by King and Robinson (1971a, 1987), were *Neohintonia*'s slender, somewhat deciduous, pappus bristles and their anther appendages that King and Robinson (1987) considered "shorter than the short form found in the typical element of the related genus *Koanophyllon*." Most species of *Koanophyllon* have scabrous pappus bristles that are stouter than those of *Neohintonia*, but this character is by no means constant within *Koanophyllon*. In short, the pappus bristles of Neohintonia would not be anomalous if included in *Koanophyllon*.

Variously reduced anther appendages occur in *Koanophyllon*, *Neohintonia*, *Mexianthus* and *Decachaeta*. The recognition of *Neohintonia* at the generic level on the basis that the anther appendages of *Neohintonia* are shorter than the typical element of *Koanophyllon*, particularly in light of the variation present in *Koanophyllon*, appears to be unjustified.

The acceptance of *Neohintonia* at the generic level has been based primarily on the presence of synflorescences. The capitula of various species of *Koanophyllon* (e.g., *K. ravenii* King & H. Robinson) tend to be sessile or shortly pedunculate and aggregated into tight clusters similar in structure to the synflorescences of *Neohintonia*. The considerable similarity of capitulescence structure between *Neohintonia* and *Koanophyllon* leads us to believe that these two taxa differ primarily in the number of florets per head and do not represent separate genera. We feel the genus *Neohintonia* is best treated as a species of *Koanophyllon* and the new combination is presented below.

SUBTRIBAL RELATIONSHIPS

The subtribes *Critoniinae* and *Hebecliinae* are weakly delimited. Several genera, including *Mexianthus*, *Peteravenia* King & H. Robinson, and, perhaps, *Erythradenia*, appear to straddle the proposed boundary of these subtribes. The trends initially proposed by Robinson and King (1977) to distinguish the *Hebeclinium* and *Critonia* groups were based on the usually hirsute receptacles and the elongate anther collars comprised of mostly subquadrate cells of the *Hebeclinium* group. Otherwise, the *Hebeclinium* group was described as having "mostly Critonioid features including the subimbricate partially deciduous involucral bracts, the smooth corolla lobes and unenlarged style bases." A recent key to the subtribes of the Eupatorieae (King & Robinson 1987) claimed the Hebecliinae possessed anther collars usually more than five times as long as wide with quadrate cells filling the lower half or more. The receptacles were noted to be often densely pubescent. The anther collars of the Critoniinae were described as usually less than five times as long as wide with quadrate cells in the lower half. The receptacles were noted as usually glabrous.

The structure of the anther collars as reflected by the presence of subquadrate cells and the length to width ratio has been found to be variable in several of the taxa investigated. The anther collars of several species of *Koanophyllon* that we examined were generally less than five times as long as wide. Subquadrate cells were found filling the lower half in some species (e.g., *K. standleyi* (B. Robins.) King & H. Robinson) or restricted to the lower quarter of the anther collar in others (e.g., *K. ravenii*). The structure of the anther collars in *Neohintonia* are quite similar to those of *Koanophyllon*. In general, the anther collars are four times as long as wide with ornamented, subquadrate cells in the lower portion of the anther collar. The anther collars of *Decachaeta* are very variable in their length to width ratio. Those of *D. scabrella* (B. Robins.) King & H. Robinson are only four times as long as wide or less and have subquadrate cells filling the lower half. *Decachaeta incompta* (DC.) King & H. Robinson has longer (six to almost seven times as long as wide) anther collars with unornamented, subquadrate, cells in only the lowermost portion of the anther collar. Finally, the anther collars of *Mexianthus* are ca. five times as long as wide with the lower half comprised of unornamented, subquadrate cells. This condition does not resolve the placement of *Mexianthus* in either the Hebecliinae or Critoniinae. For this reason, we have relied upon the chromosome count of $n = 16$ pairs to provisionally place this genus in the Hebecliinae.

KEY TO GENERA

1. Achenes fusiform; pappus a crown of deeply erose scales. . . . . *Mexianthus*
1. Achenes wedge-shaped; pappus of bristles or bristles rarely lacking.
    2. Leaves opposite; receptacle glabrous; pappus bristles fused at base . . *Koanophyllon*
    2. Leaves alternate (opposite in *D. perornata*); receptacle pubescent; pappus bristles free . . . . *Decachaeta*

1. **Mexianthus mexicanus** B. L. Robinson, Contr. Gray Herb. 80:5. 1928. Type: MEXICO. Jalisco: Arroyo del Chorillo, hamlet of Quimixto on Bay of Banderas, ca. 7 leagues S of Puerto Vallarta, 1 Dec 1926, *Mexia 1202* (holotype: GH!; isotypes: BH!, CAS!, DS!, MO!, TEX!).

Suffrutescent perennial 1 – 2 m high. **Stems** rounded, 1 – 5 mm in diameter, glabrate, arising from a coarse, fibrous root system. **Leaves** alternate throughout; petioles winged, 1 – 5 cm long; blades ovate to elliptic, 6 – 25 cm long, 3.5 – 10.0 cm wide, the base gradually or abruptly attenuate, irregularly dentate, glabrate or sparsely pubescent, especially along the veinlets, glandular throughout. **Capitulescence** an open, sparsely branched, terminal panicle. **Heads** in globose clusters, the latter on puberulent peduncles 5 – 35 mm long. **Involucre** 2.0 – 2.5 mm long; bracts 2-ranked, the outer 2 ca 0.5 mm long, the inner 2 broadly obovate, ciliate, rounded and glabrous on the adaxial surface. **Florets** 1 per head; corolla white, 1.3 – 2.0 mm long, tube ca 0.5 mm long, the throat abruptly flaring, 0.8 – 1.5 mm long, lobes glandular, ca 0.2 mm long, as wide as long or wider; anther appendages reduced to 2 small lobes; style branches linear-clavate, mammillose, ca 2.5 mm long; achene ca 1.7 mm long, ca 0.6 mm wide, abruptly narrowed at the apex and fringed with a deeply erose, deciduous, scaley crown, 0.7 – 1.0 mm long. **Chromosome number** $n = 16$ pairs.

ILLUSTRATION: Monogr. Syst. Bot. 22: 336, pl. 132. 1987.

DISTRIBUTION (Fig. 1): Known only from three sites about Puerto Vallarta, Jalisco, from near sea level to 500 m; ocurring on volcanic rock in subtropical deciduous forest dominated by *Byrsonima* and *Curatella*. Flowering: Oct – Dec.

REMARKS: Initial efforts to find a population of *Mexianthus* at the type locality in the month of March were unsuccessful. We returned in October and found a small population growing along the old eroded burro trails leading from Quimixto to the falls frequented by tourists on the Arroyo del

Chorillo. Rootstocks and tip cuttings were gathered and plants propagated in the greenhouse at the University of Texas (TEX) from 1983 – 1988. Chromosome counts were obtained from the greenhouse stock.

Representative specimens: MEXICO. Jalisco: trail to falls just above Quimixto, a village on Bay of Banderas S of Pto. Vallarta, 24 Oct 1983, *Ayers et al. 331* (TEX & to be distributed); gorge of the Río Horcones, ca 27 km by road S from Puerto Vallarta, 3 – 5 Nov 1971, *Dieterle 4028* (MO, TEX); cerca de El Corte Colorado, municipio de La Resolana, 16 Nov 1960, *Rzedowski 15040* (TEX).

2. Koanophyllon **monanthum** (Schultz-Bip.) Ayers & B. Turner, comb. nov. *Neohintonia monantha* (Schultz-Bip.) King & H. Robinson, Phytologia 22: 143. 1971; *Eupatorium monanthum* Schultz-Bip. in Seem., Bot. Voy. Herald 299. 1856. Type: MEXICO. Sinaloa (?): "Sierra Madre" (probably collected near the village of Copala; cf. Bot. Voy. Herald 299, p. 257 – 261), Nov 1849, *Seemann 1990* (holotype: K, photo at MICH!; isotype: GH!).

Suffrutescent perennial 2 – 5 m high; main stem erect, the branches clambering. **Leaves** opposite below, alternate above; petioles distinct, 1 – 3 cm long; blades deltate, 4 – 10 cm long, 3 – 10 cm wide, usually 3-nerved, the lower leaves often 3-lobed, dentate, sparsely pubescent with glandular and non-glandular trichomes. **Capitulescence** an open, leafy, terminal panicle. **Heads** in globose clusters, the latter on villosulous peduncles 2 – 7 mm long. **Involucre** 2.3 – 3.0 mm long, glandular; bracts 2-ranked, the outer 2 ca 0.5 mm long, the inner 2 obovate, ciliate, glabrous on the adaxial surface. **Florets** 1 per head; corolla white, 1.8 – 2.5 mm long, tube ca 0.8 mm long, the throat abruptly flaring, 1.0 – 1.5 mm long, lobes glandular, ca 0.2 mm long, as wide as long or wider; anther appendages small, divided into 2 halves vertically, the margin reflexed; style branches linear-clavate, mammillose, ca 2 mm long; achene wedge-shaped with 5 ribs, ca 1.5 mm long, sparsely hispid, fringed with a setiferous crown, 1.8 – 2.5 mm long. **Chromosome number** n = 10 pairs.

ILLUSTRATION: Monogr. Syst. Bot. 22: 338, pl. 133. 1987.

DISTRIBUTION (Fig. 1): Occurring in low volcanic hills along the western coast of México, from Sinaloa to Guerrero, at altitudes of 200 – 1500 m. Most collections have been made in subtropical deciduous forest dominated by *Bursera, Tabebuia*, and arborescent *Ipomoea*.

REMARKS: In Jalisco and Nayarit during March 1982, the senior author found the species to be abundant in roadside gullies and along steep, shady, north-facing hillsides. Two populations were cultivated in the greenhouse at TEX from rootstocks collected in the field. Chromosome counts were obtained from the Jalisco population.

Representative specimens: MEXICO. Colima: Cuidad Colima, 27 – 28 Feb 1891, *Palmer 1300* (DS, GH, MICH, UC); 9 – 10 km E by winding road from Minatitlán,

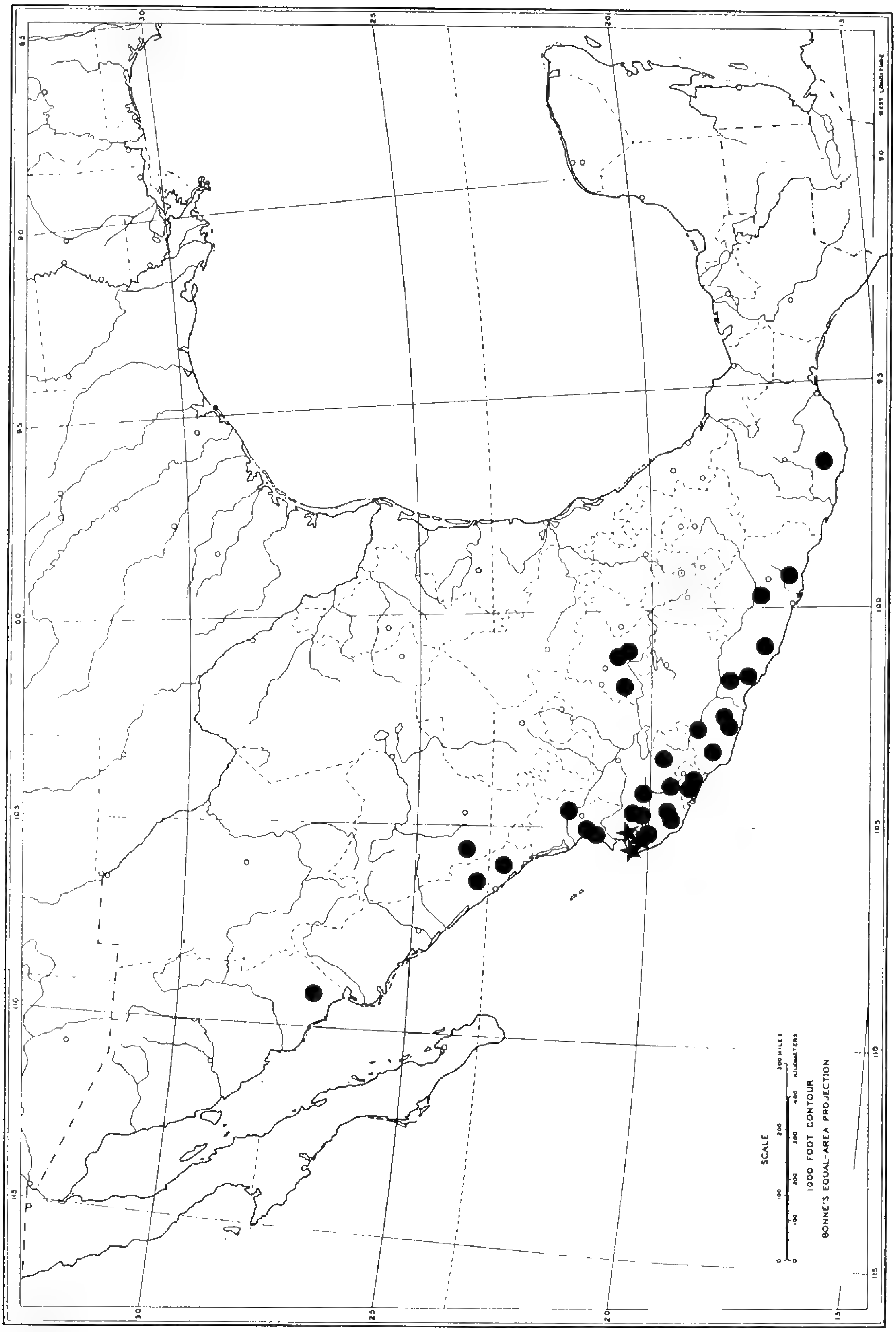

FIG. 1. Distribution of the two Mexican taxa of Eupatorieae with single-flowered heads. The circles represent populations of *Koanophyllon monanthum* and the stars represent populations of *Mexianthus*.

10 – 11 Feb 1975, *McVaugh 26231* (MICH). **Durango**: Steep side canyons of the Río Tamazula between La Bajada and La Junta, 20 Mar 1972, *Breedlove 24486* (CAS, MICH, MO). **Guerrero**: Calavera, 6 Apr 1937, *Hinton 10019* (BH, GH, TEX); Acapulco, Oct 1894--Mar 1895, *Palmer 515* (F, GH, NY, TEX, UC); Iguala Canyon, 28 Jan 1907, *Pringle 10348* (BH, CAS, GH, MICH, NY, UC); Cañón de la Mano Negra, al N de Iguala, 15 Feb 1970, *Rzedowski 27091* (DS, F, MICH, MO, TEX). **Jalisco**: 1.8 mi S of La Huerta on highway to Barra de Navidad, 15 Mar 1982, *Ayers, et al. 96* (TEX & to be distributed); Arroyo La Calera, ca 9 km distancia aérea al N de Casimiro Castillo en el camino entre Autlán y la costa, 7 Jan 1985, *Judziewicz et al. 5123* (TEX); Las Mesitas, NW of San Sebastián, 15 Mar 1927, *Mexia 1879* (CAS, DS, F, GH, MICH, MO, NY, UC); Barranca de Chavanda, 2 km al S de Atenquique, 6 Feb 1966, *Rzedowski 21947* (DS, MICH, TEX); **México**: Acatitlán, 21 Jan 1933, *Hinton 3185* (GH, MO, TEX); México D,.F., winter of 1893 – 94, *Sheldon s.n.* (GH). **Michoacán**: Coalcomán, 19 Mar 1939, *Blake 13655* (GH, TEX, UC); 45 – 48 km S of Arteaga, 12 – 15 km N of Playa Azul, 26 – 27 Feb 1965, *McVaugh 22571*, 22613 (DS, MICH, NY); Monte de los Pájaros, 6 Mar 1898, *Langlasse 16* (F, GH). **Nayarit**: between km markers 41 – 42 on road to Miramar, W of Jalcocotán, 18 Mar 1982, *Ayers et al. 105* (TEX & to be distributed); La Barranca, 21 Feb 1927, *Jones 23418* (CAS, GH, MO, NY, TEX, UC). **Oaxaca**: Vicinity of Cafetal Concordia, 1 – 15 Apr 1933, *Morton & Makrinius 2361* (DS, F, MICH). **Sinaloa**: Africa, Sierra Taculchamona, 17 Feb 1949, *Gentry 5651* (DS, GH, MICH, MO); Cañón de Tarahumara, Sierra Surotato, 17 – 24 Mar 1945, *Gentry 7305* (F, GH, MICH, NY, UC); Las Breas, Mar 1931, *Ortega 6869* (CAS, F, GH). **Sonora**: Curohui, Río Mayo, 4 Apr 1938, *Gentry 3654* (GH, TEX, UC).

ACKNOWLEDGMENTS

This study is based in large part upon the examination of 88 sheets from the following 10 herbaria: BH (3), CAS (5), DS (9), F (7), GH (16), MICH (12), MO (10), NY (6), TEX (14), UC (6). We are grateful to the directors and curators for the loan of specimens.

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FOURTEEN ADDITIONS TO THE KNOWN STRANDED SEEDS AND FRUITS OF NORTHWEST FLORIDA BEACHES

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ABSTRACT

Disseminules from the following fourteen plants are reported as additions to those previously documented from beaches of Santa Rosa Island, Florida: *Astrocaryum* sp., *Canavalia rosea, Carya glabra, Corylus* sp., *Crescentia cujete, Crinum americanum, Dioclea reflexa, Entada gigas, Manicaria saccifera, Mucuna sloanei, Nyssa aquatica, Rhizophora mangle, Spondias mombin*, and *Terminalia catappa*.

In a recent study Gunn and Dennis (1973) inventoried the stranded seeds and fruits (collectively called disseminules or propagules) found on eleven different beaches from Brazos Island near Brownsville, Texas, eastward to Santa Rosa Island near Pensacola, Florida. Their list included the following eight species whose disseminules were collected along beaches of Santa Rosa Island: (1) *Caesalpinia bonduc* (L.) Roxb., (2) *Carya aquatica* (Michx. f.) Nutt., (3) *Hippomane mancinella* L., (4) *Juglans cinerea* L., (5) *Juglans nigra* L., (6) *Mucuna urens* (L.) Medic., (7) *Quercus lyrata* Walt., and (8) *Taxodium distichum* (L.) Rich. Disseminules from species (2), (4), (5), (7), and (8) are of local or more northerly temperate origin and have probably been transported down the Escambia River and/or the Mississippi River. The other three disseminules are from tropical species which occur in South America, Africa, the Caribbean, or even in south Florida, and have been transported by various ocean currents into the Gulf of Mexico (Gunn 1968; Dennis and Gunn 1972; Gunn and Dennis 1972, 1973, 1976).

For the past several years we have been collecting and examining drift seeds and other stranded disseminules from the beaches of western Santa Rosa Island near Pensacola Beach, Florida. All of the eight disseminules reported by Gunn and Dennis (1973) and listed above have been collected during our field trips. In addition, we are reporting here the discovery of disseminules from the following fourteen plants which have not previously been recorded for Santa Rosa Island beaches: *Astrocaryum* sp., *Canavalia*

SIDA 13(3):345–349. 1989.

Table 1. Stranded seeds and fruits from Santa Rosa Island near Pensacola Beach, Florida.

Scientific Name	Place of Origin	
	Local or Northern	Tropical
Astrocaryum sp.		Tropical America, West Indies
*Caesalpinia bonduc**		Southeast Asia, Pantropical
Canavalia rosea		Pantropical, South Florida, Texas
*Carya aquatica**	X	
Carya glabra	X	
Corylus sp.	X	
Crescentia cujete		New World Tropics, South Florida
Crinum americanum	X	
Dioclea reflexa		Pantropical
Entada gigas		Pantropical
*Hippomane mancinella**		Caribbean Islands, C. & S. America, South Florida
*Juglans cinerea**	X	
*Juglans nigra**	X	
Manicaria saccifera		American Tropics
Mucuna sloanei		New World Tropics, South Florida
*Mucuna urens**		New World Tropics
Nyssa aquatica	X	
*Quercus lyrata**	X	
Rhizophora mangle		New World Tropics, Africa, South Florida
Spondias mombin		New World Tropics
*Taxodium distichum**	X	
Terminalia catappa		Tropical Asia

*Also reported from Santa Rosa Island by Gunn and Dennis (1973).

rosea (Sw.) DC., *Carya glabra* (Mill.) Sweet, *Corylus* sp., *Crescentia cujete* L., *Crinum americanum* L., *Dioclea reflexa* Hook. f., *Entada gigas* (L.) F. & R., *Manicaria saccifera* Gaertn., *Mucuna sloanei* F. & R., *Nyssa aquatica* L., *Rhizophora mangle* L., *Spondias mombin* L., and *Terminalia catappa* L.

Disseminules from *Corylus* are of northern temperate origin (this plant grows no farther south than central Alabama (Brockman 1968; Dean 1968; Clark 1971) and were probably transported via the Mississippi River.

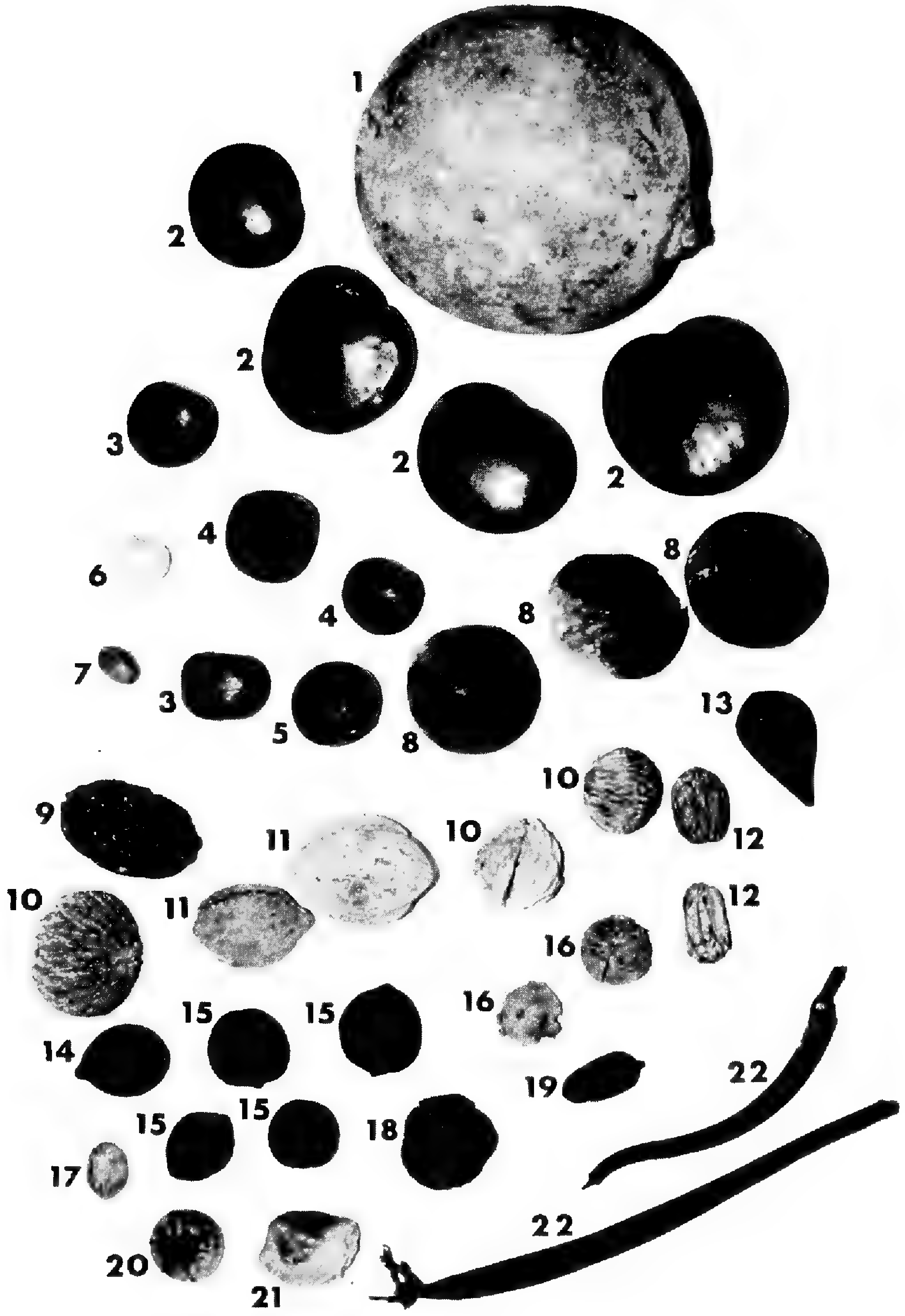

FIG. 1. Stranded disseminules from Santa Rosa Island near Pensacola Beach, Florida. 1 = *Crescentia cujete*, 2 = *Entada gigas*, 3 = *Dioclea reflexa*, 4 = *Mucuna sloanei*, 5 = *Mucuna urens*, 6 = *Caesalpinia bonduc*, 7 = *Canavalia rosea*, 8 = *Manicaria saccifera*, 9 = *Juglans cinerea*, 10 = *Juglans nigra*, 11 = *Terminalia catappa*, 12 = *Spondias mombin*, 13 = *Astrocaryum* sp., 14 = *Carya glabra*, 15 = *Carya aquatica*, 16 = *Hippomane mancinella*, 17 = *Corylus* sp., 18 = *Taxodium distichum*, 19 = *Nyssa aquatica*, 20 = *Quercus lyrata*, 21 = *Crinum americanum*, 22 = *Rhizophora mangle*.

Crinum americanum is of local occurrence and its seeds were probably transported down the Escambia River, along which this plant grows abundantly, or may have come from other Gulf coast states, since *Crinum* grows as far west as Texas (Godfrey and Wooten 1979). Trees of *Nyssa aquatica* and *Carya glabra* also occur in the Escambia River drainage area, and fruits from these species probably originated there, but they may also have been transported via the Mississippi River or have come from coastal states along the Atlantic seaboard west to Texas (Elias 1980). Seeds of *Canavalia rosea* may have originated in the tropics (Sauer 1964) or may have been transported from south Florida (Long and Lakela 1976) or from Texas, where this species also grows along the coast (Correll and Johnston 1970). Similarly, seeds of *Mucuna sloanei* and fruits of *Crescentia cujete* may be of tropical origin (Gunn and Dennis 1976) or may have originated from south Florida (Long and Lakela 1976). *Rhizophora mangle* is a native tree of south Florida (Davis 1940; Gore 1977) and its propagules may have originated there or may have come from various tropical areas where this species also occurs (Gunn and Dennis 1976). The other disseminules newly reported here are of strictly tropical origin (Gunn and Dennis 1976) and have been transported from a number of different possible locations (see Table 1).

Figure 1 shows all stranded disseminules mentioned in this article. They have been deposited into the seed collection of the Herbarium of the University of West Florida (UWFP) for permanent curation.

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CHROMOSOME NUMBERS IN *THYMOPHYLLA* (COMPOSITAE: TAGETEAE)

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ABSTRACT

Chromosome numbers in *Thymophylla tenuiloba* var. *tenuiloba* and congeners are evidently all based on $x = 8$. Past reports of $n = 13$ for taxa referable to *Thymophylla* probably resulted from incorrect interpretations of meiotic figures in triploids with $2n = 3x = 24$. Reproduction in the triploids is apparently apomictic.

Johnston and Turner (1962) reported *Thymophylla tenuiloba* (DC.) Small (as *Dyssodia tenuiloba*) to have two chromosome numbers: $n = 8$ and $n = 13$. I accepted Johnston and Turner's observations and reported, myself, chromosome counts of $n = 8$, 13, 13 + fragment, ca. 13, 16, ca. 16, ca. 20, and 26 for *Thymophylla tenuiloba* var. *tenuiloba* (as *Dyssodia*; Strother 1969).

But, also in 1969, I began to doubt the counts of $n = 13$ and $n = 26$. I had discovered that some plants of *Thymophylla tenuiloba* were triploid with $2n = 3x = 24$ and that tetraploid ($2n = 32$) individuals were also present in some local populations. And, I had realized that because some species of *Dyssodia* do have somatic chromosome numbers of $2n = 26$, it had been easy, at least for me, to see what I expected to see, to misinterpret meiotic figures in $2n = 3x = 24$ triploids as "13 sticky pairs."

My first public report of these observations was in an oral presentation (Strother 1970) in which I acknowledged that my earlier reports of $n = 13$ and $n = 26$ for *T. tenuiloba* were doubtless mistaken interpretations of meiotic figures in triploid and higher polyploid plants. I also suggested that other reports of $n = 13$ from those species of *Thymophylla* (i.e., part of *Dyssodia* sensu Strother 1969) for which $n = 8$ had also been recorded were similarly based on erroneous interpretations of triploids.

Flyr (1973) reported my observation that an adventive population of *T. tenuiloba* var. *tenuiloba* (as *Dyssodia*) contained triploids.

In 1975 (see Strother 1977), I reported that triploids were common in *T. tenuiloba* var. *tenuiloba* and that circumstantial evidence (see following) strongly suggested apomictic seed production in the triploids and perhaps in other polyploids of *T. tenuiloba*. In the same paper I pointed out a similar pattern of triploidy in *Porophyllum scoparium* A. Gray (citing Johnson

1969), also a member of Tageteae. In 1976, I noted a second instance of triploidy in *Porophyllum* and reported triploidy in *Chrysactinia mexicana* A. Gray (Strother 1976), also referable to Tageteae. Apomictic triploidy is apparently a recurrent theme in reproductive biology of Tageteae.

In all of these triploids, pollen stainability and pollen production are relatively low, or even nil, and seed-set is consistently high. In *T. tenuiloba* var. *tenuiloba*, for example, stainability of pollen (in lactophenol cotton-blue) ranges from 40 to 100 % in diploids ($N = 62$) with 46 of the 62 individuals scored having stainabilities above 70 %. The range of stainabilities is 0 to 27 % in triploids ($N = 60$) with 45 of the 60 below 10 %; the range is 0 to 82 % in tetraploids ($N = 66$). In diploids, pollen-grains-per-floret averages ca. 4000; in triploids pollen-grains-per-floret ranges from ca. 2000 to virtually (or actually) zero—in some triploid individuals, anther development ceases in some florets before any pollen is produced! Triploid plants in nature and bagged heads of triploid plants (pollen production and stainability not checked) grown under glass in Berkeley produce full complements of plump achenes.

In 1986, I indicated again my belief that chromosome numbers in all members of *Thymophylla* are based on 8 and that the reports of $n = 13$ for plants referable to *Thymophylla* were misinterpretations. Some colleagues have expressed (in litt. and viva voce) reluctance to accept my 1986 circumscriptions of *Dyssodia*, *Thymophylla*, et al. Their reluctance seems to stem, at least in part, from continued belief that some species of *Thymophylla* (sensu Strother 1986) have gametic chromosome numbers of both 8 and 13 or that some species of the genus have $n = 8$ and others have $n = 13$. For the record, then, I feel I should present the following brief summary of my observations on chromosome numbers in *T. tenuiloba* and some of its congeners.

Altogether, I have studied meiotic configurations of chromosomes in some 443 individuals from 82 sites from across most of the natural and much of the adventive range of *Thymophylla tenuiloba* var. *tenuiloba*. The distinction between natural and adventive ranges of *T. tenuiloba* var. *tenuiloba* is based on cumulative mapping of collections in chronological sequence up to selected dates (cf. figure 1). Local populations in areas beyond the range as known through ca. 1940 are restricted to immediate shoulders of roadways, do not appear to be part of surrounding, native vegetation, and are thought to be adventive (cf. Strother and Smith 1970).

All chromosome counts reported here were made from aceto-carmine squashes of microsporocytes from florets fixed in Carnoy's solution (6 vols. ethanol: 3 chloroform: 1 glacial acetic acid). Ten representative populations of *T. tenuiloba* var. *tenuiloba* are cited in table 1. Voucher collections for

TABLE 1. Chromosome counts in selected species of *Thymophylla*. Collection numbers (e.g., *619*) are Strother's; numbers in parentheses indicate numbers of individuals of the ploidy-level indicated.

T. acerosa (DC.) Strother

Arizona. Cochise Co.: ca. 13 mi W of Willcox on road to Benson, 26 Apr 1968, *695*, $2n$ = ca. 25 (1). **Texas**. Culberson Co.: ca. 23 mi E of Van Horn along I-10 at Plateau exit, 25 Mar 1986, *1330*, $2n$ = 24 (1); Kinney Co.: ca. 2 mi S of county line on Rte. 277, 20 Apr 1968, *627*, $2n$ = **8 II + 2 frags.** (1); Pecos Co.: ca. 4 mi N-NE of Sheffield, near I-10 on Rte. 290, 25 Mar 1986, *1339*, $2n$ = 24 (1); Reeves Co.: ca. 6 mi E of I-20 on I-10 at Rte. 290 turnoff to Toyahvale, 25 Mar 1986, *1331*, $2n$ = 24 (1); Terrell Co.: ca. 13 mi W of Dryden, 20 Apr 1968, *619*, $2n$ = **8 II** (1), $2n$ = 24 (2); Val Verde Co.: just E of Comstock, 20 Apr 1968, *621*, $2n$ = **8 II** (1).

T. pentachaeta (DC.) Small var. *pentachaeta*

Texas. Goliad Co.: ca. 1 mile SW of Goliad on Rte. 59, 29 Mar 1970, *848*, $2n$ = 32 (2); Starr Co.: ca. 8.5 mi E of Rio Grande City, 29 Apr 1969, *706*, $2n$ = **16 II** (1); Val Verde Co.: just E of Comstock, 20 Apr 1968, *623*, $2n$ = **16 II** (1).

T. tenuiloba (DC.) Small var. *tenuiloba*

Texas. Chambers Co.: I-10 at Rte. 146, 3 Jun 1976, *1227*, $2n$ = 24 (4); Dimmit Co.: ca. 4.6 mi NW of Carrizo Springs, 30 Apr 1969, *724*, $2n$ = **8 II** (1), $2n$ = 24 (13), $2n$ = **16 II** (4); Duval Co.: ca. 2.7 mi SW of Realitos, 29 Apr 1969, *713*, $2n$ = **8 II** (4), $2n$ = 24 (8), $2n$ = **16 II** (9); Llano Co.: ca. 8.7 mi E of Llano on Rte. 29, 2 May 1969, *747*, $2n$ = 24 (23); Mason Co.: ca. 12.5 mi E of Mason on Rte. 29, 2 May 1969, *749*, $2n$ = 24 (13); Nueces Co.: ca. 15 mi S of Robstown, 28 Apr 1969, *700*, $2n$ = **8 II** (15); San Patricio Co.: ca. 4.5 mi S of Odem, 22 Apr 1968, *655*, $2n$ = 24 (9); Webb Co.: ca. 6 mi S of Laredo, 21 Apr 1968, *639*, $2n$ = 24 (1), $2n$ = **16 II** (5), $2n$ = 40 (1); Willacy Co.: ca. 8 mi S of Sarita, 22 Apr 1968, *648*, $2n$ = **8 II** (3), $2n$ = 24 (4), $2n$ = **16 II** (2); Zapata Co.: ca. 4 mi W of Starr Co. line on Rte. 83, 29 Apr 1969, *709*, $2n$ = **16 II** (20).

T. tenuiloba var. *treculii* (A. Gray) Strother

Texas. Maverick Co.: NE of Eagle Pass on loop, 30 Apr 1969, *726*, $2n$ = 32 (2), $2n$ = 40 (4).

T. tenuiloba var. *wrightii* (A. Gray) Strother

Texas. Bee Co.: ca. 2.5 mi SE of Skidmore on Rte. 181, 22 Apr 1968, *657*, $2n$ = **8 II** (1); Colorado Co.: ca. 3 mi W of Rock Island on Rte. 90A, 28 Apr 1969, *697*, $2n$ = **8 II** (2); San Patricio Co.: 1 mile W of Sinton on Rte. 181, 22 Apr 1968, *656*, $2n$ = **8 II** (9).

TABLE 2. Meiotic figures observed in a sample of 35 cells from a single triploid plant of *Thymophylla tenuiloba* var. *tenuiloba* (*Strother 734G* from Medina Co., Texas). (Numbers of cells per class in parentheses).

7 III	+ 1 II	+ 1 I	(3)	4 III	+ 3 II	+ 6 I	(1)
6	+ 2	+ 2	(9)	3	+ 5	+ 5	(4)
5	+ 3	+ 3	(6)	2	+ 6	+ 6	(1)
5	+ 2	+ 5	(1)	1	+ 9	+ 3	(1)
4	+ 4	+ 4	(8)	1	+ 7	+ 7	(1)

all 82 populations of *T. tenuiloba* var. *tenuiloba* sampled, including the 76 marked on figure 2, and for the other counts reported in table 1 have been deposited in TEX and/or UC.

As indicated in figure 2, diploids of *T. tenuiloba* var. *tenuiloba* are con-

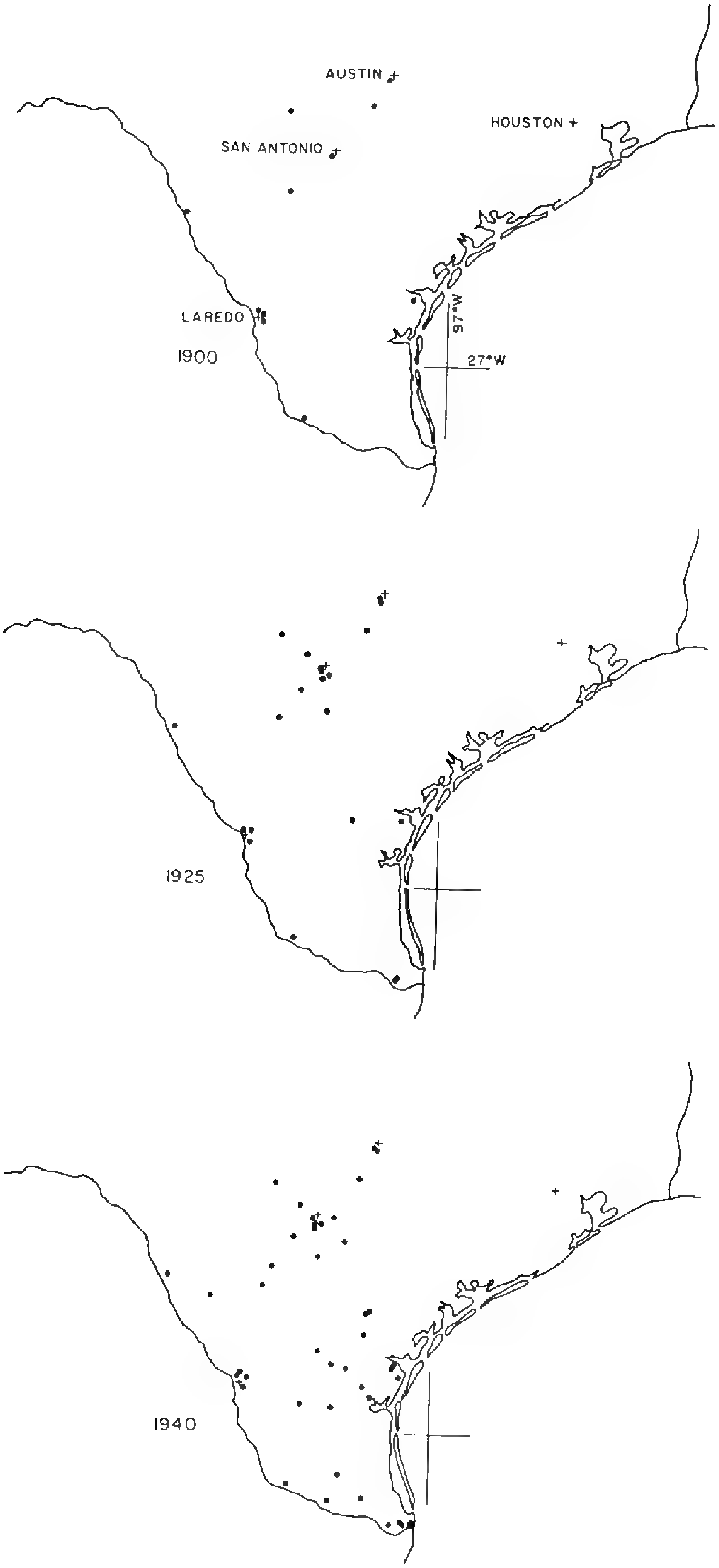
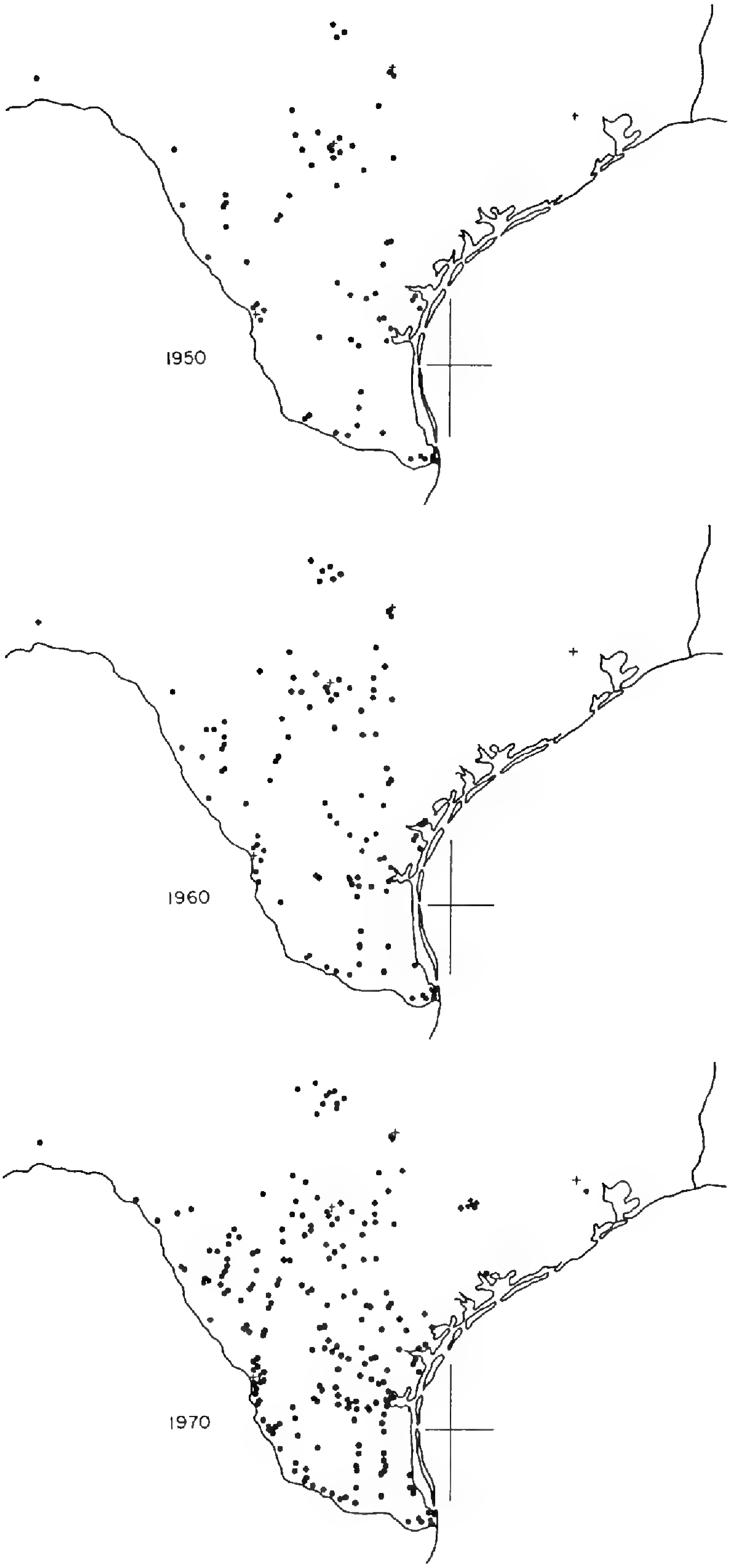


FIG. 1. Historical changes in distribution of *Thymophylla tenuiloba* var. *tenuiloba*. Range documented by collections made through ca. 1940 is thought to be the natural or native distribution of the taxon;



populations from beyond that range are thought to be adventive (cf. distribution of different ploidy-levels in fig. 2).

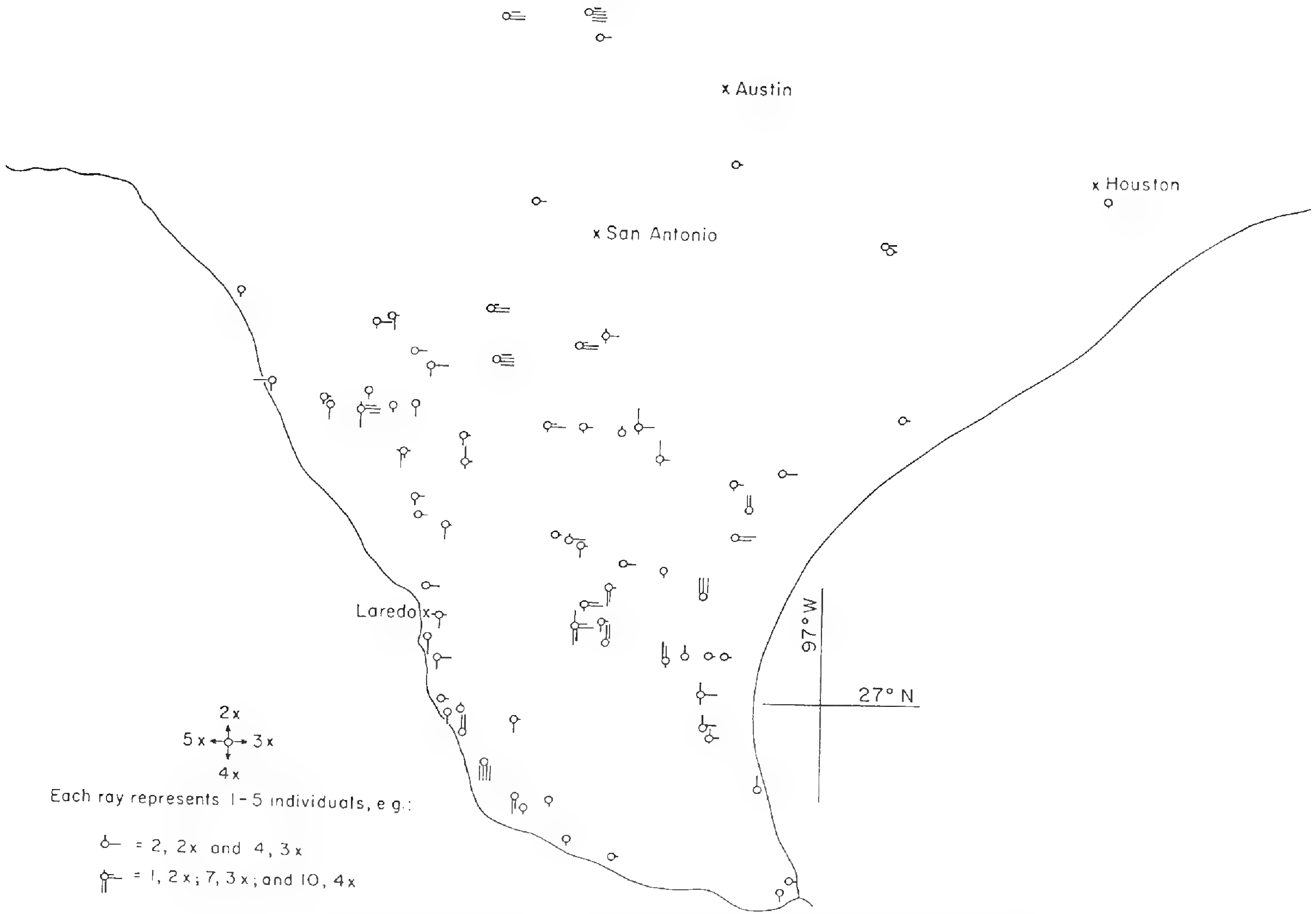


FIG. 2. Distribution of ploidy-levels in *Thymophylla tenuiloba* var. *tenuiloba* (cf. fig. 1).

centrated around the core of the distribution of the taxon and only triploids and other polyploids are found at peripheral and disjunct sites (i.e., in populations that are thought to be adventive, cf. fig. 1). That samples from some sites included individuals of more than one ploidy level, including some with both diploids and tetraploids, suggests that the origin of the triploid plants may well be polytopic. Of the 443 individuals of *T. tenuiloba* var. *tenuiloba* for which ploidy-level has been determined, 87 were diploid, 230 were triploid, 118 were tetraploid, and 8 were pentaploid.

Meiotic figures in the triploids include a considerable array of III's, II's, and I's at diakinesis and first metaphase, including, rarely, the maximal expected configuration: 8 III's. Sample observations from a single triploid plant are presented in table 2. Tetraploids often have quadrivalent associations. In none of the 1000's of cells in 100's of squashes made after I became aware of the triploids have I observed meiotic configurations of $2n = 13$ II or $2n = 26$ II in any plant referable to *T. tenuiloba*. During the same interval I have observed chromosomes of other species of *Thymophylla*; all have chromosome numbers based on $x = 8$ (table 1).

Acknowledging that one black sheep suffices to prove that the flock is not all white and acknowledging, too, that there are well-documented taxa with disparate chromosome numbers such as *Hymenoxys odorata* DC. (Sanderson and Strother 1973) and *H. texana* (J. Coulter & Rose) Cockerell (Strother and Brown 1988) and *Cevallia sinuata* Lag (Powell et al. 1977), I nevertheless submit that a reasonable inference from the observations summarized here is that all plants referable to *T. tenuiloba* have chromosome numbers based on $x = 8$ and that none has a chromosome number based on $x = 13$. While I cannot be quite so certain for the other species, I strongly feel that the same will prove true for all plants referable to *Thymophylla* (sensu Strother 1986).

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DOCUMENTED PLANT CHROMOSOME NUMBERS 1989: 1. CHROMOSOME NUMBERS IN MEXICAN ASTERACEAE WITH SPECIAL REFERENCE TO THE TRIBE TAGETEAE

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ABSTRACT

Chromosome counts are reported for 24 species of Mexican Asteraceae, 12 of these previously unreported. Newly reported counts include *Stevia latifolia*, $n=45$ I; *S. lucida* var. *bipontini*, $n=12$ II; *Desmanthodium fruticosum*, $n-17$ II; *Viguiera potosina*, $n=17$ II, *Dyssodia glandulosa*, $n=13$ II; *Geissolepis suadaefolia*, $n=8$ II; *Gymnolaena oaxacana*, $n=13$ II; *Leucactinia bracteata*, $n=16$ II; *Machaeranthera stenophylla*, $n=4$ II; *Porophyllum calcicola*, $n=12$ II; and *Pinaropappus multicaulis*, $n=9$ II. Reports for species of *Desmanthodium*, *Geissolepis* and *Leucactinia* represent new generic counts. Chromosome counts are reported for six species in four genera of the tribe Tageteae and are compared with all numbers previously reported in the tribe. When deemed appropriate, phyletic digressions are made.

Numerous chromosome reports for the large family Asteraceae are available in the literature. Indeed, attempts to ascertain the chromosome counts reported for a given large genus or group of several moderate-sized genera may necessitate several hours of patient search among the 10 or more available texts for this purpose. Because of this, it is becoming increasingly difficult to know if newly obtained chromosome counts have been reported. With this as an introduction, we report here counts for 24 species of Mexican Asteraceae (Table 1). Twelve of these represent previously unreported taxa, and three, *Desmanthodium Geissolepis* and *Leucactinia*, represent new generic reports.

METHODS AND MATERIALS

Nearly all of the chromosome counts were made from bud material by the senior author using standard acetocarmine squash techniques. Voucher specimens (Table 1) are on deposit at the University of Texas Herbarium (TEX).

DISCUSSION

EUPATORIEAE—Chromosome counts for *Stevia latifolia* ($n=45$ univalents), suggest that the species is an asexual apomict, much as

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suggested by its pollen grains (Grashoff 1972). The count for *Stevia lucida* var. *bipontini* ($n = 12$ II) is the same as that of *S. l.* var. *lucida* (Grashoff et al. 1972).

ASTEREAE—Counts for the several species listed in Table 1 are consistent with previous reports. The counts for *Geissolepis suadaefolia* ($n = 8$ II) and *Machaeranthera stenophylla* ($n = 4$ II) are newly reported. The count for the monotypic *Geissolepis* is especially noteworthy in that its tribal position is conjectural. Largely because of its chaffy receptacle, the species was originally positioned in the tribe Heliantheae, but Robinson (1981) placed it in the tribe Astereae, where it appears to be properly positioned.

Geissolepis, however, appears to be strongly isolated from other American Astereae. It is distinct in its combination of a prostrate, succulent habit, sparsely short-pilose, eglandular vestiture, strongly developed resin canals on the phyllaries, achenes and disc corollas, achenial trichomes with bifurcate, sharply hooked apices, pappus of scales with the margins uncinate-ciliate, and its chromosome number of $n = 8$ pairs.

Among the white- and blue-rayed members of the tribe, *Geissolepis* shows at least a vague similarity to *Astranthium* ($x = 4, 5$) and particularly to *Aphanostephus* ($x = 4, 5$) in its conical receptacles, peculiar achenial trichomes, and chromosome number.

HELIANTHEAE—Counts for the eight species listed in Table 2 are consistent with previous reports; those for *Desmanthodium fruticosum* ($n = 17$ II) and *Viguiera potosina* ($n = 17$ II) are newly reported.

LACTUCEAE—Counts for *Pinaropappus multicaulis* ($n = 9$ II) have not been previously reported.

TAGETEAE—Counts for *Dyssodia glandulosa* ($n = 13$ II), *Gymnolaena oaxacana* ($n = 13$ II), *Leucactinia bracteata* ($n = 16$ II), and *Porophyllum calcicola* ($n = 12$ II) have not been previously reported; that for *Leucaetinia* ($n = 8$ II) being a new generic report.

As noted in the introduction, it is becoming increasingly difficult to assess the chromosomal status of generic or suprageneric taxa. For this reason, and because of our interest in the systematics of this largely Mexican group, we present an "update" on the chromosomal reports for the tribe Tageteae (Table 2).

Strother (1977) presented a systematic review of the tribe Tageteae. He recognized 16 "accepted genera", as follows. For each of these we have listed base chromosome numbers as recounted in our Table 2.

Adenopappus	no counts
Chrysactinia	$x = 15$
Dyssodia	$x = 7, 8, 13$
Gymnolaena	$x = 13$

Harnackia	no counts
Hydropectis	no counts
Lescaillea	no counts
Leucactinia	$x = 8$
Nicolletia	$x = 10$
Pectis	$x = 12$
Porophyllum	$x = 11, 12, 15$
Schizotrichia	no counts
Strotheria	$x = 8$
Tagetes	$x = 11, 12, 18$
Urbinella	$x = 8$
Vilobia	no counts

An additional genus, *Hydrodyssodia*, recently proposed by Turner (1988) has not been counted. In addition, we would add to this assemblage the genus *Chaetymenia* (chromosome number unknown), which Rydberg (1914) positioned in the subtribe Jaumeinae. Robinson (1981) did not account for this genus in his revision of the subtribal limits of the tribe Heliantheae (within which he positioned the Tageteae as a subtribe).

Base chromosome numbers are now known for 10 of the 18 above-mentioned genera. While most of the small genera are monobasic, several larger genera (with the exception of *Pectis*) are multibasic. Thus, *Porophyllum* (sensu Johnson, 1969) has base numbers of $x = 11$, 12, and 15, and is possibly polyphyletic. While those few species with $x = 11$ may be dysploid derivatives of $x = 12$, it is more difficult to reconcile the base number of $x = 15$, which is found in *P. crassifolium* and *P. tridentatum*, both rather atypical members of that genus. We suggest that the latter might be more closely related to *Nicolettia* ($x = 10$). The count for *P. greggii* ($n = 18$ II) is enigmatic because the species clearly relates to *P. scoparium* ($n = 12$ II). It is possibly a derived triploid on a base of $x = 12$. Indeed, Johnson (1969) thought *P. greggii* to be of hybrid origin (*P. gracile n P. scoparium*). This would be consistent with the chromosomal data, *P. gracile* with $n = 24$, *P. scoparium* with $n = 12$, the ancestral hybrid derivative being $n = 18$.

Tagetes, with base numbers of $x = 11$ and 12, seemingly has a base number of $x = 12$, because species on a base of $x = 11$ are relatively few and specialized.

By far the most complex genus chromosomally is *Dyssodia*. Strother (1969) originally treated the genus in its broad sense. So treated, the genus can be shown to be multibasic with $x = 7, 8$ and 13.

More recently, Strother (1986) provided a rather drastic renovation of his concept of *Dyssodia* (sensu 1969). Instead of the more inclusive *Dyssodia* accepted in his earlier assessments (1969, 1977), he split the group into

TABLE 1. Chromosome numbers of Mexican Asteraceae.

Species	*Voucher*	*Chromosome Number*
EUPATORIEAE		
Barroetea pavonii A. Gray	Guerrero: *T15878*	$n = 9$II
	Puebla: *T15897*	$n = 9$II
**Stevia latifolia* Benth.	Puebla: *T15891*	$n = 45$I
**Stevia lucida* var. *bipontini* B.L. Rob.	Puebla: *T15906*	$n = 12$II
ASTEREAE		
Erigeron unguiphyllus Nesom	San Luis Potosi: *N6653*	$n = 9$II
Geissolepis suaedifolia B.L. Rob.	San Luis Potosi: *N6634*	$n = 8$II
Gutierrezia alamani var. *megacephala* (Fern.) Lane	Chihuahua: *N6463*	$n = 8$II
Machaeranthera crutchfieldii B. Turner	Nuevo Leon: *N6753*	$n = 4$II
**Machaeranthera stenoloba* (Greene) Shinners	Chihuahua: *N6535*	$n = 4$II
Machaeranthera turneri R.C. Jackson	Chihuahua: *N6543a*	$n = 5$II
HELIANTHEAE		
Aldama dentata Llave	Puebla: *T15889*	$n = 17$II
**Desmanthodium fruticosum* Greenm.	Guerrero: *T15876*	$n = 17$II
Lagascea rigida var. *mociniana* (DC.) Stuessy	Guerrero: *T15869*	$n = 17$II
Lasianthaea ceanothifolia (Willd.) Becker var. *ceanothifolia*	Morelos: *N6764*	$n =$ ca. 10II
Montanoa frutescens DC.	Morelos: *N6758*	$n =$ ca. 19II
Sabazia humilis (H.B.K.) Cass.	Morelos: *Wells 1*	$n = 4$II
**Viguiera grammatoglossa* DC.	Puebla: *T15905*	$n = 17$II
**Viguiera potosina* Blake	San Luis Potosi: *N6678*	$n = 17$II
TAGETEAE		
**Dyssodia glandulosa* (Cav.) O. Hoffm.	Puebla: *T15894*	$n = 13$II
Dyssodia porophyllum (Cav.) Cav.	Guerrero: *T15868*	$n = 13$II
**Gymnolaena oaxacana* (Greenm.) Rydb.	Puebla: *T15408*	$n = 13$II
**Leucactinia bracteata* (S. Wats.) Rydb.	Nuevo Leon: *N6793*	$n = 16$II
**Porophyllum calcicola* Rob. & Greenm.	Guerrero: *T15874*	$n = 12$II
Porophyllum linaria (Cav.) DC.	Puebla: *T15902*	$n = 12$II
	Puebla: T15910	$n = 12$II
LACTUCEAE		
**Pinaropappus multicaulis* Brandegee	San Luis Potosi: *N6675*	$n = 9$II

Voucher numbers preceeded by T are those of *Turner*; those preceeded by N are those of *Nesom*.
*Represent taxa previously unreported

TABLE 2. Update on chromosome numbers in tribe Tageteae.

Genera	Species or variety	Reference	Chromosome Number
Chrysactinia			
	mexicana	Keil & Stuessy (1977)	$n = 15$II, 15I
	mexicana	Strother (1976)	$n =$ ca45
	pinnata	Powell & Turner (1963)	$n = 15$II
	truncata	Sundberg et al. (1986)	$n = 15$II
Dyssodia			
	acerosa		$n = 8$II
	(Fourteen populations of this species have been counted: 7 of these are reported as $x = 8$ pairs and 7 with $x = 13$ pairs). Strother (1969), Turner et al. (1973), Keil & Stuessy (1977), Powell & Powell (1977), Brown & Thompkins (1982), Parfitt et al. (1985).		$n = 13$II
	anomala	Strother (1969)	$n = 7$II
	anomala	Keil and Pinkava (1976)	$n = 7$II
	anthemidifolia	Strother (1969)	$n = 7$II
	appendiculata	Strother (1983)	$n = 13$II
	aurea	Strother (1969)	$n = 8$II
	aurea	Keil & Stuessy (1975)	
	concinna	Strother (1969)	$n = 8$II
	cooperi	Strother (1969, 1976)	$n = 13$II
	decipiens	Strother (1969, 1972, 1976)	$n = 13$II
	decipiens	Keil et al. (1988)	$n = 13$II
	gentryi	Strother (1969)	$n = 8$II
	glandulosa	present paper	$n = 13$II
	littoralis	Strother (1972)	$n = 7$II
	micropoides	Strother (1969)	$n = 8$II
	micropoides	Keil & Pinkava (1976)	$n = 8$II
	montana	Strother (1983)	$n = 13$II
	neomexicana	Strother (1969)	$n = 7$II
	papposa	Strother (1969)	$n = 13$II
	papposa	Grashoff et al. (1972)	$n = 13$II
	papposa	Urbatsch (1974)	$n = 13$II
	papposa	Keil & Stuessy (1975)	$n = 13$II
	papposa	Keil et al. (1988)	$n = 13$II
	pentachaeta		
	var. *belenidium*	Strother (1969)	$n = 13$II
		Keil & Stuessy (1975)	$n = 16$II
		Keil & Pinkava (1976)	$n = 13$II
		Keil et al. (1988)	$n = 13$II
	var. *hartwegii*	Strother (1969)	$n = 26$II
	var. *pentachaeta*	Strother (1969)	$n = 13$II
		Powell & Powell (1978)	$n = 8$II
	var. *puberula*	Strother (1969)	$n = 13$II
	pinnata	Strother (1969)	$n = 13$II
		Keil & Stuessy (1977)	$n = 13$II
	porophylloides	Strother (1969, 1972)	$n = 13$II
		Keil & Pinkava (1976)	$n = 13$II
		Pinkava & Keil (1977)	$n = 13$II
		Gallagher & Parfitt (1982)	$n = 13$II

(TABLE 2 continued)

porophyllum		
var. *cancellata*	Strother (1969)	n = 13II
	Powell et al. (1975)	n = 13II
	Keil & Stuessy (1977)	n = 13II
	Pinkava & Keil (1977)	n = 13II
var. *porophyllum*	Strother (1969)	n = 13II
sanguinea	Strother (1969)	n = 13II
setifolia	Strother (1969)	n = 13, 26II
	Keil & Stuessy (1977)	n = 26II
speciosa	Strother (1972)	n = 13II
	Turner et al. (1973)	n = 13II
	Gallagher & Parfitt (1982)	n = 13II
tagetiflora	Strother (1969)	n = 13II
	Keil & Stuessy (1977)	n = 13II
	Keil et al. (1988)	n = 13II
tagetoides	Strother (1969)	n = 13II
tenuifolia	Strother (1969)	n = 8II
	Gupta & Gill (1983)	n = 8II
tenuiloba		
var. *tenuliloba*	Strother (1969)	n = 8, 13, 16II*
var. *texana*		n = 8II
var. *treculi*		n = 13, 16II
var. *wrightii*		n = 8II
tephroleuca	Strother (1969)	n = 8II
Gymnolaena		
chiapasana	Strother (1983)	n = 13II
oaxacana	present paper	n = 13II
Leucatinia		
bracteata	present paper	n = 16II
Nicolletia		
edwardsii	(numerous workers!)	n = 10II
trifida		n = 10II
Pectis [40 or more species counted, all on a base of x = 12 (Keil, 1988)]		
Porophyllum		
calcicola	present paper	n = 12II
coloratum	Johnson (1969)	n = 12II
	Keil & Stuessy (1975)	n = 12II
crassifolium	Turner et al. 1973	n = 15II
gracile	(numerous authors)	n = 24II
greggii	Powell & Sikes (1970)	n = 18II
lanceolatum	Turner et al. 1979	n = 22II
linaria	present paper	n = 12II
macrocephalum	(numerous authors)	n = 11II
nelsonii	Strother (1983)	n = 12II
ochroleucum	Turner et al. (1973)	n = 12II
punctatum	(numerous authors)	n = 12II
ruderale	(numerous authors)	n = 11,22,II

Most of the counts of *P. ruderale* have been n = 22II, but a few have been reported as n = 11II; the latter perhaps represent *P. macrocephalum*, which is often treated as part of *P. ruderale*).

scoparium	(numerous authors)	n = 12II
tridentatum	Johnson (1965)	n = 15II
	Reveal & Moran (1977)	n = 15II

(Table 2 continued)

Strotheria		
gypsophila	(several authors)	$n = 8$II
Tagetes spp.		$n = 11, 12, 18, 24$II
About 30 species of this genus are reported in the literature: nearly all are on a base of $x = 12$ but *T. lucida* is consistently reported as $n = 11$ pairs; the only other anomalous count is for *T. signata* with $n = 18$ pairs, but this is presumably a triploid derivative, much as discussed for *Porophyllum greggii*].		
Urbinella		
palmeri	Strother (1969)	$n = 8$II

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*Strother (1989) has presented convincing evidence that the chromosome counts of $n = 13$ II in this taxon are miscounts of triploid individuals with $3x = 24$ (or seemingly diploids with $n =$ ca. 12 II).

seven genera, most having been recognized as subgenera and/or sections by previous authors. We list below those genera elevated by Strother, along with those species listed in his "nomenclator for *Dyssodia*" (1986, p. 376). Chromosome counts are from Table 2.

ADENOPHYLLUM
A. appendiculatum $n = 13$
A. cooperi $n = 13$
A. glandulosum $n = 13$
A. porophylloides $n = 13$
A. porophyllum $n = 13$
A. speciosum $n = 13$
A. squamosum no count
A. anomalum $n = 7$
A. wrightii $n = 7$

BOEBERASTRUM
B. anthemidifolia $n = 7$
B. littoralis $n = 7$

BEOBEROIDES
B. grandiflora no count

COMACLINIUM
C. montanum $n = 13$

DYSSODIOPSIS
D. tagetoides $n = 13$

DYSSODIA
D. decipiens $n = 13$
D. papposa $n = 13$
D. pinnata $n = 13$
D. sanguinea $n = 13$
D. tagetiflora $n = 13$

THYMOPHYLLA
T. acerosa $n = 8, 13$
T. aurantiaca no count
T. aurea $n = 8$
T. concinna $n = 8$
T. gentryi $n = 8$
T. gypsophila no count
T. micropoides $n = 8$
T. mutica no count
T. pentachaeta $n = 8, 13$
T. setifolia $n = 13$
T. tenuifolia $n = 8$
T. tenuiloba $n = 8$
T. tephroleuca $n = 8$

Chromosome numbers are now known for all of the generic segregates of *Dyssodia* except the monotypic *Boeberoides*. Even with this much narrower generic concept, counts on a base of both $x=7$ and 13 occur in *Adenophyllum*, and counts of both 8 and 13 occur in *Thymophylla* (presumably even within the same species, although this is discounted by Strother 1989). It would appear that the chromosome numbers provide little insight into relationships, unless, of course, those species of *Adenophyllum* with $n=7$ belong with *Boeberastrum*, or vice versa. It would seem best to view the various segregates as perhaps having an ancestral base number of $x=8$, and that $x=7$ is a dysploid derivative. Strother (1989) believes that at least some, if not all, of the counts of $x=13$ within *Thymophylla* are miscounts of sterile triploids (i.e., $2n=24$, the meiotic configurations appearing as $n=$ ca. 12 or 13). Nevertheless, the origin of species with $n=13$ pairs must be of long-standing, to judge by its distribution among at least four of the generic segregates from *Dyssodia*. But, looking at the broad picture, it would appear that species on a base of $x=13$ are largely confined to *Dyssodia* and closely related genera; hence, its occurrence in *Gymnolaena*, which has been placed within *Dyssodia* upon occasion. Indeed, considering its chromosome base, it would be reasonable to include *Gymnolaena* within *Dyssodia* (sensu lato).

Accepting *Dyssodia* in the broad sense, the most common base numbers in the Tageteae are $x=8$ and 12, the former occurring in four of the nine genera counted to date (*Dyssodia*, *Leucactinia*, *Strotheria* and *Urbinella*), the latter occurring in three of these (*Pectis*, *Porophyllum* and *Tagetes*). All of this would be simplified if one were to assume an *ancestral* base chromosome number of $x=4$ or 5; this would imply that numbers of $x=8$, 12 and 18 are 4x, 6x, and 9x respectively. Genera on a base of $x=5$ would include *Nicolletia* (2x), *Chrysactinea* (3x), and possibly the 2 taxa of *Porophyllum* (*P. crassifolium* and *P. tridentatum*) with $n=15$ pairs.

Most of the above is mere numerology. What is needed foremost is a detailed character-analysis of the tribe, perhaps with a sound cladistic analysis using *Chaetymenia* as an outgroup. This should be followed by a thorough chloroplast DNA analysis of the type performed by Jansen and Palmer (1988) to ascertain the likely reliability of the morphological systems proposed. Data from the latter workers (pers. comm.) suggest that the Tageteae is related to, or belongs within, the tribe Heliantheae (much as treated by Robinson, 1981, who recognized the Tageteae as but a subtribe within the Heliantheae). At present, chloroplast DNA studies on the Tageteae are limited, but such an approach will be needed before any confirmed new insights into phyletic relationships within the Tageteae is forthcoming. Until that time it would seem most prudent to retain the very familiar classificatory schemes, which would include a broad *Dyssodia*, as conceived by Strother (1969).

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DOCUMENTED PLANT CHROMOSOME NUMBERS 1989: 2. CHROMOSOME COUNTS OF THREE SPECIES IN THE GENUS *LEUCOPHYLLUM*[1]

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Correll and Johnston (1970) list three species of *Leucophyllum* (cenizo) as native to Texas, *L. frutescens* (Berl.) I. M. Johnst., *L. minus* Gray, and *L. candidum* I. M. Johnst. The chromosome number of *L. minus* was reported to be $n = 16$ based on one meiotic count (Flyr 1970). Chromosome numbers for the other two species have not been reported previously. We obtained chromosome counts on all three species to provide basic information for an enhancement project on cenizo under way at the Texas A&M University Research and Extension Center at Dallas (Simpson 1984a & 1984b). Chromosome numbers were obtained from root tip smears prepared by the Feulgen technique (Read 1987). The chromosomes in at least 20 cells undergoing mitosis were counted for each species. *Leucophyllum frutescens* and *L. minus* were found to be diploids ($2n = 2x = 34$) and *L. candidum* is tetraploid ($2n = 4x = 68$). We found $x = 17$ in these species and not 8 as reported by Flyr (1970).

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[1] Contribution No. TA24157 of the Texas Agricultural Experiment Station.

NOTES

NOMENCLATURAL NOTES ON *CALOPOGON, CORALLORHIZA*, AND *CYPRIPEDIUM* (ORCHIDACEAE) IN THE GREAT PLAINS REGION—During the preparation of a manuscript on the native orchids of the Great Plains Region it became obvious that the status of three orchid taxa occurring in this area needed to be clarified.

CALOPOGON TUBEROSUS (L.) B.S.P. var. **simpsonii** (Small) Magrath, comb. nov.

It appears that var. *simpsonii* (basionym: *Limodorum simpsonii* Small, Fl. SE U.S. 322. 1903) was never changed from *C. pulchellus* (Salisb.) R. Br. var. *simpsonii* (Small) Ames when *tuberosus* (basionym: *Limodorum tuberosum* Linnaeus, Sp. Pl. 2:950. 1753) was recognized as the correct name for *pulchellus*.

In Oklahoma, *C. tuberosus* is represented by two different taxa. One taxon is a relatively small plant that grows in wet prairie hay meadows and blooms in mid-May to early June and the other taxon is a large plant that occurs only in sphagnum bogs and blooms in early to mid-June. In trying to correctly identify these two taxa it was found that they were both referable to *C. tuberosus* but were obviously different. It was finally determined that the larger taxon was var. *simpsonii* and the smaller var. *tuberosus*.

KEY TO THE TAXA IN OKLAHOMA:

1. Plants of open moist prairies; plant height usually 35 cm or less; petal length 11 – 20 mm; column 9 – 14 mm long .... var. *tuberosus*
1. Plants of open sphagnum bogs; plant height usually 40 cm or more; petal length 20 – 30 mm; column 17 – 22 mm long .... var. *simpsonii*

CORALLORHIZA STRIATA Lindl. f. FULVA Fern.

It is my opinion that the name that is best applied to the pale yellow form of *C. striata* is f. *fulva* Fern. I had previously believed that the yellow form of *striata* was primarily restricted to the Black Hills of South Dakota and adjacent areas of the Rocky Mountains in Colorado, and therefore accepted Rydberg's name *C. ochroleuca* but reduced it from species rank to varietal rank. It is under this combination [*C. striata* Lindl. var. *ochroleuca* (Rydb.) Magrath] that the plant appears in the Flora of the Great Plains published in 1986. At the time that this combination was made, Rydberg's *C. ochroleuca* appeared to comprise a very distinct population of small plants that had flowers with connivent sepals and petals and a bright lemon yellow lip. However, examination of other specimens, including one from the Cypress Hills of Alberta, Canada has convinced me that Fernald's forma *fulva* should be applied to all of the yellowish flowered members of *C. striata* complex.

CYPRIPEDIUM PARVIFLORUM Salisb. f. **albolabium** Magrath & Norman, form. nov.

A forma *parviflorum* labellum album differt.

TYPE: OKLAHOMA: ADAIR CO.: Tate Ranch, ca 5 mi SW of Chewey; oak-hickory woods, north-facing slope; gravelly soil; one clump with 2 single-flowered stems and 7 sterile stems; lip pure white with pinkish-purple veining; *Magrath & Norman 16847* (HOLOTYPE: OCLA!). This clump of white-flowered *C. parviflorum* has been observed to exist for over 10 years by Jim Norman who first brought it to Dr. Magrath's attention in 1983. The main colony consists of about 140 scattered plants and small clumps with typical bright yellow lips.

A second collection of what appears to be the same taxon was made in Benton County, Arkansas (*Timme 2434*, UARK). In a recent letter (8 September 1988), Dr. Edwin Smith from the University of Arkansas Herbarium noted that C. J. Sheviak at the New York State Museum had annotated this specimen in 1987 as "*C.* × *andrewsii* Fuller nm. *favillianum* (J. T. Curtin) Boivin—or possibly a white-lipped plant of a normally yellow-lipped species. The identity of the yellow-lipped plant, however, is uncertain." Smith stated that he was "satisfied that it is a white-lipped variant of *C. parviflorum*." as are we.

We would like to express our sincere appreciation to Dr. Edwin Smith (UARK), Marion Norman, Dr. John Packer (ALTA), and Drs. John and Connie Taylor (DUR) for their help in providing specimens and information.—*Lawrence K. Magrath, Discipline of Biology, University of Science and Arts of Oklahoma, Chickasha, OK 73018 and James L. Norman, 502 N. 14th Street, Muskogee, OK 74401.*

NOMENCLATURAL CHANGES IN *PEDIOMELUM* (FABACEAE)—Isely (1986) has essentially followed Rydberg in his treatment on the genus *Psoralea* L. and placed the U.S. psoraleas in *Orbexilum* Raf., *Pediomelum* Rydb., and *Psoralidium* Rydb. Subsequent to this publication, Isely (1988) pointed out that what was known by the name *Psoralea psoralioides* (Walt.) Cory var. *eglandulosa* (Ell.) Freeman [= *Orbexilum pedunculatum* (Mill.) Rydb. var. *eglandulosa* (Ell.) Isely] must be called *O. pedunculatum*

latum var. *pedunculatum*. Isely's 1986 work has made it necessary to make four new combinations for Texas psoraleas. Mahler (1987) made two of the four required new combinations. The following two new combinations are made in *Pediomelum*.

PEDIOMELUM DIGITATUM (T. & G.) Isely var. **parvifolia** (Shinners) Gandhi & L. E. Brown, comb. nov.

Psoralea digitata T. & G. var. *parvifolia* Shinners, Field & Lab. 19:19. 1951.

PEDIOMELUM LATESTIPULATUM (Shinners) Mahler var. **appressa** (Ockendon) Gandhi & L. E. Brown, comb. nov.

Psoralea latestipulata Shinners var. *appressa* Ockendon, Southw. Naturalist 10:100. 1965.

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STELLARIA PARVA PEDERSEN (CARYOPHYLLACEAE) IN NORTH AMERICA—*Stellaria parva* Pedersen was recently identified from Louisiana collections and reported as new to North America (Landry et al. 1988).

The purpose of this report is to record additional collections of *S. parva* in Louisiana and to present further information on its habit and habitat and on its distinctions from *S. media*.

In early April, 1988, Steve Zaunbrecher, an employee of the G & H Seed Company of Crowley, Louisiana brought to our attention an unusual lawn weed he had observed in two locations in Acadia Parish. The weed was a *Stellaria* species distinct from the common *S. media* (L.) Vill. Examination of specimens in the University of Southwestern Louisiana herbarium (LAF) indicated that this unique plant had been previously collected in Louisiana (*Callahan s.n.*, in 1966; *Allen 10481*, in 1981) but misidentified. The former collection had been assigned to the genus *Arenaria*, attesting to its distinctive qualities. The latter collection had been identified as *S. media*.

Stellaria parva is distinguished from *S. media* by its lack of a cyme, having instead, solitary, axillary flowers and by its small, sessile leaves. A further distinction is that the seeds of *S. parva* are grossly muricate (Pedersen 1961, 1987) and easily distinguished from the merely papillate seeds of *S. media*. The habit of *S. parva*, including its proclivity for rooting at the nodes of its prostrate stems, is well illustrated by Pedersen (1987), who gives its range as Argentína and Paraguay, and suggests that it also occurs in southern and eastern Brazil.

Specimens we have seen (all at LAF unless otherwise noted) include: LOUISIANA. **Acadia Parish**: 1 mile S of Egan, 10 Apr 1966, *C. Callahan s.n.*; Bayou Mallet just E of abandoned RR, ca 0.5 mi west of La 13, ca 3.5 mi S of Eunice, Sect. 47 T7S R1W, 17 Apr 1988, *C. M. Allen 15955*; N of Crowley, Parish Road 4-74, 0.5 mi S of I-10, Sect. 32 T9S R1W, 29 Apr 1988, *G. Landry & W. D. Reese 8172* (LAF, MICH, NY); Bayou Bend Country Club, S side of Crowley, vicinity of 6th green, 11 Apr 1988, *G. Landry, W. D. Reese & S. Zaunbrecher 8166* (LAF, NY). **Jefferson Davis Parish**: Jennings Golf and Country Club, Jennings, wet area at 7th green, 29 Apr 1988, *G. Landry & W. D. Reese 8176* (LAF, MICH, NY). **St. Landry Parish**: City Park N of US 190, just west of Eunice, 31 Mar 1981, *C. M. Allen 10481* (LAF, LSU, NLU).

At all Louisiana localities, *S. parva* was found in open disturbed sites. It was consistently common and often abundant along wet ditches and around moist greens of the two golf courses and as a lawn weed associated with drainage pipes and wet ditches. In unmowed habitats, *S. parva* commonly grows luxuriantly, with the plants intricately interwoven to form deep, dense, tangled mats. Frequently associated species were *Stellaria media, Alternanthera philoxeroides* (Martius) Griseback, *Ludwigia palustris* (L.) Ell., and *Hydrochloa caroliniensis* Beauvois.

It is interesting to note that while *S. parva* was first described from Argentína in 1961, a specimen of it was collected in Louisiana as early as 1966. This suggests the possibility that this species may have dispersed to South America and Louisiana from an as yet unknown native source and that additional specimens of this interesting taxon may exist in herbaria masquerading under other names.

We thank Steve Zaunbrecher for bringing the plant to our attention, Charles R. Dugas for permission to collect at the Jennings Golf and Country Club, and Charles M. Allen for furnishing specimens.—*Garrie P. Landry and William D. Reese, Department of Biology, University of Southwestern Louisiana, Lafayette, LA 70505-2451; Karl Vincent, New York Botanical Garden, Bronx, NY 10458-5126.*

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A NOTE ON THE EPIDERMAL SPECKLES IN *CHAMAECRISTA CALYCIOIDES* (FABACEAE)—During the process of identifying a *Cassia* specimen, collected from extreme south Texas, we noticed that the stems, stipules, petioles, leaf rachises, young leaflets, sepals, petal bases, and fruits were speckled with violet lineoles/spots. Some of the matured leaflets also exhibited these speckles. However, on leaflets, these speckles were inconspicuous, but conspicuous on fruits, and moderate on other parts mentioned above. The specimen was identified to *C. aristellata* Penn. in Correll and Johnston (1970). Subsequently we noted this character in the following Texas specimens on deposit at SMU: Brooks Co.: 19 Nov 1954, *Gould & Morrow 6738*; Jim Hogg Co.: 25 Jun 1941, *Tharp s.n.*; 9 Oct 1954, *Tharp & Johnston 541853*; San Patricio Co.: 7 May 1951, *Jones 493*; Starr Co.: 13 Sep 1954, *Johnston 541428*.

To us this trait seemed to be one of the diagnostic features of this species and looked for a description of this trait in Correll and Johnston (loc. cit.), Isely (1975), and Irwin and Barneby (1982). Correll and Johnston failed to note the occurrence of these violet lineoles/spots for *Cassia aristellata* Penn. which they considered a Texas endemic and scarcely distinct from *C. calycioides* DC. ex Collad. of the American tropics. Isely also did not mention these violet speckles on *C. aristellata* which he considers a synonym of *C. calycioides*.

Irwin and Barneby recognize three genera in the *Cassia* complex: *Cassia* L. (sensu stricto), Chamaecrista Moench, and *Senna* Mill. These authors place *Cassia aristellata* and *C. calycioides* as synonyms of *Chamaecrista calycioides* (Collad.) Greene. They did note the occurrence of these violet speckles on the stem, stipules, sepals, petal bases, and valves of the fruits; however, they did not mention this character for petioles, leaf rachises, and leaflets.—*Kancheepuram N. Gandhi, Range Science, Texas A&M University, College Station, TX 77843, and Larry E. Brown, Houston Community College, Houston, TX 77270 – 7849, U.S.A.*

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ASCLEPIAS OBOVATA ELL. (ASCLEPIADACEAE) REDISCOVERED IN ARKANSAS—*Asclepias obovata* or sand milkweed is an easily overlooked and infrequently collected species of the Gulf and Atlantic Coastal Plains, known to occur from South Carolina to Florida and Texas. Recent collections from Ashley and Calhoun Counties in southern Arkansas prompted the senior author to check its published distribution in Woodson's 1954 monograph. One specimen is mapped from central Arkansas on the Arkansas River. However, in the list of counties from which specimens had been examined, no mention of Arkansas is made. The species is not included in Smith's (1978) atlas of the Arkansas flora.

Inquiry at the Missouri Botanical Garden, where Woodson worked, turned up a single Arkansas collection from Hazen in Prairie County, dated 1955, the year after the publication of Woodson's study. Robert Woodson threw away his card file of *Asclepias* exsiccatae after his monograph was published (W. D. Stevens, pers. comm.). Since he saw specimens from numerous herbaria, the locality of the original Arkansas material—the dot on the map—cannot presently be recovered.

On a search of the Hazen area in July of 1988, a small population of *Asclepias obovata* was located growing in the gravel of the elevated and abandoned Chicago, Rock Island and Pacific railroad bed. Comparable sites in Monroe and St. Francis Counties to the east were investigated without success.

Asclepias obovata is presently known in Arkansas from ten populations in four counties. Ashley, Drew and Prairie County populations are on or adjacent to roadside remnants of tall grass prairie. (At Fountain Prairie, one of the Ashley County sites, east of Fountain Hill, within a three mile stretch of disturbed roadside, are found five relatively uncommon species of milkweeds: *A. amplexicaulis, A. hirtella, A. viridis, A. viridiflora*, and *A. obovata*!) Despite the prairie connection, *A. obovata* seems rather to be favoring the well drained soils of road and railroad banks. In Prairie County, plants were not observed on the relatively undisturbed Grand

Prairie remnant below the railroad. Long Prairie and Fountain Prairie, in Drew and Ashley counties, respectively, have been reduced by agricultural activities to roadside strips heavily infiltrated with ruderal species. Only in southern Ashley County and in Calhoun County, are plants to be found along sandy oak and pine wood margins, probably the species' most typical habitat on the Gulf Coastal Plain.

The following Arkansas collections of *Asclepias obovata* are deposited at Northeast Louisiana University (NLU), the University of Arkansas at Monticello (UAM), the University of Arkansas at Fayetteville (UARK), and the Missouri Botanical Garden (MO), as indicated:

Ashley Co.: *R. Dale Thomas 9333 & Susan Hooks 1310, R. Dale Thomas 9335 & Susan Hooks 1339*, and *R. Dale Thomas 9755* (NLU); *R. Dale Thomas 101,173* (UAM, UARK). **Drew Co.**: *Sundell & Barnes 8495, 8496, 8497* (UAM). **Calhoun Co.**: *Sundell & Etheridge 7919, Sundell, Amason & Etheridge 7953*, and *Sundell & Barnes 8407* (UAM). **Prairie Co.**: *Delzie Demaree 37884* (MO) and *Eric Sundell 8446* (UAM).

Although *Asclepias obovata* is inconspicuous (its flowers are greenish and its typically lateral defexed inflorescences partially hidden under the broadly oblong leaves), it is readily identified in flower using keys in appropriate floristic manuals. Sterile or in fruit, *A. obovata* and *A. viridiflora* are easily confused but can be distinguished by pubescence: *A. obovata* follicles, stems and lower leaf surfaces are densely tomentulose, while those of *A. viridiflora* are puberulous at most. Additionally, *A. obovata* is a larger and coarser plant, reaching a height of at least 9 dm under optimal conditions.

ACKNOWLEDGMENTS

We thank Dr. Warren Douglas Stevens, Head of the Research Department at the Missouri Botanical Garden, for checking collections at MO and Carl Amason of Calion, Arkansas, for his invaluable help in the field in Calhoun County. Travel to Calhoun County was supported by a grant from the Arkansas Nongame Preservation Committee.—*Eric Sundell, Department of Natural Sciences, University of Arkansas at Monticello, Monticello, AR 71655, U.S.A.; R. Dale Thomas, Department of Biology, Northeast Louisiana University, Monroe, LA 71209, U.S.A. and Susan Lee Hooks, Department of Botany and Microbiology, University of Arkansas, Fayetteville, AR 72701, U.S.A.*

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CAREX MICRODONTA TORR. & HOOK. (CYPERACEAE) NEW TO FLORIDA—While visiting some chalky limestone glades in Gadsden County, Florida, the senior authors collected *Carex microdonta* Torr. & Hook., familiar to us from the prairies and glades of Arkansas, Oklahoma, and Texas, but apparently unreported for Florida (Ward 1968; Clewell 1985). Anderson independently found the species on these glades a year later. The full specimen citations are as follows:

FLORIDA: Gadsden Co.: common on exposed white chalk of the Chattahoochee Formation (Miocene) in chalky limestone glade (named "Chalk Glade" by local botanists) on lower northeast facing slope 0.8 mi N of Dolan Road at a point 2 mi W of FL 269, ca. 3 mi SW of Chattahoochee, SEQ, SWQ, Sec. 8, T3N, R6W, Chattahoochee 7.5′ Quad., 30° 39′52″ N, 84° 51′40″ W, Elev. 120 ft, 10 May 1987, *Orzell, Bridges, A. K. Gholson, & R. K. Godfrey 5213* (FLAS, FSU, TEX), 8 May 1988, *A. K. Gholson 11968* (FSU), 13 May 1988, *Anderson 11271* (FSU); open flat of slightly raised glade (named "E. B. Glade", ca. 0.2 mi ENE of "Chalk Glade"), SWQ, SEQ, Sec. 8, T3N, R6W, Chattahoochee 7.5′ Quad., 30° 39′55″ N, 84° 51′28″ W, Elev. 130 ft, 29 Apr 1988, *Anderson & J. B. Nelson 11194* (FSU).

The glades supporting *Carex microdonta* were dominated by *Schoenus nigricans* L. Other associated species at one or both sites included *Bumelia reclinata* (Michx.) Vent., *Carex granularis* Muhl., *Dichanthelium dichotomum* (L.) Gould, *Hedyotis nigricans* (Lam.) Fosb., *Juniperus silicicola* (Small) Bailey, *Polygala boykinii* Nutt., *Rhynchospora divergens* Chapm. ex M. A. Curtis, and *R. globularis* (Chapm.) Small. At Chalk Glade, *Carex microdonta* occurs in areas with generally low vegetative cover over hard chalky limestone rubble, whereas at E. B. Glade it occupies areas of shallow gravelly soil with no obvious limestone outcrops.

Carex microdonta is primarily a species of shallow-soil prairies in the south-central United States. Its range center is from southeastern Kansas southward through central Oklahoma to the calcareous formations of northeastern, central, and southeastern Texas. More isolated records are known from northeast Kansas (1 county), central (2) and southwestern (2) Missouri, southwestern Arkansas (4), central Louisiana (1–2), central Tennessee (1), northern Alabama (1), and the Blackbelt regions of Alabama (5) and Mississippi (3). It is perhaps most abundant in shallow soil blackland prairies on the chalky cuestas of north central and central Texas and

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the calcareous coastal prairies of southeastern Texas. The nearest known station to Florida is apparently in Wilcox County, Alabama, about 250 km northwest of the Gadsden County site (Kral 1973, 1976).

The chalky limestone glade/outcrop complex community where *Carex microdonta* occurs in northwestern Gadsden County, Florida, is a very rare and phytogeographically significant natural community for the state. These areas occur where resistant beds of white, cream or gray colored, arenaceous or argillaceous, pasty, silty, or chalky impure limestone are exposed within the dissected west-facing escarpment of the Tifton Uplands just east of the Apalachicola River (Cooke 1945; Moore 1955; Puri & Vernon 1964; Brooks 1981; Schmidt et al. 1985). These glades apparently are unique to Florida, with the possible exception of one or two sites in adjacent Decatur County, Georgia (Ward & Gholson 1987). A partial floristic description of these habitats can be found in Ward & Gholson (1987). Their floristic distinctiveness is clearly indicated by the dominance over some of the less disturbed glades of *Schoenus nigricans*, a sedge known in the United States apparently only from Florida, Texas, Nevada, and California (Sparling 1968). Many species rare in Florida and disjunct primarily from areas farther north or west occur on these glades, including *Asclepias viridiflora* Raf. (Anderson 1984), *Aster pratensis* Raf. [= *Aster phyllolepis* T. & G. in Kral (1981), Cronquist (1980), and Clewell (1985)], *Callirhoe papaver* (Cav.) Gray, *Bouteloua curtipendula* (Michx.) Torr. (Nelson 1985), *Delphinium carolinianum* Walt., *Dodecatheon meadia* L. (Anderson 1988), *Echinacea purpurea* (L.) Moench, *Lepuropetalon spathulatum* (Muhl.) Ell. (Ward and Gholson 1987), *Sporobolus vaginiflorus* (Torr.) Wood (Anderson 1988), and *Stachys crenata* Raf. *Polygala boykinii* is a restricted southeastern calciphile (Bridges & Orzell 1986) that ranges down the west coast of Florida. It is characteristic of these glades and is generally absent from the more acidic coastal terraces to the west. The flora of these glades has much in common with that of shallow soil chalk outcrops in Alabama and Mississippi (Harper 1920; Kral 1973, 1976, 1981), and many of the same species occur on limestone glades in Tennessee (Bridges & Orzell 1986) and glauconitic outcrops, Catahoula Formation (Miocene) tuffaceous siltstone barrens, and hillside blackland prairies in southeastern Texas (Orzell & Bridges, unpublished data).

The senior authors wish to acknowledge Angus Gholson of Chattahoochee, Florida, for showing us these sites. He and Robert Godfrey provided a full and memorable day of botanizing these unique habitats.—*Edwin L. Bridges and Steve L. Orzell, The University of Texas Herbarium, Austin,*

Texas 78713, and Loran C. Anderson, Department of Biological Science, Florida State University, Tallahassee, Florida 32306, U. S. A.

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NOTEWORTHY *CAREX* L. (CYPERACEAE: SECTION *STELLULATAE*) COLLECTIONS FROM MISSOURI—*Carex atlantica* L. H. Bailey subsp. *atlantica*. Shannon Co.: NW 1/4, SW 1/4 of section 5, T31N, R2W, Bunker 7.5′ Quad, sedge-shrub fen in valley of Big Creek,

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at base of east-facing valley slope on west side of Big Creek, 3 May 1981, *Orzell 261B* (MICH, MO). **Wayne Co.**: NE 1/4, SW 1/4, SE 1/4 of section 29, T29N, R7E, Lowndes 7.5′ Quad, ca. 2 mi southeast of Hiram, property of Mr. Owen Hughey, in wooded seepage area at base of slope on east side of Bear Creek, 28 May 1983, *Orzell 927* (MICH, MO). At the Wayne County site *C. atlantica* subsp. *atlantica* is common, forming cespitose clumps on elevated mossy hummocks of *Thuidium delicatulum* (Hedw.) B.S.G. and *Climacium americanum* Brid. in a seep forest dominated by *Acer rubrum* L. in the canopy and *Alnus serrulata* (Dry.) Willd. in the understory. Common associates are *Solidago patula* Muhl. ex Willd., *Impatiens capensis* Meerb., *Carex bromoides* Willd., and *Osmunda regalis* L. var. *spectabilis* (Willd.) Gray.

An immature specimen annotated by Reznicek (pers. comm.) [*J. A. Steyermark 78281* (MO, PH)] from Stoddard County in extreme southeastern Missouri represents the only previous record for the state. This record was indicated on the distribution map for the taxon in Reznicek and Ball (1980). *Carex atlantica* ssp. *atlantica* is primarily a bog or acidic seepage wetland species widespread throughout eastern North America. It is apparently most frequent on the coastal plain and occurs inland primarily in unglaciated areas with oligotrophic to weakly minerotrophic seepage wetlands. It is often characteristic in oligotrophic seepage forests dominated by deciduous canopy trees and shrubs in the Ouachita Mountains of southwestern Arkansas and on the coastal plain of eastern Texas and northern Louisiana. These collections are the first for the Ozark Plateau and represent a westward range extension of about 120 km from stations near the inner margin of the Mississippi Embayment.

Carex sterilis Willd. **Dent Co.**: N 1/2, SE 1/4 of section 3, T34N, R3W, Viburnum West 7.5′ Quad, calcareous seep-fens at base of slope, on north side of creek, in Bates Hollow, 9 Jun 1983, *Orzell 982* (MICH, MO, TEX). **Shannon Co.**: NW 1/4, SW 1/4 of section 5, T31N, R2W, Bunker 7.5′ Quad, sedge-shrub fen in valley of Big Creek, at base of east-facing slope on west side of Big Creek, 3 May 1981, *Orzell 262* (MICH, MO). **St. Francois Co.**: NW 1/4, SW 1/4, NE 1/4, SE 1/4 of section 9, T38N, R5E, Bonne Terre 7.5′ Quad, calcareous seep-fens in headwaters of Coonville Creek, in St. Francois State Park, 22 May 1981, *Orzell 263* (MICH, MO).

Carices most commonly associated with *C. sterilis* at these sites include *C. interior* Bailey, *C. hystricina* Muhl. ex Willd., *C. leptalea* Wahlenb., *C. lurida* Wahlenb., and *C. stricta* Lam. Other frequent associates include

Parnassia grandifolia DC., *Rudbeckia fulgida* Ait. var. *umbrosa* (C. L. Boynt. & Beadle) Cronq., *Viola cucullata* Ait., and *Fuirena simplex* Vahl (Orzell 1983). Further information on the natural communities and associated species of Ozark fens is available in Orzell (1983, 1984). Although similar to *Carex interior*, often an associate at Missouri sites, *C. sterilis* lacks prolonged clavate staminate bases, particularly on the terminal spikelet (Wheeler & Ownbey 1984, Reznicek & Ball 1980).

The range of *C. sterilis* is principally in the glaciated area centered on the Great Lakes region with a discontinuous secondary center along the Gulf of St. Lawrence (Reznicek & Ball 1980). Outlying stations occur in Minnesota, Manitoba, Saskatchewan, northern Ontario, and from eastern Pennsylvania to western Massachusetts (Reznicek & Ball 1980). The nearest collections to Missouri represent disjunct occurrences—Cole County in east-central Illinois (Mohlenbrock & Ladd 1978) and Fentress County on the northern Cumberland Plateau of Tennessee (Reznicek, pers. comm.). Reznicek and Ball (1980) consider *C. sterilis* an obligate calciphile occurring in fens, marl meadows, calcareous shores, moist limestone flats, wet prairies, and calcareous swamps. Wheeler and Ownbey (1984) consider *C. sterilis* to be a calcareous fen species in Minnesota. *Carex sterilis* is a fidel calciphile restricted to minerotrophic fens, constantly saturated by cold, telluric seepage at its isolated, disjunct stations on the Ozark Plateau of southeastern Missouri. These collections represent the first of *C. sterilis* for Missouri and are disjunct 270 – 350 km from the nearest isolated locality and 340 – 420 km southwest of its relatively continuous range.

We thank Dr. Anton A. Reznicek at the University of Michigan Herbarium for verification of all cited specimens and for providing label data for other specimens mentioned in the text. Helpful suggestions were made by reviewers A. A. Reznicek and George Yatskievych. Vascular plant nomenclature follows Kartesz & Kartesz (1985) for vascular plants and Crum et. al. (1973) for bryophytes.—*Steve L. Orzell and Edwin L. Bridges, University of Texas Herbarium, Austin TX 78713, U.S.A.*

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AGRIMONIA INCISA (ROSACEAE) NEW TO TEXAS.—In the course of routine identifications for Edward C. Fritz of the Texas Committee on Natural Resources, specimens of *Agrimonia incisa* T. & G. were identified. Steve Orzell (Texas Natural Heritage Program, Texas Parks and Wildlife Department; pers. comm.) did not find any specimens at TEX from Texas. From the literature, the species ranges from the Carolinas to northern Florida westward to Mississippi. While one would expect it to occur in Louisiana, no reports of this taxon appear in the literature from that state.

Jasper Co.: dry longleaf uplands; upper Trout Creek, 0.8 mi E of FR 330 on Plum Ridge Road and 0.5 mi S, 21 Aug 1988, *Edward C. Fritz & John Ward 8884* (ASTC, SMU).

—*Wm. F. Mahler, SMU Herbarium/BRIT, Dallas, TX 75275, U.S.A.*

LEONURUS MARRUBIASTRUM L. (LAMIACEAE), NEW TO MISSOURI—*Leonurus marrubiastrum* L., Biennial Motherwort, a native to northern Asia and eastern Europe (Ball 1972), is one of the numerous European invaders to the eastern United States. It occurs in isolated sites from Delaware and eastern Pennsylvania to Illinois and south to Florida (Fernald 1950; Gleason 1952). In the central U.S., it is found near the Missouri River in only seven counties in four states: northeastern Kansas (Douglas County), in east central Nebraska (Washington and Douglas counties) and southeastern Nebraska (Richardson and Nemah counties), western Iowa (Harrison County), and southeastern South Dakota (Hutchinson County) (Gr. Plains Fl. Assoc. 1977).

Biennial Motherwort was collected for the first time in Missouri during the summers of 1986 and 1987 at the Jamerson McCormack Wildlife Refuge Area in Holt County. These collections were made at the edge of woods in the refuge's parking lot. It should now be expected to occur in similar habitats along the Missouri River in Missouri from the Iowa border to Kansas City.

Voucher specimens *Priesendorf 466*, 2 August 1986 (WARM) and *847*, 16 July 1987 (WARM, MO) are briefly described: Stems, with appressed pubescence, 2.5 – 4 dm tall; leaves, ovate-obovate, oppositely arranged, 30 – 55 mm long and 15 – 30 mm wide, glabrous above, pubescent with simple hairs below; leaf margins, coarsely crenate-serrate, 3 – 6 teeth per side; corolla, white 5 – 7 mm long; calyx 5 – 7 mm long.

Whereas the perianth lengths of the Missouri specimens differ somewhat from that given in *Gray's Manual* (Fernald 1950): "*corolla*, whitish, shorter than the calyx-teeth," they are similar to those given in *Flora Europaea* (Ball 1972): "Calyx 5 – 7 . . . Corolla 5 – 7mm". The lengths of the specimens were shorter than those given in either description.—*David Castaner and Tom Priesendorf, Biology Department, Central Missouri State University, Warrensburg, MO 64093-5053, U.S.A.*

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RUSSELL LEE KOLOGISKI

1946—1988

R. L. Kologiski, known as "Rusty," was born 19 August 1946 in Franklin, Indiana but grew up in Charlotte, North Carolina where he graduated from high school.

He attended the University of North Carolina at Charlotte and received the B.S. degree in 1971. However, he interrupted his undergraduate education due to the war, serving in the U.S. Marine Corps from 1966 – 1968 in Vietnam. He developed a strong interest in botany and ecology as a result of his military service and the courses he took after his return to UNCC. He conducted an undergraduate project on the Flora of Mecklenburg County, NC (Charlotte) during 1969 – 71.

In 1971, he entered North Carolina State University to further his education. During the summers of 1972 – 73, he was an Intern for the North Carolina Department of Natural Resources and Community Development, Division of State Parks, Natural Areas Program. His job was to survey potential natural areas within the state and prepare reports on the significance of these areas.

He moved to Washington, D.C. in September, 1972 as Botanist for the Center for Natural Areas, Ecology Program, Smithsonian Institution. The primary activity involved the inventory of natural areas of the Atlantic Coastal Plain with emphasis on the Chesapeake Bay. He was instrumental in the initial development of the national list of threatened and endangered plants that became the Smithsonian list of 1975.

Returning to North Carolina State University in 1973 as a Research Assistant in the Department of Botany, he began a study of the Phytosociology of the Green Swamp, Brunswick County, North Carolina. The study correlated the vegetation, soils, hydroperiod and fire for a 30,000 acre portion of the 200,000 acre swampland. His publication of this study has become a standard for comparison of wetland studies. He received the Ph.D. from North Carolina State University in Botany (Plant Ecology and Taxonomy) in 1977.

In September, 1976, he joined the U.S. Fish and Wildlife Service moving to Jamestown, North Dakota where he remained until May, 1980. His appointment was at the Northern Prairie Wildlife Research Center as Staff Ecologist. The primary responsibility was to conduct synecological research on the grassland vegetation of the Northern Great Plains. Most of this activity was to investigate the relationships between the vegetation,


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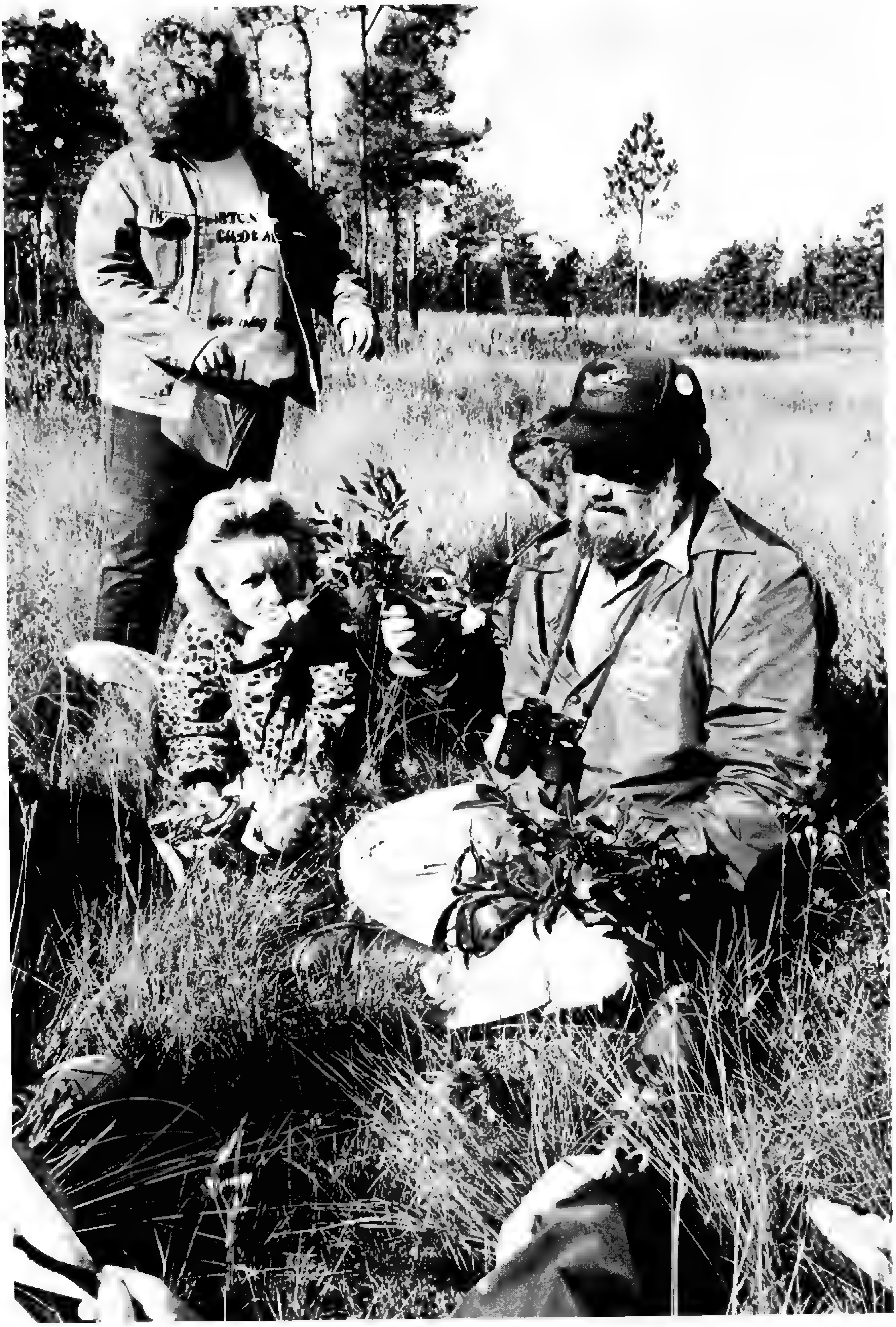

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abiotic factors and bird communities. He also served as curator of the herbarium. While at Jamestown, he assisted in the Platte River vegetation analysis and directed the work of a Ph.D. student at Iowa State University. Four publications resulted from his tenure in North Dakota.

In May, 1980, he moved to Albuquerque, New Mexico to become the Regional Botanist for the Endangered Species Program of the U.S. Fish and Wildlife Service. The region included the states of Arizona, Oklahoma, New Mexico, and Texas. His duties included gathering data for and the development of listing packages for endangered and threatened species, directing recovery efforts on listed plants, providing technical assistance to other governmental agencies, and interfacing with the southwestern botanical community. During this period, status reports on ca. 200 species were prepared.

In April, 1984, he became Botanist/Wetland Ecologist for the National Wetlands Inventory of the U.S. Fish and Wildlife Service at St. Petersburg, Florida. He managed the technical aspects for the group's activities in the specialized disciplines of botany, ecology, and natural resources inventory. A large part of the duties involved monitoring the mapping of wetland sites. Field investigations to check aerial photointerpretation were conducted to develop the NWI Classification System and its application to the United States. He acted as liaison to the Fish and Wildlife Service Research and NWI related activities including: training on the NWI Classification System, development of the NWI Plant Species database, and developing a methodology to assess the wildlife value of the specific NWI mapping units.

He retired from the U.S. Fish and Wildlife Service in 1986 for health reasons relating to pressure and intensity. Returning to Charlotte, North Carolina, he became an Adjunct Lecturer and Research Associate of Biology at the UNCC campus. He taught courses and conducted Wetland Plant Identification Workshops for the Soil Conservation Service and Fish and Wildlife Service, and directed the Summer Ventures Biology Program for gifted high school students. He also maintained a successful environmental consulting practice providing environmental assessments for sewer, highway, and lake-dam projects.

On December 2, 1988, he was hospitalized following a stroke. The initial stroke was followed by others and he died on December 4, 1988. The Department of Biology at the University of North Carolina at Charlotte has established the "Russell L. Kologiski Field Trip Fund" in his honor.

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—*James F. Matthews, Department of Biology, The University of North Carolina at Charlotte, Charlotte, NC 28223, U.S.A.*

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CALL FOR CONTRIBUTIONS TO THE DELZIE DEMAREE TRAVEL AWARD FUND

An endowment to underwrite a travel award in memory of Dr. Delzie Demaree is being established. This award will be given annually to a graduate student in systematics for travel to the Systematics Symposium sponsored each fall by the Missouri Botanical Garden in St. Louis. Such an award is a very appropriate way to honor Dr. Demaree because of the high esteem and long record of attendance (right up to the meeting of October 1986 prior to his death at age 97 the following July). In addition, this will be a significant way to continue his legacy of assistance to students of botany.

Delzie Demaree was a graduate of Indiana University and The University of Chicago, and received a doctorate from Stanford University. He taught botany at Hendrix College, the University of Arkansas at Fayetteville and Monticello, and at Arkansas State University. He later donated his extensive collections of the flora of Arkansas to the herbarium of Southern Methodist University. See SIDA 9(4):269-289 for tributes and colorful anecdotal accounts of the life and times of this tireless plant collector.

Our goal is to establish an endowment sufficient to underwrite a travel award of $250.00 to $300.00 per year. A call for applications will appear each year at approximately the same time that the meeting date and topic are announced. If you wish to make a contribution please contact: Donna M. E. Ware, Herbarium, Dept. of Biology, The College of William and Mary, Williamsburg, Virginia 23185 or Barney Lipscomb or Wm. F. Mahler, Herbarium, Southern Methodist University, Dallas, Texas, 75275. Checks may be written payable to "The Delzie Demaree Travel Award."

REVIEW

SMITH, EDWIN B. 1988. An atlas and annotated list of the vascular plants of Arkansas, 2nd edition. 494 pp. Privately published by the author, Fayetteville, Arkansas.

The flora of Arkansas has until recently been rather poorly known, and more active floristic exploration in the past decade has resulted in a relatively large number of floristic discoveries for a state of the eastern United States in the late 20th century. Most of this increase in floristic knowledge is directly or indirectly attributible to the publication in 1978 of the first edition of this Atlas. Smith is the first worker to compile a complete taxonomically and nomenclaturally consistent list of the documented flora of Arkansas. In addition, it is the first Arkansas list to cite a voucher specimen for each species and to include county distribution maps. Anyone familiar with floristic work knows this is a voluminous and meticulous task, and perhaps no other state floristic atlas reflects such dedication, precision, and consistency by a single worker.

Each species account includes relevant synonomy, misapplied names from other Arkansas floristic lists, notes on taxonomic and nomenclatural problems, forms, distributional and habitat notes, previous reports, chromosome numbers, a voucher citation (mostly from UARK, other herbaria cited when used), and a county distribution map. On the distribution maps, solid dots refer to specimens seen by Smith and accepted as accurately determined, whereas the symbol "R" is used to document other reports. These reports include a wide range of local floras, monographs, and numerous other publications. Smith has done a thorough job of uncovering hundreds of references, sometimes rather obscure, to the Arkansas flora. A valuable part of the Atlas are lists of "Possible Additions" and "Excluded Names" for the state flora, with pertinent references given for each. The book also contains a statistical summary of the flora, an extensive bibliography (ca. 600 citations), and a very useful comprehensive index to all accepted, synonymized, and excluded names.

The total number of taxa accepted is 2,469, an increase of 131 (5.6%) from the first edition. However, the increase in the number of full species is 148, a 6.7% increase. This indicates that the increase in floristic knowledge of the state in the past decade has not been so much due to the addition of minor varieties as to the discovery of distinct species new to the state. In examining most of the species accounts, we do have some dif-

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ferences with Smith on taxonomic judgement and treatment of literature reports. However, these are to be expected with any floristic work and are minor in comparison to our points of agreement. The most striking aspects of the atlas are its consistency and thorough documentation, which make it an essential and reliable resource for all taxonomists, ecologists, and floristicians concerned with all or any part of the Arkansas flora. There are countless refinements over the first edition (reflecting all the changes in the five atlas supplements issued from 1980-1986), and we strongly recommend acquiring the new edition. Those of us who have carefully added all the information from the five supplements to our atlas copies greatly appreciate having a new, updated assessment of the floristic knowledge of the state, and hope that it will stimulate even more botanical exploration in Arkansas, which remains undercollected and underrated for its floristic diversity. Based on Smith's statistics on known taxa by county and our knowledge of the state, we estimate that less than 20 of the 75 counties have over 80% of their potential total flora documented in the atlas.

The format is a photocopied 8 1/2′ x 11′ format with Velo binding. It can be ordered from Kinko's, 653 West Dickson Street, Fayetteville, AR 72201 (Phone 501-443-5018). The price per copy is $25.08, plus $4.00 each for shipping and handling and $1.50 sales tax for Arkansas residents.

—*Edwin L. Bridges and Steve L. Orzell, The University of Texas Herbarium, Austin, TX 78713, U.S.A.*

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NEW WORLD GENERA OF THE PANICEAE (POACEAE: PANICOIDEAE)

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ABSTRACT

Fifty genera are recognized in a taxonomic account of the Paniceae for the New World. A description of the tribe, based on a summation of variation in the recognized genera, is presented. A bracketed key is given and based on a computer analysis of the variation among the genera. A set of synoptic descriptions is presented and based on an accumulation of diagnostic characters. **Panicum acostia** R. Webster is proposed as a new name. English, Portuguese, and Spanish versions of the character list, key, and comprehensive descriptions are included on an accompanying microfiche.

INTRODUCTION

Webster (1988) and Webster & Valdes (1988) provided detailed taxonomic accounts of the genera in the Paniceae for the area north of South America. The generic concepts and data presented in these reports were analyzed using data recorded in DELTA format (Dallwitz 1974 & 1980) from which the keys and descriptions were generated. The database has been expanded to include the variation and genera occurring in South America. A total of 50 genera are recognized as native or introduced in the New World. The objective of this paper is to provide a synopsis of the 50 New World genera and to provide on microfiche a comprehensive set of data in English, Portuguese, and Spanish.

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It seems appropriate to mention that this database or information retrieval system not only includes these 50 genera but ca. 30 genera restricted to the Australian and Asian regions and about 400 subgeneric taxa. Upon request, the senior author will provide special purpose keys, descriptions or special information retrieval systems for the New World genera. For example, it would be relatively easy to provide a key to the taxa of a specific geographical region and descriptions based on a subset of characteristics, such as vegetative or spikelet characters. Present studies are underway to include data for the endemic genera from the African region. The primary goal of these studies is to produce a comprehensive DELTA database from original data collections for the Paniceae genera of the world. These data will be used in a phenetic and cladistic analysis of the tribe. However, in the meantime it is worthwhile to make the collected generic data for the New World generally available.

A description of the Paniceae R. Br. is presented based on the variation exhibited by the New World genera. The description was generated by combining the technologies of INTKEY and CONFOR. Initially, a subset of taxonomically relevant characters was selected. INTKEY was used to combine the data of these characters for the 50 genera into one description in DELTA format which was then converted into a natural language description by CONFOR. In the description, each character state is followed by a fraction presenting the number of taxa exhibiting the state over the number of taxa recorded for the character. For example, "Plants annual (30/50) or perennial (45/50)" indicates that 30 of the 50 taxa are recorded as annual and 45 of the 50 taxa are recorded as perennial.

A bracketed key to the recognized genera is given. As in Webster (1988) and Webster & Valdes (1988), it was generated by KEY and is the result of numerous experimental trials to produce a mechanically efficient key reflecting the authors' concepts of character reliabilities and relationships among the genera.

A set of synoptic descriptions for the New World genera of the Paniceae is given. Selection of characters for inclusion in these descriptions was based on an analysis of the variation among the genera. Initially, a diagnostic subset of characters was selected for each genus. That is, the minimum set of characters needed to separate each genus from the other 49 were chosen. Selection of this subset by INTKEY was greatly influenced by the imposed concepts of character reliabilities. The number of characters required to distinguish a genus varied from one (e.g., *Sacciolepis* and *Reimarochloa*) to 12 in *Panicum*. For most genera two to four characters were required. The diagnostic characters for all genera were accumulated into one list and used in generation of the descriptions. Highlighted within each description are the diagnostic characters for that genus. Implied characters are omitted from the descriptions. For example, the statement "first glume fused with the callus to form a cup-like structure" is given for *Eriochloa*, but the implied negative statement "first glume not fused with the callus to form a cup-like structure" does not appear in the other descriptions. In addition, for situations where a character is of diagnostic value for only one or two genera and of little value for others, then this relatively insignificant data was omitted. Therefore, in places where the descriptions are not fully comparative it can be assumed that the missing data is either a negative implied statement or data of limited value for the genus. The result of this exercise is the production, via CONFOR and INTKEY, of a set of descriptions suitable for a floristic account. Of course, the content of these descriptions would change if the analysis was performed on the genera from a different geographical region or from a region of more limited geographical coverage.

The accompanying microfiche contains the DELTA character files and comprehensive taxonomic treatments in English, Portuguese, and Spanish. First, the English version of the characters is presented and followed by Portuguese and Spanish translations. Each character file consists of a numbered sequence of characters for which the taxa were recorded. At present a total of 282 characters are included. Each character consists of a feature description (e.g., first glume) followed by associated states. Where necessary comments are included to define or clarify the application of terms. The character files are followed by an English taxonomic treatment (key and descriptions) for the 50 recognized genera. Design of the key (that is, the use of the characters and placement of taxa) is essentially identical to the version appearing in hardcopy. Descriptions were generated including the first 264 characters. Data for the remaining miscellaneous non-descriptive characters were not included in the descriptions. Character numbers corresponding to the numbers in the character files were included in the descriptions to facilitate locating and comparing information. The English treatment is followed by identical treatments in Portuguese and Spanish. The final page on the microfiche contains the important directives used in the key generating and information retrieval processes. These include KEY STATES, CHARACTER RELIABILITIES, IMPLICIT VALUES, and DEPENDENT CHARACTERS. KEY STATES defines how the character states were converted for key generation. For example, character 101 is a three state character, however, the statement "101,1-2/3" in KEY STATES directs the program to treat this as a two state character by combining the first two states. CHARACTER RELIABILITIES define the relative character weights. For example, character 101 was assigned the relatively high weight of "9" and character 99 the relatively weight of "4." IMPLICIT VALUES defines what character states are implied. DEPENDENT CHARACTERS defines which characters are dependent on preceding characters. For example, the statement "158,2:159 – 174" indicates that the first glume characters (159 – 174) are inapplicable if the first glume is absent (158,2).

TAXONOMY OF *ACOSTIA* SW.

Swallen (1968) described *Acostia* Sw. to account for the variation exhibited by a single specimen (*M. Acostia-Sols 12131*). Swallen suggested a close relationship of his new genus with *Digitaria* and *Panicum*, but excluded it from these genera based on the presence of involute margins on the upper lemma and the absence of a first glume. Since that time there have been no further known collections of the species and no new taxa have been described in the genus. A diagnosis of the specimen is given below. It possesses no characteristics that distinguishes it from *Panicum*. This conclusion necessitates the placement of *Acostia* as a synonym of *Panicum* and the following new name is proposed.

PANICUM **acostia** R. Webster, nom. nov. *Acostia gracilis* Sw., Bol. Soc. Arg. Bot. 12:109. 1968 (non *Panicum gracile* R. Br., 1810). TYPE: *M. Acostis-Solis 12131* (HOLOTYPE: US).

Perennial; erect; about 3 dm tall. Internodes glabrous; hollow. Nodes glabrous. Ligule a membrane; about 0.3 mm long; erose. Leaf blades conduplicate or flat; about 2 mm wide; 10 cm long; the surface glabrous; margins and midnerve usually with short bulbose-based hairs. Inflorescence a panicle. Main axis glabrous; about 8 cm long; primary branches 3 to 5; with appressed secondary branches; about 2 cm long. Spikelets lanceolate; 2.3 – 2.6 mm long; paired. First glume a small nerveless scale about 0.3 mm long. Second glume 5-nerved; sparsely pubescent; subequal to spikelet length; apiculate at the apex. Lower floret lacking a palea. Lower lemma sparsely pubescent. Upper floret about 0.8 times the length of the lower floret; cartilaginous; with involute margins; with a few hairs at the apex.

PANICEAE R. BR.

Plants annual (30/50) or perennial (45/50). Flowering culms lignified (1/50) or not lignified. Internodes solid (12/49), spongy (13/49), or hollow (34/49). Ligule a membrane (18/50), a ciliate membrane (24/50), a fringe of hairs (28/50), or absent (3/50). Inflorescence a panicle (49/50), a raceme (4/50), or a solitary spikelet (1/50). Main axis present or absent (7/50); with distichous primary branches (8/49), with secund primary branches

(10/49), or with quaquaversal primary branches (37/49). Primary branches appressed to the main axis (32/48), spreading (34/48), divaricate (6/48), or reflexed (2/48); with appressed secondary branches (36/48), with spreading secondary branches (19/48), or reduced to a fascicle of spikelets (5/48); with secund spikelets (32/46), with distichous spikelets (2/46), or with spikelets neither secund nor distichous (15/46). Rachis terminating in a spikelet (41/50), terminating in an unmodified naked point (5/50), or terminating in a bristle (8/50). Pedicels present (48/50) or absent (4/50); perpendicular with the spikelet base (46/50) or oblique to the spikelet base (6/50); apex concave (35/43), flat (12/43), or convex (5/43). Disarticulation above the lower glume (4/50), at the spikelet base (43/50), at the base of the primary branches (5/50), at the nodes of the main axis (1/50), or at the base of the inflorescence (1/50). Callus differentiated (15/49) or not differentiated (40/49).

Spikelets divergent from the axis (7/50) or not divergent from the axis (48/50); adaxial (33/45) or abaxial (15/45); laterally compressed (11/50), dorsiventrally compressed (37/50), planoconvex (12/50), or terete (3/50). First glume present (44/50) or absent (14/50); encircling the spikelet base (20/43) or not encircling the spikelet base (23/43); muticous (37/43) or awned (9/43). Rachilla pronounced between the florets (9/50) or not pronounced between the florets (45/50). Second glume present (49/50) or absent (1/50); 0.05 – 0.8932 – 1.3 times spikelet length; saccate (1/50), gibbose (2/50), or neither saccate nor gibbose (48/50); 0 – 7-nerved (46/49), 8 – 13-nerved (13/49), or more than 13-nerved (2/49). Fertile florets 1 or 2 (1/50). Sterile florets one. Lemma of lower floret hyaline (4/50), membranous (42/50), chartaceous (15/50), coriaceus (3/50), or cartilaginous to indurate (6/50); with a central longitudinal groove (4/50) or lacking a central longitudinal groove (48/50). Palea of lower floret with nerves not pronounced (2/50), with nerves pronounced but not winged (46/50), or with nerves pronounced into obvious wings (2/50). Upper floret 0.4 – 0.8841 – 1.2 times the length of the lower floret. Lemma of upper floret hyaline (4/50), membranous (5/50), chartaceous (17/50), coriaceus (1/50), cartilaginous (24/50), or indurate (14/50); smooth (37/50), scabrous (3/50), striate (8/50), muricate (10/50), rugose (7/50), or papillate (1/50); with flat margins (22/50) or with involute margins (32/50); with margins thinner in texture than the body (10/50) or with margins of the same texture as the body (45/50); with basal scars or appendages (2/50), constricted at the base (6/50), or without basal modifications (48/50); differentiated at the apex (7/50) or not differentiated at the apex (46/50); muticous (45/50), apiculate (5/50), mucronate (7/50), or awned (4/50). C-4 (33/49), or C-3 (18/49).

Key for the New World genera of the Paniceae

1(0).	Rachis terminating in a spikelet or terminating in an unmodified naked point	2
	Rachis terminating in a bristle	56
2(1).	Disarticulation above the lower glume or at the spikelet base	3
	Disarticulation at the base of the primary branches or at the nodes of the primary branches	55
3(2).	Palea of lower floret with nerves not pronounced or with nerves pronounced but not winged	4
	Palea of lower floret with nerves pronounced into obvious wings	*Otachyrium*
4(3).	Inflorescence a panicle	5
	Inflorescence a raceme or a spike	52
5(4).	Lemma of upper floret with flat margins	6
	Lemma of upper floret with involute margins	24
6(5).	Primary branches with secund or distichous spikelets	7
	Primary branches with spikelets neither secund nor distichous	16
7(6).	Second glume saccate or gibbose	8
	Second glume neither saccate nor gibbose	9
8(7).	Spikelets laterally compressed; second glume indumentum uncinate; lemma of lower floret with a hyaline area at the base	*Pseudechinolaena*
	Spikelets dorsiventrally compressed; second glume indumentum not uncinate; lemma of lower floret consistent in texture	*Sacciolepis*
9(7).	Ligule a membrane or a ciliate membrane	10
	Ligule a fringe of hairs or absent	12
10(9).	Spikelets adaxial	11
	Spikelets abaxial	*Digitaria*
11(10).	First glume present; primary branches appressed to the main axis; primary branches with loosely arranged spikelets	*Hymenachne*
	First glume absent; primary branches spreading; primary branches with tightly appressed spikelets	*Axonopus*
12(9).	Lemma of lower floret with a hyaline area at the base; spikelets abaxial	*Alloteropsis*
	Lemma of lower floret consistent in texture; spikelets adaxial	13
13(12).	First glume present; primary branches with loosely arranged spikelets	14
	First glume absent; primary branches with tightly appressed spikelets	*Axonopus*
14(13).	First glume muticous; first glume encircling the spikelet base	*Scutachne*
	First glume awned; first glume not encircling the spikelet base	15
15(14).	Spikelets laterally compressed; lemma of upper floret linear to oblong; lemma of upper floret hyaline	*Reynaudia*
	Spikelets dorsiventrally compressed; lemma of upper floret lanceolate; lemma of upper floret cartilaginous	*Chaetium*
16(6).	Spikelets laterally compressed	17
	Spikelets dorsiventrally compressed or planoconvex	20
17(16).	First glume present; pedicels discoid at the apex	18
	First glume absent; pedicels cupuliform at the apex	*Anthaenantia*
18(17).	First glume muticous; second glume up to 1 times the length of the lower floret; lemma of upper floret lanceolate to elliptic	19

First glume awned; second glume about 1.2 times the length of the lower floret; lemma of upper floret linear to oblong . . . . *Arthropogon*

19(18). Second glume 5-nerved; internodes neither viscid nor glaucous . . . . *Rhynchelytrum*

Second glume 7-nerved; internodes viscid or glaucous . . . . *Melinis*

20(16). Primary branches with appressed secondary branches; lemma of upper floret with margins of the same texture as the body 21

Primary branches with spreading secondary branches; lemma of upper floret with margins thinner in texture than the body 23

21(20). Ligule a membrane or a ciliate membrane; second glume saccate; collar differentiated . . . . *Sacciolepis*

Ligule a fringe of hairs or absent; second glume neither saccate nor gibbose; collar not differentiated 22

22(21). Cleistogamous inflorescence present; lemma of upper floret hairy; spikelets heteromorphic . . . . *Amphicarpum*

Cleistogamous inflorescence absent; lemma of upper floret glabrous; spikelets homomorphic . . . . *Triscenia*

23(20). First glume present; ligule a membrane; lemma of upper floret yellow; sheaths not keeled . . . . *Homolepis*

First glume absent; ligule a ciliate membrane or fringe of hairs; lemma of upper floret brown; sheaths keeled . . . . *Anthaenantia*

24(5). Primary branches with secund spikelets or with distichous spikelets 25

Primary branches with spikelets neither secund nor distichous 48

25(24). Lemma of upper floret smooth, scabrous, striate, muricate, pitted, or papillate 26

Lemma of upper floret rugose 47

26(25). Rachilla pronounced between the florets 27

Rachilla not pronounced between the florets 31

27(26). Rachilla with lateral appendages 28

Rachilla without lateral appendages 29

28(27). Pedicels concave at the apex; pedicels cupuliform at the apex; second glume subequal to spikelet length . . . . *Ichnanthus*

Pedicels flat or convex at the apex; pedicels discoid at the apex; second glume 0.5 – 0.9 times spikelet length . . . . *Echinolaena*

29(27). Spikelets laterally compressed; upper floret 0.4 – 0.48 times the length of the lower floret . . . . *Phanopyrum*

Spikelets dorsiventrally compressed to planoconvex; upper floret more than 0.5 times the length of the lower floret 30

30(29). Pedicels concave at the apex; lemma of upper floret differentiated at the apex; upper lemma lacking basal scars . . . . *Acroceras*

Pedicels flat or convex at the apex; lemma of upper floret not differentiated at the apex; upper lemma with basal scars . . . . *Echinolaena*

31(26). Pedicels perpendicular with the spikelet base 32

Pedicels oblique to the spikelet base . . . . *Spheneria*

32(31). Pedicels concave at the apex 33

Pedicels flat or convex at the apex 40

33(32). Lemma of upper floret differentiated at the apex 34

Lemma of upper floret not differentiated at the apex 35

34(33). Ligule a membrane or a ciliate membrane; upper lemma conduplicate at the apex; internodes hollow . . . . *Acroceras*

Ligule a fringe of hairs or absent; upper lemma with the apex becoming membranous; internodes solid or spongy . . . . *Echinochloa*

35(33). First glume present 36

First glume absent . . . . *Axonopus*

36(35). Ligule a membrane or a ciliate membrane 37

Ligule a fringe of hairs or absent 38

37(36). First glume muticous; pedicels cupuliform at the apex; rachilla not pronounced below the second glume . . . . *Panicum*

First glume awned; pedicels truncate at the apex; rachilla pronounced below the second glume . . . . *Oplismenopsis*

38(36). Lemma of lower floret with a hyaline area at the base; lemma of upper floret awned; spikelets abaxial . . . . *Alloteropsis*

Lemma of lower floret consistent in texture; lemma of upper floret muticous; spikelets adaxial 39

39(38). Lemma of upper floret glabrous; main axis with secund primary branches; pedicels discoid at the apex . . . . *Brachiaria*

Lemma of upper floret hairy; main axis with quaquaversal primary branches; pedicels truncate at the apex . . . . *Streptostachys*

40(32). Lemma of lower floret with the area between the central nerve and the first lateral nerve thinner in texture than the rest of the structure 41

Lemma of lower floret consistent in texture 42

41(40). Second glume 9 – 15-nerved . . . . *Thrasyopsis*

Second glume 3 – 7-nerved . . . . *Thrasya*

42(40). Lemma of upper floret glabrous; rachilla not pronounced below the second glume 43

Lemma of upper floret hairy; rachilla pronounced below the second glume . . . . *Streptostachys*

43(42). Lemma of upper floret chartaceous to cartilaginous 44

Lemma of upper floret indurate 46

44(43). First glume present and awned; plants lacking rhizomes; flowering culms rooting at the lower nodes . . . . *Oplismenus*

First glume present or absent, but never awned; plants rhizomatous; flowering culms not rooting at the lower nodes 45

45(44). Lemma of upper floret ovate to elliptic; lower floret with stamens; callus not differentiated . . . . *Anthaenantiopsis*

Lemma of upper floret oblanceolate; lower floret without stamens; callus differentiated . . . . *Centrochloa*

46(43). Second glume 9 – 15-nerved . . . . *Thrasyopsis*

Second glume less than 9-nerved . . . . *Paspalum*

47(25). First glume fused with the callus to form a cuplike structure . . . . *Eriochloa*

First glume not fused with the callus . . . . *Urochloa*

48(24). Ligule a membrane or a ciliate membrane; first glume encircling the spikelet base 49

Ligule a fringe of hairs or absent; first glume not encircling the spikelet base 51

49(48). Spikelets dorsiventrally compressed or planoconvex; first glume not inflated at the base; lemma of upper floret chartaceous to cartilaginous . 50

Spikelets terete; first glume inflated at the base; lemma of upper floret indurate . . . . *Lasiacis*

50(49). Lemma of lower floret with a central longitudinal groove; lemma of upper floret differentiated at the apex; pedicels discoid at the apex . . . . *Plagiantha*

Lemma of lower floret lacking a central longitudinal groove; lemma of upper floret not differentiated at the apex; pedicels cupuliform at the apex . . . . *Panicum*

51(48). Pedicels perpendicular with the spikelet base; rachilla pronounced between the florets; lemma of lower floret consistent in texture . . . . *Isachne*

Pedicels oblique to the spikelet base; rachilla not pronounced between the florets; lemma of lower floret with a hyaline area at the base . . *Tatianyx*

52(4). Pedicels perpendicular with the spikelet base 53

Pedicels oblique to the spikelet base . . . . *Mesosetum*

53(52). Primary branches with secund spikelets; spikelets dorsiventrally compressed or planoconvex; lemma of upper floret with involute margins 54

Primary branches with spikelets neither secund nor distichous; spikelets laterally compressed; lemma of upper floret with flat margins . . . . *Arthropogon*

54(53). Rachilla pronounced between the florets; lemma of lower floret consistent in texture; lemma of lower floret lacking a central longitudinal groove . . . . *Echinolaena*

Rachilla not pronounced between the florets; lemma of lower floret with a hyaline area at the base or with the area between the central nerve and the first lateral nerve thinner in texture than the rest of the structure; lemma of lower floret with a central longitudinal groove . . . . *Thrasya*

55(2). Second glume present; first glume present; stamens 3 . . . . *Stenotaphrum*

Second glume absent; first glume absent; stamens 2 . . . . *Reimarochloa*

56(1). Disarticulation above the lower glume or at the spikelet base; lemma of upper floret rugose 57

Disarticulation at the base of the primary branches or at the nodes of the primary branches; lemma of upper floret smooth, scabrous, striate, muricate, pitted, or papillate 60

57(56). Palea of lower floret with nerves not pronounced or with nerves pronounced but not winged; bristles antrorsely or retrosely scabrous; first glume encircling the spikelet base 58

Palea of lower floret with nerves pronounced into obvious wings; bristles smooth; first glume not encircling the spikelet base . . . . . . *Ixophorus*

58(57). Lemma of lower floret with a hyaline area at the base; first glume 13 – 23-nerved . . . . *Setariopsis*

Lemma of lower floret consistent in texture; first glume less than 9-nerved 59

59(58). Main axis with distichous or secund primary branches . . . . *Paspalidium*

Main axis with quaquaversal primary branches . . . . *Setaria*

60(56). Second glume up to 0.1 times spikelet length; cleistogamous inflorescence present . . . . *Paratheria*

Second glume 0.2 times spikelet length or more; cleistogamous inflorescence absent 61
61(60). Spikelets in clusters of 4 with each opposite a flared bract . . . . *Anthephora*
Spikelets not consistently in clusters of 4 with each opposite a flared bract 62
62(61). Callus flared to form a discoid receptacle . . . . *Cenchrus*
Callus not flared to form a discoid receptacle . . . . *Pennisetum*

SYNOPTIC DESCRIPTIONS FOR THE NEW WORLD GENERA OF THE PANICEAE

Acroceras Stapf

Internodes hollow. Ligule a membrane or a ciliate membrane. Main axis with quaquaversal primary branches. Primary branches with appressed secondary branches; with secund spikelets. Rachis terminating in a spikelet. Pedicels concave at the apex. Disarticulation at the spikelet base. Spikelets adaxial; dorsiventrally compressed, but approaching lateral compression. First glume encircling the spikelet base; muticous. Rachilla pronounced or not pronounced between the florets. Second glume subequal to spikelet length. Lemma of upper floret indurate; *smooth*; with involute margins; constricted at the base or without basal modifications; *differentiated at the apex; conduplicate at the apex*; muticous or apiculate.

Alloteropsis Presl

Internodes hollow. Ligule a fringe of hairs with a small membranous part at the base. Primary branches with appressed secondary branches; with secund spikelets. Rachis terminating in a spikelet. Pedicels concave at the apex. Disarticulation at the spikelet base. Spikelets abaxial; dorsiventrally compressed. First glume not encircling the spikelet base; muticous to awned. Rachilla not pronounced between the florets, but close examination will reveal a minute stipe ca. 0.3 mm long. Second glume subequal to spikelet length. *Lemma of lower floret with a hyaline area at the base*, frequently splitting at the base at maturity. Lemma of upper floret chartaceous to cartilaginous; striate to muricate; with flat or involute margins; *awned.*

Amphicarpum Kunth

Internodes hollow. Ligule a fringe of hairs. Inflorescence a panicle for the aerial spikelets or a solitary spikelet for the subterranean cleistogamous spikelets. Main axis with quaquaversal primary branches. Primary branches with appressed secondary branches; with spikelets neither secund nor distichous. Rachis terminating in a spikelet. Pedicels concave at the apex. Disarticulation at the spikelet base. *Spikelets heteromorphic*, referring to the presence of differentiated cleistogamous spikelets; adaxial; dorsiventrally compressed. First glume present or absent; not encircling the spikelet base; muticous. Second glume 0.92 – 1 times spikelet length. Lemma of upper floret chartaceous; smooth or faintly striate; with flat margins; muticous.

Anthaenantia P. Beauv.

Internodes spongy to hollow. Ligule a ciliate membrane or a fringe of hairs. Main axis with quaquaversal primary branches. *Primary branches with spreading secondary branches; with spikelets neither secund nor distichous*. Rachis terminating in a spikelet. Pedicels concave at the apex. Disarticulation at the spikelet base, frequently with a secondary point of disarticulation at the base of the caryopsis. Spikelets laterally compressed, dorsiventrally compressed, or planoconvex. *First glume absent*. Second glume 0.9 – 1 times spikelet length. Lemma of upper floret chartaceous; smooth; with flat margins; differentiated or not differentiated at the apex; the apex becoming flared and hyaline; muticous.

Anthaenantiopsis Pilger

Internodes hollow. Ligule a ciliate membrane or a fringe of hairs. *Main axis with distichous primary branches*. Primary branches with appressed secondary branches; with secund spikelets. Rachis terminating in a spikelet. *Pedicels flat at the apex*. Disarticulation at the spikelet base. Spikelets adaxial; dorsiventrally compressed. First glume present or absent; not encircling the spikelet base; muticous. Second glume 0.8 – 1 times spikelet length. Lemma of lower floret consistent in texture; *lacking a central longitudinal groove*. Lemma of upper floret chartaceous; smooth or minutely striate; *without basal modifications*; with involute margins; not differentiated at the apex; muticous.

Anthephora Schreb.

Internodes hollow. Ligule a membrane. Main axis with quaquaversal primary branches. Primary branches reduced to a fascicle of spikelets; with spikelets neither secund nor distichous. Rachis terminating in a bristle. Disarticulation at the base of the primary branches. Callus differentiated. *Spikelets in clusters of four, each opposite a flared bract*; adaxial; dorsiventrally compressed. First glume absent. Second glume 0.75 – 1 times spikelet length. Lemma of upper floret chartaceous; smooth; with flat margins; muticous.

Arthropogon Nees

Internodes spongy or hollow. Ligule a ciliate membrane or a fringe of hairs. Inflorescence a panicle or a raceme. Main axis with quaquaversal primary branches. Primary branches with appressed to spreading secondary branches; with spikelets neither secund nor distichous. Rachis terminating in a spikelet. Pedicels concave at the apex. Disarticulation at the spikelet base. *Callus differentiated.* Spikelets adaxial; laterally compressed. First glume not encircling the spikelet base; *awned.* Second glume subequal to spikelet length. *Lemma of upper floret hyaline to membranous*; smooth; with flat margins; muticous.

Axonopus P. Beauv.

Internodes solid or spongy. Ligule a ciliate membrane or a fringe of hairs. Main axis with quaquaversal primary branches. Primary branches with appressed secondary branches; with secund spikelets. Rachis terminating in a spikelet. *Pedicels concave at the apex. Disarticulation at the spikelet base. Spikelets adaxial*; dorsiventrally compressed or planoconvex. *First glume absent.* Second glume subequal to spikelet length. *Lemma of upper floret cartilaginous*; smooth or muricate; with flat or involute margins; muticous.

Brachiaria (Trin.) Griseb.

Internodes hollow. *Ligule a fringe of hairs.* Main axis with secund primary branches. *Primary branches with appressed secondary branches*; with secund spikelets. Rachis terminating in a spikelet. Pedicels concave at the apex. Disarticulation at the base of the upper floret or at the spikelet base. Spikelets adaxial; planoconvex. *First glume 0.1 – 0.2 times spikelet length*; encircling the spikelet base; muticous. Second glume subequal to spikelet length. Lemma of upper floret chartaceous; smooth; *white*; with involute margins; muticous.

Cenchrus L.

Internodes solid to spongy. Ligule a ciliate membrane or a fringe of hairs. Main axis with quaquaversal primary branches. Primary branches reduced to a fascicle of spikelets; with spikelets neither secund nor distichous. *Rachis terminating in a bristle. Disarticulation at the base of the primary branches.* Callus differentiated; *flared to form a discoid receptacle.* Spikelets dorsiventrally compressed. First glume present or absent; not encircling the spikelet base; muticous. Second glume 0.3 – 1 times spikelet length. Lemma of upper floret chartaceous to cartilaginous; smooth to muricate;

with flat margins; constricted at the base or without basal modifications; muticous.

Centrochloa Swallen

Internodes hollow. Ligule a ciliate membrane. Main axis with quaquaversal primary branches. Primary branches with appressed secondary branches; with secund spikelets. Rachis terminating in a spikelet. Pedicels convex at the apex. Disarticulation at the spikelet base. Callus differentiated. *Spikelets adaxial*; dorsiventrally compressed. First glume absent. Second glume subequal to spikelet length, excluding the callus. Lemma of upper floret cartilaginous; smooth or faintly striate; *oblanceolate*; with involute margins; muticous to apiculate.

Chaetium Nees

Internodes spongy. Ligule a fringe of hairs. *Inflorescence a panicle.* Main axis with quaquaversal primary branches. Primary branches with appressed secondary branches; with secund spikelets. Rachis terminating in a spikelet. *Pedicels oblique to the spikelet base* and modified with the oblique callus; flat at the apex. Disarticulation at the spikelet base. *Callus differentiated*, ca. 0.5 mm long. Spikelets adaxial; dorsiventrally compressed. First glume not encircling the spikelet base; *awned*. Second glume subequal to spikelet length. Lemma of upper floret cartilaginous; striate to muricate; with flat margins; mucronate to awned.

Digitaria Haller

Internodes hollow. *Ligule a membrane or a ciliate membrane.* Main axis with quaquaversal primary branches. Primary branches with appressed or spreading secondary branches; *with secund spikelets.* Rachis terminating in a spikelet. Pedicels concave at the apex. Disarticulation at the spikelet base. Spikelets homomorphic; *abaxial*; planoconvex. First glume present or absent; not encircling the spikelet base; muticous. Rachilla not pronounced between the florets, however some members of section *Trichachne* possess a short stipe at the base of the upper floret. Second glume 0.3 – 1 times spikelet length. Lemma of upper floret cartilaginous; smooth, striate, or muricate; *with flat margins; with margins thinner in texture than the body*; muticous or mucronate.

Echinochloa P. Beauv.

Internodes spongy. Ligule a fringe of hairs or absent. Main axis with secund or quaquaversal primary branches. Primary branches with appressed secondary branches; with secund spikelets. Rachis terminating in a spikelet. Pedicels concave at the apex. Disarticulation at the spikelet base. Callus differentiated (referring to fused portion at the base of the first glume) or not differentiated. Spikelets adaxial; dorsiventrally compressed to planoconvex. First glume encircling the spikelet base; muticous or mucronate. Second glume present; subequal to spikelet length. Lemma of upper floret indurate; smooth; with involute margins; differentiated at the apex; *the apex becoming membranous*; muticous.

Echinolaena Desv.

Internodes hollow. Ligule a ciliate membrane or a fringe of hairs. Inflorescence a panicle or a raceme. Main axis with secund or quaquaversal primary branches. Primary branches with appressed secondary branches; *with secund spikelets*. Rachis terminating in a spikelet. Pedicels flat to convex at the apex. Disarticulation at the spikelet base, with a secondary point at the base of the primary branch. Spikelets adaxial or abaxial; dorsiventrally compressed. First glume encircling the spikelet base; muticous or awned. *Rachilla pronounced between the florets. Second glume 0.5 – 0.9 times spikelet length*. Lemma of upper floret cartilaginous; smooth; with involute margins; with basal scars or appendages; muticous.

Eriochloa Kunth

Internodes hollow. Ligule usually a fringe of hairs with a minute membranous rim at the base. Main axis with distichous or quaquaversal primary branches. Primary branches with appressed secondary branches; with secund spikelets. Rachis terminating in a spikelet. Pedicels concave at the apex. Disarticulation at the spikelet base. Callus differentiated. Spikelets adaxial; dorsiventrally compressed. *First glume fused with the callus to form a cuplike structure*; typically absent, rarely present. Second glume 0.9 – 1.3 times spikelet length. Lemma of upper floret indurate; *rugose*; with involute margins; mucronate or awned.

Homolepis Chase

Internodes hollow. *Ligule a membrane*. Main axis with quaquaversal primary branches. Primary branches with spreading secondary branches; with spikelets neither secund nor distichous. Rachis terminating in a spikelet. Pedicels perpendicular or oblique to the spikelet base; concave to flat at the apex. Disarticulation at the spikelet base. Spikelets adaxial; *dorsiventrally compressed. First glume subequal to or slightly longer than the length of the second glume*; not encircling the spikelet base; muticous. Rachilla pronounced or not pronounced between the florets. Second glume 0.9 – 1 times spikelet length. Lemma of upper floret chartaceous to coriaceus; smooth; *with flat margins*; muticous.

Hymenachne P. Beauv.

Internodes spongy. *Ligule a membrane or a ciliate membrane*. Main axis with quaquaversal primary branches. *Primary branches with appressed secondary branches*; with secund spikelets. Rachis terminating in a spikelet. Pedicels concave to flat at the apex. Disarticulation at the spikelet base. Spikelets adaxial; dorsiventrally compressed. *First glume encircling the spikelet base*; muticous or apiculate. Second glume 0.8 – 1 times spikelet length; *not gibbose*. Lemma of upper floret membranous to chartaceous; smooth to scabrous; *with flat margins*; muticous.

Ichnanthus P. Beauv.

Internodes hollow; rarely glaucous. Ligule a membrane, a ciliate membrane, or a fringe of hairs. Main axis with quaquaversal primary branches. Primary branches with appressed or spreading secondary branches; with secund spikelets. Rachis terminating in a spikelet. Pedicels concave at the apex. Disarticulation at the spikelet base. Spikelets adaxial; laterally compressed or dorsiventrally compressed. First glume encircling the spikelet base; muticous or apiculate. Rachilla pronounced between the florets; *geniculate*. Second glume subequal to spikelet length. Lemma of upper floret cartilaginous; smooth; with involute margins; *with basal scars or appendages*; muticous.

Isachne R. Br.

Internodes hollow. Ligule a fringe of hairs or absent. Main axis with quaquaversal primary branches. *Primary branches with spreading secondary branches*; with spikelets neither secund nor distichous. Rachis terminating in a spikelet. Disarticulation above the lower glume. Spikelets abaxial; dorsiventrally compressed. First glume not encircling the spikelet base; muticous. *Rachilla pronounced between the florets*. Second glume 0.7 – 0.95 times spikelet length. Lemma of upper floret cartilaginous; smooth or striate; *with involute margins; without basal modifications*; muticous.

Ixophorus Schlecht.

Internodes solid. Ligule a membrane. Main axis with quaquaversal primary branches. Primary branches with appressed secondary branches; with secund spikelets. Rachis terminating in a bristle. *Bristles smooth*. Pedicels concave at the apex. Disarticulation at the spikelet base. Spikelets abaxial; dorsiventrally compressed. First glume not encircling the spikelet base; muticous. Second glume subequal to spikelet length. Palea of lower floret with nerves pronounced into obvious wings. Lemma of upper floret cartilaginous; faintly rugose; with involute margins; mucronate, the mucro ca. 0.15 mm long.

Lasiacis (Griseb.) Hitchc.

Internodes solid and lignified or hollow. Ligule a membrane. Main axis with quaquaversal primary branches. Primary branches with spreading secondary branches; with spikelets neither secund nor distichous. *Rachis terminating in a spikelet.* Pedicels concave at the apex. Disarticulation at the spikelet base, rarely disarticulating above the first glume. Spikelets divergent from the axis; adaxial; *terete.* First glume encircling the spikelet base; muticous. Second glume 0.85 – 1 times spikelet length. Lemma of upper floret indurate; smooth; with involute margins; constricted at the base or without basal modifications; differentiated at the apex; the apex crested with a tuft of hairs; muticous or apiculate.

Melinis P. Beauv.

Internodes spongy; *viscid.* Ligule a fringe of hairs. Main axis with quaquaversal primary branches. Primary branches with spreading secondary branches; with spikelets neither secund nor distichous. Rachis terminating in a spikelet. Pedicels concave at the apex. Disarticulation at the spikelet base. Spikelets laterally compressed. First glume not encircling the spikelet base; muticous. Second glume subequal to spikelet length; *7-nerved.* Lemma of upper floret hyaline to membranous; smooth; with flat margins; muticous.

Mesosetum Steud.

Internodes hollow. Ligule a fringe of hairs. *Inflorescence a raceme.* Main axis with secund primary branches. Rachis terminating in a spikelet. *Pedicels oblique to the spikelet base*; concave at the apex. Disarticulation at the spikelet base. Callus differentiated or not differentiated. Spikelets adaxial; laterally to dorsiventrally compressed. First glume not encircling the spikelet base; muticous or awned. Second glume 0.7 – 1 times spikelet length. Lemma of lower floret with the area between the central nerve and the first lateral nerve thinner in texture than the rest of the structure. Lemma of upper floret chartaceous to cartilaginous; smooth or striate; with flat margins; muticous or apiculate.

Oplismenopsis Parodi

Internodes spongy. Ligule a ciliate membrane. Main axis with quaquaversal primary branches. Primary branches with appressed secondary branches; with secund spikelets. Rachis terminating in a spikelet. Pedicels concave at the apex. Disarticulation at the spikelet base. Spikelets adaxial; dorsiventrally compressed, somewhat laterally compressed at anthesis. *First glume 0.9 – 1.7 times the length of the second glume*; encircling the spikelet base; *awned*. Second glume subequal to spikelet length. Lemma of upper floret chartaceous to cartilaginous; smooth; *with involute margins*; muticous.

Oplismenus P. Beauv.

Internodes solid. Ligule a ciliate membrane. Main axis with secund primary branches. Primary branches with appressed secondary branches or reduced to a fascicle of spikelets; with secund spikelets. Rachis terminating in a spikelet. Pedicels flat at the apex. Disarticulation at the spikelet base. Spikelets divergent or not divergent from the axis; adaxial; laterally or dorsiventrally compressed. First glume not encircling the spikelet base; *awned. Second glume 0.5 – 0.8 times spikelet length. Lemma of lower floret mucronate to awned*. Lemma of upper floret cartilaginous; smooth; with involute margins, rarely becoming flat at maturity; mucronate.

Otachyrium Nees

Internodes hollow. Ligule a membrane or a ciliate membrane. Main axis with quaquaversal primary branches. Primary branches with appressed or spreading secondary branches; with secund spikelets. *Rachis terminating in a spikelet*. Pedicels perpendicular with the spikelet base; concave at the apex. Disarticulation at the spikelet base. Spikelets adaxial; dorsiventrally compressed to planoconvex. First glume encircling the spikelet base; muticous. Second glume 0.3 – 0.4 times spikelet length; gibbose or not gibbose. Lemma of lower floret with a hyaline area at the base; with or without a central longitudinal groove. *Palea of lower floret with nerves pronounced into obvious wings*. Lemma of upper floret chartaceous to indurate; smooth; with involute margins; muticous.

Panicum L.

Internodes hollow to solid; neither viscid nor glaucous. *Ligule a membrane or a ciliate membrane. Inflorescence a panicle*. Main axis with quaquaversal primary branches. Primary branches with appressed or spreading secondary branches; with secund or quaquaversal spikelets. *Rachis terminating in a spikelet. Pedicels cupuliform at the apex*; concave at the apex. *Disarticulation at the spikelet base*. Spikelets adaxial; *dorsiventrally compressed. First glume present*; encircling the spikelet base; *muticous*. Rachilla pronounced or not pronounced between the florets. Second glume subequal to spikelet length. *Lemma of lower floret consistent in texture; lacking a central longitudinal groove.* Lemma of upper floret cartilaginous; smooth to muricate; *with involute margins; without basal modifications*; muticous.

Paratheria Griseb.

Internodes hollow. Ligule a ciliate membrane, the membranous part only about 0.2 mm long. Main axis with quaquaversal primary branches, possibly distichous but difficult to determine. Primary branches with appressed secondary branches. Rachis terminating in a bristle. Disarticulation at the base of the primary branches. Callus differentiated. Spikelets with lateral orientation or abaxial; dorsiventrally compressed. First glume not encircling the spikelet base; muticous. *Second glume 0.05 – 0.07 times spikelet length.* Lemma of upper floret chartaceous; smooth; with flat margins; muticous.

Paspalidium Stapf

Internodes hollow. Ligule a ciliate membrane. *Main axis with distichous or secund primary branches.* Primary branches with appressed secondary branches; with secund or distichous spikelets. *Rachis terminating in a bristle.* Pedicels concave at the apex. *Disarticulation at the spikelet base.* Spikelets divergent or not divergent from the axis; abaxial; planoconvex or terete. First glume encircling the spikelet base; muticous. Lemma of upper floret cartilaginous to indurate; rugose; with involute margins; constricted at the base or without basal modifications; muticous or mucronate.

Paspalum L.

Internodes solid to hollow; glaucous or neither viscid nor glaucous. Ligule a membrane or a fringe of hairs. Main axis with quaquaversal primary branches. Primary branches with appressed secondary branches; with secund spikelets. Rachis terminating in a spikelet or in an unmodified naked point. *Pedicels flat or convex at the apex.* Disarticulation at the spikelet base. Spikelets homomorphic; *abaxial*; planoconvex. First glume usually absent, rarely present as a small nerveless scale; *not encircling the spikelet base*; muticous. Second glume 0.7 – 1 times spikelet length. Lemma of upper floret indurate; smooth or striate; with involute margins; constricted at the base or without basal modifications; muticous.

Pennisetum Rich.

Internodes spongy or hollow; glaucous or neither viscid nor glaucous. Ligule a ciliate membrane or a fringe of hairs. *Main axis straight*; with quaquaversal primary branches. *Primary branches reduced to a fascicle of* *spikelets. Rachis terminating in a bristle. Disarticulation at the base of the primary branches.* Callus differentiated or not differentiated; *not flared to form a discoid receptacle.* Spikelets dorsiventrally compressed. First glume present or absent; not encircling the spikelet base; muticous. Second glume present, rarely absent; 0.5 – 1.1 times spikelet length. Lemma of upper floret chartaceous to cartilaginous; smooth or scabrous; with flat or involute margins; muticous.

Phanopyrum Nash

Internodes hollow. Ligule a membrane. Main axis with quaquaversal primary branches. Primary branches with appressed secondary branches; with secund spikelets. Rachis terminating in a spikelet. Pedicels concave at the apex. Disarticulation at the base of the upper floret or at the spikelet base. Spikelets adaxial; *laterally compressed.* First glume encircling the spikelet base; mucronate. Rachilla pronounced between the florets. Second glume 0.92 – 0.96 times spikelet length. *Lemma of upper floret 0.4 – 0.48 times the length of the lower floret*; indurate; smooth; with involute margins; muticous.

Plagiantha Renv.

Internodes hollow. Ligule a ciliate membrane. Main axis with quaquaversal primary branches. Primary branches with spreading secondary branches; with spikelets neither secund nor distichous, or not distinctly secund. Rachis terminating in a spikelet. Pedicels concave at the apex. Disarticulation at the spikelet base. *Spikelets divergent from the axis*; adaxial; dorsiventrally compressed. First glume encircling the spikelet base; muticous. Second glume 0.8 – 0.86 times spikelet length. *Lemma of lower floret with a central longitudinal groove.* Lemma of upper floret chartaceous; muricate; with involute margins; differentiated at the apex (darker in color); muticous.

Pseudechinolaena Stapf

Internodes solid. Ligule a membrane. Main axis with distichous primary branches. Primary branches with appressed or spreading secondary branches; with distichous spikelets. Rachis terminating in a spikelet. Pedicels concave at the apex. Disarticulation at the base of the upper floret or at the spikelet base. Spikelets adaxial or abaxial, depending on the development of the lower spikelet; *laterally compressed.* First glume encircling the spikelet base; muticous, mucronate, or awned. Rachilla pronounced between the florets, minute and positioned on the adaxial side of the spikelet. Second glume 0.95 – 1 times spikelet length; *gibbose.* Lemma of lower floret with a hyaline area at the base. Lemma of upper floret cartilaginous; smooth; with flat margins; muticous.

Reimarochloa Hitchc.

Internodes hollow. Ligule a membrane or a fringe of hairs. Main axis with distichous or quaquaversal primary branches. Primary branches with spreading secondary branches; with secund spikelets. Rachis terminating in a spikelet or in an unmodified naked point. Disarticulation at the base of the primary branches. Callus not differentiated, however the base of the primary branches are weaker and discolored especially at maturity. Spikelets abaxial; planoconvex. First glume absent. *Second glume absent* (rarely present). Lemma of upper floret chartaceous; smooth; with involute margins; without basal modifications; muticous.

Reynaudia Kunth

Internodes solid. Ligule a fringe of hairs. Main axis with quaquaversal primary branches. Primary branches with appressed to spreading secondary branches; with secund spikelets. Rachis terminating in a spikelet. Pedicels perpendicular or oblique to the spikelet base; concave to flat at the apex. *Disarticulation at the spikelet base.* Spikelets divergent or not divergent from the axis; adaxial; laterally compressed. First glume not encircling the spikelet base; awned from between the lobes. Second glume subequal to spikelet length. Lemma of upper floret hyaline; smooth; with flat margins; muticous. *Stamens 2.*

Rhynchelytrum Nees

Internodes solid to hollow. Ligule a fringe of hairs. Main axis with secund primary branches. Primary branches with spreading secondary branches; *with spikelets neither secund nor distichous.* Rachis terminating in a spikelet. Pedicels concave at the apex. Disarticulation at the spikelet base. Callus differentiated or not differentiated. Spikelets divergent or not divergent from the axis; *laterally compressed. First glume present*; not encircling the spikelet base; *muticous.* Rachilla pronounced or not pronounced between the florets, but frequently slightly developed between the second glume and lower floret. Second glume 0.95 times spikelet length; 5-*nerved.* Lemma of upper floret membranous to chartaceous; smooth; with flat margins; muticous.

Sacciolepis Nash

Internodes hollow. Ligule a membrane or a ciliate membrane. Main axis with quaquaversal primary branches. Primary branches with appressed secondary branches; with secund or quaquaversal spikelets. Rachis terminating in a spikelet. Pedicels concave at the apex. Disarticulation at the spikelet base and with a secondary point at the base of the upper floret. Spikelets adaxial; dorsiventrally compressed. First glume not encircling the spikelet base; muticous. Rachilla pronounced or not pronounced between the florets. Second glume subequal to spikelet length; *saccate.* Lemma of upper floret cartilaginous; scabrous; with flat margins; muticous.

Scutachne Hitchc. & Chase

Internodes hollow. *Ligule a fringe of hairs.* Main axis with quaquaversal primary branches. Primary branches with appressed or spreading secondary branches; with secund spikelets. Rachis terminating in a spikelet. Pedicels concave at the apex. Disarticulation at the spikelet base. *Spikelets paired*; adaxial; laterally to dorsiventrally compressed. First glume encircling the spikelet base; muticous. *Second glume 0.8 – 0.9 times spikelet length.* Lemma of upper floret cartilaginous; smooth or rugose; *with flat margins*; muticous.

Setaria P. Beauv.

Internodes solid to hollow. Ligule a ciliate membrane or a fringe of hairs. *Main axis with quaquaversal primary branches.* Primary branches with appressed or spreading secondary branches, or reduced to a fascicle of spikelets; with secund spikelets. *Rachis terminating in a bristle.* Pedicels concave at the apex. *Disarticulation at the spikelet base* (or at the base of the upper floret in some cultivated taxa). Spikelets divergent or not divergent from the axis; abaxial; planoconvex to terete. First glume encircling the spikelet base; muticous or mucronate. Second glume present; 0.4 – 1 times spikelet length. *Lemma of upper floret subequal to the length of the lower floret*; cartilaginous to indurate; rugose; with involute margins; constricted at the base or without basal modifications; muticous.

Setariopsis Scribn. & Millsp.

Internodes hollow. Ligule a ciliate membrane. Main axis with quaquaversal primary branches. Primary branches with appressed secondary branches; with secund spikelets. Rachis terminating in a bristle. Pedicels concave at the apex. Disarticulation at the spikelet base. Spikelets abaxial; dorsiventrally compressed. First glume encircling the spikelet base; *13 – 23-nerved*; muticous. Second glume 0.85 – 1 times spikelet length. Lemma of lower floret with a hyaline area at the base. Lemma of upper floret indurate; *rugose*; with involute margins; muticous or apiculate.

Spheneria Kuhlm.

Internodes hollow. Ligule a membrane, subtended by a line of setaceous hairs. Main axis with distichous primary branches. Primary branches with appressed secondary branches; with secund spikelets. Rachis terminating in a spikelet. *Pedicels oblique to the spikelet base.* Disarticulation at the spikelet base. Callus differentiated. Spikelets abaxial; dorsiventrally compressed. *First glume absent.* Second glume 0.95 – 1 times spikelet length. Lemma of upper floret indurate; papillate to slightly rugose; with involute margins; muticous and slightly mucronate and recurved.

Stenotaphrum Trin.

Internodes solid to spongy. Ligule a ciliate membrane. Main axis with distichous or secund primary branches. *Rachis terminating in an unmodified naked point.* Pedicels concave at the apex. *Disarticulation at the nodes of the main axis or at the base of the inflorescence.* Spikelets abaxial; dorsiventrally compressed. First glume not encircling the spikelet base; muticous. *Second glume present*; 0.9 – 1 times spikelet length. Lemma of upper floret cartilaginous; smooth or muricate; with flat or involute margins; without basal modifications; muticous.

Streptostachys Desv.

Internodes hollow. Ligule a fringe of hairs or absent. Main axis with quaquaversal primary branches. Primary branches with appressed secondary branches; with secund spikelets. Rachis terminating in a spikelet. Pedicels concave or flat at the apex. Disarticulation at the spikelet base. Spikelets adaxial; dorsiventrally compressed. *First glume encircling the spikelet base*; muticous. Second glume 0.9 – 1 times spikelet length. Lemma of upper floret indurate; smooth; *hairy*; with involute margins; muticous.

Tatianyx Zuloaga & Soderstrom

Internodes hollow. Ligule a fringe of hairs. Main axis with quaquaversal primary branches. Primary branches with spreading secondary branches; with spikelets neither secund nor distichous. Rachis terminating in a spikelet. *Pedicels oblique to the spikelet base*; slightly concave at the apex. Disarticulation at the spikelet base. Callus differentiated. Spikelets probably adaxial but difficult to determine; dorsiventrally compressed. First glume not encircling the spikelet base; muticous. Second glume 0.85 – 0.95 times spikelet length. *Lemma of lower floret with a hyaline area at the base.* Lemma of upper floret cartilaginous; minutely striate; with involute margins; muticous.

Triscenia Griseb.

Ligule a fringe of hairs. Main axis with distichous primary branches. Primary branches with appressed secondary branches; with spikelets neither secund nor distichous. Rachis terminating in a spikelet. Pedicels concave at the apex. Disarticulation at the spikelet base. Spikelets adaxial; *dorsiventrally compressed.* First glume encircling the spikelet base; muticous. Second glume slightly longer than spikelet length. *Lemma of upper floret hyaline to membranous*; smooth; with flat margins; muticous.

Thrasya Kunth

Internodes hollow. Ligule a membrane. Inflorescence a panicle or a raceme. Main axis with secund primary branches. Primary branches with appressed secondary branches; with secund spikelets. Rachis terminating in a spikelet or in an unmodified naked point. *Pedicels flat or convex at the apex.* Disarticulation at the spikelet base. Callus differentiated or not differentiated. Spikelets adaxial; dorsiventrally compressed to planoconvex. First glume fused or not fused with the callus; present or absent; not encircling the spikelet base; muticous. Rachilla generally not pronounced between the florets but slightly developed in some species, 0.1 – 0.2 mm long. Second glume 0.7 – 1.2 times spikelet length; *3 – 7-nerved*;. Lemma of lower floret with a hyaline area at the base or with the area between the central nerve and the first lateral nerve thinner in texture than the rest of the structure; *with a central longitudinal groove.* Lemma of upper floret cartilaginous; striate or muricate; with involute margins; differentiated (hairy in some species) or not differentiated at the apex; muticous.

Thrasyopsis Parodi

Internodes mostly spongy. Ligule a membrane and a fringe of hairs. Inflorescence a panicle but highly reduced. Main axis with secund primary branches; *with 1 or 2 primary branches.* Primary branches with appressed secondary branches; with secund spikelets. Rachis terminating in a spikelet or in an unmodified naked point. *Pedicels flat at the apex.* Disarticulation at the spikelet base. Spikelets adaxial; dorsiventrally compressed. First glume not encircling the spikelet base; muticous. Second glume 0.92 – 1 times spikelet length; *9 – 15-nerved.* Lemma of lower floret with the area between the central nerve and the first lateral nerve thinner in texture than the rest of the structure or consistent in texture; with a central longitudinal groove or lacking a central longitudinal groove. Palea of lower floret with nerves pronounced and becoming indurate but not winged. Lemma of upper floret indurate; smooth or muricate; with involute margins; muticous.

Urochloa P. Beauv.

Internodes hollow. Ligule a fringe of hairs. Main axis with quaquaversal primary branches. Primary branches with appressed or spreading secondary branches; with secund spikelets. *Rachis terminating in a spikelet.* Pedicels concave, flat, or convex at the apex. Disarticulation at the spikelet base. Callus differentiated or not differentiated. Spikelets adaxial or abaxial; dorsiventrally compressed or planoconvex. *First glume not fused with the callus*; encircling the spikelet base; muticous. Second glume 0.95 – 1 times spikelet length. Lemma of upper floret cartilaginous to indurate; *rugose; with involute margins*; differentiated or not differentiated at the apex; muticous, mucronate, or awned.

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Appreciation is extended to John Wiersema for making suggestions to improve the wording of the manuscript. Vittoria Hess provided technical assistance in all aspects of data collection, storage, analysis and presentation.

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NEW WORLD GENERA OF THE PANICEAE
R. WEBSTER, J. KIRKBRIDE AND J. VALDEZ R.   SIDA 13(4): 1989

A NEW SPECIES OF ACOURTIA (ASTERACEAE-MUTISIEAE) FROM CHIHUAHUA, MÉXICO

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ABSTRACT

Recent collections from the state of Chihuahua, México, reveal a new species, *Acourtia dieringeri,* which coexists with *A. thurberi* and is similar to it in some characters.

ACOURTIA **dieringeri** L. Cabrera , sp. nov. (Fig. 1)

Acourtia thurberi (A. Gray) Reveal & King similis sed caulibus glabris, foliis coriaceis, leviter subtus cinereis, phyllariis plerumque obtusatis marginibus tomentelli-ciliatis, corollis albis vel roseis, et acheniis eglanduliferis minute hispidis differt.

Erect perennial herb, with a short, brownish woolly caudex; stem solitary or few-branched, up to 1.5 m high, greenish to dark purple, glabrous, sparsely pubescent in the upper part. Leaves sessile, obovate-spatulate, 5 — 23 cm long, 2.5 — 10 cm wide (in the widest part), progressively reduced in size distally, irregularly spinulose-dentate marginally with small hairs between the teeth, auriculate to sagitate basally or even truncate in the young leaves, obtuse or acutish, apically, apiculate, coriaceous, rigid, puberulent below, with minute, sessile resin glands, usually gray-greenish, sparsely puberulent above; bract-like leaves of the flowering branches progressively reduced distally, 1 — 3.5 cm long, 0.5 — 2 cm wide, with margins remotely spinulose-dentate to entire in the upper half, obscurely auriculate to truncate basally, acute-apiculate apically, puberulent, less so on the upper surface. Inflorescences of heads in compound cymes; heads short-pendunculate; involucre cylindric, narrowly turbinate in dry material, 8 — 10 mm long; phyllaries in 2 — 3 series with the outer ones obovate, acute at the apex, and the inner ones oblanceolate and longer, obtuse at the apex, both marginally scarious, ciliate-tomentulose, mucronate apically; receptacle slightly convex, with glandular trichomes. Flowers 5 (6) per head; corollas white to slightly pinkish, 9 — 10 mm long including the 4 mm long outer lip, with the inner lip slightly shorter; anthers 4 mm long including the sterile tips, yellow; style branches ca. 1 mm long, papillose, capitate-truncate. Achenes cylindric, 4 mm long (immature), hispidulous; pappus 8 mm long, with white, uniseriate bristles.

TYPE: MÉXICO. CHIHUAHUA: 20 km North of Basaseachic, along the Basaseachic-Yepachic dirt road, on slopes in pine-oak forest, 2150 m, 23 Aug 1988, *Cabrera & Dieringer 628* (HOLOTYPE: TEX; ISOTYPES: ENCB, GH, MEXU).

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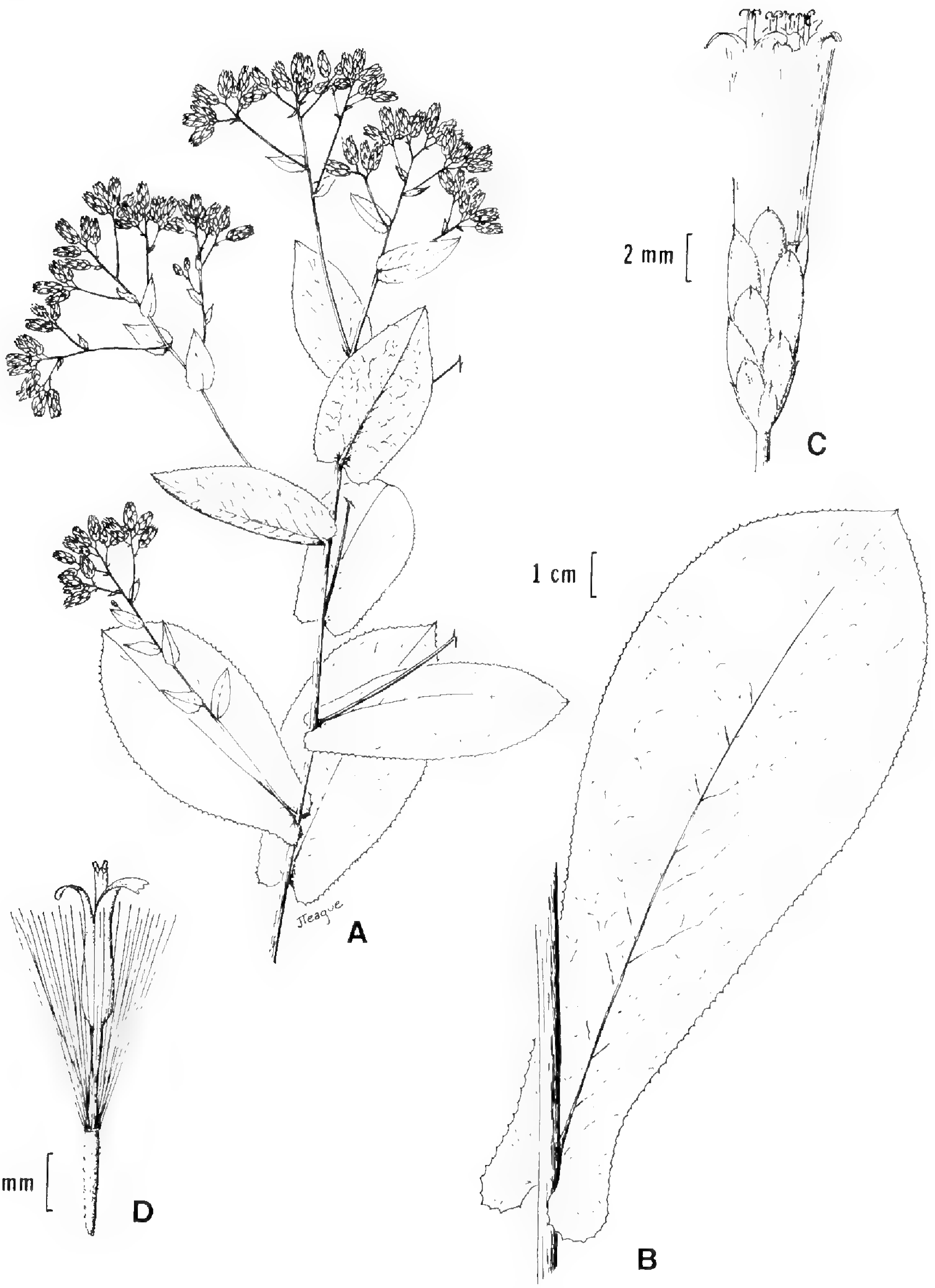

FIG. 1. *Acourtia dieringeri*: a) flowering branch; b) basal leaf showing venation; c) capitulum; d) flower with achene.

Additional collections examined: MÉXICO. CHIHUAHUA: 20 km N of Basaseachic, along the Basaseachic-Yepachic dirt road, on slopes in pine oak forest, 2150 m, 23 Aug 1988, *Cabrera & Dieringer 629, 630, 633, 634, Cabrera & Morgan 631, 632, 638.*

Two neighboring populations of *Acourtia dieringeri* were found coexisting with *A. thurberi*, to which it appears to be most similar. Even though the latter species has been well-characterized by Bacigalupi (1931), it can be confused in the field with the new species. The two species share a very similar habit, leaf shape, a glandular lower surface of the blade, and sometimes the number of phyllary series. *Acourtia dieringeri* differs from *A. thurberi* in having glabrous stems, coriaceous, rigid leaves with grayish blade under surfaces, mostly obtuse phyllaries with ciliate-tomentulose margins, white corollas, that are rarely obscurely pinkish, and hispidulous eglandular achenes. In contrast, *A. thurberi* has densely glandular-puberulent stems, chartaceous, green leaves, phyllaries all attenuate-acuminate with glandular margins, pink corollas, and glandular achenes.

In dry material, the leaves of *Acourtia dieringeri* resemble those of *A. platyphylla* (Gray) Reveal & King and *A. rigida* DC, but in these latter species, the leaves are completely glabrous and much more rigid than in the new species. Other characters (number and color of flowers, glandular achenes, number of phyllary series) suggest that these two species are not closely related to *A. dieringeri.*

This species is named for Dr. Gregg Dieringer who provided invaluable assistance in several field trips, looking for species of the genus *Acourtia.*

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I want to thank Dr. Beryl B. Simpson and Dr. Guy Nesom for their critical revision to the manuscript. The field trip to Chihuahua, México, would have not been possible without the funds from a B. L. Turner Fellowship granted by the Department of Botany of the University of Texas at Austin.

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STATUS OF *ARISTIDA* (POACEAE) IN PUERTO RICO AND THE VIRGIN ISLANDS

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ABSTRACT

Seven species of *Aristida* (POACEAE) are known from Puerto Rico and the Virgin Islands: *A. spiciformis* Elliott, *A. chaseae* Hitchcock, *A. portoricensis* Pilger, *A. adscensionis* L., *A. suringarii* Henrard, *A. cognata* Trin. et Rupr., and *A. refracta* Griseb. *Aristida chaseae*, previously known only from the type collection, was rediscovered and *Aristida portoricensis* was found in new localities. *Aristida suringarii* previously unknown for Puerto Rico, is reported from Mona Island. The two endemic, potentially threatened species may benefit from management practices. A key and illustrations are provided for all species.

RESUMEN

Se conocen siete especies del género *Aristida* (Poaceae) originarias de Puerto Rico y de las Islas Vírgenes: *A. spiciformis* Elliott, *A. chaseae* Hitchcock, *A. portoricensis* Pilger, *A. adscensionis* L., *A. suringarii* Henrard, *A. cognata* Trin. et Rupr., and *A. refracta* Griseb. Se descubrió nuevamente a *Aristida chaseae*, conocida anteriomente sólo a partir de colección tipo, y se encontró a *Aristida portoricensis* en nuevos lugares. En el presente trabajo, se informa sobre la existencia en la Isla Mona de *Aristida suringarii*, antes desconocida para Puerto Rico. Las prácticas de manejo que se recomiendan en este artículo podrían beneficiar a las dos especies endímicas pontencialmente amenazadas. Se incluyen una clave e ilustraciones para todas las especies.

The genus *Aristida* L. is represented in the West Indies by 26 species, which along with other Caribbean species, have been the subject of little taxonomic investigation except for work by Hitchcock (1924, 1935, 1936: 87 – 98), Henrard (1926, 1927, 1928, 1929, 1932), Lindeman & Stoffers

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SIDA 13(4):423 – 447. 1989.

(1963: 135 – 139), and Catasus (1985). The purpose of this study is to evaluate the status of representatives of the genus in Puerto Rico and the Virgin Islands, to update geographic distributions, to stress additional criteria which could be useful in identification, to suggest management and conservation measures for endemic or rare species, and to make recommendations for additional studies.

Species in the genus *Aristida* are generally erect, annual or perennial bunch grasses that lack rhizomes or stolons and have wiry culms and blades (Hitchcock 1924:517, Gould 1968:298). Inflorescences usually are open or contracted panicles of single-flowered spikelets, each with a pair of narrow, lanceolate, acute, acuminate, or awn-tipped glumes and an indurate lemma. The lemmas are usually terete, convolute around the palea, 3-nerved, with a hard, sharp-pointed, minutely bearded callus at the base, and tapering above to an awn column bearing usually three stiff awns. In some African species the awns are plumose and feathery (Hitchcock 1924:515, Gould 1968:298). The awns and sharp, bearded callus aid in dissemination of fruit (Hitchcock 1924:517, Chase 1951:462). Species found in tropical and subtropical regions apparently flower and fruit throughout the year.

The genus has a worldwide distribution, with the majority of species occurring in subtropical and tropical regions of the world (Henrard 1929:24 – 30, Lindeman & Stoffers 1963:135, Gould 1975:382). Species in the genus are usually found on seimarid or arid habitats, and on dry, sterile soils (Radford et al. 1968:97, Gould 1968:299, Correll & Correll 1982:96). Estimates of the number of species in the genus range from 200 (Gould 1968:298) to 400 (Lindeman & Stoffers 1963:135). The greatest number of species apparently occurs in Africa (Gould 1968:298). Due to the pattern of variability within and among species, certain complexes present numerous taxonomic problems (Allred 1984a, 1984b, 1985, 1986, Catasus 1985).

The genus is represented in Puerto Rico and the Virgin Islands by seven species: *A. spiciformis* Elliott, *A. chaseae* Hitchcock, *A. portoricensis* Pilger, *A. adscensionis* L., *A. suringarii* Henrard, *A. cognata* Trin. et Rupr., and *A. refracta* Griseb., (Britton & Wilson 1924:62 – 63, Henrard 1932:209, 224, 253, 284, 313 – 314, 322; Hitchcock 1924, 1935, 1936:87 – 98, Lindeman & Stoffers 1963:135 – 139, Liogier & Martorell 1982:194). Because thorough descriptions for these species are given in Hitchcock (1924:543, 552 – 553, 575 – 577, 585; 1935:387, 391, 400 – 401, 405 – 406, 1936:87 – 98), Henrard (1926:8 – 9, 89 – 90, 104 – 106; 1927:461 – 463; 1928:505 – 507, 583 – 585, 616 – 618; 1932:208 – 209, 223 – 224, 252 – 253, 283 – 284, 313 – 314, 321 – 322), and

Lindeman & Stoffers (1963:135 – 139), we did not repeat the information here. Table 1, however, provides a convenient means of comparing diagnostic features for the species under consideration. Because specimens from Puerto Rico and the Virgin Islands were lacking for some species, we examined additional material from other locations in the West Indies.

KEY TO THE SPECIES OF *ARISTIDA* IN PUERTO RICO AND THE VIRGIN ISLANDS

1a. Column/beak of lemma 6 – 30 mm long, beak strongly twisted; awns of glumes 4 – 12 mm long . . . . 1. *A. spiciformis*
1b. Column/beak of lemma < 6 mm long, beak not strongly twisted; awns of glumes < 1 mm long 2
2a. Lemma awns 20 – 30 mm long 3
    3a. Panicles contracted with appressed branches; lateral culms spreading and often horizontal to the ground; blades at base flat (usually > 2 mm wide); awns ascending . . . . 2. *A. chaseae*
    3b. Panicles open or loose with ascending branches; lateral culms erect; blades conspicuously involute (usually < 1.5 mm wide); awns ascending to nearly horizontally spreading . . . . 3. *A. portoricensis*
2b. Lemma awns (8) 10 – 15 (rarely to 23) mm long 4
    4a. Blades without long villous hairs at throat (sheath apex) and/or upper surface near base; lemma lacking a beak and often flattened near the apex; plants annuals or occasionally short-lived perennials . . . 4. *A. adscensionis*
    4b. Blades with long villous hairs at throat (sheath apex) and/or upper surface near base; lemma with a beak (scarcely so in *A. refracta*) and terete near the apex and tapering to a gradual point; plants perennial 5
    5a. First glume longer than the second glume . . . . 5. *A. suringarii*
    5b. First glume shorter than the second glume 6
    6a. Lemma (5.2) 5.5 – 7.0 (7.5) mm long, distinctly beaked; blades of dried specimens involute to flat at base (0.4 – 1.5 mm wide); internodes 1 – 7 cm long, elongated; culms branched, geniculate at base; second glume (5.5) 7.2 – 8.0 (8.3) mm long; lemma awns of mature specimens straight, ascending . . . . 6. *A. cognata*
    6b. Lemma (3.8) 4 – 5 (6) mm long, scarcely beaked; blades of dried specimens filiform at base (0.2 – 0.3 mm wide); internodes < 0.5 cm long, congested at base, giving the plant the appearance of having a conspicuous, basal tuft of leaves; culms sparingly branched, not geniculate at base; second glume (3.5) 5.2 – 6.0 (6.9) mm long; lemma awns of mature specimens often spirally contorted . . . . 7. *A. refracta*

1. ARISTIDA SPICIFORMIS Elliott. Sketch Bot. S. Carolina. 1: 141. 1816. TYPE: SOUTH CAROLINA, presumably near Charleston (Hitchcock 1924:552), *Combs and Baker 1115* (HOLOTYPE: CHARL).

Aristida stricta Muhl. Descr. Gram. 174. 1817. Not *A. stricta* Michx. 1803. "Habitat in Georgia" (Hitchcock 1924:552).

Species	Habit	Culms	Sheaths	Leaf Blades	Inflorescence	Glumes	Lemmas	Lemma Awns
A. *spiciformis*	tufted, cespitose perennial	strictly erect, unbranched	apices glabrous	flat to involute, scabrous adaxially	spiciform with short appressed branches, twisted	long awned, 2nd 4-6 mm longer than 1st	twisted, with .7-3 cm long column	2-3 cm long, slightly twisted
A. *chaseae*	tufted, cespitose perennial	frequently branched, reclining horizontally	apices villous	flat to involute, villous adaxially	contracted with appressed branches	about equal in length	terete, scarcely beaked	ca. 2-3 cm long, straight, divergent
A. *portoricensis*	tufted, cespitose perennial	erect, sparingly branched	apices with a few long hairs	involute, with a few long hairs adaxially	loose, open, with stiffly ascending branches	2nd 1-3 mm longer than 1st	terete, distinctly beaked	2-3 cm long, divergent or horizontally spreading
A. *adscensionis*	annual or short-lived perennial	branched and often geniculate basally	apices glabrous	flat to involute, glabrous adaxially	narrow, erect or slightly drooping	2nd 2-4 mm longer than 1st	lacking a distinct beak, apex flattened	10-15 mm long, straight, divergent
A. *suringarii*	tufted, cespitose perennial	frequently branched	apices long-bearded	involute to flat, villous adaxially	narrow with erect or ascending branches	1st 1.5-2.5 mm longer than 2nd	terete, distinctly beaked	1.5-2.5 cm long, straight, divergent
A. *cognata*	laxly cespitose perennial	frequently branched	apices villous	involute to flat, villous adaxially	narrow with ascending branches	2nd 1-2 mm longer than 1st	terete, distinctly beaked	10-15 mm long, straight, ascending
A. *refracta*	densely tufted perennial	erect, sparingly branched	apices long-bearded	involute to filiform, with a few long hairs adaxially	narrow, lax with ascending branches	2nd 1-2 mm longer than 1st	terete, scarcely beaked	ca. 1 cm long, often spirally contorted

TABLE 1. Comparison of diagnostic features of Puerto Rican and Virgin Island aristidas.

Aristida squarrosa Trin. in Spreng. Neu. Entd. 2: 62. 1821. "Habitat in America boreali" (HOLOTYPE: Trinius Herbarium) (Hitchcock 1924:552). *Chaetaria squarrosa* Schult. Mant. 3: 577. 1827. Based on *Aristida squarrosa* Trin.

Aristida spiciformis (Fig. 1) is known from the southern United States, Cuba, Puerto Rico (Hitchcock 1924:553, 1935:391, 1936:90), and Brazil (Henrard 1932:224). It occurs in "sandy barrens in thickets or pine woods" (Hitchcock 1936:90), or "wet pine barrens" (Henrard 1928:583). In Puerto Rico, this species is known only from white sand near Campo Alegre (Britton & Wilson 1924:62, Liogier & Martorell 1982:194), a locality now probably destroyed by urban development, and Laguna Tortuguero.

Because of its restricted range and habitat, the conspicuous long, twisted lemma beak (Fig. 1c), and the long-awned glumes (Fig. 1b), this species should not be confused with any other species of *Aristida* in Puerto Rico.

Specimens examined: PUERTO RICO. **Campo Alegre**: 25 Nov 1913, *Chase 6614* (US) (Amer. Gr. Nat. Herb. 765). **Laguna Tortuguero**: 13 Mar 1980, *Gould 15712* (UPR); 1 Sep 1983, *Proctor 39475* (SJ); 8 Nov 1983, *Liogier 34604* (UPR); 15 Oct 1987, *McKenzie 771* (FLAS, LSU, MO, NMCR, US).

CUBA. **Province: Pinar del Rio**- Colma road: 5 Jan 1940, *Leon & Alain 17454* (US); 28 Nov 1940, *Leon & Alain 19402* (US). **Santa Barbara**: 29 Oct 1920, *Ekman 11971* (US). **Pinar del Rio City**: 28 Oct 1923, *Ekman 17811* (US). **Sabalo**: 22 Jun 1920, *Ekman 11422* (US). **La Maquina**: 28 Nov 1940, *Leon 19402* (US). **Isle of Pines- Los Indios**: 13 Feb 1916, *Britton et al. 14198* (US).

2. ARISTIDA CHASEAE Hitchcock, Contr. U.S. Natl. Herb. 22: 575. 1924. TYPE: PUERTO RICO. BOQUERON, 12 Nov 1913, *Chase 6507* (HOLOTYPE: US! Hrbr. nr. *732548*, as photograph LSU!; ISOTYPE: L- Henrard 1926:90).

Aristida chaseae (Fig. 2) is endemic to Puerto Rico and was previously known only from open, stony ground at Boqueron (Henrard 1926:90, Hitchcock 1924:576, 1935:401, 1936:94, Liogier & Martorell 1982:194), until it was rediscovered by McKenzie on 29 March 1987, along a sandy trail of the Cabo Rojo National Wildlife Refuge, near Corozo, ca. 8 km south of the type locality (*McKenzie 581* LSU, US). Other voucher specimens from this location include: (*McKenzie 723* FLAS, LSU, MO, NMCR, SJ, TAES, UPR, US; *Proctor 43816* IJ, NY, SJ, US). On 20 September 1987, McKenzie and Proctor discovered a third population of the species on the upper slopes of Cerro Mariquita of the eastern end of the Sierra Bermeja Range in southwestern Puerto Rico. Because specimens in this population were old and in poor condition, no voucher specimens were taken until later trips (11 November & 5 December 1987) when the plants had flowered (*McKenzie 816* LSU, NMCR, SJ, UPR, US; *McKenzie 832*

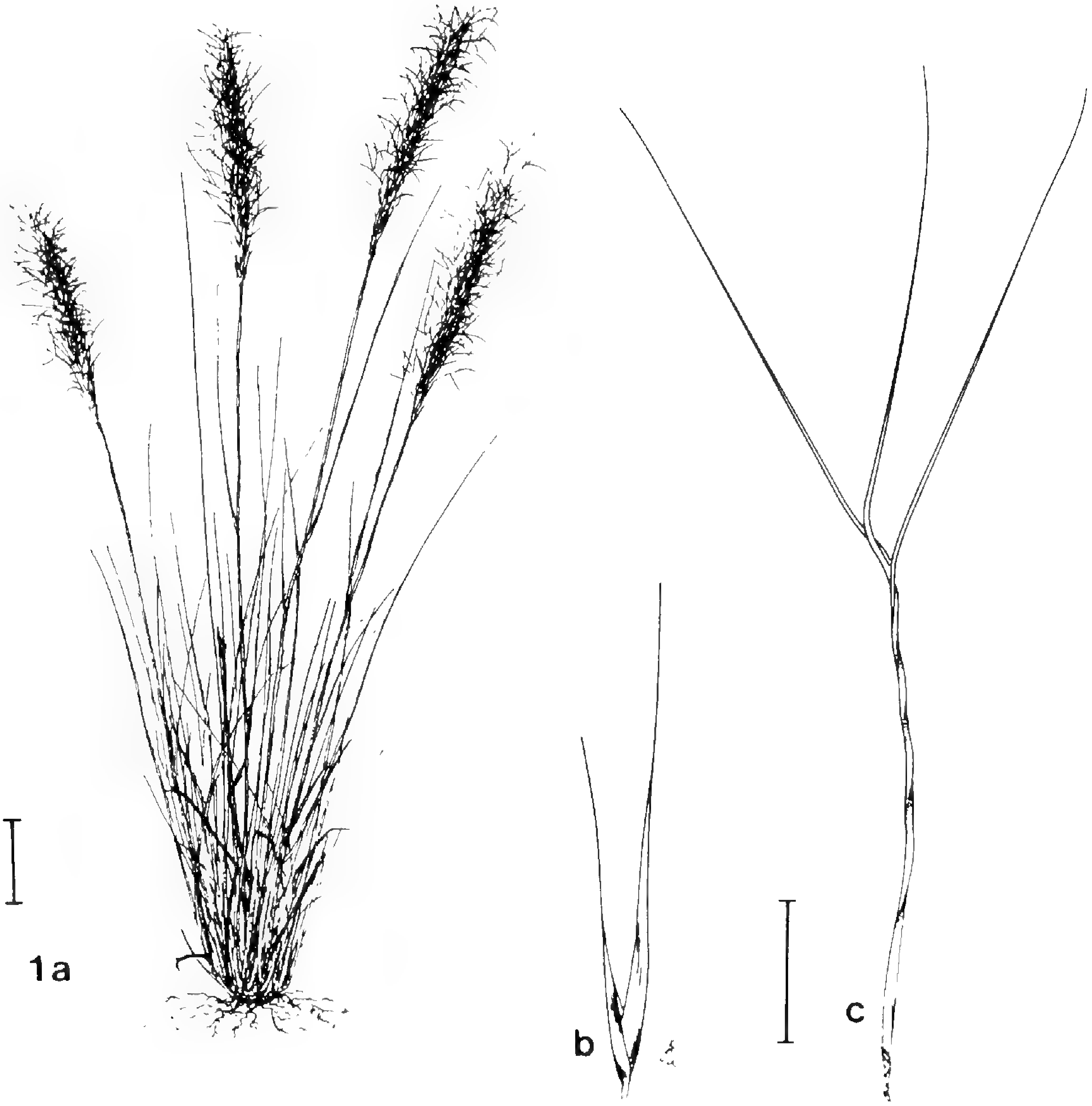


FIG. 1. *Aristida spiciformis* Elliott: a. habit (scale: 4 cm); b. first and second glume; c. lemma, callus, and lemma awns (scale for b & c: 5 mm).

FLAS, LSU, MO, NMCR, SJ, TAES, UPR, US). At this site the grass was growing in an open, rocky habitat similar to that of Chase's original locality. On 28 August and 3 September 1988, McKenzie discovered *A. chaseae* on the upper slopes of ridges of the western end of the Sierra Bermeja (*McKenzie 1003* LSU, SJ, US; *McKenzie 1008* LSU, NMCR, US). The grass was growing on exposed rocky outcrops and openings, usually between 150 and 200 m.

Aristida chaseae is a densely cespitose perennial that has glumes, lemmas and awns similar in length to those of *A. portoricensis*, with which it often associates on the Sierra Bermeja. *Aristida chaseae* can easily be separated from *A. portoricensis* by its contracted panicles with appressed branches, its fewer flowering culms, the often spreading and horizontally reclining nature of the lateral culms, its wider blades, and its ascending awns (Figs. 2a, 2c, 2d). In the presence of long, scattered, villous hairs on the upper surface of the leaf blades near the base (Fig. 2d), *A. chaseae* resembles *A. cognata* and *A. suringarii*. *Aristida chaseae*, however, can be differentiated from the other two species by its longer lemmas and lemma awns (Figs. 2b, 2c). Although some spikelets of *A. chaseae* have glumes where the first glume is longer than the second (Fig. 2b), the majority have either equal glumes or the second glume is longer than the first. The second glume of *A. suringarii* is always conspicuously shorter than the first glume.

We disagree with Hitchcock's (1924:576) and Henrard's (1926:90) suggestion that *A. chaseae* is similar in habit to *A. cognata*. *Aristida chaseae* differs from *A. cognata* by having more contracted panicles with appressed branches and by the often spreading and horizontally reclining nature of the culms (Fig. 2a). The habit, narrow panicles with appressed branches, and glume and lemma lengths, leads us to believe that *A. chaseae* has closer affinities with *A. erecta* Hitchc. of Cuba. *Aristida chaseae* differs from *A. erecta* in having thinner culms, shorter and narrower leaf blades that are adaxially villous near the base, longer lemma calluses, and equal awn lengths. In Hitchcock's keys (1924:532, 1936:88), *A. chaseae* is separated from other species in the West Indies in having awns of the lemma "not conspicuously contorted at the base at maturity," and by having "involute" blades. We have observed, however, that the awns are contorted in very old plants at Cerro Mariquita. Additionally, we have noted that although the blades of *A. chaseae* are involute on herbarium specimes, the blades of live specimens are conspicuously flat during periods of sufficient rain. On the Sierra Bermeja, due to the poorer condition of the soil, plants of *A. chaseae* are not as robust as plants found in deep sand on the Cabo Rojo National Wildlife Refuge.

Additional specimens examined : PUERTO RICO. **Cabo Rojo National Wildlife Refuge**: 29 Mar 1987, *McKenzie 581* (LSU, US); 2 Sep 1987, *McKenzie 723* (FLAS, LSU, MO, NMCR, SJ, TAES, UPR, US); *Proctor 43816* (IJ, NY, SJ, US). Cerro Mariquita: 22 Nov 1987, *McKenzie 816* (LSU, NMCR, SJ, UPR, US); 5 Dec 1987, *McKenzie 832* (FLAS, LSU, MO, NMCR, SJ, TAES, UPR, US). Sierra Bermeja- western ridges: 28 Aug 1988, *McKenzie 1003* (LSU, SJ, US); 3 Sep 1988, *McKenzie 1008* (LSU, SJ, US).

3. ARISTIDA PORTORICENSIS Pilger in Urban, Symb. Antill. 4: 100. 1903. TYPE: PUERTO RICO. Monte Mesa, Mayaguez, 24 Oct 1884, *Sintenis 77* (HOLOTYPE: B, destroyed; photograph of holotype: US!, as photograph LSU!; ISOTYPE: US! Hrbr. nr. *820706*, as photograph LSU!).

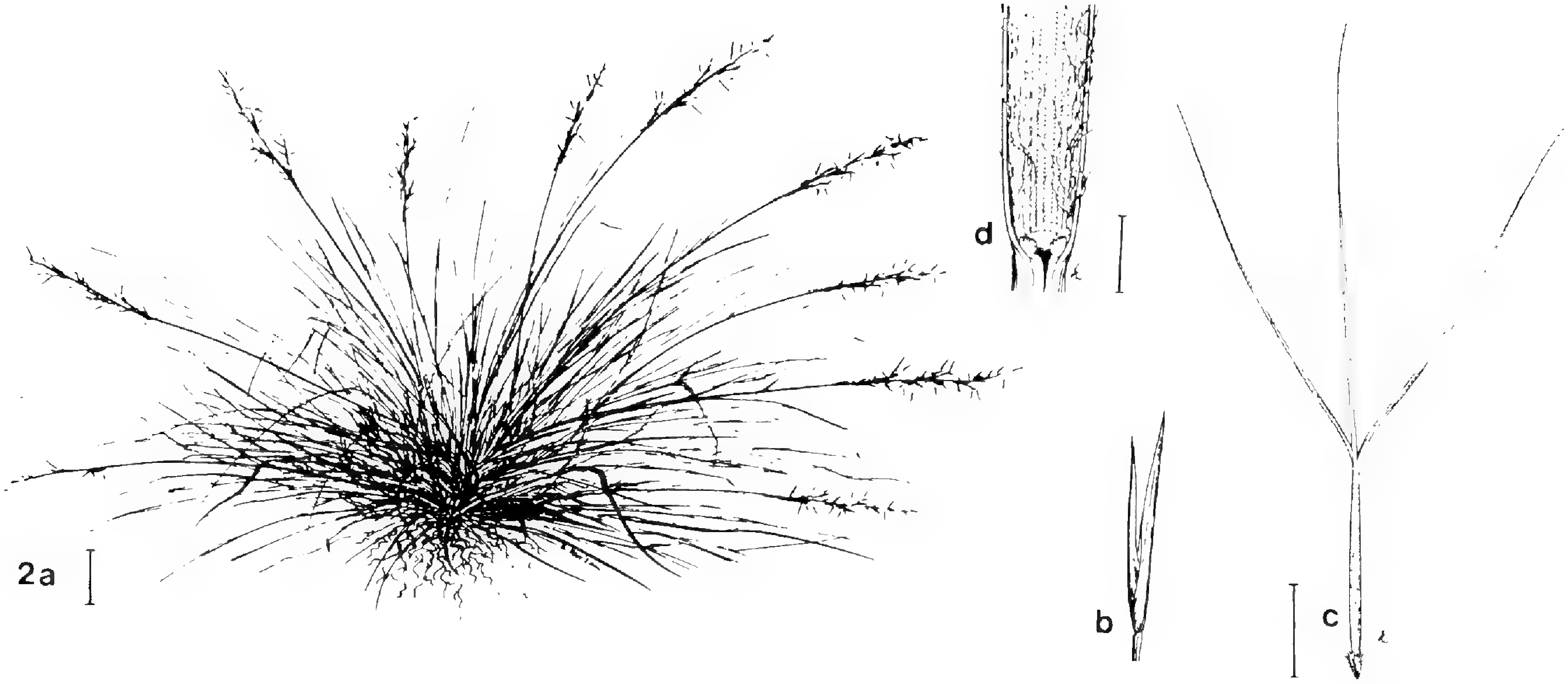


FIG. 2. *Aristida chaseae* Hitchcock: a. habit (scale: 7 cm); b. first and second glume; c. lemma, callus, and lemma awns (scale for b & c: 5 mm); d. ligule and base of upper surface of leaf blade (scale: 2 mm).

Aristida portoricensis (Fig. 3) is endemic to Puerto Rico and was previously known only from red clay slopes on Cerro Las Mesas at Mayaguez (Hitchcock 1924:575, 1935:400, 1936:94, Henrard 1927:463, Liogier & Martorell 1982:194) and Hormiguero (pers. comm., Susan Silander, Botanist, United States Fish and Wildlife Service, Caribbean Field Office, Boqueron, Puerto Rico, 1987), and serpentine banks at Guanajibo, Puerto Rico (Britton & Wilson 1924:62, Liogier & Martorell 1982:194). On 20 September 1987, McKenzie and Proctor discovered a population of this species on the upper slopes of Cerro Mariquita of the eastern Sierra Bermeja (*McKenzie 739* LSU; *Proctor 43948* SJ). The species was growing on exposed rock crevices, often in association with *A. chaseae* and Digitaria eggersii (Hack.) Henrard (McKenzie et al. 1989a). Additional voucher specimens were taken at this locality on subsequent dates (*McKenzie 817* FLAS, LSU, MO, NMCR, SJ, TAES, US; *McKenzie 833* FLAS, LSU, MO, NMCR, SJ, TAES, UPR, US; *Proctor 44211* SJ). On 28 August and 3 September 1988, McKenzie discovered *A. portoricensis* on the upper slopes of ridges of the western end of the Sierra Bermeja (*McKenzie 1004* LSU, SJ; *McKenzie 1009* LSU). The species was growing on exposed rocky outcrops and openings, usually between 180 and 200 m.

As already discussed with respect to awn and glume length, this species is similar to *A. chaseae*, but can be readily identified by its open or loose panicles, its erect lateral culms, its narrower blades, and its ascending to nearly horizontally spreading awns (Figs. 3a, 3b, 3c).

Additional specimens examined : PUERTO RICO. **Cerro Las Mesas**: 8 Apr 1938, *Otero & Alvarez 544* (UPR); 20 Nov 1938, *Molinari 301* (UPR); 25 Mar 1980, *Gould 15823, 15835* (UPR); 10 Oct 1986, *Proctor 42290* (SJ); 15 Jun 1987, *McKenzie 635* (FLAS, LSU, MO, NMCR, US); 10 Nov 1987, *Proctor 44170* (SJ). **Guanajibo**: 18 Feb 1915, *Britton et al. 4361* (LSU). **Cerro Mariquita**: 20 Sep 1987, *McKenzie 739* (LSU), *Proctor 43948* (SJ); 22 Nov 1987, *McKenzie 817* (FLAS, LSU, MO, NMCR, SJ, TAES, US), *Proctor 44211* (SJ); 5 Dec 1987, *McKenzie 833* (FLAS, LSU, MO, NMCR, SJ, TAES, UPR, US). **Sierra Bermeja- western ridges**: 28 Aug 1988, *McKenzie 1004* (LSU, SJ); 3 Sep 1988, *McKenzie 1009* (LSU).

4. ARISTIDA ADSCENSIONIS L. Sp. Pl. 82. 1753. TYPE: "In Insula Adscensionis," *Earle 559* (HOLOTYPE: Linnaean Herbarium, LSU microfiche nr. 2(73)−98.1!).

Aristida maritima Steud. Syn. Pl. Glum. 1: 137. 1854. TYPE: "In martimis Guadeloupe." (HOLOTYPE: P).

Aristida debilis Mez, Repert. Sp. Nov. Fedde. 17: 151. 1921. "Venezuela (Mortiz); Jamaica (MacNab)". Hitchcock (1924:543) and Henrard (1926:132−133) are in disagreement on which collection should be taken as the type for *A. debilis*.

Aristida adscensionis L. var. *typica* Stapf. O. Stapf in J. D. Hooker, Flora of British India, Vol. VII. 1897:224.

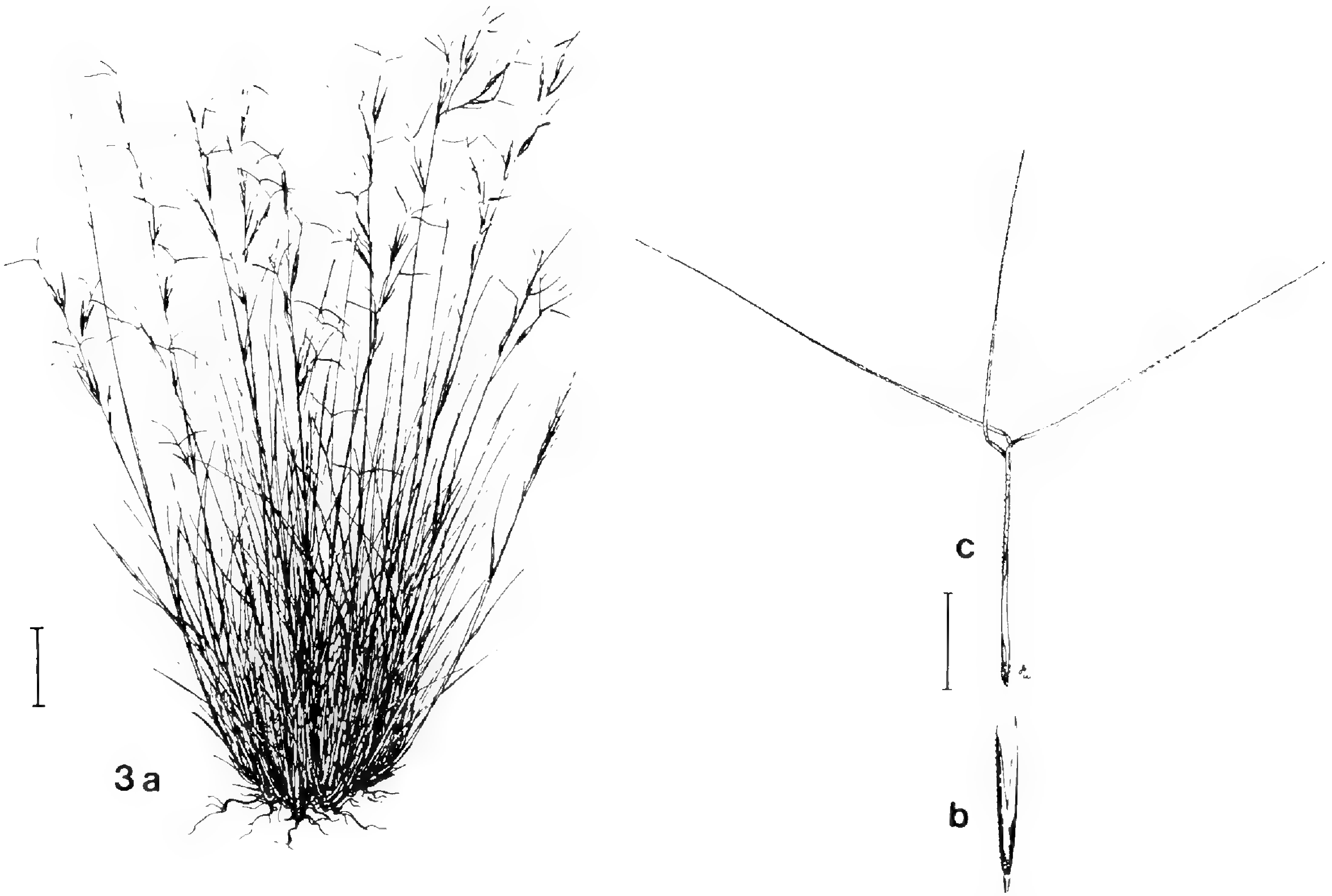


FIG. 3. *Aristida portoricensis* Pilger: a. habit (scale: 4 cm); b. first and second glume; c. lemma, callus, and lemma awns (scale for b & c: 5 mm).

Aristida bromoides H.B.K. Nov. Gen. & Sp. 1:122. 1815. For a more complete discussion on the synonymy of this species see Hitchcock (1924:541 – 543, 1935:386 – 387).

Aristida adscensionis is a weedy species, occupying dry ground and waste places, and is widely distributed throughout the warmer parts of America and the Old World (Hitchcock 1924:543, 1935:387, 1936:89, Henrard 1932:322, Correll & Correll 1982:98). The species is apparently common in the southwestern districts of Puerto Rico and throughout the Virgin Islands (Hitchcock 1936:89, Lindeman & Stoffers 1963:136, Correll & Correll 1982:98, Liogier & Martorell 1982:194).

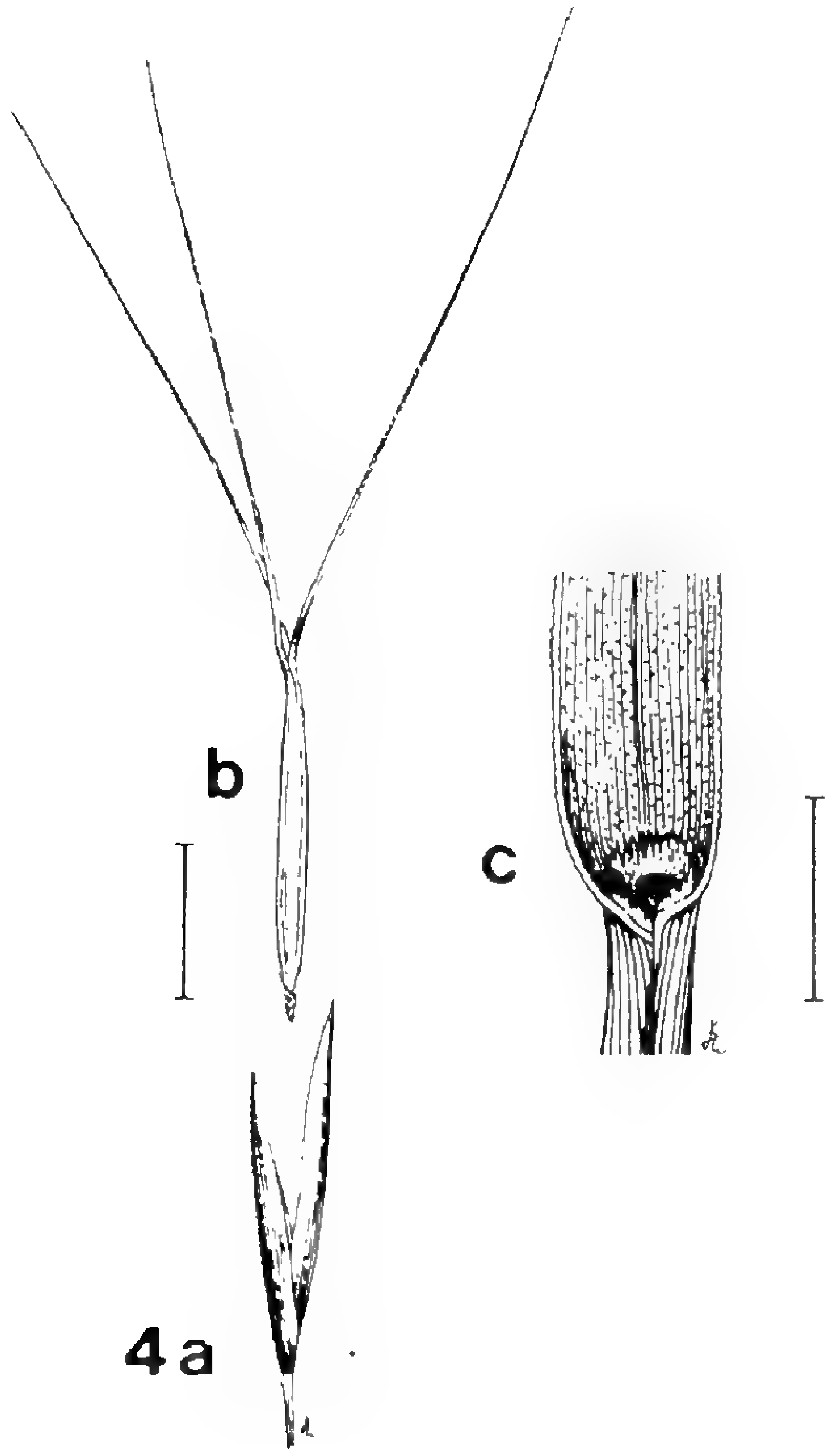
This is a highly variable species, ranging from small plants with short, involute blades and erect 5 – 10 cm long panicles, to large plants with long (up to 10 cm), sometimes flat (to 2 mm wide) blades, and open or loose, somewhat drooping (to 15 cm long) panicles (Hitchcock 1924:543, 1935:387, Henrard 1932:322). In awn and callus length (Figs. 4b), larger individuals of this species with open or loose, drooping panicles resemble *A. cognata* or *A. suringarii*. *Aristida adscensionis*, however, lacks the long villous hairs on the throat (sheath apex) and upper surface of the leaf blades near the base (Fig. 4c). It is a weedy annual or occasionally a short lived perennial, and the lemmas lack a beak and are often flattened near the apex.

Specimens examined. Unless stated otherwise, specimen citations are US. PUERTO RICO. **Boqueron**: 12 Nov 1913, *Chase 6506, 6510*. **Guanica**: 25 Jan 1886, *Sintenis 3438*; 13 Feb 1886, *Sintenis 3766*; 8 Apr 1936, *Velez 747* (LSU); 17 Nov 1954, *Schubert et al. 371*; 7 Sep 1979, *del Llano et al. s.n.* (UPR); 26 Sep 1979, *A. Liogier et al. 29512* (UPR); 9 Nov 1982, *A. Liogier et al. 33630, 33683* (UPR); 11 Dec 1985, *A. Liogier et al. 35794* (UPR). **Desecheo Island**: 5 Apr 1967, *Woodbury & Martorell D-99* (UPR); 13 Jul 1968, *Woodbury & Martorell D-65* (UPR); 27 Jun 1986, *McKenzie 319* (LSU, NMCR). **Pole Ojea**: 7 Jul 1987, *McKenzie 693* (FLAS, LSU, MO, NMCR, US); 4 Dec 1987, *Proctor 44259* (SJ). **Salinas de Cabo Rojo**: 14 Feb 1885, *Sintenis 553*. **Southern dry coast**: 20 Dec 1938, *Velez 1376*. **La Parguera**: 21 Oct 1987, *McKenzie 778* (FLAS, LSU, MO, NMCR, US). **Sierra Bermeja- western ridges**: 28 Aug 1988, *McKenzie 1005* (LSU, NMCR, US). **El Tuque**: 18 Nov 1980, *A. Liogier et al. 31204* (UPR). **Mona Island**: 24 Feb 1914, Hess 437; 22 – 24 Feb 1968, *Woodbury et al. M-10* (UPR); 20 Jul 1944, *Chardon et al. 818* (UPR).

ST. CROIX. **New Fort**: 11 Nov 1895, *Ricksecker 64*. **Frederiksted**: 1 Feb 1913, *Rose et al. 3211*. **Anna's Hope**: 10 May 1923, *Thompson 28* (UPR). Without locality: 9 Oct 1921, *Thompson 22*; Feb 1941, *Molinari 300* (UPR); Jun 1942, *Molinari 299* (UPR).

CUBA. Province: **Oriente- Santiago**: 11 Aug 1951, *Webster 4055*. **Guantamamo**: 28 Jul 1951, *Webster 3951*. Between Maria Pilar and the mouth of Rio Bacuranao: 6 Nov 1916, *Ekman 8248*. **Caimanera**: Nov 1920, *Hioram 1263*.

JAMAICA. **Flamstead**: 26 Nov 1912, *Harris 11474*. **St. Andrew**: 12 Jan 1912, *Harris 11480*. **Park Camp**: 9 Dec 1912, *Harris 11500*. **Gordon Town**: 8 Dec 1912, *Harris 11513*. **Kingston**: 28 – 29 Feb 1908, *Britton & Hollick 1746*; 18 Nov 1916, *Harris 12452*. Haiti. **Fort National**: 1 Apr 1920, *Leonard 3451*; 22 May 1929, *Leonard & Leonard 15878, 15881*. **Cal de Lai**: Aug 1921, *Buch 2041*. **Matheux**: 18 Jul 1924, *Ekman 960*. **Cabaret**: 12 Jan 1929, *Leonard & Leonard 11852*; 13 Jan 1929, *Leonard & Leonard 11863*; 14 Jan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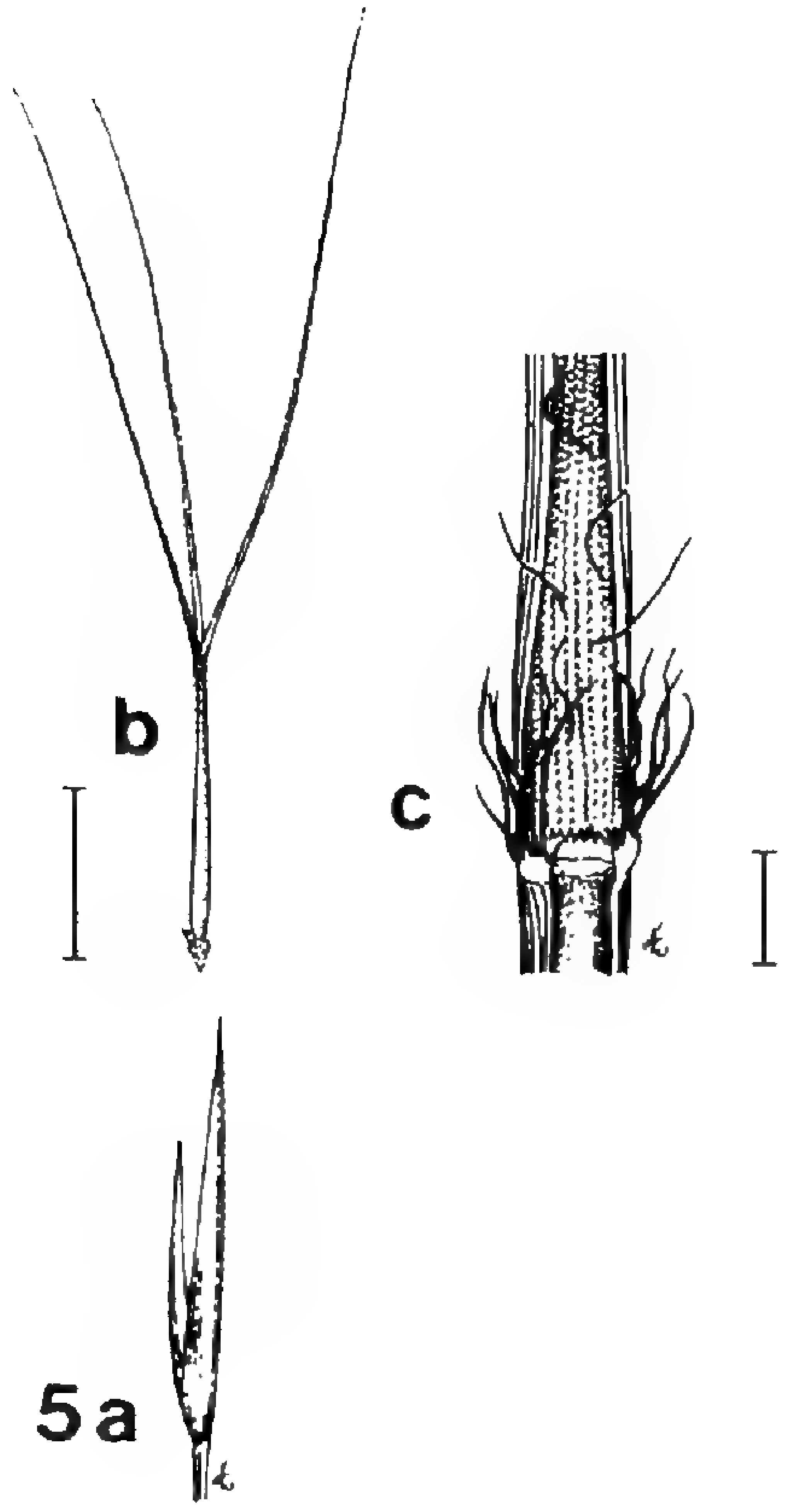
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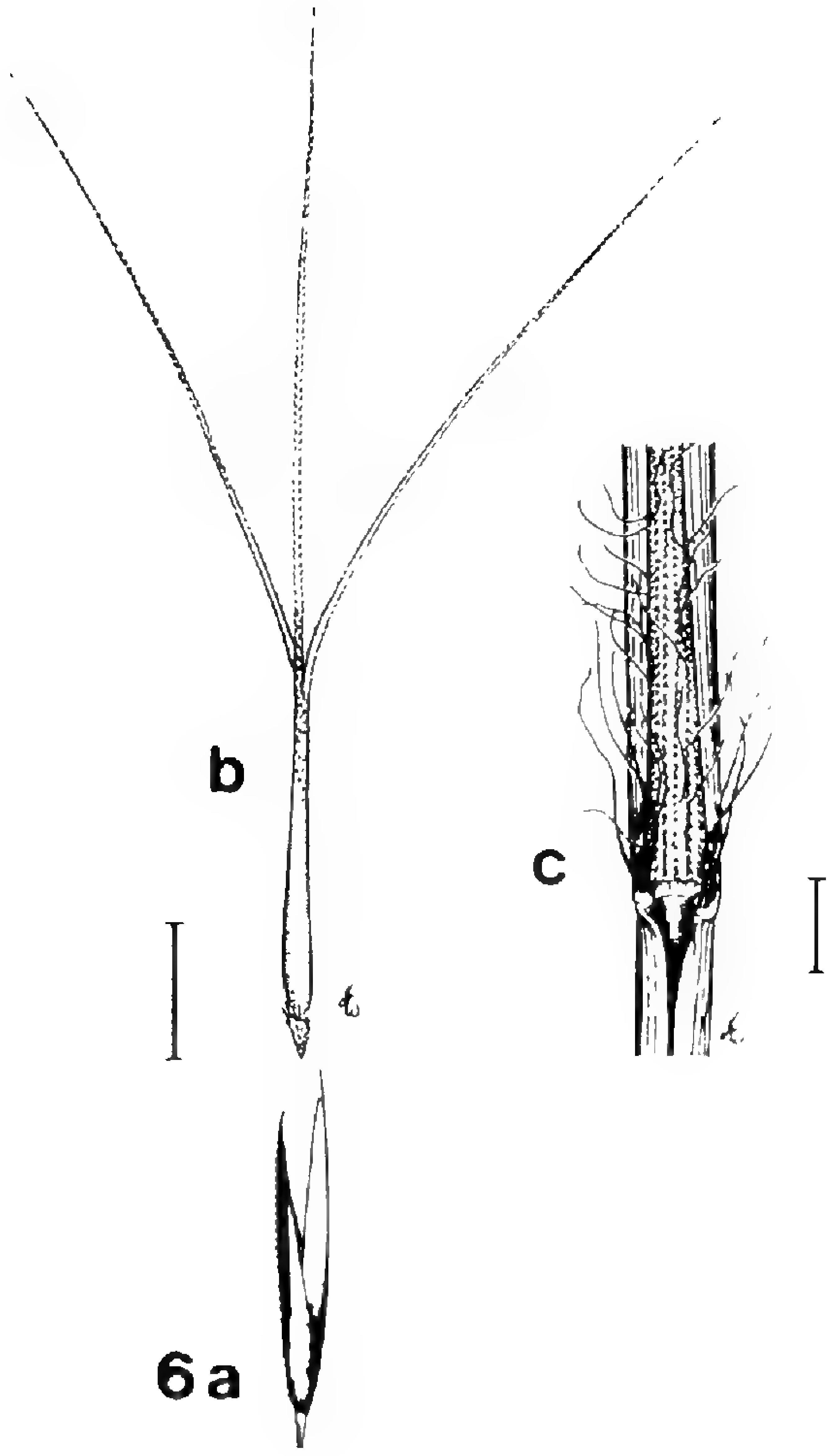
b
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6a

1929, *Leonard & Leonard 11960*. **Jean Rabel**: 6 Feb 1929, *Leonard & Leonard 12968*. **Mole St. Nicolas**: 17 Feb 1929, *Leonard & Leonard 13343*. **Port au Prince**: 3 Jul 14 1941, *Bartlett 17488*; 26 Sep 1950, *Anderson 1309*.

DOMINICAN REPUBLIC. **Province Monte Cristi- Guayubin**: 17 Feb 1921, *Abbott 955*. **Parole**: 29 Jan 1949, *Jimenez 1803*. **El Morro**: 2 Feb 1958, *Jimenez 3622*. **Province Valverde**: 7 Mar 1929, *Ekman 13096*; 19 Aug 1959, *Jimenez 4085*. **Province Barahona**: 17 Aug 1946, *Howard & Howard 8406*. **Province Azua**: 29 Aug 1946, *Howard & Howard 8637*.

BAHAMAS. **Fortune Island (Long Cay)**: Nov 1890, *Hitchcock s.n.*; 7 – 17 Dec 1905, *Brace 4077*; 16 – 19 Mar 1907, *Britton & Millspaugh 6309*. **Crooked Island**: 9 – 23 Jan 1906, *Brace 4633*. **South Caicos**: 9 Jul 1954, *Proctor 9133*; 11 Feb 1978, *Correll 49447*. **Great Inagua**: 4 Mar 1974, *Correll 41806* (GH, FTG); 20 Jul 1976, *Correll 47422* (FTG). **Grand Turk, Waterloo**: 28 Nov 1977, *Correll 49214*. **Hog Cay**: 19 Jan 1979, *Correll & Correll 50430* (FTG). **Guadeloupe**: 1892, *Duss 3159*; 5 Mar 1941, *Desirade 4854*. **St. Bartholomew**: 30 Jun 1938, *Gastavia 336*. **Antigua**: 11 Jan 1932, Box 127; Mar 1937, *Box 555*. **Montserrat**: 19 Jan 1907, *Shafer 18*. **Saba Island**: 29 Jan 1947, *Arnoldo 909*.

5. ARISTIDA SURINGARII Henrard. Meded. Rijksherb. Leiden 54B: 616. 1928. TYPE: St. Eustatius, Surgarloaf, 11 May 1885, *Suringar s.n.* [HOLOTYPE: L!, Herb. Lugd. Batav. No. *908.84-1084*, Rijksherbarium no. *L. 8612 No. 3*, as photograph LSU!; PARATYPE: St. Eustatius, White Wall, 15 April 1885, *Suringar s.n.* (L!), Herb. Lugd. Batav. No. *908.84-1043*, Rijksherbarium no. *L. 8612 No. 2*, as photograph LSU!].

Aristida suringarii extends from St. Croix and St. Thomas through the Netherlands Antilles (Henrard 1932:253, Lindeman & Stoffers 1963:138), to Venezuela (State of Sucre, near Quetepe, east of Cumana, 23 May 1945, *Julian A. Steyermark 62879* US, hrbr. nr. *1869685*). The only record of *A. suringarii* for Puerto Rico is a specimen collected from a limestone plateau on Mona Island, 3 March 1944, by C.E. Chardon and J.I. Otero (*Chardon & Otero 819* UPR). This specimen, however, was previously identified erroneously as *A. adscensionis* (Woodbury et al. 1977:13, McKenzie et al. 1989b). Lindeman & Stoffers (1963:138) described the habitat for *A. suringarii* as "rocky and open grounds."

In its habit and the presence of scattered, long, white hairs at the base of the upper surface of the leaf blade (Fig. 5c), *A. suringarii* is similar to *A. cognata* and *A. chaseae*. Additionally, the awn and lemma lengths (Fig. 5b)

FIG. 4. *Aristida adscensionis* L.: a. first and second glume; b. lemma, callus, and lemma awns (scale for a & b: 3 mm); c. ligule and base of upper surface of leaf blade (scale: 1 mm).

FIG. 5. *Aristida suringarii* Henrard: a. first and second glume; b. lemma, callus, and lemma awns (scale for a & b: 3 mm); c. ligule and base of upper surface of leaf blade (scale: 1 mm).

FIG. 6. *Aristida cognata* Trin. et Rupr.: a. first and second glume; b. lemma, callus, and lemma awns (scale for a & b: 3 mm); c. ligule and base of upper surface of leaf blade (scale: 1 mm).

of the spikelets of *A. suringarii* are similar to those of *A. cognata*. It can be readily distinguished from *A. cognata*, however, by the inverse position of the glumes (i.e., the first glume is ca. 1 – 2 mm longer than the second: Fig. 5a). In *A. cognata*, the second glume is ca. 1 – 2 mm longer than the first (Fig. 6a). *Aristida suringarii* can be differentiated from *A. chaseae* by the much shorter lemmas and lemma awns (Fig. 5b), by its more open panicles with diffuse branches, and its lack of spreading and horizontally reclining lateral culms. With its inverse glume position, *A. suringarii* resembles *A. arubensis* Henrard of Aruba and Curacao. That entity, however, has much shorter, unbranched culms, longer awns, and reportedly longer glumes [first glume 11 – 12 mm long; second glume 8 mm long: Henrard (1926:41, 1932:253), Lindeman & Stoffers (1963:136)]. We have examined original material of *A. arubensis* (Aruba, 4 Feb 1885, *Suringar s.n.*, Leiden- Herb. Lugd. Batav. No. *908.84-423*, Rijksherbarium no. *L. 8612 No. 1*), however, and noted that the glume lengths are within the range of *A. suringarii* (i.e., the first glumes are 7.0 – 9.5 mm long, and the second glumes are 5.5 – 7.0 mm long). Although Henrard (1926:42) indicated that he had viewed additional type material from Leiden (Herb. Lugd. Batav. sub. No. *908.84-422*; paratype: Curacao, Christoffelberg, 21 Jan 1885, *Suringar s.n.*, Herb. Lugd. Batav. sub. No. *908.84-425*, Henrard 1926:42), we have not seen these referenced specimens. Consequently, the longer glume lengths recorded by Henrard (1926:41) in his original description may be based on type material not studied by us, or may represent a measuring error by Henrard. Regardless, future studies need to assess the taxonomic relationships between *A. suringarii*, *A. arubensis*, and *A. venesuelae* Henrard.

Henrard (1932:252) and Lindeman & Stoffers (1963:138) reported that lemmas of *A. suringarii* were characterized by having a distinct nodule at the summit. Earlier, however, Henrard (1928:617) described such nodules at the summits of the lemmas of *A. suringarii* as being "faint." In our opinion, these nodules are hardly discernible and therefore inappropriate in a key covering species of *Aristida* in Puerto Rico and the Virgin Islands. Using nodules as an aid in identification would be more appropriate for members of the section *Pseudarthratherum* Chiovenda, where the awns are articulated with the twisted column just below their branching point (Henrard 1932:34, 117).

Previous authors (Henrard 1928:616, 1932:253; Lindeman & Stoffers 1963:138, McKenzie et al. 1989) have published *A. suringarii* with only one "i" on the ending (i.e., *A. suringari*). However, based on articles 73 & 75 of the International Code of Botanical Nomenclature (1988:71 – 77) the termination should be with "ii." Consequently, we have included the proper ending for *A. suringarii* in this report.

Additional specimens examined: ST. CROIX: without locality or date, *Benzon s.n.* **Buck Island:** Jun 1969, *Woodbury s.n.* (UPR).

PUERTO RICO. **Mona Island:** 3 Mar 1944, *Chardon & Otero 819* (UPR).

VENEZUELA. **State of Sucre:** near Quetepe, E of Cumana: 23 May 1945, *Julian A. Steyermark 62879* (US), hrbr. nr. *1869685*.

6. Aristida cognata Trinius et Ruprecht. Mem. Acad. St. Petersburg. V1. Sci. Nat. 5: 127. 1842. Type: "Ins. St. Thomas- Ind. Occ." (holotype: Ventenat Herbarium, photograph of holotype: US! Hrbr. nr. *81001*, as photograph LSU!; fragment of holotype: US! Hrbr. nr. *81001*). Note: although Hitchcock (1924:577) indicated that the holotype was at the Trinius Herbarium, Henrard (1928:619) (and repeated as a note on a photograph of the holotype US! Hrbr. nr. *81001*) stated that the holotype was at the Ventenat Herbarium.

Aristida cognata var. *media* Trin. et Rupr. Mem. Acad. St. Petersburg. V1. Sci. Nat. 5: 128. 1842. Fragment of isotype: US! Hrbr. nr. *81000*! Type locality: unknown; apparently cultivated.

The range of *A. cognata* is not clear. Henrard (1926:105 – 106, 1932:314), Hitchcock (1924:577, 1935:401, 1936:96) and Lindeman and Stoffers (1963:139) indicated that the species was restricted to the Virgin and Windward Islands. Although, Britton & Millspaugh (1920:31) and Correll & Correll (1982:98) listed the species for the Bahamas, all specimens of *Aristida* that we have examined from these islands that were previously identified as *A. cognata*, are *A. adscensionis* [e.g., *Correll 41806* (GH, FTG), *Correll 47422* (FTG), and *Correll & Correll 50430* (FTG)]. These specimens all lack the long villous hairs on the upper surface of the leaf blade near the base, a characteristic diagnostic for *A. cognata*. Part of the problem could be in keys that stress the usually annual habit of *A. adscensionis*. We agree with McVaugh (1983:53) that the annual habit of *A. adscensionis* "may be difficult or impossible to determine from herbarium material, especially in the case of large plants . . ." Some specimens of *A. adscensionis* that we have examined would be better described as short-lived perennials and not annuals. Kelly Allred (pers. commun., New Mexico State University- NMCR, March 1989) reported the same characteristic for many specimens of the species collected in western North America.

We can find only four references that indicate that the Greater Antilles is included in the range of *A. cognata*: Britton & Millspaugh (1920:31- Jamaica), Britton & Wilson (1924:62- Puerto Rico), Jimenez (1966:6 – 7- Hispaniola) and Gould (1979:94- Cuba). Because Adams (1972:168) did not list *A. cognata* for Jamaica, Britton & Millspaugh's (1920:31) report of the species for the island may be based on material referable to *A. swartziana* Steud., an apparent close relative (Henrard 1926:105 – 106, Hitchcock 1924:577). Britton & Wilson's (1924:62) statement that *A. cognata* occurred in Puerto Rico was based on a specimen collected near Boqueron, Puerto Rico, in 1913 by A. Chase. This specimen (Chase 6507: Holotype: US! hrbr. nr. *732548*, as photograph LSU!) later proved, however, to be type material for *A. chaseae* (Hitchcock 1924:576; see Liogier 1965:319 and Liogier & Martorell 1982:194). Based of a specimen collected in Dominica Republic by Jimenez (*Jimenez 2462* US), Hispaniola was included within the range of *A. cognata* (Jimenez 1966:6 – 7). Gould (1979:94) listed the species for Cuba, and we have examined specimens from the island that are referable to this species (*Leon 12316* GH, US: hrbr. nr. *1258995; Leon 9128* US: hrbr. nr. *2378694*).

Amshoff (1942), Velez (1957), and Fournet (1978:103 – 104) indicated that *A. cognata* occurred on the islands of Guadeloupe and Martinque of the Lesser Antilles. Based on two specimens (*Shafer 48* US, *Shafer 430* US) taken on Monserrat Island, Hitchcock (1924:577) also included the Lesser Antilles within the range of *A. cognata*. Gould (1979:94), however, refuted this claim and indicated that these specimens should be identified as *A. adscensionis*. After examining these specimens, however, we agree with Hitchcock's assessment. Both specimens are perennials with long villous hairs on the upper surface of the leaf blade near the base. These characteristics are diagnostic for *A. cognata* and not *A. adscensionis*. Interestingly, in his description of *A. cognata*, Gould (1979:94) failed to mention the diagnostic long villous hairs on the upper surface of the leaf blade near the base, a feature consistently emphasized by other authors (Henrard 1932:313; Hitchcock 1924:577, Lindeman & Stoffers 1963:135,139).

Steyermark (1957:786) and Pittier et al. (1945:90) listed *A. cognata* for Venezuela, and we have examined specimens of this species from that country: (*Chase 12601* GH, *Gines 2699* US).

In summary, we believe that the correct range for *A. cognata* should be listed as Cuba, Hispaniola, the Virgin Islands, Windward Islands, Lesser Antilles, and Venezuela.

Habitat for *A. cognata* has been described as rocky soil (Lindeman & Stoffers 1963:139) and dry hillsides (Hitchcock 1936:96). In its habit, awn length, lemma length, and presence of long, scattered, villous hairs on the upper surface of the leaf blades near the base (Figs. 6a, 6b, 6c), *A. cognata* resembles *A. suringarii*, but the glume position is reversed in the two species (Figs. 5a, 6a). In *A. cognata*, the second glume is conspicuously longer than the first glume (Fig. 6a), while in *A. suringarii* the first glume is the longest glume (Fig. 5a). The villous hairs on the upper surface of the leaf blades of *A. cognata* (Fig. 6c) are also similar to the hairs on the leaf blades of *A. chaseae*, but *A. chaseae* has much longer glumes, lemmas and lemma awns (Figs. 2b, 2c). *Aristida cognata* may also resemble typical specimens of *A. adscensionis* that have drooping panicles. It can be separated from that species by the long villous hairs (to 1.5 – 3.0 mm long) on the upper surface of the leaf blades near the base and throat (sheath apex) (Fig. 6c), its beaked lemmas, and its perennial habit.

Depauperate specimens of *A. cognata* that have unusually involute leaf blades (e.g. Montserrat, West Indies: 7 Feb 1907, *Shaefer 430* (US), hrbr. nr. *695382*) can be differentiated from *A. refracta* by the usually longer lemmas (Fig. 6b), the more tapering summit of the lemma column (thus distinctly beaked: Fig. 6b), and the longer second glumes (Fig. 6a), and the lack of conspicuous, basal tufts of dense filiform leaves. Specimens of *A. cognata* with abnormally short lemmas (to 5.2 mm) and second glumes (to 5.5 mm) [e.g., Montserrat, West Indies: 20 Jan 1907, *Shafer 48* (US), hb. nr. *695088*] can be distinguished from *A. refracta* by its longer lemma beaks, its geniculate culms, by the lack of a basal tuft of dense filiform leaves, and the distinctly beaked lemmas. Depauperate specimens of *A. cognata* that resemble *A. refracta* in habit (e.g. Cuba-Oriente Province: Jul 1924, *Leon 12316* GH, US: hrbr. nr. *1258995*), can be differentiated from that entity by the longer glumes and lemmas, and by the presence of a distinct lemma beak.

Additional specimens examined. ST. THOMAS: Dec 1882, *Eggers 119* (US). **Water Island**: Jan 31-Feb 4 1913, *Britton et al. 119* (US); 8 – 9 Nov 1969, *Woodbury et al. WI-9* (UPR); **Signal Hill**, Mar 1 – 5 1913, *Rose 3189*.

ST. JOHN. **Rustenberg**: without date, *Eggers 3003* (US). **Monserrat Island, Plymouth**: 20 Jan 1907, *Shafer 48* (US); 7 Feb 1907, *Shafer 430* (US).

VENEZUELA. **Cuidad Bolivar**: 2 Apr 1940, *Chase 12601* (GH). **Los Bayres**: Dec 1951, *Gines 2699* (US).

7. ARISTIDA REFRACTA Grisebach. Catalogus Plantarum Cubensium 228. 1866. TYPE: "Cuba occ. (*Wright 3431*)" [(HOLOTYPE: Grisebach-Hitchcock (1924:585)]. Fragments at the US!, hrbr. nr. *981856*, are Wright 3431, but no information is given on whether they are from the holotype or an isotype. Hitchcock's report (1924:585) that "a specimen of Wright's no. 3431 is in the U.S. National Herbarium," is apparently referable to the above-mentioned fragments.

Aristida refracta (Fig. 7) is restricted to the Greater Antilles (Henrard 1932:284, Hitchcock 1936:97) and occurs on dry slopes and in pine woods (Hitchcock 1924:585, 1935:406, 1936:97). In Jamaica, Adams (1972:168) stated that the species was "local in clearings in arid woodlands and thickets". In Puerto Rico, the grass is known only from serpentine slopes at Guanajibo, near Boqueron (Liogier & Martorell 1982:194), Susua Alta near Yauco (*Velez 1157* LSU), and Guyanes (*Woodbury s.n.* UPR).

Although the majority of specimens of *A. refracta* have a conspicuous, short tuft of basal leaves (4 – 10 cm long) (Fig. 7a), the species is quite variable, ranging from robust plants that lack a basal tuft and with longer leaves (to 26 cm long) and thicker culms, to individuals that have acicular leaves with much longer, unbranched inflorescences. *Aristida refracta* has previously been differentiated, in keys, from other species in the West Indies by the spiral contortion of the awns at maturity (Hitchcock 1924:533, 1935:379, 1936:89). Although we agree with Hitchcock (1924:585), that this characteristic is not a consistent feature of the species, it can occasionally be used to distinguish *A. refracta* from depauperate specimens of *A. cognata* that have unusually short lemmas and glumes. Additionally, *A. refracta* can be differentiated from specimens of *A. cognata* that have unusually involute blades by the shorter, scarcely beaked lemmas (Fig. 7c), the shorter second glumes (Fig. 7c), and by the usually conspicuous, unbranched, basal tufts of dense filiform leaves.

Additional specimens examined. Unless stated otherwise, specimen citations are US. PUERTO RICO. **Guanajibo**: 18 Feb 1915, *Britton et al. 4358* (UPR, US); **Yauco**: Aug 1937, *Velez 1157* (LSU). **Guyanes**: 16 Oct 1968, *Woodbury s.n.* (UPR). **Boqueron**: 12 Nov 1913, *Chase 6508*.

CUBA. **Province: Habana-Guanabacoa**: 15 – 20 Mar 1906, *Hitchcock 231*; 2 Sep 1909, *Leon 875*; 6 Jul 1911, *Leon 2641*; 10 Sep 1914, *Leon 4646*; 27 Nov 1914, *Leon & Hioram 4718*; 26 Aug 1915, *Leon & Hioram 5605, 5606*; 23 Nov 1926, *Hitchcock 23226*; Oct 1927, *Leon 13113*. **Province: Sta. Clara- Manajanabo**: 3 Aug 1915, *Leon & Gustave 5276*. **Mariacas**: 27 Dec 1915, *Cazauas 5830, 5863, 5874*. **Placetas del Sur**: 9 Aug 1918, *Leon & Roca 8179*. **Motembo**: 28 Aug 1922, *Leon & Loustalot 11338, 11340, 11342*; 27 Jun 1923, *Ekman 16816a*. **Province: Oriente- Sierra Nipe**: 4 Dec 1909, *Shafer 2990*; 8 Dec 1909, *Shafer 3080*; 16 – 18 Oct 1941, *Morton & Acuna 3034*. **Loma Mensura**: 1 – 3 Feb 1910, *Shafer 3858*. **Holguin**: 28 Oct 1914, *Ekman 3228*; 17 Nov 1922, *Ekman 15719, 15720*; 4 Jul 1932, *Leon 15714*. **Guaro**: 14 Dec 1926, *Hitchcock 23425, 23426*. **Sierra de Cobre**: 10 Jun 1916, *Ekman 7808*. **Sierra de Moa**: 3 Aug 1945, *Leon et al. 22640*. **Province: Pinar del Rio**- Without locality: 25 Nov 1926, *Hitchcock 23255, 23262*. **Herradura**: 16 Mar 1906, *Hitchcock 233, 499*; 22 Oct 1923, *Ekman 17749*. West of Guane: 21 – 22 Nov 1911, *Shafer 10414*. **Laguna Jovero**: 5, 7 Dec 1911, *Shafer 10718*; 8 Dec 1911, *Shafer 10864*; without date, *Wright 3433, 3833, 3834*. **El Payuco**: 23 Dec 1937, *Killip 32361, 3227*. **Montua-Arroyos**: 28 Dec 1911, *Shafer 11254*. Between San Diego de los Banos and La Salma: 5 Apr 1915, *Leon & Charles 4845*. **Pan de Cojalbana**: 5 Apr 1915, *Leon & Charles 4846*. **Sabana de San Julian de Guane**: 27 Dec 1916, *Leon & Roca 6942, 6971*; Jul 1917, *Lamas & Valdes 7307, 7308*; Aug 1919, *Valdes 8971*; 6 Jun 1920, *Ekman 11107*. **Sabana de Chirigote**: 9 Aug 1917, *Leon 7444, Leon & Roca 7454*. **Remates**: 9 Jun 1920, *Ekman 11162*. **La Grifa**: 14 Jun 1920, *Ekman 11246*. **Las Pozas**: 7 Jan 1921, *Ekman 12737*. Colma road: 25 Nov 1926, *Leon 72856*. **Province Las Villas- Loma Belen**: 24 Jun 1932, *Leon 15623*. **Cumbre Sabana**: 28 Jun 1931, *Leon 14926*.

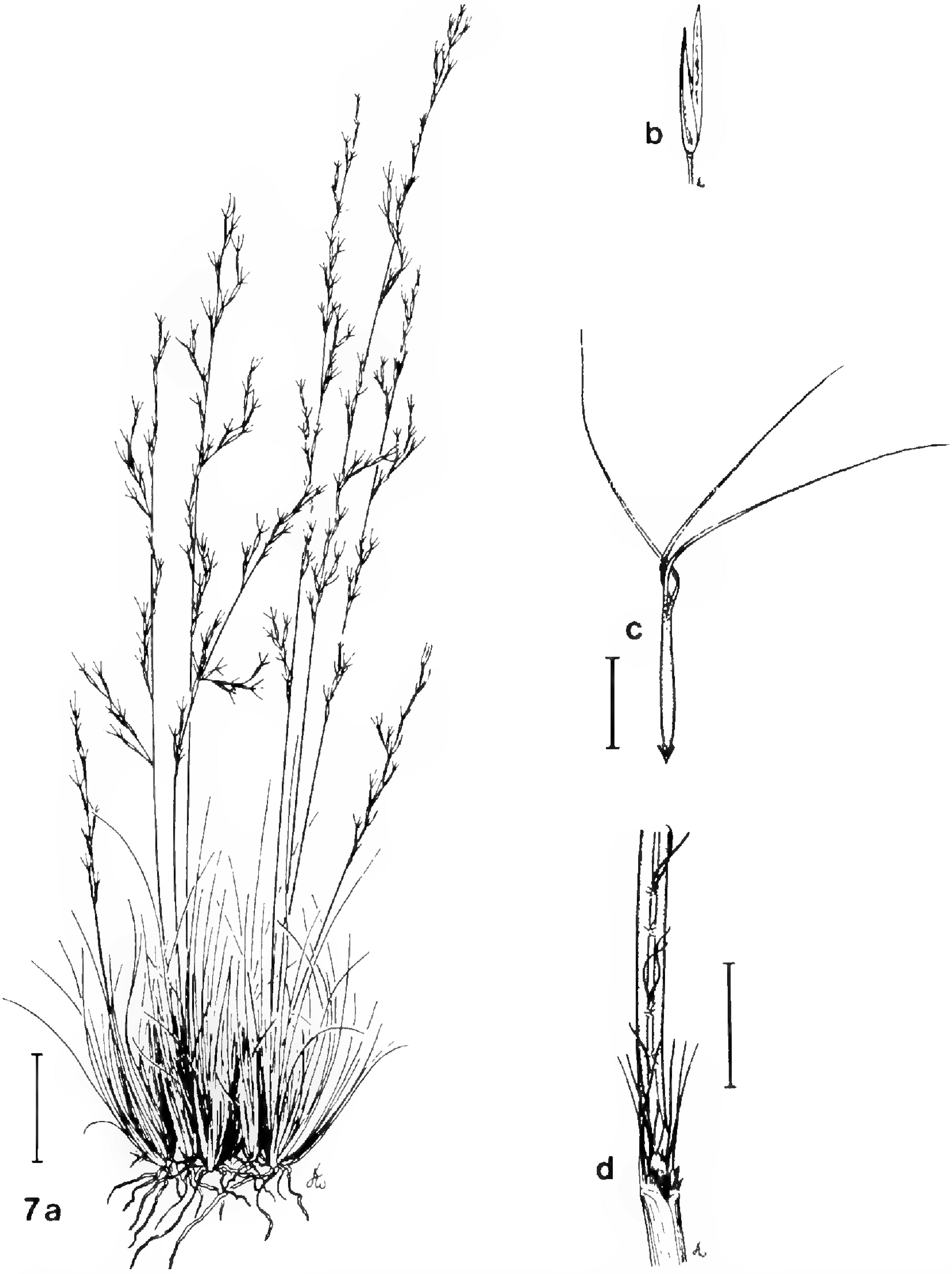

FIG. 7. *Aristida refracta* Griseb.: a. habit (scale: 4 cm); b. first and second glume; c. lemma, callus, and lemma awns (scale for b & c: 3 mm); d. ligule and base of upper surface of leaf blade (scale: 1 mm).

Province Camaguey: without locality, 21 Oct 1922, *Ekman s.n.* (Amer. Gr. Nat. Herb. 792). **Santayana Sabana**: 9 Jul 1932, *Leon 15785*. **San Serapio Sabana**: Jun 1937, *Leon 21182*. **Baragua Central**: 9 Dec 1926, *Hitchcock 23373*. **Province Guantanamo-Baracoa**: 13 Feb 1976, *Areces et al. 38125* (SJ). **Isle of Pines**: **Siguanea**, 12 Mar 1916, *Britton et al. 15369*. **Playa Nueva Gerona**: 9 Jan 1955, *Killip 44513*. **Jucaro**: 19 Jan 1955, *Killip 44558*.

HAITI. **Plaine Centrale, St-Michel de l'Atalaye**: 19 Dec 1927, *Ekman 9402*; Mar 1943, *Curtis s.n.* **Plaine du Nord, Acul-Samedi**: 29 Apr 1928, *Ekman 9908*.

DOMINICAN REPUBLIC. **Province de Santiago**: 17 Apr 1946, *Jimenez 1106*. **Province de Santo Domingo- Sabana de Santa Rosa**: 5 Oct 1947, *Allard 15865*. **Province de Monte Cristi- Moncion**: 26 May 1929, *Ekman 12634*.

JAMAICA. **New Forest, Southern Manchester**: 8 Nov 1912, *Hitchcock 9853* (Amer. Gr. Nat. Herb. 793). **Lititz Savanna, Manchester**: 11 Feb 1916, *Harris 12433*. **Ashley Hall**: 6 Dec 1917, *Harris 12734*.

Identification can be difficult for the previously mentioned robust specimens of *A. refracta* that have unusually long (to 76 cm), erect culms and inflorescences, and lack a conspicuous basal tuft of leaves (e.g., the following specimens collected in Pinar del Rio and Oriente Provinces of Cuba: **Pinar del Rio**: 25 Nov 1926, *Hitchcock 23262*, hrbr. nr. *1297696*, *Leon 12856*, hrbr. nr. *1867258*. **Herradura**: 16 Mar 1906, *Hitchcock 233*, hrbr. nr. *559352*. **Loma Mensura**: 1 – 3 Feb 1910, *Shafer 3858*, hrbr. nr. *697563*. **Laguna Jovero**: 5, 7 Dec 1911, *Shafer 10718*, hrbr. nr. *1037196*; 8 Dec 1911, *Shafer 10864*, hrbr. nr. *1037194*. **Sabana de San Julian de Guane**: 27 Dec 1916, *Leon & Roca 6942*, hrbr. nrs. *991850, 1060631, 6971*, hrbr. nr. *991863*; Jul 1917, *Lamas & Valdes 7307, 7308*, hrbr. nrs. *1060627, 1060634*; 6 Jun 1920, *Ekman 11107*, hrbr. nr. *1387418*. **Sabana de San Chirigote**: 9 Aug 1917, *Leon 7444, Leon & Roca 7454*, hrbr. nrs. *1060635, 1060630*. **La Grifa**: 14 Jun 1920, *Ekman 11246*, hrbr. nr. *1387421*. **Holguin**: 17 Nov 1922, *Ekman 15719, 15720*, hb. nrs. *1161258, 1295007, 1502347*. **El Payuco**: 23 Dec 1937, *Killip 32270, 32361*, hrbr. nrs. *1761064, 1761076*. **Guaro**: 14 Dec 1926, *Hitchcock 23425, 23426*, hrbrb. nrs. *1297699, 1297700*). These specimens (except for *Killip 32270* and *32361* which were collected after the printing of Hitchcock's work) were annotated and referenced (1936) by Hitchcock as *A. refracta*. No less than five unpublished names have been associated with these unusual specimens. In some respects, such specimens better fit the description of *A. sandinensis* Catasus (1985), which was based on material collected from the same area of Cuba (Pinar del Rio Province). Based on Catasus' description, *A. sandinensis* should be distinguished from *A. refracta* by its lack of a conspicuous tuft of dense filiform leaves, its more robust habit with much longer flowering culms, its longer glumes and lemmas, and the scabrous nature of the back of the first glume. Most of the above-mentioned specimens agree in habit with *A. sandinensis*, but the length of the glumes and lemmas better fit the description of *A. refracta.* Additionally, we have examined many specimens of *A. refracta* that have the more typical tuft of dense filiform leaves but have the first glume with varying amounts of pubescence. Finally, we have examined a specimen of *Aristida* (Bisse et al. 13657 SJ) from the Pinar del Rio Province of Cuba which was identified by Catasus as *A. sandinensis.* Although the habit of this specimen agrees with Catasus' description for *A. sandinensis,* the lengths of most of the glumes and lemmas fall well within the range of variation for *A. refracta.* Additional research is needed to determine if *A. refracta* and *A. sandinensis* are specifically distinct. Until such taxonomic relationships can be ascertained, we believe that it would be prudent to agree with Hitchcock's assessment of the above-mentioned specimens.

CURRENT STATUS OF *ARISTIDA CHASEAE* AND *ARISTIDA PORTORICENSIS*

Aristida chaseae is restricted to the Cabo Rojo National Wildlife Refuge (approximately 150 – 175 plants) and the upper, rocky slopes of the Sierra Bermeja. In 1987, McKenzie searched for the species in areas surrounding the Cabo Rojo National Wildlife Refuge and Boqueron and discovered no additional populations. The disappearance of *A. chaseae* from the type locality at Boqueron is apparently due to competition from such vigorous, introduced grasses as *Cenchrus ciliaris* L., *Bothriochloa pertusa* (L.) A. Camus, *Dichanthium annulatum* (Forssk.) Stapf, *Cynodon dactylon* (L.) Pers., *Panicum maximum* Jacq., and *Brachiaria subquadripara* (Trin.) Hitchc. When McKenzie searched these areas, he noted that exposed, rocky openings, that were apparently formerly occupied by *A. chaseae,* were completely dominated by these introduced grasses. While the population of *A. chaseae* on the Cabo Rojo National Wildlife Refuge is protected, it may be threatened by wildfires or competition from *Brachiaria subquadripara.* At this locality, McKenzie noted in 1987 that natural regeneration of *A. chaseae* was apparently restricted by *Brachiaria subquadripara,* a vigorous perennial, that dominated small openings that could have provided habitat for the establishment of young seedlings of *A. chaseae.*

Although *A. chaseae* is not uncommon on the Sierra Bermeja, the species is usually restricted to the upper, exposed, rocky slopes, between elevations of 150 to 301 m. Specimens noted below 150 m are found only on exposed rocky openings. As at the type locality at Boqueron, *A. chaseae* on the Sierra Bermeja is probably restricted to exposed, rocky areas, because of competition from introduced grasses. The population on the Cabo Rojo National Wildlife Refuge suggests that the species probably once extended from sandy areas along the coastal lowlands, eastward to summits throughout the Sierra Bermeja Range, and westward to rocky hillsides at Boqueron.

Aristida portoricensis is restricted to red clay and serpentine slopes at Cerro Las Mesas and Hormigureo, near Mayaguez, and along the upper, rocky slopes of the Sierra Bermeja, usually between 180 and 301 m. The population of *A. portoricensis* on Cerro Las Mesas at Mayaguez is currently threatened from land clearing for commercial and residential development. On 7 September 1988, McKenzie and Proctor noted that recent house construction continues to encroach upon habitat formerly occupied by *A. portoricensis*. Populations of *A. chaseae* and *A. portoricensis* along the Sierra Bermeja Range are under private ownership and may not be secure. Recent land clearing by the landowner of Cerro Maraquita, to enhance cattle grazing operations, has destroyed habitat formerly occupied by both species. When McKenzie and Proctor visited the location on 20 September 1987, *A. chaseae* and *A. portoricensis* were growing on an area that was later cleared. Additionally, on 28 August 1988, McKenzie noted land clearing on the summit of the western most ridge of the Sierra Bermeja that was adjacent to habitat occupied by *A. chaseae* and and *A. portoricensis*.

Both *A. chaseae* and *A. portoricensis* are listed as threatened species by the Puerto Rican Natural Heritage Program (fide V. Quevedo, Botanist, Programa Pro-Patrimonio Natural, Puerta de Tierra, Puerto Rico, 1987). Both species are being considered for "endangered status" under the Endangered Species Act (fide Susan Silander, Botanist, United States Fish and Wildlife Service, Caribbean Field Office, Boqueron, Puerto Rico, 1987).

FUTURE RECOMMENDATIONS FOR *ARISTIDA CHASEAE* AND *ARISTIDA PORTORICENSIS*

Steps need to be taken to protect *A. chaseae* and *A. portoricensis* on Commonwealth and federal levels. We suggest that both species be petitioned for federal listing as endangered species. Sound management plans must be formulated to protect the species. This includes, but is not limited to: 1) successional retardation, 2) habitat protection (from grazing, disturbance, development, etc.), 3) studies to evaluate the role of fire and competition from introduced grasses, and 4) artifical and natural regeneration experiments to test the feasibility of establishing populations in former and new areas of appropriate habitat. The populations of *A. portoricensis* on Cerro Las Mesas at Mayaguez, currently threatened by development, should be protected. Negotiations with the landowners at Cerro Mariquita and the western most ridges of the Sierra Bermeja are necessary to determine if disturbances can be minimized. Purchase of critical habitats on Cerro Las Mesas and along the upper slopes of the Sierra Bermeja is probably necessary to insure survival of *A. chaseae* and *A. portoricensis*.

STATUS AND SUGGESTIONS FOR *A. SPICIFORMIS*, *A. REFRACTA*, *A. SURINGARII*, AND *A. COGNATA*.

Although *A. spiciformis* is currently (1989) present at Laguna Tortugero, no data exists on its abundance there. In 1987, McKenzie searched serpentine slopes near Boqueron, but did not find *A. refracta*. Additionally, in 1988, McKenzie and Proctor searched for *A. refracta* on serpentine slopes at Susua Alta, near Yauco, but did not find the species. It is presently not known whether a population of *A. suringarii* still exists on Mona Island. No information is available on the abundance of the species in the Virgin Islands. Consequently, because of their limited ranges in Puerto Rico and the lack of information on their abundance, we recommend that status surveys be conducted on *A. spiciformis*, *A. refracta*, and *A. suringarii* in Puerto Rico. Such surveys may warrant the placement of these species on the Commonwealth's list of threatened plants. A status survey on *A. suringarii* and *A. cognata* should also be conducted in the U.S. Virgin Islands to determine if the range of the species are restricted enough to merit protection under the federal Endangered Species Act.

SUGGESTIONS FOR ADDITIONAL RESEARCH

Taxonomic relationships need to be assessed among *A. refracta*, *A. rosei* Hitchc., *A. sandinensis*, and *A. pinifolia* Catasus. Studies need to be initiated to determine what affinities *A. cognata* has with *A. suringarii*, *A. swartziana* Steud., and *A. moritzii* Henrard. Additionally, we recommend that research be initiated to examine the relationships within the *A. suringarii*, *A. arubensis*, and *A. venesuelae* species complex.

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Kunio Iwatsuki
Secretary General
XV International Botanical Congress

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NOMENCLATURAL CHANGES IN THE *CAREX PENSYLVANICA* GROUP (SECTION *ACROCYSTIS*, CYPERACEAE) OF NORTH AMERICA

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ABSTRACT

A new variety of *Carex lucorum* Willd. ex Link (*C. lucorum* var. **austrolucorum**) from the southern Appalachians is proposed. *Carex artitecta* Mackenzie and *C. physorhyncha* Liebm. ex Steud. are reduced to varieties of *C. emmonsii* Dewey ex Torrey (*C. emmonsii* var. *muhlenbergii* and *C. emmonsii* var. *australis*, respectively).

Se propone una nueva variedad de *Carex lucorum* Willd. ex Link (*C. lucorum* var. **austrolucorum**) del sur de la sierra Appalachia. Se reduce *C. artitecta* Mackenzie a variedad de *C. emmonsii* Dewey ex Torrey (como *C. emmonsii* var. *muhlenbergii*) así como *C. physorhyncha* Liebm. ex Steud. (como *C. emmonsii* var. *australis*).

The *Carex pensylvanica* Lam. group consists of in three closely related species complexes. During a revisionary study (Rettig 1988), it became apparent that new names for some taxa should be proposed.

Carex pensylvanica complex.—The geographical range of *C. lucorum* Willd. ex Link s.l. is divided into two disjunct ranges: northeastern North America and the Appalachians of southern Virginia to northern Georgia, eastern Tennessee and western Carolinas. Plants from the southern Appalachians, here proposed as *C. lucorum* var. *austrolucorum* J. Rettig, produce Luteolin-7-O-Me-4′-O-diglucoside and two flavone 5- substituted glycosides absent from northern populations (*C. lucorum* var. *lucorum*); conversely, *C. lucorum* var. *lucorum* uniquely produces a Luteolin C-glycosylflavone (Rettig 1988). The two varieties also differ in their achene micromorphology, chromosome number (*C. lucorum* var. *lucorum* n = 20, *C. lucorum* var. *austrolucorum* n = 14) and are most easily distinguished morphologically by leaf width: (1.2) 1.5 – 1.8 (2.4) mm wide vs. 1.1 – 1.3 (1.5) mm wide, respectively. A new variety for the southern Appalachian plants is proposed:

CAREX LUCORUM Willd. ex Link var. **austrolucorum** J. Rettig, var. nov.

Var. nova e sectione *Acrocystis*. Herba perennis, laxe caespitosa, rhizomata longa tenuiaque emittens; culmis erectis 1.7 – 3.9 dm; quorum vaginis basilibus aliquantum fibrillo-

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sis et brunneo-vinosis; foliis linearibus culmo 1.3 − 3 dm longis, *1 − 1.5 mm latis*; inflorescentiis 1.7 − 5 cm longis, bracteis 3.9 − 8.8 mm longis, 1.1 − 1.7 mm latis; spica mascula terminali, solitaria, lineari, 11.6 − 22.1 mm longa, 1.4 − 3.1 mm lata, pedunculo 1.8 − 5.9 mm longo; squamis masculis oblongo-obovatis, obtusis aut subacutis, subpurpureis, nervo pallidiore, marginibus albis, hyalinis, squama mediana 3.7 − 6 mm longa, 1 − 1.4 mm lata; spicis femineis 2 − 3, 4.7 − 8.9 mm longis, 3.4 − 5.2 mm latis, pedunculo 0.6 − 2.8 mm longo, squamis femineis ovato-lanceolatis, acuto-acuminatis, 2.8 − 3.7 mm longis, 0.8 − 1.8 mm latis; corpore perigyniali obovoideo, 3.1 − 4.6 mm longo, 1 − 1.5 mm lato, bicarinato, puberulento, brunneo, obtuse trigono, abrupte in rostrum erectum contractante, 1.1 2.6 mm longo, bidentato, dente 0.1 − 0.5 mm longo; achaenio obovoideo-globoso, lateribus convexis triangulari, brunneo, 1.4 − 2 mm longo, 0.9 − 1.3 mm lato, cuius corpore 1.1 − 1.5 mm longo, stigmatibus 3.

Herbaceous perennial, loosely cespitose with long horizontal rhizomes; culms erect, 1.7 − 3.9 dm tall, basal sheaths somewhat fibrillose and brownish-red; leaves linear, 1.3 − 3 dm long, *1 − 1.5 mm wide;* inflorescences 1.7 − 5 cm long, bracts 3.9 − 8.8 mm long, 1.1 − 1.7 mm wide; staminate spike terminal, solitary, linear, 11.6 − 22.1 mm long, 1.4 − 3.1 mm wide, peduncle 1.8 − 5.9 mm long; staminate scales oblong-obovate, obtuse or acutish, purplish with lighter midvein and white hyaline margins, median scale 3.7 − 6 mm long, 1 − 1.4 mm wide; pistillate spikes 2 − 3, 4.7 − 8.9 mm long, 3.4 − 5.2 mm wide, peduncle 0.6 − 2.8 mm long; pistillate scales ovate to lanceolate, acute-acuminate, 2.8 − 3.7 mm long, 0.8 − 1.8 mm wide; perigynium body obovoid, 3.1 − 4.6 mm long, 1 − 1.5 mm wide, 2-keeled, puberulent, brown, obtusely trigonous, abruptly contracting to an erect beak, 1.1 − 2.6 mm long, bidentate, tooth 0.1 − 0.5 mm long; achene obovoid- globose, triangular with convex sides, brown, 1.4 − 2 mm long, 0.9 − 1.3 mm wide, body of achene 1.1 − 1.5 mm long, stigmas 3.

Type: UNITED STATES. North Carolina. Buncombe Co.: along North Carolina Hwy 9, 8 km N of its jct. with U.S. Hwy 74 in the town of Bat Cave, 6 May 1986, *Rettig 1554* (holotype: GA; isotypes: BH, GH, MICH, MO, NY, TRTE, US, VDB).

Within this complex, *C. lucorum* var. *austrolucorum* is sympatric only with *C. pensylvanica*. These two taxa can easily be distinguished based on the perigynium beak length: (1) 1.2 − 1.6 (2.6) mm long vs. (0.2) 0.6 − 1 (1.2) mm long, respectively.

Carex nigromarginata Schwein. complex—*Carex emmonsii* Dewey ex Torrey and *C. artitecta* Mackenzie have been treated as varieties of *C. nigromarginata* (Gleason 1952). However, *C. emmonsii*, *C. artitecta* and *C. physorhyncha* Liebm. ex Steudel form a related set of taxa within this complex based on flavonoid chemistry, achene micromorphology and macromorphological characters (Rettig 1988). These three taxa lack tricin compounds and produce an unidentified compound and have convex sides of the achene cell central bodies, while *C. nigromarginata, C. floridana* Schwein. and *C. peckii* Howe ex Peck produce tricin compounds and lack the unidentified compound and have concave sides of the achene cell central bodies (Rettig 1988).

It is proposed that *C. emmonsii, C. artitecta* and *C. physorhyncha* be treated as varieties of a single species:

CAREX EMMONSII Dewey ex Torrey var. EMMONSII. Ann. Lyceum Nat. Hist. New York 3:411. 1836. *Carex davisii* Dewey, Amer. J. Sci. Arts 10:279. 1826, non Schwein. et Torrey, 1825. TYPE: MASSACHUSETTS, Williamstown, 1828 (LECTOTYPE—chosen here: NY!). *Carex varia* var. *minor* Boott in Hooker, Fl. Bor.-Amer. II:223. 1839. *Carex novae-angliae* var. *emmonsii* (Dewey ex Torrey) Carey in A. Gray, Manual 556. 1848. *Carex lucorum* var. emmonsii (Dewey ex Torrey) Chapman, Fl. South. U.S.:539. 1860. C. varia emmonsi (Dewey ex Torrey) W. Stone, Pl. S. New Jersey 304. 1912. *Carex nigromarginata* var. *minor* (Boott in Hooker) Gleason, Phytologia 4:22. 1952.

Dewey (1826) did not designate a type for *C. davisii* but indicated it was from "Williamstown", presumably in Massachusetts since the species was named for E. Davis of Westfield, Mass. No specimen was located that could be construed as Dewey's type material. Torrey (1836) replaced the illegitimate name with "*C. Emmonsii*, Dewey! in litt., Hab. Massachusetts!" The lectotype chosen here is from Torrey's Herbarium and labeled in Torrey's hand "*Carex Emmonsii* Dewey in litt. *alpestris* Torr. & Schw; *Davisii* Dewey not of Torr. & Schw. Williamstown, Mass. 1828."

CAREX EMMONSII Dewey ex Torrey var. **muhlenbergii** (A. Gray) J. Rettig, comb. nov. BASIONYM: *Carex pensylvanica* var. *muhlenbergia* A. Gray, N. Amer. Gram. 2:163. 1835. TYPE: PENNSYLVANIA, *Muhlenberg s.n.* (HOLOTYPE: HAL!, BH [PHOTO!], GH [PHOTO!]). *Carex varia* Muhlenb. ex Willd. Sp. Pl. 4:259. 1805, non Host, 1801. *Carex nigromarginata* var. *muhlenbergii*. (A. Gray) Gleason, Phytologia 4:22. 1952.

Carex albicans Willd. ex Sprengel, Syst. veg. 3:818. 1826. TYPE: Carolina (HOLOTYPE: B, GA [photo!]).

Carex emmonsii var. *distincta* Howe ex Peck, Annual Rep. New York State Mus. 48:176. 1895. TYPE: NEW YORK, New Baltimore, May, *Peck s.n.* (LECTOTYPE—chosen here: NYS!). *Carex varia* f. *distincta* (Howe ex Peck) Kukenth. in Engler, Pflanzenr. IV. 20 (Heft 38):449. 1909.

Carex varia var. *colorata* L. Bailey, Mem. Torrey Bot. Club 1:40–41. 1889. TYPE: DELAWARE, Faukland, 9 May 1883, *Commons s.n.* (LECTOTYPE—chosen here: BH!). *Carex emmonsii* var. *colorata* (L. Bailey) Peck, Annual Rep. New York State Mus. 48:176. 1895. *Carex artitecta* f. *colorata* (L. Bailey) Dole, Fl. Vermont, ed. 3:57. 1937.

Carex artitecta Mackenzie, N. Amer. Fl. 18:189. 1935. TYPE: PENNSYLVANIA, *Muhlenberg s.n.* (HOLOTYPE: UPS). (BASED ON *C. varia* Muhlenb. ex Wahlenb.).

Carex artitecta var. *subtilirostris* F. J. Herm., Rhodora 40:79. 1938. TYPE: INDIANA.

Vermillion Co.: 5 May 1934, *Deam 54764* (HOLOTYPE: GH!; ISOTYPE: MICH [fragment!]).

Although *C. albicans* is the oldest species name within this complex, it has been "widely and persistently" used for the taxon now known as *C. emmonsii* var. *emmonsii*. The type, however, belongs to *C. emmonsii* var. *muhlenbergii* and the name *C. albicans* therefore must be rejected under Article 69.1 of the ICBN (Greuter et al. 1988).

CAREX EMMONSII Dewey ex Torrey var. **australis** (L. Bailey) J. Rettig, comb. nov. BASIONYM: *Carex varia* var. *australis* L. Bailey, Bot. Gaz. (Crawfordsville) 16:153. 1892. SYNTYPES: MISSISSIPPI, Tupelo, 6 Apr 1889, *Tracy s.n.*; MISSISSIPPI, Starkville, 14 Apr 1890, *Tracy s.n.*; TEXAS. Harris Co.: Hockley, *Thurow 13*; TEXAS, Houston, 1886, *Nealley s.n.* (LECTOTYPE—chosen here: *Tracy s.n.*, Tupelo, BH!; ISOLECTOTYPE: NY!, US!). *Carex varia* f. *australis* (L. Bailey) Kukenth. in Engler, Pflanzenr. IV. 20 (Heft 38):449. 1909.

Carex rhynchophysa Liebm., Kongel. Danske Vidensk. Selsk. Naturvidensk. Math. Afh. Ser. 2:264–265. 1849, non C. A. Meyer, 1838. TYPE: MEXICO, Chinautla, May (HOLOTYPE: C!, BH [photo!). *Carex physorhyncha* Liebm. ex Steudel, Syn. Pl. Glumac. Pars II:219. 1855. *Carex nigromarginata* f. *minor* Boeckeler, Bot. Jahrb. Syst. 1:364. 1881.

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TAXONOMY OF *HELENIUM* SECT. *AMARUM* (ASTERACEAE)

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ABSTRACT

This treatment, which takes into account all known morphologic, ecologic, cytologic, and chemical data, recognizes *Helenium* L. sect. *Amarum* Bierner with two taxa: *Helenium amarum* (Raf.) Rock var. *amarum* and *H. amarum* var. *badium* (A. Gray ex S. Wats.) Waterfall. These are the only taxa of *Helenium* in North America with leaves not decurrent along the stem.

INTRODUCTION

Helenium L. sect. *Amarum* Bierner comprises two taxa distributed mainly in the southcentral and southeastern United States (Bierner 1972, Stanford and Turner 1988). The taxa are here recognized at the varietal level as *Helenium amarum* (Raf.) Rock var. *amarum* and *H. amarum* var. *badium* (A. Gray ex S. Wats.) Waterfall. This concept follows the views of Watson (1883), Waterfall (1960), and Stanford and Turner (1988).

The specific epithet "*amarum*" was originally used by Rafinesque (1817) when he described a plant from Louisiana and Mississippi as *Galardia amara*. Nuttall's (1834) name *Helenium tenuifolium*, however, was used for many years until Rock (1957) recognized that the two were synonymous and formed the new combination *Helenium amarum*. In fact, var. *badium* was originally described as *H. tenuifolium* var. *badium*.

In 1902, Greene recognized these taxa as separate species, a concept that persisted for quite some time (Bierner 1972, Correll and Johnston 1970, Rock 1957). In this treatment, I have recognized them as varieties of one another because of the compelling ecologic evidence presented by Stanford and Turner (1988), and because such treatment is warranted when the morphologic, cytologic, and chemical data are considered.

It is hoped that this taxonomic treatment will be of value to researchers who are interested in this section because of *Helenium amarum* var. *amarum*'s well known toxicity to livestock and its ability to cause bitterness in the milk of cows that eat it (e.g., Ivie et al. 1975). This taxon also contains chemical compounds that may be efficacious as insecticides (e.g., Arnason et al. 1987) and as antineoplastic agents (e.g., Waddell et al. 1979). With

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regard to the above subjects, I have found no reports in the literature for var. *badium*.

INTERSECTIONAL RELATIONSHIPS

Section *amarum* is delimited from the four other North American sections of *Helenium* by its nondecurrent leaves (Bierner 1972). There are, however, many nondecurrent-leaved species in South America in sections *Actinea* and *Cephalophora* (Bierner 1978, 1987). In addition, *Helenium aromaticum* (Hook.) Bailey of sect. *Cephalophora* produces the sesquiterpene lactones aromaticin, helenalin, and mexicanin I (Romo et al. 1964), all of which have been isolated from *H. amarum* var. *amarum* (Seaman 1982). I was tempted at one point, therefore, to use these data to suggest that sect. *Amarum* of North America is most closely related to sect. *Cephalophora* of South America. Later, however, it was my opinion that there was better evidence (Bierner 1987) for a disjunction from sect. *Tetrodus* of North America to Chile giving rise to sect. *Cephalophora*. If this hypothesis is correct, there is no direct link between sect. *Amarum* and the South American sections.

It appears on morpholgic and cytologic grounds that sect. *Amarum* may be most closely related to sect. *Tetrodus*. In particular, both taxa of sect. *Amarum* and 12 of the 14 taxa of sect. *Tetrodus* are annuals with narrow involucral bracts that are reflexed at anthesis, while the other North American taxa are perennials with wide involucral bracts that often are only spreading at anthesis. Cytologically, the chromosome number of $n = 15$, which is found in both taxa of sect. *Amarum*, has been observed in only two other species of *Helenium*, both of which are in sect. *Tetrodus* (Bierner et al. 1977, Grashoff et al. 1972).

INTRASECTIONAL RELATIONSHIPS

Recognizing the two taxa of sect. *Amarum* as varieties of the same species is not a new idea. *Helenium amarum* var. *badium* was, in fact, originally described as a variety under the old name *H. tenuifolium*.

The two taxa are very similar morphologically, differing mainly in the color of the disc corolla lobes and the shape of lower and basal leaves (see descriptions). Based on observations of a mixed population in Austin, Texas, Stanford and Turner (1988) suggested that the section be " . . . treated as monotypic, the single species comprised of two regional intergrading varieties . . ." For approximately 10 years, Turner had noted that this population included plants with yellow discs and plants with reddish-brown discs, that the percentage of each would vary from year to year, and that this was the only character that would distinguish between them. In addition, Stanford and Turner noted that plants in populations to the west of Austin on the Edwards Plateau become totally reddish-brown-headed and have lower leaves that are more pinnatisect, while plants in populations east of the Edwards Plateau become more robust, have all yellow heads, and have less dissected lower leaves.

These morphologic differences are not great, but they are fairly consistent, and there is a geographic integrity to the distribution of plants that have these distinguishing characters. Plants referable to var. *badium* are found mainly from central Texas north to southcentral Oklahoma, and southwest to the states of Coahuila and Chihuahua in northcentral Mexico, while those referable to var. *amarum* are found mainly from central Texas and central Oklahoma to the east (Stanford and Turner 1988). There is some overlap in their distributions, particularly along the Balcones Escarpment in Texas. Populations containing plants with both types of morphology (e.g., *Bierner and Averett 42* & *43* TEX; the population noted by Stanford and Turner 1988) or with apparent intermediate morphology (e.g., *Bierner and Szatkowski 297* & *298* TEX) can be found in these areas.

Ecologically, both are weedy taxa that commonly grow near roadsides and in disturbed pastures and fields. However, var. *amarum* tends to grow on clay soils in areas with 30 – 60 inches annual precipitation, while var. *badium* grows mainly on calcareous soils in drier areas to the west (Stanford and Turner 1988). Furthermore, var. *amarum* behaves as a winter or summer annual and completes its life cycle predominantly during the following summer or autumn (Baskin and Baskin 1973), while var. *badium* flowers mainly during the spring and early summer. Plants of both taxa, however, can be found flowering throughout most of the year.

All plants of sect. *Amarum* that have been examined thus far have a chromosome number of $n = 15$ (Grashoff et al. 1972). In general, meiosis is very regular with 15 clear bivalents formed during diakinesis and metaphase I. In the population mentioned above as containing plants with apparent intermediate morphology, however, I was not able to obtain counts because of irregularities in the meiotic process. This combination of morphologic intermediacy and irregular meiosis suggests that the plants were hybrids and supports a hypothesis that there are two taxa that have diverged from one another to some extent.

The flavonoid chemistry of var. *amarum* and var. *badium* is almost identical (Bierner 1973), but sesquiterpene lactone chemistry is unclear at present. Several sesquiterpene lactones have been reported in var. *amarum* (Seaman 1982), while only tenulin has been identified in var. *badium* (Clark 1939). I suspect that many of the sequiterpene lactones found in var. *amarum* will be found in var. *badium* when it is thoroughly characterized.

This is a classic situation for the recognition of geographic varieties. The taxa are very similar as to their morphology, ecology, cytology, and chemistry, but they occupy different geographic areas, they are morphologically separable in areas of allopatry, and there is a zone of sympatry in which there is some morphologic intergradation with some meiotic irregularities.

TAXONOMY

HELENIUM L. sect. AMARUM Bierner, Brittonia 24(4):335. 1972.
TYPE: *Helenium amarum* (Raf.) Rock.

Taprooted annuals. Stems one to occasionally several originating at the base, unbranched to usually corymbosely branched above, sulcate below becoming striate above, glabrous below becoming sparsely pubescent above with short antrorse hairs, usually moderately dotted with sessile glands. Peduncles 3 – 11 cm long, striate, sparsely pubescent with short antrorse hairs, moderately dotted with sessile glands, broadened beneath the receptacle. Leaves sessile, not decurrent. Middle and upper leaves linear, entire, sparsely pubescent with short antrorse hairs, densely dotted with impressed glands. Lower and basal leaves often withered at anthesis, linear to ovate in outline, entire to pinnately toothed or lobed to pinnatifid, glabrous to sparsely pubescent with short antrorse hairs, densely dotted with impressed glands. Heads solitary to numerous, hemispheric to globoid to globose. Receptacle hemispheric to globoid to ovoid, alveolate, naked. Involucre of two series of free bracts, the outer exceeding the inner, reflexed at anthesis. Outer involucral bracts green, linear lanceolate, acuminate, moderately to densely pubescent with short antrorse hairs, moderately dotted with impressed and sessile glands. Inner involucral bracts yellow-brown, often green toward the tips, oblanceolate to obovate, acuminate, sparsely to moderately pubescent with short antrorse hairs, sparsely to moderately dotted with sessile glands. Ray florets 8 – 10 per head, pistillate, fertile. Ligules 3-lobed, yellow, upper surface glabrous and without glands, lower surface moderately to densely pubescent with short antrorse hairs, moderately to densely dotted with sessile glands. Disc florets bisexual and fertile. Disc corollas 5-lobed, cylindric, yellow with yellow to yellow-brown to purple lobes, sometimes purple the upper 1/4 to 3/4, sparsely to moderately dotted with sessile glands. Achenes ribbed, moderately to densely pubescent with straight hairs that are forked at the apex. Pappus scales 6 – 8, obovate, awn-tipped or acuminate into the awn. Chromosome number, $n = 15$.

KEY TO THE TAXA OF *HELENIUM* SECT. *AMARUM*

A. Disc corollas yellow with yellow to yellow-brown lobes; lower and basal leaves usually withered at anthesis; lower leaves usually entire, occasionally pinnately toothed; basal leaves entire to pinnately toothed to occasionally pinnatifid. . . . . 1a. *H. amarum* var. *amarum*

A. Disc corollas usually yellow with purple lobes, but sometimes yellow at the base and purple in the upper 1/4 to 3/4; lower and basal leaves sometimes withered at anthesis, but often persistent; lower leaves linear to ovate in outline, entire to pinnately toothed or lobed to pinnatifid; basal leaves pinnatifid. . . . . 1b. *H. amarum* var. *badium*

1a. HELENIUM AMARUM (Raf.) Rock var. AMARUM, Rhodora 59:131. 1957. BASIONYM: *Galardia amara* Raf., Fl. Ludov. 69. 1817. TYPE: U.S.A. LOUISIANA. Rapides Parish: Alexandria, 6 Sep 1898, *C.R. Ball 182* (NEOTYPE: US!).

Helenium tenuifolium Nutt., J. Acad. Nat. Sci. Philadelphia 7:66. 1834. TYPE: ALABAMA. *Beck s.n.* (LECTOTYPE: PH!). *Heleniastrum tenuifolium* (Nutt.) Kuntze, Rev. Gen. Pl. 1:342. 1891.

Plants (1)2 – 6(10) dm tall. Lower and basal leaves usually withered at anthesis. Basal leaves linear to ovate in outline, entire to pinnately toothed to occasionally pinnatifid. Lower cauline leaves usually linear, usually entire, but occasionally pinnately toothed. Heads 5 – 9 mm high, 6 – 10 mm wide. Receptacle 1.2 – 2.1 mm high, 1.4 – 3.5 mm wide. Ligules 6.5 – 14 mm long, 4 – 10 mm wide. Disc corollas yellow with yellow to yellow-brown lobes, 2.0 – 2.7 mm long, 0.8 – 1.2 mm wide. Achenes 0.9 – 1.3 mm long, 0.6 – 0.8 mm wide. Pappus scales 6 – 8, 1.2 – 1.8 mm long including the awn, 0.4 – 0.6 mm wide, the awn 0.7 – 1.1 mm long. Chromosome number, $n = 15$.

Flowering February to December, mainly July to October. From central Texas and central Oklahoma eastward throughout the southeastern United States and northeast as far as Connecticut.

1b. HELENIUM AMARUM (Raf.) Rock var. BADIUM (A. Gray ex S. Wats.) Waterfall, Rhodora 62:321. 1960. BASIONYM: *Helenium tenuifolium* Nutt. var. *badium* A. Gray ex S. Wats., Proc. Amer. Acad. Arts 18:108. 1883. TYPE: TEXAS. Travis Co.: "Bottoms," Austin, 20 May 1872, *E. Hall 364* (LECTOTYPE: here designated GH!; ISOLECTOTYPES: NY!, PH!, US!). ≡ *Helenium badium* (A. Gray ex S. Wats.) Greene, Pittonia 5:55 – 56. 1902.

Plants 1 – 5(8) dm tall. Lower and basal leaves sometimes withered at anthesis, but often persistent. Basal leaves pinnatifid. Lower cauline leaves linear to ovate in outline, entire to pinnately toothed or lobed to pinnatifid. Heads 5 – 8 mm high, 6 – 9 mm wide. Receptacle 1.1 – 2.0 mm high, 1.3 – 3.1 mm wide. Ligules 4.5 – 14 mm long, 2 – 9 mm wide. Disc corollas usually yellow with purple lobes, but sometimes yellow at the base and purple in the upper 1/4 to 3/4, 1.6 – 2.5 mm long, 0.8 – 1.2 mm wide. Achenes 0.7 – 1.0 mm long, 0.5 – 0.7 mm wide. Pappus scales usually 6, 1.0 – 1.5 mm long including the awn, 0.4 – 0.5 mm wide, the awn 0.4 – 0.8 mm long. Chromosome number, $n = 15$.

Flowering March to November, mainly April to July. The Edwards Plateau of central Texas north to north Texas and southcentral Oklahoma, and west and southwest to Trans-Pecos Texas and adjacent Mexico.

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SEED COAT MORPHOLOGY OF *DRAPERIA SYSTYLA* (HYDROPHYLLACEAE) AND ITS IMPORTANCE TO THE SYSTEMATICS OF *NAMA*

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ABSTRACT

Seeds of *Draperia systyla*, sometimes considered to be a close relative of *Nama*, have been examined using scanning electron microscopy. Seeds are ovate-elliptic in outline, average 1.8 mm in length and exhibit an alveolate surface pattern. Secondary deposits are found in the outermost testa cells. The deposits fill the lower 1/3 — 1/2 of each cell and continue upward as a veneer of decreasing thickness to the apex of radial walls. Removal of deposits, by sonication, reveals that radial walls of these outermost cells have both pits and thickenings, a radial wall pattern not found in seeds of any species of *Nama*. Seeds of *D. systyla* are distinct from those of *Nama* and do not suggest the two genera are closely related.

INTRODUCTION

An important aspect of continuing revisionary studies of *Nama* is the determination of relationships with other genera. The nearest relatives of *Nama* generally have been held to be *Eriodictyon*, *Turricula* and *Lemmonia* (Hitchcock 1933; and see Constance 1963). As surmised by Hitchcock (1933), the alliance of *Nama* with *Eriodictyon* and *Turricula* (the latter included in *Eriodictyon* by Hitchcock), was to be traced through the anomalous *N. lobbii* A. Gray, placed by Hitchcock in his monotypic *Nama* sect. *Arachnoidea*. Recently, the relationship of *N. lobbii* to *Eriodictyon*, *Turricula* and the remainder of *Nama* has been assessed using seed coat structure (Bacon, Bragg and Hannan 1986a; Chance and Bacon 1984) and flavonoid chemistry (Bacon, Fang and Mabry 1986b; and see Bacon et al 1986c). These studies suggested that *N. lobbii* should be placed in its own genus, with affinities nearer to *Eriodictyon* than to *Nama*. Bacon (1989, 1987) has examined seed coat structure and floral characters of *Lemmonia* and selected species of *Nama* and concluded that *Lemmonia* must be united with *Nama*. Therefore, relationships of *Nama* appear to be more obscure than traditionally proposed, and that *Nama* has close relatives elsewhere within the Hydrophyllaceae should be considered.

Draperia systyla (A. Gray) Torr. ex A. Gray is a perennial herb with opposite leaves that is endemic to California (Jepson 1943; Munz and Keck

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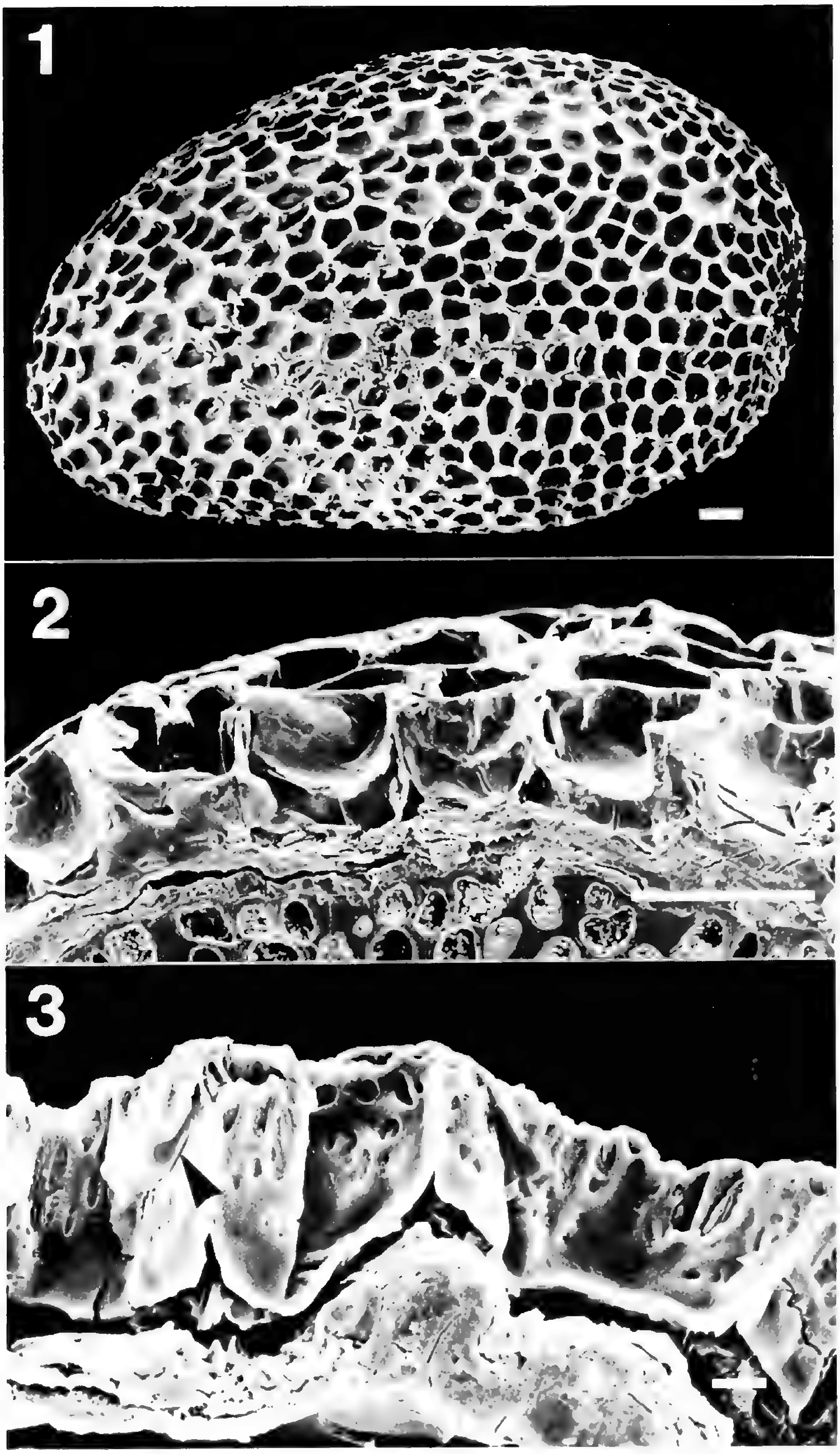
1959). Originally described by Gray (1862) as *Nama systyla* A. Gray, the taxon was subsequently established as the monotypic genus *Draperia* by Torrey (in Gray 1868) and placed in Gray's tribe *Phacelieae* (Gray 1875). Nevertheless, Gray (1877) maintained an indirect relationship between *Nama* and *D. systyla* when he founded *Lemmonia*, placed it in his tribe *Nameae*, along with *Nama* and *Eriodictyon* and stated that it was "somewhat related to *Draperia*". Also, Hitchcock (1933) cited *Draperia* as a close relative of *Nama*. However, because *Draperia* and *Nama* are dissimilar both morphologically and cytologically—in *Draperia* $n = 9$ (see Constance 1963), in *Nama* $x = 7$ (Bacon 1984, 1974; Constance 1963)—the potential relationship of the two genera has not been fully explored. With the submergence of *Lemmonia* in *Nama*, this potential relationship requires assessment. Seed coat features have proven valuable in assessing relationships within *Nama* (Chance and Bacon 1984) and among *Nama* and its suggested relatives (Bacon 1987; Bacon et al 1986a). Therefore, seeds of *D. systyla* have been examined using the scanning electron microscope (SEM), with the aim of assessing seed coat features as they bear on the relationship of *Nama* and *Draperia*. Results of that study are presented here.

MATERIALS AND METHODS

Mature, whole seeds were removed from herbarium specimens of *D. systyla* (see Appendix). For examination of internal structure, seeds were sectioned free-hand with a single-edge razor blade, placed in a 1/4 dram screw cap vial and extracted for about two minutes in acetone to remove obscuring oils. Additionally, some whole seeds and seed sections were placed in a 1/4 dram screw-cap vial, covered with acetone and sonicated in a Bransonic 12 Ultrasonic Cleaner for 120 − 180 seconds in an effort to remove the outer tangential wall and contents of reticulum cells (outermost testa layer) to reveal radial walls. Whole seeds and sections were mounted on aluminum stubs with carpet tape. Specimens were coated in an Anatech Hummer VI sputter coater using a gold-palladium target and examined with a JEOL JSM 35-C SEM at an accelerating voltage of 15 kV.

RESULTS

Seeds of *D. systyla* are dark red brown in color and generally ovate-elliptic in outline (Fig. 1). Examined seeds range from 1.6 to 2.1 mm in length, and average 1.8 mm (N = 15). The outer testa is "moderately reticulate" as interpreted by Chance and Bacon (1984). Reticulum cells are irregularly angular, quadrangular to hexagonal (Fig. 1), generally as broad as long and radial walls—those at right angles to the long axis of the



FIGS. 1 – 3. Seeds of *Draperia systyla*. (Bar in Figs. 1 and 2 = 100 μm; bar in Fig. 3 = 10 μm.) 1. Whole seed. 2. Unsonicated seed section showing secondary deposits in reticulum cells. 3. Sonicated seed section with secondary deposits removed (except at arrow) showing pits and thickenings on reticulum cell radial walls.

seed—are of equal height. In other examined species with angular reticulum cells the cells tend to be narrower in one dimension than the other and radial walls are unequal in height (Bacon et al 1986a; Chance and Bacon 1984). There is no definite pattern in the arrangement of reticulum cells in *D. systyla*, in contrast to the regular patterns found in *Eriodictyon* and *Turricula* (Bacon et al 1986a) and some groupings of *Nama* (Bacon 1987; Chance and Bacon 1984). Sections reveal that reticulum cells of *D. systyla* contain secondary deposits that adhere to but are not a part of reticulum cell walls, and, in fact, obscure details of wall structure. These deposits fill the lower 1/3 – 1/2 of each cell and continue upward as a veneer of decreasing thickness to the apex of radial walls (Fig. 2,3). The deposits are not removed from cells of sonicated whole seeds, but are removed in some cells of sonicated seed sections, revealing that radial walls have both pits, of varying size and shape, and thickenings (Fig. 3).

DISCUSSION

In overall features, seeds of *D. systyla* are distinctive when compared to those of *Nama*. Seeds of *D. systyla* are larger than those of *Nama* proper, those of the latter ranging from 0.3 mm to about 1 mm in length, and there is little similarity in general reticulum organization between the two. The deposits found in reticulum cells of *D. systyla* are absent in the latter species, and the radial wall pattern found in reticulum cells of *D. systyla* is not found in species of *Nama*. Pits but not thickenings characterize reticulum cell radial walls in some species of *Nama*, while thickenings but not pits are found in several others (Bacon 1987; Chance and Bacon 1984). Pits in *D. systyla* are less rounded and of less uniform size and thickenings are more irregular in size and shape than those found in *Nama*. The pattern of both pits and thickenings on reticulum cell walls in *D. systyla* is unlike any found among species of *Nama*.

Deposits similar to those in *D. systyla* are found in reticulum cells of *N. lobbii* and *N. rothrockii* A. Gray, another anomalous species of *Nama* (Hitchcock 1933) whose placement has been challenged (Bacon et al 1986a; Chance and Bacon 1984). However, whereas those of *D. systyla* fill no more than half of each cell, those in the latter two species characteristically fill each cell. Nevertheless, seeds of *D. systyla*, *N. lobbii* and *N. rothrockii* are all comparable in size and larger than those of other species of *Nama*.

The differences between seeds of *D. systyla* and most species of *Nama* are consistent with morphological and cytological differences between the two taxa. In addition to its opposite leaves, *D. systyla* produces herbaceous, upright stems which arise from "horizontal, rooting branches of a large root crown" (Jepson 1943). Its inflorescences are terminal, branched, scorpioid cymes. Its capsules contain 1–4 but typically 4 seeds.

Two species of *Nama* produce opposite leaves, but this arrangement appears sporadically elsewhere within the family and appears to be of little taxonomic importance at the generic level. There are no species of *Nama* that produce the horizontal, rooting branches characteristic of *D. systyla*, but, perhaps significantly, *N. lobbii* and *N. rothrockii* initiate stems from horizontal rhizomes. Inflorescences in *Nama* are cymose but never scorpioid. With the exception of *N. californicum* (A. Gray) Bacon (= *Lemmonia californica*), all species of *Nama* produce more than four seeds per capsule (see below).

Torrey (in Gray 1868) stated that *D. systyla* had the corolla and "nearly the androecium" of *Nama* while possessing the seeds and gynoecium of *Phacelia* proper. [Indeed, in overall size and reticulum organization, seeds of *D. systyla* are similar to seeds of some species of the Crenulatae group of *Phacelia* (Constance 1963), but they lack the excavations and salient ridge found on the ventral surface of seeds of the latter (see Atwood 1975).] In his generic description, Torrey noted that corollas of *D. systyla* are tubular-funnelform and that the stamens are unequal and unequally inserted, the typical conditions in *Nama*. Gray (1877), erecting *Lemmonia*, simply noted that *Lemmonia* was ". . . somewhat related to *Draperia* . . ." but was properly placed in his tribe *Nameae*. He pointed out that *Lemmonia* had a campanulate corolla and noted differences in stamen features which distinguished *Lemmonia* from *Nama*, and therefore, from *D. systyla*. He then noted that *Lemmonia* produced only two ovules per locule and formed large seeds. Thus, it seems that Gray's association of *Draperia* and *Lemmonia* must have been based in large part on ovule/seed number, a feature which he emphasized in his reorganization of *Phacelia* (Gray 1875), but which has since been shown to be unreliable (see Constance 1963).

In conclusion, evidence from morphology, cytology and seed structure supports recognition of *Draperia* and *Nama* as separate and perhaps unrelated genera.

ACKNOWLEDGEMENTS

I wish to thank Dr. Lincoln Constance for kindly providing material of *D. systyla*, Mr. Barney Lipscomb for cheerfully helping to locate a number of references, and an anonymous reviewer for constructive criticisms of the original manuscript. This research was supported in part by NSF Grant DEB 8108513, as well as by Grant 15-211 from the Organized Research Fund of The University of Texas at Arlington.

APPENDIX: SOURCE OF SEED SAMPLES.

California: Siskiyou Co.: White Ridge, S. Fork Sacramento River, *Crampton 3839* (UC); Tulare Co.: Old Colony Mill, *K. Brandegee s.n.* (UC).

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TRIFOLIUM STOLONIFERUM (FABACEAE) IN OHIO: HISTORY, HABITATS, DECLINE AND REDISCOVERY

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ABSTRACT

Trifolium stoloniferum Muhl. ex A. Eaton (Fabaceae) (running buffalo clover) is Federally listed as an Endangered species by the U.S. Fish and Wildlife Service. This species formerly grew in eight states from West Virginia to Kansas. As of 1987 this species was confirmed extant at only five sites in Indiana, Kentucky, and West Virginia. *Trifolium stoloniferum* was known historically from eight counties in southern Ohio, the last collection being in 1907. In 1988 this species was rediscovered at eight sites in Clermont, Hamilton, and Warren counties. Population sizes range from 1 to ca. 110 individuals. Historic and modern habitats for running buffalo clover are described. *Trifolium stoloniferum* seems restricted to mesic sites in semishade where there is a pattern of long term disturbance, such as mowing, trampling, or grazing. The decline of running buffalo clover in Ohio seems related to the decimation of herbivores on which the species depended for dispersal and subsequently to maturation of habitats.

INTRODUCTION

Trifolium stoloniferum Muhl. ex A. Eaton (running buffalo clover) (Fabaceae) is a stoloniferous perennial which formerly grew over a broad area of the American Midwest. Brooks (1983) described the geographic range of this species and pointed out its remarkable decline in the twentieth century. Running buffalo clover formerly occurred in the states of West Virginia, Ohio, Kentucky, Indiana, Illinois, Missouri, Kansas, and Arkansas. Yet Brooks was unable to locate any specimens later than a 1940 collection from Webster County, West Virginia. This revelation spurred a search for the clover in West Virginia and its eventual rediscovery in Fayette and Webster counties in that state (Bartgis 1985). In 1987 *Trifolium stoloniferum* was listed by the U.S. Fish and Wildlife Service as an endangered species in the United States. In that same year populations of running buffalo clover were discovered in Indiana and Kentucky (M. Homoya, Indiana Heritage Program, pers. comm. 1987; Campbell et al. 1988).

Five populations of *Trifolium stoloniferum* were known to be extant nationally as of the spring of 1988: Fayette and Webster counties, West

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Virginia; Ohio County, Indiana (two populations); and Boone County, Kentucky. The Kentucky population consists of several hundred plants and is the largest so far located.

In 1988 the U.S. Fish and Wildlife Service, Region 3, funded a statewide status survey for *Trifolium stoloniferum* in Ohio as a part of regionwide efforts to relocate this species. The Division of Natural Areas and Preserves, Ohio Department of Natural Resources, assembled a team of botanists to search for this species in its historic range. The writer coordinated this survey and trained the Division staff. "The Clover Team" included: John Baird, New Richmond, Ohio; Renee Beaudoin, Miami University, Oxford; Susan Smith, Middletown; and Sabina Sulgrove, Dayton. We also were assisted by Division ecologist W. T. Rankin. This paper summarizes our knowledge of historic records of this species in Ohio, presents the results of the 1988 survey, and discusses the factors which led to the decline of this species throughout its range in this century.

Herbarium specimens of *Trifolium stoloniferum* are known from seven counties of central and southwest Ohio, as well as a single county in the east: Belmont, Butler, Clark, Clermont, Clinton, Franklin, Greene, and Hamilton counties. The last known Ohio collection was in 1907 in Belmont County. These historic records for running buffalo clover are mapped as solid dots in Figure 1. The dots indicate only the county distribution since the vague locality data on most nineteenth century specimens precludes exact mapping. At least 28 separate collections of this species are known from Ohio before 1907. Thirteen of these collections are from Hamilton County. A list of these historic collections is available from the author.

The county distribution of Figure 1 differs from that in Brooks (1983) by the omission of Hancock and Warren counties. The Hancock County report is based upon a specimen at ILL collected by E.J. Paddock in 1834. This sheet is cited by Brooks as from "Williamstown". Paddock was a well-known botanist in central Ohio during the 1830's. Most of his specimens were collected in or near Worthington. Franklin County, where he resided (Stuckey 1988). Almut Jones (pers. comm. 1988), curator of the herbarium at ILL, confirmed that the original collector's label reads "Wtn", Paddock's usual abbreviation for Worthington. Paddock's "Wtn" was expanded to "Williamstown" by an unknown hand, apparently when the specimen was accessioned about 1919.

The Warren County record in Brooks is based upon a 1877 collection by J. F. James, also at ILL, labeled "Loveland" with no county indication. The town of Loveland is in Clermont County at the border of Hamilton and

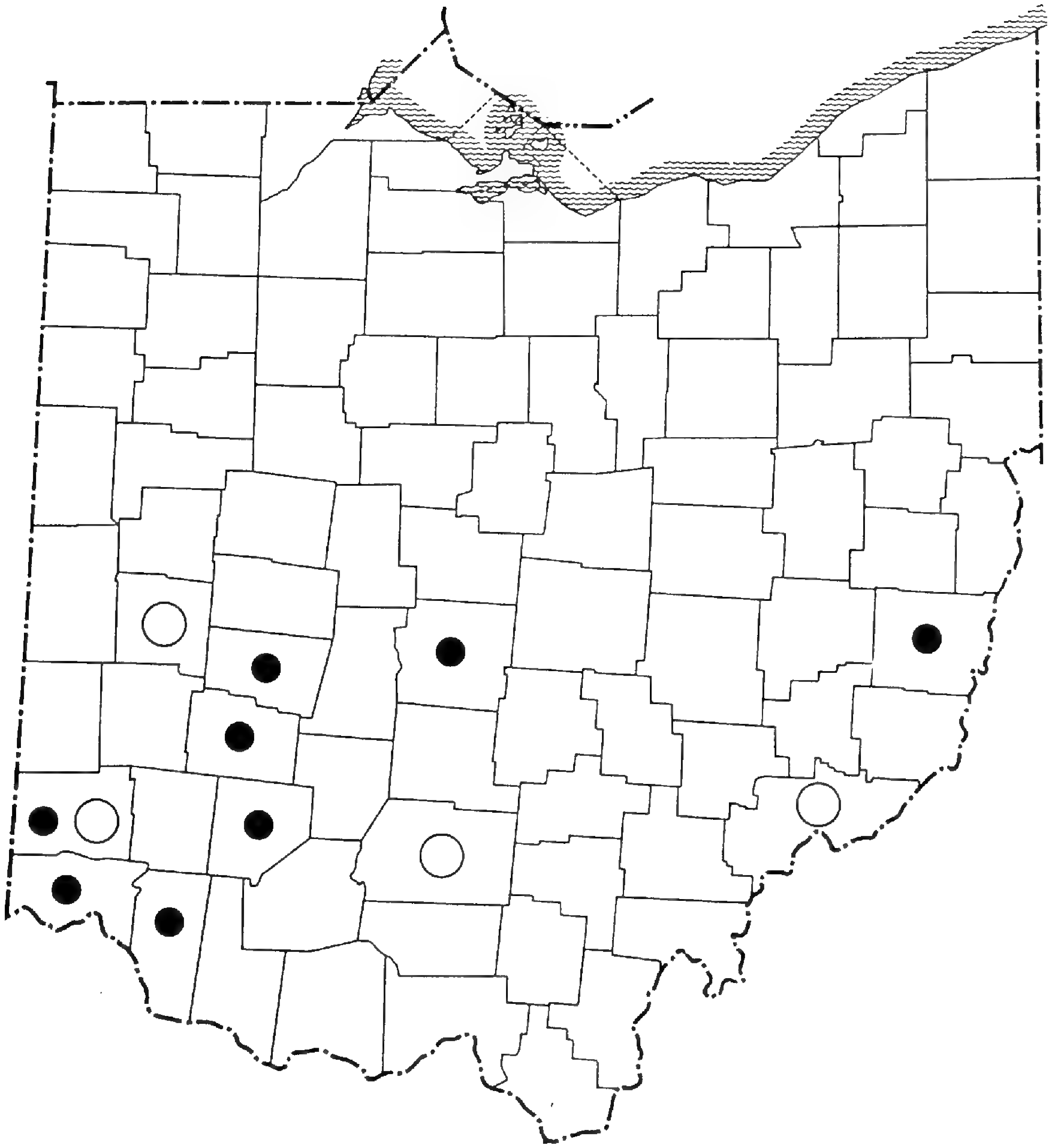

FIG. 1. Historic distribution of *Trifolium stoloniferum* Muhl. ex A. Eaton in Ohio: open circles, 18th century literature reports; solid dots, herbarium specimens, 1830's-1907.

Warren counties. There is no way of knowing exactly from which county James collected this specimen.

Running buffalo clover also is attributed to Sandusky County by Roberts & Cooperrider (1982). This report is based upon a misidentified specimen of *Trifolium repens* L. at OS.

The open circles on the map in Figure 1 represent four eighteen century references to "clover" or "buffalo clover" as a part of the pre-settlement landscape in Ohio. These reports are discussed in the following section.

HISTORIC HABITATS

There is little historical information on the habitat of *Trifolium stoloniferum* in Ohio at the time of European settlement. Campbell et al. (1988) sumarized the historic data on this species in Kentucky, which suggests that running buffalo clover grew in open woods and along trails and water courses. Historic references to running buffalo clover in Ohio are more scarce than in Kentucky because Ohio was not settled until late in the eighteenth century. The four known eighteenth century references are mapped as open circles in Figure 1.

The earliest known reference to clover in Ohio is found in the journal of the British trader Christopher Gist. In 1751 Gist traveled from the Ohio River near the modern Portsmouth to the Indian towns along the Great Miami River near the present Piqua. After leaving the hills of unglaciated Ohio, Gist entered the till plains and reported seeing: "fine, rich level Land, well timbered with large Walnut, Ash, Sugar Trees, Cherry Trees &, it is well watered with a great number of little Streams or Rivulets, and full of beautiful natural meadows, covered with wild Rye, blue Grass and clover, and abounds with Turkeys, Deer, Elks, and most Sorts of Game particularly Buffaloes, thirty or forty of which are frequently seen feeding in one meadow." (quoted in Shriver 1987, p. 54).

These comments by Gist are doubly significant in being the only direct link between *Trifolium stoloniferum* and buffalo, *Bison bison* (Linnaeus), in Ohio. Evidence suggests that this species grew along buffalo traces in Kentucky and, possibly, West Virginia (Bartgis 1985; Campbell et al. 1988). Buffalo were quickly extirpated from Ohio, the last animal reportedly being killed in 1803 (Shriver 1987).

A second early reference to clover in the valley of the Great Miami River is found in a journal kept by a travelling minister, James Smith (1907). In 1795 Smith described the luxuriant vegetation on the terraces of the Great Miami River north of the modern city of Hamilton, noting that "wild rye and clover was here in abundance" (p. 379).

Two writers indirectly link buffalo and *Trifolium stoloniferum* in the valley of the Muskingum River north of Marietta, Ohio. John May, a Boston merchant who arrived at Marietta, the state's first organized settlement, in 1788, twice refers to hunters seeing buffalo along the Muskingum River (Smith 1961, pp. 61, 63). S. P. Hildreth, the foremost historian of the Marietta settlement, described the bottomland near the mouth of the Muskingum River in 1788: "The pea vines, and buffalo clover, with various other plants were nearly knee high, and afforded a rich pasture for their hungry horses" (1848, p. 207).

In 1796 James Finley, a circuit-riding minister from Kentucky, visited the valley of the Scioto River in the vicinity of the present-day city of Chillicothe. Here he found "a garden of nature" with a variety of tree species and "beneath all, the wild rye . . . mixed with the prairie and buffalo clover" (Strickland 1853, p. 105).

A problem in interpreting the historic records is the possibility that they may refer to the ubiquitous European white clover *Trifolium repens* L. That species was introduced into North America at an extremely early date and quickly became naturalized throughout the continent. John May, the Boston merchant mentioned above, brought "cloverseed" to Marietta in 1788 (Smith 1961, p. 35). This undoubtedly was seed of *T. repens*. Pursh (1816) refers to the occurrence of *T. repens* in disturbed ground as far as 100 miles distant from the nearest habitations. Drake (1815, p. 56) indicates that *T. repens* was a common plant in the Cincinnati region that appeared spontaneously almost immediately following cultivation. Campbell et al. discusses this problem and concludes that almost all pre-1800 reports from Kentucky refer to *T. stoloniferum*. References after that date are more dubious. It is likely that the four eighteenth century references from Ohio refer not to European, but to indigenous clovers. Finley and Hildreth specifically refer to "buffalo clover" and the early date of the Gist and Smith references argue for the indigenous species.

The labels on herbarium specimens of running buffalo clover from Ohio have little habitat description. Although tersely worded, these remarks confirm the presence of the species in open woods and borders and on stream terraces.

The earliest Ohio specimens of *Trifolium stoloniferum* date from the 1830's. An 1834 collection by E. J. Paddock has no habitat data and simply is labelled "Worthington", Franklin County. There are two undated, pre-1840 specimens from Hamilton County. Thomas Lea collected this species in "Riddle's ploughed cornfield" (PH). Riddle's property was along the valley of Mill Creek just north of downtown Cincinnati (Braun 1934). Lea's specimen neatly links the border and stream terrace settings with a recent disturbance. A C.W. Short specimen is labeled "North Bend, Fernbank in woods along Ohio River" (MO). Fernbank is not a habitat description, but the name of a small community which existed for a few years just east of the present North Bend (Ford & Ford 1881). Fernbank was only a few miles east of one of the extant Ohio populations of running buffalo clover. The Short collection confirms the occurrence of the species in an alluvial habitat.

The earliest published reference to *Trifolium stoloniferum* in Ohio is contained in Riddell's catalog (1835). Riddell simply states that this species occurs "fields, o[pen] w[oods], etc., O, Ky." (p. 23). This generalized description is not particularly useful. However, it does suggest that running buffalo clover was distributed rather generally. No Riddell specimen of *Trifolium stoloniferum* has been located in this study. Riddell might have seen this species in either the Columbus or Cincinnati areas where he lived.

Subsequent Ohio specimens of running buffalo clover lack habitat data with two exceptions. An undated Braun specimen from Hamilton County is labeled "dry fields" (US). This atypical reference is unexplained. A 1907 E. M. Laughlin specimen from Belmont County is labeled "edge of Stur's Woods, low ground". Laughlin's comments confirm the link between this species, edge habitats, and moist situations.

The primeval forests of North America were not as uniform and unbroken as pictured in romance. Running buffalo clover probably survived in a variety of disturbed, successional habitats. Likely situations include animal and human trails, young woods, and openings created by windstorms and fires.

RESULTS OF 1988 SURVEY

Eight Ohio populations of *Trifolium stoloniferum* were discovered in 1988: five in Hamilton, two in Warren, and one in Clermont counties. Voucher specimens are deposited at OS and US. The eight stations are mapped in Figure 2. The five sites in western Hamilton County are clustered in a small area, therefore, the distance between the dots in Figure 2 is considerably exagerrated. Warren County is a new county record for this species. Population sizes range from a single individual to ca 110 plants. The total number is approximately 250 – 270 plants. This is a significant increase in both the number of sites and individual plants confirmed extant in the national range of running buffalo clover. The largest of Ohio's populations presently is the second largest known site for this species in its total range. *Trifolium stoloniferum* is listed as an Endangered species in the State of Ohio (ODNAP 1988).

The modern habitats of *Trifolium stoloniferum* are in open, moist, disturbed situations. However, it is difficult to pinpoint any single factor linking all the known habitats. Successful searches for this species should not concentrate on a single type of habitat, but must broadly survey a variety of moist openings. Detailed data on habitat, associated species, and location is contained in the database of the Division of Natural Areas and Preserves. Additional information is available to researchers from the author.

The largest of the eight Ohio populations of this species, ca 110 plants, grows at the Miami Fort in the Hamilton County Park District. This is an outstanding archaeological area with earthworks probably built by Indians of the Hopewell culture ca 100 BC to 600 AD (Welsh n.d.). The clover

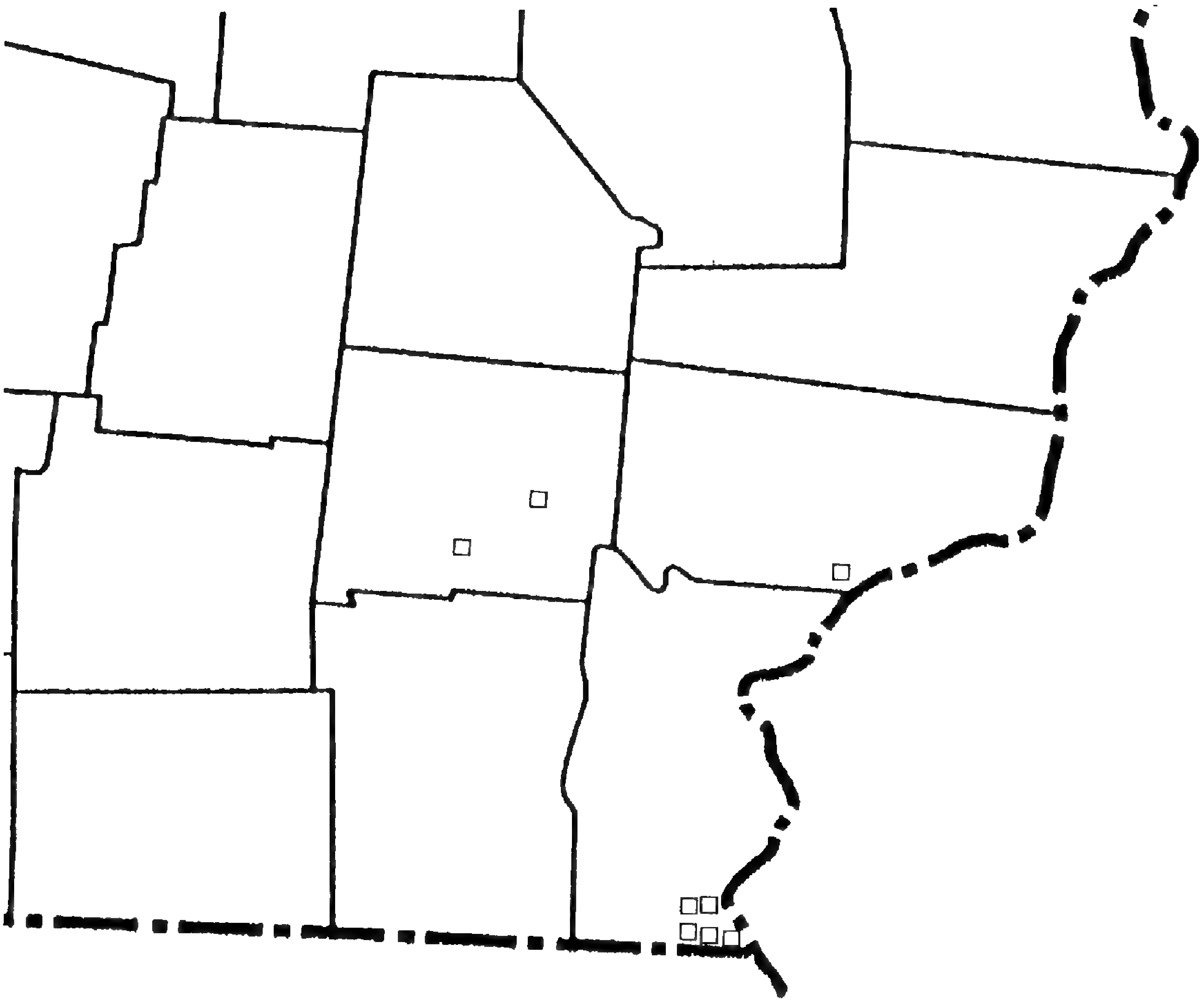

FIG. 2. Extant populations of *Trifolium stoloniferum* in southwest Ohio, 1988.

population is located within these earthworks. Most of the plants cluster about the bases of large black walnuts (*Juglans nigra* L.) while others grow adjacent to a gravel trail. The opening is moist, grassy, and parklike with filtered light. Typical herbaceous associates of the clover include: *Elymus virginicus* L., *Glechoma hederacea* L., and *Stellaria media* (L.) Cyrillo.

The Miami Fort apparently was heavily forested at the time of European settlement. The earliest description of the site was given by J. Scott Harrison who was born in 1804 at a homestead directly below the Miami Fort. His remarks date from 1838. As a young man Harrison observed the deforestation of the Miami Fort and nearby hilltops. These areas presented "precisely the same appearance as the circumabient forest. You will find on all of them the beautiful variety [of tree species] which gives such universal richness to our forest." (quoted in Ford & Ford 1881, p. 321).

The Miami Fort was acquired by the county park district in 1967. During the 1950's it had been a city park used sporadically by scouting groups and for day camping activities. Its earlier history is not known, but the isolated, large walnuts suggest that the area was selectively logged at least 50 years ago. It is likely that the fort was grazed as well. Since 1979 the fort has been lightly mowed about once a month from April to September.

Three other populations of *Trifolium stoloniferum* grow in the same Hamilton County park. Two of these are at the edges of footpaths which also are heavily used by deer. The other population is below a black walnut in a picnic area. All three sites share the common disturbance factors of trampling and regular mowing.

The fifth Hamilton County population grows in a cemetery owned and managed by the Ohio Historical Society. This is one of the oldest cemeteries in Ohio, having been established about 1790 (Burress 1987). This is the only extant population of *Trifolium stoloniferum* located in the vicinity of an historic collection of the species. The Short collection of 1834 came from the former settlement of Fernbank only a few miles further east along the Ohio Valley. This cemetery contains the graves of several individuals prominent in the history of Hamilton County. For that reason, the cemetery has been mowed and cleared of brush for an extended period. It was acquired by the Ohio Historical Society in 1935. The cemetery is kept closely mowed, which may benefit the clover by reducing herbaceous competition. As at the Miami Fort, the herbaceous associates are common species, such as *Carex jamesii* Schw. and *Muhlenbergia schreberi* Gmel. The clover grows at this site under the shade of American elms (*Ulmus americana* L.).

Two populations of *Trifolium stoloniferum* grow in mowed and trampled ground near houses. These dooryard sites, as we may call them, are in Clermont and Warren counties. The Warren county population is in a moist path between an 1820's homestead and an old barn. The Clermont County plants grow under a large American elm adjacent to an old stone barn. Herbaceous associates at these sites are weedy, non-indigenous species such as *Glechoma hederacea*, *Polygonum cespitosum* Blume, and *Trifolium repens*.

A single plant of running buffalo clover was located on a sandbar in the bed of an intermittent stream in a ravine in Warren County. Deer commonly are observed in this valley. It is conceivable that this single plant sprang from deer droppings and that the animals had grazed on the clover at a nearby site, so far not discovered.

MODERN HABITATS

Despite the diversity of habitats described above, it is possible to make a few generalizations about the ecological requirements of *Trifolium stoloniferum*.

All but the dooryard site in Warren County are near streams and rivers. The five Hamilton County populations are on slopes or hilltops above the Great Miami or Ohio rivers. The Clermont County site is on the terrace of a small tributary of the Ohio River. The single plant in Warren County is on a sandbar in the bed of an intermittent stream.

None of the extant populations of the clover are in full sun or dense shade. Most, including the largest, are in semi-shade with about 40-50% filtered light. The plants grow under black walnut or American elm or, at one site, tree-of-heaven (*Ailanthus altissima* (Mill.) Swingle).

All sites exhibit some sort of current disturbance. The sources of the disturbance may be mowing or trampling or a combination of both. The four populations in the Hamilton County Park District are along trails and in a picnic grove. Mowing and trampling probably encourages the growth of the clover by reducing competition from herbaceous species.

This disturbance has continued over an extended period of time at most sites. The cemetery has been kept open since the late eighteenth century. The woodland opening at the Miami Fort dates from at least the 1950's and probably is a good deal older. The dooryard populations are adjacent to nineteenth century structures.

All sites but the cemetery are linked to past or present grazing by herbivores. The Hamilton County park supports large herds of deer. The plant in the Warren County ravine is along a deer trail. Although there is no direct evidence of cattle grazing on any of the known sites, this is likely in the case of the dooryard sites and is possible at the Miami Fort. The connection between running buffalo clover and herbivores is discussed in the following section.

It is instructive to compare the Ohio habitats of *Trifolium stoloniferum* with those in other states. The two known West Virginia populations of running buffalo clover occur in alluvial soils of stream terraces. One of the populations is along a jeep trail. Both of the known Indiana populations are located in small ravines of intermittent streams near the Ohio River. The woods are very young, quite open, and lightly grazed by cattle. The clover grows on the slopes, in pathways created by the cattle, in the bed of an old logging road, and on sandbars and cobbles in the streambeds. The Kentucky population is found in a shaded pathway between a 1830's farmhouse and a family cemetery. This path is mowed about twice a year and the area had been pastured until about 50 years ago.

Soil associations apparently play only a minor role in the distribution of running buffalo clover. There is no known correlation between the range of this species and any specialized soil type. The extant Ohio populations grow in fine-textured, loamy soil of alluvial or lacustrine origin (Lerch 1971; Lerch et al. 1980; Smith 1964).

In general terms, *Trifolium stoloniferum* grows in semishade in a variety of moist openings and edge habitats which are maintained by long-term disturbance of a moderate nature. The species is not found in mature habitats nor in areas of severe disturbance. There may be a direct link between the occurence of this species and grazing by herbivores.

PHENOLOGY AND REPRODUCTION

Trifolium stoloniferum blooms in Ohio from mid May through early June. In 1988 the peak of bloom had already past by 24 May. This brevity of bloom is an important difference between running buffalo clover and the common *Trifolium repens* which often blooms till frost. Nothing is known about possible pollinators of the flower.

Mature seeds were obtained from two populations of *Trifolium stoloniferum* on 6 July 1988. By that date most leaves were withered and the plants difficult to locate among the surrounding vegetation. However, it is uncertain what role weather plays in the phenology of this species. The summer of 1988 was excessively hot and dry in southwest Ohio; the observed phenology may have been atypical. Persistence of the leaves and stolons may depend on moisture. The plants at the Miami Fort were almost totally withered by mid September 1988. However, at the same time the stolons were green and flourishing at the two dooryard sites where more water was available.

Trifolium stoloniferum reproduces both by seeds and vegetatively by stolons. It is unknown whether seed production results from selfing or outbreeding. The seeds of running buffalo clover remain in the legume until the outer walls of the pod are broken down mechanically by exterior forces. The thick seed coats require scarification for germination (Campbell et al. 1988; J. Foster, USDA, pers. comm. 1989). Herbivory is the most likely means of dispersal of running buffalo clover. The plants undoubtedly are browsed by deer and other animals. They are known to be palatable to rabbits which in one documented case selectively ate *T. stoloniferum* leaving nearby plants of *T. repens* untouched (Davis 1987).

If indeed the distribution and reproduction of running buffalo clover are linked to herbivory, the most likely animal in Ohio is deer. Buffalo always were rare in Ohio (Shriver 1987). The two references to both buffalo and the clover in Ohio are quoted above. Most of the known populations occur in areas with large herds of deer. The plants frequently grow in clusters of four or five individuals, suggesting deposition of the seeds in the feces of deer.

Seeds and cuttings from selected Ohio populations were gathered 6 July 1988 by Joyce C. Foster, USDA, Beckley, West Virginia. Viable seeds germinated after refrigeration for two months followed by scarification with sandpaper. The cuttings also rooted successfully.

DECLINE

The number of historic collections of this species indicates that *Trifolium stoloniferum* formerly was relatively frequent in central and southwest Ohio, particularly in the vicinity of Cincinnati. The twentieth century saw a remarkable and sudden change. What factors lead to this precipitate decline?

Habitat destruction is the obvious answer to this question. However, the species itself grows in disturbed situations and probably requires disturbance to maintain itself. Campbell et al. (1988) suggested the best answer to this paradox—the lack of historical continuity of disturbance.

Running buffalo clover apparently has a poor dispersal mechanism. Deforestation created many new habitats, but there was no efficient means by which the species could move into new sites from remnant populations. The destruction of the original forest coincided with the decimation of the herbivores upon which the clover probaby depended for dispersal. The new openings quickly were usurped by alien species such as *Trifolium repens*. Deer virtually disappeared from Ohio in the nineteenth century and only have flourished under management in the past 50 years.

In the twentieth century the lack of disturbance probably played a contradictory role in the decline of running buffalo clover. Woodlands were allowed to mature, increasing the shade under which the clover cannot grow. Remnant populations became even more isolated, persisting in openings maintained by appropriate disturbance. At least some of the extant populations of running buffalo clover may have persisted in place for several decades.

The high palatability of this species also may have contributed to its decline. The cattle of European settlers were greater in number than the indigenous herbivores. The grazing pressure was much more intense than in pre-settlement times.

Other biological and environmental factors as yet unknown may have contributed to the decline of *Trifolium stoloniferum*. Among these possibilities are disease and the disappearance of a pollinator and resultant reduction in outbreeding. Suppression of woodland fires might have led to the closure of suitable habitats. *Trifolium stoloniferum* is the only taxon in this genus which lacks rhizobial bacteria (Campbell et al. 1988). Has the infecting bacterium been lost?

Some or all these factors probably acted in concert and led to the virtual extirpation of running buffalo clover from Ohio and most of its geographic range.

MANAGEMENT AND PRESERVATION

Successful management for *Trifolium stoloniferum* must tread a thin line between too little and too much disturbance. Most populations have withstood mowing or trampling over time with little effect. Mowing seem especially important in controlling the alien weedy species Japanese honeysuckle (*Lonicera japonica* Thunb.) and garlic-mustard (*Alliaria petiolata* (Bieb.) Cavara and Grande. (This latter species often is known by the later name *A. officinalis* Andrz. ex Bieb.; see Clapham et al. 1962). At the Miami Fort the unmown woodlands and shady openings are carpeted with garlic-mustard. This species is only a minor element of the groundcover in the area maintained by regular mowing. There seems no reason to drastically alter existing disturbance regimes. Mowing might be suspended in early May to allow flowering and resumed in mid July after seed set.

The prospects are bright for preserving *Trifolium stoloniferum* in Ohio. Four populations, including Ohio's largest, are owned by the Hamilton County Park District. The park district is most willing to cooperate in protecting these populations and plans to monitor the species over time. The presence of running buffalo clover will be taken into account in management plans being prepared by the Ohio Historical Society for the cemetery site (M. Pratt, pers. comm. 1988). The owners of the dooryard sites have registered their populations with ODNAP as Ohio Natural Landmarks.

ACKNOWLEDGEMENTS

Special thanks go to the many landowners who gave permission for the Clover Team to search for running buffalo clover on their properties. The Hamilton County Park District, the Ohio Historical Society, and private landowners permitted us to collect plants, cuttings, seeds, and soil samples from their populations. Julian Campbell, University of Kentucky, generously shared his unpublished data on the native clovers of Kentucky and pointed out additional references to *Trifolium stoloniferum* in Ohio. Marc Evans, Kentucky Nature Preserves Commission, Frankfort, guided the Clover Team to the Kentucky population of running buffalo clover. Michael Homoya, Indiana Natural Heritage Program, Indianapolis, likewise led us to an Indiana population. Joyce C. Foster, USDA, Beckley, West Virginia provided data on the seeds and cuttings obtained from Ohio populations of running buffalo clover. Almut Jones, University of Illinois at Urbana-

Champaign, checked specimens of this species in the herbarium at that institution. Marilyn Ortt, ODNR, brought the Hildreth reference to buffalo clover to my attention. The U.S. Fish and Wildlife Service provided financial support and encouragement. The Division of Natural Areas and Preserves thanks James Engel and William Harrison of the U.S. Fish and Wildlife Service for their support and assistance.

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A NEW SPECIES OF *POLYMNIA* (COMPOSITAE: HELIANTHEAE) FROM THE OUACHITA MOUNTAIN REGION OF ARKANSAS

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ABSTRACT

A new species, **Polymnia cossatotensis**, is described from the Cossatot Mountains, a range of mountains in the Ouachita Division of the Interior Highlands. It was found growing abundantly on and among cherty novaculite talus. *Polymnia cossatotensis* is most closely related to *P. laevigata* and *P. canadensis* but is easily distinguished by its annual habit, cordate cauline leaves, fewer rays, and larger achenes.

In early October of 1988, during fieldwork along the Little Missouri River in west-central Arkansas, an unusual composite was noticed growing abundantly in an open area of cherty novaculite talus. The plants, approaching two meters in height and exuding a pungent odor, were often directly attached to bare rock surfaces by both adventitious and thickened secondary roots. Also present in the talus were *Ambrosia trifida, Hybanthus concolor, Phytolacca americana, Rhamnus carolinianus, Bumelia lanuginosa, Asimina triloba*, and several common woody vines, *Toxicodendron radicans, Vitis rotundifolia, Campsis radicans*, and *Parthenocissus quinquefolia*. The overstory on the terrace below the talus slope consisted primarily of *Fagus grandifolia, Carpinus caroliniana, Magnolia tripetala*, and *Ilex opaca* while *Quercus muhlenbergii, Liquidambar styraciflua, Ostrya virginiana*, and *Celtis laevigata* occurred on the adjacent drier slopes. The new *Polymnia* is named after the Cossatot Mountains, a range of mountains in the south-central section of the Ouachita Division of the Interior Highlands.

POLYMNIA **cossatotensis** A. B. Pittman & V. Bates, sp. nov. Figures 1,2.

Herba annua, aromatica, erecta, caulescens, robusta, usque ad 15 dm alta, radice palari, foliis solum caulinis. Caules juniores simplices, graciles, humiles, atropurpureis, foliis

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vulgo longipetiolatis, oblongis vel ovatis, cordiformibus, acutis, dentatis vel pinnatilobis; caules maturi fistulosi, ramosissimi, teretes, leviter multicostati, basin versus glabris, brunneolis, usque ad 12 mm crassis, sursum parce vel dense glanduloso-puberuli, ramis principalibus elongatis. Folia (praeter inflorescentiam) opposita, decussata, inferiora ante anthesin marcentes; folia principalia grandiora ad medium caulis aut ad basin inflorescentiae, sursum gradatim redacta, petiolis 2 — 10 cm longis, *laminis membranaceis, rufo-glandulosis, cordiformis* (ovatis vel suborbiculatis), 10 — 18 cm longis, reticulato-pinnatis (venae simplices in apicem dentatum foliis excurrentes), apicibus rotundatis vel late acutis, marginibus manifeste sinuatis vel crenato-dentatis aut ad apicem caulis integris. Inflorescentia expansa, leviter convexa, diffusa, 5 — 10 dm lata, ramis arcuato-ascendentibus, elongatis, ramulis gracilibus, purpureis, varie elongatis, varie puberulis. Capitula solitaria aut in parvis cymis ad apicem ramulorum; involucrum campanulatum, 4 — 6 mm altum 5 — 7 latum, apparentur biseriatum, bracteis laxe ascendentibus vel erectis, imbricatis, bracteis externis (2-) 3, late vel anguste oblongis, 1.5 — 3 mm longis, ad apicem viridibus, ciliatis, bracteis interioribus 3, late oblongo-obovatis, 5 — 6 mm longis, scariosis, luteolis viridibus, late rotundatis vel subtruncatis, ad apicem squarrulosis, ciliolatis, convexis, ad basin subcucullatis, dorsaliter striatulis, multinervis, glabris. Receptaculum leviter convexum, paleaceum, paleis oblongo vel anguste spathulatis aut anguste obovatis, 5 — 6 mm longis, ad apicem rotundatis vel late acutis, luteolis, ciliolatis. *Flosculi radii epapposi, (2-) 3*, pistillati, bracteis interioribus oppositi, tubo corollae gracili, ca. 1 mm longo, pilulosus, ligula oblongo-obovata, 4 — 5 mm longa, tridentata, alba, ramis styli divaricati, linearibus, ca. 1 mm longis, leviter compressis. Flosculi disci 12 — 15, epapposi, fungente masculi, tubo corollae ca. 1.5 — 2 mm longo, limbo luteolo, campanulato-infundibulari, 1.5 — 2 mm longo, glabri, lobis 5, erectis vel leviter expansis, *pilis multicellulosis sparsis*, triangulatis, ca. 0.5 mm longis; antherae 5, 1.1 — 1.3 mm longae, basibus tecarum rotundatis, ramis stylorum erectis. *Fructus obovoideus, 4.5 — 6 mm longus*, olivaceus vel atrobrunneolus, leviter dorsiventraliter compressus sed biconvexus, subtiliter reticulatus, *valde longitudine 5-costatus*, 2 costae margines facientes, ad apicem cum incrassato-annulato tuberculo 0.8 mm lato, 0.5 mm alto.

Annual, aromatic, erect, caulescent, robust herb to 15 dm tall from a taproot, the leaves strictly cauline. Young stems simple, slender, low deep purple, the leaves commonly long-petioled, oblong to ovate, cordiform, acute, dentate or pinnatilobed; mature stems fistulose, much-branched, terete, with many low ribs, brownish and smooth toward base, to 12 mm thick, upstem slightly to densely glandular-puberulent, the principal branches elongate. Leaves (except those of the inflorescence) opposite and decussate, the lower ones withering prior to anthesis; main foliage leaves largest at midstem or at inflorescence base, upstem gradually reduced, the petioles 2 — 10 cm long, *the blades membranaceous, reddish-glandular, cordiform* (ovate to suborbicular), 10 — 18 cm long, pinnate-reticulate (with veinlets short-excurrent from tips of leaf teeth), the tips rounded or broadly acute, the margin manifestly sinuate to crenate-dentate or entire at or toward stem tips. Inflorescence broad, somewhat convex, diffuse, 5 — 10 dm wide, the branches arched-ascending, elongate, the branchlets slender, purplish, variously elongate, variously puberulent. Heads solitary or in

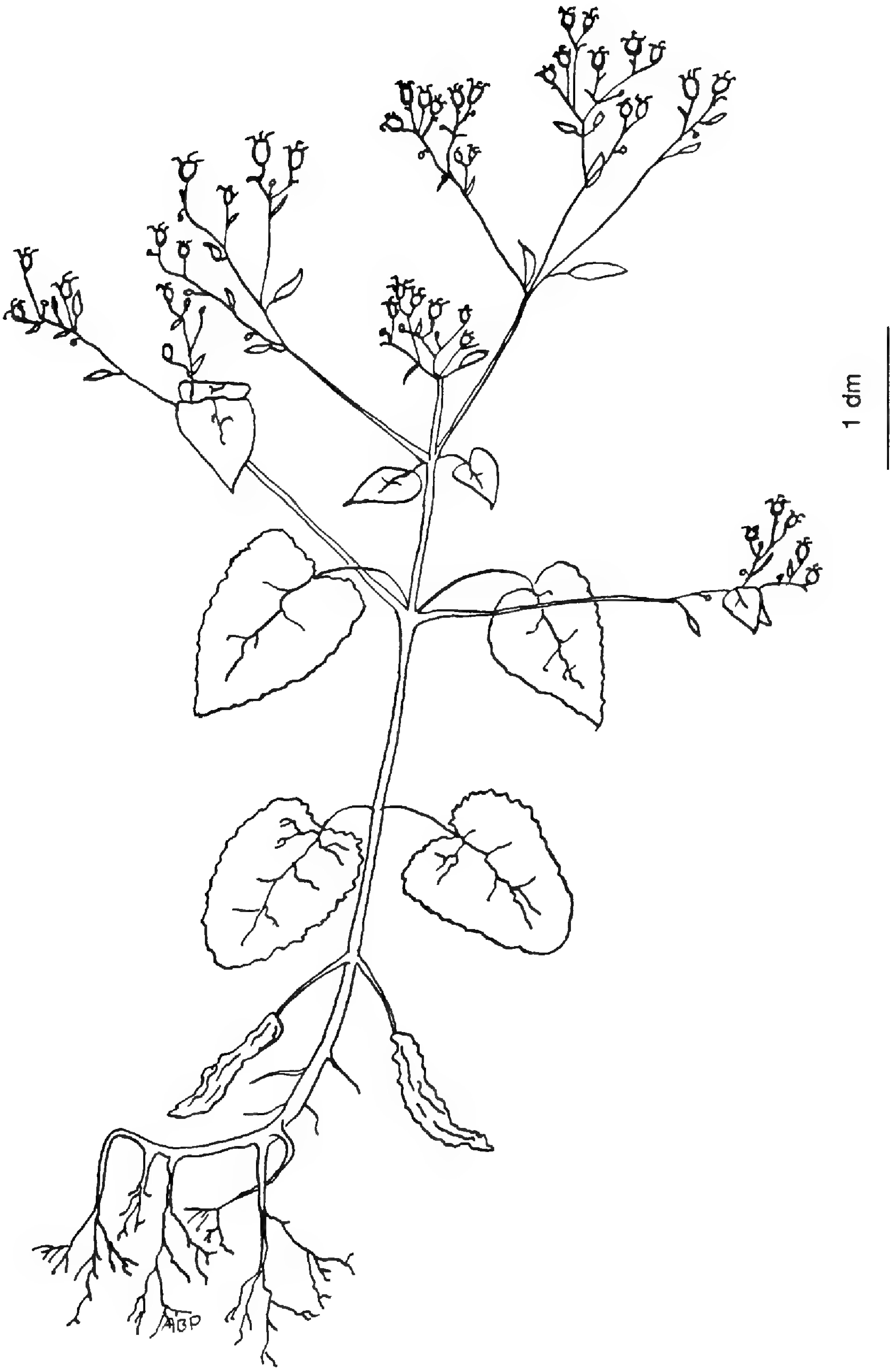

FIG. 1. Habit of *Polymnia cossatotensis*.

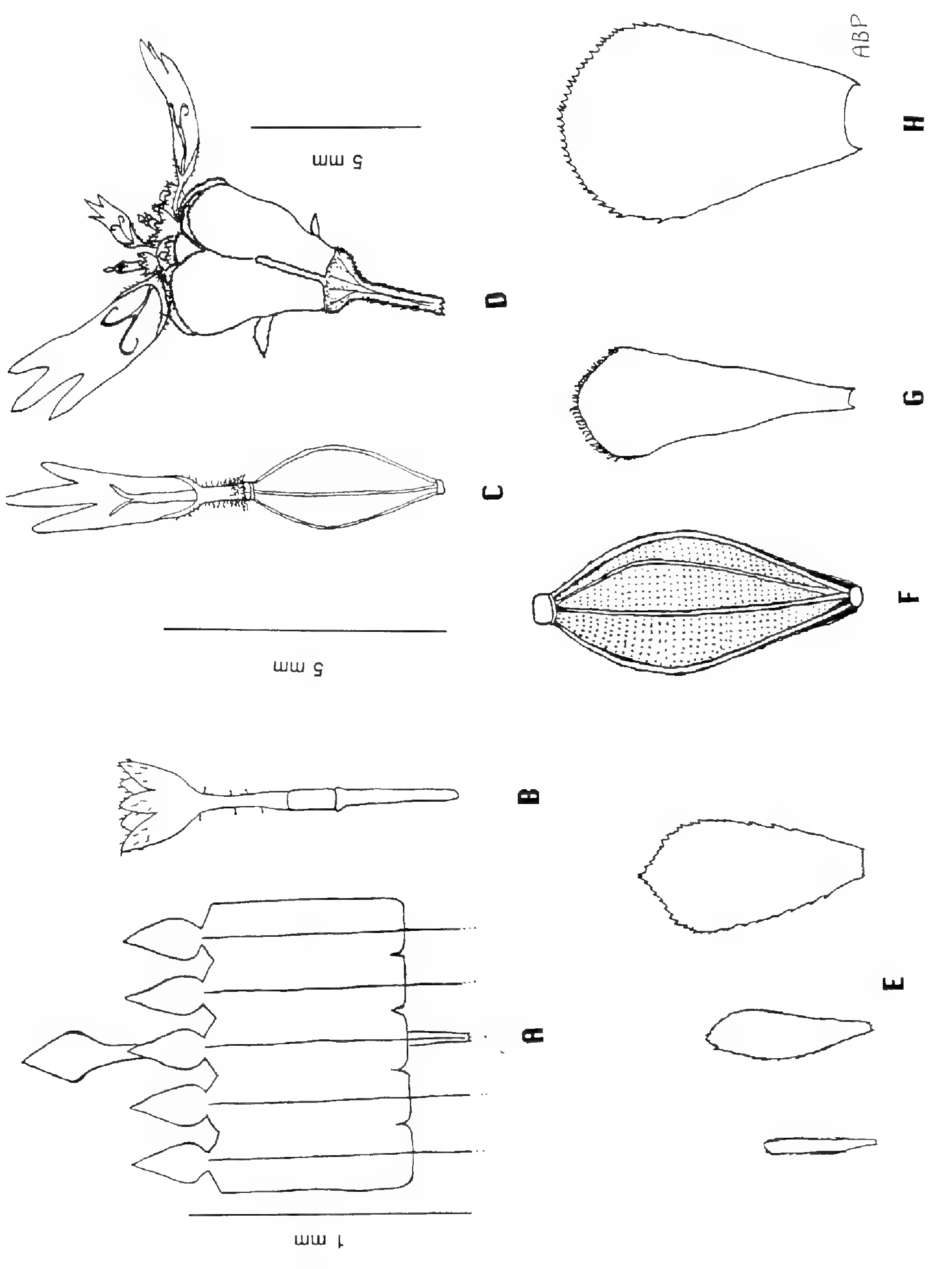

FIG. 2. Illustration of *P. cossatotensis*. A. Anthers and stigma of disk floret. B. Disk floret. C. Ray floret. D. Head. E. Outer involucral bracts. F. Achene. G. Palea. H. Inner involucral bract. The same scale applies to B, C, and E – H.

small cymes at branch tips; involucres campanulate, 4 – 6 mm high, 5 – 7 mm wide, evidently biseriate, the bracts loosely ascending to erect, imbricate, the outer bracts (2-) 3, broadly to narrowly oblong, 1.5 – 3 mm long, scarious-based and herbaceous-tipped, ciliate, the inner bracts 3, broadly oblong-obovate, 5 – 6 mm long, scarious, yellow green, broadly rounded or subtruncate, the tips squarrulose, ciliolate, the backs convex, toward base subcucullate, dorsally striate, multinerved, smooth. Receptacle slightly convex, paleaceous, the pales oblong to narrowly spathulate or narrowly obovate, 5 – 6 mm long, rounded or broadly acute at tip, yellowish, ciliolate. *Ray florets epappose, (2-) 3*, pistillate, opposite the interior bracts, the corolla tube slender, ca. 1 mm long, pilosulous, the ligule oblong-obovate, 4 – 5 mm long, tridentate, white the style branches divaricate, linear, ca. 1 mm long, slightly compressed, thick-edged. Disc florets 12 – 15, epappose, functionally male, the corolla tube ca. 1.5 – 2 mm long, the limb yellowish, campanulate-funnelform, 1.5 – 2 mm long, smooth, the lobes 5, erect or slightly spreading, *with multicellular hairs*, triangular, ca. 0.5 mm long; anthers 5, 1.1 – 1.3 mm long, the thecal bases rounded, the style branches erect. *Fruit obovoid, 4.5 – 6 mm long*, olivaceous to deep brown, somewhat compressed dorsiventrally but biconvex, finely reticulate, *strongly longitudinally 5-costate*, 2 costae making margins, the apex with an incrassate-annulate tubercle 0.8 mm wide, 0.5 mm high.

TYPE. UNITED STATES. ARKANSAS. Montgomery Co.: growing on cherty novaculite talus along the Little Missouri River, E-facing side of Blaylock Mtn., ca. 1.6 mi downstream from Albert Pike Recreation Area, T4S R27W Sect 32, 6 Oct 1988, *Pittman & Bates 7222* (HOLOTYPE: GH; ISOTYPES: MICH, MO, NCU, NY, OSU, TENN, TEX, UARK, US, VDB). Young specimens which were collected the following spring were distributed along with the type specimens (*Pittman & Bates 8923*, 9 Apr 1989).

The genus *Polymnia* L. has been variously treated by Wells (1965), Robinson (1978), and Cronquist (1980). Three species are present in the southeastern United States, *P. canadensis* L., *P. laevigata* Beadle, and *P. uvedalia* (L.) L.. The latter species has been placed in the genus *Smallanthus* (MacKenzie in Small 1933; Robinson 1978). According to Robinson, *Polymnia sensu stricto* has short multicellular hairs on the disk corollas that are unique in the Heliantheae. Our new species shares this character with *P. canadensis* and *P. laevigata* and, therefore, clearly fits into his narrow concept of *Polymnia*.

Polymnia cossatotensis is easily distinguished from other species in the genus by its annual habit, cordate cauline leaves, fewer rays, and larger achenes. Both *P. laevigata* and *P. canadensis* are perennials with large deeply pinnatifid cauline leaves. The achenes of *P. cossatotensis* are 5-ribbed as in *P. laevigata* while *P. canadensis* is 3-ribbed. The achenes of *P. cossatotensis* can be further differentiated from *P. laevigata* by their size, shape, and ornamentation.

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CAREX ASYNCHRONA, A NEW SPECIES OF SECTION *GRISEAE* (CYPERACEAE) FROM TAMAULIPAS, MÉXICO

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ABSTRACT

Carex asynchrona, a new species of section *Griseae*, is described from the Gómez Farías area of southwestern Tamaulipas, México. It differs from its close relatives (*C. hitchcockiana, C. impressinervia, C. oligocarpa*, and *C. ouachitana*) in that it possesses brown bases, glabrous sheaths, upper 3 – 4 spikes overlapping, and crowded, definitely beaked perigynia. Locally frequent in the upper elevational limit of cloud forest, *C. asynchrona* exemplifies the floristic affinity of the Gómez Farías cloud forest with forests in the southeastern United States.

Carex section *Griseae* (Bailey) Kükenthal (including section *Oligocarpae* (Carey) Mackenzie) is a group of about 16 taxa endemic to eastern North America. Most taxa inhabit mesic deciduous forests and several are widespread and common. The geographic distribution of the section is continuous from Nova Scotia west to Minnesota and south to central peninsular Florida and southern coastal Texas. Recent exploration of the Sierra Madre Oriental in southwestern Tamaulipas, México has resulted in the collection of a distinctive new species of *Carex* section *Griseae*. This new species is disjunct from the rest of the members of the section and is the first documentation of section *Griseae* in México or the tropics.

CAREX **asynchrona** Naczi, sp. nov. (Fig. 1).

Plantae cespitosae; culmi 29 – 79 cm alti; bases culmorum basibus brunneis saepe fibrosis foliorum veterum obtectae. Cataphylla glabra, straminea vel castanea vel atrobrunnea. Folia 6 – 12; laminae 4.7 – 63 cm longae, 1.2 – 4.0 mm latae; vaginae 2.6 – 6.8 cm longae, arctae, glabrae; ligulae 0.9 – 3.2 mm longae. Surculi vegetativi 24 – 49 cm alti; pseudoculmi 2.9 – 8.0 cm alti. Inflorescentiae 6 – 41 cm longae; spicae superae imbricatae; spicae infimae remotae vel vix imbricatae. Spicae 4 – 6, erectae. Spica terminalis 1.4 – 2.7 (3.5) cm longa, 1.5 – 3.7 mm lata, omnino mascula, in pedunculo 2.4 – 10.8 (14.8) mm longo, spicas superas laterales vix superans. Spica infima 1.4 – 3.2 cm longa, 4.3 – 5.8 mm lata, omnino feminea, in pedunculo 2.0 – 15.5 cm longo; flores 10 – 17 spiraliter imbricati, internodium inter flores infimos 1.9 – 3.7 (5.9) mm longum. Spicae laterales 1.0 – 2.4 cm longae, omnino femineae vel androgynae. Squamae femineae 2.5 – 5.9 mm longae, 1.3 – 2.4 mm latae, aristatae; aristae 0.2 – 3.6 mm longae. Perigynia (3.6) 4.0 – 4.7 mm longa, 1.4 – 1.8 mm lata, ascendentia, obscure trigona, glabra, nervata, in rostrum abrupte contracta; nervi 50 – 61 impressi; rostra 0.5 – 1.0 mm

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longa, laevia, plus minusve excurvata, integra. Achenia 2.8 – 3.4 mm longa, 1.4 – 1.6 mm lata, arcte inclusa perigyniis. Stigmata 3, 2.4 – 3.6 mm longa. Antherae 3, (2.1) 2.5 – 2.8 mm longae.

Plants densely to loosely cespitose. Rhizomes short with internodes 0.2 – 3.0 (8.0) mm long, 1.2 – 1.8 mm thick. Roots fibrous, smooth or sparsely covered with root hairs, pale to dark brown. Fertile culms 29 – 79 cm tall, 0.5 – 1.1 mm wide at mid-height, trigonous, erect to spreading, elongating in fruit, antrorsely scabridulous-angled; bases covered by brown, often fibrous bases of old leaves. Cataphylls glabrous, stramineous or red-brown or very dark brown, multicostate. Leaves 6 – 12, all arising in basal 0.1 – 0.5 of culm, the longest half as long as to slightly surpassing culms in fruit; blades 4.7 – 63 cm long, 1.2 – 4.0 mm wide, the widest 2.5 – 4.0 mm wide, flat to barely plicate, glabrous, margins antrorsely scabridulous, adaxial surface antrorsely scabridulous, abaxial surface with elevated veins and smooth or midrib antrorsely scabridulous; leaf sheaths 2.6 – 6.8 cm long, tight, glabrous, green; inner band of sheaths glabrous, hyaline, apex slightly concave and not thickened to slightly thickened; ligules 0.9 – 3.2 mm long, inverted V-shaped with apex acute or lingulate with apex obtuse. Vegetative shoots 24 – 49 cm tall, half as tall as to equalling culms; leaves 7 – 12, similar to those of fertile culms except blades 1.7 – 44 cm long; pseudoculms 2.9 – 8.0 cm tall, 1.3 – 2.1 mm wide. Inflorescences 6 – 41 cm long, 0.1 – 0.8 of culm height, with the upper 3 – 4 spikes overlapping; the uppermost lateral spikes 0.7 – 1.5 (2.2) cm distant; the lowest spikes separate or barely overlapping, 3.7 – 17.9 (23.5) cm distant; lowest bract blade 7.0 – 18.5 cm long, sheath (0.3) 0.7 – 3.1 (6.1) cm long; upper bracts much reduced; uppermost lateral spike bract blade 0.4 – 4.0 cm long, sheath 1.3 – 5.0 mm long, slightly shorter than to slightly exceeding terminal spike; uppermost bract subtending terminal spike and scale-like, sheathless, body 2.7 – 6.3 mm long and awn 2.1 – 6.7 mm long. Spikes 4 – 6, simple, single at nodes, erect. Terminal spike 1.4 – 2.7 (3.5) cm long, 1.5 – 3.7 mm wide, entirely staminate, 54 – 137-flowered, on peduncle 2.4 – 10.8 (14.8) mm long, barely exceeding upper lateral spikes. Lowest spike 1.4 – 3.2 cm long, 4.3 – 5.8 mm wide, entirely pistillate, 10 – 17-flowered, the flowers spirally imbricate, the internode between the lowest flowers 1.9 – 3.7 (5.9) mm long, on peduncle 2.0 – 15.5 cm long. Lateral spikes 1.0 – 2.4 cm long, 4.3 – 7.7 mm wide, entirely pistillate and 7 – 12-flowered or androgynous with 7 – 11 pistillate and 1 – 6 staminate flowers, on peduncles 0.1 – 4.8 cm long. Pistillate scales 2.5 – 5.9 mm long, 1.3 – 2.4 mm wide; body 1.4 – 3.0 mm long and ovate to lanceolate with midrib prolonged as antrorsely scabridulous awn 0.2 – 3.6 mm long, center green

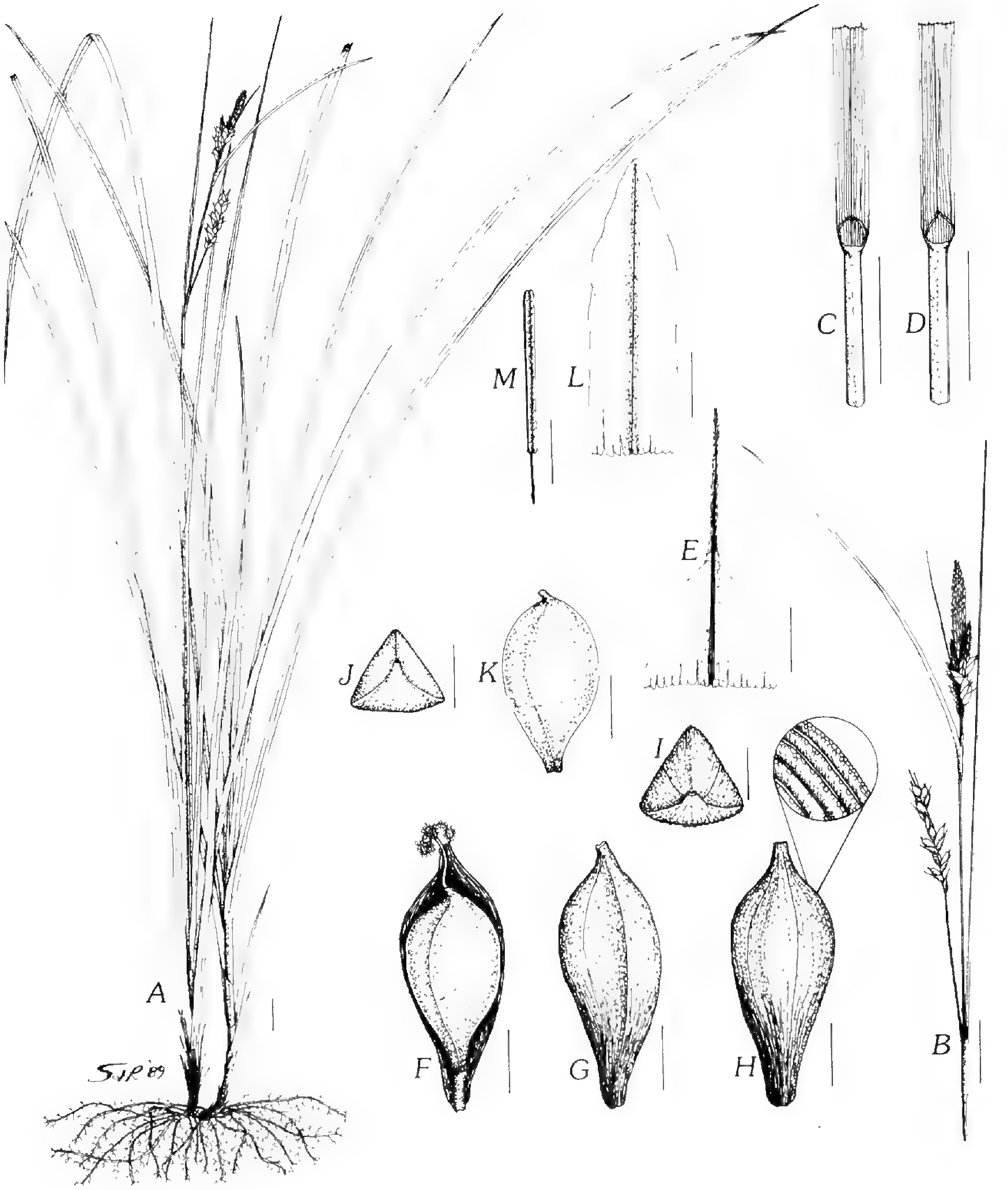

FIG. 1. *Carex asynchrona*. A. Habit. B. Inflorescence. C. Sheath and lingulate ligule. D. Sheath and inverted V-shaped ligule. E. Pistillate scale. F. Perigynium, side view, dissected to reveal achene. G. Perigynium, side view. H. Perigynium, front view, with enlarged portion showing impressed nerves. I. Perigynium, top view. J. Achene, top view. K. Achene, side view. L. Staminate scale. M. Anther. Bar equals 1 cm in A – D and 1 mm in E – M. Drawn by Susan A. Reznicek from the type.

and 2 – 7-veined, margins hyaline and whitish. Staminate scales 3.9 – 7.6 mm long, 1.1 – 1.8 mm wide, oblong, acute to acuminate, awnless, center green and 1 – 3-nerved, margins hyaline and whitish to stramineous. Perigynia (3.6) 4.0 – 4.7 mm long, 1.4 – 1.8 mm wide, 2.4 – 2.9 times as long as wide, ascending, obtusely trigonous with faces flat to slightly convex, with many fine and impressed nerves on each face, the total number of nerves 50 – 61, glabrous, green to red-brown, fusiform, gradually tapered to truncate base, abruptly contracted to a beak; beaks 0.5 – 1.0 mm long, 0.1 – 0.2 of perigynium length, smooth, slightly excurved, entire. Achenes 2.8 – 3.4 mm long, 1.4 – 1.6 mm wide, obtusely trigonous with faces slightly concave to flat, tightly enveloped by perigynia, brown, obovate, basally abruptly narrowed to stipe 0.3 – 0.4 mm long, apically abruptly narrowed to beak 0.2 – 0.3 mm long; body 2.2 – 2.9 mm long; beak bent 10 – 90° from vertical. Styles slender, jointed with achenes, withering; stigmas 3, 2.4 – 3.6 mm long. Anthers 3, (2.1) 2.5 – 2.8 mm long.

TYPE: MÉXICO. TAMAULIPAS: Mpio. Gómez Farías, vicinity of Rancho del Cielo Biological Station ca. 7 km WNW of Gómez Farías, along forest trail from old lumber road to the lumber road to Indian Springs (Ojo de Agua de los Indios), cloud forest of *Quercus, Liquidambar, Acer, Magnolia*, and *Podocarpus*, NE-facing, rocky, moist slope, 1200 m, frequent in one local area, 1 Jun 1989, *Naczi 2220 & Reznicek* (HOLOTYPE: MICH; ISOTYPES: BM, CHAPA, ctb - Charles T. Bryson personal herbarium, F, GH, MEXU, MO, NY, PH, SMU, TAES, TEX, US, VDB, WIS).

Additional specimens examined. MÉXICO. TAMAULIPAS: near Frank Harrison's "Rancho del Cielo" in Sierra de Guatemala above Gómez Farías, trail to Ojo de los Indios, 4500 ft, 27 Aug 1952, *Sharp et al. 52103* (MSC, TENN); "North Woods" off the Joya de Salas trail, 4600 ft, 1 Sep 1952, *Sharp et al. 52232 and 52248* (MSC, TENN); Mpio. Gómez Farías, vicinity of Rancho del Cielo Biological Station ca. 7 km WNW of Gómez Farías, along logging road from Indian Springs (Ojo de Agua de los Indios) to Agua Linda turnoff, moist cloud forest of *Quercus, Liquidambar, Acer*, and *Podocarpus*, 1400 m, frequent in bed of old logging road and along forest edge in old clearing, 1 Jun 1989, *Naczi 2221 & Reznicek* (CHAPA, ctb, MICH, NCU); NE of Indian Springs (Ojo de Agua de los Indios) toward Agua Linda, edge of sunny, open clearing between low ridges in open Pinus forest, 1500 m, few scattered clumps, 1 Jun 1989, *Naczi 2222 & Reznicek* (CHAPA, MICH).

The numerous (50 – 61) nerves impressed in the mature, dried perigynia of *Carex asynchrona* clearly place this species in section *Griseae*. Within section *Griseae*, *C. asynchrona* belongs to a group of species possessing tight leaf and bract sheaths and perigynia tightly enveloping the achenes. The other species in this group are *C. hitchcockiana* Dewey, *C. impressinervia* Bryson, Kral, & Manhart, *C. oligocarpa* Willdenow, and *C. ouachitana* Kral, Manhart, & Bryson. The purple-red bases and distichous perigynia of *C. oligocarpa* and the purple-red bases and stout, long-creeping rhizomes of *C. ouachitana* easily distinguish each of these species from *C. asynchrona*.

Although *C. hitchcockiana* has brown bases and perigynia with definite, excurved beaks like *C. asynchrona*, *C. hitchcockiana* has pubescent leaf and bract sheaths, wider leaf blades (widest leaf blade per plant 3.0 – 6.3 mm vs. 2.5 – 4.0 mm wide), longer bract blades (bract blade of uppermost lateral spike (1.8) 4.5 – 15.3 cm vs. 0.4 – 4.0 cm long), and longer perigynia ((3.9) 4.2 – 5.7 mm vs. (3.6) 4.0 – 4.7 mm long) than *C. asynchrona*. *Carex impressinervia* has brown bases and fibrous remains of old leaves at its culm bases like *C. asynchrona*, but the former usually has non-overlapping upper spikes, much longer terminal spike peduncles ((5) 19 – 66 (89) mm vs. 2.4 – 10.8 (14.8) mm long) and less definitely beaked, more remote perigynia (the lowest 2 perigynia of the lowest spike usually non-overlapping and 4.2 – 17 mm distant vs. usually overlapping and only 1.9 – 3.7 (5.9) mm distant) than *C. asynchrona*. The following key will aid in distinguishing *C. asynchrona* from its close relatives.

1. Cataphylls and basal leaf sheaths purple-red.
    2. Densely cespitose, rhizomes very short; bract of uppermost lateral spike usually exceeding terminal spike; terminal spike 1.2 – 3.0 mm wide. . . . . *C. oligocarpa*
    2. Loosely cespitose, rhizomes long-creeping; bract of uppermost lateral spike usually much shorter than terminal spike; terminal spike 2.8 – 4.5 (5.4) mm wide. . . . . *C. ouachitana*
1. Cataphylls and basal leaf sheaths brownish.
    3. Leaf and bract sheaths pubescent; bract blade of uppermost lateral spike (1.8) 4.5 – 15.3 cm long; widest leaf blade 3.0 – 6.3 mm wide. *C. hitchcockiana*
    3. Leaf and bract sheaths glabrous; bract blade of uppermost lateral spike 0.2 – 6.8 cm long; widest leaf blade 2.5 – 4.0 mm wide.
        4. Upper 3 – 4 spikes overlapping; terminal spike peduncle 2.4 – 10.8 (14.8) mm long; lowest 2 perigynia of lowest spike 1.9 – 3.7 (5.9) mm distant. . . . . *C. asynchrona*
        4. Upper spikes usually nonoverlapping; terminal spike peduncle (5.0) 19 – 66 (89) mm long; lowest 2 perigynia of lowest spike 4.2 – 17 mm distant . . . . *C. impressinervia*

Carex asynchrona is locally frequent at 1200 – 1500 meters (4000 – 5000 feet) elevation in the vicinity of the Rancho del Cielo Biological Station. It inhabits heavily to lightly shaded, moist loam of forests and forest edges at the upper elevational limit of cloud forest. Unlike the temperate members of section *Griseae*, culm development within an individual of *C. asynchrona* is staggered. Several specimens possess culms with flowers at anthesis as well as culms shedding mature perigynia, hence the epithet "asynchrona." Peak fruiting appears to occur in late May-June, with one fruiting culm (*Sharp et al. 52248*, MSC) among otherwise sterile material collected in late August and early September (*Sharp et al. 52103*

(MSC, TENN), *52232* (MSC, TENN), and *52248* (TENN)) indicating that fruiting occurs sporadically at other times of the year.

Carex asynchrona joins other recently described species of section *Griseae* (Bryson et al. 1987; Kral et al. 1987) in increasing the membership of this taxonomically complex and poorly resolved group (Naczi, revision in preparation). That a species of a section most diverse in the southeastern United States would occur disjunctly in southwestern Tamaulipas is not a total surprise. The community of which *C. asynchrona* is a member exhibits much floristic affinity with forests of the southeastern United States. Genera of forest trees and shrubs with the same or closely related species in both the Gómez Farías area and the southeastern United States include *Acer, Carpinus, Carya, Cercis, Fagus, Hamamelis, Illicium, Liquidambar, Magnolia, Morus*, and *Tilia*. As well, closely related or conspecific members of such herbaceous genera as *Arisaema, Botrychium, Epifagus, Laportea, Mitchella, Sanicula*, and *Viola* occur in the forests of both regions (Hernández X. et al. 1951; Martin and Harrell 1957; Rzedowski 1978).

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OBSERVATIONS ON SEED DISPERSAL AND IMPLANTATION IN BURROGRASS (*SCLEROPOGON BREVIFOLIUS* - GRAMINEAE)[1]

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ABSTRACT

Diaspores of burrograss (*Scleropogon brevifolius* Phil.) possess morphological features that enhance dispersal and seed implantation by wind on flat, non-vegetated ground. The awns of the female spikelet orient the diaspore to facilitate implantation of the floret into soil cracks, and the callus hairs hold the floret in the soil. In areas with even slight ground cover, however, the awns prevent contact of soil and diaspore and implantation of the floret is prevented.

INTRODUCTION

Burrograss (*Scleropogon brevifolius* Phil.) commonly inhabits semi-arid playas, swales, and plains of the southwestern United States and northern Mexico. In the Chihuahuan Desert region of southern New Mexico burrograss typically forms patches of vegetation associated with tobosa [*Hilaria mutica* (Buckl.) Benth.], ear muhly [*Muhlenbergia arenacea* (Buckl.) A.S. Hitchc.], threeawns (*Aristida* spp.), and various other grasses and forbs that comprise the zonal vegetation surrounding playas and alkali flats. One commonly finds nearly solid stands of either tobosa, burrograss, or a forb/grass mixture, with each population separated by areas of bare ground.

Burrograss populations normally grow as dense stands of vegetation formed by numerous small tufted plants, each plant spreading by offshoots from slender stolons. The spikelets are unisexual and the plants may be monoecious or dioecious, with occasionally both sexes present in the same panicle. The spikelets for each sex produce several florets, but are morphologically dissimilar: male spikelets are awnless, whereas female spikelets develop long, twisted awns from the lemmas.

Awns of grasses are commonly regarded as aids in dispersal, either by wind or animals (Chase 1922; Gould & Shaw 1983; Hitchcock 1914). But the awns may also function in seedling establishment and germination. In *Aristida*, the awns hold the floret at an angle against the soil surface that

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allows greater contact of the callus with the soil, thus enhancing germination possibilities. Germination of *Aristida* florets with awns removed is lower than florets with awns intact. Also, the callus hairs hold the germinating seedling in the ground against the force of the primary root penetrating the soil (Peart 1981). A similar adaptation is described for burrograss.

THE DISPERSAL UNIT (DIASPORE)

Disarticulation of female spikelets of burrograss occurs above the glumes and below the lowermost floret, and the resulting dispersal unit (diaspore) is initially a compound structure composed of several florets (Fig. 1). The basal floret is the largest and has a sharp-pointed callus bearded with numerous, short, stiff, upward-pointing hairs. The next one or two florets are morphologically identical to the basal one, but smaller, and the terminal one or two florets are generally represented as awns. At the time of disarticulation the awns of the lower florets are well-developed, 5 – 10 cm long, twisted, and generally recurved, forming an umbrella-like or cage-like arrangement around the florets. The smaller awns of the terminal

FIG. 1. Compound dispersal unit formed by several florets.

florets remain erect. The average weight of a compound diaspore is 0.02 grams, determined from the combined weight of 50 diaspores. When dropped from a height of 1.5 m in an essentially wind-free environment, diaspores consistently fall with the callus end down. Upon landing, the cage of awns holds the diaspore more or less erect, with the callus normally resting upon the ground. The awns are not hygroscopic, and do not twist or change configuration when wetted or suspended over a container of water.

DISPERSAL AND IMPLANTATION

Soils in burrograss habitats typically contain a high percentage of clay. Upon drying, the soil surface cracks and forms polygonal plates. The fissures between plates may be up to 1 cm wide, but widths of 1 to 2 mm predominated in the habitats examined. The edge of the plate is often lifted up as the soil crust dries, forming a miniature ridge. Upon disarticulation from the spikelet, diaspores of burrograss eventually land on a flat area with polygonal plates and fissures, the awns holding the diaspore in a nearly vertical position. Wind moves the unit across the soil surface, the diaspore "walking" on the tips of the awns. If the callus catches on a fissure, the diaspore is forced into the crack by the wind (Fig. 2). The backward-pointing hairs of the callus then hold the diaspore in the fissure. Wind velocity also seems to be an important factor. Heavy gusts will pull the diaspores from the spikelets and may disperse them for long distances, but strong winds are too violent and turbulent to function in the drilling

FIG. 2. Diaspore implanted in fissure.

process; the diaspore simply tumbles in the air, with never a chance for the callus to catch on the ridge of a fissure. When a diaspore is resting on the ground, however, very light winds will inch the dispersal unit across the surface, and the callus can easily snag on a fissure and be forced down into the crack. This is apparently a common phenomenon. Fourteen burrograss habitats in southern New Mexico examined in November 1988 all had diaspores prominently embedded in fissures. The placement of the diaspores in the fissures was so uniform and widespread within each site it gave the impression they had been planted artificially.

Once implanted, the diaspores of burrograss remain in the soil. In August 1989, diaspores were still imbedded in the soil, even though awns and above ground portions of the spikelets were badly weathered. The retention of the diaspores in the ground was aided by the dissolution of the cracks during rains, the diaspores then being "set" in the rehardened crust.

This type of dispersal and seeding mechanism is adapted to open, bare areas adjacent to burrograss stands. In one population sampled the density of embedded diaspores in a bare area was 79.2 diaspores/m^2, nearly six times their density in an adjoining area vegetated with a forb/grass mixture (13.6 diaspores/m^2, determined from 20 1/2-m plots). Vegetation as low as 1 cm was tall enough to keep the callus off the ground surface and reduce drastically the implanting of diaspores into fissures. Consequently, few young plants of burrograss were found growing within other vegetation. The vegetative cover was often annual forbs, such as species of *Allionia* or *Euphorbia*. Because the location of these annuals within the bare areas varies from season to season, burrograss diaspores are excluded from different portions of the bare areas each year; this may contribute to maintaining the patchy community structure of burrograss habitats.

Rather than being solely an adaptation to distance dispersal by wind, the awns of the burrograss diaspore also function to orient the diaspore during both its fall and its movement across the ground surface so that implantation of the dispersal unit into the soil is enhanced.

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NOTEWORTHY PLANTS FROM NORTH FLORIDA. IV.

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ABSTRACT

The following appear to be first reports for the state of Florida: *Carex willdenowii* var. *megarrhyncha*, *Crepis pulchra*, *Galium obtusum*, *Gnaphalium helleri*, *Iris fulva*, *Polygala nuttallii*, and *Scutellaria thieretii* (mistakenly reported as *S. drummondii* in an earlier paper). Some additions to the Florida panhandle are documented here, and several significant range extensions, particularly for rare or endangered taxa within our area, are given.

This is the fourth installment of a series (Anderson 1984, 1986, 1988) to update our knowledge of the flora of the Florida panhandle and Clewell's guide (1985) to the flora. Carter (1988), Johnson and Blyth (1989), and Bridges et al. (1989) have also added new records from this region. The area of coverage is from the Suwannee River west to the Alabama state line.

New discoveries—i.e., taxa not listed by Clewell—and range extensions of selected rare or endemic species are given here. A few collections appear to be the first reports for Florida. Exotics that appear to be adventive or naturalized are also listed. Voucher specimens are at FSU unless noted otherwise.

The Apalachicola River region of Florida has long been noted for its unique flora (Gray 1875, Clewell 1977, Ward 1979) with many endemic or otherwise rare species (see Wood 1988 for officially listed endangered taxa in Florida). Through recent field surveys in this region by the author, A. K. Gholson, R. K. Godfrey, and W. W. Baker, many new sites have been found within the known ranges of endemics such as *Cuphea aspera* Chapm., *Euphorbia telephioides* Chapm., *Justicia crassifolia* (Chapm.) Small, *Macbridea alba* Chapm., and *Scutellaria floridana* Chapm. In addition, new county records are given here.

TAXA NEW TO THE AREA

ALLIUM NEAPOLITANUM Cyr. Franklin Co.: common in sparsely sodded lawns, Apalachicola, 5 Mar 1987, *L.C. Anderson 10311*; naturalized, new to Florida panhandle.

ASPARAGUS OFFICINALIS L. Escambia Co.: Pine Forest road, Pensa-

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cola, 23 Apr 1986, *J.R. Burkhalter 10298* (UWFP); Nine Mile Road, Pensacola, 16 May 1987, *J.R. Burkhalter 10597* (UWFP); naturalized, new to Florida panhandle.

CAREX WILLDENOWII Schk. ex Willd. var. MEGARRHYNCHA F. J. Hermann. Gadsden Co.: 4.5 air mi SW of Chattahoochee on Apalachicola River, 21 Apr 1988, *L.C. Anderson 11161*; native, the variety (perigynia 9 mm long) new to Florida.

COREOPSIS TINCTORIA Nutt. Escambia Co.: near Pensacola, 2 Jun 1985, *J.R. Burkhalter 9958*. Leon Co.: roadside in Tallahassee, 25 May 1988, *L.C. Anderson 11327*. Madison Co.: I-10 SW of Madison, 5 Jul 1988, *D. H. Mead 1001*; naturalized from Alabama or farther west, new to Florida panhandle.

CREPIS PULCHRA L. Gadsden Co.: River Junction, S of Chattahoochee, 23 May 1982, *A.K. Gholson 9752*; native, new to Florida.

CUSCUTA UMBELLATA H.B.K. Franklin Co.: beside highway 98 near Ochlockonee Bay, 26 Aug 1988, *L.C. Anderson 11795*; native, new to Florida panhandle. The species is considered rare in peninsular Florida (Austin 1980).

CYRTOMIUM FALCATUM (L.f.) Presl. Washington Co.: limestone ledges of "Berry Sink" SE of Chipley, 26 Mar 1987, *A.K. Gholson 11779*, 8 Apr 1987, *R.K. Godfrey 82320*; naturalized, new to Florida panhandle.

DIGITARIA BICORNIS (Lamk.) R. & S. Escambia Co.: near University Mall sewage treatment plant, 4 Aug 1976, *J.R. Burkhalter 4409* (FLAS). Wakulla Co.: edge of salt marsh E of Panacea, 22 Jul 1957, *R.K. Godfrey 55630*; native, new to Florida panhandle.

GALIUM OBTUSUM Bigelow var. FILIFOLIUM (Wieg.) Fern. Wakulla Co.: moist depression in longleaf pine remnant along hiway 98, 1.2 air mi NW of St. Marks, 11 Jun 1988, *L.C. Anderson 11451*; native, new to Florida.

GNAPHALIUM HELLERI Britt. Gadsden Co.: edge of woods E side of Chattahoochee, 24 Oct 1988, *A.K. Gholson 12086* (Gholson Herbarium), *R.K. Godfrey 82941*; native, new to Florida.

IRIS FULVA Ker-Gawl. Santa Rosa Co.: Quinn Bayou, Milton, 6 Apr 1985, *G.S. Wilhelm & J.R. Burkhalter 12565* (MOR); native, new to Florida.

IRIS × GERMANICA L. Jackson Co.: wet woodland 4 mi N of Mariana, 2 Apr 1983, *R.K. Godfrey 80395*; naturalized, new to Florida panhandle.

LUDWIGIA HEXAPETALA (Hook. & Arn.) Zardini & Peng. Santa Rosa Co.: canal E of Milton, 3 May 1967, *J.W. Wooten 958*. Walton Co.: flatwoods, 28 Jul 1938, *E.G. Hume s.n.* (FLAS); naturalized, new to

Florida panhandle. The specimens were previously misidentified as *L. uruguayensis* (Camb.) Hara, but the two species are distinct.

POLYGALA NUTTALLII T. & G. Wakulla Co.: cypress pond in Apalachicola Nat'l Forest, 3.7 mi W of Crawfordville, 9 Aug 1988; *R.K. Godfrey 82798*; native, new to Florida.

SCUTELLARIA DRUMMONDII Benth. Okaloosa Co.: adventive on railroad siding, Eglin Air Force Reservation, 17 Jul 1968, *D.B. Ward 6711* (FLAS). This collection was documented by Wilhelm (1984); it is repeated here to avoid confusion with the next entry.

SCUTELLARIA THIERETII Shinners. Columbia Co.: W of High Springs, 9 Apr 1982, *A.K. Gholson 9521* (FLAS, FSU), 10 Apr 1983, *R.K. Godfrey 80459* (indet. R. Kral); adventive, new to Florida. These collections were mistakenly reported as *S. drummondii* (Anderson 1984). The two species are closely related, and both are now known to occur in Florida.

RANGE EXTENSIONS IN THE APALACHICOLA RIVER REGION

ASCLEPIAS VIRIDULA Chapm. Bay Co.: savannah 4 mi N of Youngstown, 8 Aug 1988, *A.K. Gholson 12019* (Gholson Herbarium).

ASTER SPINULOSUS Chapm. Bay Co.: E of Panama City, 9 Oct 1949, *S.C. Hood 3267, 3275* (FLAS), 8.8 mi E of hiway 98 on rte 22, 12 Sep 1979, *W.S. Judd 2318* (FLAS); pine plantation W of Sandy Creek, S of rte 22, 28 Jul 1988, *A.K. Gholson 12006* (Gholson Herbarium). Franklin Co.: wiregrass-longleaf pine remnant 3.1 mi drive NW of Apalachicola, 29 Jul 1967, *J. Beckner 1874* (FLAS), 24 Jun 1988, *L.C. Anderson 11525*; savannah near Huckleberry Creek, 5 air mi WNW of Apalachicola, 14 Jul 1988, *L.C. Anderson 11627*. This species is endemic to the Florida panhandle.

BAPTISIA SIMPLICIFOLIA Croom. Gadsden Co.: Quincy, 26 Jul 1935, *E. West s.n.* (FLAS). Liberty Co.: longleaf pineland 3 mi N of Wilma on rte 65, 25 Sep 1981, *R.K. Godfrey 79518*; wiregrass-pinewoods ca. 4.5 air mi NW of Sumatra, 20 Sep 1983, *J.B. Nelson 2949*; junction forest roads 123 and 123C (NW of Sumatra), 7 Nov 1987, *P.W. Alcorn 393* (FLAS); wet savannah 7 air mi NNW of Sumatra, 14 Sep 1988, *L.C. Anderson 11828*. This species is endemic to the Florida panhandle.

CUPHEA ASPERA Chapm. Calhoun Co.: flatwoods at Chipola Park on Dead Lake, 6 Jul 1988, A. K. Gholson (visual sighting, no voucher because of rareness here). This species is endemic to the Florida panhandle.

EUPHORBIA TELEPHIOIDES Chapm. Bay Co.: longleaf pine woods along highway 98 just N of Panama City Beach, 8 Aug 1988, *A.K. Gholson 12021*. This species is endemic to the Florida panhandle.

GENTIANA PENNELLIANA Fern. Bay Co.: 0.5 mi N hiway 98, Panama City Beach, 30 Nov 1988, *A.F. Johnson & A. Blyth 8221*; Pringle (1967) cited a collection from Bay County. Calhoun Co.: 22 Dec 1938, *L.T. Nieland s.n.* (FLAS); Blountstown, 26 Jan 1939, *L.T. Nieland s.n.* (FLAS); Parker Wildlife Management Area near Chipola River, 29 Nov 1980, *A.K. Gholson 8654*. Franklin Co.: ca. 1.8 air mi SSW of Sumatra, 19 Jan 1985, *A.K. Gholson 11189*; Ft. Gadsden State Park, ca. 4.5 air mi SSW of Sumatra, 24 Jan 1986, *L.C. Anderson 9092*, 29 Jan 1987, *L.C. Anderson 10295* (FLAS, FSU); boggy savannah just W of New River, 4 air mi WNW of Carrabelle, 26 Dec 1988, *L.C. Anderson 11897*. This species is endemic to the Florida panhandle.

LIATRIS SQUARROSA (L.) Michx. Gadsden Co.: calcareous glade S of hiway 90 on E side of Chattahoochee, 29 Jul 1988, *A.K. Gholson 12007* (Gholson Herbarium). This is first known population in Florida panhandle E of Apalachicola River.

MACBRIDEA ALBA Chapm. Liberty Co.: wet pine savannah 4 mi NW of Sumatra, 16 Jul 1978, *R.K. Godfrey 76619*; 3 mi NW of Sumatra on forest road 106, 30 Jun 1984, *A.K. Gholson 10968* (FLAS, FSU). This species is endemic to the Florida panhandle.

RHEXIA PARVIFLORA Chapm. Bay Co.: 0.2 mi S of rte 22 near Gulf County line, 1 Aug 1988, *A.K. Gholson 12011*. Calhoun Co.: rte 71, 3 mi SW of Chipola River, 29 Jun 1988, *R.K. Godfrey 82748*. Gulf Co.: rte 387, ca. 3.5 air mi ENE of White City, 5 Jul 1988, *L.C. Anderson 11565*. Bounds (1987) indicates this species is the rarest in the genus; it is listed as endangered in Florida (Wood 1988).

RUDBECKIA NITIDA Nutt. Gulf Co.: pine plantation E of Old Parkwood Tramroad, ca. 6 air mi NNE of Port St. Joe, 23 Jun 1988, *L.C. Anderson 11504*.

SALVIA URTICIFOLIA L. Gadsden Co.: edge of limestone glade, ca. 1.5 air mi SW of Chattahoochee, 12 Sep 1985, *A.K. Gholson 11489*, 1 Apr 1986, *L.C. Anderson 9197*.

SCUTELLARIA FLORIDANA Chapm. Franklin Co.: flatwoods 3.3 air mi SSE of Sumatra, 21 Jul 1987, *A.K. Gholson 11859* (Gholson Herbarium). Liberty Co.; wet savannah 7 air mi NW of Sumatra, 11 Jun 1987, *A.K. Gholson 11838*, 17 Jun 1987, *A.K. Gholson 11839*. This species is endemic to the Florida panhandle.

SORGHASTRUM APALACHICOLENSE Hall. Gulf Co.: E of rte 71 in slashpine woods, 3 mi N of Wewahitchka, 16 Aug 1983, *R.K. Godfrey 80904* (FLAS, FSU), 23 Jul 1986, *R.K. Godfrey 82060*; 2.4 mi N of rte 22, ca. 11 air mi WNW of Wewahitchka, 23 Aug 1988, *L.C. Anderson 11778*. This species was thought to be endemic to the Florida panhandle until it was found in Mississippi (Lamar Co.: 1 mi NW of Talowah, 28 Aug 1982, *S. McDaniel 26434*).

SPIGELIA GENTIANOIDES Chapm. Calhoun Co.: oak pine clay upland, 8 mi N of Wewahitchka, 19 Jul 1954, *E.S. Ford 3331* (FLAS); longleaf pinewoods ca. 5.5 air mi S of Clarksville near Juniper Creek, 20 Jul 1988, *A.K. Gholson 11996* (Gholson Herbarium). Washington Co.: Chipley, 4 Jul 1940, *C.E. Pleas s.n.* (FLAS), 3 Jul 1941, *C.E. Pleas s.n.* (FLAS). This species is endemic to the Florida panhandle.

STACHYDEOMA GRAVEOLENS (Chapm.) Small. Franklin Co.: wiregrass-longleaf pine ridge near Hickory Landing, ca. 2.7 air mi SW of Sumatra, 1 Sep 1980, *R.K. Godfrey 78071*, 16 Sep 1985, *A.K. Gholson 11498*; near Wright Lake, ca. 2 air mi SW of Sumatra, 29 Sep 1983, *J.B. Nelson 3039*. Gulf Co.: wiregrass-longleaf pine woods 1.2 mi S of rte 22, ca. 3 air mi W of Wewahitchka, 1 Jun 1989, *L.C. Anderson 12015*. Wakulla Co.: near Pine Creek Landing of Ochlockonee River, 20 Sep 1987, *M.A. Garland 580* (FLAS, FSU). This monotypic genus is endemic to the Florida panhandle. The species was once considered part of *Hedeoma* (see Irving 1980 for review); Clewell (1985) and Wood (1988) list the species under the latter.

VERBESINA CHAPMANII Coleman. Franklin Co.: wooded savannah 9 air mi NNE of Apalachicola along rte 65, 14 Sep 1983, *J.B. Nelson 2912* (FLAS, FSU); 4 air mi SSW of Sumatra beside road to Ft. Gadsden, 14 Sep 1983, *J.B. Nelson 2934*; 8.5 air mi NNE of Apalachicola at railroad crossing, 21 Jun 1985, *L.C. Anderson 8336* (FLAS, FSU); near East River 7.5 air mi N of Apalachicola, 30 Jun 1988, *L.C. Anderson 11539*. This species is endemic to the Florida panhandle; several earlier collections from Bay and Walton Counties are at FSU (apparently overlooked by Clewell).

XYRIS ISOETIFOLIA Kral. Gulf Co.: E side of logging road 1.3 mi N of rte 22, ca. 10 air mi E of Callaway, 2 Aug 1988, *L.C. Anderson 11713*, 23 Aug 1988, *L.C. Anderson 11776*. This endemic was previously known only from two sites in Bay County and one in Washington County (Kral 1966, p. 214) but erroneously listed from Gulf County (Kral 1966, p. 227; Clewell 1985).

ADDITIONAL RANGE EXTENSIONS

Wilhelm (1984) reported the following four species for the western part of the Florida panhandle based on his collections or those of J.R. Burkhalter that were not listed by Clewell (1985). They have been found elsewhere in our region; citations (excluding those of Wilhelm and Burkhalter) follow.

ANAGALLIS ARVENSIS L. Calhoun Co.: 1.2 mi S of Blountstown, 4 Jul 1978, *A.K. Gholson 7225* (FLAS), *R.K. Godfrey 76588* (FLAS, FSU).

CLEMATIS VIRGINIANA L. Jefferson Co.: Wacissa Springs, 6 Sep 1982, *R.K. Godfrey 79947* (FLAS, FSU), 26 Nov 1987, *R.K. Godfrey 82638* (FLAS, FSU). Washington Co.: limestone ledges of "Berry Sink" SE of Chipley, 8 Apr 1987, *R.K. Godfrey 82319*.

MITRACARPUS HIRTUS (L.) DC. Bay Co.: rte 22 at Cook's Bayou, 28 Sep 1983, *J.B. Nelson 3020*. Calhoun Co.: near Apalachicola River, N of Blountstown, 19 Aug 1988, *R.K. Godfrey 82808*. Santa Rosa Co.: I-10 at highway 281, *L.E. Brown 13062* (SBSC); 15 mi E of Jay, 8 Dec 1978, *J. Spears s.n.* (FLAS, FSU), Milton, 13 Sep 1988, *L. S. Dunavin s.n.* (FLAS). Wakulla Co.: rte 365 at Wakulla, 18 Sep 1983, *R.K. Godfrey 80976*.

POA CHAPMANIANA Scribn. Gadsden Co.: Chattahoochee, 2 Apr 1988, *A.K. Gholson 11936* (FLAS), *R.K. Godfrey 82644* (FLAS, FSU). Leon Co.: near Capitola, 24 Apr 1988, *R.K. Godfrey 82648*.

ASPLENIUM HETERORESILIENS Wagner. Washington Co.: limestone walls of Cedar Grove Sink, S of Chipley, 26 Mar 1987, *A.K. Gholson 11778* (Gholson Herbarium), 8 Apr 1987, *A.K. Gholson 11781* (FLAS). This is a westward extension of range for this stabilized hybrid.

ELYONURUS TRIPSACOIDES Humb. & Bonpl. ex Willd. Gadsden Co.: calcareous glade S of hiway 90 on E side of Chattahoochee, 20 Oct 1988, *A.K. Gholson 12085* (Gholson Herbarium). All other known populations of this species in the Florida panhandle are coastal.

The following were listed by Clewell (1985) for one county but have been found in one or more additional counties as noted:

BROMUS PUBESCENS Muhl. ex Willd. Gadsden Co.: bluff above Apalachicola River floodplain, WSW of Chattahoochee, 22 May 1982, *R.K. Godfrey 79821* (FLAS, FSU); edge of limestone glade, ca. 1.5 air mi SW of Chattahoochee, 9 May 1987, *L.C. Anderson 10488*; steep calcareous slope S of River Junction, 8 May 1982, *A.K. Gholson 9681* (FLAS), 8 May 1988, *A.K. Gholson 11970* (Gholson Herbarium).

HYDRANGEA ARBORESCENS L. Walton Co.: steep slopes of upper Hughes Ditch, 2.5 air mi SW of Ponce de Leon, 29 Apr 1987, *A.K. Gholson 11801* (FLAS), *R.K. Godfrey 82362*.

PANICUM FLEXILE (Gattinger) Scribn. Gadsden Co.: limestone glade, 2.5 air mi SW of Chattahoochee, 19 Oct 1985, *A.K. Gholson 11519* (FLAS, FSU); glade ca. 2.0 air mi SW of Chattahoochee, 4 Oct 1987, *R.K. Godfrey 82564* (FLAS, FSU); Brickyard Glade, 0.5 mi SW of Chattahoochee, 2 Oct 1987, *A.K. Gholson 11899* (FLAS), 4 Oct 1987, *R.K. Godfrey 82568* (FLAS, FSU); glade E of Chattahoochee, 20 Oct 1988, *A.K. Gholson 12076* (Gholson Herbarium).

PTERIS VITTATA L. Gulf Co.: stabilized sand and shell cliffs bordering Gulf County Canal ca. 4.5 air mi NNE of Port St. Joe, 23 Jun 1988, *L.C. Anderson 11497*; Wilhelm (1984) reported this species for Escambia County.

SPIRANTHES LONGILABRIS Lindl. Escambia Co.: near Liberty Bible College, SW of Pensacola, 27 Oct 1985, *J.R. Burkhalter 10237*. Liberty Co.: savannah E of rte 379, 0.4 mi S of forest road 123, 16 Nov 1988, *A.K. Gholson 12097* (Gholson Herbarium). Santa Rosa Co.: edge of wiregrass savannah S of Avalon Beach, 16 Nov 1985, *J.R. Burkhalter 10267*; wet savannah S of Milton adjacent to East Bay, 4 Dec 1986, *A.K. Gholson 11759* (Gholson Herbarium).

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NOTES

PICEA ABIES (PINACEAE) NATURALIZED IN SOUTHEASTERN MINNESOTA—For three summers I have been observing two naturalized populations of Norway spruce, *Picea abies* (L.) Karst. (Pinaceae), in southeastern Minnesota. According to Little (1979), this species "has escaped from cultivation from Conn. to Mich. and perhaps elsewhere and may be naturalized locally." The Minnesota plants are found in closely adjacent sites along secondary (gravel) roads in sections 11 and 12, T 102 N, R 8 W, near the South Fork Church, Preble Township, about 10 mi south of Rushford, Fillmore County. At each site there are large—up to about 0.8 m DBH—obviously planted trees of the species—some at an old homesite, some at an old cemetery—that without doubt served as the original source of seeds. On the north-facing wooded slopes and the roadsides contiguous to the homesite and cemetery are many Norway spruces of all sizes from seedlings a few centimeters tall to trees ca. 8 m tall. I counted at least 250 individuals clearly visible from a 0.4-km section of the road. Many of the larger trees—ca. 2.5 m and taller—produced cones each of the three years of observation. Seeds from cones collected from one of the trees in summer 1988 germinated freely after two months of stratification at 40 F.

The soil at the sites is a silty loam with scattered small pieces of limestone. Much of it is bare; it is in the bare spots that seedlings of the spruce are found. The moss *Bryum pseudotriquetrum* (Hedw.) Gaertn., Meyer, & Scherb. (determined by Jerry A. Snider, University of Cincinnati) is present in dense mounds to about 10 cm thick; I noted no spruce seedlings in this substratum. Associated vascular plants included *Betula papyrifera, Campanula rotundifolia, Cystopteris fragilis, Fragaria virginiana, Juniperus virginiana, Populus deltoides, P. tremuloides*, shrubby *Salix* spp., and *Ulmus rubra*. Voucher specimens (*JWT 55237*) collected on 24 Jun 1989 have been deposited in KNK and MINN.—*John W. Thieret, Department of Biological Sciences, Northern Kentucky University, Highland Heights, KY 41076, U.S.A.*

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A NOMENCLATURAL NOTE ON *VITIS CINEREA* AND *V. BERLANDIERI* (VITACEAE).—*Vitis cinera*, commonly known as gray-bark-, sweet-, or pigeon-grape, is primarily distributed along the "Mississippi and Missouri river banks, in eastern Missouri bottomlands, on all streams from Missouri River to the Gulf, east of the Brazos River and through the lower Mississippi valley" (Munson 1909). The authority of this species has been attributed to either Engelmann (Mohr 1901; Munson 1909; Small 1933; Deam 1940; Fernald 1950; Gleason and Cronquist 1963; Styermark 1963; Duncan 1967; Correll and Johnston 1970; Strausbaugh and Core 1978; Soil Conservation Service 1982; McGregor 1986; Mahler 1988) or Engelmann ex Millard (Bailey 1934; Jones and Fuller 1955; Radford et al. 1968; Long and Lakela 1971; Godfrey and Wooten 1981; Comeaux 1986, 1987).

This taxon was first described at varietal rank, as *V. aestivalis* Michx. var. *cinerea*, by Engelmann (1868). Later, Engelmann (1883) elevated his variety to species rank. However, prior to Engelmann's 1883 article, Millardet (1880) recognized the taxon in species rank (Millardet's article, titled "Etudes sur quelques especes de vignes sauvages" was presented in the "Societe des sciences - physique et naturelles, de Bordeaux," in 1879, but was published in 1880). In his 1880 article, Millardet (p. 319) cited Engelmann's 1868 treatment of this taxon and commented that since Engelmann treated this taxon at varietal rank, he (Millardet) preferred to reserve his opinion on the rank of this taxon before definitely pronouncing himself one way or the other. However, in the same article, Millardet described this taxon (p. 336) under the name *V. cinerea* and attributed the name to Engelmann. Further, in the summary of his article (p. 343), Millardet listed the name *V. cinerea*. In addition, Millardet illustrated the seed of the taxon as *V. cinerea* (p. 351).

From his remarks on p. 319, it appears that Millardet did not positively recognize this taxon at species rank. Based on article 34 of *International Code of Botanical Nomenclature* (Greuter 1988), one may conclude that Millardet did not make a new combination. However, we suggest that Millardet's initial reluctance to positively recognize the taxon at species rank be considered as a preliminary analysis, and his treatment on p. 336, 343, and 351 may be interpreted as his final conclusion. Futhermore, in his 1881 (p. 43) and 1885 (p. 197) publications, Millardet indicated that *V. cinerea* definitely deserves species rank. We believe that it was Millardet's intention to use this name at species rank (in spite of his remark in p. 319 of his 1880 article) and that he did indeed make the combination at species rank based upon Engelmann's *V. aestivalis* var. *cinerea*.

Since the basionym was published in Gray's *Manual of Botany*, some authors may attribute the basionym to "Engelmann ex Gray." But Gray did not describe the variety. Gray used Engelmann's description for the variety. This is evident from Gray's treatment; whenever Gray used descriptions from other people, apparently it was his custom to mention such descriptions in quotation. For this variety, Gray provided the following information: var.? **cinerea** Engelm. "branchlets and both sides of the almost entire leaves canescent, even when mature; berries very small, black and shining, very acid until after frost.—Rich bottom lands in the Mississippi Valley, Illinois, southward." Gray cited Engelmann's name at the end of the description. Hence the correct authority for the basionym is: "Engelm. in Gray," not "Engelm. ex Gray." Since Millardet (1880) attributed the name *V. cinerea* to Engelmann, we herewith cite the complete author citation: "(Engelm.) Engelm. ex Millard." The correct nomenclature for this species is given below:

VITIS CINEREA (Engelm.) Engelm. ex Millard., Mem. Soc. Sci. Phys. Nat. Bordeaux II. 3:319, 336. 1880. *Vitis aestivalis* Michx. var. *cinerea* Engelm. in Gray, Man. Bot., 5th ed. 679. 1868.

According to Munson (1909, *V. berlandieri* Planchon is found in "central southwestern Texas, west of Brazos River to the Rio Grande and Mexico." Bailey (1934) added southwestern Arkansas to this range. However, this species was excluded for Arkansas by Smith (1988). The Soil Conservation Service (1982) treated this species as a synonym of *V. aestivalis* Michx. var. *argentifolia* (Munson) Fern. However, Kartesz (1990) treat the var. *argentifolia* as a synonym of var. *aestivalis*. In his field studies, Comeaux (1986) noted intergradation, between *V. berlandieri* and *V. cinerea* southwest of the Brazos River. Becuase of this intergrdation Comeaux reduced *V. berlandieri* to a variety and made the new combination: *V. cinerea* var. *berlandieri* (Planchon) Comeaux. Unfortunately, Comeaux's new combination was not validly published. He did not provide the citation of the basionym, and a full and direct reference to its author and original publication as required by article 33.2 of the *International Code of Botanical Nomenclature* (Greuter 1988).

Prior to Comeaux's 1986 comments, Munson (1909) noted that *V. cinerea* often hybridizes with *V. cordifolia* Lam. and with *V. lincecumii* Buckl. Munson also remarked that *V. berlandieri* often hybridizes with *V. arizonica*

Engelm., *V. candicans* Engelm., *V. monticola* Buckl., and *V. rupestris* Scheele. Furthermore, Munson added that *V. berlandieri* is closely allied to *V. cinerea*, but he did not merge or reduce any of them. In the absence of a biosystematic study on this problem, we prefer to recognize *V. berlandieri* and *V. cinerea* as two distinct species.

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EVOLVULUS SERICEUS (CONVOLVULACEAE) IN GEORGIA, WITH FLORISTIC AND ECOLOGICAL NOTES—*Evolvulus sericeus* Sw. is a diminuitive, reclining to prostrate, perennial herb. It was previously known in Georgia only from a single collection by LeConte, without date or specific locality (Van Ooststroom 1934). The collector was likely J. E. LeConte (1784-1860), who collected in Georgia and deposited specimens in the herbaria cited for this collection (Chaudhri et al. 1972). *Evolvulus sericeus* was listed for Georgia by Small (1933) and Duncan and Kartesz (1981), but was not included by Coile and Jones (1985), Jones and Coile (1988), or Mellinger (1984). *Evolvulus sericeus* may have escaped notice in Georgia for over 100 years until the following collection. GEORGIA: COFFEE CO.: Flat sandstone glade of the Altamaha Grit (Miocene) on W side of ravine of Rocky Creek, just N of Rock Falls, ca. 0.2 mi E of gravel rd, ca. 2 mi E of paved rd at a point ca. 7 mi N of int. GA 268 north of

Broxton; ca. 2 mi S of GA 107; Broxton NE 7.5′ Quad.; 31° 43′59″ N, 82° 51′17″ W, Elev. 210 ft., 10 Sep 1985, *Orzell & Bridges 2930* (GA).

Evolvulus sericeus is occasional on open, sparsely vegetated glades dominated by *Bigelowia nuttallii* L. C. Anderson and *Selaginella acanthonota* Underw. Other associated species which are rare or otherwise absent from the Georgia coastal plain include *Polygala curtissii* Gray, *Aristida dichotoma* Michx., *Cheilanthes lanosa* (Michx.) D. C. Eat., *Oxalis violacea* L., *Talinum teretifolium* Pursh, *Rhynchospora saxicola* Small, *Cyperus granitophilus* McVaugh, *Portulaca umbraticola* HBK., and *Forestiera ligustrina* (Michx.) Poir. Associated species which are more common on the Georgia coastal plain include *Lindernia monticola* Muhl. ex Nutt., *Nothoscordum bivalve* (L.) Britt., *Seymeria cassioides* (J. F. Gmel.) Blake, *Crotonopsis elliptica* Willd., *Hypericum gentianoides* (L.) BSP., *Schizachyrium scoparium* (Michx.) Nash, *Diodia teres* Walt., *Eupatorium hyssopifolium* L., and *Chionanthus virginicus* L. On these glades, shrubs and trees are restricted to deep cracks in the rocks and the edges of the surrounding forest. The soils are mapped as Esto-rock outcrop complex (Rigdon 1988), which consists of 40% rock outcrops surrounded by Esto soils (Typic Paleudults). This map unit covers 1,090 acres in the Rocky Creek area of Coffee County. To the east, the glades end at sandstone bluffs from 10 to 20 feet high bordering the creek ravine. Most of the surrounding area is either managed pine plantations or clear-cuts, but the immediate vicinity of the glades is less disturbed.

Harper (1905, 1906a) was the first to describe the distinctive flora of the Altamaha Grit outcrops of Georgia. Harper described the Rock Falls site (Harper 1906b), reporting new records from its glade flora. However, apparently Harper never collected or noted *Evolvulus sericeus* in Georgia. This site is described by Wharton (1978) as perhaps the only example of his "Tipton Upland Ravine" natural environment, and he notes that the canyon rims are arid sandstone outcrops. The flora differs somewhat from his "Sandstone Outcrops" environment, which has stunted pine and oak trees, more perennial herbs and grasses, and tends to have more weathered outcrops and occur on slopes. Both of these communities share several species with the granitic outcrops of the Georgia piedmont (Harper 1905, 1906a, Wharton 1978, Bridges 1986, Holifield and Carter 1989), however, the Rock Falls site seems to be the only Georgia coastal plain location for *Cheilanthes lanosa*, *Cyperus granitophilus*, and *Rhynchospora saxicola*, all of which are characteristic of Southern Piedmont Granitic Outcrops (Bridges 1986).

Evolvulus sericeus is wide ranging in the subtropics of the Western Hemisphere, reaching its northern limit in the southern United States. It is perhaps more common in central to southern Texas than elsewhere in this country. We have records from at least 52 Texas counties. In this region, it is frequent on xeric limestone outcrops and calcareous prairies, extending eastward in calcareous coastal prairies and on tuffaceous siltstone outcrops. In eastern Texas, *E. sericeus* is characteristic of open herbaceous barrens on the tuffaceous siltstone of the Catahoula Formation (Miocene), which is contemporaneous with and somewhat floristically analagous to the Altamaha Grit (Harper 1905, 1906a, Bridges and Orzell 1989). In southwestern Louisiana, *Evolvulus sericeus* is known only from open, droughty, relatively barren areas in clay-based wetland longleaf pine savannahs (Bridges 1988). In southern Arkansas, this species is fidel to saline soil barrens on the coastal plain, with *Geocarpon minimum* Mackenzie and several range disjunctions from the west and south. Ward (1968) reports *E. sericeus* to be fairly widespread in "open, grassy, wet to dry areas", and maps it throughout much of western Peninsular Florida, however, he noted that collections cited by Van Ooststroom (1934) from the Florida Panhandle had not been recently verified. The authors have observed this species on several chalky limestone glades of the Chattahoochee Formation (Miocene) in Gadsden County, in the Florida Panhandle, also with many species more common further west (Bridges et al. 1989). A cursory examination of its Florida distribution indicates a possible restriction to calcareous or limestone formations in the state. The nearest records to Georgia are in Jackson, Gadsden, Hamilton, and Lafayette counties, Florida (Clewell 1985), therefore, the Coffee County record represents a northward disjunction of about 100 km from the nearest locality.—*Edwin L. Bridges and Steve L. Orzell, The University of Texas Herbarium, Austin, Texas 78746, U.S.A.*

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SYNGONANTHUS FLAVIDULUS (ERIOCAULACEAE) NEW TO MISSISSIPPI—We observed *Syngonanthus flavidulus* (Michx.) Ruhl. in Mississippi in 1985, and collected specimens in May of 1987. Since *S. flavidulus* commonly occurs in similar habitats in the Florida panhandle, we did not consider its presence in Mississippi as unusual. Only after discussing the Mississippi occurrences with Will McDearman of the Mississippi Museum of Natural Science and Cary Norquist of the U. S. Fish and Wildlife Service in the summer of 1988, and reviewing the literature, did we realize that *Syngonanthus flavidulus* may not have been previously collected or definitively reported for Mississippi. In surveying the flora of fifteen bogs in five southern Mississippi counties, we located this species at

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six sites in three counties. Data on the Hancock County site was provided by Cary Norquist. The collection data are as follows:

MISSISSIPPI: **George Co.**: high hillside seepage bog on 20% slope to SW of US 98, from 0.8 – 1.1 mi NW of Escatawpa River and Alabama state line, ca. 11 mi SE of Lucedale; EH, SEQ, Sec. 13, T2S, R5W; Howell 7.5′ Quad., 30° 52′13″ N, 88° 25′51″ W, Elev. 90 – 120 ft, 1 Aug 1988, *Orzell & Bridges 7724* (NCU, TEX). **Hancock Co.**: W side of Hwy 603, ca. 3.5 mi NW of Kiln, bog near transmission line, 16 Apr 1988, *Norquist, L. Smith, & N. Gilmore 2411* (MMNS). **Harrison Co.**: quaking deep muck hillside bog on lower slope above Bayou Bernard, on W side of county rd, 0.3 mi N of New Hope, 1.3 mi N of int. I-10 at a point 2.3 mi W of US 49 N of Gulfport; N edge, NEQ, Sec. 13 & S edge, SEQ, Sec. 12, T7S, R12W; Gulfport NW 7.5′ Quad., 30° 26′30″ N, 89° 08′25″ W, Elev. 45 – 50 ft, 26 May 1987, *Orzell & Bridges 5299* (SMU, TEX), 5 Aug 1988, *Orzell & Bridges 7925* (MO, TEX); disturbed low hillside seepage bog on N side of Sixteen Section Rd, 0.9 mi E of Edwin Ladner Rd and 1.4 mi W of paved rd to St. Anne Church, ca. 6 mi NW of DeLisle; SEQ, NWQ, Sec. 17, T7S, R13W; Vidalia 7.5′ Quad., 30° 26′12″ N, 89° 19′03″ W, Elev. 40 – 60 ft, 7 Aug 1988, *Orzell & Bridges 7949* (FSU, GA, IBE, NCU, SMU, TEX); frequently burned quaking sapric peat streamhead bog on S side of MS 53, 6.1 mi NW of US 49 at Lyman, just W of CC Camp Rd.; NWQ, SWQ, Sec. 16, T6S, R12W; Wortham 7.5′ Quad., 30° 31′17″ N, 89° 12′08″ W, Elev. 90 – 110 ft, 4 Aug 1988, *Orzell & Bridges 7864* (NCU, NY, SMU, TEX); sapric deep muck bog on W side of paved rd, 0.7 mi S of Stone Co. line, ca. 1.5 mi N of Riceville and 10 air miles W of Saucier; center of SWQ, Sec. 4, T5S, R13W; Silver Run 7.5′ Quad., 30° 38′13″ N, 89° 18′14″ W, Elev. 180 – 210 ft, 4 Aug 1988, *Orzell & Bridges 7879* (MO, SMU, TEX). **Jackson Co.**: sapric deep muck streamhead bog in ravine to E of Daisy-Vestry Rd, ca. 0.8 mi S of Indian Fork Rd., ca. 4 mi N of Latimer, in DeSoto National Forest; SH, SWQ, SWQ, Sec. 23, T5S, R9W; Latimer 7.5′ Quad., 30° 35′24″ N, 88° 51′54″ W, Elev. 70 – 80 ft, 2 Aug 1988, *Orzell & Bridges 7755* (IBE, NCU, TEX).

Syngonanthus flavidulus is a characteristic, overall infrequent but locally abundant, indicator of the deep muck seepage bogs which are fairly common in the six southernmost counties of Mississippi. The sapric soils of these bogs consist of highly decomposed organic material with little fiber content. At most sites, *S. flavidulus* occurs in areas of copious groundwater seepage but little permanent standing water, near the upslope edge of streamhead bogs or scattered within hillside bogs. The most frequently associated species (growing intermixed with *S. flavidulus* at three or more sites) are *Lachnocaulon digynum* Koern., *Sarracenia psitticina* Michx., and *Xyris drummondii* Malme. Other closely associated species include *Bigelowia nudata* (Michx.) DC., *Burmannia capitata* (Walt.) Mart., *Drosera capillaris* Poir., *D. tracyi* Macfarlane, *Eriocaulon decangulare* L., *E. texense* Koern., *Eryngium integrifolium* Walt., *Lophiola aurea* Ker-Gawl., *Oxypolis filiformis* (Walt.) Britt., *Pinguicula planifolia* Chapm., *Polygala cruciata* L., *P. hookeri* Torr. & Gray, *Rhynchospora macra* (C. B. Clarke) Small, *R. oligantha* Gray, *R. stenophylla* Chapm. ex M. A. Curtis, *Sabatia macrophylla*

Hook., *Sarracenia alata* Wood, *Tofieldia racemosa* (Walt.) B.S.P., *Xyris ambigua* Beyr. ex Kunth, *X. baldwiniana* Schultes, *X. difformis* Chapm. var. *curtissii* (Malme) Kral, *X. fimbriata* Ell., and *X. scabrifolia* Harper. Of these species, several are listed as rare in Mississippi (Mississippi Natural Heritage Program 1986), including *Eriocaulon texense, Lachnocaulon digynum, Pinguicula planifolia, Polygala hookeri, Rhynchospora macra, Xyris drummondii*, and *X. scabrifolia*. Another noteworthy associate is *Rhynchospora stenophylla*, which we found to be a characteristic species of these deep muck bogs and perhaps more frequent in Mississippi than elsewhere in its limited range. Southern disjunct populations of *Carex exilis* Dewey occur at several of these bog sites (Bryson et al. 1988), but in a distinctly wetter, lower, and less sloping microhabitat with deeper organic soils, and not closely associated with *Syngonanthus flavidulus*.

According to Kral (1966) *S. flavidulus* ranges from Florida north to southeastern Virginia (?) and west to southern Alabama. Kral (1966), Harvill et al. (1981), and Moldenke (1977, 1980) map or list no Virginia records for this species. The westernmost localities mapped in Kral (1966) are in Baldwin County, Alabama and Okaloosa County, Florida. Moldenke (1977) adds Santa Rosa County, Florida and Mobile County, Alabama to these westernmost reports. Wilhelm (1984) adds Escambia County, Florida, where we have found this species in pannes (interdunal wetlands) on Santa Rosa Island (*Orzell & Bridges 7651* - GA, MO, NCU, NY, SMU, TEX). Moldenke (1984) adds Washington County in southern Alabama based on a collection by Kral. Kral (1989) reports *Syngonanthus flavidulus* as occurring from North Carolina south to Florida and west to Alabama. Moldenke (1977, 1980) also lists *S. flavidulus* from Holmes County (Ebenezer), Mississippi, on the basis of *Cabanis s.n.* (B). We questioned the validity of the locality of this collection, since suitable habitats for this species apparently do not occur in Holmes or adjacent counties. J. L. Cabanis is known to have collected in South Carolina, Florida, and Kentucky in the period 1839–41 and to have distributed plants collected in Florida by E. F. Leitner before 1838 under his own name (Lanjouw & Stafleu 1954). Koernicke (1856) cites a collection of *Eriocaulon flavidulum* Michx. as "Prope Charlestown attul. Cabanis (Hb. Berol.)," therefore Cabanis probably collected *S. flavidulus* in South Carolina. Perhaps the reference to "Mississippi" could be a mixup in labeling of this or another Cabanis collection.

Other Mississippi collections of *Syngonanthus flavidulus* may exist, perhaps misidentified as other species of Eriocaulaceae. Moldenke (1977,

1984) noted that *S. flavidulus* has often been misidentified as *Eriocaulon lineare* Small. *Eriocaulon lineare* was reported from a bog which may be identical with one of our Harrison County, Mississippi *S. flavidulus* sites (Eleuterius & Jones 1969). Our records represent a slight westward extension of from 10 to 90 km from the nearest previously reported localities for *Syngonanthus flavidulus* in southern Alabama.

We wish to acknowledge Will McDearman of the Mississippi Museum of Natural Science for supplying the localities of three of these bogs, and Cary Norquist of the U. S. Fish and Wildlife Service for providing her collection data.—*Edwin L. Bridges and Steve L. Orzell, The University of Texas Herbarium, Austin, TX 78713 , U.S.A.*

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SIDA 13(4):515. 1989.

ANCHUSA AZUREA (BORAGINACEAE), NEW TO TEXAS—Although several members of the Old World genus *Anchusa* L. (Boraginaceae), including *A. azurea* Mill, *A. barrelieri* (All.) Vitm., and *A. officinalis* L., have been reported to be sporadically naturalized in North America (Peck 1961; Fernald 1970), not one has been recorded from Texas (Correll and Johnston 1970; Johnston 1988). An examination of specimens on deposit in the University of Texas herbaria (LL, TEX) revealed no previous Texas collections. The following recent collection of *A. azurea* from central Texas is apparently the first record of the genus and species for the state:

TEXAS. Kerr Co.: Ranchero and Quail Valley Road intersection, W of Texas hwy 16, Kerrville, 2 Mar 1984, *Wesby & Wesby s.n.* (TEX).

Although these plants doubtlessly represent garden escapes, the small population is slowly expanding its size and range. The plants were flourishing in the summer of 1988 and have apparently become naturalized in their roadside habitat.—*David E. Lemke, Department of Biology, Southwest Texas State University, San Marcos, TX 78666, U.S.A. and Vernon Wesby, 1 Rio Vista Drive, Kerrville, TX 78028, U.S.A.*

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FISHER, T. RICHARD. 1989. The Vascular Flora of Ohio. Vol. 2. The Dicotyledoneae of Ohio. Part 3: Asteraceae. Ohio State University Press, 180 Pressey Hall, 1070 Carmack Road, Columbus, OH 43210-1002. Hardbound $65.00. 280 pp. Illustrated by Sharon Ames Glett.

This treatment of the Asteraceae of Ohio contains keys, descriptions, illustrations, and distribution maps of the taxa within the state. It is a valuable addition to the flora of Ohio. WFM

WAGNER H., HIROSHI HIKINO, and NORMAN R. FARNSWORTH (Eds.). 1989. Economic and Medicinal Plant Research, Vol. 3. Academic Press Inc., San Diego, CA 92101, London, New York, Berkeley, Boston, Sydney, Tokyo, Toronto. Hardbound 28 lbs? 150 pp.

There are five Chapters in this volume with each written by a different author on a different subject. Chapter 1: The Economic Significance of Plants and their Constituents as Drugs (P.P. Principe), Chapter 2: Qinghaosu (Artemisinin) as an Antimalarial Drug (P.I. Trigg), Chapter 3: The Azadirachtins - Their Potential for Insect Control (H. Rembold), Chapter 4: Plant-Derived Molluscicides of Current Importance (K. Hostettmann), Chapter 5: Plant Compounds as Sources and Models of Insect-Control Agents (J.A. Klocke). WFM

ARBER, AGNES. 1938. Herbals, Their Origin and Evolution. A Chapter in the History of Botany, 1470 - 1670. Cambridge University Press, Cambridge, New York, New Rochelle, Melbourne, Sydney. Labeled the Third Edition (1988), this is a reprint of the 2nd Edition (1938) with Introduction and annotations by Wm. T. Stearne (1986).

The Preface of the First Edition (1912) and the Second Edition (1938) are reproduced prior to the Table of Contents. The Introduction: Agnes Arber's Herbals by Stearne adds a personal discussion to the background of the author and the text that is not present in the original publications. Additional information is added by Stearne in some of the Appendices. WFM

TAYLOR, R. JOHN and CONSTANCE E. S. TAYLOR. 1989. An Annotated List of the Ferns, Fern Allies, Gymnosperms and Flowering Plants of Oklahoma. Biology Department Herbarium, Southeastern

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Oklahoma State University, Durant, OK 74701. 110 pp. 8.5 X 11 plastic ring binding.

This checklist is the latest for the state and includes additions to the flora since 1969 as well as species names that have been excluded from the Oklahoma flora. A summary of the vascular plant taxa treated and the related literature result in an excellent reference for the continued study of the Oklahoma flora. WFM

PATERSON, JOHN and KATHERINE PATERSON. 1986. Consider the Lilies: Plants of the Bible. Paintings by Anne Ophelia Dowden. Thomas Y Crowell, N.Y. Hardbound $13.95. 96 pp.

Selected plants from the Bible are described with text from versions of the Bible along with commentaries on some of the species.. In the Acknowledgments, reference to Professor Zohary, who authored the most definitive treatment of biblical plants to this date, "Plants of the Bible," and other prominent botanists here and abroad, has produced an incredibly accurate account using the latest information available on this subject. The paintings were based upon herbarium plant specimens resulting in detailed botanical illustrations. The quality of the color reproduction of the paintings within the book is excellent making it pleasant to look at in addition to the readable commentaries. WFM

KINDSCHER, KELLY. 1987. Edible Wild Plants of the Prairie: An Ethnobotanical Guide. University Press of Kansas, 329 Carruth, Lawrence, KS 66045. Cloth $25.00; Paper $9.95. 276 pp. Illustrated by Carol Kuhn.

Selected species are alphabetically arranged with common names, Indian names, scientific names, description, habitat, parts used, food use, and cultivation. This is an excellent treatment and should be of interest to the naturalist as well as the scientific community. WFM

(Continued from front cover)