STUDIES IN THE VASCULAR FLORA OF THE SOUTHEASTERN UNITED STATES. IX

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ABSTRACT

As part of ongoing work on the *Flora of the Southeastern United States* (Weakley & Southeastern Flora Team 2022a) and related projects, as well as for general floristic, conservation, and scientific work in eastern North America, it is essential to document taxonomic and nomenclatural changes and significant distribution records. Here we describe three new species (in *Rhynchospora*, *Sabulina*, and *Solidago*), describe a new section (in *Trichostema*), make new combinations to treat taxa at appropriate ranks in appropriate genera and with appropriate nomenclatural application based on types (in *Lycopodioides*, *Moeroris*, *Morella*, *Nellica, Tamala*, and *Trichostema*), and propose the lumping of two species, resulting in a change in name and nativity status (in *Sisyrinchium*). These new combinations (rank changes, or generic transfers to apply newly accepted generic concepts to taxa that do not have corresponding available names at the appropriate rank) are needed to accurately reflect current taxonomic understanding of the regional flora. In the course of doing so, we discuss and address various nomenclatural issues, including typifications, and clarify characters and identification of difficult groups (providing new keys) in the regional flora. We also report significant new distribution and naturalization records in many genera, in New Jersey (taxa in the genera *Anthriscus*, *Calibrachoa*, *Chaenomeles*, *Dichanthelium*, *Diplotaxis*, *Ditrichia*, *Dysphania*, *Erigeron*, *Eucommia*, *Eupatorium*, *Lepidium*, *Malus*, *Montia*, *Nepeta*, *Persicaria*, *Picea*, *Psammophiliella*, *Pulmonaria*, *Quercus*, *Silphium*, *Verbascum*, *Verbena*, *Vicia*), in the Coastal Plain of Alabama and Mississippi (taxa in the genera *Baptisia*, *Clematis*, *Coreopsis*, *Galium*, *Matelea*, *Mirabilis*, *Poterium*, *Rhynchospora*, *Silphium*, and *Symphyotrichum*), in southern Indiana (taxa in the genera *Andropogon*, *Brunnichia*, *Echinacea*, *Landoltia*, *Montia*, *Persicaria*, and *Solidago*), and in North Carolina, Virginia, and likely other states (*Euphorbia*).

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RESUMEN

Como parte del trabajo en curso sobre la *Flora del Sudeste de Estados Unidos* (Weakley & Southeastern Flora Team 2022a) y proyectos relacionados, así como para el trabajo florístico, de conservación y científico general en el este de Norteamérica, es esencial documentar los cambios taxonómicos y nomenclaturales y los registros de distribución significativos. Aquí describimos tres nuevas especies (en *Rhynchospora, Sabulina,* y *Solidago*), describimos una nueva sección (en *Trichostema*), hacemos nuevas combinaciones para tratar los taxones en los rangos apropiados en los géneros apropiados y con la aplicación nomenclatural apropiada basada en los tipos (en *Lycopodioides, Moeroris, Morella, Nellica, Tamala,* y *Trichostema*), y proponemos la agrupación de dos especies, resultando en un cambio de nombre y estatus de natividad (en *Sisyrinchium*). Estas nuevas combinaciones (cambios de rango, o transferencias genéricas para aplicar conceptos genéricos recientemente aceptados a taxones que no tienen nombres correspondientes disponibles en el rango apropiado) son necesarias para reflejar con precisión la comprensión taxonómica actual de la flora regional. Para ello, discutimos y abordamos diversas cuestiones de nomenclatura, incluidas las tipificaciones, y aclaramos los caracteres y la identificación de grupos difíciles (proporcionando nuevas claves) en la flora regional. También presentamos nuevos registros significativos de distribución y naturalización en muchos géneros, en Nueva Jersey (taxones de los géneros *Anthriscus, Calibrachoa, Chaenomeles, Dichanthelium, Diplotaxis, Ditrichia, Dysphania, Erigeron, Eucommia, Eupatorium, Lepidium, Malus, Montia, Nepeta, Persicaria, Picea, Psammophiliella, Pulmonaria, Quercus, Silphium, Verbascum, Verbena, Vicia*), en la llanura costera de Alabama y Mississippi (taxones de los géneros *Baptisia, Clematis, Coreopsis, Galium, Matelea, Mirabilis, Poterium, Rhynchospora, Silphium* y *Symphyotrichum*), en el sur de Indiana (taxones de los géneros *Andropogon, Brunnichia, Echinacea, Landoltia, Montia, Persicaria* y *Solidago*), y en Carolina del Norte, Virginia y probablemente otros estados (*Euphorbia*).

INTRODUCTION

We here present a ninth volume of taxonomic descriptions, reassessments of taxonomy, generic transfers, rank changes, typifications, reassessments of nativity and establishment status in the regional flora, range records for native and non-native taxa, all related to the southeastern United States, as defined by the Southeastern Flora Project (Weakley & Southeastern Flora Team 2022a). This ninth volume is contributed by thirteen authors, and follows similar conventions and philosophical approaches as the earlier volumes in the series (Weakley et al. 2011, 2017, 2018a, 2018b, 2019, 2020, 2021, 2022). Primary authorship is cited for each section of this paper, as follows: *Solidago* (MB & LDE), *Sabulina* (MB), *Rhynchospora* (ELB & SLO), *Euphorbia* (SGW), *Sisyrinchium* (BAS), *Trichostema* (RKSM & ASW), *Tamala* (ASW). *Morella* (ASW & DBP), *Moeroris* and *Nellica* (GAL & ASW), *Lycopodioides* (ASW), New Jersey records (RJS), Alabama and Mississippi records (JCK), and southern Indiana records (SAN); these sections are citable based on the primary author(s) of the section.

ASTERACEAE

SOLIDAGO: A new species of *Solidago* sect. *Erectae* from Tennessee

Primary authors: Mason Brock and L. Dwayne Estes

While visiting the herbarium of the Botanical Research Institute of Texas (BRIT) in 2013, we came across an unusual specimen of *Solidago* L. The specimen was collected by Robert Kral in 1978 from phyllite boulders along the banks of the Hiwassee River in east Tennessee. Although identified by Kral as *S. speciosa* Nutt. (and as *S. roanensis* Porter in additional collections at NY and TENN), the specimens instead appear to instead bear a strong resemblance to the “riverscour” *Solidago* species of subsect. *Erectae* (G. Don) Semple & J.B. Beck (*S. arenicola* B.R. Keener & Kral, *S. plumosa* Small, and *S. racemosa* Greene) known from other river systems in the unglaciated southeastern United States. None of these three taxa had previously been documented in the Blue Ridge of Tennessee (with *S. arenicola* being restricted to the Cumberland Plateau, *S. plumosa* being endemic to the Yadkin River in the Piedmont of central North Carolina, and *S. racemosa* reported from northern Virginia and northwards and disjunct in the Cumberland Plateau of Tennessee and Kentucky). The presence of a “riverscour” *Solidago* in a region where none were known before spurred suspicion that it might represent an undescribed species.

In 2014 Tennessee Valley Authority botanist Adam Datillo visited the Hiwassee River, made collections of the *Solidago,* and deposited them at APSC. Close examination of this series of specimens provided additional clarity. Applying the most recent key at the time (Weakley 2020) to the Hiwassee River *Solidago* specimens resulted in a tentative determination as the single-site endemic *S. plumosa*. This determination could not be accepted however, as the Hiwassee River specimens differ from *S. plumosa* in having a distinctly puberulent inflorescence axis and broader basal leaves.

A second possibility for the *Solidago* was considered, which was that the Hiwassee River entity simply represented a disjunct population of *S. arenicola,* albeit with a smaller involucre than previously documented. However, the heads were not simply shorter, but denser as well. In addition, the Hiwassee River material has a more consistently hispid-puberulent inflorescence than the often scarcely puberulent to scabrid *S. arenicola*. While the Hiwassee entity also bears a resemblance to the more upland *S. erecta*, and has been previously identified as such on two specimens (NY, TENN), it can be readily distinguished by its glabrous leaf margin (as opposed to ciliate-scabrid).

With all identification possibilities eliminated, it appears that the Hiwassee River *Solidago* has a novel combination of characters not found in any other *Solidago* known in North America. The morphological distinctiveness, combined with its unusual riverscour habitat and significant geographic disjunction from its morphologically closest relatives (*S. arenicola*, *S. plumosa,* and *S. racemosa*), leads us to the conclusion that this population warrants recognition as a previously undescribed species.

Solidago ayuhwasi M. Brock & D. Estes, **sp. nov.** (**Figs. 1–3**). TYPE: U.S.A. TENNESSEE. Polk Co.: Cherokee National Forest, Hiwassee River, River mile 58 on the Hiwassee River, 35.176900, -84.381800, crevices of rock outcrops in the scour zone within the Hiwassee River channel, growing with *Pityopsis ruthii*, 25 Sep 2014, *A. Dattilo s.n.* (HOLOTYPE: APSC).

Diagnosis.—*Solidago ayuhwasi* appears most morphologically similar to *S. arenicola, S. plumosa,* and *S. racemosa* but differs as follows: from *S. arenicola* in its shorter involucres, more densely arranged heads, and densely hispid-puberulent inflorescence axis (with the pubescence of *S. arenicola* being sparser and scabrid); from *S. plumosa* in its broader basal leaves and hispid-puberulent inflorescence axis (with *S. plumosa* being glabrous); and from *S. racemosa* in its glabrous achenes, hispid-puberulent inflorescence axis (as opposed to scabrid), smaller involucres, and more densely arranged heads.

Description.—Perennial, 3–15 cm, from stout rhizome with caudex-like branches. Stems erect, single or in tight clusters; glabrous proximally, becoming hispid-puberulent distally especially near inflorescence; green or maroon-tinged. Basal and proximal cauline leaves with long tapering petioles, oblanceolate to broadly lanceolate, 3–18 × 0.5–3.5 cm, margins distally serrulate, apices acute, blades and margins glabrous; mid stem and distal cauline with short, strongly winged petioles scarcely discernible from leaf blade, elliptic to linear, up to 14 × 2 cm and gradually tapering in size distally, serrulate to nearly entire, acute, blades and margins glabrous. Inflorescence a cylindrical paniculate raceme of heads, with short-erect side branches and leafy bracts, (5)18–30 × 2–7 cm; branches 1–4 cm long with 6–15 heads per 3 cm of length; axis and branches with hispid-puberulent arching hairs. Involucres around 3–4 mm long, campanulate on short peduncles; phyllaries strongly unequal, in 3–5 series, with prominent central stripe, median phyllaries 2.2 × 0.8 mm. Ray flowers 3–4, 5.0–5.6 mm; limb 2.4–3.0 mm; claw 1.5–2.6 mm. Disc flowers 6–8, 3.2–4.8 mm, lobes 0.8 mm. Achenes glabrous, ridged, 2.0–2.8 mm; pappus 1.7–2.6 mm.

Additional collections**: TENNESSEE. Polk Co.:** Phyllite boulders along Hiwassee River, ca. 5 mi E Reliance, 3 Oct 1978, *Kral 62761* (VDB); Phyllite ledges and island along Hiwassee River, ca. 5 mi E Reliance, 3 Oct 1978, *Kral 62768* (NY, TENN); McFarland Quad., along trail on N side of Hiawasee River above Apalachia Powerhouse, Cherokee National Forest, 18 Sep 1981 *Fusiak s.n.* (NY).

Distribution and Habitat.—Known only from a 2 km stretch of the Hiwassee River of Polk County, Tennessee. Riverscour habitat, consisting of open, sunny phyllite bedrock in and along margins of river channel. Flowering Sep–Oct.

Etymology.—*Solidago ayuhwasi* is named after the Hiwassee River, where it is currently known to be endemic. The name of the river is derived from the Cherokee word "ayuhwasi," which means savanna or large meadow (Conley 2005). The word "ayuhwasi" has multiple anglicized spelling variants including "Hiwassee," "Hiwasse," and "Hiawassee." The epithet of "*ayuhwasi*" was chosen over the alternatives (including over the variant commonly applied to the river) as it more closely matches the word in the Cherokee language.

Discussion.—*Solidago* subsect. *Erectae* (as circumscribed by Semple & Beck 2021) includes a number of species which have only been described in recent years. These include *S. kralii* (Semple 2003), *S. arenicola* (Keener & Kral 2003), *S. georgiana* (Semple 2017), and *S. austrocaroliniana* (Semple & Nelson 2018). The addition of *S. ayuhwasi* marks the fifth newly described species in this subsection over the past two decades.

Flora of Tennessee
Polk County

Asteraceae
Solidago sp.

Directions: Cherokee National Forest. Hiwassee River. River mile 58 on the Hiwassee River.

Coordinates: 35.176900 / -84.381800

Habitat: Crevices of rock outcrops and in the scour zone within the Hiwassee River channel. Growing with Pityopsis ruthii.

Collector(s): Adam J. Dattilo.

September 25, 2014 s.n.

Fig. 1. *Solidago ayuhwasi*. Holotype, *Datillo s.n.*, (APSC).

Fig. 2. Detail of inflorescence axis, showing dense arching hairs. Holotype, *Datillo s.n.*, (APSC).

KEY TO CLOSELY-RELATED SPECIES OF *SOLIDAGO* OF SECT. *ERECTAE*

1. Leaf margins ciliate-scabrid; [typically in dry uplands, rarely in riparian areas] ________ **Solidago erecta**
1. Leaf margins smooth; [rocky, flood-scoured riversides]
    2. Achenes with at least some pubescence; [ne. TN and w. VA northward] ________ **Solidago racemosa**
    2. Achenes glabrous [n. AL, nw. GA, c. NC, e. TN, and e. KY]
        3. Involucres 6–12 mm high; inflorescence more loosely congested with 1–6 heads on a typical 3 cm branch; [n. AL, nw. GA, e. TN, and se. KY] ________ **Solidago arenicola**
        3. Involucres 3–5 mm high; inflorescence more tightly congested with 6–15 heads on a typical 3 cm branch; [e. TN and c. NC]
            4. Inflorescence axis and branches densely puberulent with arching hairs; basal leaves lanceolate to ovate, up to 3.5 cm wide; [known only from the Hiwassee River in e. TN] ________ **Solidago ayuhwasi**
            4. Inflorescence axis and branches glabrous; basal leaves linear-lanceolate, up to 2.2 cm wide; [known only from the Yadkin River in c. NC] ________ **Solidago plumosa**

Fig. 3. *Solidago ayuhwasi*. Detail of upper stem pubescence. Holotype, *Datillo s.n.*, (APSC).

CARYOPHYLLACEAE

SABULINA: A new species of *Sabulina* (Caryophyllaceae) from the eastern United States and the typification of *Arenaria patula* Michx.

Primary author: Mason Brock

The identity of a *Sabulina patula*-like entity in the rugged calcareous barrens and cliffs in the mid-south has long perplexed botanists. These populations resemble *S. patula* (Michx.) Small ex Rydb. in many respects, and most herbarium specimens are currently identified under historical synonyms, viz., *Arenaria patula* Michx., *Minuartia patula* (Michx.) Mattf., and *Mononeuria patula* (Michx.) Dillenb. & Kadereit. However, the *S. patula*-like populations are distinct in their sepal and seed morphology, inflorescence and growth habit, and habitat. They are described here as a new species: *Sabulina diffusa*.

This new taxa was first brought to my attention during a collection trip to an area of limestone cliffs in Estill County Kentucky in 2019. The *Sabulina* growing at this location was highly aberrant from the *S. patula* I was accustomed to seeing around the disturbed flat limestone glades of the Nashville Basin. The branches were divaricate-spreading, forming a bush-like mound, and the plant in general was more robust. In addition, the sepals had three nerves, as opposed to the five nerves of the *S. patula* with which I was familiar. This problem inspired me to visit the Missouri Botanical Garden (MO) in 2020, where I investigated this issue more deeply and began mapping populations from herbarium specimens.

In both the regional Atlas of Kentucky (Campbell & Medley 2012) and in Bassett Maguire's 1951 conspectus of *Arenaria* (Maguire 1951) this eastern *Sabulina* was treated as disjunct populations of what is now known as *S. muscorum* (Fassett) E.E.Schill. [syn. *Arenaria patula* var. *robusta* (Steyerm.) Maguire, *Minuartia muscorum* (Fassett) Rabeler, *Mononeuria muscorum* (Fassett) Dillenb. & Kadereit]. This eastern mapping of *S. muscorum* is also currently being adopted by Weakley's *Flora of the Southeastern United States* (Weakley & Southeastern Flora Team 2022a). The primary reason these populations have been called *S. muscorum* by some researchers is understandable: the sepals have three nerves as in *S. muscorum* instead of five found in *S. patula*.

However, as noted by Rabeler et al. (2005), a close examination of the seed morphology reveals a problem with these plants simply being *S. muscorum*: They have the tuberculate surface texture typical of *S. patula*, distinctly unlike the pebbled-papillose surface texture typical of *S. muscorum* (Rabeler et al. 2005). In addition, the general habit of these plants is more diffuse with a divaricate-spreading inflorescence, in contrast with the more sparingly flowered and erect-spreading inflorescence of the western *S. muscorum*.

A recent phylogenetic study of the stichwort complex provided additional genetic evidence of this taxon's distinctiveness (Schilling et al. 2022). As part of a study that used molecular data of populations of Caryophyllaceae to determine generic delimitations within the family, they revealed that *Sabulina patula* as it is currently understood is polyphyletic, with two specimens from eastern Tennessee (from Claiborne and Knox counties, TENN herbarium) appearing more closely related to *S. michauxii* (Fenzl) Dillenb. & Kadereit [syn. *Arenaria stricta* Michx., *Alsine michauxii Fenzl*, *Minuartia michauxii* (Fenzl) Farw.] than other populations of *S. patula*. This molecular data also showed that these populations were distinct from the clade containing *S. muscorum*.

An examination of these specimens on the online SERNEC database revealed that they indeed are specimens of the unusual and difficult-to-place entity in question. This unexpected placement of the atypical *Sabulina* as sister to neither *S. patula* nor *S. muscorum* confirms what other lines of evidence has already indicated: These populations represent an undescribed species.

Sabulina diffusa M. Brock, **sp. nov.** (**Fig. 4**). Type: U.S.A. KENTUCKY. Woodford Co.: Limestone ledge, Mundy's Landing, 25 May 1955, *M. Wharton 8914* (holotype: GH; isotypes: APSC, NCU).

Diagnosis.—*Sabulina diffusa* appears morphologically similar to *S. michauxii*, *S. muscorum* and *S. patula* but differs as follows: from *S. michauxii* in its reduced to absent axillary leaves and its stipitate-glandular inflorescence branches; from *S. muscorum* in its narrower and more linear leaves, its tuberculate seed surface (as opposed to pebbled-papillose) and more diffuse-divaricate mature inflorescence branches; and from *S patula* in its larger seeds, its tendency to have fewer and weaker sepal nerves (Figs. 5, 6), its diffuse-divaricate mature inflorescence branches (Fig. 4), and its shorter and less acuminate sepal tips (Figs. 5, 6). In addition, *S. diffusa* has a later flowering time where sympatric with *S. patula*.

Description.—Taprooted annual. Stems ascending to lax, 10–27 cm, stipitate-glandular, sometimes minutely so. Leaves linear, up to 25 mm × 1 mm, decreasing in size distally, 1-veined abaxially (weakly 3 veined at base), linear, glabrous to stipitate-glandular; reduced axillary present or absent. Inflorescences spreading-ascending in flower, becoming diffusely divaricate-branching in fruit; bracts 1-nerved. Pedicels 1–3 cm, stipitate-glandular. Sepals lanceolate, 3.5–5.2 mm, apex acute (rarely acuminate), glabrous to sparsely stipitate-glandular; green with hyaline margin, prominently 3 veined (occasionally 5), spaces between veins wider than veins; petals 5–8 mm long, weakly notched. Seeds reddish brown to black, 0.5–0.7(0.75) mm across, tuberculate with low, rounded ridges.

Additional collections. **GEORGIA. Murray Co.:** cedar glade at cross road between old and new GA 411, opposite and W of Carters regulation dam, 0.5 mi W of L&N, Conasuga ribbon dolomite, 10 May 1986, *Samuel B. Jones 24784* (GA). **KENTUCKY. Barren Co.:** Prewitt's Knob, 0.5 mi SW of Cave City on US 31W, 28 Apr 1979, *G.P. Johnson 611* (APSC). **Edmonson Co.:** vicinity of Mammoth Cave, May 1899, *E.J.*

Fig. 4. *Sabulina diffusa*. *Wharton 8914* (holotype: GH).

Fig. 5. Calyx of *Sabulina patula* at 10×. From left to right, starting top left: 1. Rutherford Co. Tennessee, *Kral 73298,* 2. Warren Co. Kentucky, *Medley 4311* 3. Catoosa Co. Georgia, *Baskin 1009* 4. Houston Co. Tennessee, *Brock 2823.*

Palmer s.n. (NY). **Estill Co.:** Grassy Knob, cedar glade like area near the summit on SW corner of knob, ca. 2 air mi SW of Hargett, 11 Jun 1983 *M. Medley 8142* (APSC). **Garrard Co.:** narrow limestone point between unnamed stream and Dix River near end of Bryantsville-Buena Vista Road, 8 May 1987, *M. Medley 16005* (APSC). **Jackson Co.:** Berea College Forest, Owsley Fork Reservoir west-trending Mississippian limestone outcrop cliff crevices and ledges, 26 May 1983, *R.L. Thompson 83-1244* (APSC, BEREA). **Jessamine Co.:** Brooklyn Bridge on US 68 at Kentucky River, wooded bluffs just east of bridge, 1 Jun 1984, *M. Medley 10246* (APSC). **Madison Co.:** Berea College Forest, on limestone cap on NW and N lobes of Robe Mountain, 14 Jul 1982, *D. Taylor 1819* (BEREA, LSU). **Mercer Co.:** Shaker Ferry on W side of ephemeral stream ravine, dry limestone bluff edges and upper bluffs, 1 Jun 1987, *M. Medley 10188* (APSC). **Pulaski Co.:** by Short Creek on Short Creek Road near Stab, 20 May 1983, *M. Medley 7733* (APSC). **Warren Co.:** Hwy 31W glade, 4 Jun 1971, *Baskin 1053* (APSC). **MISSOURI**. **Howell Co.:** in section 3, 4 mi E of Lanton limestone glade along Myatt Creek, 27 Apr 1938, *J. Steyermark 5174* (MO). **Oregon Co.:** The Narrows, W of Calm limestone glade above Blue Spring, 11 May 1935, *J. Steyermark 18911* (MO). **TENNESSEE. Claiborne Co.:** Hwy 33 and Sharps Chapel Road, in PLROW, 36°21'3.84"N, 83°44'10.93"W. Abundant on large mossy boulders and on limestone pavement. 19 Apr 2016, *Aaron Floden 2917* (TENN). **Knox Co.:** on limestone gravel and outcrops, in power line cut near quarry at Marbledale, TN, 35.965206 -84.136571, 16 May 2003, *C. Winder s.n.* (TENN). **White Co.:** vicinity of Blue Hole at Rock Island, 23 May 2011, *D. Estes 11956* (APSC). **VIRGINIA**. **Lee Co.:** cedar-limestone barrens west of county road 656, 0.6 mi S of US 58, 6 mi west of Jonesville, 7 Jun 1984, *L.J. Uttal 13194* (CM, FSU).

Fig. 6. Calyx of *Sabulina diffusa* at 10×. From left to right, starting top left: 1. Estill Co. Kentucky *Medley 8142*, 2. Jessamine Co. Kentucky *Medley 10246*, 3. Garrard Co. Kentucky *Medley 16005*, 4. Pulaski Co. Kentucky *Medley 7733* 5. Woodford Co. Kentucky *Wharton 8914* (isotype), 6. Warren Co. Kentucky *Baskin 1053*.

Distribution and Habitat.—Known from the Mid-South region in northwestern Georgia, Kentucky, Missouri, Tennessee, and far-western Virginia (Fig. 7). It is found in the physiographic regions of the Ridge and Valley, Cumberland Escarpment, Interior Plateau, and Ozark Highlands. Its habitat is on dry calcareous cliffs, bluffs, barrens, and sloping glades. Typical of middling to highly ecologically intact habitats; rarely found in degraded situations such as pastures. Addition specimen examination will likely reveal a significantly wider range in the Ridge and Valley region than is documented in the provided map, as the primary herbaria used for this study have relatively few collections from that region compared to the Interior Plateau, Cumberland Escarpment, and Ozark Highlands regions.

Discussion.—As pointed out by Schilling et al. (2022), clade structure and sequence variability of their samples of "*Sabulina patula*" suggest that additional taxonomic work is needed, and there is a possibility that one or more additional taxa remain undescribed in the complex. This paper is only intended to differentiate *Sabulina diffusa* from typical *Sabulina patula* as defined by its type specimen, and no attempt here is made to address the larger taxonomic issues in the *Sabulina patula* complex. Because of this, the following key should be approached with caution, as many specimens outside the Appalachian and Interior Plateau regions will key unsatisfactorily.

COMPARISON KEY OF *SABULINA DIFFUSA* AND MORPHOLOGICALLY SIMILAR TAXA

1. Seed surface pebbled-papillose; mature leaves narrowly lanceolate or oblanceolate, 1.5–3 mm wide; sepal nerves 3 ____ **Sabulina muscorum**
1. Seed surface tuberculate with low ridges, resembling a brain; mature leaves linear; <1.5 mm wide; sepal nerves 3 or 5.
    2. Leaves with prominent axillary bracts as long the leaf; leaves rigid and spine-like; stem and inflorescence strictly glabrous; sepal nerves 3 ____ **Sabulina michauxii**
    2. Leaves with axillary bracts reduced or absent; leaves flexuous and softer; stem and inflorescence variously stipitate-glandular to glabrous, sepal nerves 3 or 5.
        3. Sepal nerves 3 (occasionally weakly 5), widely spaced, not appearing ribbed; inflorescences divaricately-branching at maturity, forming a diffuse tangled mound in robust specimens; seeds 0.8–0.9 mm across; flowering time centered May through June ____ **Sabulina diffusa**
        3. Sepal nerves 5, typically closely spaced and appearing elevated and ribbed (widely spaced in some specimens); inflorescences ascending to spreading at maturity; seeds 0.5–0.7(0.75) mm across; flowering time centered April through May ____ **Sabulina patula**

The identity of Steyermark's *S. patula* formae

For his *Arenaria patula*, Michaux (1803) cited the locality as: "Hab. in rupibus, circa Knoxville" ["living on the rocks, near Knoxville"], a city in eastern Tennessee. Online observation of Michaux's collection housed at P reveals that the sepals have five strong veins, corresponding to the morphology of the *Sabulina* typical of disturbed limestone glades.

In 1941 Julian Steyermark published a treatment of *Arenaria patula* in which he described new formae for *A. patula*, resulting in four infraspecific taxa in total for the species beyond the typical (Steyermark 1941). While one might expect that *Sabulina diffusa* (being relatively well-collected) might be encompassed by one of these three infraspecific taxa, this does not appear to be the case. The problem is that Steyermark's specimen citations reveal that he appears not to rely on Michaux's type material as the basis for informing his understanding of *A. patula* var. *patula*, but instead uses a specimen from the limestone cliffs of the Clinch River in Knox County, Tennessee (*Jennison 97* TENN) which corresponds to *S. diffusa* proposed here.

This was an easy mistake to make, as both *Sabulina patula* and the *Sabulina diffusa* occur in Knox County Tennessee, albeit in different habitats. Steyermark likely assumed (not unreasonably) that the *Jennison 97* specimen, being from the same county in which Michaux cited as the type locality, would do well to serve as the basis for understanding the typical variety.

Although Michaux's habitat notes of "rochers [rocks]" is vague, evidence of the habitat of his *Sabulina patula* collection can be inferred by his collection of *Leavenworthia uniflora* (Michx.) Britton (syn. *Cardamine uniflora* Michx.) from around the same time period in Knoxville. *Leavenwothia uniflora* is a species of Brassicaceae endemic to calcareous bedrock glade habitat and is never found on limestone cliffs. Michaux's

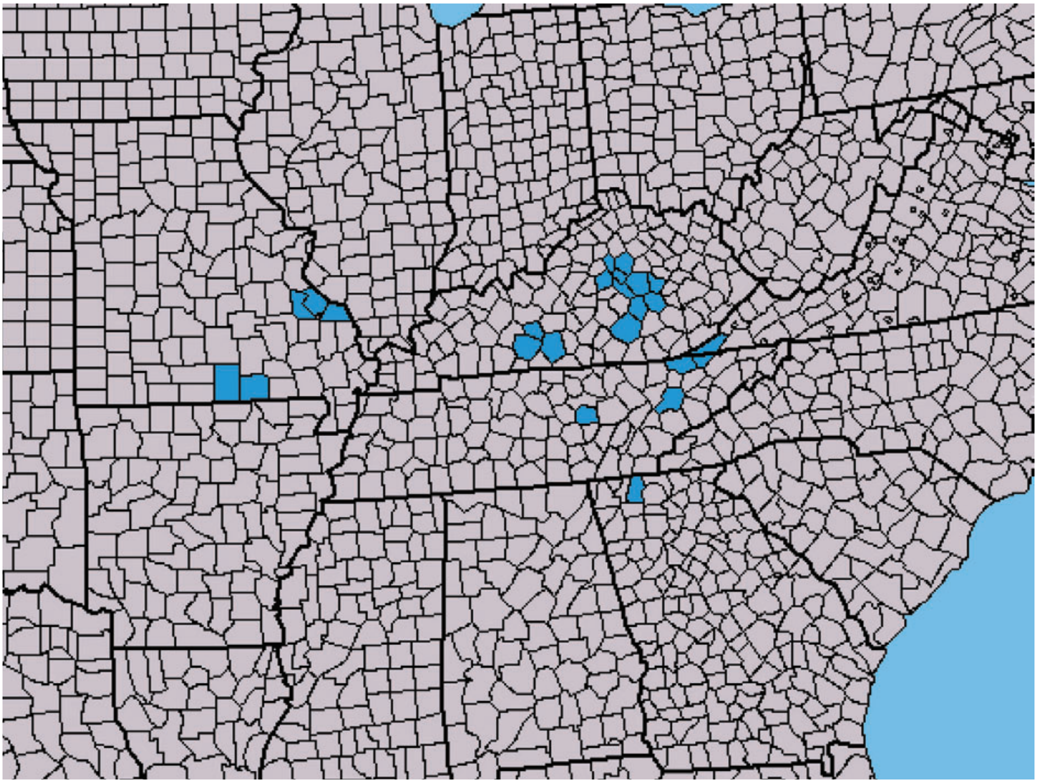


Fig. 7. Known county documentation of *Sabulina diffusa.*

specimen of *L. uniflora* also bears a similar wording of “in roches [rocks] environs, circa Knoxville,” which suggests that his collection of *S. patula* originated from a similar ecological community.

Because Steyermark misapplied the type, he provided no forma to apply to the undescribed entity. In addition, the form he described for the widespread limestone glade entity (*Arenaria patula* f. *media* Steyerm.) is superfluous as it applies to the type entity.

Typification of *Arenaria patula*

No evidence of the typification of *Arenaria patula* can be found. Although specimens of *Arenaria patula* located in the Muséum National d’Histoire Naturelle of Paris, France (P) are described as “types” in an online database, the specimens themselves bear no marking or labeling suggesting that they are types, nor would any such marking constitute an actual type designation under the Code. A review of literature relating to *Arenaria patula* reveals no such formal designation having been made.

Of the three specimens bearing the name *Arenaria patula* in Michaux’s collection at P, only one also bears the inscription of “Knoxville” on the label. Because Michaux was a widely traveling botanist, it cannot be assumed that the other two specimens are from the same locality. Unfortunately, the two specimens currently marked as “types” in the P online database are the two specimens that do not bear any locality information. Confusingly, the specimen that bears the inscription of “Knoxville” isn’t currently present in the P online database. It was possible to examine an image of this specimen due to the photography efforts of Blackwell et al. (2018) published on an independent website (image name “Michaux0306”). The label data on the specimen [“Environs de Knoxville sur les Rochers”] and that of the protologue [“Hab. in rupibus, circa Knoxville”] have exactly the same meaning in French and Latin, respectively, providing further weight to the appropriate designation of this specimen as the lectotype.

A lectotypification of the specimen which bears the inscription of "Knoxville" is therefore provided here, with its identifying reference based on the Blackwell et al. (2018) database.

Arenaria patula Michx., Fl. Bor.-Amer. 1:273. 1803. *Sabulina patula* (Michx.) Small ex Rydb., Fl. Plains N. Amer. 321. 1932. Type: U.S.A. Tennessee. Knox Co.: environs de Knoxville sur les Rochers, *Michaux s.n.* (lectotype, **designated here**: P, specimen name michaux.2017a:10_11, n.s.; see Fig. 8 of this paper).

CYPERACEAE

RHYNCHOSPORA: *Rhynchospora vernalis* (Cyperaceae), a new species from peninsular Florida

Primary authors: Edwin L. Bridges and Steve L. Orzell

Around 30 years ago, we first noticed a confusing *Rhynchospora* in central peninsular Florida. When using bristle characters, it keyed to *Rhynchospora decurrens* Chapm., but it lacked the decurrent tubercle base of that species, and also differed in spikelet color, inflorescence shape, and habitat. We distributed five collections of this entity to herbaria labeled as *R. decurrens* before realizing it only superficially resembled that species. At that time, *Rhynchospora* sect. *Mixtae* Kük. (sensu McMillan 2007) was not well studied, with some species (such as *R. sulcata* Gale) not consistently recognized until the detailed work on *Rhynchospora* in South Carolina by McMillan (2006, 2007). Although Florida material was outside of the scope of his study, the detailed descriptions, comparative character tables, illustrations, and discussion of variation in McMillan (2007), convinced us that our peninsular Florida entity did not match any of the known species in sect. *Mixtae*, and consequently, we here name *R. vernalis* as a new species.

Rhynchospora vernalis is named for its typically early spring peak flowering and fruiting, often with mature achenes by April or May in central Florida, when it is most conspicuous. This robust, clump-forming perennial species will occasionally reflower later in the season, but it typically has mature fruit long before most species of *Rhynchospora* in undisturbed habitats. It is distinguished from other species of *Rhynchospora* sect. *Mixtae* with some difficulty. Superficially, it might be mistaken for *Rhynchospora mixta* Britton, *R. elliottii* A. Gray, or R. *microcarpa* Baldwin ex A. Gray. The new species *R. vernalis* has a much more spreading inflorescence of lighter brown colored spikelets than *R. microcarpa*, and forms larger clumps of stiffer culms than does *R. mixta*. It tends to differ in habitat from either of these species, being locally abundant in deep wet prairies, shallow marshy, depressional ponds, and in the grassy groundcover of open cypress dome swamps. In these habitats, it is often in association with *R. inundata* Fernald and *R. cephalantha* A. Gray, and less commonly with *R. fascicularis* Vahl, *R. filifolia* A. Gray, *R. rariflora* Elliott, *R. latifolia* Baldwin ex Elliott, and *R. tracyi* Britton, none of which are closely related. It will key incompletely to *R. sulcata* or *R. microcarpa* in McMillan (2007) and to these or *R. decurrens* in most other keys to southeastern US *Rhynchospora*, but differs in several characters from each of these, as detailed in the description and key. It is rather common and widespread in central peninsular Florida, becoming less frequent north and south of this region.

Rhynchospora vernalis E. Bridges & Orzell, **sp. nov.** (**Fig. 9**). Type: U.S.A. FLORIDA: Highlands Co.: wet prairie margin of cypress dome with short-stature *Taxodium ascendens* just N of Kissimmee Rd, ca. 0.7 mi E of O. Q. Rd at O. Q. Range; Avon Park Air Force Range; Lake Arbuckle NE 7.5' Quad.; SEQ, SWQ Sec. 4, T33S, R30E; 27°37'55"N; 81°19'44"W; 18 Apr 1998, *Orzell and Bridges 25273* [holotype: NCU; isotypes: DUKE, FLAS, FSU, FTU, GA, MO, NCSC, NY, USF].

Diagnosis.—Similar to *Rhynchospora microcarpa*, differing in being more robust, with widely spreading primary inflorescence branches, lighter brown spikelets, and with unequal bristle lengths from 0.9–1.5 times as long as the achene body.

***Description.*—**Densely cespitose perennial, typically with 8–18(–26) culms per clump. Largest culms in each clump mostly 1.2–1.4(–1.7) m tall, with shorter culms in the clumps 0.4–1.0 m tall, each culm with (3–)7–12(–21) basally disposed leaves. Leaves (11–)40–60(–88) cm long, (2–)3–5(–7) mm wide, glabrous. Inflorescence (11–)20–32(–50) cm long, typically occupying only the terminal 20–30% of the culm length. Inflorescence units (clusters) mostly 2–3(–5) per culm, 3–5(–6) cm wide, (3–)5–8(–12) cm long, subtended by a leaf-like bract mostly 2–5(–8) cm long and 1–2 mm wide, the primary branches of each unit spreading to ascending in

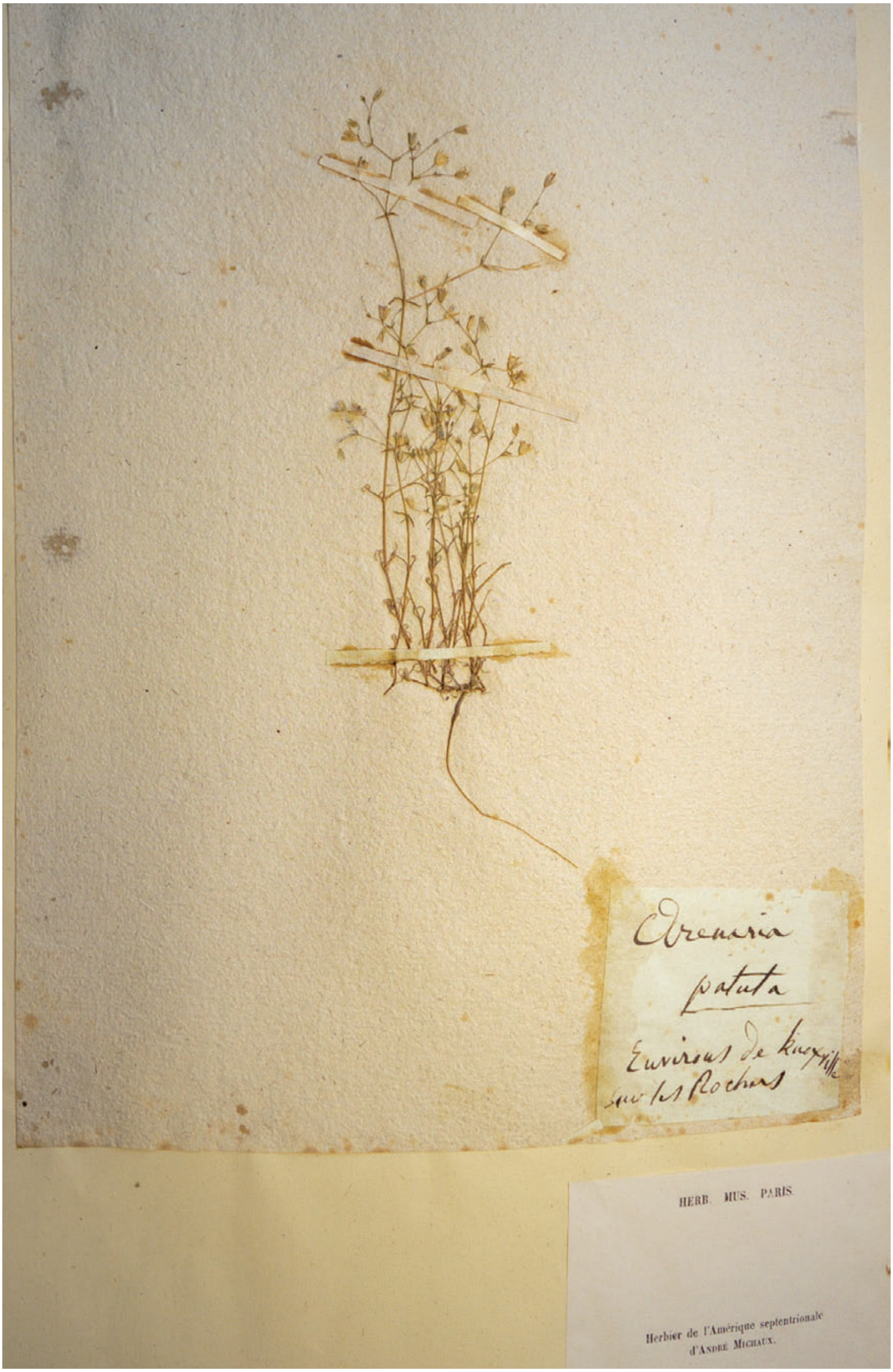


Fig. 8. Lectotype of *Sabulina patula* (syn. *Arenaria patula*), *Michaux s.n.* (P). Image name: Michaux0306. Specimen name: michaux.2017a:10_11.

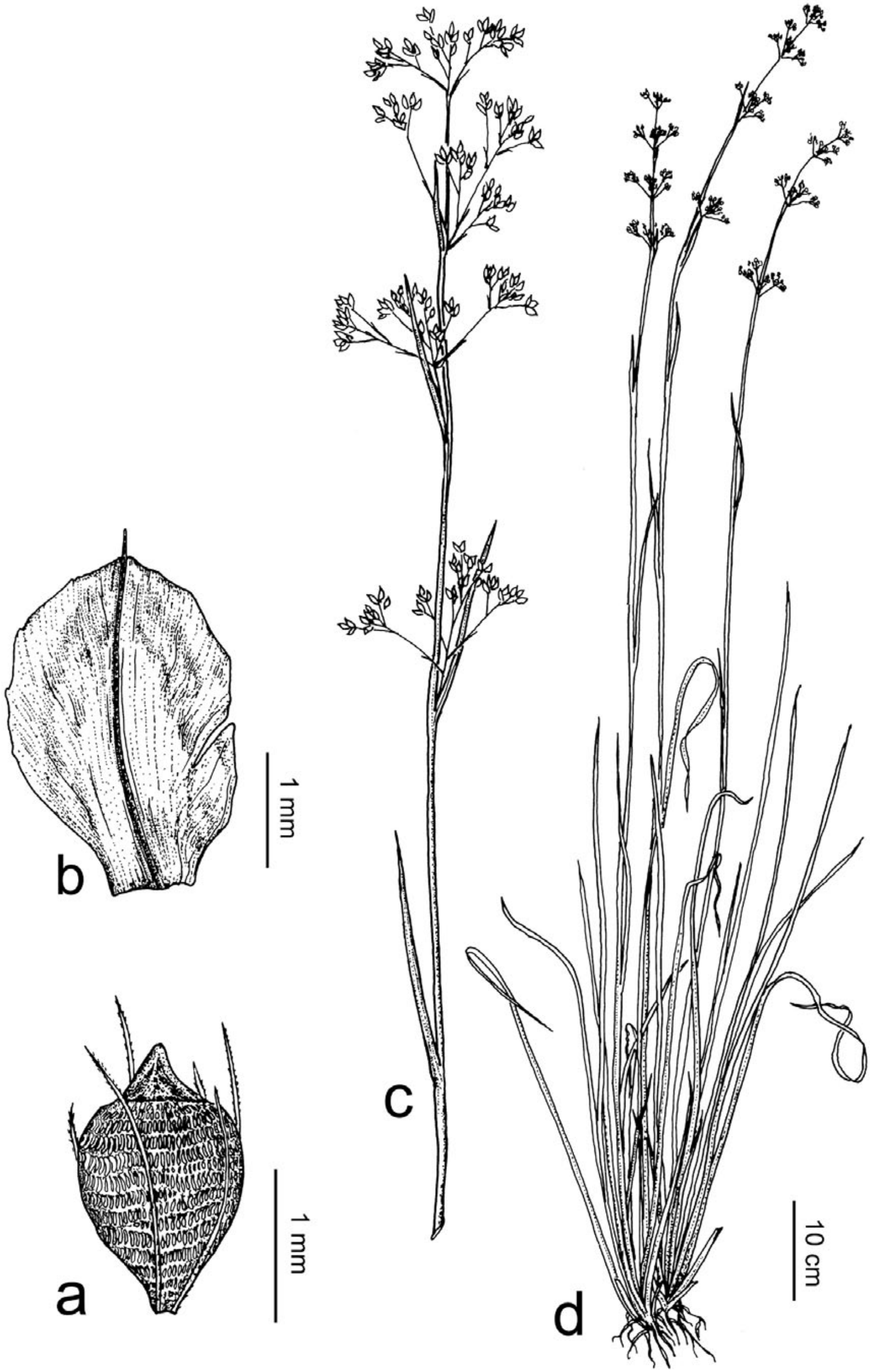


Fig. 9. *Rhynchospora vernalis:* **a.** Achene; **b.** Spikelet scale; **c.** Inflorescence; **d.** Habit. Drawing by Rebecca Yahr from type specimen and living material.

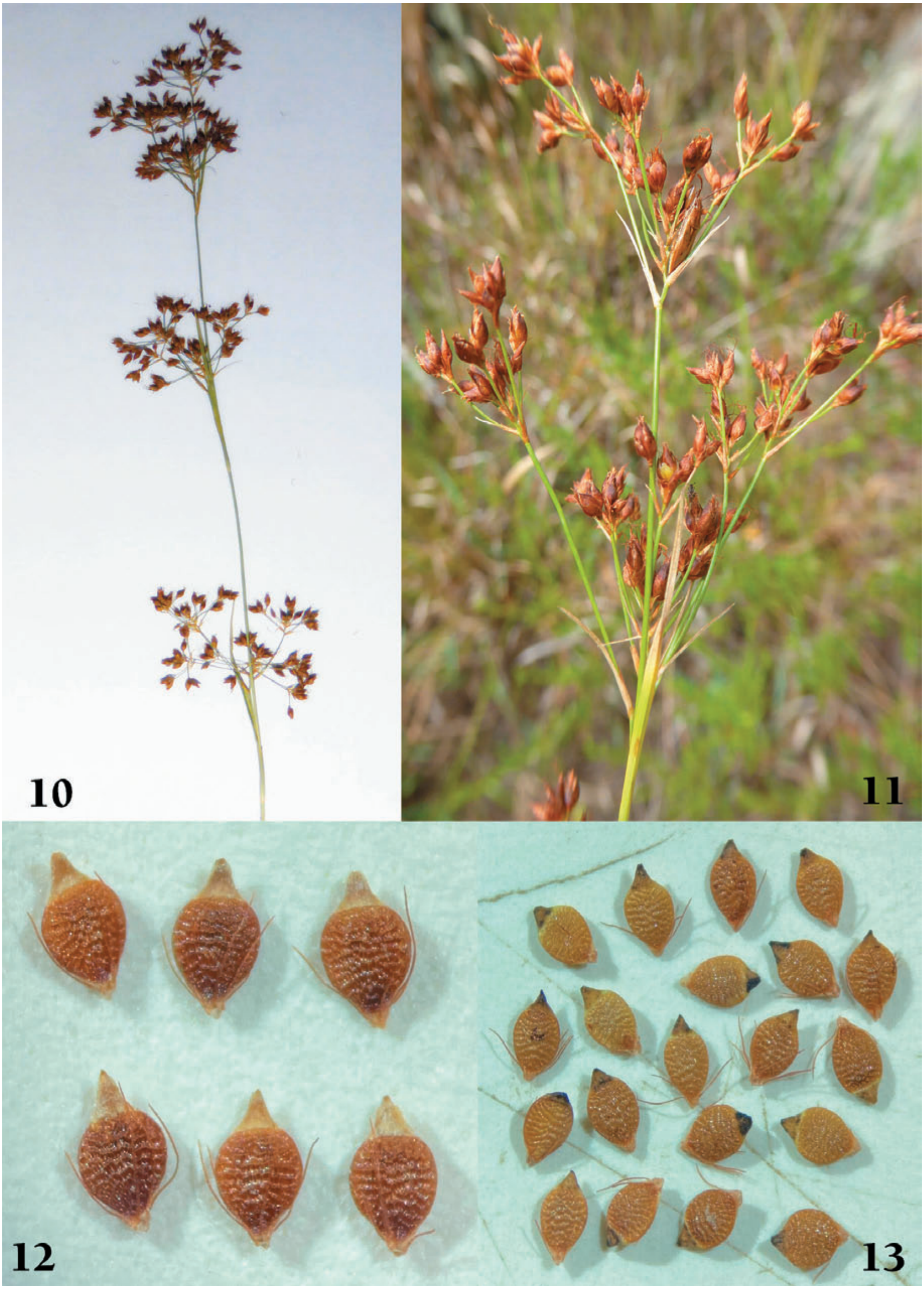
flower, not flexuous, becoming ascending in fruit, each unit rather open and diffuse (not congested) with elongate primary branches, the terminal branchlets mostly separated, each with a terminal cluster of 3–8 well-defined spikelets, not closely packed, the lowermost spikelets in each cluster pedicellate. Spikelets light to medium brown (not dark brown), broadly ovoid, 2–3.5 mm long, 2–3 mm wide, often 3–5 or more fruited, spikelet scales broadly ovate, abruptly short-aristate. Achenes broadly obovoid, biconvex, but not strongly tumid, light to medium brown (not dark brown), 1.0–1.2 mm long, 0.8–1.1 mm wide, the length/width ratio mostly 1.0–1.2. Achene surface strongly transversely ridged, with 6–8 mostly irregular ridges, the alveolae very narrow. Bristles 6, sometimes easily detached, finely antrorsely barbed, 0.9–1.6 mm long, unequal in length, from 0.9–1.5 times as long as the achene body, the shortest slightly shorter than the achene body, the longest nearly as long as the tubercle. Tubercle broadly conic to deltoid, narrower than the top of the achene body, 0.4–0.5 mm wide at the base, 0.4–0.5 mm long, distinct from the achene body and not decurrent on the achene, the margins smooth (not setose). See Figs. 10–13.

In *Flora of North America,* Volume 23, page 228, Kral (2002), in his discussion of *Rhynchospora microcarpa*, states “In peninsular Florida, apparent intergradation with *R. elliottii* produces some individuals with broad leaves and triangular subulate tubercles on nearly flat fruits.” McMillan (2007) notes that, as expected, some characters overlap between the closely related species of this section, but that these do not show a pattern which would indicate intergradation between species. This manuscript further clarifies these issues, since some of the confusion between *R. microcarpa* and *R. elliottii* for specimens now referred to *R. vernalis* is borne out by annotation labels in which experts shift determinations back and forth between these two species.

Writing a consistently workable key to *Rhynchospora* sect. *Globulares* and *Mixtae* has been a challenge for many authors. In Weakley & Southeastern Flora Team (2022a), LeBlond combines these two sections into a single long key with several of the species (notably, *R. microcarpa, R. decurrens*, and *R. sulcata*) keying out in multiple couplets, based on subtle differences in achene thickness (expressed as having either tumid, biconvex, concave-convex, flattened or concave achene faces) and bristle length, which can vary between species in these sections from being absent or nearly so to consistently exceeding the tubercle length. However, in each of these key locations, *R. vernalis* will key out imperfectly at the couplets separating *R. decurrens, R. microcarpa* and *R. sulcata*. The couplets from the key below separating these can be inserted in the Weakley & Southeastern Flora Team (2022a) key and will likely work in identifying *R. vernalis*. The following key is based on the *Rhynchospora* key in McMillan (2006, 2007), for sect. *Mixtae*.

KEY TO *RHYNCHOSPORA* SECT. *MIXTAE*, MODIFIED FROM MCMILLAN (2006, 2007)

1\. Achene body slender ellipsoid-obovoid, more than 1.8 mm long, more than 1.75 times as long as wide **R. inexpansa**
1\. Achene body broader, 1.8 mm or less long, less than 1.75 times as long as wide.
  2\. Achenes with flat or concave faces, sometimes with one face slightly concave and the opposite slightly convex.
    3\. Perianth bristles longer than the achene body (1.2–2.1 times as long as achene body); often exceeding the tubercle and widely spreading; plants robust with widest leaves 2.71–6.21 mm wide **R. elliottii**
    3\. Perianth bristles rudimentary to approximately 0.8 times as long as achene body, never exceeding the achene body; plants tall but slender, leaves narrower.
      4\. Tubercle not decurrent on the achene body; achene broadly obovoid to suborbicular 1.0–1.4 mm long; surface with 8 or fewer prominent deep transverse ridges; perianth bristles 1–3 or absent, 0.2–0.6 times as long as the achene body **R. perplexa**
      4\. Tubercle decurrent on the achene body; achene obovoid 1.3–1.8 mm long; achene surface with 10 or more shallow transverse ridges; perianth bristles 6, 0.4–0.9 times as long as the achene body **R. torreyana**
  2\. Achenes biconvex, sometimes slightly tumid.
    5\. Tubercle margins setulose (at least basally), obviously differentiated from the achene body, not decurrent, the base of the tubercle clearly differentiated and running straight across the summit of the achene body.
      6\. Achene narrowly ovoid to obovoid or elliptic, 0.7–1.2 mm wide, 1.0–1.7 times as long as wide; achene surface of rows of alveolae without obvious and deep transverse rugosity; tubercle triangular-subulate, with bases 0.4–0.7 mm wide; plants cespitose but with long and well-developed rhizomes present but easily broken during collection **R. mixta**
      6\. Achene broadly obovoid to suborbicular 1.0–1.5 mm wide, 0.9–1.4 times as long as wide; achene surface evidently and deeply transversely rugulose; tubercle triangular, broad-based 0.4–0.9 mm wide at base; plants cespitose with short or long rhizomes.



Figs 10–13. **Fig. 10** (upper left)—*Rhynchospora vernalis* inflorescence from type collection; **Fig. 11** (upper right)—*Rhynchospora vernalis* upper inflorescence, in a depression marsh in Osceola County, Florida, 9 Apr 2022. **Fig. 12** (lower left)—*Rhynchospora vernalis* achenes from Woodruff s.n., Alachua County, Florida. **Fig. 13** (lower right)—*Rhynchospora vernalis* achenes from A. de la Paz 2745, Alachua County, Florida. Figs. 12 and 13 taken by Alexander de la Paz.

7. Spikelets 6–9 mm long; stamens obviously marcescent (withered but persistent); achenes dark-castaneous at maturity **R. odorata**

7. Spikelets 5 mm or less long; stamens not evidently macrescent; achenes pale to deep brown but not dark castaneous at maturity.

8. Primary branches of inflorescence clusters ascending to flexuous-arching; achenes 1.2–1.8 mm long; tubercles triangular 0.3–0.9 mm long; plants cespitose with short or insignificant rhizomes **R. caduca**

8. Primary branches of clusters spreading at or near right angles to the culm forming a web-like arrangement; achenes 0.9–1.2 mm long; tubercles depressed conic to short and broadly triangular 0.2–0.4 mm long; plants long rhizomatous **R. miliacea**

5. Tubercle margins appearing entire, decurrent or obscurely differentiated from the achene body on the margins, decurrent or not, the base of the tubercle slightly arched upwards centrally, though occasionally imperceptible, often seeming to merge with the achene body.

9. Cluster branches elongate, flexuous and often with terminal cluster drooping; achene with 8–12 very narrow, shallow horizontal to transverse rugulose ridges; tubercles with margins slightly decurrent on the wire-like margin of the achene body **R. decurrens**

9. Cluster branches spreading to ascending, rarely, if ever drooping; achene with 6–8(9) broader, horizontal to transverse ridges; tubercles with margins not or rarely slightly decurrent, margin of achene not perceptibly wire-like.

10. Spikelets less than 2.0 mm long; achene body suborbicular to broadly obovoid; 0.8–1.0 mm long, 0.7–1.0 mm wide, tubercle 0.2–0.4 mm long; achene surface deeply ridged and transversely rugose with 5–7(8) evident ridges; inflorescence clusters produced over 3/4 or more of the stem length, congested with short branches **R. sulcata**

10. Spikelets 2.0–3.0 mm long; achene body ovoid to obovoid, 1.0–1.2 mm long and 0.7–1.1 mm wide, 1.0–1.7 times as long as wide; achene surface shallowly to strongly transversely ridged or with relatively horizontal rows with rectangular to isodiametric alveolae; primary ridges 6–9; clusters produced only in the upper ½ to ¼ of the stem length.

11. Inflorescence cluster branches ascending, the clusters mostly tightly congested; achene 1.0–1.7 times as long as wide, dark brown, shallowly nearly horizontally ridged or with nearly isodiametric alveolae, ridges 7–9; bristles of each achene nearly equal in length, from 0.5 to 1.5 times as long as the achene body; plants slender, mostly less than 1 meter tall, with leaves typically less than 40 cm long and 3 mm wide **R. microcarpa**

11. Inflorescence cluster branches widely spreading in flower, spreading to ascending in fruit, the clusters rather open, not congested; achene 1.0–1.2 times as long as wide, light brown, strongly transversely ridged with 6–8 irregular ridges and narrow rectangular alveolae; bristles unequal in length, from 0.9–1.5 times as long as the achene body; plants robust, typically more than 1.2 meters tall, with leaves often over 50 cm long and 4 mm wide **R. vernalis**

Distribution and ecology.—*Rhynchospora vernalis* is one of many species endemic to the Floridian natural division of the Southeastern United States Coastal Plain, a region which is characterized by a pine savanna-flatwoods landscape, spodosol soils, and plant distributions centered on peninsular Florida and extending north to southeastern Georgia and extreme southern South Carolina. *Rhynchospora vernalis* is frequent and often abundant in the seasonal depression marshes of the pine savanna landscape of peninsular Florida. It less commonly occurs in low areas of wetland pine savannas, *Aristida beyrichiana*-cyperoid dominated wet-grasslands, herbaceous ecotones fringing depression marshes, cypress swamps and cypress domes. We have observed it to vigorously resprout after fire, bearing mature fruit in less than three months post-fire.

At Avon Park Air Force Range in Highlands and Polk counties, Florida, we have recorded *Rhynchospora vernalis* on 120 site-specific and habitat-specific species lists over the last 30 years. Of these locations, 49 were in the depression marsh community class, 25 were in wet grasslands, 32 were in seepage-influenced community classes, and 14 were in the depression swamps community class. The frequency of association with other species in each of these four community classes are given in Table 1 for species with at least 50% association in at least one community class. Taken as a whole, these characterize most of the species likely to be found in communities supporting *R. vernalis* in central peninsular Florida.

Additional collections: FLORIDA: Alachua Co.: wet ditch in disturbed powerline ROW downslope from mesic-wet pine flatwoods, Morningside Nature Center, 29°39'58.6"N, 82°17'04.8"W, 6 Jun 2021, *A. de la Paz 2745* (PIHG); seasonally wet depression pond in mesic flatwoods, Morningside Nature Center, 29°39'46.1"N, 82°16'55.4"W, 10 Jun 2021, *A. de la Paz 2763* (PIHG); roadside ditch, 39th Avenue near Main Street, Gainesville, 29 May 1965, *R.E. Woodruff s.n.* (PIHG). **Brevard Co.:** flatwoods pond and burned slash pine/palmetto flatwoods on E side of Weber Rd., from 0.6–1.1 mi N of Valkaria Rd., from 1.9–2.4 mi S of FL 514 at a point ca. 1.4 mi E of I-95 at Palm Bay exit, Grant 7.5' Quad., WH, NWQ, Sec. 14, T29S, R37E; 27°57'46"N; 80°36'19"W, 19 May 1991, *Orzell and Bridges 16769* (FLAS, FSU, FTU, GA,

Table 1. Percent association of species with *Rhynchospora vernalis* by community class at Avon Park Air Force Range, Highlands and Polk counties, Florida. Taxonomy and nomenclature follow Weakley & Southeastern Flora Team (2022a).

Percent association of species with *Rhynchospora vernalis* at APAFR by community class	**All communities *n*=120**	**seepage influenced *n*=32**	**wet grasslands *n*=25**	**depression marshes *n*=49**	**depression swamps *n*=14**
Rhynchospora cephalantha var. cephalantha	77	94	84	65	64
Eriocaulon decangulare var. decangulare	76	91	96	59	64
Hypericum fasciculatum	67	59	68	71	64
Proserpinaca pectinata	67	59	52	76	79
Hymenachne hemitomon	58	47	40	71	64
Amphicarpum muehlenbergianum	57	56	68	47	71
Fuirena scirpoidea	57	53	56	57	64
Rhexia mariana	55	56	76	37	79
Centella erecta	53	63	72	35	64
Morella cerifera	50	56	76	22	86
Pluchea foetida var. foetida	49	59	40	45	57
Hypericum myrtifolium	48	47	72	37	43
Rhynchospora inundata	46	28	52	45	79
Paspalum praecox var. praecox	45	59	52	27	64
Andropogon virginicus var. 1 (sensu Weakley & Southeastern Flora Team 2022a)	42	31	60	39	43
Pluchea baccharis	38	13	56	39	57
Xyris fimbriata	37	66	16	29	36
Scleria muehlenbergii	36	56	44	14	50
Xyris elliottii	35	38	72	24	0
Euthamia caroliniana	35	47	40	16	64
Bacopa caroliniana	34	16	24	43	64
Pontederia cordata var. lancifolia	33	25	24	29	79
Andropogon cretaceus	32	59	32	14	29
Nyssa biflora	29	31	20	24	57
Xyris ambigua	28	53	44	4	29
Anchistea virginica	28	47	16	12	57
Hartwrightia floridana	27	69	24	4	14
Cyperus haspan	26	25	28	16	57
Setaria parviflora	23	22	36	10	50
Dichanthelium scabriusculum	23	47	16	4	50
Axonopus furcatus	23	19	24	12	64
Sporobolus bakeri	23	3	12	31	57
Hydrocotyle umbellata	23	16	28	14	57
Carex verrucosa	22	6	16	24	57
Coleataenia tenera	22	3	28	22	50
Sphagnum spp.	21	59	12	4	7
Diodia virginiana	20	13	32	8	57
Coleataenia abscissa	19	56	8	6	0
Hyptis alata var. alata	19	6	32	6	71
Xyris platylepis	18	50	8	4	7
Kellochloa verrucosa	13	9	12	2	57
Dichanthelium lucidum	11	6	8	4	50

NCU, NY, USF). **Duval Co.:** burned powerline right-of-way through flatwoods W of Powerline Rd, ca. 0.4 mi S of Big Oaks Rd, N of jct. of Cypress Pond Rd, ca. 3 air mi NE of jct US 301 and FL 119 on S side of Bryceville (in Nassau Co.); Cary WMA / State Forest, Bryceville 7.5' Quad.; WH, NWQ, Sec. 22, T1S, R24E; 30°24'04"N; 81°53'55"W, 4 Jun 1996, *Bridges 24515* (FLAS, FSU, NCU). **Highlands Co.:** freshwater marsh, Pittman Bay, Lykes Brothers Ranch, 1 Jul 1980, *L. L. Yarlett s.n.* (PIHG). **Hillsborough Co.:** cypress depression swamp near mesic pine savanna, Lake Dan Nature Preserve, Keystone, 9 May 2020, *A. de la Paz 1227* (PIHG). **Okeechobee Co.:** wet ditch in open wetland savanna ca. 0.8 mi E of NE corner of Dead Pine Island Marsh, 0.2 mi N of Kissimmee Prairie Sanctuary, ca. 2.8 mi S of Osceola Co line, 7.5 air mi SW of Yeehaw Junction; AAA Peacock Ranch, Fort Drum SW 7.5' Quad.; NEQ, SWQ, SWQ, Sec. 17, T33S, R34E; 27°36'03"N; 80°57'14"W, 9 Jun 1993, *Orzell and Bridges 22064* (FLAS, FSU, GA, NCU, NY, USF). **Orange Co.:** wet slash pine savanna on E side of Turkey Creek Bay, ca. 0.5 mi N of Disston Canal, ca. 2 air mi S of FL 528 (Bee Line Exp), ca. 0.6 air mi SW of Magnolia Ranch headquarters, Magnolia Ranch, Narcoossee NW 7.5' Quad.; NWQ, NEQ, Sec. 8, T24S, R32E; 28°25'14"N; 81°08'05"W, 18 Jul 1990, *Orzell and Bridges 14432* (FLAS, FTG, NCU, USF). **Osceola Co.:** disturbed seepy flatwoods-savanna and cypress slough on E side of Co Rd 523 (Canoe Creek Rd), 2.1 mi S of int US 192 in St. Cloud, St. Cloud South 7.5' Quad.; NWQ, NWQ, Sec. 23, T26S, R30E; 28°12'53"N; 81°17'29"W, 12 May 1990, *Orzell and Bridges 13562* (FLAS, FTG, USF); Flatwoods pond in wet cleared pine flatwoods on NE side of US 192-441, ca. 0.3 mi NW of jct FL 534, ca. 0.5 mi SW of Buck Lake, ca. 5.7 mi ESE of Ashton, ca. 7.5 air mi SE of St. Cloud, Birchwood / Triple E Ranch, Ashton 7.5' Quad.; NEQ, Sec. 25, T26S, R31E; 28°12'00"N; 81°09'56"W, 6 Jun 1991, *Orzell and Bridges 17049* (FLAS, NCU, USF). **Pasco Co.:** wetland pine savanna and cypress pond edges N of Center Grade Road, 0.5 mi W of Sumter Co. line and FL 471, ca. 1.1 mi SSE of Clay Sink, ca. 9.5 air mi NE of Dade City, Withlacoochee SF, Clay Sink 7.5' Quad.; SWQ, NEQ, Sec. 25, T23S, R22E; 28°27'29"N; 82°03'40"W, 29 Jun 1992, *Orzell and Bridges 19770* (FLAS, FSU, NCU, NY, USF). **Polk Co.:** burned wet prairie S of North Fence East at a point ca 0.45 air mi E of jct with Wise Rd, Avon Park Air Force Range, Lake Arbuckle NE 7.5' Quad.; NWQ, NWQ, NWQ Sec. 31, T31S, R31E; 27°44'46"N; 81°16'00"W, 29 Apr 1998, *Orzell 25276* (DUKE, FLAS, FSU, FTU, GA, NCU, NY, US, USF), burned, sandy, mucky, wet prairie ca 0.85 air mi WNW of Smith Rd at Delta Rd, Avon Park Air Force Range, Lake Arbuckle NE 7.5' Quad.; SWQ, SEQ, NEQ Sec. 21, T32S, R30E; 27°40'56"N; 81°19'24"W, 20 Sep 1994, *Orzell and Bridges 23205* (NCU), burned, wet-mesic longleaf pine flatwoods ca. 0.4 air mi SE of Andrea Lea Rd at Porter Rd, Avon Park Air Force Range, Lake Arbuckle 7.5' Quad.; NWQ, NEQ Sec. 4, T32S, R29E; 27°43'55"N; 81°25'30"W, 8 Nov 1994, *Orzell and Bridges 23425* (NCU), depression marsh ca 1.3 mi NW of Willingham & Frostproof Rds jct, Avon Park Air Force Range, Lake Arbuckle 7.5' Quad.; NEQ, NWQ, NWQ Sec. 11, T32S, R29E; 27°43'01"N; 81°23'45"W, 13 Aug 1993, *Orzell and Bridges 22207* (FLAS, FSU, USF), marshy shoreline of Lake Godwin at end of Road #2, ca. 1.0 mi S of School Bus Rd at a point 1.1 mi S of entrance gate to SF and 2.0 mi S of Lake Arbuckle Rd, ca. 8 air mi SE of Frostproof, Lake Godwin, Lake Wales Ridge State Forest, Lake Arbuckle 7.5' Quad.; NEQ, Sec. 20, T32S, R29E; 27°41'14"N; 81°26'08"W, 15 May 1993, *Orzell and Bridges 21820* (FLAS, FSU, NCU, USF), mesic hardwood hammock with mowed understory N of South Blvd. ca 0.2 mi W of Oakleaf Ave, Avon Park Air Force Range, Lake Arbuckle NE 7.5' Quad.; SEQ, NWQ, SEQ Sec. 25, T32S, R29E; 27°39'56"N; 81°22'18"W, 5 Apr 1997, *Orzell 25211C* (NCU), mesic longleaf pine / palmetto flatwoods and open ponds ca. 0.8 air mi N of Lake Weohyakapka, ca. 0.3 mi NE of Nalcrest, ca. 1.8 air mi SW of FL 60 bridge over Weohyakapka Creek, ca. 2.5 air mi SW of Hesperides, Hesperides Scrub CARL site, Lake Weohyakapka 7.5' Quad.; NEQ, NEQ, NWQ, Sec. 21, T30S, R29E; 27°51'49"N; 81°25'30"W, 11 May 1991, *Orzell and Bridges 16632* (FSU, NCU), herbaceous flatwoods pond ca. 0.5–1.0 mi N of FL 664 (County Line Rd) at a point ca 1.0 mi E of jct Keller Rd, and 5 mi E of jct US 17 on N side of Bowling Green, Mobil S. Ft. Meade Mine, Bereah 7.5' Quad.; NWQ, Sec. 32, T32S, R26E; 27°39'16"N; 81°44'30"W, 18 May 1992, *Orzell and Bridges 19541* (FLAS, FSU, FTU, GA, NCU, NY, USF), shallow sandy depression pond S & SE of FL 64 at jct with Alico Access Rd, 1 mi NE on FL 64 from Highlands Co line, ca. 7.6 mi NE of Avon Park, Bonnet Creek North Scrub, Lake Arbuckle SF, Lake Arbuckle 7.5' Quad.; SEQ, NWQ, Sec. 35, T32S, R29E; 27°39'20"N; 81°23'36"W, 10 Nov 1990, *Orzell and Bridges 15829* (FTG), 6 May 1992, *Orzell and Bridges 19510* (FLAS, FSU, FTU, GA, NCU, NY, USF). **Sarasota Co.:** flatwoods pond margin ca. 1.5 mi S of FL 72 at a point ca. 1 mi SE of Myakka River bridge, just E of Myakka River SP boundary, ca. 10 mi E of jct I-75 S of Sarasota, Myakka Prairie, Lower Myakka Lake 7.5' Quad.; NWQ, SWQ, Sec. 3, T38S, R20E; 27°12'06"N; 82°18'08"W, 9 May 1991, *Orzell and Bridges 16560* (NCU, USF). **Seminole Co.:** marshy depression pond at Orange Co. line, ca. 4.4 air mi SE of Chuluota, 0.2 mi W of end of Brown Rd, 0.8 mi S of Curryville Rd, and 0.7 mi E of Roberts Branch, Econ—St. Johns CARL, Bithlo 7.5' Quad.; SWQ, SEQ, SWQ, Sec. 31, T21S, R33E; 28°36'46"N; 81°03'27"W, 30 Jun 1992, *Orzell and Bridges 19832* (FLAS, NCU, USF). **Sumter Co.:** wet marly pine flatwoods and cypress pond edges on N side of Center Grade Rd, ca. 1.3 mi E of jct FL 471, near Weeks Pond and N of Gator Hole Slough, ca. 7.7 mi S of jct FL 50 at Tarrytown, Withlacoochee SF, Clay Sink 7.5' Quad.; NWQ, Sec. 29, T23S, R23E; 28°27'30"N; 82°02'10"W, 29 Apr 1991, *Orzell and Bridges 16427* (FLAS, NCU, USF). **Volusia Co.:** wetland pine savanna and ecotone of cypress depression S of FL 44, ca. 3.3 mi W of jct with FL 415, ca. 12 mi E of Deland, ca. 0.2 mi E of jct CR 4118 and Ranchette St., Samsula 7.5' Quad.; NWQ, SWQ, Sec. 17, T17S, R32E; 29°01'26"N; 81°07'20"W, 24 Jun 1992, *Orzell and Bridges 19705* (FLAS, FSU, NCU, NY, USF); disturbed slash pine flatwoods and pond transitions ca. 2.3 air mi S of jct FL 40 and US 17 in Barberville, Pierson 7.5' Quad.; NWQ, NWQ, SEQ, NWQ, Sec. 32, T15S, R29E; 29°09'15"N; 81°25'17"W, 12 Jun 1990, *Orzell and Bridges 13918* (FLAS, FTG).

Possible additional specimens.—Based only on examination of digital specimen images, with close examination of achene and bristle characters needed for definitive confirmation: **FLORIDA: Hillsborough Co.:** Tampa, May 1876, *A.P. Garber* (BRU). **Lake Co.:** cypress dome interior, Green Swamp Flood Detention Area, Sec. 17, T24S, R24E, 4 May 1982, *T.F. Rochow* (USF); low wet pineland border of Nyssa Cypress swamp, Ocala National Forest off Fla. Rte. 42, 17 May 1960, *J.D. Ray and G.R. Cooley 9845* (VDB). **Levy Co.:** clearing of swampy woodland, 1 mi W of Bronson, 4 Jun 1958, *R.K. Godfrey and W. Lindsey 57000* (VDB). **Nassau Co.:** swampy woodland, vicinity of Crawford, 2 Jun 1958, *R.K. Godfrey and W. Lindsey 56847* (FSU, USF). **[Orange Co]**.: Lake Butler, Mar 1921, *F. Baeckwith 560* (USF). **Orange Co.:** littoral zone of man-made lake, with 6 inch layer of much overlying sandy soils, inundated from 0–24 in, Lake SSJ-6, T23S, R31E, Sec. 36, Oct 1990, *J. Cutler s.n.* (USF); under powerline right of way, University Park, SE corner of jct of FL 50 and FL 408, at the end of Bonneville Dr, 20 Apr 2002, *W.D. Longbottom and D.H. Williams 5077* (FLAS, USF); in ditch near Christmas, 25 Apr 1948, *P.C. Schallert s.n.* (CLEMS). **Osceola Co.:** frequent in shallow water along edge of depression marsh, Disney Wilderness Preserve (Walker Ranch), ca. 11 air mi S of Kissimmee, NWQ, NEQ, Sec. 28, T27S, R29E, 26 Jun 1997, *L.C. Anderson 18008* (FSU). **Pinellas Co.:** Tarpon Springs, Mar 1921, *F. Baeckwith 561* (USF). **Polk Co.:** frequent in open grassy border and in shallow waters of cypress swamp, Disney Wilderness Preserve (Walker Ranch), ca. 2 air mi N of Lake Hatchinella, NWQ, SWQ, Sec. 3, T28S, R29E, 26 Jun 1997, *L.C. Anderson 17973* (FSU); moist open roadside, FL 37 at Manatee County line, 30 mi S of Lakeland, 28 May 1973, *L. Baltzell 5272* (LSU). **Sarasota Co.:** wet prairie, Deer Prairie Creek Preserve, Jordyn Parcel, northern parcel limit 4.5 mi E of int S. Moon Dr and Border Rd, I-75 borders to the south, 27 6.12'N, 82 15.84'W, 14 May 2010, *L.B. Birch et al 519* (SEL); wet hammock-edge, roadside, Myakka River State Park, hammock – road SE of Deer Prairie Slough control structure, 7 May 1988, *J.M. Huffman 88-05-07-01* (FLAS). **Seminole Co.:** in swampy woods on flood plain of river, CR 419 at the Econlockhatchee River W of Willingham Rd, Town of Oviedo, 28 39'22.76"N, 81 10'13.61"W, 19 Apr 2012, *W.D. Longbottom 17106* (USF). **Volusia Co.:** narrow "transition" area between former flatwoods (now planted *Pinus elliottii* plantation) and bayhead swamp, south of Hwy 40, 8 mi N of Deland, 29 11.175N, 81 23.827W, 8 Dec 2002, *Carr 5706* (FLAS); in cypress-gum swamp along Rte. 40, just E of crossing of Rte, 11, 25 May 1981, *D.S. Correll, H.B. Correll, and R.K. Godfrey 51918* (USF); cypress swamp, abundant, W of Ormond Beach, W of I-95, by Fla. Rt. 40, 25 May 1981, *R.K. Godfrey 78732* (FSU); cypress-gum depression in flatwoods, by Fla. Rt. 44, ca. 1 mi W of New Smyrna Beach, 26 May 1981, *R.K. Godfrey 78749* (FSU).

EUPHORBIACEAE

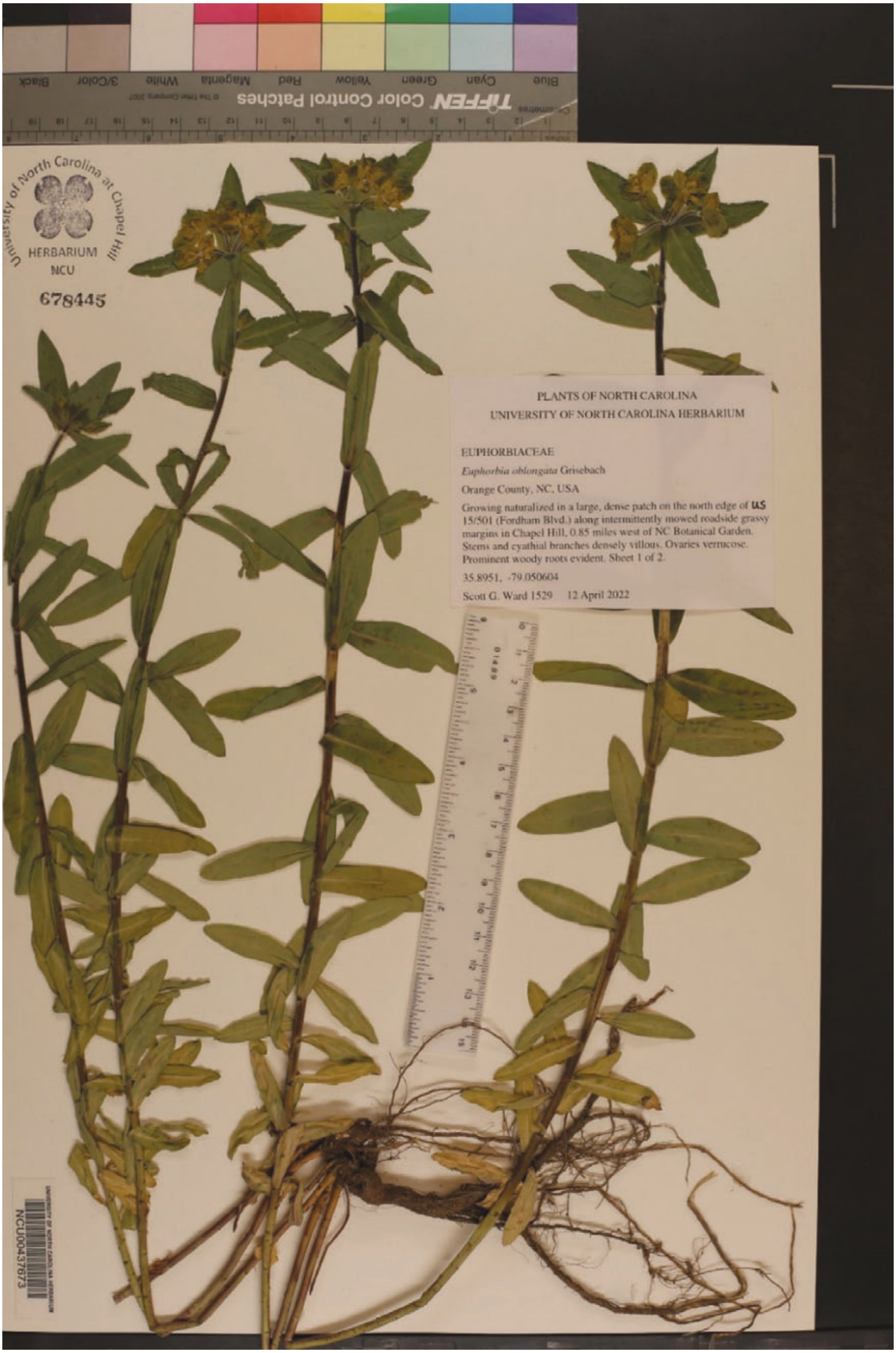
EUPHORBIA: Surging spurges: confirming the presence of naturalized populations of *Euphorbia oblongata* in the eastern United States, with comparisons to similar members of subgenus *Esula*

Primary author: Scott G. Ward

The species *Euphorbia oblongata* Griseb. is hereby confirmed as a naturalized member of the flora of the eastern United States. Currently it appears to be only occurring sporadically and spontaneously in disturbed anthropogenic habitats, but it has spread considerably in the western United States. This naturalized species has likely been overlooked in the eastern United States due to lack of concerted urban *Euphorbia* collections, its relatively recent naturalization, and possible confusion with other members of subgenus *Esula* Pers. I present here a brief history of spread, and detailed pictures and descriptions for *E. oblongata* as well as a revised partial dichotomous key and comparisons for *Euphorbia* subg. *Esula* in the southeastern US. Further monitoring and herbarium work may reveal further naturalized populations in our area.

Introduction

Eggleaf spurge (*Euphorbia oblongata*) has long been established in the flora of the western United States. Originally native to southern Europe in the Aegean region and southern Balkan peninsula (Smith & Tutin 1968), *E. oblongata* has since naturalized elsewhere in North America, South Africa, Australia, New Zealand, and throughout remaining portions of Europe. In California, It has been documented as occurring spontaneously since at least 1929 as a garden escape (*Copeland 1221*, DAV), and was increasingly being collected from established populations as early as the 1950's. It is now recognized as a noxious weed in California, Oregon, and Washington (Kartesz 2015; Riina et al. 2016). While its documentation has been extensive westward, an increasing number of recent iNaturalist observations suggest that this species may now be spontaneously occurring outside of cultivation in the eastern US. Despite this uptick in observations, only two collections are currently known from the eastern US: one from a Bronx County, NY specimen originally identified as *Euphorbia cyparissias* (*Roy 104,* NY) and another specimen originally identified as *Euphorbia platyphylla*[*os*] collected in Orange County, NC in 2010 by Alan S. Weakley and later brought to my attention recently by Alan S. Weakley and Carol Ann McCormick (see location for *Ward 1529,* Fig. 14). The former specimen (*Roy 104*) was not annotated to its correct identity as *E. oblongata* until 33 years after its initial identification in 2015 (D. Atha), and the latter specimen (*Weakley s.n.*, NCU; lacking roots) had not been examined since its initial determination in 2010, thus, further specimens could be awaiting proper identification in other regional herbaria. As a relatively recent naturalized member of the flora, *Euphorbia oblongata* is understandably underrepresented in other regional or statewide plant atlas authorities (e.g., Kartesz 2010; LeGrand et al. 2023). The overall lack of attention afforded this species in the southeast could be due, in part, to confusion or disinterest in identification within subg. *Esula* or merely that this species has only intermittently naturalized in our



PLANTS OF NORTH CAROLINA
UNIVERSITY OF NORTH CAROLINA HERBARIUM

EUPHORBIACEAE
Euphorbia oblongata Grisebach
Orange County, NC, USA
Growing naturalized in a large, dense patch on the north edge of US 15/501 (Fordham Blvd.) along intermittently mowed roadside grassy margins in Chapel Hill, 0.85 miles west of NC Botanical Garden. Stems and cyathial branches densely villous. Ovaries verrucose. Prominent woody roots evident. Sheet 1 of 2.
35.8951, -79.050604
Scott G. Ward 1529 12 April 2022

Fig. 14. ***Euphorbia oblongata*** **collected 12 Apr 2022 from a naturalized population in Orange County, NC (*Scott G. Ward 1529*). Note numerous robust stems arising from woody taproot. Picture by James Nathaniel Ross (UNC).**

region. Additionally, its status as an overlooked garden waif may also be due to the uncertainty of whether current populations are truly occuring spontaneously. Given the recent increased spread of non-native garden flora throughout the southeastern US (e.g., *Mahonia beadlei*, *Ilex crenata*, *Ilex cornuta*), and shorter invasion lag time for non-native herbaceous plant species (Niemiera & Holle 2009), a close but perhaps not overly obsessive eye should be kept on *E. oblongata*.

Description and comparisons

Euphorbia oblongata

Is a showy, robust, cespitose perennial bearing woody taproots and serrulate leaves to 25 mm wide (Fig. 14). It is also conspicuously villous along the stems and terminal cyathial branches (terminal rays, sensu Riina et al. 2013) and bears conspicuously verrucose or tuberculate capsules 3.0–4.5 mm long (Smith & Tutin 1968; Riina et al. 2016, Fig. 15). It is similar to a smaller group of members in subg. *Esula*, which are generally marked by finely serrulate leaves and verrucose capsules (Geltman et al. 2011; Riina et al. 2016). Approximately half of the species in subgenus *Esula* occurring in North America are non-native (Riina et al. 2016); however, there are also a number of restricted endemics in the southeastern US (e g., *E. austrotexana, Euphorbia georgiana*, *E. ouachitana*), thus identification within this subgenus plays an important role in distinguishing nativity.

Euphorbia oblongata has a similar gestalt to *E. obtusata* and *E. spathulata*, but differs primarily in having distinct woody taproots (vs. annual with thin herbaceous taproots), and conspicuously villous (vs. glabrous) stems and pleiochasial branches (Fig. 15). *Euphorbia oblongata* will often form dense cespitose clumps, with as many as 4–6 stems often arising from a single taproot (Fig. 14). While *E. obtusata* and *E. spathulata* may also have multiple stems arising from their taproots, they also appear to more often contain single culms. The leaves of *E. oblongata* are often much wider (to 25 mm) compared to *E. obtusata* and *E. spathulata* (to 11 mm wide). Furthermore, *E. oblongata* is unique within the southeastern members of subg. *Esula* that bear serrulate or crenulate leaf margins in that it is the only perennial species with a robust woody taproot (see key below).

Euphorbia oblongata appears to currently grow in highly urbanized or garden-adjacent suburban habitats, along roadsides, in botanical gardens and in other similar disturbed anthropogenic or cultivated habitats. It does not appear to be readily establishing within intact or higher-quality natural areas in our area. In the western US; however, it appears to be opportunistic and more closely tied to human-impacted habitats, but still clearly established within intact natural areas (especially in the San Francisco Bay area). It could eventually occur similarly in the eastern US. *Euphorbia oblongata* clearly occurs outside of cultivation in at least portions of Virginia and North Carolina (Fredericksburg County, VA; Orange County, NC; Wake County, NC), but its occurrence as truly spontaneous is questionable elsewhere (New York County, New York; Hamilton County, OH; Orange County, NC; Orange County, NC; Wake County, NC). It is also obviously cultivated at arboreta and private or public botanical gardens; remaining iNaturalist observations appear to be strictly cultivated. The southeastern US is home to a number of non-native *Euphorbia* taxa, most of which thrive in disturbed areas. These disturbances will surely increase in abundance, especially as projections for southeastern urbanization continue to look potentially drastic (Terando et al. 2014).

A brief note on *Euphorbia spathulata* and *E. obtusata*

It is not a primary objective of this paper to discuss the taxonomic history of *E. spathulata* Lam. and *E. obtusata* Pursh; however, these two species have been distinguished (Yatskievych 2006) or discussed (Riina et al. 2016) based upon a variety of characters listed in the key below. Other authors have segregated this group further, such as *Galarhoeus arkansanus* (Engelm. & A. Gray) Small ex Rydb., which allegedly occurs even further westward to Alaska and has slightly shorter capsules than *E. obtusata* (Small 1933). There appears to be ample morphological evidence to support *E. obtusata* at species rank (see key below). Additionally, while *E. spathulata* appears to prefer glades, prairies, bluffs, and dry or similar disturbed areas, *E. obtusata* appears to prefer sites with more soil moisture such as streambanks, rivers and bottomland forests (although it apparently also can similarly sometimes occur in disturbed areas, see Yatskievych 2006). More research is certainly still needed to clarify the distributions of both taxa (*E. spathulata* is apparently more westerly in its

Fig. 15. *Euphorbia oblongata* cyathial branches (rays) and stems. **A.** Cyathia and terminal pleiochasial branches (rays) in early flower. **B.** Terminal pleiochasial branches (rays), in early flower (*Scott G. Ward 1529*). **C.** Villous stem pubescence beneath ray leaves. **D.** Verrucose capsules (green arrows) and cyathia with dichasial bracts (yellow arrows). Pictures A-C by Scott G. Ward. Picture D by Stacie Wolny.

distribution) and to solidify the morphological characters most reliable in deciphering the two, as well as apparent intergrades discussed in Riina et al. (2016).

Partial key to members of *Euphorbia* subgenus *Esula* with serrulate leaf margins in the southeastern United States. Key primarily based upon Yatskievych 2006, Riina et al. 2016, & Weakley & Southeastern Flora Team 2022a.

1. Principal stem leaves finely serrulate or crenulate (especially toward the apex); [subgenus *Esula*, sect. *Helioscopia*].
  2. Ovary and capsule smooth.
    3. Leaf margins crenulate, the teeth rounded; terminal pleiochasial branches (rays) usually 3 and not or less radiant from above; capsules 1.6–2 mm long; seeds 1.4–1.5 mm long; [endemic to southeastern TX and adjacent LA] ____ **E. texana**
    3. Leaf margins serrulate, the teeth pointed; terminal pleiochasial branches (rays) usually 5 and conspicuously radiating from above; capsules 2.5–4 mm long; seeds 1.6–2.2 mm long; [uncommon non-native of disturbed areas in e. US] ____ **E. helioscopia**
  2. Ovary and capsule verrucose-roughened.
    4. Plants perennial, with thickened woody taproots; stems villous (often densely so, especially on inflorescence branches); leaves to 25 mm wide; [non-native waif] ____ **E. oblongata**
    4. Plants annual, rarely biennial, with thin herbaceous to only partially woody taproots; stems glabrous (or occasionally pilose in *E. platyphyllos*); leaves to 11 mm wide; [natives and waifs].
      5. Leaves sparsely pilose, usually with acute apices; plants usually with 5 terminal pleiochasial branches; [non-native waif, disturbed areas] ____ **E. platyphyllos**
      5. Leaves glabrous, usually with obtuse or rounded apices; plants usually with 3 terminal pleiochasial branches; [natives of intact and disturbed areas].
        6. Seeds smooth or very obscurely reticulate, 1.7–2.5 mm long; cyathia with the involucre 1.2–1.5 mm long; involucral bracts typically red; dichasial bracts cordate-clasping ____ **E. obtusata**
        6. Seeds distinctly alveolate, 1.3–1.8 mm long; cyathia with the involucre 0.6–0.9 mm long; involucral bracts typically yellow; dichasial bracts rounded to subcordate ____ **E. spathulata**
1. Principal stem leaves entire ____ **(Numerous other species)**

IRIDACEAE

SISYRINCHIUM: *Sisyrinchium rosulatum* re-examined

Primary author: Bruce A. Sorrie

In preparing a species account of *Sisyrinchium rosulatum* Bicknell for the *Vascular Plants of North Carolina* website (LeGrand et al. 2023), I felt uncomfortable assigning it a native status, even though it is considered to be native and endemic to the southern United States (Cholewa & Henderson 2002). The vast majority of specimens at the SERNEC data portal (SERNEC, *sernecportal.org*) from North Carolina and also from South Carolina were collected from roadsides, lawns, and other open disturbed sites. Very few were collected from apparently natural habitats, such as longleaf pine (*Pinus palustris* P. Miller) savannas and slopes near streams. However, the fact that nearly all North and South Carolina records of *S. rosulatum* are from disturbed habitats does not automatically render it an alien; there are a number of plant species native and endemic to the Southeastern United States that occur primarily in roadsides and powerlines, e.g., *Crocanthemum rosmarinifolium* (Pursh) Janchen.

Additional searches through SERNEC in 2022 revealed that throughout its distribution in the United States, *S. rosulatum* occurs in roadsides and other disturbed sites. The *Atlas of North American Plants* (Kartesz 2015) maps it primarily on the coastal plain from southeastern Virginia to southern Florida, west to central Arkansas, south-central Texas (Bastrop and Travis counties), and southeastern Texas (Jackson and Matagorda counties). There are records extending inland to western North Carolina, northwestern South Carolina, northern Georgia, northern Alabama, and northern Mississippi. Neither Kartesz (2015, Cholewa and Henderson (2002), nor Weakley & Southeastern Flora Team (2022a) suggest that it extends southward into Mexico or the West Indies.

From the original description by Bicknell (1899) to the present, authors of floras and floristic works have treated *S. rosulatum* as native and endemic to the United States. Bicknell (1899) stated that it was “Very distinct from any of our eastern species, having its affinity with certain South American forms and a Mexican and Central American species which is perhaps unnamed.”

The earliest collection date of *S. rosulatum* is 1852 [Sullivan's Island, SC, *Gibbes s.n.* (NY)]. This relatively early date is suggestive of native status, but by no means proof, as there are many native species in the Southeast that were not discovered until later in the 19th and 20th centuries, and many alien species documented as early as the late 17th and 18th centuries. Examples of early discoveries that were originally thought to be native to the United States, but later determined to be native elsewhere include *Commelina caroliniana* Walter (India) and *Modiola caroliniana* (L.) G. Don (South America). *Modiola*, and perhaps also *Sisyrinchium rosulatum*, may have arrived in the U.S. via early maritime trade from old South American ports such as Buenas Aires, Argentina and Salvador, Brazil, many decades prior to the first specimen collections.

Morphological characteristics of *Sisyrinchium rosulatum*

Detailed morphological descriptions of *S. rosulatum* can be found in Bicknell (1899) and Cholewa and Henderson (2002). Most notably it is an annual, one of only two annuals in the United States; the other is *S. minus* Engelmann & A. Gray. Shinners (1962) cites a third annual, *S. exile* Bicknell, with a similar range as *S. rosulatum*, but later authors invariably synonymize it under the latter. Plants of *S. rosulatum* are typically ascending or even prostrate, but can also be erect; stems typically are multiple and form a radial tuft. Another highly notable character is that tepal color is highly variable, from pale lavender-blue to white, red-purple, and yellow (Fig. 16). The corolla has a central star-shaped yellow throat, bordered by red-purple or brownish maroon. One to five slender red-purple lines extend the length of each tepal. More than one color morph may occur together in a population, but often form separate populations. These color variants were formerly thought (Bicknell 1899, 1901; Small 1933; Shinners 1962) to represent an additional two species: *S. exile* (pale yellow proximally, bluish distally) and *S. brownei* Small (yellow throughout), but the large number of so-called "hybrids" documented by Shinners (1962) renders the recognition of separate species untenable; petal color seems to be a polymorphic trait.

Other morphological characters used by various authors of taxonomic and floristic works have proven to be unreliable in separating *S. rosulatum, S. exile,* and *S. brownei* in North America. These include leaf dimensions, shape of perianth base, tepal size, length of stamen filament, extent of filament connation, size of capsule, presence of dark sutures on capsule, and seed shape (Shin et al. 2016; Shinners 1962).

Latin American correlates

Species diversity in *Sisyrinchium* is highest in South America (Chauveau et al. 2011) and the few annual species are thought to originate there (Goldblatt & Manning 2008). In Latin America, extending from northern Argentina to northern Mexico, there exists a group of three annual species that produce virtually the same range of plant morphology and flower color as *S. rosulatum* (Henrich & Goldblatt 1994, Johnston 1938, Tacuatia et al. 2012) (Fig. 16). Distinguishing among *S. micranthum* Cavanilles, *S. iridifolium* Kunth, and *S. laxum* of authors non Otto ex Sims has proven intractable (Johnston 1938, Shin et al. 2016) and recent authors synonymize them under *S. micranthum* (Zuloaga et al. 2008). What might be the relationship be between *S. rosulatum* and *S. micranthum*?

Sisyrinchium rosulatum vs. *S. micranthum*

Shinners (1962) stated for *S. rosulatum* that "most of its North American range has been attained more recently" than 1908, and reports that he frequently found it in 1961–1962 in eastern TX where it was rare in 1948. He boldly stated that "Its original home was nearly the same as that of *S. exile*, from southern Brazil to Argentina." As for *S. exile*, he stated that "The original home of this now very widespread weed seems to have been in the region from southern Brazil to northern Argentina. Since 1820, at least, the name *S. micranthum* has been used [in South America] for the plant here discussed." Thus, Shinners appears to be the first to 1) connect the U.S. plants of *S. rosulatum/exile* with the plants of South America, and 2) treat them as non-native to the U.S. More recently, Goldblatt and Manning (2008) stated: "It seems likely that the two or three annual species that occur in the southern United States are fairly recent introductions from South America and not native."

The native range of *Sisyrinchium micranthum* is primarily South American: southern Brazil, Uruguay,

Fig. 16. **A.** *Sisyrinchium micranthum* southern Brazil by author. **B.** *S. micranthum* from www. **C.** *S. micranthum* from www. **D.** *S. micranthum* color variation from Flora e Funga do Brasil online. **E.** *S. rosulatum* from CaliFlora. **F.** *S. rosulatum* from www. **G.** *S. rosulatum* from www. **H.** *S. rosulatum* from www.

northern Argentina, and eastern Paraguay (Zuloaga et al. 2008). In addition, plants originally determined as *S. iridifolium* Kunth in northern South America have been included within *S. micranthum* by recent authors. *Sisyrinchium micranthum* has also been documented from Central America north to Chiapas, Mexico (Henrich & Goldblatt 1994) and the West Indies (Henrich & Goldblatt 1987). There are specimens at SERNEC (SERNEC 2022, herbarium TEX) that extend the Mexican range to Coahuila and Nuevo Leon states, both of which border on Texas. All of the above are treated as natural occurrences by the authors.

As an alien or adventive plant, *Sisyrinchium micranthum* (including synonyms *S. iridifolium, S. laxum*) has been documented from Australia, California, China, Fiji, Korea, Madagascar, Malaysia, New Guinea, New Zealand, South Africa, and Sri Lanka (GBIF 2022). Yamaguchi and Hirai (1987) studied hybridization among color morphs of non-native *S. rosulatum* in Japan, "introduced from North America," identification made by K. Hornberger. Of note, one of these variants was previously identified as *S. iridifolium* var. *laxum* (Otto) Maekewa, which is native to South America and now treated as a synonym of *S. micranthum*. Thus, Japanese alien plants apparently involved two "species."

In the United States, Oliver and Lewis (1962) determined chromosome numbers for plants of "*S. laxum*" collected in Angelina and Nocogdoches counties, Texas; and plants of "*S. micranthum*" collected in Angelina, Hardin, and Trinity counties, Texas. Both represent the first reports of those two South American taxa in North America. To comply with North American nomenclatural concepts of the time, Shinners added an Editor's Note (p. 43), stating that *S. laxum* = *S. rosulatum* and *S. micranthum* = *S. exile*, based on flower color. Here again, Shinners treats the North and South American entities as conspecific and non-native in the United States.

Clearly, there has been much confusion regarding the specific boundaries of the members of the *S. rosulatum/micranthum* complex. Keys and descriptions do not provide any real help, as mensural characters overlap greatly if not completely, flower color is duplicated in both North and South America, and fruit size and color overlap completely. Johnston (1938) stated: "In my key I have given the characters which usually serve to distinguish *S. laxum* from *S. micranthumz* … There are plants which present embarrassing combinations of characters…from the region of overlap…where hybridization may be expected." Chauveau et al. (2011, p. 1299) stated: "The range recorded in the World Checklist of Iridaceae for *S. micranthum* was applied similarly to all morphotypes of the complex, because their respective ranges were impossible to determine accurately from the existing data." Shin et al. (2016) stated: "Because of the morphological plasticity observed within *S. micranthum* and the lack of careful studies on *S. rosulatum*, the identification of the two species is often unclear and recent molecular studies suggested that both are a single species, i.e., *S. micranthum*." Examples of the variation are shown in Fig. 16.

Genetic evidence for synonymizing *S. rosulatum* and *S. micranthum*

Oliver and Lewis (1962) documented chromosome numbers for *S. laxum/rosulatum* and for *S. micranthum/exile*, with *n*=16 reported for both. In southern Brazil, Tacuatia et al. (2012) documented diploids, tetraploids, and hexaploids. Yamaguchi and Hirai (1987) reported similar values in Japan. With a base chromosome number of x=8, the documentation of polyploidy may help explain some of the observed morphological variation (Tacuatia et al. 2016). In the first extensive phylogenetic research in the genus, Chauveau et al. (2011) analyzed eight molecular markers from 85 *Sisyrinchium* species. "A special effort was put into sampling of *S. micranthum*, a species which shows a high level of morphological plasticity and is closely related to *S. laxum* and *S. rosulatum*." The maximum likelihood topology, as well as the consensus tree, clearly showed that *S. rosulatum* (specimen from U.S.A.) is embedded within *S. micranthum* (specimens from Latin America), but sampling was limited.

Additional genetic sampling of plants from the United States would be welcome, to corroborate the results of Chauveau et al. (2011). Meanwhile, data from Chauveau et al. and from morphology strongly suggest that *Sisyrinchium rosulatum* Bicknell is a junior synonym of *S. micranthum* Cavanilles, and that it is not native to the United States.

LAMIACEAE

TRICHOSTEMA: *Trichostema coeruleum*, a new name for the species currently known as *Trichostema brachiatum* or *Isanthus brachiatus*, and its placement in a new section, *Isanthus*

Primary authors: R. Kevan Schoonover McClelland and Alan S. Weakley

A detailed review of the published names in the genus *Trichostema* (Lamiaceae) uncovered inconsistencies with applications of species names. Linnaeus (1753) named two species of *Trichostema*, *T. dichotomum* L. and *T. brachiatum* L. These two species have been assumed to represent the two most widely distributed species of the genus in eastern North America for the past 220 years, although *Trichostema brachiatum* has sometimes been placed in the genus *Isanthus* Michaux (1803), based on its different flower morphology (as *I. brachiatus* (L.) Britton, Sterns, & Poggenb.; Poggenburg et al. 1888). The lectotype of *Trichostema brachiatum* was designated in 2001 (Jarvis et al. 2001) and has since been determined to be an illustration of *Trichostema dichotomum* (McClelland 2022). Based on the lectotype, it is clear that *Trichostema brachiatum*/*Isanthus brachiatus* is conspecific with *Trichostema dichotomum*. Given that *T. dichotomum* and *T. brachiatum* were published simultaneously and their synonymy has not been established before, we choose to place *T. brachiatum* in synonymy under *T. dichotomum* given that *T. dichotomum* is the generitype species. Furthermore, because of the new synonymy, a new combination is needed for the plant originally published as *Isanthus coeruleus* Michaux (1803) in the genus *Trichostema*. Appropriate synonymy for *T. dichotomum*, *T. brachiatum*, and *I. coeruleus* Michaux (1803) is provided in addition to a new combination for *I. coeruleus* in the genus *Trichostema*. Furthermore, a monotypic section is erected to hold this species, based on our current understanding of the phylogeny of *Trichostema*.

Background

Trichostema Gronov. (Linnaeus 1753) is a genus in the mint family (Lamiaceae, Ajugoideae) endemic to North America. Its two most widespread eastern species, *T. dichotomum* L. and *T. brachiatum* L., were named in Linnaeus' first edition of *Species Plantarum* (volume 2, 1753). The only character separating these two species in *Species Plantarum* is the staminal characters *staminibus longissimus exsertis* for *T. dichotomum* and *staminibus brevibus inclusis* for *T. brachiatum*. Linnaeus' later works (Linnaeus 1759, 1763, 1767, 1770, 1774) and encyclopedic and check-list style works modeled after Linnaeus (Miller 1768; Forster 1771; Houttuyn 1778; Reichard 1780; Christmann 1781; Gmelin 1792; Persoon 1797; Willdenow 1801) consistently included and described both species. However, three floras compiled using specimens as evidence of presence or absence (Gronovius 1762; Walter 1788; Michaux 1803) included only *T. dichotomum*, not *T. brachiatum*. This suggests that despite the extensive travels and collecting by these authors or their contributors, they were unable to find plants ascribable *T. brachiatum* in the eastern Unites States.

The identity of (what was meant by) *T. brachiatum* changed over the next 20 years following Michaux's (1803) flora and his publication of the new genus *Isanthus* and its one species *I. coeruleus* Michaux. Initially, *T. dichotomum*, *T. brachiatum*, and *I. coeruleus* were all considered separate species (Lamarck & Poiret 1805; Lamarck & Poiret 1808; Pursh 1814). However, Muhlenberg (1813) and Nuttall (1818) treated *T. brachiatum* as a synonym under *I. coeruleus*. Subsequent authors continued to treat *T. dichotomum* and *I. coeruleus* as separate species without including *T. brachiatum* in any synonymy (Sprengel 1825; Torrey 1826; Beck 1833) and Sprengel (1825) even called into question the validity of *T. brachiatum* as a species. After Beck's (1833) publication, most major monographs and floras recognized *T. dichotomum* and *I. coeruleus* with *T. brachiatum* in synonymy under *I. coeruleus* following the Muhlenberg-Nuttall synonymy (Bentham 1833, 1835; Gray 1848; Gray 1878; Torrey 1843) though there were at least two exceptions that did not include *T. brachiatum* in their synonymy (Chapman 1860; Chapman 1883). The nomenclatural change of the species epithet from *I. coeruleus* to *I. brachiatus* (L.) Britton, Sterns, & Poggenb. (Poggenburg et al. 1888) was done following the establishment of the rules of nomenclatural priority (de Candolle 1867). *Isanthus brachiatus* was used as the species name in most subsequent floras (Small 1903; Small 1913; Britton & Brown 1913; Small 1933) though again Chapman (1897) still used *I. coeruleus*. *Isanthus brachiatum* was transferred back into the genus *Trichostema* by Epling (1929). Lewis

(1945) also recognized *I. brachiatus* as *T. brachiatum* and placed it in section *Orthopodium* Bentham (1835) based on life history, chromosome number, and morphological characteristics.

Despite the extensive treatment of these two species, typification of the names was not effected until the late 20th and early 21st centuries (Epling 1929 and Lewis 1945 both use the term "standard" for *T. brachiatum*, which is not considered valid typification by the International Code of Nomenclature for algae, fungi, and plants [ICN]; Turland et al. 2018). *Isanthus coeruleus* had a lectotype designated by Uttal (1984) based on Michaux's specimens in the Paris Herbarium (P). *Trichostema brachiatum* was determined to have no specimens present that could be considered original material, so Reveal designated the illustration from Dillenius (1732) cited by Linnaeus (1753) as the lectotype of that species (Jarvis et al. 2001). It is clear looking at the lectotype of *T. brachiatum* that this species name does not apply to the plant later named *I. coeruleus* by Michaux. For a more in-depth discussion of the application of species names and synonymy, see McClelland (2022).

Issues with application of the name *Trichostema brachiatum*

The decision by Nuttall (1818) to synonymize *I. coeruleus* with *T. brachiatum* stems from Linnaeus' description of the stamens of the genus *Trichostema*. Specifically, the genus was described to have *staminibus longissimis exsertis*, i.e., long, exserted stamens (Linnaeus 1737, 1738, 1754), whereas Linnaeus' second species had *staminibus brevibus inclusis*, i.e., short, inserted stamens (Linnaeus 1753). This apparent contradiction was also noted and used by Bentham (1833; 1835) to support Nuttall's synonymy of *I. coeruleus* and *T. brachiatum* despite identifying Lamarck's (1823) reprint of Dillenius' (1732) plate as *T. dichotomum*.

Linnaeus' staminal character of *T. brachiatum* may seem to align more closely with *I. coeruleus* than with the genus *Trichostema*, but the matter is not so clear. The straight stamens of the plant usually referred to as "*Trichostema brachiatum*" or "*Isanthus brachiatus*" are shorter than the curled stamens of *T. dichotomum* but are characteristically exserted from the rotate to broadly cup-shaped and radially symmetrical corolla. The long and strongly arching stamens of *T. dichotomum* coil more tightly as the flower ages, and become "included," as actually depicted in Dillenius's plate (the lectotype of *T. brachiatum* L.; Figs. 17 & 18). Thus, Linnaeus' three-word diagnosis is ambiguous and could apply equally well to either taxon. The only other basis for determining the correct application of Linnaeus' name *T. brachiatum* is the sole source he cited, since designated as the lectotype—Dillenius's (1732) plate and description. Dillenius' description is unequivocally of *Trichostema dichotomum*, and the plate unequivocally depicts *T. dichotomum* (Figs. 17 & 18). We showed the plate to over 25 southeastern United States botanists familiar with the two species, and the unanimous conclusion was that the plate depicts *Trichostema dichotomum*, not the species widely known as "*Trichostema brachiatum*." Reasons cited by those polled for this identification of the type of *T. brachiatum* L. as *T. dichotomum* L. were: 1. the clearly zygomorphic corolla with a well-developed lip (contrary to the actinomorphic corolla of *Isanthus coeruleus* Michx.), 2. spotting on the lip (none of the corolla lobes of *Isanthus coeruleus* are spotted), 3. The terminal inflorescence (*Isanthus coeruleus* has small cymose clusters of flowers in leaf axils), 4. The pinnately veined leaves (the leaves of *Isanthus coeruleus* are strongly three-veined), 5. The strongly bilateral calyx, with 3 lobes conjoined into a long lip and 2 conjoined into a short lip (the calyx of Isanthus coeruleus is radially symmetrical), and 6. The obtuse leaf apex (*Isanthus coeruleus* has an acute to acuminate leaf apex). Points 1 and 5 were included in the genus description of *Trichostema* by Linnaeus (1737, 1738, 1754). There are also additional characters present in the description and lectotype of *T. brachiatum* (Dillenius 1732: 380–381, plate 285) that clearly distinguish these species (Table 2; Figs. 17 & 18).

A review of Linnaeus' citations (Dillenius 1732: 380–381, plate 285; Linnaeus 1737; 1737[1738]; Gronovius 1739; van Royen 1740) and their citations (Plukenet 1696: 338; 1705: 191, plate 441, figure 8; Ray 1704: 311; Ray 1704 appendix: 241–249) also revealed several specimens (and potential uncited original material; Linnaeus 1957) located in the Sloane Herbarium H.S.74 f 47.2, H.S.94 f. 81, H.S.158 f. 172, and H.S.247 f. 72 (Britten et al. 1958). These were viewed with the assistance of Mark Carine at BM. All the specimens were attributable to *T. dichotomum* L. Furthermore, tracing through the citations of Linnaeus, Dillenius, Ray, and Plukenet, *Trichostema dichotomum* and *Trichostema brachiatum* both refer to the same specimen(s): Banister's

Fig. 17. Dillenius' illustration of *Teucrium Virginicum, Origani folio*, the lectotype of *Trichostema brachiatum* (left), and Michaux's illustration of *Isanthus coeruleus* (right). Dillenius' illustration shows the zygomorphic flowers and calyces of his plant that conform to the genus descriptions of *Trichostema* provided by Linnaeus. Michaux's illustration shows the actinomorphic flowers and calyces of his species, which does not conform with Linnaeus' description of the genus *Trichostema*. Images courtesy of Biblioteca Digital del Real Jardín Botánico: https://bibdigital.rjb.csic.es.

material of "Scutellaria caerulea, majoranae foliis, americana" (Fig. 19). Given the evidence present in the lectotype of *T. brachiatum*, the numerous plants present in the Sloane Herbarium, and the dissemination of citations, we see no reasonable basis to try to retain the application of the name *Trichostema brachiatum* Linnaeus to the plant accurately named, described, and figured by Michaux (1803) as *Isanthus coeruleus*. Given that the type material of *T. brachiatum* and *I. coeruleus* unambiguously represent different taxa and the fact that the known nomenclatural changes involving these two taxa were not done using original material of *T. brachiatum* (Nuttall 1818; Bentham 1833; Bentham 1835; Poggenburg et al. 1888; Epling 1929; Lewis 1945), we do not support the notion of conserving the name of *T. brachiatum* L. over *I. coeruleus* Michx., and therefore make a new combination in *Trichostema* based on Michaux's epithet and place *T. brachiatum* in synonymy under *T. dichotomum*.

Nomenclature

Note that publication dates (below) follow Stafleu & Cowan, 2nd edition (Stafleu & Cowan 1976; Stafleu & Cowan 1979; Stafleu & Cowan 1981; Stafleu & Cowan 1983; Stafleu & Cowan 1985; Stafleu & Cowan 1986; Stafleu & Cowan 1988). Herbarium codes follow Index Herbariorum (Thiers 2022).

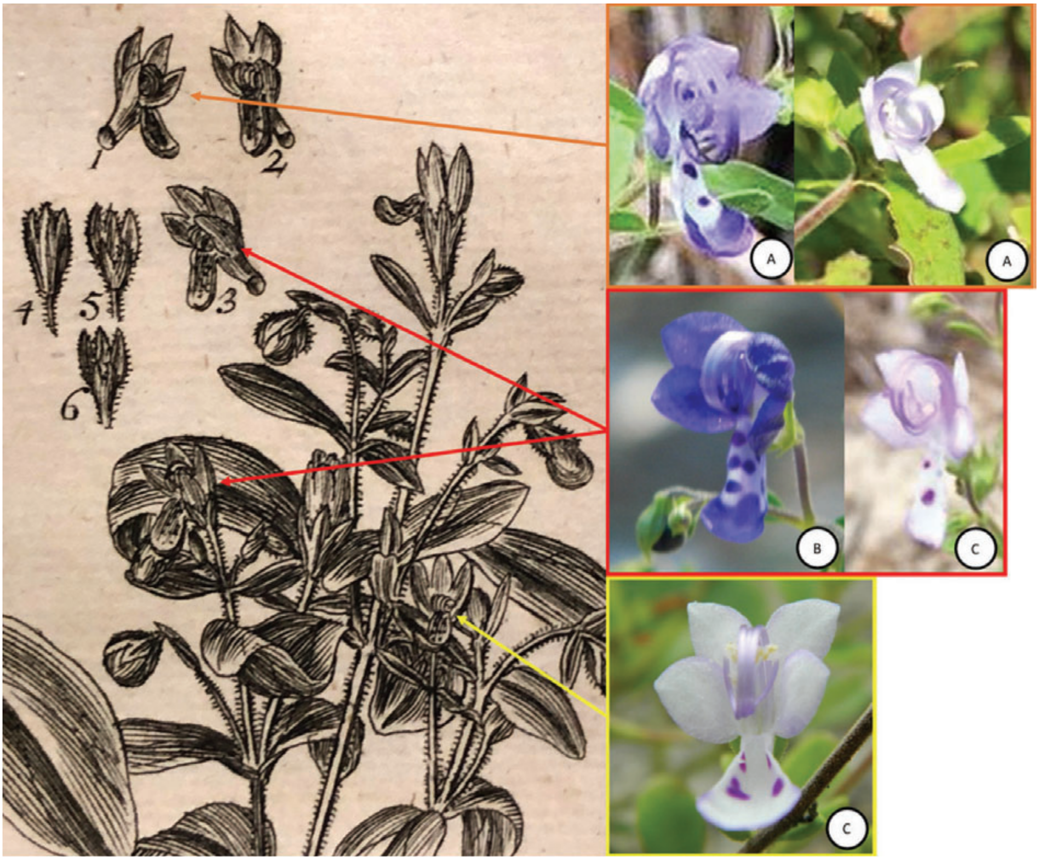


Fig. 18. Composite of the detail from Dillenius plate 285 (1732), the lectotype of *Trichostema brachiatum* and three species from *Trichostema* sect. *Trichostema* (A- *T. dichotomum*, B- *T. suffrutescens*, C- *T. nesophilum*) showing how the Dillenius plate is attributable to the older flowers of most of section *Trichostema*. Plate detail imaged by Barney Lipscomb; flower photographs by R. Kevan Schoonover McClelland.

Trichostema coeruleum (Michx.) K.S. McClell. & Weakley, **comb. nov.** Basionym: *Isanthus coeruleus* Michx., Fl. Bor.-Amer. (Michaux) 2:4. 1803. Type: U.S.A. [Kentucky]: *Michaux s.n.* (lectotype, **designated here:** P, microfiche! digital image!); the same as *Isanthus coeruleus* Michx. (designated by Uttal 1984) in accordance with Article 7.3 of the ICN (Turland et al. 2018).

Isanthus pumilus Raf., New Fl. N. Amer. 2:34–35. 1837. Type: U.S.A.: West Kentucky and Illinois, *Rafinesque s.n.* (syntypes, designated by Rafinesque 1837).

Isanthus pubescens Raf., New Fl. N. Amer. 2:35. 1837. Type: U.S.A. Kentucky: Mts. Wasioto or Cumberland, *Rafinesque s.n.* (syntypes, designated by Rafinesque 1837).

Isanthus multiflorus Raf., New Fl. N. Amer. 2:35. 1837. Type: U.S.A. Kentucky: in the Wasioto hills, *Rafinesque s.n.* (syntypes, designated by Rafinesque 1837). *Notes.*—This and the previous two species all seem to be local variations of *T. coeruleum* rather than distinct species (Lewis 1945). No illustrations were included in the publication, thus no original material is known to exist by the author from which to choose a lectotype. Neotypes are in the process of being chosen for these three taxa (McClelland in prep.).

Isanthus brachiatus (L.) Britton, Sterns, & Poggenb. var. *linearis* Fassett, Rhodora 35(420):388. 1933. Type: CANADA. Ontario. Manitoulin District: dry limestone flats, Cloche Peninsula, 20 Aug 1932, *N.C. Fassett 14770* (holotype: WIS, internet image!; isotypes: CMN, GH, internet image!). *Notes.*—Until common garden and genetic data is collected, we follow Lewis' (1945) treatment of this variety as a synonym of the species.

Trichostema dichotomum L., Sp. Pl. 2:598. 1753. Type: U.S.A. [Virginia]: ex Virginia, *Clayton 177* (lectotype, designated by Lewis 1945: BM, internet image!). Originally designated as "type," here corrected to "lectotype" in accordance with Article 9.10 of the ICN (Turland et al. 2018). We reject the later lectotypification of LINN specimen 750.1 (Reveal et al. 1987) as superfluous.

Table 2. Comparison of characteristics of *Trichostema dichotomum*, the lectotype and description of *T. brachiatum* (Dillenius 1732), and the lectotype and description of *Isanthus coeruleus* (Michaux 1803)

Morphological Character	*Trichostema dichotomum*	*T. brachiatum*	*Isanthus coeruleus*
Stamens	Long, arching, exserted; becoming tightly curled with age	Tightly curled, inserted	Short, straight, inserted or slightly exserted depending on corolla age
Corolla	Zygomorphic, 4 anterior lobes solid colored, acute, 1 posterior lobe spotted, rounded to truncate	Zygomorphic, 4 anterior lobes violet, acute, 1 posterior lobe spotted with darker purple spots, rounded to truncate	Actinomorphic, 5 lobes solid colored, rounded to mucronate, 1 posterior lobe without spotting, more rounded
Calyx	Zygomorphic, 3 long 2 short teeth, pedicel recurving in fruit	Zygomorphic, 3 long 2 short teeth, pedicel recurving in fruit	Actinomorphic, 5 equal teeth, pedicel not recurving in fruit
Inflorescence	Arranged terminally	Arranged terminally	Arranged axillary
Leaves	Pinnate venation, obtuse to slightly acute apices	Pinnate venation, obtuse apices	3-nerved from the base, acute to acuminate apices

Trichostema brachiatum L. Sp. Pl. 2:598. 1753. *Isanthus brachiatus* (L.) Britton, Sterns, & Poggenb., Prelim. Cat. 44. 1888. Type: AMERICA Septentrionali [locality uncertain but probably from Virginia; see note] (lectotype, designated by Reveal in Jarvis et al. 2001: [icon] Dillenius, Hort. Eltham. t. 285, f. 369, BRIT, digital photograph!, MA, internet image!). *Notes.*—Plate 285 in *Hortus Elthamensis* was based on plants grown in the Eltham Garden of James Sherard from seed procured by Charles DuBois, Treasurer of the East India Company (Dillenius 1732: 381). Given Charles DuBois position and the name given to this plant by Dillenius, the seeds were likely collected in the Virginia colony. Linnaeus's (1753) minimal description is non-diagnostic and can be interpreted as compatible with a late-in-the-day specimen of *T. dichotomum*. Dillenius's plant as figured is obviously and unquestionably *T. dichotomum* (Table 2; Figs. 17 & 18). As the flowers of all members of section *Trichostema* age, the stamens go from being very long and arched (*staminibus longissimis*) to being tightly curled within the flower as the flower ages (*staminibus brevibus inclusis*; pers. obs.; Fig. 18).

Trichostema pilosum Roth, Nov. Pl. Sp. 280. 1821. Roth did not cite specific specimens but says that his material came from "Dr. Stüve." Type: U.S.A.: [locality uncertain but likely New Jersey] (syntypes, designated by Roth 1821: destroyed; see Turner 2021). Neotypes are in the process of being chosen for this taxon (McClelland in prep.).

Trichostema dichotomum L. var. *puberulum* Fernald & Griscom, Rhodora 39:445. 1937. Type: U.S.A. Florida. Duval Co.: dry thickets and woodlands, Oct, *A.H. Curtiss 1976* (holotype: GH, internet image!; isotypes: CM!, FLAS!, MISSA, US!). *Note.*—This variety as described represents several taxa under study by the author (McClelland & Weakley, in review); however, the type specimen has been determined to represent *T. dichotomum sensu stricto* as opposed to one of the other taxa (McClelland 2022).

Sectional Taxonomy in *Trichostema*

The affinities of *T. coeruleum* within the genus *Trichostema* have been uncertain. Sometimes treated in a separate genus *Isanthus,* the species has more recently been included in *Trichostema,* and in sect. *Orthopodium* (Lewis 1945). Current morphologic and phylogenetic evidence (see below in Discussion) suggests that the species is discordant in sect. *Orthopodium* and is best placed in its own monotypic section. Given that this species was originally named in a separate genus, we retain that name at the new rank of section, creating the new combination:

Trichostema Gronov. sect. **Isanthus** (Michx.) K.S. McClell , **comb. et stat. nov.** Basionym: *Isanthus* Michx., Fl. Bor.-Amer. (Michaux) 2:3. 1803. Type: *Trichostema coeruleum* (Michx.) K.S. McClell., specimen 74:18 (Uttal 1984) at **P, here designated.**

***Discussion.*—**Lewis (1945) placed *T. coeruleum* (as *T. brachiatum*) in sect. *Orthopodium* based largely on its annual life history, strongly nerved leaves, and base chromosome number of *n*=7. While these three characters do align *T. coeruleum* with members of sect. *Orthopodium,* recent morphological and genetic analyses (Huang et al. 2008; McClelland 2022; McClelland & Weakley in review; Fig. 20) show that this species does not form a clade with the rest of sect. *Orthopodium*.

There are several morphological, cytological, and genetic differences (apart from the statistical analyses)

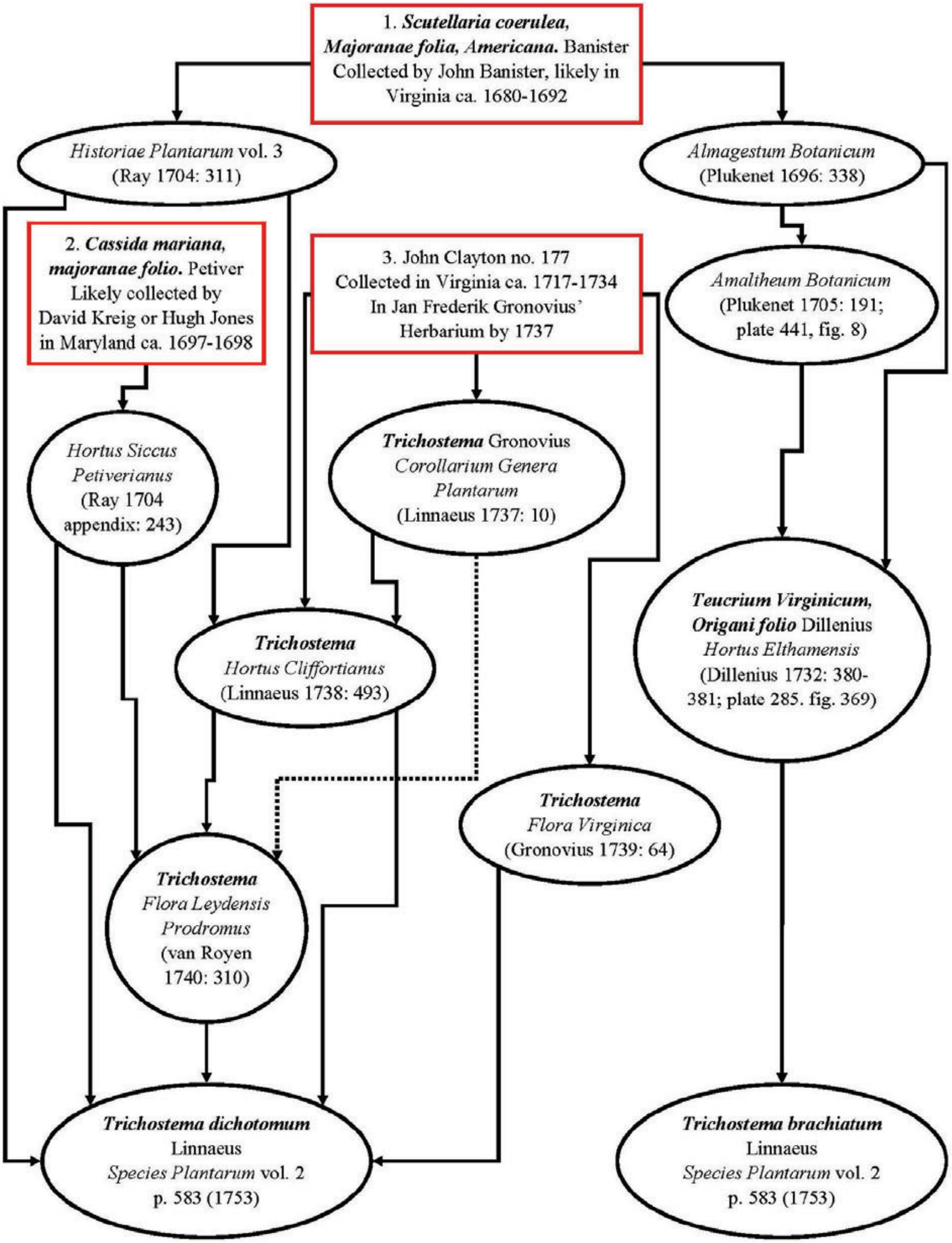


Fig. 19. A flowchart showing the transduction of the various names cited by Linnaeus in Species Plantarum volume 2 under his two species of *Trichostema* (1753: 598). Red boxes represent the three collections from which all other names are derived. Black circles represent publications. Arrows between boxes and circles represent citations (e.g., the arrow going from the red box labeled "Scutellaria caerulea majoranae folia" to the black circle labeled Historiae Plantarum means that *Scutellaria* is included/cited in Historiae). The hashed arrow going from *Trichostema* Gronovius Corollarium to *Trichostema* Florae Leydensis Prodromus is to clarify the direction of arrows that cross. Authors, collectors, collector numbers, and associated publications are provided in each box where known.

that distinguish sect. *Isanthus* from the other sections. The combination of being an herbaceous annual, having actinomorphic calyces, and having a base chromosome number of *n*=7 sets sect. *Isanthus* apart from sects. *Chromocephalum, Paniculatum, Rhodanthum,* and *Trichostema*. Morphological characteristics that separate sect. *Isanthus* from sect. *Orthopodium* are the two lateral nerves arising near the base of the leaf (vs. multiple lateral nerves arising in a pinnate fashion), greatly reduced inflorescence having a maximum of 3 to 5 flowers per axil (vs. regularly having more than five flowers per inflorescence axil), nearly straight stamens emerging directly from the throat of the corolla (vs. arching stamens emerging along the notch in the two most posterior lobes), and nearly actinomorphic corollas with little differentiation between the four posterior and one anterior lobe (vs. zygomorphic corollas with clear differentiation between the four posterior and one anterior lobe). There is also a genetic characteristic that separates sect. *Isanthus* from sect. *Orthopodium*, which is the presence of an eleven base-pair insertion in the ITS-1 gene that is absent in sect. *Orthopodium* but shared among sects. *Isanthus, Trichostema, Rhodanthum,* and *Paniculatum*.

In addition to the genetic and morphological evidence presented, the geographic range of this section does not correspond with that of sect. *Orthopodium* but rather sects. *Paniculatum* and *Trichostema* (Lewis 1945; McClelland 2022). All other sections are genetically and geographically cohesive in addition to being morphologically and cytologically cohesive (Lewis 1945, 1960; Huang et al. 2008; McClelland 2022), supporting the recognition of *Trichostema* sect. *Isanthus* as a distinct taxon.

Description.—Herbaceous annuals to 40 cm tall; Stems hirtellous with short, downwardly curled hairs, pilose with long, spreading eglandular hairs to 1 mm, occasionally with capitate glands. Leaves elliptic to nearly linear, 2–5 × 0.4–1.6 cm, base subcuneate, margins entire, apex acute. Inflorescences loose, 1–3 (–5)-flowered. Calyx actinomorphic, to 4–7.7 mm in fruit, hirtellous with short, downwardly curled hairs, pilose with long, spreading hairs to 1 mm, with capitate glands, lobes distinct, subequal, narrowly deltate to lanceolate, acute, 1.5–2 times longer than tube; corolla ± actinomorphic, blue-lavender to pale pink-lavender, tube straight, 1.6–3.5 mm, shorter than calyx lobes, anterior lobe 1.3–2.1 mm; stamens 2.3–4.2 mm, ± straight. Nutlets 1.9–2.9 mm, alveolate, hirtellous, with capitate glands, ridges prominent. 2*n*=14.

Etymology.—The epithet *Isanthus* is derived from the genus name *Isanthus*. The roots of the word are derived from *isos*, Greek for equal, and *anthos*, Greek for flower, referring to the nearly actinomorphic flowers.

LAURACEAE

TAMALA: The three Southeastern United States native species of *Persea* are better treated in *Tamala*, as formerly done by C.S. Rafinesque and J.K. Small

Primary author: Alan S. Weakley

Rohwer (1993) stated that many of the genera in the Lauraceae were "in need of revision" or "badly in need of revision," and many were noted as likely needing splitting or changes in circumscription. In the three decades since, molecular phylogenetic results have clarified the circumscription of some of the component genera in ways that affect species present as native or naturalized in the southeastern North United States. Trofimov et al. (2016) removed *Damburneya* Raf. from *Nectandra* Rottb., resulting in the recognition of *Damburneya coriacea* (Swartz) Trofimov & Rohwer (formerly often placed in *Nectandra* or *Ocotea* Aubl.) in the *Flora of the Southeastern United States* (Weakley & Southeastern Flora Team 2022a). Work by Huang et al. (2016) and Yank et al. (2022) have resulted in the resegregation of *Camphora* Fabr. from *Cinnamomum* Schaeff., resulting in treatment of the non-native and invasive camphor tree as *Camphora officinarum* Nees, often in the past called *Cinnamomum camphorum* (L.) J. Presl. Future changes in circumscription are likely in *Lindera* Thunb.—"almost certainly polyphyletic" and "badly in need of revision" (Rohwer 1993)—and *Litsea*—"comprising both anatomically and morphologically different groups, suggesting that the complex can be split into smaller entities" (Rohwer 1993) – and reworking of the circumscription of these genera may result in our few southeastern United States species being placed in other genera (both *Lindera* and *Litsea* are typified on Chinese species which may or may not clade with ours).

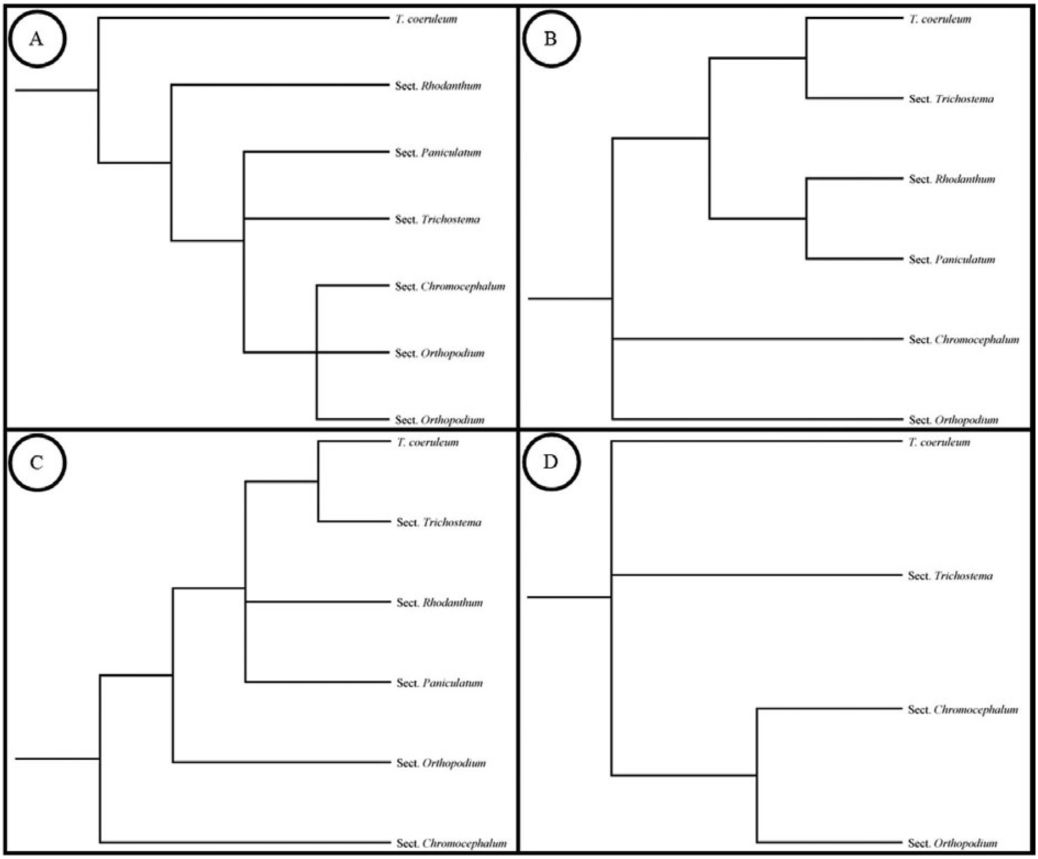


Fig. 20. Condensed trees based on genetic data (A–C: Huang et al. 2008; D: McClelland 2022) showing the consistent placement of *T. coeruleum* outside of section *Orthopodium* in which it was placed by Lewis (1945).

Persea Mill. (as broadly interpreted) is represented in the southeastern United States by three native species and the non-native and widely cultivated avocado, *Persea americana* P. Mill. Molecular phylogenetic results of Xiao et al. (2022) show five clades in tribe Perseeae. Clade I consists of *P. borbonia* in a clade with *Dehaasia* Blume 1836, *Nothaphoebe* Blume 1851 (including its type species), and species of *Alseodaphne* Nees 1831 (including its type species). Clade II consists of *Persea americana* (the type species of *Persea*). Clade III consists of *Alseodaphnopsis* H.W. Li & J. Li 2017. Clade IV includes *Phoebe* Nees 1836 and a single sampled species of *Nothaphoebe* (not its type). Clade V includes species of *Alseodaphne* and *Alsodaphnopsis*, not including the types of either genus. Clade VI consists of *Machilus* Nees 1831.

For the *Flora of the Southeastern United States*, continuing to treat our native species of "*Persea*" in *Persea* is clearly wrong; they are not congeneric with *Persea americana* (the type of the genus) under any conceivable circumscription of the genus (lumping the currently-recognized genera in all 6 clades into a single genus would not be credible). While it is conceivable that the components of Clade I could be treated as a single genus, our native *Persea* species (as represented in the analysis by *P. borbonia*) are "basal" to the rest of Clade I (*Dehaasia*, *Nothaphoebe*, and *Alseodaphne*), and estimated to diverge from that set of east Asian and southeast Asian genera ca. 39 million years ago. Morphologically distinctive and phylogenetically and geographically isolated, our native "*Persea*" are best treated as a small genus endemic to the southeastern United States and the Bahamas. Fortunately, a genus name is already available: *Tamala* Raf., named by C.S. Rafinesque (1838), and apparently based on *Laurus borbonia* L , judging from his reference to *L. borbonia* in his description of *Tamala*. Regarding the etymology of the generic name, Rafinesque merely mentioned "(n. ind)." Although one might interpret that abbreviation as indicating that Rafinesque derived the genus name from a native American language (*tamala* = thunderbolt), it appears that he instead derived it from Sanskrit of India (*tamala* = dark blue, alluding to *Laurus tamala* Buch.-Ham.). It is additionally helpful that *Tamala* has a half century of familiarity in the southeastern United States, because of its use in Small's influential floras (Small 1903, 1913, 1933). We therefore recognize *Tamala borbonia* (L.) Raf., *T. humilis* (Nash) Small, and *T. palustris* Raf. for the *Flora of the Southeastern United States*.

MYRICACEAE

MORELLA: Taxonomic recognition and names in Southeastern United States *Morella*

Primary author: Alan S. Weakley & Derick B. Poindexter

The taxonomy of bayberries of the southeastern United States (and beyond) has been unsettled and controversial at all ranks below family. In the last several decades, a consensus as to genera has developed, with four genera recognized in the family: *Comptonia* L'Hér. 1789, *Myrica* L. 1753, *Morella* Lour. 1790, and the New Caledonian endemic *Canacomyrica* Guillaumin 1940. Within *Morella*, and in eastern North America, though, there has been controversy about the number of taxa to be recognized and their rank, with some taxa not having correct and available names in *Morella* at the appropriate rank (because of the prevailing use until 1995 of *Myrica* or *Cerothamnus* for these taxa).

Based on our field experience across the region, we support the recognition of five taxa, each at species rank: *Morella inodora* (Bartram) Small, *Morella caroliniensis* (Mill.) Small, *M. pensylvanica* (Mirbel) Kartesz, *M. cerifera* (L.) Small, and a fifth species which until now has lacked an appropriate name at species rank in *Morella* (provided below). Each species is morphologically distinctive, and in general (see discussion below) does not show introgression, hybridization, or ambiguity when co-occuring in close proximity to congeneric taxa. *Morella inodora* is uncontroversially recognized at species rank. The other four taxa form two pairs, each of which has sometimes been treated at species rank, sometimes at variety rank, and sometimes lumped.

Morella pensylvanica has a largely northeastern distribution, rather common and widespread from Newfoundland west to Quebec and Ontario, south to s. Michigan, n. Ohio, w. NY, and MD, and along the coast to Dare County, North Carolina, where it reaches its southermost occurrence about 100 meters south of the southern town limit of Avon (formerly Kinnakeet). *Morella caroliniensis* has a more southern distribution, largely restricted to the southeastern Coastal Plain, but less commonly inland, from e. Texas (Pineywoods) and s. Arkansas east to the Florida peninsula (south to Highlands County), and north along the Atlantic Coastal Plain to s. New Jersey. The two are thus sympatric in the mid-Atlantic area from New Jersey to northeastern North Carolina. In that area, they differ in morphology, primary habitats, and primary geography. *M. pensylvanica* is largely a species of dry to moist, upland, sandy sites, especially maritime dunes, has narrower and more revolute leaves that are more deciduous, larger fruits, and whitish bark, while *M. caroliniansis* is a species of saturated wetlands, with broader and less revolute leaves that are more evergreen, smaller fruits, and dark bark; see Weakley & Southeastern Flora Team (2022a) for details. When they occur in proximity to one another in northeastern North Carolina and eastern Virginia, they generally retain these differences; but previous workers have been troubled with ambiguities, especially in southern New Jersey, and especially when dealing with herbarium specimens rather than the plants in the field. Wilbur's (2002) dismissal of the taxonomic difference of these two species seems based in part on "herbarium botany" and his lack of familiarity with (especially) *M. pensylvanica* in the field. He opines that "in my experience, species are separable by more and stronger characters than those differentiating these alleged species," but the relative convenience of the morphological characters used in the herbarium does not change the fact that these two species are morphologically distinctive across more than 95% of their collective distribution, and even in some parts of their shared (overlapped) distribution. I believe they therefore warrant recognition as separate entities and at species rank, that there are two entities on separate evolutionary trajectories, with the acknowledgment that some introgression or intermediacy is present in (especially) southern New Jersey. A deeper understanding of the situation there will require genetic analysis and perhaps local population studies.

Morella cerifera is the most abundant and widespread species of the genus in our region, with a similar though more extensive distribution than *M. caroliniensis* in the continental United States, but also extending extensively into the West Indies, Mexico, and Central America. In the United States, it is also now spreading in inland areas because of its horticultural use. This small tree or large, clump-forming shrub (to 15 m tall) is especially common in near-coastal wetlands, variously salt-influenced or fresh, but sometimes occurs in mesic or even sub-xeric upland sites, including longleaf pine flatwoods and dunes. A second entity, the "Dwarf Bayberry," has been recognized (or not) at species or variety rank, and in various genera): *Morella pumila* (Michx.) Small, *Cerothamnus pumilus* (Michx.) Small, *Myrica cerifera* L. var. *pumila* Michx., and *Myrica pusilla* Raf. Dwarf Bayberry is a low-growing, clonal shrub, usually 0.2–0.6 meters tall, and found in upland longleaf pine flatwoods and sandhills from southeastern Virginia to Florida, and west to southeastern Texas, strictly on the Coastal Plain and completely included within the distribution of *Morella cerifera*, usually in either deep sandy soils or in sandy spodosol soils (seasonally very dry, but with a spodic hardpan sometimes elevating the water table).

Dwarf Bayberry was first given a scientific name by André Michaux (1803), as *Myrica cerifera* L. var. *pumila* Michx., which he described as "fruticulosa, foliis minoribus, magis cuneatis" [short-shrubby, with smaller leaves that are more narrowly cuneate at the base] and with habitat "in aridis, a Carolina ad Floridam" [in dry places, from Carolina to Florida"]. A few decades later C.S. Rafinesque (1838) also named Dwarf Bayberry, as a species, with the description: "Myrica pusilla Raf. cerif. pumila Bartr? caule pumilo piloso angulato, fol. sessilib. obov. and cuneatis, apice ineq. serratis acutis, supra rugosis, subtus ferrugineis glabris, margine et nervo ciliatis—minute shrub, only 3–6 inches high, in Alabama and Florida, leaves very unequal and less than one inch long, Bartram calls them sinuate and yellow pulverulent." Rafinesque's references to Bartram and "cerif. pumila Bartr" might suggest that Bartram named a taxon, but his "Travels" (Harper 1958) do not show a nomenclatural act; clearly, though, Rafinesque's mention of Bartram in regards to this species are derived from the following passages. On p. 187 (near Alachua, Florida) Bartram describes "we soon entered a level, grassy plain, interspersed with low, spreading, three leaved pine trees, large patches of low shrubs, consisting of Prinos glaber, low Myrica, Kalmia glauca, Andromedas of several species, and many other shrubs. …" On page 242 (near the Suwanee River, Florida), Bartram describes "some remarkable barren plains" and that "I was struck with astonishment at their dreary appearance; the view Southerly seemed endless wastes, presenting rocky, gravelly, and sandy barren plains, producing scarcely any vegetable substances, except a few scrubby, crooked Pine trees, growing out of heaps of white rocks …; with clumps of mean shrubs, which served only to perpetuate the persecuting power and rage of fire, and to testify the aridity of the soil; the shrubs I observed were chiefly the following, Myrica cerifera, two or three varieties, one of which is very dwarfish; the leaves small, yet toothed or sinuated, of a yellowish green colour, owing to a farinaceous pubescence or vesicula which covers their surfaces; Prinos, varieties, Andromeda ferruginae, Andr. nitida, varieties, Rhamnus frangula, Sideroxilon sericium, Ilex aquifolium, Ilex myrtifolium, Empetrum, Kalmia ciliata, Cassine, and a great variety of shrub oaks, evergreen and deciduous, some of them singularly beautiful; Corypha repens, with a great variety of herbage …" (Harper 1958).

The descriptions by Michaux, Rafinesque, and Bartram each capture essential features of this species: its short, clonal habit, its growth in dry pinelands or "barrens" with other short heath and holly shrubs, the shorter and proportionately narrower leaves, very narrowly cuneate at the base, noticeably smaller towards the tips of the branches, and densely punctate glandular, giving a yellowish-green to ferruginous cast to the leaves, especially when young (see Fig. 21 for a representative modern specimen). In our experience, these two plants clearly behave as two distinct species. Particularly in outer Coastal Plain dryish pine flatwoods and sandhills, one can see the two growing interspersed (and also sometimes with *Morella caroliniensis*), and maintaining their morphological distinctions. Even when these pinelands are fire-suppressed, the Dwarf Bayberry remains short and clonal, while *Morella cerifera* grows taller.

Through the 1800s and early 1900s, flora authors universally recognized this taxon, according it species rank (Mohr 1901; Small 1903, 1913, 1933; Harper 1906) or variety rank (Chapman 1860, 1883, 1897; Radford et al. 1968; Clewell 1985), and described its habitat as "sandy pine barrens" (Chapman 1860, 1883, 1897), "open pine woods, dry sandy soil" (Mohr 1901), "sandy barrens" (Small 1913), "usually in dry or intermediate pine-barrens (Harper 1906), "sandy acid pinelands" (Small 1933), "sandy pinelands and low woods" (Radford et al. 1968), or "a diminutive colonial plant of flatwoods" (Clewell 1985). Mohr (1901) went out of his way to comment that the taxon is "strictly distinct." The features that distinguish Dwarf Bayberry from *Morella cerifera* are often difficult to distinguish definitively in herbarium specimens, though, and this has contributed to the non-recognition of the Dwarf Bayberry as taxonomically separate from *Morella cerifera*. Beginning in the 1980s, this taxon was largely lumped into *Morella cerifera* (Godfrey & Wooten 1981; Godfrey 1988; Wilbur 1994, 2002; Bornstein 1997; Wunderlin & Hansen 2003, 2011, 2015). Was this because of new studies or observations which cast doubt on the taxonomic recognition of the Dwarf Bayberry? No!—at least not as can be determined from any published work. Probably not coincidentally, this was a time when lumping became fashionable in eastern North American floras, as documented and discussed by Weakley (2005)—the Era of the Big Lump. Poorly prepared herbarium specimens, also lacking good information about the habit, height, and habitat of the plant collected, likely contributed to an uneasiness about the taxonomic status of Dwarf Bayberry.

Field observation across the region reveal that the two entities have distinctive distributions, distinctive habitats (with limited overlap), and distinctive morphology; when they do grow in mixed populations they remain clearly distinct. There is some evidence that they are phenologically separated in flowering when growing in proximity, with the Dwarf Bayberry flowering about 3 weeks later (Mohr 1901; Weakley & Southeastern Flora Team 2022a). This is the hallmark of two species—acting as independent evolutionary entities. That the two species can be difficult to sort from herbarium specimens (though easier from field observations and images recorded on iNaturalist) should not be a basis for non-recognition or recognition at only varietal rank—species do not evolve for the convenience of human observers.

Two similar epithets have been formally applied to Dwarf Bayberry, one at the rank of variety and one at the rank of species: *Myrica cerifera* L. var. *pumila* Michx. 1803 and *Myrica pusilla* Raf. 1838. Small accepted species rank for the taxon, and made new combinations for it at species rank in three genera: *Myrica pumila* (Michx.) Small 1896, *Morella pumila* (Michx.) Small 1903, and *Cerothamnus pumilus* (Michx.) Small 1913. He erred, at least under the modern ICNafp, however, in making new combinations using Michaux's epithet '*pumila*' at species rank, as Rafinesque's epithet '*pusilla*' has priority at that rank. If one accepts that the Dwarf Wax-myrtle should be placed in the genus *Morella* and at species rank (which we do), a new combination is needed.

Morella pusilla (Raf.) Weakley & D.B. Poind., **comb. nov.** BASIONYM: *Myrica pusilla* Raf., Alsogr. Amer. 10. 1838. We have been unsuccessful in locating any type or other original material of Rafinesque's or Bartram's. Importantly, Rafinesque (1838) seemingly distinguished between two taxa: 18. *Myrica sessilifolia* Raf. … "probably the *M. cerifera pumila* of Mx. not Bartr." and 20. *Myrica pusilla* Raf. "cerif. pumila Bartr." Therefore, while we believe that *Myrica pusilla* Raf. and *Myrica cerifera* var. *pumila* Michx. are conspecific (and we disagree with Rafinesque's tentative identification of his *M. sessilifolia*, "on the Sea Shores of New Jersey to Florida, shrub 4 to 8 feet high," which seems to us like salt-spray-dwarfed *Morella cerifera*, with Michaux's *Myrica cerifera* var. *pumila*), it seems best and most conservative to treat *Myrica pusilla* Raf. and *Myrica cerifera* var. *pumila* Michx. as heterotypic. In the apparent absence of any original material for the Rafinesquian name, we therefore here designate a neotype for it using a specimen that matches Bartram's and Rafinesque's descriptions and is geographically very close to where Bartram found in the plants in present-day Alachua County. TYPE: U.S.A. FLORIDA: Alachua Co.: Longleaf Flatwoods Reserve, SE of Rochelle on W side of Hwy 325, sandy pine savanna, low shrub, mostly ~0.75 m tall, 12 Mar 2022, *M. Brock 4294 w/T. Murphy* (**NEOTYPE, designated here:** APSC0136923). Fig. 21.

Note.—Michaux's name does have original material, but no designated type.

Morella cerifera L. var. **pumila** Michx., Fl. Bor.-Amer. (Michaux) 2:228. 1803. Type: no date, *A. Michaux, s.n.*, Ameriq. Sept. (**LECTOTYPE, designated here:** P! MNHN-P-P00760825, image!). Fig. 22.

Fig. 21. ***Morella pusilla*, modern specimen from Alachua County, Florida, from near where seen by William Bartram, designated as neotype of *Myrica pusilla* Raf.**

A KEY TO *MORELLA* SPECIES OF EASTERN NORTH AMERICA

1. Fresh leaves odorless when crushed; staminate flowers with 6–10 stamens (or as few as 3 in distal flowers); leaves usually entire; sessile glands of the leaves and branchlets colorless or white; fruits 4–8 mm in diameter; [of s. GA south and west] ____ **Morella inodora**

1. Fresh leaves aromatic when crushed; staminate flowers with 3–5(–7) stamens; leaves usually serrate, at least near the tip; sessile glands of the leaves and branchlets yellow, orange, or reddish; fruits 2–7 mm in diameter; [collectively widespread in our area].

Fig. 22. Type specimen of *Myrica cerifera* L. var. *pumila* Michx., designated as lectotype.

2. Leaves oblanceolate (generally narrowly so), most of them 0.5–1.5 cm wide, 4–6× as long as wide, evergreen; mature fruits 2.0–3.5 mm in diameter.
    3. Medium shrub to small tree (usually 2–15 m tall), not stoloniferous; leaves of fertile branches 4–9 cm long, 8–20 mm wide, cuneate, not showing differentiation in size towards branch tips; leaf surfaces densely glandular, the glands not giving the upper leaf surface an obvious yellowish or reddish cast; [of a wide range of wetland habitats, including wet Coastal Plain pinelands; also planted and naturalized in upland sites] **Morella cerifera**
    3. Small shrub (usually <1 m tall), strongly stoloniferous; leaves of fertile branches 1.5–5 cm long, 3–13 mm wide, very narrowly cuneate or attenuate, the leaves near the branch tips reduced in size compared to those lower on the branch; leaf surfaces very densely glandular, the glands giving the upper leaf surface a reddish (ferruginous) or yellow cast; [restricted to Coastal Plain pinelands (or areas formerly so)] **Morella pusilla**

2. Leaves elliptic to broadly oblanceolate, most of them 1.5–4(–5.2) cm wide, 2–4× as long as wide, evergreen to deciduous; mature fruits 3.0–7.0 mm in diameter.
    4. Leaves subcoriaceous and more or less evergreen, not revolute (or slightly so if sun-grown), the larger ones usually about 9 cm long and 3.5 cm wide (to 14.2 cm long and 5.5 cm wide), with punctate glands dense on the lower surface and nearly or entirely absent on the upper surface; fruits 3–4.5 mm in diameter, the fruit wall glabrous or sparsely glandular, the warty protuberances glandular; twigs densely hairy to rarely glabrous; older branches blackish; [of various boggy habitats, widespread in our area] **Morella caroliniensis**
    4. Leaves coriaceous, tardily deciduous, often revolute, the larger ones about 6 cm long and 2 cm wide, with punctate glands fairly dense on both surfaces; fruits 4–6(–7) mm in diameter, the fruit wall and warty protuberances densely hirsute when young; twigs glabrous to sparsely hairy; older branches whitish gray; [usually of dunes, from Dare County, NC northward] **Morella pensylvanica**

PHYLLANTHACEAE

MOERORIS and NELLICA: Recognition of segregate genera in *Phyllanthus* s.l. for the *Flora of the Southeastern United States*, with three new combinations needed

Primary authors: Geoffrey A. Levin and Alan S. Weakley

It has been recognized for almost two decades that *Phyllanthus* L., as generally circumscribed, is paraphyletic because *Breynia* J.R. Forst. & G. Forst. (including *Sauropus* Blume), *Glochidion* J.R. Forst. & G. Forst., and *Synostemon* F. Muell. were derived from within it (Wurdack et al. 2004; Kathriarachchi et al. 2005; Hoffmann et al. 2006; Kathriarachchi et al. 2006; Falcón et al. 2020). However, it was not until recently that a phylogeny with sufficient taxon sampling and support to allow resolution not only of relationships among the genera, but also within the very large genera *Glochidion* and *Phyllanthus*, became available (Bouman et al. 2021). Although one could argue for recognizing *Phyllanthus* as comprising all four genera (Hoffmann et al. 2006; Kathriarachchi et al. 2006), doing so would result in a huge (1200 species) and morphologically heterogeneous genus (van Welzen et al. 2014); it would also require significant redefinition of infrageneric taxa within *Phyllanthus* because very few previously recognized subgenera and sections are monophyletic (Kathriarachchi et al. 2006; Pruesapan et al. 2008, 2012; Bouman et al. 2018; Falcón et al. 2020). An alternative approach is to recognize multiple monophyletic and morphologically diagnosable genera. This has been done by Bouman et al. (2022), who recognized 13 genera in this clade, including 10 from within former *Phyllanthus*. That approach is accepted here, resulting in three genera being represented by native (and sometimes naturalized) species in the southeastern United States (*Moeroris* Raf., *Nellica* Raf., and *Phyllanthus* s.s.) and four others only by naturalized species (*Breynia*, *Cicca* L., *Emblica* L., and *Glochidion*). It is noted here that for his new genus *Nellica*, Rafinesque merely mentioned “(n. ind)” and the locality of its type species as “maderaspatana” (aka Chennai, Tamil Nadu, India). Nellica is a Tamil name for gooseberry fruit. Regarding *Moeroris*, Rafinesque did not provide an etymology. In Latin, *moeror* (in nominative) means “lamentation,” and *moeroris* is its genitive form.

Although Bouman et al. (2022) made many new combinations needed for their new classification, they did not make any combinations below the species rank. In order to allow taxonomy to reflect morphological variation within *Phyllanthus* s.l. species found in the southeastern United States, some new infraspecific combinations are needed. Preparing these new combinations also prompted us to review previous treatments of *Phyllanthus abnormis,* resulting in a proposed new infraspecific taxon within it.

When recognizing infraspecific taxa, one must decide on rank, i.e., subspecies vs. variety. A common approach is to follow tradition within the specific taxonomic group. However, in *Phyllanthus*, both ranks have been used. Unfortunately, other than the rule that variety is a lower rank than subspecies (Turland et al. 2018), there are no accepted definitions of these ranks. Here, we adopt the philosophy that taxa that are show minor or inconsistent morphological differences but are geographically disjunct are recognized as subspecies, whereas those that intergrade morphologically and geographically are treated as varieties. Our choice of rank is also influenced by the degree of morphological difference, with subspecies being more different from each other than are varieties. Clearly, applying these general, community guidelines is often subjective and different rank choices are defensible.

Moeroris abnormis (Baill.) R.W. Bouman, Phytotaxa 540(1):30. 2022. Basionym: *Phyllanthus abnormis* Baill., Recueil Observ. Bot. 1:42. 1860. *Diasperus abnormis* (Baill.) Kuntze, Revis. Gen. Pl. 2:598. 1891. Type: U.S.A. Texas: 1835, *Drummond 336* (holotype: G G00434968!; isotypes: GH GH00048515, internet image!, K K001056954, internet image!, P P04854497!, P04854498!).

Phyllanthus drummondii Small, Fl. S.E. U.S. 692. 1333. 1903. Type: U.S.A. Texas: *Drummond III, 336* (holotype: NY NY273011, internet image!, NY273012, internet image!, one specimen over two sheets).

In the protologue for *Phyllanthus abnormis*, Baillon explicitly cited the specimen as being in “herb. Less.,” meaning the Delessert herbarium, which is now at G. The sheet P04854498 bears a packet containing a few fragments and labeled “ex herb. Lessertian.,” confirming the source. Therefore, the holotype is the specimen at G, and the other specimens cited above are isotypes.

Small, in the protologue for *Phyllanthus drummondii*, cited the specimen of *Drummond 336* then at Columbia University, now at NY. At NY there are two sheets, explicitly labeled sheets 1 and 2. One is undated, but the other is labeled “v. Charp. 1839.” Because Drummond died in 1835, “1839” cannot be the collection date; presumably is the date it was received from elsewhere. If that is correct, the other specimens of *Drummond 336* cited above are isotypes of *P. drummondii* and the specimen at NY is an isotype of *P. abnormis*.

Two varieties have previously been accepted within this species. The nominate variety has been treated as disjunct between peninsular Florida (now also known from Camden County, Georgia) and Texas, southwestern Oklahoma, southeastern New Mexico, and northern Tamaulipas, Mexico. The other variety, *Phyllanthus abnormis* Baill. var. *riograndensis* G.L. Webster, is restricted to the Rio Grande Valley in southern Texas (Webster 1967, 1970; Levin 2016); although its geographic range of this falls within that of var. *abnormis*, they occupy different habitats and do not appear to co-occur (Levin, pers. obs.). They consistently differ in shape of the glands in the staminate flowers and the maximum number of staminate flowers in the bisexual cymules. Where they approach each other geographically, they also differ in that var. *abnormis* has smooth stems and var. *riograndensis* has scabridulous stems; elsewhere in the northwestern part of its range (not Florida, Georgia, or Tamaulipas), var. *abnormis* often has scabridulous stems (Levin 2016). Webster (1970) stated that var. *abnormis* and var. *riograndensis* differ in seed length, but examination of more specimens shows this is not the case (Levin, pers. obs.).

Although both Webster (1967, 1970) and (Levin 2016) noted that the Florida populations of var. *abnormis* (sometimes treated as *Phyllanthus garberi* Small) have three stamens in one of the two staminate flowers in the proximal cymules, whereas both flowers have only two stamens in the western part of its range, and that the Florida plants have consistently smooth stems, unlike the often scabridulous stems found farther west, they chose not to recognize the Florida populations as a distinct taxon. Upon further reflection, we consider that these differences warrant taxonomic recognition. We also note that whereas the western plants are found on sandy prairies, barrens, and usually interior, often stabilized, dunes, the Florida and Georgia plants are found only on unstable, coastal dunes (Webster 1970).

The differences in morphology and habitat combined with their disjunct distribution prompt us to recognize the Florida and Georgia plants at the subspecific rank. Although the lack of geographic disjunction between western var. *abnormis* and var. *riograndensis* might argue for retaining varietal status, the morphological differences between them are greater than those between the western and eastern forms previously included in var. *abnormis*; treating them at a lower rank than the Florida/Georgia taxon would not reflect morphological patterns. To reflect this fact and their parapatric distribution, we elevate var. *riograndensis* to subspecific rank.

Moeroris abnormis (Baill.) R.W. Bouman subsp. **garberi** (Small) G.A. Levin & Weakley, **comb. et stat. nov.** Basionym: *Phyllanthus garberi* Small, Fl. S.E. U.S. 692. 1333. 1903. Type: U.S.A. Florida. [Levy Co.]: Cedar Keys, Apr 1876, *A.P. Garber s.n.* (holotype: NY00273013, internet image!; isotypes: NDG NDG29189, internet image!, US00109250, internet image!, US01014165, internet image!).

Moeroris abnormis (Baill.) R.W. Bouman subsp. **riograndensis** (G.L. Webster) G.A. Levin & Weakley, **comb. et stat. nov.** Basionym: *Phyllanthus abnormis* Baill. var. *riograndensis* G.L.Webster, Ann. Missouri Bot. Gard. 54:198. 1967. Type: U.S.A. Texas. Starr Co.: off U.S. 83, 3 mi W of Sullivan City, 2 Apr 1941, *C.L. Lundell & A.A. Lundell 9891* (holotype: MICH1675083, photograph!, isotype: BRIT23917, internet image!).

KEY TO SUBSPECIES OF *MOERORIS ABNORMIS*

1. Pistillate nectary glands subequal, reniform, broader than long; leaf blades densely scabridulous on both surfaces; bisexual cymules with 1–3 staminate flowers (always some with 2+ staminate flowers on each plant) ________ **Moeroris abnormis** subsp. **riograndensis**

1. Pistillate nectary glands strongly unequal, spatulate, as long as or longer than broad; leaf blades glabrous on both surfaces or sparsely to moderately scabridulous abaxially; bisexual cymules with 1 staminate flower.
    2. Lower cymules with 2 staminate flowers, each with 2 stamens; stems scabridulous or smooth; [OK to TX, and westwards and southwards] ________ **Moeroris abnormis** subsp. **abnormis**
    2. Lower cymules with 2 staminate flowers, one with 3 stamens and one with 2 stamens; stems smooth; [se. GA south to s. FL] ________ **Moeroris abnormis** subsp. **garberi**

Nellica liebmanniana (Müll.Arg.) R.W. Bouman, Phytotaxa 540(1):13. 2022. Basionym: *Phyllanthus leibmannianus* Müll.Arg. in D.C., Prodr. 15(2.2):366. 1866. Type: MEXICO. [Veracruz]: "La Isleta op. Vera Cruz," Apr 1841, *F.M. Liebmann 5689* (**lectotype, designated here:** C C10023814, photograph!). Remaining syntypes: MEXICO. [Veracruz]: Potrero de Consoquitla, Aug 1841, *F.M. Liebmann 5690* (C C10023816, photograph!); Mirador, Aug 1841, *F.M. Liebmann 5691* (C C10023812, photograph!, C10023813, photograph!); Potrero de Consoquitla, Aug 1841, *F.M. Liebmann 5703* (C C10023815, photograph!).

In his original description of *Phyllanthus liebmannianus*, Müller cited no specific specimens but wrote that the material he saw was collected by Liebmann and in the Copenhagen herbarium; he also listed the three localities associated with the type material cited above. There are four gatherings comprising five specimens at C that meet these criteria. Four of these consist of loose branches, whereas the fifth is a whole plant; which we designate as the lectotype. There is also a specimen at G-DC (G00325383, internet image!) collected by Leibmann at Consoquitla in August 1841, but it has no number, and therefore it is not clear to which of the remaining syntypes it corresponds.

Nellica liebmanniana (Müll.Arg.) R.W. Bouman subsp. **platylepis** (Small) G.A. Levin & Weakley, **comb. nov.** Basionym: *Phyllanthus platylepis* Small, Fl. S.E. U.S. ed. 2, 1347, 1375. 1913. *Phyllanthus liebmannianus* subsp. *platylepis* (Small) G.L. Webster, Brittonia 22:57. 1970. Type: U.S.A. Florida. [Levy Co.]: Rosewood, Jun 1876, *A.P. Garber s.n.* (holotype: NY NY00273014, internet image!; isotypes: F F0056961, internet image!, US US00109722, internet image!).

Subspecies *platylepis* is endemic to the Florida Gulf Coast in Dixie, Lafayette, Levy, and Taylor counties, while subsp. *liebmanniana* is found in eastern Mexico (Tamaulipas south to Chiapas and east to Quintana Roo), Belize, and Guatemala. They are very similar, differing primarily in growth form, with subsp. *liebmannianus* usually having solitary main stems and subsp. *platylepis* having clustered stems (Webster 1970).

SELAGINELLACEAE

LYCOPODIOIDES: New combinations in *Lycopodioides* needed for the *Flora of the Southeastern United States* Project

Primary author: Alan S. Weakley

In making new combinations in Selaginellaceae (Weakley 2022), I made an error in not recognizing that *Lycopodioides* Boehm. 1760 has priority over *Stachygynandrum* P. Beauv. ex Mirb. 1803, if the clade treated as subgenus *Stachygynandrum* by Weststrand & Korall (2016a, 2016b) is accorded genus rank. While *Lycopodioides* Boehm. is a nom. rejic. against *Selaginella* P. Beauv. 1805 (nom. cons.), it is available if circumscribed as a genus separate from *Selaginella*, as we here do. *Lycopodioides* is typified by *Lycopodium denticulata* Linnaeus, definitely a member of the "*Stachygynandrum* clade" (of Weststrand & Korall 2016a) and *Selaginella* subgenus

Stachygynandrum (of Weststrand & Korall 2016b), and is the oldest genus name available for that clade/ subgenus.

Lycopodioides eatonii (Hieron. ex Small) Weakley, **comb. nov.** Basionym: *Selaginella eatonii* Hieron. ex Small, Ferns Trop. Florida 67. 1918. *Diplostachyum eatonii* (Hieron. ex Small) Small, Ferns S.E. States 422. 1938. Type: U.S.A. Florida: Miami-Dade Co.: about lime sinks, border of Everglades, Black Point Creek, *A.A. Eaton 265* (**lectotype, here designated:** NY).

Selaginella eatonii Hieron. ex Small was named in 1918 (Small 1918) and has been generally recognized since at species rank, though it has sometimes been merged with *S. armata* or treated at variety rank under that species, as *Selaginella armata* Baker var. *eatonii* (Hieron. ex Small) B.F. Hansen & Wunderlin (Hansen & Wunderlin 1998). In doing so, they stated that "*Selaginella eatonii* … was separated from *S. armata* by Buck on several anatomical (e.g., stomatal arrangement) characters and morphological characters, the most consistent and readily observed being differences in the leaf margin. *Selaginella armata* has evident hyaline leaf margins that are ciliate, especially at the base, while the leaves of *S. eatonii* have much less evident hyaline margins that are serrate. These characters hold up well, even in the material from western Cuba, where *S. eatonii* is sympatric with *S. armata* in the Pinar del Río and La Habana provinces. However, we feel that the characters are so minor and the two taxa so obviously closely related, that the best disposition for practicality and consistency is at varietal level." I agree with Buck (1978) that this entity should be recognized at species rank; he studied the matter most carefully, and recognized that consistent differences, not the small size of characters in small plants, is most taxonomically informative in recognizing evolutionary species.

Lycopodioides eclipes (W.R. Buck) Weakley, **comb. nov.** Basionym: *Selaginella eclipes* W.R. Buck, Canad. J. Bot. 55:366–367. 1977. Type: U.S.A. Missouri. Douglas Co.: 27 Sep 1974, *Warren L. Wagner 74159* (holotype: MICH 1190987).

Buck (1977) named *Selaginella eclipes* W.R. Buck as a moderately narrow endemic (of eastern North America) in the *Selaginella apoda* complex. It has general community recognition as an accepted species, with some gradual distribution records accumulating (unsurprising for a recently named and semi-cryptic species) that extend its range somewhat (see Weakley & Southeastern Flora Team 2022a).

MISCELLANEOUS FAMILIES

Contributions to the weedy and non-native flora of New Jersey

Primary author: Ryan J. Schmidt

For the past several centuries, New Jersey has been a center for industry and trade within the Mid-Atlantic region of the eastern United States (Meredith & Hood 1921; Lurie & Viet 2012) contributing to a high diversity of weedy and non-native plants (Schmidt et al. *submitted*). During the late 19th and early 20th centuries in particular, New Jersey botanists collected thousands of specimens of these weedy and non-native plants providing a solid foundation for understanding the non-native flora of New Jersey (Smith 1867; Martindale 1876, 1877; Burk 1877; Brown, 1878a, 1878b, 1879, 1880; Britton 1881; Schmidt et al. *submitted*). Over the past century, however, the extent of these collection efforts has declined resulting in a more-limited understanding of the current state of New Jersey's weedy and non-native flora.

Recent herbarium specimen collection efforts have provided new information on several weedy plant species for the Flora of New Jersey (Weakley & Southeastern Flora Team 2022b). Based on these collections, we recommend the addition of 14 species and hybrids to the state's flora and range extensions within New Jersey for four additional species. Additions to the flora include plants that likely escaped from horticultural plantings as well as those which have likely gone unnoticed in the region including one species native to the eastern United States. We also assert that two species that are currently listed as historical waifs are actually established species based on digitized herbarium records. We also briefly discuss several rare or waif species which we recently collected in the state. Unless otherwise noted, all localities mentioned are in New Jersey.

Additions to the Flora of New Jersey

Picea orientalis (L.) Peterm. (Pinaceae) was found as several young trees growing beneath an allée of planted *Picea orientalis* along an old road in the former nursery in the Fair Haven Fields Natural Area (U.S.A. New

Jersey. Monmouth Co.: Fair Haven, Fair Haven Fields Natural Area, 4 Jun 2022, *Schmidt 1305*, CHRB). Since the species has presently only been found naturalized in one location and these individuals were not found far beyond the original plantings, we assert that this species is present as a waif in the state.

Quercus acutissima Carruth. (Fagaceae) was found growing in a disturbed habitat near Audrey Zapp Drive in Liberty State Park northern New Jersey (U.S.A. New Jersey. Hudson Co.: Jersey City, Liberty State Park-Northern Interior [Communipaw], 5 Jul 2021, *Schmidt et al. 672*, CHRB). Given the frequent planting of this species as a street tree and its establishments in other parts of the region (Lemke et al. 2013, Weakley & Southeastern Flora Team 2022a), it is likely that this species is also present elsewhere in the state so we recommend that this species be listed as established but rare in New Jersey.

Lepidium oblongum Small (Brassicaceae) is a small species of *Lepidium* native to the southwestern-southcentral United States, Mexico, and Central America. This species was found growing on the side of the highway in two locations in the state: along Route-295 in Hamilton (U.S.A. New Jersey. Mercer Co.: Hamilton Township, Delaware & Raritan Canal State Park-Duck Island, 1 Jun 2022, *Schmidt 1248*, CHRB) and along Route-23 in Stockholm, New Jersey (U.S.A. New Jersey. Sussex Co.: Hardyston, Route-23 in Stockholm, 31 May 2022, *Schmidt 1210*, CHRB). *Lepidium oblongum* resembles *Lepidium rudrale* L , *Lepidium virginicum* L., and *Lepidium densiflorum* Schrad. and has likely been misidentified as such and overlooked (Sundell et al. 1999). *Lepidium oblongum* can be distinguished from these other species by its pubescent rachises and its much-branched habit caused by multiple branches originating from the base of the plant. Populations of *L. oblongum* have been reported in South Carolina (Al-Shehbaz 1986), Arkansas (Sundell et al. 1999) and Kentucky (Brock et al. 2020), often growing in disturbed areas along roadsides. Based on currently available collections, we assert that this species is a waif in New Jersey, however, further field work may reveal that these populations are established.

Persicaria minor (Huds.) Opiz (Polygonaceae) was collected in wetlands on Petty's Island in the Delaware River near Philadelphia (Pennsylvania) in Pennsauken, New Jersey (U.S.A. New Jersey. Camden Co.: Pennsauken, Petty's Island, 3 Aug 2021, *Schmidt & Aronson 919*, CHRB). While individuals of this species were collected two consecutive years at the same locality, these habitats have recently been highly disturbed and it is doubtful that the species persists in this locality so we recommend this species be included as a waif.

Montia linearis (Douglas) Greene (Montiaceae) is a small annual herb native to western North America that has appeared as a waif in several states on the East Coast (FSUS). A single individual of the species was found growing in a small clearing in a forested section of the interior of Liberty State Park in Jersey City (Hudson Co.) near New York City. Since only a single individual was found, it was not collected. It is unclear how this individual was introduced to this locality, however, it is possible that it was introduced from the railroads that formerly dominated the site. Due to this lone occurrence, we consider this species a waif in New Jersey.

Eucommia ulmoides Oliv. (Eucommiaceae) is a tree species native to China which is occasionally planted as a ornamental tree (Vincent 2002). A stand of *E. ulmoides* was identified by the author with Pam Zipse and Jason Grabosky growing among other non-native trees planted behind the University Inn and Conference Center at Rutgers University–New Brunswick, (U.S.A. New Jersey. Middlesex Co.: New Brunswick, Rutgers Cook/Douglass Campus, 8 Nov 2022, *Schmidt & Heithmar 1946*, CHRB). While this population undoubtedly originates from a historical planting, the *Eucommia* is recruiting and now forms a substantial portion of the understory and midstory of the area. While this population will likely persist barring any major changes to the site, we are unaware of other populations of this species so we include this species as a waif in New Jersey.

Pulmonaria officinalis L. (Boraginaceae) is an ornamental waif which has been found growing outside of cultivation along the Paulinskill Valley Rail Trail in Hardwick and near Lake Hopatcong (U.S.A. New Jersey. Morris Co.: Jefferson Township, 8 Stonehenge Rd near Great Cove, Lake Hopatcong, 27 Mar 2021, *Schmidt 176*, CHRB).

Verbascum densiflorum Bertol. (Scrophulariaceae) was found growing in the interior of Liberty State Park (U.S.A. New Jersey. Hudson Co.: Jersey City, Liberty State Park-Interior [Communipaw], 9 Aug 2021, *Schmidt et al. 976*, CHRB) and on Petty's Island in Pennsauken (U.S.A. New Jersey. Camden Co.: Pennsauken, Petty's Island, 29 Jun 2021, *Schmidt 659*, CHRB). Although no specimens of this species were previously collected at these localities, this species was likely introduced via the historical deposition of solid ballast in the two localities (Schmidt et al. *submitted*) with no other populations of the species having been identified in New Jersey. Since this species exhibits a similar distributional pattern to other species which were introduced via solid ballast deposition during the 19th century (Schmidt et al. *submitted*), we assert that this species is actually established in New Jersey despite its limited collection and geographic range.

Verbascum maurum Maire & Murb. (Scrophulariaceae) was also found growing on Petty's Island, representing the first known collection of this plant in North America (U.S.A. New Jersey. Camden Co.: Pennsauken, Petty's Island, 29 Jun 2021, *Schmidt 651*, CHRB). Similar to *V. densiflorum* this species was likely introduced via historical ballast deposition on Petty's Island. While this species was also never before collected on Petty's Island, there are reports of *V. virgatum* (which previously included *V. maurum*) having been observed by Addison Brown at another ballast site in Jersey City (Brown 1878a); the location of Brown's specimen is currently unknown and an additional contemporary population was identified at a former ballast site in Baltimore, Maryland (U.S.A. Maryland. Baltimore Co.: Baltimore, Masonville Cove, 14 Jul 2022, *Schmidt* et al. *1723*, CHRB). Given the association of both *V. maurum* and Petty's Island with ballast deposition, we assert that this species is also established and rare in New Jersey.

Verbascum × kerneri Fritsch [*V. phlomoides* × *V. thapsus*] (Scrophulariaceae) was collected near railroad lines in Glassboro (U.S.A. New Jersey. Gloucester Co.: Glassboro Township, Glassboro Historic Train Station, 27 Jul 2021, *Schmidt 835*, CHRB) and West Deptford (U.S.A. New Jersey. Gloucester Co.: West Deptford, Wheelabrator Wildlife Refuge and Butterfly Garden, 13 Jul 2022, *Schmidt & Knapik 1709*, CHRB) in Gloucester County as well as along an abandoned railroad line in Andover (U.S.A. New Jersey. Sussex Co.: Andover Township, Kittatinny Valley State Park—bed of Lehigh and Hudson River Railway, 4 Aug 2022, *Schmidt 1853*, CHRB). While this sterile hybrid is reportedly common where the two parents are present in Europe (Tutin et al. 1972), it has not before been reported in New Jersey. Since this is a sterile hybrid, it does not have established populations, however, it is occasionally present as a waif where the two parents are present.

Nepeta × faassenii Bergmans ex Stearn (Lamiaceae) is an ornamental species that was found growing along the side of the road in the interior of Liberty State Park (U.S.A. New Jersey. Hudson Co.: Jersey City, Liberty State Park-Interior [Communipaw], 21 Jun 2021, *Schmidt & Semmling 545*, CHRB).

Verbena × moechina [*V. stricta* × *simplex*] Moldenke (Verbenaceae) was found growing in dry soil near a seldom-used road in the interior of Liberty State Park (U.S.A. New Jersey. Hudson Co.: Jersey City, Liberty State Park-Interior [Communipaw], 5 Jul 2021, *Schmidt* et al. *699*, CHRB). Both parents are not very common in New Jersey (Anderson 1989), however, where the two species occur in the West, hybrids are known to occur (McGregor et al. 1986). We consider this species a waif in New Jersey.

Erigeron divaricatus Michx. (Asteraceae) is a small species of *Erigeron* native to the midwestern United States. This species was originally located by Kerry Barringer in pavement cracks in the walkway at Liberty State Park (U.S.A. New Jersey. Hudson Co.: Jersey City, Liberty State Park-Public Lawn Area, 29 Jul 2022, *Schmidt 1805*, CHRB) with a second population located shortly thereafter in the courtyard of the Floricultural Greenhouse at Rutgers University–New Brunswick (U.S.A. New Jersey. Middlesex Co.: New Brunswick, Rutgers Cook/Douglass Campus, 14 Sep 2022, *Schmidt 1930*, CHRB). The origin of these two populations is currently unclear but it is unclear if they are established so we recommend they are included as waifs.

Silphium asteriscus var. **trifoliatum** (L.) Clevinger (Asteraceae) is a species of rosinweed native to the eastern United States that was found growing among *Artemisia vulgaris* L. in the Sullivan Natural Area of Liberty State Park (U.S.A. New Jersey. Hudson Co.: Jersey City, Liberty State Park-Sullivan Natural Area [Communipaw], 9

Aug 2021, *Schmidt* et al. *993*, CHRB). It is unclear whether this is an established population of the species so we recommend including it as a waif pending future investigation.

Range Extensions

Dichanthelium villosissimum (Nash) Freckmann (Poaceae) is native to the eastern United States and was recorded in the interior of Liberty State Park (U.S.A. New Jersey. Hudson Co.: Jersey City, Liberty State Park-Interior [Communipaw], 9 Aug 2021, *Schmidt* et al. *980*, CHRB), extending its range northward in New Jersey.

Vicia grandiflora Scop. (Fabaceae) is a European species that was collected in the interior of Liberty State Park (U.S.A. New Jersey. Hudson Co.: Jersey City, Liberty State Park-Interior [Communipaw], 25 May 2022, *Schmidt & Knapik 1178*, CHRB), extending its range into northern New Jersey.

Chaenomeles speciosa (Sweet) Nakai (Rosaceae) was found growing as a waif in a Vacant Lot along Mays Landing-Somers Point Road in Hamilton Township (U.S.A. New Jersey. Atlantic Co.: Hamilton Township, Vacant Lot along Mays Landing-Somers Point Road, 24 Jul 2021, *Schmidt* et al. *749*, CHRB), extending its range to southern New Jersey.

Malus halliana Koehne [= *Malus* × *floribunda* Siebold ex Van Houtte] (Rosaceae) was found growing in the interior of Liberty State Park (U.S.A. New Jersey. Hudson Co.: Jersey City, Liberty State Park-Interior [Communipaw], 9 Aug 2021, *Schmidt* et al. *974*, CHRB) adding northern New Jersey to its introduced range.

Eupatorium torreyanum Short & R. Peter (Asteraceae) is native to the eastern United States and was identified by Bonnie Semmling in a dry meadow in the interior of Liberty State Park (U.S.A. New Jersey. Hudson Co.: Jersey City, Liberty State Park-Northern Interior [Communipaw], 5 Jul 2021, *Schmidt* et al. *666*, CHRB), extending its range into northern New Jersey.

Transfer from Waif to Established Species

Diplotaxis tenuifolia (L.) DC. (Brassicaceae) was noted by Addison Brown as "common in all our ballast grounds" in 1879, including the area that would become Liberty State Park (Brown 1879; U.S.A. New Jersey. Hudson Co.: Hoboken, Hoboken, 3 Jul 1880, *Brown s.n.*, NY). We subsequently re-collected this species in the same locality, Liberty State Park, almost 150 years later (U.S.A. New Jersey. Hudson Co.: Jersey City, Liberty State Park-Sullivan Natural Area [Communipaw], 25 May 2021, *Schmidt* et al. *335*, CHRB). We assert that this subsequent collection is not the result of a secondary introduction but rather indicates that there is an established population at Liberty State Park. No established populations have been identified in southern New Jersey.

Calibrachoa parviflora (Juss.) D'Arcy (Solanaceae) was historically collected at several ballast sites in the vicinity of Camden including on Petty's Island by Elias Diffenbaugh in 1866 (U.S.A. New Jersey. Camden Co.: Pennsauken, Petty's Island, 22 Jul 1866, *Diffenbaugh s.n.*, PAC). During a field trip of the Philadelphia Botanical Study, we identified a small population of the *Calibrachoa* still present on the island more than 150 years later (U.S.A. New Jersey. Camden Co.: Pennsauken, Petty's Island, 24 Sep 2022, *Schmidt & Novak 1904*, CHRB). We therefore assert that this species is established on Petty's Island.

Some Rare and Waif Species

Dysphania pumilio (R.Br.) Mosyakin & Clemants (Amaranthaceae) was found growing in many places throughout the northern half of the state including locations in Bergen, Hudson, Middlesex, Union, and Middlesex counties (U.S.A. New Jersey. Bergen Co.: Alpine, Palisades Interstate Park, Alpine Marina, 27 Jul 2022, *Schmidt 1781*, CHRB; U.S.A. New Jersey. Hudson Co.: Jersey City, Liberty State Park-Interior [Communipaw], 5 Jul 2021, *Schmidt* et al. *693*, CHRB; U.S.A. New Jersey. Morris Co.: Rockaway Township, parking lot along in Rockaway Townsquare, 13 Aug 2021, *Schmidt 1009*, CHRB; U.S.A. New Jersey. Union Co.: Summit, Maple St. and Springfield Ave , 7 Jul 2021, *Schmidt 713*, CHRB; U.S.A. New Jersey. Middlesex Co.: New Brunswick, Rutgers University Cook/Douglass Campus, 6 Sep 2021, *Schmidt 1034*, CHRB). It is likely overlooked due to its propensity for growing in sidewalk cracks and along building foundations, however, we assert that this species is at least uncommon in northern New Jersey.

Psammophiliella muralis (L.) Ikonn. (Caryophyllaceae) was found growing in the courtyard of the Floricultural Greenhouse at Rutger University in New Brunswick near *Erigeron divaricatus* (U.S.A. New Jersey. Middlesex Co.: New Brunswick, Rutgers Cook/Douglass Campus, 14 Sep 2022, *Schmidt 1929*, CHRB). While this species was also introduced to northern New Jersey via solid ballast deposition during the 19th century (Schmidt et al. *submitted*), it is unlikely that this historic population is connected with this new waif population.

Dittrichia graveolens (L.) Greuter (Asteraceae) was found growing in several places on the Rutgers University Cook/Douglass Campus in New Brunswick (U.S.A. New Jersey. Middlesex Co.: New Brunswick, Rutgers Cook/Douglass Campus, 26 Sep 2023, *Schmidt 1931*, CHRB). The origin of this population is currently unclear and further investigation is needed to determine whether this population is established or simply a waif population.

Anthriscus caucalis M.Bieb. (Apiaceae) was found growing in a vacant lot near Pavonia Yard, an active railroad junction in Camden (U.S.A. New Jersey. Camden Co.: Camden, vacant lot near Pavonia Yard, 14 Jun 2021, *Schmidt* et al. *490*, CHRB). While this appears to be a waif population, it is possible that this plant could continue to spread along the railroad line so further monitoring of this population is needed to determine its potential establishment.

MISCELLANEOUS FAMILIES

Noteworthy collections from Mississippi and Alabama

Primary author: John C. Kees

Ten notable records are discussed as part of continuing efforts to document the flora of the inner East Gulf Coastal Plain of south Mississippi and Alabama. Seven taxa are reported new to the flora of Mississippi, most located during surveys of prairie openings, barrens, glades, woodlands, and rich forests associated with calcareous substrates of the Jackson Prairie and related Oligocene limestones; three significantly rare taxa are reported for new counties, ecoregions, or physiographic provinces. Voucher specimens are deposited in the Mississippi Museum of Natural Science (MMNS), Austin Peay State University (APSC), and University of North Carolina, Chapel Hill (NCU) herbaria. Detailed locality information is excluded, as all of the native taxa are significantly rare in the state and on unprotected land (many unlikely to persist without changes in management). The habitat, rarity, and distribution within the state of each taxon are discussed.

Baptisia aberrans (Larisey) Weakley (Fabaceae). ALABAMA: Choctaw Co.: *J.C. Kees 1286* (NCU). This is the first report of *B. aberrans* for the Coastal Plain. Plants occur in Choctaw County on roadsides over calcareous clay soils which formerly supported open Jackson Prairie and woodlands, now converted to improved pasture. Surveys did not locate any plants in nearby remnant prairie openings—it is possible that this species, along with a number of other relatively mesophytic "prairie" indicators, preferred relatively mesic soils which supported open oak woodlands, savannahs, or "black prairies" (now more-or-less collapsed; see Hilgard 1860 and soil surveys), presumably maintained by fire, and not the extreme edaphic conditions of remaining prairie patches. Plants were collected within a few miles of the state line, and more extensive examples of these communities existed, at least historically, in adjacent Mississippi—thorough searches for roadside remnants may yield additional occurrences.

Clematis pitcheri Torr. & A. Gray var. **pitcheri** (Ranunculaceae). MISSISSIPPI: Newton Co.: *J.C. Kees 483* (APSC, NCU), Rankin Co.: *J.C. Kees 1200* (NCU). Previous reports of *C. pitcheri* from Mississippi likely represent recently described species in the *C. reticulata-flaccida* complex (D. Estes pers. comm.); these appear to be the first two verified reports of *C. pitcheri* from the state, and possibly the only known populations east of the Mississippi River and south of the Interior Low Plateau. At both sites *C. pitcheri* is associated with calcareous woodlands over outcrops of the Jackson formation. In Rankin County, it occurs in oak-hickory-cedar woodlands transitional between alluvial bottomland forest and an isolated group of open calcareous prairies, probably formerly more open, associated with *Carex cherokeensis, Echinacea purpurea, Carya myristiciformis, Quercus shumardii,* and *Camassia scilloides*; the Newton County population is in a state highway right-of-way bisecting calcareous brownwater terrace forest. Most of the Rankin County mosaic, except the prairie opening where *C. pitcheri* occurs, has been converted to agricultural uses; the Newton County population is subject to frequent mowing and may not survive continued herbicide application.

Coreopsis grandiflora Hogg ex Sweet var. **inclinata** J.R. Allison (Asteraceae). MISSISSIPPI: Wayne Co.: *J.C. Kees 1334* (NCU), *J.C. Kees 1412* (NCU). *Coreopsis grandiflora* Hogg ex Sweet var. *inclinata* is known only from dolomite glades in Bibb County, Alabama. The dominant *Coreopsis* in the Oligocene limestone glades and barrens of Wayne County, Mississippi, seems to most closely fit var. *inclinata* morphologically and is placed there provisionally, but may actually represent an undescribed species. Wayne County limestone barren *Coreopsis* plants bloom in early May; var. *inclinata* in the Bibb glades blooms in late summer. Like *Rhynchospora thornei,* its future is uncertain as remaining glades are unprotected and continue to be cleared for log landing grounds and wildlife food plots and degraded by Off Road Vehicle (ORV) activity and cogongrass (*Imperata cylindrica*).

Galium concinnum Torr. & A. Gray (Rubiaceae). MISSISSIPPI: Jasper Co.: *J.C. Kees 1262* (NCU). This is the first report of *G. concinnum* for Mississippi and the East Gulf Coastal Plain floristic province, approximately 300 miles distant from the nearest records east of the Mississippi River, in the Interior Low Plateau of Williamson County, Tennessee. It is one of many northern disjuncts associated with Oligocene-age limestone outcrops which occur scattered across central, MS from Rankin County eastward, separated from the Jackson Prairie by the generally acidic and sandy Forest Hill formation. The species is locally abundant on steep limestone bluffs east of Tallahalla Creek in Jasper County, including lower-quality cutover sites and roadsides, but was not observed at any other known systems of Oligocene limestone bluffs in MS during field surveys.

Matelea baldwyniana (Sweet) Woodson (Apocynaceae). MISSISSIPPI: Wayne Co.: *J.C. Kees 1344* (NCU). *Matelea baldwiniana* was erroneously attributed to Mississippi by Kartesz (2015), there are no vouchers or occurrence records (MSNHP 2021) of the species from MS and suitable habitat is not known from either county reported. This is the first verified report from the state. Populations also occur in limestone forests of the coastal plain of Alabama and Florida, disjunct from a primary distribution in the Ozarks and Ouachitas of Arkansas and adjacent Oklahoma and Missouri. In Wayne County, MS, *M. baldwyniana* occurs in dry *Quercus muehlenbergii*—dominated woodlands at the crest of several steep Oligocene limestone bluffs and bordering limestone barrens. These communities are closely related geologically and floristically to the submesic limestone forests of the Lime Hills region of Alabama where the species has been previously documented. All occurrences documented in Mississippi are on unprotected land and threatened by timber management.

Mirabilis albida (Walter) Heimerl (Nyctaginaceae). MISSISSIPPI: Lowndes Co.: *J.C. Kees 1436* (NCU). Vouchers of this species from chalk prairies in the Black Belt of Mississippi appear to represent *Mirabilis linearis*. *Mirabilis albida* has been previously reported from "sandy fields" in Noxubee County (*A.G. Marler s.n.*, MISS) and the "Chitlin Corners" area of Lowndes County (Holmes & Amor 2010), but apparently not observed in the state since 1976. A few plants were located during a brief survey of sand barrens of Chitlin Corners, restricted to a single relatively undisturbed xeric opening on Corps of Engineers property along the Tennessee-Tombigbee Waterway. Development along the waterway and growth of a dense, fire-suppressed midstory has eliminated most of the former open woodland and barrens in the area. Natural open sand barrens over alluvial deposits, apparently maintained by deep, xeric, sandy soils even in the absence of fire, occur along the Tombigbee River from Monroe County southeast into Alabama, and continue to yield new reports of rare and disjunct species. While sand barren-like vegetation has developed over some Corps of Engineers dredge deposits (some of which have replaced natural sand barrens) and sandy old fields in the area, many of the rarer species associated with this undescribed community, such as *Mirabilis albida, Astragalus distortus, Sida elliottii,* and *Callirhoe triangulata* are known only from natural and relatively undisturbed xeric openings or roadsides through nearby woodlands. Soil disturbance from past grazing and clearing for wildlife food plots has degraded most remaining sand barrens, and the construction of the Tennessee-Tombigbee waterway has eliminated natural flooding events which were likely involved in the formation of these barrens.

Poterium sanguisorba L. var. **polygamum** (Waldst. & Kit.l) Vis. (Rosaceae). MISSISSIPPI: Lamar Co.: *J.C. Kees 1367* (NCU). This is the first report of *P. sanguisorba* from Mississippi, collected on roadsides through a disturbed Longleaf Pine sandhill at Camellia Lakes Farm in Lamar County during a bioblitz. *Poterium sanguisorbum* is treated as a waif in most of the southeast by Weakley & Southeastern Flora Team (2022a), but its presence in a fairly remote area suggests it may be naturalizing in Mississippi and overlooked in other southeastern states.

Rhynchospora thornei Kral (Cyperaceae)—MISSISSIPPI: Wayne Co.: *J.C. Kees 1287* (MMNS), *J.C. Kees 1429* (NCU). *Rhynchospora thornei* is rare, disjunctly distributed, and of conservation concern throughout its range, restricted to calcareous wet pine savannahs and seepages in limestone glades. This is the first report for Mississippi, located during surveys of a previously undocumented system of barrens and glades over Oligocene limestone, perhaps more closely related to the glades of Jackson County and Gadsden County, Florida than to nearby Jackson and Black Belt "prairies." In thin-soiled glades in Wayne County saturated by seepage (apparently nearly year-round), *R. thornei* may be locally dominant or codominant, associated with *Rhynchospora colorata, Schizachyrium scoparium, Sporobolus junceus, Scleria verticillata, Carex microdonta, Agalinis oligophylla, Linum sulcatum, Ruellia humilis, Silphium confertifolium,* and *Sabatia angularis. R. thornei* was also observed (but not collected) in similar grassland patches in Clarke County Alabama, where much larger mosaics exist. All occurrences of *R. thornei* and this undescribed association are on unprotected land and threatened by timber management activities; tilling, surface mining, and other soil disturbances have destroyed most of the Oligocene glades in both states, and remaining sites continue to be lost at a rapid rate to wildlife food plots and soil disturbance from logging equipment. Most relatively intact glades observed have been impacted by some combination of mowing, herbicide, ORV activity, and resulting infestations of cogongrass (*Imperata cylindrica* L.).

Silphium radula Nutt. (Asteraceae). MISSISSIPPI: Yazoo Co.: *J.C. Kees 1240* (NCU), Hinds Co.: *J.C. Kees 1437* (NCU). The name *S. radula* was formerly misapplied to *S. asperrimum* Hook; previous reports from MS are based on *S. asperrimum* and alternate-leaved *S. integrifolium* plants (not uncommon where plants have been mowed or otherwise damaged early in the growing season). True *S. radula* appears to be restricted to isolated western groups of calcareous prairies over outcrops of the Jackson formation on the Yazoo bluff and in southeast Hinds County, not ranging east of the Pearl River or into the Jackson Prairie ecoregion proper. At both sites it is sympatric with *S. integrifolium*, but more restricted to treeless calcareous prairie openings. *S. integrifolium* is mostly restricted to calcareous prairies eastward, occurring in virtually every known Jackson Prairie remnant from Rankin County to western Jasper County (though abundant in disturbed sites, perhaps preferring relatively deep or mesic calcareous clay soils, and largely replaced farther east by *S. confertifolium*), but becomes widespread in a variety of open habitats in the Loess Plains. Apparent hybrids were also collected on roadsides near the Hinds co. site. Nearly all examples of this western Jackson Prairie variant have been cleared for lawn or housing developments in the past few decades; all are on private land and unprotected, although some associated calcareous woodland and bluff forest communities occur at Lefleur's Bluff State Park (MDWFP), Butts Park (City of Jackson), and Parham Bridges Park (City of Jackson).

Symphyotrichum pratense (Raf.) G.L. Nesom (Asteraceae). MISSISSIPPI: Clarke Co.: *J.C. Kees 1373* (NCU), Wayne Co.: *J.C. Kees 1411* (NCU). These collections represent the first two reports of *S. pratense* from the Jackson Prairie and Oligocene limestone, respectively. In Mississippi and Alabama, this species was formerly known only from a handful of remnant chalk prairies in the Black Belt and from limestone glades in north Alabama. It is also known from limestone glades in the Florida panhandle. In Clarke co. it occurs in a small stretch of road median with other species associated with post oak flatwoods and calcareous prairie (much reduced by frequent mowing and herbicide use) close to several degraded mesic Jackson Prairie openings; plants in Wayne co. were collected around dry limestone outcrops within open limestone barrens. It should be sought in other remnant limestone glades, barrens, and xeric Jackson Prairies, particularly in south Alabama.

MISCELLANEOUS FAMILIES

Species newly documented for southern Indiana

Primary author: Scott A. Namestnik

The following nine species are reported as occurring in southern Indiana. Documentation of these species adds to the knowledge of the flora of this region of the state and of the southeastern United States. *Andropogon glomeratus* (Walter) Britton, Sterns, & Poggenb , *Brunnichia ovata* (Walter) Shinners, *Echinacea simulata* R.L. McGregor, *Landoltia punctata* (G. Mey.) Les & D.J. Crawford and *Persicaria densiflora* (Meisn.) Moldenke are reported as new to Indiana. *Montia linearis* (Doug. ex Hook.) Greene was previously known to occur in northern Indiana, but this report documents the first occurrence of this species in southern Indiana. *Persicaria robustior* (Small) E.P. Bicknell, *Persicaria setacea* (Baldwin) Small and *Solidago rupestris* Raf. are reported as extant in southern Indiana.

Andropogon glomeratus (Walter) Britton, Sterns, & Poggenb. [Poaceae]

Andropogon glomeratus (sensu stricto) is reported as new to Indiana in Ripley County based on collections in 2013, 2020 and 2021. It was originally discovered in the state by Daniel Boone, Ben Walker and Alex Wardwell at Big Oaks National Wildlife Refuge, and to date this is the only location known for this species in Indiana, though it occurs at various places within the preserve. This distinctive grass occurs along gravel roadsides, sometimes in shallow ditches and occasionally with species more typical of clay barrens, as well as in marshes with species that have an affinity to the coastal plain of the eastern United States.

This species is common along portions of the Atlantic Ocean and Gulf of Mexico coastal plains of the southeastern United States, with more scattered occurrences in the interior of the southeastern United States (Kartesz 2015; Weakley & Southeastern Flora Team 2022a). It is considered globally secure (G5T5 [as *A. glomeratus* var. *glomeratus*]) and secure in the United States (N5); it has not been given a subnational conservation status rank in most of the states in which it occurs, but where ranked it ranges from vulnerable (S3) towards the northern portion of its range to apparently secure (S4) to secure (S5, S5?) further south (NatureServe 2023). In Indiana, the conservation status of *A. glomeratus* has not yet been determined (SNR), but it is being treated as a native species that has naturally moved into the state. It is not currently on the list of Endangered, Threatened, and Extirpated Plants of Indiana (Indiana Department of Natural Resources 2022).

Voucher Specimens: **INDIANA. Ripley Co.:** Big Oaks National Wildlife Refuge, along eroded roadsides, very barren like, 18 Sep 2013, *D. Boone, B. Walker & A. Wardwell 1434-013* (JEF); Big Oaks National Wildlife Refuge, in coastal marsh, 39.0102, –85.4163, 27 Aug 2020, *S. Namestnik, R. Hedge, J. Larson, K. Flickinger & M. Swenson 4552* (IND); Big Oaks National Wildlife Refuge, along roadside between road and flatwoods, associated species: *Acer rubrum*, *Agrostis gigantea*, *Apios americana*, *Coleataenia anceps*, *Coleataenia rigidula*, *Daucus carota*, *Desmodium paniculatum*, *Dichanthelium microcarpon*, *Doellingeria umbellata*, *Eupatorium hyssopifolium*, *Helenium flexuosum*, *Juncus anthelatus*, *Juncus biflorus*, *Liquidambar styraciflua*, *Ludwigia alternifolia*, *Nyssa sylvatica*, *Quercus palustris*, *Rhynchospora capitellata*, *Scirpus georgianus*, *Solidago juncea*, *Solidago nemoralis*, *Solidago rugosa*, *Spiraea tomentosa*, *Symphyotrichum racemosum*, *Toxicodendron radicans*, 39.03864, –85.42616, 5 Aug 2021, *S. Namestnik, J. Robb, D. Boone & J. Bens 5104* (BUT, IND).

Brunnichia ovata (Walter) Shinners [Polygonaceae]

Brunnichia ovata is reported as new to Indiana (Floyd County) based on a collection made in 2022 by Scott Namestnik. It was found growing not far from a population of *Alternanthera philoxeroides*. A vegetative, mounding colony of *B. ovata* approximately 15 m^2 in size was discovered on a muddy slope along the Ohio River, above the Ordinary High Water Mark of the river but within its floodway (Fig. 23). To date, this is the only known occurrence of *B. ovata* in Indiana.

This semi-woody vine with tendrils and distinctive alternate, simple, lanceolate to ovate leaves with wavy margins and truncate to subcordate bases is common through the Mississippi Embayment, with scattered occurrences outside of this region of the southeastern United States (Kartesz 2015; Weakley & Southeastern Flora Team 2022a). It is treated as introduced in Virginia (Weakley & Southeastern Flora Team 2022a) but is native elsewhere in its North American range. Subnational conservation status ranks have not been assigned throughout most of its native range, but at its northernmost extent in Illinois it is considered vulnerable (S3?), and in Kentucky it is considered secure (S5); globally it is apparently secure (G4G5), and in the United States it is apparently secure (N4N5) (NatureServe 2023). In Indiana *B. ovata* is being treated as an unnatural but unintentional introduction, expected to have been brought into the state on fishing equipment or through Ohio River floodwaters, and thus it does not have a conservation status rank (SNA). It can grow in disturbance communities and ruderal areas and has been considered a problem weed in crop fields in some parts of its range (Yatskievych 2013), so there is potential for spread at this site and beyond in southern Indiana.

Voucher Specimens: **INDIANA. Floyd Co.:** River Front Park, New Albany, on muddy slope along Ohio River, 38.2917, –85.6774, 17 Aug 2022, *S. Namestnik 5557* (BUT, IND).

Echinacea simulata McGregor [Asteraceae]

Echinacea simulata is reported as new to Indiana based on a collection made in 2020 (Harrison County) by Scott Namestnik and Roger Hedge. This species was abundant in a southwest-facing glade-like limestone barrens (Fig. 24). Prior to this collection, plants at this location had been referred to as *E. pallida*, but there was suspicion that the plants here may be *E. simulata* (Michael Homoya, pers. comm.), and upon observation and collection while plants were in flower, the collectors determined that the population was in fact *E. simulata*.

This coneflower with bright yellow pollen and white to rose ray flowers over 4 mm wide is naturally occurring in the Interior Low Plateau and Ozarks, is considered a waif in Virginia and North Carolina, and is also reported in southern Florida (Weakley & Southeastern Flora Team 2022a); it also may be introduced further north in Illinois (Kartesz 2015; Urbatsch et al. 2006). *Echinacea simulata* is considered globally apparently secure (G4) and apparently secure in the United States (N4); its subnational conservation status ranks range from critically imperiled (S1) in Arkansas to imperiled (S2) in Georgia and Tennessee to vulnerable (S3S4) in Kentucky; the subnational conservation status rank is unknown (SU) in Indiana, in Illinois it is not a conservation priority (SNA), and the status has not been determined in the other states in which it is known to occur (NatureServe 2023). In Indiana, this species is currently tracked as state endangered on the list of Endangered, Threatened, and Extirpated Plants of Indiana (IDNR 2022). The collection documented here is thought to represent the only currently extant population of *E. simulata* in the state.

Voucher Specimens: **INDIANA. Harrison Co.:** Teeple Glade, in limestone barrens, pollen bright yellow, associated species: *Allium cernuum*, *Andropogon gerardii*, *Asclepias verticillata*, *Asclepias viridiflora*, *Carex pensylvanica*, *Diospyros virginiana*, *Fraxinus quadrangulata*, *Helianthus hirsutus*, *Hypericum dolabriforme*, *Isanthus brachiatus*, *Lithospermum canescens*, *Manfreda virginica*, *Quercus muehlenbergii*, *Quercus stellata*, *Ratibida pinnata*, *Rhus aromatica*, *Rosa carolina*, *Ruellia humilis*, *Schizachyrium scoparium*, *Sorghastrum nutans*, *Symphyotrichum patens*, 38.02554, –85.95626, 22 Jun 2020, *S. Namestnik & R. Hedge 4392* (IND).

Landoltia punctata (G. Mey.) Les & D.J. Crawford [Araceae]

Landoltia punctata is reported as new to Indiana based on collections made in Posey County in 2020 by Scott Namestnik, Roger Hedge and Ryan Keller and in 2021 by Scott Namestnik, and in Warrick County in 2022 by Scott Namestnik and Wyatt Williams. In all situations it was growing in swamps and sloughs in standing water. No systematic effort was made to quantify abundance, but it is expected that it is widespread and abundant at these locations. Although these two sites are the only known locations for *L. punctata* in Indiana to date, it is likely that it is more common in the southern part of the state than is currently documented by collections.

This free-floating aquatic duckmeat with fronds >1.5 times as long as wide and usually with 2–7 roots per frond and 5–7 nerves per frond is considered by most to be native to the southern hemisphere and introduced in the northern hemisphere (Kartesz 2015; Landolt 2000 [as *Spirodela punctata*]; Weakley & Southeastern Flora Team 2022a), but Illinois and Kentucky apparently consider it native (NatureServe 2023). In the United

Fig. 23. *Brunnichia ovata*. River Front Park, New Albany, Floyd Co., IN. Muddy slope along Ohio River. Photo by S.A. Namestnik.

Fig. 24. *Echinacea simulata*. Teeple Glade, Harrison Co., IN. Abundant in limestone barrens. Photo by S.A. Namestnik.

States *L. punctata* is known to occur from Oregon and California east across the country, extending on the east coast from Massachusetts to Florida, with most occurrences close to the Pacific Ocean, Atlantic Ocean and Gulf of Mexico (Kartesz 2015). Globally it is secure (G5), and based on being considered native in Illinois and Kentucky it has a national conservation status rank in the United States of apparently secure (N4N5) (NatureServe 2023). In Indiana *Landoltia punctata* is being treated as an introduction, presumed to have been introduced through the aquarium trade, and thus it does not have a conservation status rank (SNA).

Voucher Specimens: **INDIANA. Posey Co.:** Twin Swamps Nature Preserve, along east margin of *Quercus lyrata* slough, associated species: *Azolla caroliniana*, *Spirodela polyrhiza*, 37.8252, –87.9902, 10 Sep 2020, *S. Namestnik, R. Hedge & R. Keller SN* (IND). Twin Swamps Nature Preserve, on edge of swamp in shallow water, in shade, associated species: *Acer rubrum*, *Azolla caroliniana*, *Bidens discoidea*, *Carya* sp., *Fraxinus lanceolata*, *Liquidambar styraciflua*, *Quercus lyrata*, *Quercus palustris*, *Spirodela polyrhiza*, *Ulmus americana*, *Wolffia brasiliensis*, 37.82263, –87.99186, 19 May 2021, *S. Namestnik 4883* (IND). **Warrick Co.:** Little Pigeon Creek Wetland Conservation Area, in slough of Little Pigeon Creek, associated species: *Acer saccharinum*, *Campsis radicans*, *Cephalanthus occidentalis*, *Lemna* sp., *Ludwigia palustris*, *Ludwigia peploides*, *Persicaria punctata*, *Platanus occidentalis*, *Spirodela polyrhiza*, 38.049435, –87.098579, 11 Aug 2022, *S. Namestnik & W. Williams 5537* (IND).

Montia linearis (Douglas) Greene [Montiaceae]

Montia linearis is reported as new to the Indiana portion of the Flora of the Southeastern United States coverage area based on a collection made in 2022 (Dearborn County) by Scott Namestnik and Jason Larson. It was found growing abundantly in an agricultural field below stubble from the previous year. Scott Namestnik, Lindsay Namestnik and Cooper T. Namestnik collected the only other Indiana records of *M. linearis* in April and May 2019 in St. Joseph County (Consortium of Midwest Herbaria 2023). Although this report from Dearborn County documents the only known occurrence of *M. linearis* in southern Indiana, it is expected that it will be found in agricultural fields and lawns elsewhere in the southern part of the state.

This branching ephemeral herbaceous plant with alternate, succulent leaves and flowers with five white petals subtended by sepals over 3 mm long is found as a native plant throughout much of the western fifth of North America; it has a scattered distribution as an introduction in the eastern part of the United States, being most common in the southeast (Kartesz 2015; Weakley & Southeastern Flora Team 2022a). It is globally secure (G5) and secure in Canada (N5), but its status in the United States has not been determined (NNR). In Indiana *M. linearis* is being treated as introduced and thus it does not have a conservation status rank (SNA).

Voucher Specimens: **INDIANA. Dearborn Co.:** Dearborn County Farm, in agricultural field, 39.15234, –85.04072, 26 May 2022, *S. Namestnik & J. Larson 5391* (BUT, IND).

Persicaria densiflora (Meisn.) Moldenk. [Polygonaceae]

Persicaria densiflora is reported as new to Indiana in two counties based on collections made in 2020 (Jefferson County) by Scott Namestnik and Roger Hedge and in 2021 (Jackson County) by Scott Namestnik. These collections provide documentation of the occurrence of *P. densiflora* in Indiana preliminarily reported by Weakley & Southeastern Flora Team (2022a). The Jefferson County population was found along the margin of the man-made Krueger Lake, forming a dense and robust colony in a zone several meters wide. The Jackson County population was found in an impounded wetland as the dominant vegetation covering several acres in shallow water.

This conspicuous, decumbent smartweed has a scattered distribution within the Mississippi Embayment and along the coastal plain of the southeastern United States, with outlier populations sparsely distributed elsewhere in the southeastern United States (Kartesz 2015 [as *P. glabra*]; Weakley & Southeastern Flora Team 2022a). There is some disagreement in the native range of the species, as Weakley & Southeastern Flora Team (2022a) and Kartesz (2015) consider it introduced in Kentucky and native in Maryland, whereas NatureServe (2023 [as *Polygonum densiflorum*]) considers it native in Kentucky and introduced in Maryland; all of these sources treat it as native elsewhere in North America. Subnational conservation status ranks have not been assigned throughout most of its native range, but at its northernmost extent within the Mississippi Embayment in Missouri and Kentucky it is considered critically imperiled (S1S2 and S1?, respectively), at its northernmost extent along the coastal plain in New Jersey it is considered imperiled (S2), in North Carolina and Georgia it is considered vulnerable (S3 and S3?, respectively), in Delaware it is considered apparently secure (S4), and in Virginia it is considered secure (S5); globally *P. densiflora* is secure (G5), and in the United States it is apparently secure (N4?) (NatureServe 2023). In Indiana, because it is growing in created wetland conditions, it is being treated as an unnatural introduction and thus will not have a conservation status rank (SNA). It is expected that additional populations of *P. densiflora* will be found in other southern Indiana counties, as it likely can be spread via waterfowl, as well as on fishing and boating equipment.

Voucher Specimens: **INDIANA. Jefferson Co.:** Krueger Lake County Park, abundant, rhizomatous colony along margin of Krueger Lake, 38.827683, –85.388828, 23 Sep 2020, *S. Namestnik & R. Hedge 4674* (IND, NY). **Jackson Co.:** Muscatatuck National Wildlife Refuge, in impounded marsh in shallow water, associated species: *Cephalanthus occidentalis*, *Persicaria robustior*, *Taxodium distichum*, *Typha* sp., 38.94063, -85.80513, 7 Oct 2021, *S. Namestnik 5297* (BUT, IND).

Persicaria robustior (Small) E.P. Bicknell [Polygonaceae]

Persicaria robustior is reported as extant in southern Indiana based on a collection made in 2021 (Jackson County) by Scott Namestnik. This collection provides documentation of the occurrence of *P. robustior* in the Indiana portion of the Flora of the Southeastern United States coverage area, preliminarily reported by Weakley & Southeastern Flora Team (2022a). Plants within the observed population were growing in a fairly dense colony on the margin of an impounded marsh.

Often taxonomically lumped into *P. punctata*, the true distribution of this rhizomatous and stoloniferous species is probably not well understood. It differs from *P. punctata* in having wider leaves (often over 2.5 cm wide, especially earlier in the year), less interrupted spike-like racemes, and at least the lower ocreolae in the raceme entire (or nearly so) at their summits (versus being ciliate) (Wilhelm & Rericha 2017; Weakley & Southeastern Flora Team 2022a). *Persicaria robustior* generally has a more northern distribution, most frequent in the New England states but extending north into Nova Scotia, Quebec and Ontario, and its distribution extends south along the northern portion of the Atlantic coastal plain, with several counties of occurrence scattered through the eastern United States generally south to Missouri, Kentucky and North Carolina; there are outlier populations in Texas and Florida, the latter of which is treated as a waif (Kartesz 2015; Weakley & Southeastern Flora Team 2022a). *Persicaria robustior* is considered globally apparently secure (G4G5) and apparently secure in the United States (N4N5); within the United States, its subnational conservation status ranks range from historical (SH) in Maine and Missouri to critically imperiled (S1) in New Hampshire to imperiled (S2) in New Jersey and Ohio to apparently secure (S4) and secure (S5) in Pennsylvania and New York, respectively (NatureServe 2023). Several states have not assessed the subnational conservation status rank for this species (NatureServe 2023). In Indiana, the conservation status of *P. robustior* is unknown (SU). Prior to 2021, it was considered extirpated from Indiana, with historical records from Porter and Greene counties (Consortium of Midwest Herbaria 2023). In 2021, Scott Namestnik, Nathanael Pilla and Dominick Pilla rediscovered it in Porter County (Consortium of Midwest Herbaria 2023), and, as a result, it was moved to state endangered on the list of Endangered, Threatened, and Extirpated Plants of Indiana (IDNR 2022). The occurrence of the species in Jackson County, Indiana represents the only currently known extant population of the species in southern Indiana.

Voucher Specimens: **INDIANA. Jackson Co.:** Muscatatuck National Wildlife Refuge, on edge of impounded marsh, soil saturated to several inches of inundation, associated species: *Carex hyalinolepis*, *Cephalanthus occidentalis*, *Juncus effusus*, *Lemna turionifera*, *Ludwigia palustris*, *Ludwigia peploides*, *Persicaria coccinea*, *Spirodela polyrhiza*, *Typha* sp., *Wolffia brasiliensis*, *Wolffia columbiana*, 38.94040, –85.81058, 7 Oct 2021, *S. Namestnik 5298* (BUT, IND).

Persicaria setacea (Baldwin) Small [Polygonaceae]

Persicaria setacea is reported as new to the Indiana portion of the Flora of the Southeastern United States coverage area based on collections made in 2020 (Jefferson County) by Scott Namestnik, Roger Hedge and Joe Robb and in 2021 (Ripley County) by Scott Namestnik, Joe Robb, Dan Boone and Joe Bens. In these two adjacent counties, *P. setacea* was observed growing in mudflats, in wetlands and along drainages associated with beaver activity.

This smartweed with spreading-hirsute pubescence on the ocreae is found throughout the eastern United States, with the greatest concentration within its distribution along the Atlantic coastal plain in the southeastern United States and in peninsular Florida; it extends west into Texas, Oklahoma and Missouri and north to New York and Massachusetts (Kartesz 2015; Weakley & Southeastern Flora Team 2022a). *Persicaria setacea* is considered globally secure (G5) and secure in the United States (N5); its subnational conservation status ranks have not been calculated in most of the states in which it occurs, but where calculated it is secure (S5) in North Carolina, apparently secure (S4) in Virginia, vulnerable (S3S4) in Kentucky, imperiled (S2) in Massachusetts and Pennsylvania, and critically imperiled in Indiana (S1), New York (S1S2), and Ohio (S1) (NatureServe 2023 [as *Polygonum setaceum*]). In Indiana, there are historical collections from two northern counties (Consortium of Midwest Herbaria 2023), and the species is currently tracked as state endangered on the list of Endangered, Threatened, and Extirpated Plants of Indiana (IDNR 2022), but the collections documented here may represent the only currently extant populations of *P. setacea* in the state.

Voucher Specimens: **INDIANA. Jefferson Co.:** Big Oaks National Wildlife Refuge, along edge of drainage between beaver ponds, associated species: *Agalinis tenuifolia*, *Agrimonia parviflora*, *Bidens polylepis*, *Carex lurida*, *Coleataenia rigidula*, *Echinochloa muricata*, *Eupatorium serotinum*, *Juncus acuminatus*, *Juncus effusus*, *Juncus tenuis*, *Leersia oryzoides*, *Ludwigia palustris*, *Mimulus ringens*, *Persicaria punctata*, *Platanus occidentalis*, *Sagittaria australis*, *Scirpus atrovirens*, *Scirpus cyperinus*, *Solidago rugosa*, 38.85238, –85.40543, 26 Aug 2020, *S. Namestnik, R. Hedge & J. Robb 4542* (NY). **Ripley Co.:** Big Oaks National Wildlife Refuge, dense colony and scattered individuals in older mudflat created by beaver dam, associated species: *Boehmeria cylindrica* var. *drummondiana*, *Carex lupulina*, *Cephalanthus occidentalis*, *Coleataenia rigidula*, *Eleocharis obtusa*, *Galium tinctorium*, *Leersia oryzoides*, *Ludwigia palustris*, *Mimulus ringens*, *Onoclea sensibilis*, *Persicaria punctata*, *Persicaria sagittata*, *Salix nigra*, *Scirpus cyperinus*, *Vitis labrusca*, 38.93076, –85.38869, 5 Aug 2021, *S. Namestnik, J. Robb, D. Boone & J. Bens 5102* (BUT, IND).

Solidago rupestris Raf. [Asteraceae]

Solidago rupestris is reported as extant in Indiana in Harrison County based on a collection made in 2021 by Scott Namestnik. This specimen represents the first confirmed collection of the species in Indiana in nearly 40 years. The plants were observed growing on a limestone ledge riverscour along the Blue River (Fig. 25). Less than 30 individuals were noted at this location, which is habitat for at least three other species of *Solidago*, including one that is federally endangered and globally critically imperiled (G1).

This smooth-stemmed (below the inflorescence), narrow-leaved, small flowerhead subsection *Canadensae* goldenrod of riverscour habitats has a restricted distribution in the eastern United States, with extant occurrences in Maryland (recently rediscovered after having been considered extirpated for over 100 years), Virginia, West Virginia, Kentucky, Tennessee and now Indiana; it is considered extirpated from Pennsylvania, and the Ohio and Illinois reports in Weakley & Southeastern Flora Team (2022a) seem to be in error (Kartesz 2015; Weakley & Southeastern Flora Team 2022a). *Solidago rupestris* is considered globally apparently secure (G4?) and apparently secure in the United States (N4?); it is apparently secure (S4) in Kentucky but is a species of conservation concern and critically imperiled (S1) in every other state in which it is extant (NatureServe 2023). Given the limited distribution and county distribution in Kentucky (per Kartesz 2015), the national and global conservation ranks may warrant reevaluation. In Indiana, there are historical collections of *S. rupestris* from Clark and Floyd counties (Consortium of Midwest Herbaria 2023, Deam 1940). There are collections currently stored as *S. rupestris* from Lake and Montgomery counties in Indiana (Consortium of Midwest Herbaria 2023), but these specimen identifications are clearly in error. The species is currently tracked as state extirpated on the list of Endangered, Threatened, and Extirpated Plants of Indiana (Indiana Department of Natural Resources 2022), but will be moved to state endangered on the next iteration of this list. The occurrence of the species in Harrison County represents the only currently known extant population of *S. rupestris* in Indiana.

Voucher Specimens: **INDIANA. Harrison Co.:** Greenbrier Knob Nature Preserve, on limestone ledge along the Blue River, associated species: *Allium cernuum*, *Andropogon gerardii*, *Baptisia australis*, *Campsis radicans*, *Cornus drummondii*, *Cornus obliqua*, *Hypericum sphaerocarpum*, *Lespedeza cuneata*, *Panicum flexile*, *Platanus occidentalis*, *Sorghastrum nutans*, *Symphoricarpos orbiculatus*, *Symphyotrichum urophyllum*, *Toxicodendron radicans*, 38.22591, –85.26249, 16 Sep 2021, *S. Namestnik 5253* (NCU).

Fig. 25. ***Solidago rupestris*. Greenbrier Knob Nature Preserve, Harrison Co., IN. Limestone riverscour along Blue River. Photo by A.H. Balzer.**

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