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SOLIDAGO AUSTROCAROLINIANA (ASTERACEAE: ASTEREAE), A NEW SPECIES OF SUBSECT. *HUMILES* FROM SOUTH CAROLINA

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ABSTRACT

A new, apparently very rare species of *Solidago* subsect. *Humiles* is described from a previously unidentified collection made in June 1957 in South Carolina. **Solidago austrocaroliniana** Semple & J.B. Nelson, **sp. nov.**, is compared to other species of the subsection native to the southeastern USA.

An unidentified collection, *Bell 8499*, was included in a loan to the first author of multiple taxa and unidentified collections of *Solidago* from NCU (Thiers, continuously updated; Figs. 1 and 2). In preparation for returning this loan all of the indeterminants were examined and identified, except for the Bell collection from Union Co., South Carolina. The specimen had features most similar to *S. arenicola* and *S. racemosa* (*S. simplex* var. *racemosa* in FNA) but did not fit either species or others in subsect. Humiles (to which the collection is apparently referrable), because the involucres were smaller than those of *S. arenicola* and *S. racemosa* has sparsely hairy ovaries/cypselae. The collection was certainly not *S. kralii* or *S. plumosa*. As well, the plant from which the specimen was made was flowering in early June and the older post-blooming involucres were already developing fruit, thus it would have been in flower in mid to late May.

The second author was asked about possible additional unidentified collections of *Solidago* from Union Co. and presumably nearby counties. None were found at USCH and a trip was made by him in late June of 2013 to explore the location from which the Bell collection was made 56 years earlier (the sewage treatment plant noted in the label data was still across the road). No flowering goldenrods were found at the site, although the basal rosette of one damaged plant (identity unknown) was collected and a sample of another goldenrod taxon not in bloom was collected from a nearby hill, both clearly not conspecific with the Bell plant. The plan had been to gather more material and discover more about the biology of this new species. Instead, it is described here from the original single collection with the hope of stimulating a hunt for more populations by botanists in the greater Union County area of South Carolina.

There is only one normally spring blooming species of *Solidago*, *S. verna* M.A. Curtis ex Torr. & Gray, native to the coastal plain in North and South Carolina; this is a much hairier, non-resinous plant than the new species described below and is a member of subsect. *Argutae* (Semple & Cook 2006). Other species in the genus occasionally bloom in the spring or through much of the flowering season, especially in subtropical and tropical areas. However, all of these species have a primary blooming season in the fall. Thus, it is surprising to discover an additional late spring/early summer-blooming species of goldenrod.

Figure 1. Holotype of *Solidago austrocaroliniana*.

Figure 2. Details of the holotype of *Solidago austrocaroliniana*. A. Rootstock and basal leaves. B. Adaxial surface of lower stem basal leaf. C. Abaxial surface of lower stem leaf. D. Flowering heads. E. Developing disc floret cypsela. Scale bar = 1 cm in A, C, and 1 mm in B, D and E.

SOLIDAGO AUSTROCAROLINIANA Semple & J.B. Nelson, **sp. nov. TYPE**: **USA**. **South Carolina**. Union Co.: SW of Union opposite sewage disposal plant [Cross Keys Hwy, SC-49], 5 Jun 1957, *C.R. Bell 8499* (holotype: NCU!). Figs. 1 and 2.

Plants with features of *Solidago* subsect. *Humiles*; similar to *S. arenicola* but involucres smaller and blooming in spring.

Plants 30–40 cm; stem ascending from a short thick woody branching caudex, to 8 mm thick, mostly embedded in imbricate chaffy bases of older leaves. **Stems** 1, terete, shallowly multicostate, glabrous proximally, sparsely to moderately hirtellous in the inflorescence. **Leaves:** basal and proximal cauline petiolate to winged-petiolate, 24–70 × 5–10 mm; blades spatulate to mostly oblanceolate, tapering, margins distally coarsely but shallowly serrate-crenate, apices acute to rounded, often narrowed to short, often brown callused tipped; mid to distal cauline progressively more narrowly oblanceolate and acute, then to elliptic or lanceolate-elliptic, 35–47 × 6–10 mm, reduced distally, grading into widely ascending to spreading or reflexed bracts; faces abaxially pale, midnerves raised, level reticulum of dark somewhat translucent branch nerves, margins 0-4 fine serrations, ciliate, adaxially darker with only impressed midnerve evident. **Heads** 20–25 (1–5+ per branch), in racemiform or narrowly paniculiform arrays, mostly with primary branches widely to narrowly ascending, proximal most usually longest. **Peduncles** widely ascending, angulate, linear-oblanceolate bracteolate; bracts 1–3, grading into phyllaries, sparsely hirtellous, margins ciliate. **Involucres** broadly cylindrical, 5–6 mm. **Phyllaries** (in 3–4 series) 1–1.3 mm wide, unequal, glabrous; outer mostly green, oblong, blunt, inner spatulate or linear-oblanceolate, somewhat resinous or shiny, distally sparsely minutely glandular. **Ray florets** 5–6; laminae 3–4 mm long 0.8–1.2 mm wide. **Disc florets** 8–12; corollas 4.8–5.5 mm long, lobes 1–1.6 mm. **Cypselae** somewhat compressed-obconic, 2.5–2.7 mm, 1–3-ribbed, glabrous; **pappi** triseriate, whitish to straw-colored, outer bristles fine, 2° outer bristles 60% of longest, 1° outer taping 90–95% of longest, 1° inner somewhat clavate, 4.7–5 mm. **2*n*** = unknown. Known only from the type collection.

Flowering May–June. Mesic woods around pond margin; 140-150 m elevation.

The species is named for the state in which it was discovered, South Carolina.

Solidago austrocaroliniana is most similar to *S. arenicola*, but from its involucre height it is assumed to be diploid. The holotype collection appears to have bloomed first from the shorter main stem, which has flowering and post flowering heads with developing to nearly mature fruit. The most mature heads would have been flowering in May. A lower branch elongated well above the main stem and is producing both immature heads and flowering heads. There is no obvious damage to the main stem that would account for the lower branch elongating as much as it did. Phyllaries can appear shiny-resinous, as is the usually case for species of subsect. *Humiles*.

The three other species of *Solidago* subsect. *Humiles* (Rydb.) Semple native to the southeastern USA also are rare to very rare. **Solidago plumosa** Small is the rarest and is known from rocks along the shore of the Yadkin River at only one population in North Carolina. It was first sampled in 1894 and thought possibly to be extinct (Cronquist 1980) until rediscovered in 1994 by Alan Weakley and Steve Leonard (Alan Weakley, pers. comm.). **Solidago arenicola** B.R. Keener & Kral was discovered growing in sandy alluvial soils at two locations in northern Alabama reported by Keener and Kral (2003) and subsequently at a location in Tennessee (Semple & Cook 2006; Peirson et al. 2012). Floden (2012) proposed that both *S. arenicola* and *S. racemosa* (using the combination *S. simplex* var. *racemosa* (Greene) Ringius) were present together at the Tennessee site. **Solidago kralii** Semple was described in the same journal issue as *S. arenicola* (Semple 2003). It occurs in sandy soils of the fall line counties in central Georgia and southwestern South Carolina and can be

locally common. None of these species would be expected to occur in Union County, SC, in moist soils in the upper Piedmont, based on habitat or biogeography.

Subsect. *Humiles* also includes five rare to very rare species in the Great Lakes Region and the northeastern USA and adjacent Canada (*S. chlorolepis* Fern., *S. gillmanii* (A. Gray) Steele, *S. ontarioensis* (Ringius) Semple & Peirson, *S. racemosa* Greene, and *S. randii* (Porter) Britt.), one relatively rare species along the Pacific coast of California and Oregon (*S. spathulata* DC.), one narrowly distributed species in Mexico (*S. simplex* Kunth; Semple et al. 2016) and one widely distributed species in western North America from Alaska to New Mexico in the Rocky Mountains and east across Canada to the Lake Superior shores in Ontario and into northern Michigan (*S. glutinosa* Nutt.; Semple & Peirson 2013; Semple 2016). The ranges of all species are presented in Semple (2018, frequently updated). In the Flora of North America all of the northeastern species were included as varieties in *S. simplex* (Semple & Cook 2006). Peirson et al. (2012) presented arguments favoring species level status for each of the ecologically and morphological distinct taxa, and Semple and Peirson (2013) presented the nomenclature. These species would also be highly unlikely to be found in the "upcountry" of South Carolina.

We thus conclude that the Bell collection represents a new species, based on its unique combination of morphological features, phenology, habitat, and geographic location. We hope that its naming will generate additional searches to locate extant populations that will corroborate its distintiveness.

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Table 1. Comparison of *Solidago austrocaroliniana* with central and southeastern North American species in subsect. *Humiles*.

	austro-caroliniana	**arenicola**	**kralii**	**plumosa**	**racemosa**
Stems	30–40 cm; glabrous proximally, sparsely to moderately hirtellous in inflorescence	35–80 cm; proximally glabrous, sparsely to moderately hirtellous in infloresence	65–110 cm; glabrous or sparsely strigillose; copiously viscid-resinous in inflorescence	40–100 cm; glabrous, viscid-resinous	6–85 cm; proximally glabrous to strigose-hirtellous in inflorescence
Basal and lower leaves	oblanceolate; rounded to obtuse	spatulate to oblanceolate; acute to narrowly rounded	oblanceolate; acute	oblanceolate; acute (outer obtuse)	spatulate to oblanceolate; usually acute
Mid stem leaves	oblanceolate, acute	elliptic to lanceolate-elliptic, acute	linear-elliptic, acute	linear, acute	lanceolate to linear, acute
Involucre height	5–6 mm	8–12 mm	5–7 mm	4.5–6 mm	4.5-8.1 mm
Rays **Means**	5–6 5.5	6-10 5.6	4–12(–45) 7	2–8 5	2-16 7.5
Ray lamina length	3–4 mm	2.2–5.7 mm	2.1–4.5 mm	2.8–3.3 mm	2-4 mm
Disc florets **Means**	12–15 13.5	9-21 14.7	5-16 10.7	5–15 8.7	6–24 13.4
Disc cypsela	compressed-obconic, glabrous, 2–3 ribs	glabrous, 5-ribbed, narrowed to short neck	compressed-obconic to fusiform, glabrous, 5-8 dark ribs	compressed-obconic, glabrous, shallowly ribbed	narrowly obconic, sparsely to moderately strigose
Disc cypsela pappus	4.8–4.9 mm	3–4 mm	5–6 mm	4–5 mm	3–5 mm
Cypsela pubescence	glabrous	glabrous	glabrous	glabrous	sparsely strigose
Chromosome number	unknown	2n=36	2n=18	2n=18	2n=36, 54