SERICOCARPUS ASTEROIDES (ASTERACEAE: ASTEREEAE), RHIZOMATOUS AND COLONIAL, AND SERICOCARPUS CAESPITOSUS, SP. NOV.

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ABSTRACT

Allopatric population systems of two growth forms comprise the eastern USA species traditionally identified as *Sericocarpus asteroides*. The typical form (the type collected by Peter Kalm in New Jersey), which produces slender, stoloniform rhizomes, occurs along the Atlantic coast from southern Maine into South Carolina. *Sericocarpus caespitosus* Nesom, sp. nov., without stoloniform rhizomes, occurs inland from western New York to coastal counties of Alabama and Florida. An epitype is designated for *Conyza asteroides* L., clearly showing the rhizomes; neotypes are designated for *Aster leucanthemus* Raf. and *Aster conyzoides* var. *plantaginifolius* Nutt. (both are synonyms of *S. asteroides* sensu stricto). *Sericocarpus oregonensis* (with stoloniform rhizomes) and *S. californicus* (without stoloniform rhizomes) are similar in morphological distinction and have geographically separate distributions—a similar rationale (morphology and geography) justifies their treatment as separate species.

*Sericocarpus asteroides* (L.) B.S.P. occurs widely through the eastern USA (Fig. 1). Over much of its range, plants produce a relatively short, thick, fibrous-rooted rhizome with short basal offsets arising from a short caudex. Short, thick, caudex branches may arise from growth of these offsets. Along the Atlantic seaboard, however, from southern Maine to South Carolina, in addition to the larger perennating rhizome, plants produce slender, scale-leaved, stoloniform rhizomes that may elongate laterally up to 15 centimeters—a rooting plantlet is produced at the tip of these rhizomes (these features are shown in type collections–Figs. 9-13 and representative collections–Figs. 17-29).

Two taxa of *Sericocarpus* of the western USA and British Columbia, *S. rigidus* and *S. oregonensis* sensu stricto (Figs. 3, 4), also produce stoloniform rhizomes, while *S. oregonensis* var. *californicus* does not (Figs. 5-7). This difference has not figured in decisions regarding the taxonomy of *S. oregonensis* sensu lato (Nesom 1993; Leonard et al. 2005; Semple & Leonard 2006). Neither has this growth habit previously been observed (or at least it has not been noted) in *Sericocarpus* of the eastern USA by recent or earlier eastern USA florists (e.g.: Fernald; Gleason & Cronquist; Radford, Ahles, & Bell; Cronquist).

The morphology, ontogeny, and behavior of the stoloniform rhizomes is complex, and the biological difference results in clonal populations of closely adjacent plants in rhizomatous forms versus more scattered plants in caespitose forms (Figs. 14-16). In addition to this conspicuous difference, the two eastern USA entities are closely contiguous in geography (Fig. 2). Each is recognized here at specific rank (as below), reflecting these discontinuities.

Treatment of *Sericocarpus oregonensis* sensu lato as two separate species is supported by the same morphological distinction — *S. oregonensis* Nutt. with stoloniform rhizomes, *S. californicus* Durand without. These two entities also are allopatric, with a geographic hiatus of about 75 miles at their closest point of approach. It is not clear even that they are sister taxa — *S. californicus* has been treated as conspecific with *S. oregonensis* and also with *S. rigidus*. Most recently it has been regarded as conspecific with *S. oregonensis* (Nesom 1993; Leonard et al. 2005; Semple & Leonard 2006), but Nesom provided no rationale for his assessment. The two were combined by Leonard et al. (2005) based on a multivariate study showing *S. oregonensis* and *S. californicus* completely intermixed in the
UPGMA analysis, but one of S. oregonensis branches is more similar to S. rigidus than to the other S. oregonensis branch. Further, neither the presence/absence of rhizomes nor the allopatric geography was considered in their decision regarding S. californicus. They noted (pp. 1484–1485) that the close similarity of S. asteroides, S. oregonensis, and S. rigidus "is reflected in the inclusion of a few of the S. oregonensis specimens within the S. asteroides and S. rigidus branches in the cluster analysis, even if such confusion of identity is unlikely due to very different general appearances and provenances."

If production of stoloniform rhizomes is a specialized feature in Sericocarpus, as seems likely, it is not clear whether there have been several origins in parallel or a single origin with evolutionary losses, although parsimony argues for the latter (e.g., Fig. 1). Molecular data have not resolved the pattern of relationships among Sericocarpus species (e.g., Brouillet et al. 2009), but a sister relationship between the two eastern entities appears to be a reasonable hypothesis, based on their mutual production and retention of basally disposed leaves, leaves with toothed margins (otherwise not seen in the genus), and their close parapatry. Loss of rhizome production might result from repression of genes impacting axillary meristem growth, with the essentially non-overlapping geographic distribution perhaps reflecting dominance of rhizome production in hybrids (or vice versa).

Figure 1. Hypothetical phylogeny of Sericocarpus species, showing possible pattern of rhizome origin and expression. Sericocarpus tortifolius and S. linifolius are species of the eastern USA — neither produces rhizomes. Assumptions here are that S. asteroides and S. caespitosus are evolutionary sisters and that S. oregonensis and S. californicus are sisters. An equally parsimonious pattern would have independent appearance of rhizomes in S. asteroides and in the ancestor of sister-paired S. rigidus/oregonensis.
The slender rhizomes in *Sericocarpus asteroides* are produced from the caudex and spread laterally through the duff or upper soil; a plantlet is produced at the rhizome apex. Rhizome production begins in mid to late June or early July, soon after the species begins to flower. They perhaps are broken off during some collections and don't show on specimens, but the consistency mapped in Figure 2 indicates that the pattern is real.

There is no strong correlation of habitat and presence/absence of rhizomes — *Sericocarpus asteroides* is primarily a coastal plain species and extends into similar habitats in New England. *Sericocarpus caespitosus* is widespread on the Appalachian Plateau but extends southward onto the coastal plain in South Carolina, Georgia, Alabama, and Mississippi. Repression of rhizome production (as hypothesized here) is more likely correlated with historical factors before these two entities reached their current geographies.

Formal taxonomic summaries of *Sericocarpus asteroides* and the newly described *S. caespitosus* are presented below, with distribution maps and photos of representative specimens. Distribution maps and representative specimens are shown for *S. rigidus*, *S. oregonensis*, and *S. californicus*.


It is assumed here that Kalm made the type collection in 1748 in the vicinity of Swedesboro, Gloucester Co., New Jersey, where his activities were centered during his relatively brief time in North America (see Reveal 1983 and Wikipedia entry on Kalm). He also traveled farther into the northeastern USA, into New York and Connecticut, where typical *Sericocarpus asteroides* occurs and as far west as Niagara Falls, passing through a region of New York where the caespitose form occurs. The epitype unambiguously establishes the identity of the name.


During Rafinesque's first trip to the USA, from April 1802 through December 1804, he lived in Philadelphia and several nearby towns (Rafinesque 1836) and made excursions to the countryside of Pennsylvania, New Jersey, Delaware, and Maryland, collecting plants and other organisms from a variety of habitats. "When the flora of Michaux was published in 1803, it became my manual and I..."
Nesom: *Sericocarpus caespitosus*, sp. nov.

labored to write a Supplement to it" (1836, p. 18). His only excursion into Virginia was in July or August of 1804, where essentially he reached no farther southeast than the region of Washington, visiting the Falls of the Potomac and the Alexandria vicinity. Presumably his "Virginia" collection of *Sericocarpus* was made in this area, where the typical (rhizomatous) form occurs, and the neotype is from there.

Rafinesque returned to Europe in January 1805, carrying his plant collection: "My herbal contained nearly 2400 species and 10,000 specimens. I sent many to the Professors Savi of Pisa and Radi of Florence who gave me Italian plants in exchange" (1836, p. 26). He lived for about 10 years in Palermo, Sicily, from where he submitted his paper to the The Medical Repository (1808). "Having been prevented in 1807 by the want of communication, to send to Paris my supplement to the Flora of North America of Michaux, which my friend Turpin had induced the publisher Levrault to publish: I sent an abridgement of it, or the N.G. and new species to Dr. Mitchill of New York, who published them in his medical repository, and this paper was afterwards translated in French by Desvaux (1809) for his Journal of Botany" (1836, p. 33).


*Sericocarpus asteroides* (L.) B.S.P. forma *roseus* Svenson, Rhodora 30: 136. 1928. **TYPE: Massachusetts.** Barnstable Co.: Falmouth, 1 Sep 1926, H.K. Svenson s.n. (holotype: GH, Fig. 12; isotype: LL).

**SERICOCARPUS CAESPITOSUS** Nesom, sp. nov. **TYPE: Pennsylvania.** Westmoreland Co.: Stewart's Station, swamp at Trafford, 15 Aug 1900, J.A. Shafer s.n. (holotype: PH, Fig. 13).

Similar to typical *Sericocarpus asteroides* in vestiture, leaf disposition and morphology, and inflorescence and floral morphology, but different in its strictly caespitose growth habit, without slender, scale-leaved rhizomes.

*Sericocarpus asteroides* (L.) B.S.P. forma *albopapposus* Farw., Pap. Michigan Acad. Sci. 1: 100. 1923. **TYPE: Michigan.** Kalamazoo Co.: Galesburg, dry grounds, 31 Aug 1918, O.A. Farwell 5097a (holotype: MICH not seen; isotype: GH!). According to Voss (1996), this is the only known collection of the species from Michigan and it is of "dubious status."
Figure 2. Distribution of *Sericocarpus asteroides* sensu stricto and *S. caespitosus*. Reports from Indiana and Wisconsin apparently are based on cultivated plants. Light green shading represents counties with collections without basal parts (or with vouchers not seen in southeastern New York) but that probably are *S. asteroides*. Question marks represent counties with vouchers without diagnostic basal parts. Counties with hatching have both entities.

The Mississippi records are these: Clarke Co.: ca. 20 mi NE of Quitman, dry, rocky ridge of Burstone Cuesta, sandy soil, scrub oak and longleaf pine, 12 Jun 1969, Jones 16326 (FSU); Madison Co. — Lowe (1921) noted specifically that a collection was made in August at Canton in Madison Co. and deposited at "Geol. Surv. Herb." but I have not found the voucher. Other Mississippi reports are based on misidentifications.
Figure 3. Distribution of *Sericocarpus rigidus*. Plants of *S. rigidus* produce stoloniform rhizomes.
Figure 4. Distribution of *Sericocarpus oregonensis* and *S. californicus*. Plants of *S. oregonensis* produce stoloniform rhizomes; those of *S. californicus* do not.
Figure 5. *Sericocarpus rigidus*. Thurston Co., Washington, Montague 68 (WTU).
Figure 7. *Sericocarpus californicus*. Nevada Co., California, Williams 77-106-1 (RENO).
Figure 8. *Sericocarpus asteroides*. Lectotype, LINN 993.10, collected by Peter Kalm, presumably from New Jersey (see text).
Figure 9. Sericocarpus asteroides. Epitype, Gloucester Co., New Jersey, Sowden s.n. (PH). Plants arising from stoloniform rhizomes (arrows).
Figure 10. Neotype of *Aster leucanthemus* Raf. Arlington Co., Virginia, Leonard 748 (US).
Figure 11. Neotype of *Aster conyzoides* var. *plantaginifolius* Nutt. Gloucester Co., New Jersey, Fosberg 15627 (PH).
Figure 12. *Sericocarpus asteroides* forma *roseus*. Basal portion of holotype (GH), Barnstable Co., Massachusetts. Slender, scale-leaved, stoloniform rhizomes arising from the caudex.
Sericocarpus caespitosus, sp. nov.

Figure 13. Sericocarpus caespitosus. Holotype, Westmoreland Co., Pennsylvania, Shafer s.n. (PH). Plant with a branching caudex, without stoloniform rhizomes.
Nesom: *Sericocarpus caespitosus*, sp. nov.

Figure 17. *Sericocarpus asteroides*. Fairfield Co., Connecticut, Kennedy s.n. (GH).
Nesom: *Sericocarpus caespitosus*, sp. nov.

Figure 18. *Sericocarpus asteroides*. Hartford Co., Connecticut, Bissell 345 (NEBC).
Figure 20. *Sericocarpus asteroides*. Granville Co., North Carolina, Batson 1210 (DUKE).
Nesom: *Sericocarpus caespitosus*, sp. nov.

Figure 23. *Sericocarpus asteroides*. Marion Co., South Carolina, *Bell 13628* (NCU). Arrow points to lignescent rhizome, presumably developed from a thinner, stoloniform rhizome. See Figs. 18, 21.
Nesom: *Sericocarpus caespitosus*, sp. nov.

Figure 24. *Sericocarpus caespitosus*. Upshur Co., West Virginia, Rossbach s.n. (FLAS).
Figure 25. *Sericocarpus caespitosus*. Beaver Co., Pennsylvania, *Henrici s.n.* (PH).
Nesom: *Sericocarpus caespitosus*, sp. nov.

Figure 27. *Sericocarpus caespitosus*. Calhoun Co., Alabama, Whetstone s.n. (BRIT).
Figure 28. *Sericocarpus caespitosus*. Walton Co., Florida, Correll 52242-A (USF).
Nesom: *Sericocarpus caespitosus*, sp. nov.

Figure 29. *Sericocarpus caespitosus*. Charleston Co., South Carolina, *Hill 23819* (CLEMS).
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LITERATURE CITED


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