

A TAXONOMIC STUDY OF *ARISTIDA STRICTA* AND
A. BEYRICHIANA

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ABSTRACT

Grasses traditionally assigned to *Aristida stricta* Michx. include two morphologically and geographically separate species. The name *Aristida stricta* Michx. corresponds to a taxon confined to North Carolina and the northern tier of counties in South Carolina. A second species, *Aristida beyrichiana* Trin. & Rupr., occurs from southern South Carolina south throughout Florida and west to Mississippi.

Key Words: Taxonomy, *Aristida beyrichiana*, *Aristida stricta*, Poaceae, coastal plain, North America, southeastern U.S.

INTRODUCTION

The name *Aristida stricta* Michaux has long been applied to those southeastern plants colloquially known as "wiregrass" which dominate the understories of most frequently-burned *Pinus palustris* Mill. and *P. elliottii* Engelm. woodlands and savannas from central North Carolina south to southern Florida and west to eastern Mississippi. No intraspecific variation has previously been described for this taxon. However, the range of *A. stricta*, s.l. has a conspicuous gap in central South Carolina. Further, differences in sheath and blade indument allow plants from north of the gap to be readily distinguished from those south of the gap. In this paper I examine the morphological characteristics, distribution, and taxonomic status of these two types of *Aristida stricta*, s.l. For reasons explained below in the section on taxonomy, I refer to the northern plants as *A. stricta* Michaux and to the southern plants as *A. beyrichiana* Trinius & Ruprecht.

MORPHOLOGICAL DIFFERENCES

The two variants of *Aristida stricta*, s.l. can be readily and unambiguously differentiated by examination of leaf indument. On plants of the southern *A. beyrichiana*, a densely woolly or villous bearding or tuft of indument is present at the base of the leaf blade (Figure 1). These prominent hairs vary from being distributed on the upper surface of the blade and at the corners of the collar to also (and much more commonly) surrounding the blade, collar, and uppermost portion of the sheath. With age the

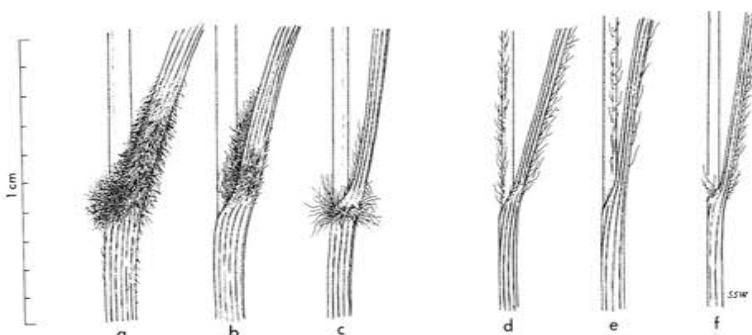


Figure 1. Characteristic blade and sheath pubescence of (a-c) *Aristida beyrichiana* Trinius & Ruprecht and (d-f) *Aristida stricta* Michaux. In each case the first (a and d) of the three figures is the most typical and the other two illustrate some of the range of variation.

hairs can be partially deciduous, but they are always evident on the younger foliage and, together with the involute leaves, allow *A. beyrichiana* to be distinguished in vegetative condition from all other southeastern North American grasses. Individual plants can differ substantially in amount of indument, but at a minimum, plants of *A. beyrichiana* have numerous hairs protruding from about the throat and corners of the collar. In contrast, the northern *A. stricta* lacks this localized bearding or tuft. At most, there may be a few prominent hairs at the corners of the collars of the most hairy plants, and on most plants there are no hairs except for those on the back of the blade as described below.

The northern *Aristida stricta*, s.s. is readily distinguished in vegetative condition from all other native grasses by the presence of a line of villous indument (hairs .6–1.5 mm long) adjacent to and on each side of the midrib along the length of the back of the involute blade (Figure 1). The hairs can be deciduous with age, but are always present on the younger foliage. The foliage of the southern *A. beyrichiana* usually lacks indument on the backs of the leaves except for the characteristic woolly to villous tufts or bearding at the bases of the blades. The one exception is that seven percent of the Florida specimens examined (17 of 251) had foliar indument along the midrib; the trait was not observed in collections of *A. beyrichiana* from any other state. In those few Florida plants where the lines of villous indument were present on the foliage, the diagnostic woolly tuft or bearding at the base of the blade was particularly conspicuous.

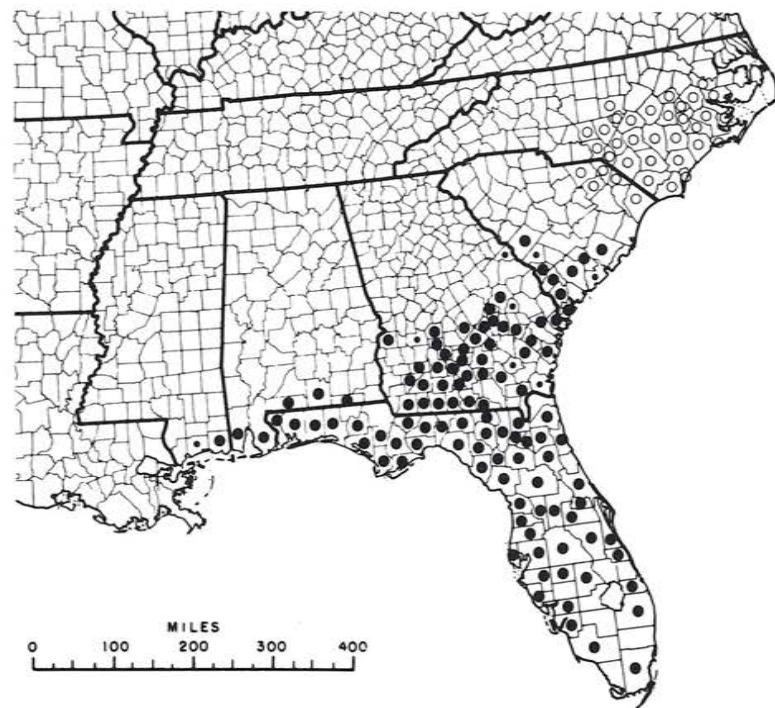


Figure 2. County distribution of *Aristida stricta* Michaux (○) and *Aristida beyrichiana* Trinius & Ruprecht (●). Unverified reports are indicated by (•).

Other differences between the taxa can be observed, but they are generally minor and often statistical. For example, the average ligule length is less for *Aristida stricta*, as is culm width, and, on average, the glumes are more unequal in *A. beyrichiana*.

DISTRIBUTION

I examined all specimens labeled as *Aristida stricta* Michx. held by the following herbaria: CLEMS, DUKE, FLA, FLAS, GA, GH, L, MO, NCSC, NCU, NY, P, UAL, US, USCH, VDB and Southern Mississippi. County range maps were drawn using data on the 564 specimens examined that were assignable to county of origin (Figure 2).

Nine counties within the range of *Aristida beyrichiana* for which I could not locate specimens to authenticate reliable reports are indicated on the map by small dots: Sumter County, Georgia

(Jones and Coile, 1988); Camden, Candler, Pierce and Richmond Counties, Georgia (Bozeman, 1971); Harrison County, Mississippi (Eleuterius and Jones, 1969); and Barnwell and Charleston Counties, South Carolina (Radford et al., 1968). A record from Oglethorpe County, Georgia, in Jones and Coile (1988) is based on an incorrectly identified collection (GA No. 133102). Blomquist (1948) indicated a record of *Aristida stricta* for Pasquotank County, North Carolina. Despite my examination of all of the herbaria Blomquist reported consulting, I have found no specimen to support that record. Because Pasquotank County is located well north of the known range of the species, I have not indicated this record on the map, although appropriate habitat does occur within the county.

The ranges of *Aristida stricta* and *A. beyrichiana* are not only distinct, but clearly separated (Figure 2). Neither species has been found in central South Carolina. The one near intrusion of the range of *A. beyrichiana* into the central part of South Carolina is in Berkeley County, where the species is known only from a single locality from which it appears to have been extirpated. Examinations of likely habitats in central South Carolina, including the sandhills around Columbia and the pine flatwoods of the Francis Marion National Forest nearer the coast failed to locate either species.

Aristida stricta Michx. is almost a North Carolina endemic, occurring only in North Carolina and the northern most counties of South Carolina. In this area the species is particularly common on coarse sands dominated by *Pinus palustris*, both in the fall-line sandhills and on the flatlands of the outer coastal plain (Frost et al., 1986; Peet and Allard, 1993). Examination of the distribution of the southern wiregrass, *Aristida beyrichiana*, shows that in the northeastern portion of its range it is largely concentrated in those counties that contain the dune systems characteristic of the northeast sides of major rivers (e.g., the Savannah and Altamaha Rivers). In the western portion of its range, the species is confined to the southernmost tier of counties along the Gulf of Mexico.

The ranges of the two species that make up the *Aristida stricta*, s.l. complex are not atypical of the ranges of other species of the southeastern pinelands. Indeed, so many species have similar ranges that it seems likely that there were two main centers of persistence of the pineland flora during the last full glacial: one

near but perhaps east of what is now southeastern North Carolina, and another along the Gulf coast. Species with ranges similar to that of *A. stricta*, s.s. and essentially endemic to the pinelands of North Carolina and adjacent South Carolina include *Dionaea muscipula* Ell., *Kalmia cuneata* Michx., *Lysimachia asperulaefolia* Poir., *Lysimachia loomisii* Torr., *Pyxidanthera brevifolia* Wells, *Solidago pulchra* Small, *Solidago verna* M. A. Curtis, *Sporobolus*, sp. nov. (aff. *teretifolius* Harper; a dominant of moist savannas), *Tofieldia glabra* Nutt., *Vaccinium crassifolium* Andr. and *Zenobia pulverulenta* (Bart. ex Willd.) Pollard. In addition, *Calamovilfa brevipilis* (Torr.) Scrib., *Gentiana autumnalis* L. and *Pyxidanthera barbulata* Michx. have similar ranges, but also have disjunct populations in the pine barrens of New Jersey. Among species that, like *Aristida beyrichiana*, have ranges that extend from the Gulf coast north to southernmost South Carolina are *Asclepias cinerea* Walt., *Astragalus villosus* Michx., *Baptisia lanceolata* (Walt.) Ell., *Gaylussacia tomentosa* (Gray) Small, *Gaylussacia mosieri* Small, *Helianthus radula* (Pursh) Torr. & Gray, *Kalmia hirsuta* Walt., *Liatris gracilis* Pursh, *Pinus elliottii* Engelm., *Sabatia bartramii* Wilbur, *Sabatia brevifolia* Raf., *Serenoa repens* (Bartr.) Small, *Sorghastrum secundum* (Ell.) Nash and *Vaccinium myrsinites* Lam.

TAXONOMY

The two taxa included in *Aristida stricta*, s.l. are quite similar and are obviously closely related. Because they are readily and consistently distinguishable morphologically and are geographically separated as well, I have chosen to treat them as separate species.

Michaux's original description of *Aristida stricta* [Fl. Bor. Amer. 1: 41. 1803], reads "A. culmis foliisque stricte erectis: foliis pubescentibus: racemo in spicam longam, angustum, non ita confertam coarctato: aristis gluma longioribus. Obs. Variat foliis planiusculis et convoluto-filiformibus. Hab. in Carolina inferiore." The reference to "foliis pubescentibus" is certainly suggestive of the northern species with its conspicuous pubescence along the back sides of the leaf blades, but the description alone is insufficient to determine definitively which taxon Michaux collected and described.

Although Michaux (1803) reported that his type collection of

Aristida stricta was from "Carolina inferiore," Michaux's annotation on the label reads only "Hab. in Carolina." L. M. C. Richard is widely believed to have anonymously written Michaux's text, some of it after Michaux's death (Hitchcock, 1908; Stafleu and Cowan, 1981; Uttal, 1984) and many of the habitat locations in the text differ from those on the specimen labels. The basis for designating South Carolina rather than simply Carolina as the collection locality in Michaux (1803) remains unclear.

Michaux described in his journal (Sargent, 1889) numerous trips through pine barrens between Charleston, South Carolina, and Charlotte, North Carolina, and along the coast past Wilmington, North Carolina, both areas which today are dominated by the northern *Aristida stricta*. Michaux is also known to have collected widely in the regions where the southern *A. beyrichiana* dominates. In short, it does not appear possible to determine from published records where in the Carolinas Michaux collected his *Aristida stricta*.

The type of *Aristida stricta* is in the Michaux Herbarium at Paris. The Michaux Herbarium contains two specimens labeled *Aristida stricta*. However, only one has the annotation "Hab. in Carolina." As Michaux (1803) reported the type as being from "Carolina inferiore," this specimen appears to be the type, a conclusion also reached by Hitchcock (1908) and Henrard (1928). The specimen is a mixed collection. The larger culm bases have had their inflorescences broken off and appear to represent some species other than *A. stricta* or *A. beyrichiana*. These culm bases have ligules 1.5 to 2.0 mm long, significantly longer than the .02 to .2 mm range normally encountered in *Aristida stricta* and *A. beyrichiana*, and longer than any I observed in the over 650 herbarium specimens I examined. In addition, they differ from both species in that they are almost entirely devoid of indument. However, there are two separate young, sterile culms (with ligules .1 mm long) and several separate but older leaf blades that have the distinctive villous indument ("foliis pubescensibus," Michaux, 1803) along the sides of the midrib that characterize the northern *Aristida stricta*. They also lack the tuft of hairs at the throat and corners of the collar typical of the southern species. Because *Aristida stricta* and *A. beyrichiana* have similar flowers and inflorescences, I cannot be absolutely certain which species the fertile portion of the type collection represents. The combined collection was interpreted as the type by Hitchcock (1908) and

Henrard (1928), but the pubescent foliage is the only portion unambiguously assignable to a single species. Thus, the pubescent young culms and pubescent older foliage on this specimen should probably be taken as the type of *A. stricta*.

The other specimen in the Michaux Herbarium labeled *Aristida stricta* is a flat-bladed species, almost certainly *Aristida purpurascens* Poir. The original Michaux description of *Aristida stricta* has the confusing line "Variat foliis planiusculis et convoluto-filiformibus" which suggests that the description mixes the leaf blade characteristics of the two species represented by the two Michaux Herbarium specimens labeled *Aristida stricta*. The "convoluto-filiformibus" foliage trait (unlike "planiusculis" foliage) is characteristic of a single species in the region, and "foliis pubescensibus" is consistent with that species, which provides further reason to apply the name *A. stricta* to the species with involute, pubescent leaves.

There is a third Michaux collection labeled *Aristida stricta* in the General Herbarium at Paris which has been referred to by Henrard (1928) as an isotype from the Richard Herbarium. This collection is more complete than the collection in the Michaux Herbarium, has conspicuous villous indument along the length of the midvein, and is unambiguously the northern form. My suspicion is that this specimen was also examined when Richard or Michaux wrote the original description of *Aristida stricta* for Michaux's 1803 text, simply because it is the only specimen with all the leaves conspicuously hairy.

In 1849, Trinius and Ruprecht described a new species, *Aristida beyrichiana* Trin. & Rupr. (*Mém. Acad. St. Pétersb.* VI. Sci. Nat. 7(2): 104. 1849), which they recognized as distinct from *Aristida stricta*. However, their description of *A. beyrichiana* has not been adequate for others to make a distinction; as a consequence, all subsequent authors have viewed *A. beyrichiana* as a synonym of *A. stricta*. Further, because the description only addresses the inflorescence, it is not possible to assign the description to either of the taxa recognized in the present paper. In his monograph of North America *Aristida*, Hitchcock (1924) stated that he thought the type of *Aristida beyrichiana* to be an immature *A. stricta*, although he admitted uncertainty. He had examined a fragment of the type in us (No. 81011), but apparently had not seen the holotype in LE. Henrard (1926) reported in his monograph of *Aristida* that "This is a plant with awns not yet fully developed,

but agrees for the rest with *A. stricta* Michx., having the striking villous tuft at the throat of the sheaths," a sure indication that he was examining the southern species.

I have examined the fragment at us (No. 81011), and a Beyrich collection at L (No. 908.83-1016) that Hennard (1926) referred to as an isotype. I found them both consistent with Hennard's description. The villous tufts are present on the us fragment, indicating that it is *Aristida beyrichiana*, although the tufts are smaller than average, and the blades are both a little wider and not quite as closely involute as is normally encountered. However, the L specimen is unambiguously the southern species with villous bearding at the leaf base extending onto the collar, and with typical leaf dimensions. The spikelets on both specimens are, as Hitchcock (1924) and Hennard (1926) reported, not fully mature.

The type locality for *Aristida beyrichiana* remains uncertain, but is probably Georgia. Trinius and Ruprecht reported that the Beyrich specimen they described originated "In pinetis Georgiae et in territorio Arkansas." However, this description may simply represent the general area in which Beyrich collected; he is also known to have collected in both North and South Carolina (Sayre, 1975). Hennard (1926) reported that the label on the type reads simply "Georgia in pinetis (Beyrich)," but this observation almost certainly derives from the label on the putative isotype at L, which it matches exactly.

Virtually all modern descriptions of *Aristida stricta* match the species I call *A. beyrichiana*. For example, Hitchcock (1924, 1935), Hennard (1932), Godfrey and Wooten (1979) and Allred (1986) all make reference to the distinctive villous tuft at the base of the leaf blades as characteristic of the species. Interestingly, Hennard (1932) reported the range of *Aristida stricta* as South Carolina to Florida and Mississippi, exactly the range of *A. beyrichiana*. There are no specimens of *Aristida stricta*, s.s. in the Leiden Herbarium where Hennard worked that are old enough to have been in the collection when he was active. Except for the type in Paris, there is no evidence that Hennard ever examined specimens of the true *A. stricta*.

Trinius and Ruprecht (1849) listed *Aristida lanuginosa* Clarion (Trinius and Ruprecht, Mem. Acad. St. Petersb. VI. Sci. Nat. 4(2): 46. 1838) as a synonym of *A. stricta*. The original 1838 reference contains the name only, and a formal description first appeared in Trinius and Ruprecht (1849) where reference was

made to a specimen in the Mertens Herbarium (LE) with the name *A. lanuginosa* Bosc. (thus the appropriate citation is *A. lanuginosa* Bosc ex Trin. & Rupr.).

Hitchcock (1924) reported that there is a Bosc specimen from South Carolina in the Padua Herbarium labeled *Aristida lanuginosa*, which is really *A. lanosa* Muhl. ex Ell. In 1924, Hitchcock declared *A. lanuginosa* to be a synonym of *A. lanosa*, but there is no evidence that he ever examined the type specimen. Like Hitchcock, Hennard (1927) stated that Bosc's plant is unambiguously the previously described *Aristida lanosa*, a conclusion that probably derives from observation of a Bosc collection in P labeled *A. lanuginosa* (probably an isotype), but which is certainly *A. lanosa*. Thus, it is extremely unlikely that the name *A. lanuginosa* refers to the southern species of *Aristida stricta*, s.l., but if it did it would be the oldest name other than *A. stricta* to be applied to the southern taxon. However, there has been described an *A. lanuginosa* Burch. (Burchell, 1824), which is a later synonym of *A. vestita* Thunb. As the 1824 name is validly published (see Hennard, 1927: 287), *A. lanuginosa* Bosc ex Trin. & Rupr. is a later homonym and could not be applied to the *A. beyrichiana* material, even if the type proved to be this taxon.

KEY AND SPECIES CHARACTERIZATION

Base of blade, collar, and upper sheath lacking a conspicuous tuft or bearding of woolly to villous indument; current-year leaves with villous indument along the sides of the midrib on the lower surface for most of the length of the blade

1. *Aristida stricta*

Base of blade and collar (and often upper sheath) with conspicuous tuft or bearding of woolly to villous indument, always present on current-year foliage but sometimes deciduous on older foliage; leaves usually glabrous above the basal 2 cm of the blade

2. *Aristida beyrichiana*

1. *Aristida stricta* Michaux, Fl. Bor. Amer. 1: 41. 1803. *Chaetaria stricta* (Michx.) Beauv. Ess. Agrost. 30, 152, 158. 1812; not *Aristida stricta* Muhlenberg, Descriptio uberior Graminum. 174. 1817. TYPE: Carolina (HOLOTYPE: P, Michaux Herbarium!; fragment us No. 81246, but insufficient material for determination; ISOTYPE: P, General Herbarium!).

Plants perennial; culms cespitose, erect, 60–120 cm; sheaths glabrous, occasionally with a few prominent hairs at the corners of the collars but typically absent with the collars glabrous; blades closely involute, .3–1.0 mm thick when rolled, to 50 cm long, mostly emerging near base, firm and somewhat flexuous, upper surfaces scabrous with some hairs up to 1.0 mm long, hairs on the upper surface hidden within the rolled leaf or with a few emerging along the lower 5 cm, villous on the lower surface along sides of midrib with hairs .6–1.5 mm (i.e., often over twice the width of the leaf) all along the length of the blade or at least along the lower 20 cm, hairs sometimes deciduous with maturity but always present on young foliage; ligules minute to nearly absent, membrane to .1 mm, lacerate or composed of flat hairs to .1 mm; panicles long and slender, 20–35 cm long, branches appressed, floriferous from the base; glumes somewhat unequal, awns 1.5–2.5 mm, awns usually emerging from bifid tips; first glume 7–10 mm, 1-nerved or with an additional nerve on one side, scaberulous on the keel but otherwise glabrous; second glume 9–12 mm, 1-nerved, glabrous, if scabrous on the keel then only near the summit; lemma 6–9 mm, shorter than the second glume, glabrous except for the densely short-pilose callus, callus .4–.6 mm; awns of lemma 3, somewhat unequal, sharply divergent with maturation, central awn 7–14 mm, lateral awns usually 1–2 mm shorter.

RANGE. Coastal plain of the Carolinas from the Pamlico River on the north to the northern tier of counties in South Carolina.

2. Aristida beyrichiana Trinius & Ruprecht, Mém. Acad. St. Petersb. VI. Sci. Nat. 7(2): 104. 1849. TYPE: Georgia? ("In pinetas Georgiae et in territorio Arkansas.") (HOLOTYPE: LE, Trinius Herbarium, not seen, *fide* Henrard, 1926; fragment us! No. 81011; ISOTYPE: L!, No. 908.83-1016, *see* Henrard, 1926).

Plants perennial; culms cespitose, erect, 40–120 cm; sheaths glabrous except at the summit, copiously to somewhat villous on the upper .5 cm, especially about throat and collar, always with prominent protruding hairs at the corners of the collar; blades closely involute, .3–1.0 mm thick when rolled, to 20–40 cm long, mostly emerging near base, firm and somewhat flexuous, upper surfaces scabrous with few to many hairs protruding near base

up to 1.0 mm, lower surface somewhat to copiously villous to woolly at the base, but usually glabrous beyond the lowest 1–3 cm (at maturity, villous indument is sometimes deciduous, but young culms always possess this woolly tuft), those few plants with indument somewhat persistent along sides of midrib on underside along lower 20–30 cm of blade as in *A. stricta* are always copiously hairy at the bases of blades and on the sheaths, and are woolly to villous around the collars; ligule membrane .05–.3 mm, behind which are often conspicuous hairs; panicles long and slender, 15–30 cm long, branches appressed, floriferous from the base; glumes subequal, with awns 1.5–2.5 mm from bifid tip; first glume 7–10 mm, 1-nerved or with an additional nerve on one side, glabrous on the back but keel scaberulous; second glume 8.5–11 mm, 1-nerved, glabrous, scabrous only on keel or not at all; lemmas 6–8 mm, shorter than the second glume, glabrous except for densely short-pilose callus, callus .4–.6 mm; awns of lemma 3, somewhat unequal, sharply divergent with maturation, central awn 7–14 mm, lateral awns usually 1–2 mm shorter.

RANGE. Southeastern coastal plain from southern South Carolina south to Dade County, Florida, and west along the coastal counties to at least Jackson County, Mississippi.

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Hitchcock 1924 as 1836 2(1), and Stafleu and Cowan as 1836 3(2). The pagination is consistent with 4(2).]

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ADDENDUM: R.K. Peet. 1993. A taxonomic study of *Aristida stricta* and *Aristida beyrichiana*. *Rhodora* 95(881):25-37.

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I have discovered an additional isotype of *Aristida beyrichiana* Trinius & Ruprecht held at MO (2874410). The label includes the specific date and location of the collection, information lacking on the labels of the other known type material. The specimen comes from the Bernhardi Herbarium (see D'Arcy 1971) and is mounted together with a collection of *Aristida stricta* Michaux, apparently collected by Nuttall. The label includes the initials CB, and J.M. Greenman annotated the collection as that of Charles Beyrich. This Beyrich collection has the same degree of spikelet immaturity as the isotypes in L and US. The label reads "6/1 33", which is consistent with the fact that Beyrich collected in the southeastern states only in 1833 (Sayre 1975), and the June 1 date is consistent with the immaturity of the spikelets. The label indicates that the collection is from the area near Ebenezer. Presumably this is the Ebenezer located in Effingham County, Georgia, approximately 25 miles north of Savannah. The isotype in L indicates the type collection is from Georgia. Ebenezer, while already a declining town in 1854 (Baldwin and Thomas), is one of the oldest villages in Georgia and, being on the main route of travel up the Savannah River, was visited by traveling botanists such as William Bartram (Harper 1968). *Aristida beyrichiana* is known for Effingham County Georgia (EHCV 571). There was in the early 1800's another village of Ebenezer, Georgia in Morgan County (Baldwin and Thomas), but this location is out of the range of *A. beyrichiana* and is much less likely to have been visited by Beyrich.

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