

STATUS OF *ARISTIDA* (POACEAE) IN PUERTO RICO AND THE VIRGIN ISLANDS

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ABSTRACT

Seven species of *Aristida* (POACEAE) are known from Puerto Rico and the Virgin Islands: *A. spiciformis* Elliott, *A. chaseae* Hitchcock, *A. portoricensis* Pilger, *A. adscensionis* L., *A. suringarii* Henrard, *A. cognata* Trin. et Rupr., and *A. refracta* Griseb. *Aristida chaseae*, previously known only from the type collection, was rediscovered and *Aristida portoricensis* was found in new localities. *Aristida suringarii* previously unknown for Puerto Rico, is reported from Mona Island. The two endemic, potentially threatened species may benefit from management practices. A key and illustrations are provided for all species.

RESUMEN

Se conocen siete especies del género *Aristida* (Poaceae) originarias de Puerto Rico y de las Islas Vírgenes: *A. spiciformis* Elliott, *A. chaseae* Hitchcock, *A. portoricensis* Pilger, *A. adscensionis* L., *A. suringarii* Henrard, *A. cognata* Trin. et Rupr., and *A. refracta* Griseb. Se descubrió nuevamente a *Aristida chaseae*, conocida anteriormente sólo a partir de colección tipo, y se encontró a *Aristida portoricensis* en nuevos lugares. En el presente trabajo, se informa sobre la existencia en la Isla Mona de *Aristida suringarii*, antes desconocida para Puerto Rico. Las prácticas de manejo que se recomiendan en este artículo podrían beneficiar a las dos especies endémicas potencialmente amenazadas. Se incluyen una clave e ilustraciones para todas las especies.

The genus *Aristida* L. is represented in the West Indies by 26 species, which along with other Caribbean species, have been the subject of little taxonomic investigation except for work by Hitchcock (1924, 1935, 1936: 87–98), Henrard (1926, 1927, 1928, 1929, 1932), Lindeman & Stoffers

(1963: 135 – 139), and Catasus (1985). The purpose of this study is to evaluate the status of representatives of the genus in Puerto Rico and the Virgin Islands, to update geographic distributions, to stress additional criteria which could be useful in identification, to suggest management and conservation measures for endemic or rare species, and to make recommendations for additional studies.

Species in the genus *Aristida* are generally erect, annual or perennial bunch grasses that lack rhizomes or stolons and have wiry culms and blades (Hitchcock 1924:517, Gould 1968:298). Inflorescences usually are open or contracted panicles of single-flowered spikelets, each with a pair of narrow, lanceolate, acute, acuminate, or awn-tipped glumes and an indurate lemma. The lemmas are usually terete, convolute around the palea, 3-nerved, with a hard, sharp-pointed, minutely bearded callus at the base, and tapering above to an awn column bearing usually three stiff awns. In some African species the awns are plumose and feathery (Hitchcock 1924:515, Gould 1968:298). The awns and sharp, bearded callus aid in dissemination of fruit (Hitchcock 1924:517, Chase 1951:462). Species found in tropical and subtropical regions apparently flower and fruit throughout the year.

The genus has a worldwide distribution, with the majority of species occurring in subtropical and tropical regions of the world (Henrard 1929:24 – 30, Lindeman & Stoffers 1963:135, Gould 1975:382). Species in the genus are usually found on semiarid or arid habitats, and on dry, sterile soils (Radford et al. 1968:97, Gould 1968:299, Correll & Correll 1982:96). Estimates of the number of species in the genus range from 200 (Gould 1968:298) to 400 (Lindeman & Stoffers 1963:135). The greatest number of species apparently occurs in Africa (Gould 1968:298). Due to the pattern of variability within and among species, certain complexes present numerous taxonomic problems (Allred 1984a, 1984b, 1985, 1986, Catasus 1985).

The genus is represented in Puerto Rico and the Virgin Islands by seven species: *A. spiciformis* Elliott, *A. chaseae* Hitchcock, *A. portoricensis* Pilger, *A. adscensionis* L., *A. suringarii* Henrard, *A. cognata* Trin. et Rupr., and *A. refracta* Griseb., (Britton & Wilson 1924:62 – 63, Henrard 1932:209, 224, 253, 284, 313 – 314, 322; Hitchcock 1924, 1935, 1936:87 – 98, Lindeman & Stoffers 1963:135 – 139, Liogier & Martorell 1982:194). Because thorough descriptions for these species are given in Hitchcock (1924:543, 552 – 553, 575 – 577, 585; 1935:387, 391, 400 – 401, 405 – 406, 1936:87 – 98), Henrard (1926:8 – 9, 89 – 90, 104 – 106; 1927:461 – 463; 1928:505 – 507, 583 – 585, 616 – 618; 1932:208 – 209, 223 – 224, 252 – 253, 283 – 284, 313 – 314, 321 – 322), and

Lindeman & Stoffers (1963:135 – 139), we did not repeat the information here. Table 1, however, provides a convenient means of comparing diagnostic features for the species under consideration. Because specimens from Puerto Rico and the Virgin Islands were lacking for some species, we examined additional material from other locations in the West Indies.

KEY TO THE SPECIES OF *ARISTIDA* IN PUERTO RICO AND THE VIRGIN ISLANDS

- 1a. Column/beak of lemma 6 – 30 mm long, beak strongly twisted; awns of glumes 4 – 12 mm long 1. *A. spiciformis*
- 1b. Column/beak of lemma < 6 mm long, beak not strongly twisted; awns of glumes < 1 mm long 2
- 2a. Lemma awns 20 – 30 mm long 3
- 3a. Panicles contracted with appressed branches; lateral culms spreading and often horizontal to the ground; blades at base flat (usually > 2 mm wide); awns ascending 2. *A. chaseae*
- 3b. Panicles open or loose with ascending branches; lateral culms erect; blades conspicuously involute (usually < 1.5 mm wide); awns ascending to nearly horizontally spreading 3. *A. portoricensis*
- 2b. Lemma awns (8) 10 – 15 (rarely to 23) mm long 4
- 4a. Blades without long villous hairs at throat (sheath apex) and/or upper surface near base; lemma lacking a beak and often flattened near the apex; plants annuals or occasionally short-lived perennials ... 4. *A. adscensionis*
- 4b. Blades with long villous hairs at throat (sheath apex) and/or upper surface near base; lemma with a beak (scarcely so in *A. refracta*) and terete near the apex and tapering to a gradual point; plants perennial 5
- 5a. First glume longer than the second glume 5. *A. suringarii*
- 5b. First glume shorter than the second glume 6
- 6a. Lemma (5.2) 5.5 – 7.0 (7.5) mm long, distinctly beaked; blades of dried specimens involute to flat at base (0.4 – 1.5 mm wide); internodes 1 – 7 cm long, elongated; culms branched, geniculate at base; second glume (5.5) 7.2 – 8.0 (8.3) mm long; lemma awns of mature specimens straight, ascending 6. *A. cognata*
- 6b. Lemma (3.8) 4 – 5 (6) mm long, scarcely beaked; blades of dried specimens filiform at base (0.2 – 0.3 mm wide); internodes < 0.5 cm long, congested at base, giving the plant the appearance of having a conspicuous, basal tuft of leaves; culms sparingly branched, not geniculate at base; second glume (3.5) 5.2 – 6.0 (6.9) mm long; lemma awns of mature specimens often spirally contorted 7. *A. refracta*

1. *ARISTIDA SPICIFORMIS* Elliott. Sketch Bot. S. Carolina. 1: 141. 1816.
TYPE: SOUTH CAROLINA, presumably near Charleston (Hitchcock 1924:552),
Combs and Baker 1115 (HOLOTYPE: CHARL).

Aristida stricta Muhl. Descr. Gram. 174. 1817. Not *A. stricta* Michx. 1803. "Habitat in Georgia" (Hitchcock 1924:552).

Species	Habit	Culms	Sheaths	Leaf Blades	Inflorescence	Glumes	Lemmas	Lemma Awns
<i>A. spiciformis</i>	tufted, cespitose perennial	strictly erect, unbranched	apices glabrous	flat to involute, scabrous adaxially	spiciform with short appressed branches, twisted	long awned, 2nd 4-6 mm longer than 1st	twisted, with .7-3 cm long column	2-3 cm long, slightly twisted
<i>A. chaseae</i>	tufted, cespitose perennial	frequently branched, reclining horizontally	apices villous	flat to involute, villous adaxially	contracted with appressed branches	about equal in length	terete, scarcely beaked	ca. 2-3 cm long, straight, divergent
<i>A. portoricensis</i>	tufted, cespitose perennial	erect, sparingly branched	apices with a few long hairs	involute, with a few long hairs adaxially	loose, open, with stiffly ascending branches	2nd 1-3 mm longer than 1st	terete, distinctly beaked	2-3 cm long, divergent or horizontally spreading
<i>A. adscensionis</i>	annual or short-lived perennial	branched and often geniculate basally	apices glabrous	flat to involute, glabrous adaxially	narrow, erect or slightly drooping	2nd 2-4 mm longer than 1st	lacking a distinct beak, apex flattened	10-15 mm long, straight, divergent
<i>A. suringarii</i>	tufted, cespitose perennial	frequently branched	apices long-bearded	involute to flat, villous adaxially	narrow with erect or ascending branches	1st 1.5-2.5 mm longer than 2nd	terete, distinctly beaked	1.5-2.5 cm long, straight, divergent
<i>A. cognata</i>	laxly cespitose perennial	frequently branched	apices villous	involute to flat, villous adaxially	narrow with ascending branches	2nd 1-2 mm longer than 1st	terete, distinctly beaked	10-15 mm long, straight, ascending
<i>A. refracta</i>	densely tufted perennial	erect, sparingly branched	apices long-bearded	involute to filiform, with a few long hairs adaxially	narrow, lax with ascending branches	2nd 1-2 mm longer than 1st	terete, scarcely beaked	ca. 1 cm long, often spirally contorted

TABLE 1. Comparison of diagnostic features of Puerto Rican and Virgin Island aristas.

Aristida squarrosa Trin. in Spreng. Neu. Entd. 2: 62. 1821. "Habitat in America boreali" (HOLOTYPE: Trinius Herbarium) (Hitchcock 1924:552). *Chaetaria squarrosa* Schult. Mant. 3: 577. 1827. Based on *Aristida squarrosa* Trin.

Aristida spiciformis (Fig. 1) is known from the southern United States, Cuba, Puerto Rico (Hitchcock 1924:553, 1935:391, 1936:90), and Brazil (Henrard 1932:224). It occurs in "sandy barrens in thickets or pine woods" (Hitchcock 1936:90), or "wet pine barrens" (Henrard 1928:583). In Puerto Rico, this species is known only from white sand near Campo Alegre (Britton & Wilson 1924:62, Liogier & Martorell 1982:194), a locality now probably destroyed by urban development, and Laguna Tortuguero.

Because of its restricted range and habitat, the conspicuous long, twisted lemma beak (Fig. 1c), and the long-awned glumes (Fig. 1b), this species should not be confused with any other species of *Aristida* in Puerto Rico.

Specimens examined: PUERTO RICO. Campo Alegre: 25 Nov 1913, Chase 6614 (US) (Amer. Gr. Nat. Herb. 765). Laguna Tortuguero: 13 Mar 1980, Gould 15712 (UPR); 1 Sep 1983, Proctor 39475 (SJ); 8 Nov 1983, Liogier 34604 (UPR); 15 Oct 1987, McKenzie 771 (FLAS, LSU, MO, NMCR, US).

CUBA. Province: Pinar del Rio- Colma road: 5 Jan 1940, Leon & Alain 17454 (US); 28 Nov 1940, Leon & Alain 19402 (US). Santa Barbara: 29 Oct 1920, Ekman 11971 (US). Pinar del Rio City: 28 Oct 1923, Ekman 17811 (US). Sabalo: 22 Jun 1920, Ekman 11422 (US). La Maquina: 28 Nov 1940, Leon 19402 (US). Isle of Pines- Los Indios: 13 Feb 1916, Britton et al. 14198 (US).

2. *ARISTIDA CHASEAE* Hitchcock, Contr. U.S. Natl. Herb. 22: 575. 1924.

TYPE: PUERTO RICO. BOQUERON, 12 Nov 1913, Chase 6507 (HOLOTYPE: US! Hrbr. nr. 732548, as photograph LSU!; ISOTYPE: L- Henrard 1926:90).

Aristida chaseae (Fig. 2) is endemic to Puerto Rico and was previously known only from open, stony ground at Boqueron (Henrard 1926:90, Hitchcock 1924:576, 1935:401, 1936:94, Liogier & Martorell 1982:194), until it was rediscovered by McKenzie on 29 March 1987, along a sandy trail of the Cabo Rojo National Wildlife Refuge, near Corozo, ca. 8 km south of the type locality (McKenzie 581 LSU, US). Other voucher specimens from this location include: (McKenzie 723 FLAS, LSU, MO, NMCR, SJ, TAES, UPR, US; Proctor 43816 IJ, NY, SJ, US). On 20 September 1987, McKenzie and Proctor discovered a third population of the species on the upper slopes of Cerro Mariquita of the eastern end of the Sierra Bermeja Range in southwestern Puerto Rico. Because specimens in this population were old and in poor condition, no voucher specimens were taken until later trips (11 November & 5 December 1987) when the plants had flowered (McKenzie 816 LSU, NMCR, SJ, UPR, US; McKenzie 832

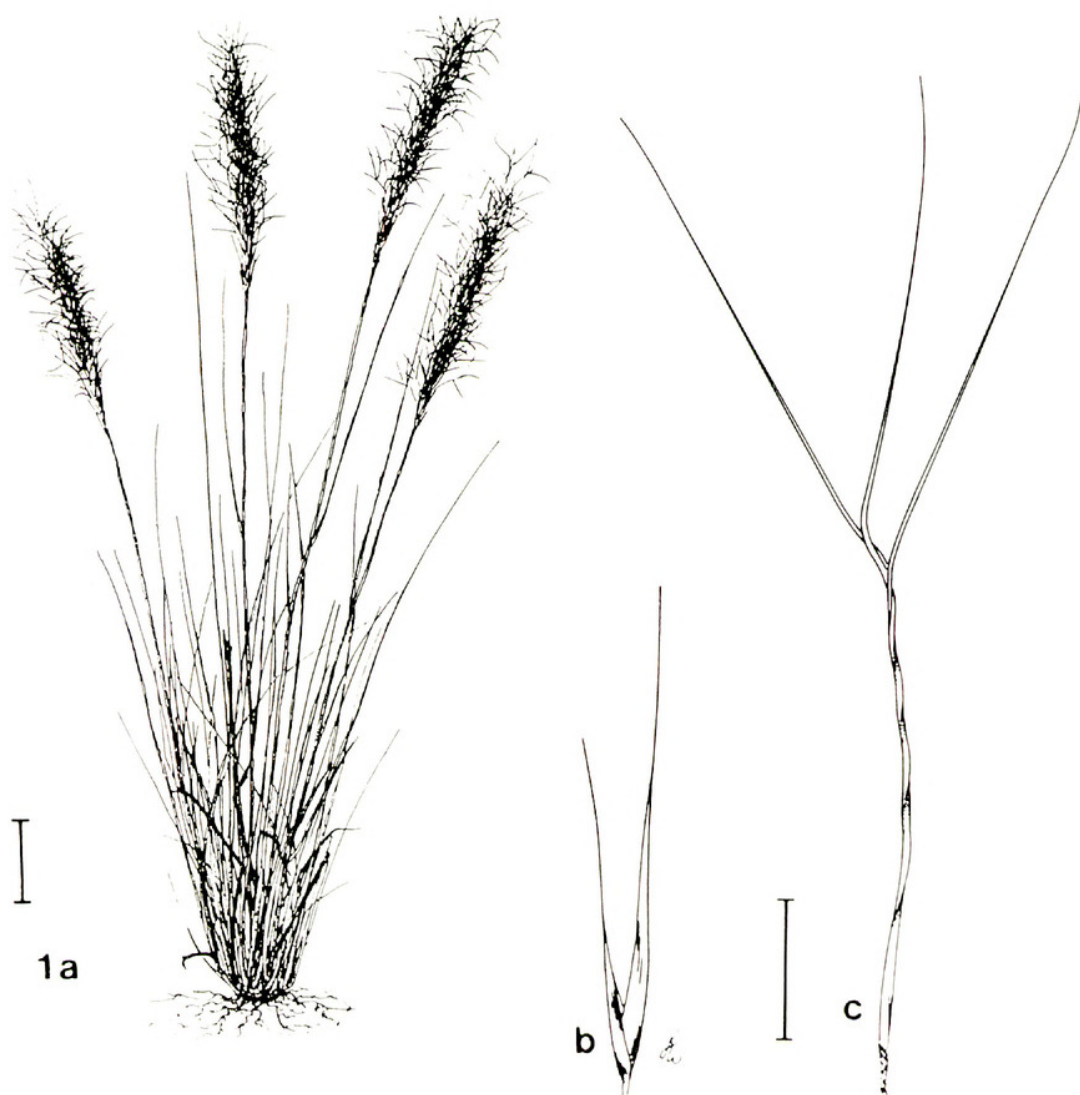


FIG. 1. *Aristida spiciformis* Elliott: a. habit (scale: 4 cm); b. first and second glume; c. lemma, callus, and lemma awns (scale for b & c: 5 mm).

FLAS, LSU, MO, NMCR, SJ, TAES, UPR, US). At this site the grass was growing in an open, rocky habitat similar to that of Chase's original locality. On 28 August and 3 September 1988, McKenzie discovered *A. chaseae* on the upper slopes of ridges of the western end of the Sierra Bermeja (McKenzie 1003 LSU, SJ, US; McKenzie 1008 LSU, NMCR, US). The grass was growing on exposed rocky outcrops and openings, usually between 150 and 200 m.

Aristida chaseae is a densely cespitose perennial that has glumes, lemmas and awns similar in length to those of *A. portoricensis*, with which it often associates on the Sierra Bermeja. *Aristida chaseae* can easily be separated

from *A. portoricensis* by its contracted panicles with appressed branches, its fewer flowering culms, the often spreading and horizontally reclining nature of the lateral culms, its wider blades, and its ascending awns (Figs. 2a, 2c, 2d). In the presence of long, scattered, villous hairs on the upper surface of the leaf blades near the base (Fig. 2d), *A. chaseae* resembles *A. cognata* and *A. suringarii*. *Aristida chaseae*, however, can be differentiated from the other two species by its longer lemmas and lemma awns (Figs. 2b, 2c). Although some spikelets of *A. chaseae* have glumes where the first glume is longer than the second (Fig. 2b), the majority have either equal glumes or the second glume is longer than the first. The second glume of *A. suringarii* is always conspicuously shorter than the first glume.

We disagree with Hitchcock's (1924:576) and Henrard's (1926:90) suggestion that *A. chaseae* is similar in habit to *A. cognata*. *Aristida chaseae* differs from *A. cognata* by having more contracted panicles with appressed branches and by the often spreading and horizontally reclining nature of the culms (Fig. 2a). The habit, narrow panicles with appressed branches, and glume and lemma lengths, leads us to believe that *A. chaseae* has closer affinities with *A. erecta* Hitchc. of Cuba. *Aristida chaseae* differs from *A. erecta* in having thinner culms, shorter and narrower leaf blades that are adaxially villous near the base, longer lemma calluses, and equal awn lengths. In Hitchcock's keys (1924:532, 1936:88), *A. chaseae* is separated from other species in the West Indies in having awns of the lemma "not conspicuously contorted at the base at maturity," and by having "involute" blades. We have observed, however, that the awns are contorted in very old plants at Cerro Mariquita. Additionally, we have noted that although the blades of *A. chaseae* are involute on herbarium specimens, the blades of live specimens are conspicuously flat during periods of sufficient rain. On the Sierra Bermeja, due to the poorer condition of the soil, plants of *A. chaseae* are not as robust as plants found in deep sand on the Cabo Rojo National Wildlife Refuge.

Additional specimens examined : PUERTO RICO. Cabo Rojo National Wildlife Refuge: 29 Mar 1987, *McKenzie* 581 (LSU, US); 2 Sep 1987, *McKenzie* 723 (FLAS, LSU, MO, NMCR, SJ, TAES, UPR, US); *Proctor* 43816 (IJ, NY, SJ, US). Cerro Mariquita: 22 Nov 1987, *McKenzie* 816 (LSU, NMCR, SJ, UPR, US); 5 Dec 1987, *McKenzie* 832 (FLAS, LSU, MO, NMCR, SJ, TAES, UPR, US). Sierra Bermeja- western ridges: 28 Aug 1988, *McKenzie* 1003 (LSU, SJ, US); 3 Sep 1988, *McKenzie* 1008 (LSU, SJ, US).

3. *ARISTIDA PORTORICENSIS* Pilger in Urban, Symb. Antill. 4: 100. 1903. TYPE: PUERTO RICO. Monte Mesa, Mayaguez, 24 Oct 1884, *Sintenis* 77 (HOLOTYPE: B, destroyed; photograph of holotype: US!, as photograph LSU!; ISOTYPE: US! Hrbr. nr. 820706, as photograph LSU!).

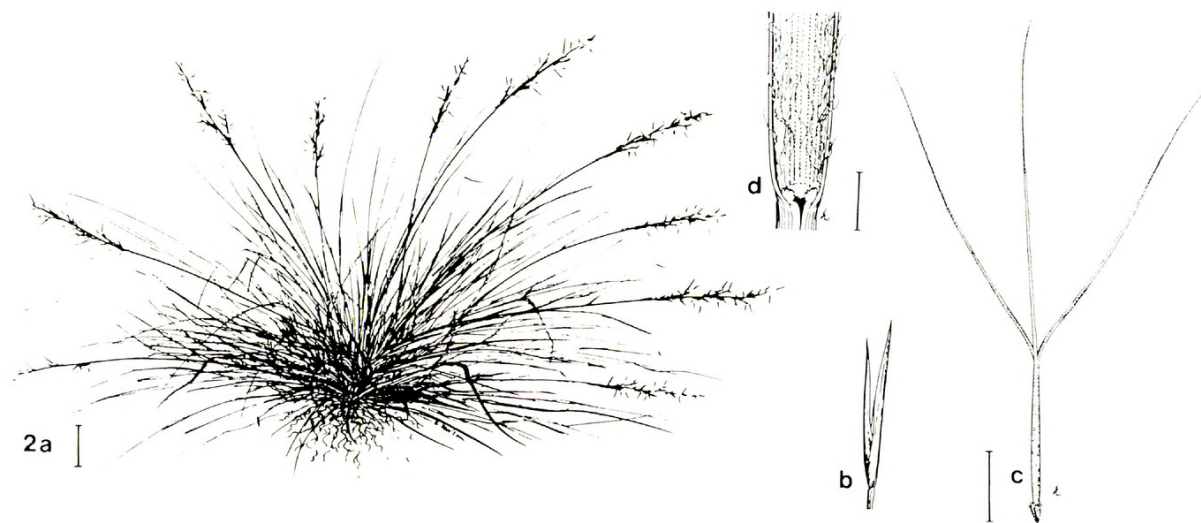


FIG. 2. *Aristida chaseae* Hitchcock: a. habit (scale: 7 cm); b. first and second glume; c. lemma, callus, and lemma awns (scale for b & c: 5 mm); d. ligule and base of upper surface of leaf blade (scale: 2 mm).

Aristida portoricensis (Fig. 3) is endemic to Puerto Rico and was previously known only from red clay slopes on Cerro Las Mesas at Mayaguez (Hitchcock 1924:575, 1935:400, 1936:94, Henrard 1927:463, Liogier & Martorell 1982:194) and Hormiguero (pers. comm., Susan Silander, Botanist, United States Fish and Wildlife Service, Caribbean Field Office, Boqueron, Puerto Rico, 1987), and serpentine banks at Guanajibo, Puerto Rico (Britton & Wilson 1924:62, Liogier & Martorell 1982:194). On 20 September 1987, McKenzie and Proctor discovered a population of this species on the upper slopes of Cerro Mariquita of the eastern Sierra Bermeja (McKenzie 739 LSU; Proctor 43948 SJ). The species was growing on exposed rock crevices, often in association with *A. chaseae* and *Digitaria eggersii* (Hack.) Henrard (McKenzie et al. 1989a). Additional voucher specimens were taken at this locality on subsequent dates (McKenzie 817 FLAS, LSU, MO, NMCR, SJ, TAES, US; McKenzie 833 FLAS, LSU, MO, NMCR, SJ, TAES, UPR, US; Proctor 44211 SJ). On 28 August and 3 September 1988, McKenzie discovered *A. portoricensis* on the upper slopes of ridges of the western end of the Sierra Bermeja (McKenzie 1004 LSU, SJ; McKenzie 1009 LSU). The species was growing on exposed rocky outcrops and openings, usually between 180 and 200 m.

As already discussed with respect to awn and glume length, this species is similar to *A. chaseae*, but can be readily identified by its open or loose panicles, its erect lateral culms, its narrower blades, and its ascending to nearly horizontally spreading awns (Figs. 3a, 3b, 3c).

Additional specimens examined: PUERTO RICO. Cerro Las Mesas: 8 Apr 1938, Otero & Alvarez 544 (UPR); 20 Nov 1938, Molinari 301 (UPR); 25 Mar 1980, Gould 15823, 15835 (UPR); 10 Oct 1986, Proctor 42290 (SJ); 15 Jun 1987, McKenzie 635 (FLAS, LSU, MO, NMCR, US); 10 Nov 1987, Proctor 44170 (SJ). Guanajibo: 18 Feb 1915, Britton et al. 4361 (LSU). Cerro Mariquita: 20 Sep 1987, McKenzie 739 (LSU), Proctor 43948 (SJ); 22 Nov 1987, McKenzie 817 (FLAS, LSU, MO, NMCR, SJ, TAES, US), Proctor 44211 (SJ); 5 Dec 1987, McKenzie 833 (FLAS, LSU, MO, NMCR, SJ, TAES, UPR, US). Sierra Bermeja- western ridges: 28 Aug 1988, McKenzie 1004 (LSU, SJ); 3 Sep 1988, McKenzie 1009 (LSU).

4. *ARISTIDA ADSCENSIONIS* L. Sp. Pl. 82. 1753. TYPE: "In Insula Adscensionis," Earle 559 (HOLOTYPE: Linnaean Herbarium, LSU microfiche nr. 2(73)-98.1!).

Aristida maritima Steud. Syn. Pl. Glum. 1: 137. 1854. TYPE: "In martimis Guadeloupe." (HOLOTYPE: P).

Aristida debilis Mez, Repert. Sp. Nov. Fedde. 17: 151. 1921. "Venezuela (Mortiz); Jamaica (MacNab)". Hitchcock (1924:543) and Henrard (1926:132-133) are in disagreement on which collection should be taken as the type for *A. debilis*.

Aristida adscensionis L. var. *typica* Stapf. O. Stapf in J. D. Hooker, Flora of British India, Vol. VII. 1897:224.

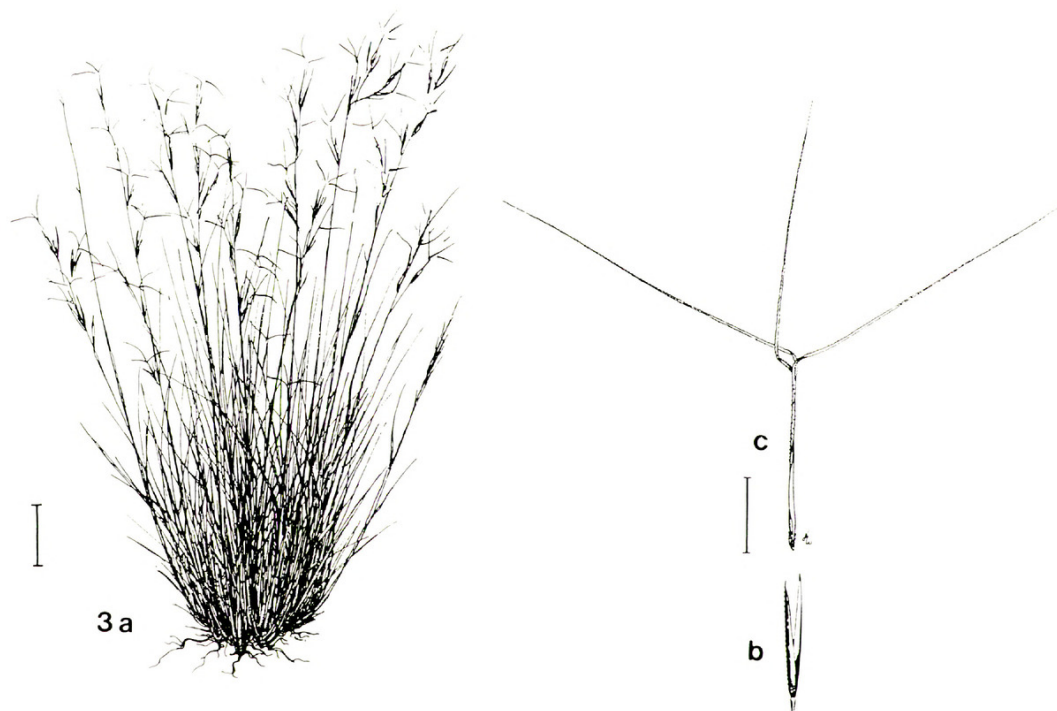


FIG. 3. *Aristida portoricensis* Pilger: a. habit (scale: 4 cm); b. first and second glume; c. lemma, callus, and lemma awns (scale for b & c: 5 mm).

Aristida bromoides H.B.K. Nov. Gen. & Sp. 1:122. 1815. For a more complete discussion on the synonymy of this species see Hitchcock (1924:541–543, 1935:386–387).

Aristida adscensionis is a weedy species, occupying dry ground and waste places, and is widely distributed throughout the warmer parts of America and the Old World (Hitchcock 1924:543, 1935:387, 1936:89, Henrard 1932:322, Correll & Correll 1982:98). The species is apparently common in the southwestern districts of Puerto Rico and throughout the Virgin Islands (Hitchcock 1936:89, Lindeman & Stoffers 1963:136, Correll & Correll 1982:98, Liogier & Martorell 1982:194).

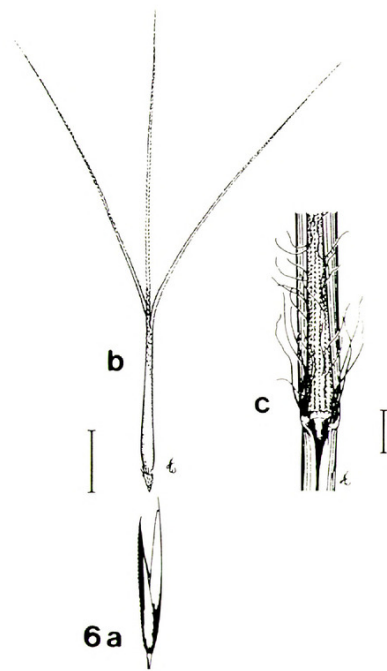
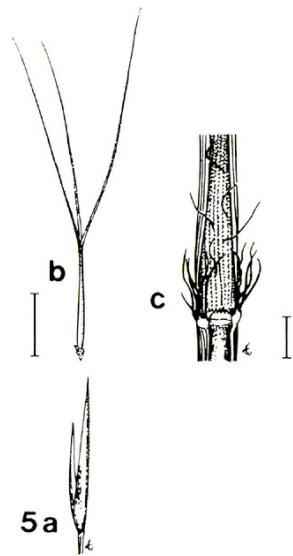
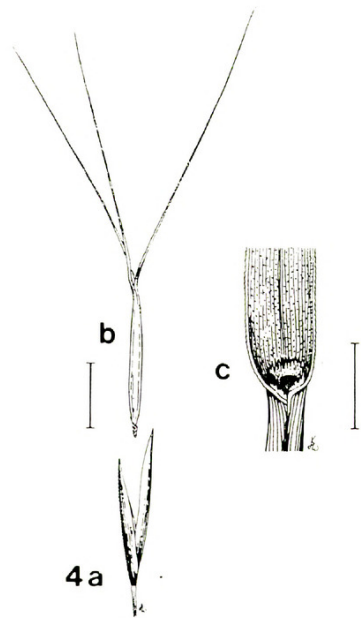
This is a highly variable species, ranging from small plants with short, involute blades and erect 5–10 cm long panicles, to large plants with long (up to 10 cm), sometimes flat (to 2 mm wide) blades, and open or loose, somewhat drooping (to 15 cm long) panicles (Hitchcock 1924:543, 1935:387, Henrard 1932:322). In awn and callus length (Figs. 4b), larger individuals of this species with open or loose, drooping panicles resemble *A. cognata* or *A. suringarii*. *Aristida adscensionis*, however, lacks the long villous hairs on the throat (sheath apex) and upper surface of the leaf blades near the base (Fig. 4c). It is a weedy annual or occasionally a short lived perennial, and the lemmas lack a beak and are often flattened near the apex.

Specimens examined. Unless stated otherwise, specimen citations are US. PUERTO RICO. Boqueron: 12 Nov 1913, Chase 6506, 6510. Guanica: 25 Jan 1886, Sinenis 3438; 13 Feb 1886, Sinenis 3766; 8 Apr 1936, Velez 747 (LSU); 17 Nov 1954, Schubert et al. 371; 7 Sep 1979, del Llano et al. s.n. (UPR); 26 Sep 1979, A. Liogier et al. 29512 (UPR); 9 Nov 1982, A. Liogier et al. 33630, 33683 (UPR); 11 Dec 1985, A. Liogier et al. 35794 (UPR). Desecheo Island: 5 Apr 1967, Woodbury & Martorell D-99 (UPR); 13 Jul 1968, Woodbury & Martorell D-65 (UPR); 27 Jun 1986, McKenzie 319 (LSU, NMCR). Pole Ojea: 7 Jul 1987, McKenzie 693 (FLAS, LSU, MO, NMCR, US); 4 Dec 1987, Proctor 44259 (SJ). Salinas de Cabo Rojo: 14 Feb 1885, Sinenis 553. Southern dry coast: 20 Dec 1938, Velez 1376. La Parguera: 21 Oct 1987, McKenzie 778 (FLAS, LSU, MO, NMCR, US). Sierra Bermeja- western ridges: 28 Aug 1988, McKenzie 1005 (LSU, NMCR, US). El Tuque: 18 Nov 1980, A. Liogier et al. 31204 (UPR). Mona Island: 24 Feb 1914, Hess 437; 22–24 Feb 1968, Woodbury et al. M-10 (UPR); 20 Jul 1944, Chardon et al. 818 (UPR).

ST. CROIX. New Fort: 11 Nov 1895, Ricksecker 64. Frederiksted: 1 Feb 1913, Rose et al. 3211. Anna's Hope: 10 May 1923, Thompson 28 (UPR). Without locality: 9 Oct 1921, Thompson 22; Feb 1941, Molinari 300 (UPR); Jun 1942, Molinari 299 (UPR).

CUBA. Province: Oriente- Santiago: 11 Aug 1951, Webster 4055. Guantamamo: 28 Jul 1951, Webster 3951. Between Maria Pilar and the mouth of Rio Bacuranao: 6 Nov 1916, Ekman 8248. Caimanera: Nov 1920, Hioram 1263.

JAMAICA. Flamstead: 26 Nov 1912, Harris 11474. St. Andrew: 12 Jan 1912, Harris 11480. Park Camp: 9 Dec 1912, Harris 11500. Gordon Town: 8 Dec 1912, Harris 11513. Kingston: 28–29 Feb 1908, Britton & Hollick 1746; 18 Nov 1916, Harris 12452. Haiti. Fort National: 1 Apr 1920, Leonard 3451; 22 May 1929, Leonard & Leonard 15878, 15881. Cal de Lai: Aug 1921, Buch 2041. Matheux: 18 Jul 1924, Ekman 960. Cabaret: 12 Jan 1929, Leonard & Leonard 11852; 13 Jan 1929, Leonard & Leonard 11863; 14 Jan



1929, *Leonard & Leonard* 11960. **Jean Rabel:** 6 Feb 1929, *Leonard & Leonard* 12968. **Mole St. Nicolas:** 17 Feb 1929, *Leonard & Leonard* 13343. **Port au Prince:** 3 Jul 14 1941, *Bartlett* 17488; 26 Sep 1950, *Anderson* 1309.

DOMINICAN REPUBLIC. **Province Monte Cristi- Guayubin:** 17 Feb 1921, *Abbott* 955. **Parole:** 29 Jan 1949, *Jimenez* 1803. **El Morro:** 2 Feb 1958, *Jimenez* 3622. **Province Valverde:** 7 Mar 1929, *Ekman* 13096; 19 Aug 1959, *Jimenez* 4085. **Province Barahona:** 17 Aug 1946, *Howard & Howard* 8406. **Province Azua:** 29 Aug 1946, *Howard & Howard* 8637.

BAHAMAS. **Fortune Island (Long Cay):** Nov 1890, *Hitchcock s.n.*; 7 – 17 Dec 1905, *Brace* 4077; 16 – 19 Mar 1907, *Britton & Millspaugh* 6309. **Crooked Island:** 9 – 23 Jan 1906, *Brace* 4633. **South Caicos:** 9 Jul 1954, *Proctor* 9133; 11 Feb 1978, *Correll* 49447. **Great Inagua:** 4 Mar 1974, *Correll* 41806 (GH, FTG); 20 Jul 1976, *Correll* 47422 (FTG). **Grand Turk, Waterloo:** 28 Nov 1977, *Correll* 49214. **Hog Cay:** 19 Jan 1979, *Correll & Correll* 50430 (FTG). **Guadeloupe:** 1892, *Duss* 3159; 5 Mar 1941, *Desirade* 4854. **St. Bartholomew:** 30 Jun 1938, *Gastavia* 336. **Antigua:** 11 Jan 1932, Box 127; Mar 1937, Box 555. **Montserrat:** 19 Jan 1907, *Shafer* 18. **Saba Island:** 29 Jan 1947, *Arnoldo* 909.

5. *ARISTIDA SURINGARII* Henrard. Meded. Rijksherb. Leiden 54B: 616.

1928. TYPE: St. Eustatius, Sargarloaf, 11 May 1885, *Suringar s.n.* [HOLOTYPE: L!, Herb. Lugd. Batav. No. 908.84-1084, Rijksherbarium no. L. 8612 No. 3, as photograph LSU!; PARATYPE: St. Eustatius, White Wall, 15 April 1885, *Suringar s.n.* (L!), Herb. Lugd. Batav. No. 908.84-1043, Rijksherbarium no. L. 8612 No. 2, as photograph LSU!].

Aristida suringarii extends from St. Croix and St. Thomas through the Netherlands Antilles (Henrard 1932:253, Lindeman & Stoffers 1963:138), to Venezuela (State of Sucre, near Quetepe, east of Cumana, 23 May 1945, *Julian A. Steyermark* 62879 US, hrbr. nr. 1869685). The only record of *A. suringarii* for Puerto Rico is a specimen collected from a limestone plateau on Mona Island, 3 March 1944, by C.E. Chardon and J.I. Otero (*Chardon & Otero* 819 UPR). This specimen, however, was previously identified erroneously as *A. adscensionis* (Woodbury et al. 1977:13, McKenzie et al. 1989b). Lindeman & Stoffers (1963:138) described the habitat for *A. suringarii* as “rocky and open grounds.”

In its habit and the presence of scattered, long, white hairs at the base of the upper surface of the leaf blade (Fig. 5c), *A. suringarii* is similar to *A. cognata* and *A. chaseae*. Additionally, the awn and lemma lengths (Fig. 5b)

FIG. 4. *Aristida adscensionis* L.: a. first and second glume; b. lemma, callus, and lemma awns (scale for a & b: 3 mm); c. ligule and base of upper surface of leaf blade (scale: 1 mm).

FIG. 5. *Aristida suringarii* Henrard: a. first and second glume; b. lemma, callus, and lemma awns (scale for a & b: 3 mm); c. ligule and base of upper surface of leaf blade (scale: 1 mm).

FIG. 6. *Aristida cognata* Trin. et Rupr.: a. first and second glume; b. lemma, callus, and lemma awns (scale for a & b: 3 mm); c. ligule and base of upper surface of leaf blade (scale: 1 mm).

of the spikelets of *A. suringarii* are similar to those of *A. cognata*. It can be readily distinguished from *A. cognata*, however, by the inverse position of the glumes (i.e., the first glume is ca. 1–2 mm longer than the second: Fig. 5a). In *A. cognata*, the second glume is ca. 1–2 mm longer than the first (Fig. 6a). *Aristida suringarii* can be differentiated from *A. chaseae* by the much shorter lemmas and lemma awns (Fig. 5b), by its more open panicles with diffuse branches, and its lack of spreading and horizontally reclining lateral culms. With its inverse glume position, *A. suringarii* resembles *A. arubensis* Henrard of Aruba and Curacao. That entity, however, has much shorter, unbranched culms, longer awns, and reportedly longer glumes [first glume 11–12 mm long; second glume 8 mm long: Henrard (1926:41, 1932:253), Lindeman & Stoffers (1963:136)]. We have examined original material of *A. arubensis* (Aruba, 4 Feb 1885, *Suringar s.n.*, Leiden- Herb. Lugd. Batav. No. 908.84-423, Rijksherbarium no. L. 8612 No. 1), however, and noted that the glume lengths are within the range of *A. suringarii* (i.e., the first glumes are 7.0–9.5 mm long, and the second glumes are 5.5–7.0 mm long). Although Henrard (1926:42) indicated that he had viewed additional type material from Leiden (Herb. Lugd. Batav. sub. No. 908.84-422; paratype: Curacao, Christoffelberg, 21 Jan 1885, *Suringar s.n.*, Herb. Lugd. Batav. sub. No. 908.84-425, Henrard 1926:42), we have not seen these referenced specimens. Consequently, the longer glume lengths recorded by Henrard (1926:41) in his original description may be based on type material not studied by us, or may represent a measuring error by Henrard. Regardless, future studies need to assess the taxonomic relationships between *A. suringarii*, *A. arubensis*, and *A. venesuelae* Henrard.

Henrard (1932:252) and Lindeman & Stoffers (1963:138) reported that lemmas of *A. suringarii* were characterized by having a distinct nodule at the summit. Earlier, however, Henrard (1928:617) described such nodules at the summits of the lemmas of *A. suringarii* as being “faint.” In our opinion, these nodules are hardly discernible and therefore inappropriate in a key covering species of *Aristida* in Puerto Rico and the Virgin Islands. Using nodules as an aid in identification would be more appropriate for members of the section *Pseudarthratherum* Chiovenda, where the awns are articulated with the twisted column just below their branching point (Henrard 1932:34, 117).

Previous authors (Henrard 1928:616, 1932:253; Lindeman & Stoffers 1963:138, McKenzie et al. 1989) have published *A. suringarii* with only one “i” on the ending (i.e., *A. suringari*). However, based on articles 73 & 75 of the International Code of Botanical Nomenclature (1988:71–77)

the termination should be with "ii." Consequently, we have included the proper ending for *A. suringarii* in this report.

Additional specimens examined: ST. CROIX: without locality or date, *Benzon s.n.* Buck Island: Jun 1969, *Woodbury s.n.* (UPR).

PUERTO RICO. Mona Island: 3 Mar 1944, *Chardon & Otero* 819 (UPR).

VENEZUELA. State of Sucre: near Quetepe, E of Cumana: 23 May 1945, *Julian A. Steyermark* 62879 (US), hrbr. nr. 1869685.

6. *ARISTIDA COGNATA* Trinius et Ruprecht. Mem. Acad. St. Petersburg.

V1. Sci. Nat. 5: 127. 1842. TYPE: "Ins. St. Thomas- Ind. Occ." (HOLOTYPE: Ventenat Herbarium, photograph of holotype: US! Hrbr. nr. 81001, as photograph LSU!; fragment of holotype: US! Hrbr. nr. 81001). Note: although Hitchcock (1924:577) indicated that the holotype was at the Trinius Herbarium, Henrard (1928:619) (and repeated as a note on a photograph of the holotype US! Hrbr. nr. 81001) stated that the holotype was at the Ventenat Herbarium.

Aristida cognata var. *media* Trin. et Rupr. Mem. Acad. St. Petersburg. V1. Sci. Nat. 5: 128. 1842. Fragment of isotype: US! Hrbr. nr. 81000! TYPE LOCALITY: unknown; apparently cultivated.

The range of *A. cognata* is not clear. Henrard (1926:105 – 106, 1932:314), Hitchcock (1924:577, 1935:401, 1936:96) and Lindeman and Stoffers (1963:139) indicated that the species was restricted to the Virgin and Windward Islands. Although, Britton & Millspaugh (1920:31) and Correll & Correll (1982:98) listed the species for the Bahamas, all specimens of *Aristida* that we have examined from these islands that were previously identified as *A. cognata*, are *A. adscensionis* [e.g., *Correll* 41806 (GH, FTG), *Correll* 47422 (FTG), and *Correll & Correll* 50430 (FTG)]. These specimens all lack the long villous hairs on the upper surface of the leaf blade near the base, a characteristic diagnostic for *A. cognata*. Part of the problem could be in keys that stress the usually annual habit of *A. adscensionis*. We agree with McVaugh (1983:53) that the annual habit of *A. adscensionis* "may be difficult or impossible to determine from herbarium material, especially in the case of large plants . . ." Some specimens of *A. adscensionis* that we have examined would be better described as short-lived perennials and not annuals. Kelly Allred (pers. commun., New Mexico State University- NMCR, March 1989) reported the same characteristic for many specimens of the species collected in western North America.

We can find only four references that indicate that the Greater Antilles is included in the range of *A. cognata*: Britton & Millspaugh (1920:31- Jamaica), Britton & Wilson (1924:62- Puerto Rico), Jimenez (1966:6 – 7- Hispaniola) and Gould (1979:94- Cuba). Because Adams (1972:168) did not list *A. cognata* for Jamaica, Britton & Millspaugh's (1920:31) report of

the species for the island may be based on material referable to *A. swartziana* Steud., an apparent close relative (Henrard 1926:105–106, Hitchcock 1924:577). Britton & Wilson's (1924:62) statement that *A. cognata* occurred in Puerto Rico was based on a specimen collected near Boqueron, Puerto Rico, in 1913 by A. Chase. This specimen (Chase 6507: Holotype: US! hrbr. nr. 732548, as photograph LSU!) later proved, however, to be type material for *A. chaseae* (Hitchcock 1924:576; see Liogier 1965:319 and Liogier & Martorell 1982:194). Based on a specimen collected in Dominican Republic by Jimenez (Jimenez 2462 US), Hispaniola was included within the range of *A. cognata* (Jimenez 1966:6–7). Gould (1979:94) listed the species for Cuba, and we have examined specimens from the island that are referable to this species (*Leon* 12316 GH, US: hrbr. nr. 1258995; *Leon* 9128 US: hrbr. nr. 2378694).

Amshoff (1942), Velez (1957), and Fournet (1978:103–104) indicated that *A. cognata* occurred on the islands of Guadeloupe and Martinique of the Lesser Antilles. Based on two specimens (*Shafer* 48 US, *Shafer* 430 US) taken on Monserrat Island, Hitchcock (1924:577) also included the Lesser Antilles within the range of *A. cognata*. Gould (1979:94), however, refuted this claim and indicated that these specimens should be identified as *A. adscensionis*. After examining these specimens, however, we agree with Hitchcock's assessment. Both specimens are perennials with long villous hairs on the upper surface of the leaf blade near the base. These characteristics are diagnostic for *A. cognata* and not *A. adscensionis*. Interestingly, in his description of *A. cognata*, Gould (1979:94) failed to mention the diagnostic long villous hairs on the upper surface of the leaf blade near the base, a feature consistently emphasized by other authors (Henrard 1932:313; Hitchcock 1924:577, Lindeman & Stoffers 1963:135, 139).

Steyermark (1957:786) and Pittier et al. (1945:90) listed *A. cognata* for Venezuela, and we have examined specimens of this species from that country: (*Chase* 12601 GH, *Gines* 2699 US).

In summary, we believe that the correct range for *A. cognata* should be listed as Cuba, Hispaniola, the Virgin Islands, Windward Islands, Lesser Antilles, and Venezuela.

Habitat for *A. cognata* has been described as rocky soil (Lindeman & Stoffers 1963:139) and dry hillsides (Hitchcock 1936:96). In its habit, awn length, lemma length, and presence of long, scattered, villous hairs on the upper surface of the leaf blades near the base (Figs. 6a, 6b, 6c), *A. cognata* resembles *A. suringarii*, but the glume position is reversed in the two species (Figs. 5a, 6a). In *A. cognata*, the second glume is conspicuously longer than the first glume (Fig. 6a), while in *A. suringarii* the first glume

is the longest glume (Fig. 5a). The villous hairs on the upper surface of the leaf blades of *A. cognata* (Fig. 6c) are also similar to the hairs on the leaf blades of *A. chaseae*, but *A. chaseae* has much longer glumes, lemmas and lemma awns (Figs. 2b, 2c). *Aristida cognata* may also resemble typical specimens of *A. adscensionis* that have drooping panicles. It can be separated from that species by the long villous hairs (to 1.5–3.0 mm long) on the upper surface of the leaf blades near the base and throat (sheath apex) (Fig. 6c), its beaked lemmas, and its perennial habit.

Depauperate specimens of *A. cognata* that have unusually involute leaf blades (e.g. Montserrat, West Indies: 7 Feb 1907, *Shaefer* 430 (US), hrbr. nr. 695382) can be differentiated from *A. refracta* by the usually longer lemmas (Fig. 6b), the more tapering summit of the lemma column (thus distinctly beaked: Fig. 6b), and the longer second glumes (Fig. 6a), and the lack of conspicuous, basal tufts of dense filiform leaves. Specimens of *A. cognata* with abnormally short lemmas (to 5.2 mm) and second glumes (to 5.5 mm) [e.g., Montserrat, West Indies: 20 Jan 1907, *Shaefer* 48 (US), hb. nr. 695088] can be distinguished from *A. refracta* by its longer lemma beaks, its geniculate culms, by the lack of a basal tuft of dense filiform leaves, and the distinctly beaked lemmas. Depauperate specimens of *A. cognata* that resemble *A. refracta* in habit (e.g. Cuba-Oriente Province: Jul 1924, *Leon* 12316 GH, US: hrbr. nr. 1258995), can be differentiated from that entity by the longer glumes and lemmas, and by the presence of a distinct lemma beak.

Additional specimens examined. ST. THOMAS: Dec 1882, *Eggers* 119 (US). Water Island: Jan 31-Feb 4 1913, *Britton et al.* 119 (US); 8–9 Nov 1969, *Woodbury et al.* W1-9 (UPR); Signal Hill, Mar 1–5 1913, *Rose* 3189.

ST. JOHN. Rustenberg: without date, *Eggers* 3003 (US). Monserrat Island, Plymouth: 20 Jan 1907, *Shaefer* 48 (US); 7 Feb 1907, *Shaefer* 430 (US).

VENEZUELA. Ciudad Bolivar: 2 Apr 1940, *Chase* 12601 (GH). Los Bayres: Dec 1951, *Gines* 2699 (US).

7. *ARISTIDA REFRACTA* Grisebach. *Catalogus Plantarum Cubensium* 228.

1866. TYPE: "Cuba occ. (*Wright* 3431)" [(HOLOTYPE: Grisebach-Hitchcock (1924:585)]. Fragments at the US!, hrbr. nr. 981856, are *Wright* 3431, but no information is given on whether they are from the holotype or an isotype. Hitchcock's report (1924:585) that "a specimen of *Wright's* no. 3431 is in the U.S. National Herbarium," is apparently referable to the above-mentioned fragments.

Aristida refracta (Fig. 7) is restricted to the Greater Antilles (Henrard 1932:284, Hitchcock 1936:97) and occurs on dry slopes and in pine woods (Hitchcock 1924:585, 1935:406, 1936:97). In Jamaica, Adams (1972:168) stated that the species was "local in clearings in arid woodlands

and thickets". In Puerto Rico, the grass is known only from serpentine slopes at Guanajibo, near Boqueron (Liogier & Martorell 1982:194), Susua Alta near Yauco (Velez 1157 LSU), and Guyanes (Woodbury s.n. UPR).

Although the majority of specimens of *A. refracta* have a conspicuous, short tuft of basal leaves (4–10 cm long) (Fig. 7a), the species is quite variable, ranging from robust plants that lack a basal tuft and with longer leaves (to 26 cm long) and thicker culms, to individuals that have acicular leaves with much longer, unbranched inflorescences. *Aristida refracta* has previously been differentiated, in keys, from other species in the West Indies by the spiral contortion of the awns at maturity (Hitchcock 1924:533, 1935:379, 1936:89). Although we agree with Hitchcock (1924:585), that this characteristic is not a consistent feature of the species, it can occasionally be used to distinguish *A. refracta* from depauperate specimens of *A. cognata* that have unusually short lemmas and glumes. Additionally, *A. refracta* can be differentiated from specimens of *A. cognata* that have unusually involute blades by the shorter, scarcely beaked lemmas (Fig. 7c), the shorter second glumes (Fig. 7c), and by the usually conspicuous, unbranched, basal tufts of dense filiform leaves.

Additional specimens examined. Unless stated otherwise, specimen citations are US. PUERTO RICO. Guanajibo: 18 Feb 1915, Britton *et al.* 4358 (UPR, US); Yauco: Aug 1937, Velez 1157 (LSU). Guyanes: 16 Oct 1968, Woodbury s.n. (UPR). Boqueron: 12 Nov 1913, Chase 6508.

CUBA. Province: Habana-Guanabacoa: 15–20 Mar 1906, Hitchcock 231; 2 Sep 1909, Leon 875; 6 Jul 1911, Leon 2641; 10 Sep 1914, Leon 4646; 27 Nov 1914, Leon & Hioram 4718; 26 Aug 1915, Leon & Hioram 5605, 5606; 23 Nov 1926, Hitchcock 23226; Oct 1927, Leon 13113. Province: Sta. Clara-Manajanabo: 3 Aug 1915, Leon & Gustave 5276. Mariacas: 27 Dec 1915, Cazanas 5830, 5863, 5874. Placetas del Sur: 9 Aug 1918, Leon & Roca 8179. Motembo: 28 Aug 1922, Leon & Loustalot 11338, 11340, 11342; 27 Jun 1923, Ekman 16816a. Province: Oriente-Sierra Nipe: 4 Dec 1909, Shafer 2990; 8 Dec 1909, Shafer 3080; 16–18 Oct 1941, Morton & Acuna 3034. Loma Mensura: 1–3 Feb 1910, Shafer 3858. Holguin: 28 Oct 1914, Ekman 3228; 17 Nov 1922, Ekman 15719, 15720; 4 Jul 1932, Leon 15714. Guaro: 14 Dec 1926, Hitchcock 23425, 23426. Sierra de Cobre: 10 Jun 1916, Ekman 7808. Sierra de Moa: 3 Aug 1945, Leon *et al.* 22640. Province: Pinar del Rio- Without locality: 25 Nov 1926, Hitchcock 23255, 23262. Herradura: 16 Mar 1906, Hitchcock 233, 499; 22 Oct 1923, Ekman 17749. West of Guane: 21–22 Nov 1911, Shafer 10414. Laguna Jovero: 5, 7 Dec 1911, Shafer 10718; 8 Dec 1911, Shafer 10864; without date, Wright 3433, 3833, 3834. El Payuco: 23 Dec 1937, Killip 32361, 3227. Montua-Arroyos: 28 Dec 1911, Shafer 11254. Between San Diego de los Banos and La Salma: 5 Apr 1915, Leon & Charles 4845. Pan de Cojalbana: 5 Apr 1915, Leon & Charles 4846. Sabana de San Julian de Guane: 27 Dec 1916, Leon & Roca 6942, 6971; Jul 1917, Lamas & Valdes 7307, 7308; Aug 1919, Valdes 8971; 6 Jun 1920, Ekman 11107. Sabana de Chirigote: 9 Aug 1917, Leon 7444, Leon & Roca 7454. Remates: 9 Jun 1920, Ekman 11162. La Grifa: 14 Jun 1920, Ekman 11246. Las Pozas: 7 Jan 1921, Ekman 12737. Colma road: 25 Nov 1926, Leon 72856. Province Las Villas-Loma Belen: 24 Jun 1932, Leon 15623. Cumbre Sabana: 28 Jun 1931, Leon 14926.

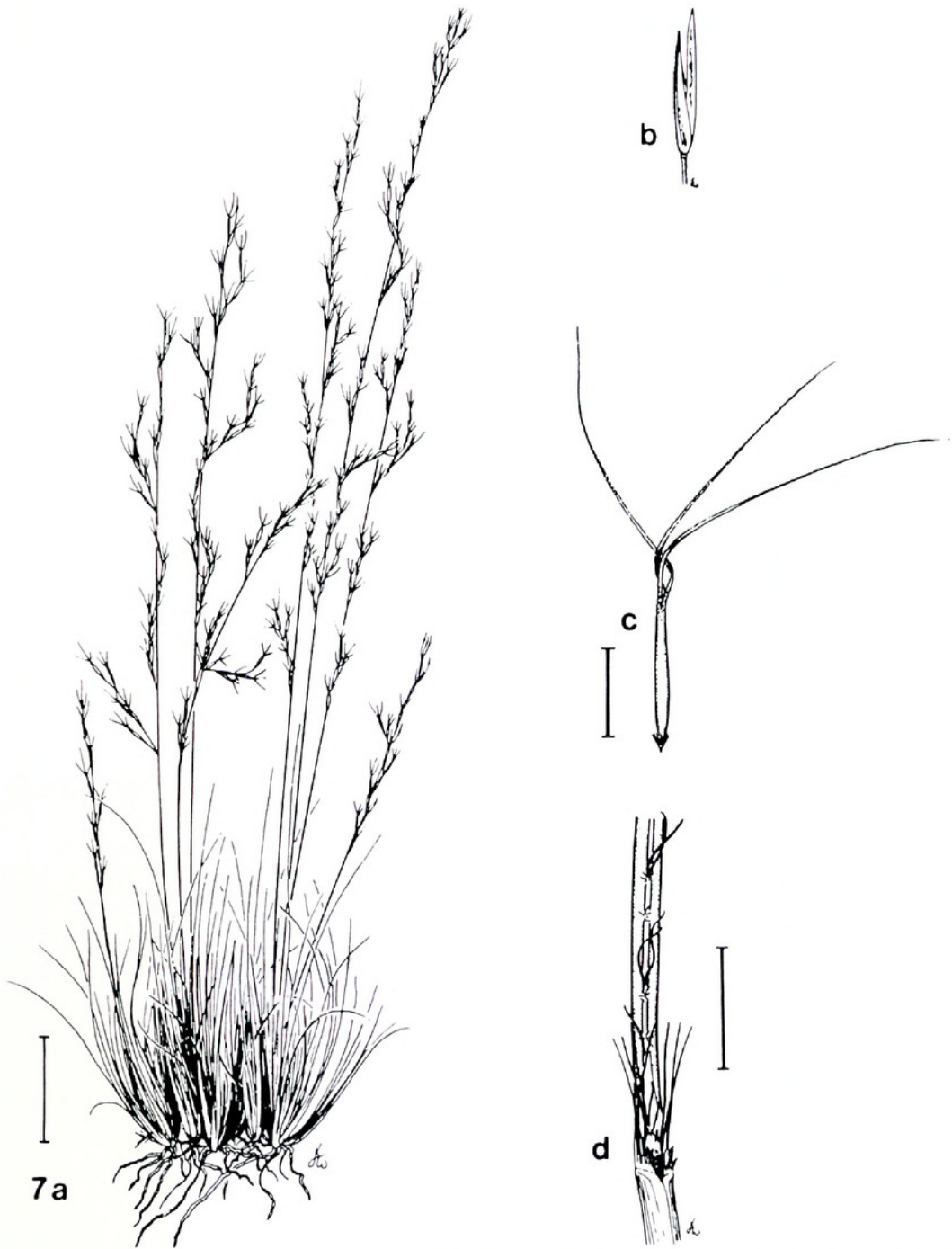


FIG. 7. *Aristida refracta* Griseb.: a. habit (scale: 4 cm); b. first and second glume; c. lemma, callus, and lemma awns (scale for b & c: 3 mm); d. ligule and base of upper surface of leaf blade (scale: 1 mm).

Province Camaguey: without locality, 21 Oct 1922, *Ekman s.n.* (Amer. Gr. Nat. Herb. 792). Santayana Sabana: 9 Jul 1932, *Leon* 15785. San Serapio Sabana: Jun 1937, *Leon* 21182. Baragua Central: 9 Dec 1926, *Hitchcock* 23373. Province Guantanamo-Baracoa: 13 Feb 1976, *Arecas et al.* 38125 (SJ). Isle of Pines: Siguanea, 12 Mar 1916, *Britton et al.* 15369. Playa Nueva Gerona: 9 Jan 1955, *Killip* 44513. Jucaro: 19 Jan 1955, *Killip* 44558.

HAITI. Plaine Centrale, St-Michel de l'Atalaye: 19 Dec 1927, *Ekman* 9402; Mar 1943, *Curtis s.n.* Plaine du Nord, Acul-Samedi: 29 Apr 1928, *Ekman* 9908.

DOMINICAN REPUBLIC. Province de Santiago: 17 Apr 1946, *Jimenez* 1106. Province de Santo Domingo- Sabana de Santa Rosa: 5 Oct 1947, *Allard* 15865. Province de Monte Cristi- Moncion: 26 May 1929, *Ekman* 12634.

JAMAICA. New Forest, Southern Manchester: 8 Nov 1912, *Hitchcock* 9853 (Amer. Gr. Nat. Herb. 793). Lititz Savanna, Manchester: 11 Feb 1916, *Harris* 12433. Ashley Hall: 6 Dec 1917, *Harris* 12734.

Identification can be difficult for the previously mentioned robust specimens of *A. refracta* that have unusually long (to 76 cm), erect culms and inflorescences, and lack a conspicuous basal tuft of leaves (e.g., the following specimens collected in Pinar del Rio and Oriente Provinces of Cuba: **Pinar del Rio**: 25 Nov 1926, *Hitchcock* 23262, hrbr. nr. 1297696, *Leon* 12856, hrbr. nr. 1867258. **Herradura**: 16 Mar 1906, *Hitchcock* 233, hrbr. nr. 559352. **Loma Mensura**: 1–3 Feb 1910, *Shafer* 3858, hrbr. nr. 697563. **Laguna Jovero**: 5, 7 Dec 1911, *Shafer* 10718, hrbr. nr. 1037196; 8 Dec 1911, *Shafer* 10864, hrbr. nr. 1037194. **Sabana de San Julian de Guane**: 27 Dec 1916, *Leon & Roca* 6942, hrbr. nrs. 991850, 1060631, 6971, hrbr. nr. 991863; Jul 1917, *Lamas & Valdes* 7307, 7308, hrbr. nrs. 1060627, 1060634; 6 Jun 1920, *Ekman* 11107, hrbr. nr. 1387418. **Sabana de San Chirigote**: 9 Aug 1917, *Leon* 7444, *Leon & Roca* 7454, hrbr. nrs. 1060635, 1060630. **La Grifa**: 14 Jun 1920, *Ekman* 11246, hrbr. nr. 1387421. **Holguin**: 17 Nov 1922, *Ekman* 15719, 15720, hb. nrs. 1161258, 1295007, 1502347. **El Payuco**: 23 Dec 1937, *Killip* 32270, 32361, hrbr. nrs. 1761064, 1761076. **Guaro**: 14 Dec 1926, *Hitchcock* 23425, 23426, hrbrb. nrs. 1297699, 1297700). These specimens (except for *Killip* 32270 and 32361 which were collected after the printing of Hitchcock's work) were annotated and referenced (1936) by Hitchcock as *A. refracta*. No less than five unpublished names have been associated with these unusual specimens. In some respects, such specimens better fit the description of *A. sandinensis* Catasus (1985), which was based on material collected from the same area of Cuba (Pinar del Rio Province). Based on Catasus' description, *A. sandinensis* should be distinguished from *A. refracta* by its lack of a conspicuous tuft of dense filiform leaves, its more robust habit with much longer flowering culms, its longer glumes and lemmas, and the scabrous nature of the back of the first glume. Most of the above-mentioned specimens agree in habit with *A. sandinensis*, but the

length of the glumes and lemmas better fit the description of *A. refracta*. Additionally, we have examined many specimens of *A. refracta* that have the more typical tuft of dense filiform leaves but have the first glume with varying amounts of pubescence. Finally, we have examined a specimen of *Aristida* (Bisse et al. 13657 SJ) from the Pinar del Rio Province of Cuba which was identified by Catasus as *A. sandinensis*. Although the habit of this specimen agrees with Catasus' description for *A. sandinensis*, the lengths of most of the glumes and lemmas fall well within the range of variation for *A. refracta*. Additional research is needed to determine if *A. refracta* and *A. sandinensis* are specifically distinct. Until such taxonomic relationships can be ascertained, we believe that it would be prudent to agree with Hitchcock's assessment of the above-mentioned specimens.

CURRENT STATUS OF *ARISTIDA CHASEAE* AND *ARISTIDA PORTORICENSIS*

Aristida chaseae is restricted to the Cabo Rojo National Wildlife Refuge (approximately 150 – 175 plants) and the upper, rocky slopes of the Sierra Bermeja. In 1987, McKenzie searched for the species in areas surrounding the Cabo Rojo National Wildlife Refuge and Boqueron and discovered no additional populations. The disappearance of *A. chaseae* from the type locality at Boqueron is apparently due to competition from such vigorous, introduced grasses as *Cenchrus ciliaris* L., *Bothriochloa pertusa* (L.) A. Camus, *Dichanthium annulatum* (Forssk.) Stapf, *Cynodon dactylon* (L.) Pers., *Panicum maximum* Jacq., and *Brachiaria subquadripara* (Trin.) Hitchc. When McKenzie searched these areas, he noted that exposed, rocky openings, that were apparently formerly occupied by *A. chaseae*, were completely dominated by these introduced grasses. While the population of *A. chaseae* on the Cabo Rojo National Wildlife Refuge is protected, it may be threatened by wildfires or competition from *Brachiaria subquadripara*. At this locality, McKenzie noted in 1987 that natural regeneration of *A. chaseae* was apparently restricted by *Brachiaria subquadripara*, a vigorous perennial, that dominated small openings that could have provided habitat for the establishment of young seedlings of *A. chaseae*.

Although *A. chaseae* is not uncommon on the Sierra Bermeja, the species is usually restricted to the upper, exposed, rocky slopes, between elevations of 150 to 301 m. Specimens noted below 150 m are found only on exposed rocky openings. As at the type locality at Boqueron, *A. chaseae* on the Sierra Bermeja is probably restricted to exposed, rocky areas, because of competition from introduced grasses. The population on the Cabo Rojo National Wildlife Refuge suggests that the species probably once extended from sandy areas along the coastal lowlands, eastward to summits throughout the Sierra Bermeja Range, and westward to rocky hillsides at Boqueron.

Aristida portoricensis is restricted to red clay and serpentine slopes at Cerro Las Mesas and Hormigureo, near Mayaguez, and along the upper, rocky slopes of the Sierra Bermeja, usually between 180 and 301 m. The population of *A. portoricensis* on Cerro Las Mesas at Mayaguez is currently threatened from land clearing for commercial and residential development. On 7 September 1988, McKenzie and Proctor noted that recent house construction continues to encroach upon habitat formerly occupied by *A. portoricensis*. Populations of *A. chaseae* and *A. portoricensis* along the Sierra Bermeja Range are under private ownership and may not be secure. Recent land clearing by the landowner of Cerro Maraquita, to enhance cattle grazing operations, has destroyed habitat formerly occupied by both species. When McKenzie and Proctor visited the location on 20 September 1987, *A. chaseae* and *A. portoricensis* were growing on an area that was later cleared. Additionally, on 28 August 1988, McKenzie noted land clearing on the summit of the western most ridge of the Sierra Bermeja that was adjacent to habitat occupied by *A. chaseae* and *A. portoricensis*.

Both *A. chaseae* and *A. portoricensis* are listed as threatened species by the Puerto Rican Natural Heritage Program (fide V. Quevedo, Botanist, Programa Pro-Patrimonio Natural, Puerta de Tierra, Puerto Rico, 1987). Both species are being considered for "endangered status" under the Endangered Species Act (fide Susan Silander, Botanist, United States Fish and Wildlife Service, Caribbean Field Office, Boqueron, Puerto Rico, 1987).

FUTURE RECOMMENDATIONS FOR *ARISTIDA CHASEAE* AND *ARISTIDA PORTORICENSIS*

Steps need to be taken to protect *A. chaseae* and *A. portoricensis* on Commonwealth and federal levels. We suggest that both species be petitioned for federal listing as endangered species. Sound management plans must be formulated to protect the species. This includes, but is not limited to: 1) successional retardation, 2) habitat protection (from grazing, disturbance, development, etc.), 3) studies to evaluate the role of fire and competition from introduced grasses, and 4) artificial and natural regeneration experiments to test the feasibility of establishing populations in former and new areas of appropriate habitat. The populations of *A. portoricensis* on Cerro Las Mesas at Mayaguez, currently threatened by development, should be protected. Negotiations with the landowners at Cerro Mariquita and the western most ridges of the Sierra Bermeja are necessary to determine if disturbances can be minimized. Purchase of critical habitats on Cerro Las Mesas and along the upper slopes of the Sierra Bermeja is probably necessary to insure survival of *A. chaseae* and *A. portoricensis*.

STATUS AND SUGGESTIONS FOR *A. SPICIFORMIS*,
A. REFRACTA, *A. SURINGARII*, AND *A. COGNATA*.

Although *A. spiciformis* is currently (1989) present at Laguna Tortugero, no data exists on its abundance there. In 1987, McKenzie searched serpentine slopes near Boqueron, but did not find *A. refracta*. Additionally, in 1988, McKenzie and Proctor searched for *A. refracta* on serpentine slopes at Susua Alta, near Yauco, but did not find the species. It is presently not known whether a population of *A. suringarii* still exists on Mona Island. No information is available on the abundance of the species in the Virgin Islands. Consequently, because of their limited ranges in Puerto Rico and the lack of information on their abundance, we recommend that status surveys be conducted on *A. spiciformis*, *A. refracta*, and *A. suringarii* in Puerto Rico. Such surveys may warrant the placement of these species on the Commonwealth's list of threatened plants. A status survey on *A. suringarii* and *A. cognata* should also be conducted in the U.S. Virgin Islands to determine if the range of the species are restricted enough to merit protection under the federal Endangered Species Act.

SUGGESTIONS FOR ADDITIONAL RESEARCH

Taxonomic relationships need to be assessed among *A. refracta*, *A. rosei* Hitchc., *A. sandinensis*, and *A. pinifolia* Catasus. Studies need to be initiated to determine what affinities *A. cognata* has with *A. suringarii*, *A. swartziana* Steud., and *A. moritzii* Henrard. Additionally, we recommend that research be initiated to examine the relationships within the *A. suringarii*, *A. arubensis*, and *A. venesuelae* species complex.

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REFERENCES

- ADAMS, C.D. 1972. Flowering plants of Jamaica. Robert Mac Lehosé and Co. Ltd., The Univ. Press, Glasgow, Great Britain, 848 pp.
- ALLRED, K.W. 1984a. Studies in the genus *Aristida* (GRAMINEAE) of the southeastern United States. I. Spikelet variation in *A. purpurescens*, *A. tenuispica*, and *A. virgata*. *Rhodora* 86:73–77.
- . 1984b. Morphological variation and classification of the North American *Aristida purpurea* complex (GRAMINEAE). *Brittonia* 36(4):382–395.
- . 1985. Studies in the *Aristida* (GRAMINEAE) of the southeastern United States. II. Morphometric analysis of *A. intermedia* and *A. longispica*. *Rhodora* 87:137–145.
- . 1986. Studies in the *Aristida* (GRAMINEAE) of the southeastern United States. IV. Key and conspectus. *Rhodora* 88(5):367–387.
- AMSHOFF, G.J.H. 1942. The grasses of the Dutch West Indies. Kolonial Institut, Amsterdam, Afdeeling Handelsmuseum No. 225, 64pp.
- BRITTON, N.L., and C.E. MILLSPAUGH. 1920. The Bahama flora. The New Era Print. Co., Lancaster, Pennsylvania, 695pp.
- , and P. WILSON. 1924. Scientific survey of Porto Rico and the Virgin Islands, Vol. 5: Pandanales to Thymeleales (POACEAE, p. 18–78). New York Academy of Science, New York.
- CATASUS, G. 1985. Cuatro nuevas especies de *Aristida* (Poaceae) de Cuba. *Acta Botanica Cubana* 24:1–4.
- CHASE, A. 1951. Hitchcock's manual of the grasses of the United States, 2nd ed., U.S.D.A. Misc. Publ. no. 200, 1051 pp.
- CORRELL, D.S., and H.B. CORRELL. 1982. Flora of Bahama Archipelago. A.R. Gantner Verlag KG., Fl-9490 Vaduz. Printed in Germany by Strauss & Cramer GmbH, 6945 Hirschberg 2, 1692 pp.
- FOURNET, J. 1978. Flore illustree des phanerogames de Guadeloupe et de Martinique. Institut National de La Recherche Agronomique 149, rue de Grenelle- 75007 Paris, 1654pp.
- GREUTER, W. 1988 (ed.). International Code of Botanical Nomenclature. Vol. 118. Koeltz Scientific Books, D-6240 Königstein, Federal Republic of Germany, 328 pp.
- GOULD, F.W. 1968. Grass systematics. Mc Graw-Hill Book Co., New York, 382 pp.
- . 1975. The grasses of Texas. Texas A&M Univ. Press, College Station, 653 pp.
- . 1979. Pp. 251–220 in Flora of the Lesser Antilles. Leeward and Windward Islands. Volume 3. MONOCOTYLEDONEAE. R. A. Howard. Arnold Arboretum, Harvard Univ., Jamaica Plain, Mass., 586 pp.
- HENRARD, J.TH. 1926. A critical revision of the genus *Aristida*. Vol. I, No. 54, Firma P.W.M. Trap, Leiden, pp. 1–220.
- . 1927. A critical revision of the genus *Aristida*. Vol. II, No. 54 A, Mededeelingen van's Rijks Herbarium, Leiden, pp. 221–464.
- . 1928. A critical revision of the genus *Aristida*. Vol. III, No. 54 B, Mededeelingen van's Rijks Herbarium, Leiden, pp. 465–701.
- . 1929. A monograph of the genus *Aristida*. Vol. I, No. 58, Boekdrukkerij-

- voorheen P.W.M. Trap, Mededeelingen van's Rijks Herbarium, Leiden, pp. 1 – 153, plates 1 – 60.
- . 1932. A monograph of the genus *Aristida*. Vol. II, No. 58 A, Drukkerij H. Buurman, Mededeelingen van's Rijks Herbarium, Leiden, Leiden, pp. 158 – 325, plates 61 – 169.
- HITCHCOCK, A.S. 1924. The North American species of *Aristida*. Contr. U.S. Natl. Herb. 22(7):517 – 586.
- . 1935. North American Flora (Poales) Poaceae (pars). New York Botanical Garden. 17(5):355 – 418.
- . 1936. Manual of the grasses of the West Indies. U.S.D.A. Agric. Publ. 243, 439 pp.
- JIMENEZ, J.D.J. 1966. Pp. 6 – 7 in Suplemento No. 1 al Catalogus Florae Domingensis, Universidad de Santo Domingo, Tipografía Valbonesi-Florli (Italy).
- LINDEMAN, J.C., and A.L. STOFFERS. 1963. Gramineae. Pp. 121 – 203 in Flora of the Netherlands Antilles. Vol. 1:85 – 203, SPERMATOPHYTA, MONOCOTYLEDONEAE. Publications of the Foundation for Scientific Research in Surinam and the Netherlands Antilles, A.L. Stoffers, ed., No. 36, Utrecht, Netherlands.
- LIOGIER, H.A. 1965. Nomenclatural changes and additions to Britton and Wilson's "Flora of Puerto Rico and the Virgin Islands." *Rhodora* 67(722):315 – 361.
- , and L.F. MARTORELL. 1982. Flora of Puerto Rico and adjacent islands: a systematic synopsis. Editorial de la Universidad de Puerto Rico, Rio Piedras, 342 pp.
- MCKENZIE, P.M., R.E. NOBLE, L.E. URBATSCH, and G.R. PROCTOR. 1989a. A new locality for *Digitaria eggersii* (POACEAE) in the West Indies. *Carib. J. Sci.* 25(1-2):88 – 90.
- . 1989b. Additions and corrections to the POACEAE of Puerto Rico. *Sida*. 13(3):293 – 301.
- MCVAUGH, R. 1983. Flora Novo-Galiciana. A descriptive account of the vascular plants of Western Mexico. Vol. 14: Gramineae. Univ. Mich. Press, Ann Arbor, 436 pp.
- PITTIER, H., T. LASSER, L. SCHNEE, Z. LUCES-DE FEBRES, and V. BADILLO. 1945. Catalogo de las Flora Venezolana. Tomo 1. Lit. Y Tip. Vargas, Caracas, 423 pp.
- RADFORD, A.D., H.E. AHLES, and R.C. BELL. 1968. Manual of the vascular flora of the Carolinas. Univ. North Carolina Press, Chapel Hill, 1183 pp.
- STEYERMARK, J.A., 1957. Contributions to the flora of Venezuela. *Fieldiana: Botany*, Publ. 810, 28(4):679 – 1190.
- VELEZ, I. 1957. Herbaceous angiosperms of the Lesser Antilles. Inter American Univ. of Puerto Rico, 121 pp.
- WOODBURY, R.C., L.F. MARTORELL, and J.G. GARCIA-TUDURI. 1977. The flora of Mona and Monito Islands, Puerto Rico (West Indies). Univ. of Puerto Rico Agric. Exp. Sta. Bull. 252, 60 pp.



Mckenzie, Paul M et al. 1989. "STATUS OF ARISTIDA (POACEAE) IN PUERTO RICO AND THE VIRGIN ISLANDS." *SIDA, contributions to botany* 13, 423–447.

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