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A New Synonym in *Senna*, Series *Aphyllae* (Leguminosae, Caesalpinioideae)

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Abstract—Multivariate and univariate analyses based on morphological characters were carried out in order to understand the taxonomic status of *Senna spiniflora* and *S. chacoënsis*. Fifteen morphological characters from herbarium specimens were recorded and analyzed by the Kruskal-Wallis test and principal components analysis. The type specimens and all available herbarium material were examined for the taxonomic study. The results showed that the taxa differed only by the character of stem pubescence and this feature displayed high variability. In parallel, the principal components analysis demonstrated that no clearly separated groups were recognized. Based upon these results, the synonymy of *S. chacoënsis* to *S. spiniflora* is proposed.

Keywords—*Aphyllae*, Fabaceae, morphometric analyses, quantitative characters, taxonomic position.

Series *Aphyllae* Benth. belongs to the genus *Senna* Mill. (Leguminosae) and is comprised of xeromorphic shrubs and subshrubs, with deeply woody roots; the leaves of the adult branch are represented by minute triangular or sublobate scales; the stem is junciform, green, and photosynthetic (Bravo 1978a; Irwin and Barneby 1982; Robbiati et al. 2011). This series was previously considered under the genus *Cassia* L. by Bentham (1871), Burkart (1946, 1952), and Bravo (1978a, 1978b, 1982). Based on vegetative and reproductive characters, Irwin and Barneby (1982) divided *Cassia* into three genera: *Senna*, *Chamaecrista* Moench, and *Cassia* s. s. Within ser. *Aphyllae*, *S. spiniflora* (Burkart) H. S. Irwin & Barneby and *S. chacoënsis* (L. Bravo) H. S. Irwin & Barneby form a complex characterized by having rigid and spine-tipped branches, mostly spreading at more or less 90° from the parent axis (Bravo 1978a; Irwin and Barneby 1982). These species co-occur in the provinces of central and northern Argentina: Chaco, Formosa, and Santiago del Estero (Robbiati et al. 2011).

Burkart (1946) described *Cassia spiniflora* Burkart for the Paraguayan Chaco region (middle Pilcomayo) as having stems finely velvety-puberulent, sepals finely pilosulous, and racemes crowded towards the branchlet tips; and *C. aphylla* Cav. var. *robusta* Burkart for the Argentinean Chaco region, which differs by glabrous stems and sepals and racemes borne along the length of the flowering branchlets. Subsequently, Burkart (1952) reported new morphological characters (i.e. stiff and broad (3–4 mm) branches) and treated *C. aphylla* var. *robusta* as *C. rigida* (Hieron.) Burkart var. *robusta* Burkart. Bravo (1978a), based on the same features analysed by Burkart (1952), recognized the taxon as a distinct species, *C. chacoënsis* L. Bravo; and Irwin and Barneby (1982) accepted the delimitation of the taxon but treated it as *Senna chacoënsis*.

The status of *Senna spiniflora* and *S. chacoënsis* as distinct species from each other has also been controversial. Fortunato (1984) has reported *S. spiniflora* from northern Argentina and pointed out variability in the pubescence of the calyx: northern Argentinean specimens slightly differ from those of Paraguay by the calyx being externally glabrous instead of pubescent. Marazzi et al. (2006) also noted that herbarium materials are often misidentified due to the presence of specimens morphologically intermediate between the two species, especially from adjacent areas of Paraguay and Argentina. In addition Robbiati et al. (2011) found the same situation.

The aim of this study is to clarify the systematics of these two species that have been subjected to conflicting taxonomic opinions in the past.

Materials and Methods

Plant Material—Field studies were conducted between 2010 and 2013. Information regarding habitat and intra-population variation was recorded. The type collection and all available material were examined.

Morphological Characters—Twenty-six herbarium specimens (eight of *S. spiniflora* and 18 of *S. chacoënsis*) were considered as operational taxonomic units (OTUs). We covered the whole distribution range with the selected specimens. Twenty-five characters were examined of which only 15 were informative (Table 1). For each specimen, floral features were scored from one fully expanded and rehydrated flower, and size measurements were made with an ocular micrometer using a binocular microscope (Carl Zeiss 475003–9902). The dimensions of the internodes were taken from young branches, and the width was measured in the median part.

Morphometric Analyses—The statistical analyses were performed using INFOSTAT statistical program version 2012 (Group InfoStat, Córdoba, Argentina). For the univariate analysis the average (M), standard deviation (Std), coefficient of variation (CV), minimum and maximum were recorded for each feature. To represent the variability of each character, box plots containing medians and quartiles were prepared.

The Kruskal-Wallis test (K) with a significance value of $p > 0.05$ was used to test differences between pairs of means. Prior to carrying out multivariate analysis, the data matrix itself was examined. A Pearson's Correlation was performed to identify pairs of characters with a high degree of correlation ($\rho > 0.6$). The principal components analysis (PCA) was based on a correlation matrix and the results were plotted in two-dimensional scatter plots. The cophenetic correlation coefficient was calculated to determine goodness of fit between the Euclidian distance among OTUs in the two dimensional plot.

Geographic distribution—The geographic distribution was analysed with software DIVA-GIS (Hijmans et al. 2005); the coordinates were mapped from herbarium specimens, and when this information was lacking, the localities were georeferenced using gazetteers or following the georeferencing procedures of Chapman and Wieczorek (2006).

Results

Univariate Analysis—The average, standard deviation, CV, minimum, and maximum values of quantitative morphological characters are summarized (Table 2) and their variation is presented in box plots (Figs. 1A, 1B). The character of calyx

Table 1. Quantitative characters used for the phenetic analysis.

1. Anther length of abaxial stamens (mm). **2**. Anther length of median stamens (mm). **3**. Asymmetric and lower petal length (mm). **4**. Calyx pubescence (hair density cm^2). **5**. Divergence angle of branches (degree). **6**. Gynoecium length (mm). **7**. Internode length (mm). **8**. Internode width (mm). **9**. Leaf length (mm). **10**. Long sepal length (mm). **11**. Pedicel length (mm). **12**. Peduncle length (mm). **13**. Plant height (m). **14**. Staminode length (mm). **15**. Stem pubescence (hair density cm^2).

pubescence showed the highest CV for both taxa (*S. spiniflora*: 145.67; *S. chacoënsis*: 255.17), and stem pubescence displayed higher CV (424.26) for *S. chacoënsis*. Of the 15 features, only the character of stem pubescence showed a significant difference between the means (H = 16 $p < 0.0001$). This character was used by Burkart (1946, 1952) and Bravo (1978a) to distinguish *S. spiniflora* from *S. chacoënsis*.

Principal Component Analysis—The characters of asymmetric petal length and peduncle length showed strong correlation ($\rho > 0.63$), so the former was excluded from the principal components analysis. The first three principal components together account for 46.2% (20%, 13.8%, and 12.4%, respectively) of the variance within the data. The cophenetic correlation is r = 0.782, indicating a goodness of fit between the Euclidian distance among OTUs in the two dimensional plot. Loading on the first component was contributed mainly by leaf length, internode length, divergence angle of branches, long sepal length, plant height, and calyx pubescence; loading on the second component was contributed mainly by staminode length, gynoecium length, calyx pubescence, peduncle length, and long sepal length; the highest loadings on the third component correspond to anther length of abaxial stamens, peduncle length, and staminode length (Table 3). The scatterplot of components one, two, and three resulted in no clear differentiation between the OTUs of the taxa; moreover, they showed an overlap (Figs. 2, 3).

Geographic distribution—The northern region had more specimens with pubescent calyx and stems, while the southern specimens were glabrous; plants from the central area were very variable (Fig. 4).

Discussion

A taxonomic study and phenetic analyses were conducted to explore the taxonomic position of *S. spiniflora* and *S. chacoënsis*. Among the characters analyzed, only stem pubescence showed significant differences. This feature was used by Burkart (1946, 1952), Bravo (1978a), and Irwin and Barneby (1982) in the taxonomic delineation of *S. spiniflora* and *S. chacoënsis*. This character displayed high variability (CV = 424.26) in *S. chacoënsis*: while glabrous stems have been reported by previous authors (Burkart 1946; Bravo 1978a; Irwin and Barneby 1982), during this study we found several specimens with pubescent branches, especially in populations growing in the central-western parts of Argentina. This result is in agreement with the morphologically intermediate individuals pointed out by Robbiati et al. (2011). On the other hand, the character of calyx pubescence which was assigned taxonomic value to segregate *S. spiniflora* and *S. chacoënsis* (Burkart 1946, 1952; Bravo 1978a; Irwin and Barneby 1982) did not show significant differences and presented high CV (145.67 and 255.17, respectively) for the two species, indicating that this character is unsuitable for specific delimitation. This conclusion concurs with the variability in the calyx pubescence in *S. spiniflora* cited by Fortunato (1984). The PCA analysis showed no clear differentiation between *S. spiniflora* and *S. chacoënsis*, resulting in an overlap of specimens from the central regions of distribution. This result suggests that no characters were useful in the segregation of the two taxa; this finding agrees with the similarities between *S. spiniflora* and *S. chacoënsis* reported by Fortunato (1984) and Marazzi et al. (2006). Historically *S. spiniflora* and *S. chacoënsis* have been treated as seperate species based on pubescence and inflorescence. Results from this study show that these characters are too variable to be used for species delimitations. Therefore, synonymy is indicated.

Taxonomic Treatment

Senna spiniflora (Burkart) H. S. Irwin & Barneby emend. Robbiati & Fortunato, Iconography: Bravo, 1978a: 362, Figure 4; 363, Figure 5. *Cassia spiniflora* Burkart, Darwiniana 7: 235. 1946.—TYPE: PARAGUAY. Dpto. de

Table 2. Mean ± standard deviation, coefficient of variation, and range (minimum– maximum) for the 15 characters used for phenetic analysis. Characters numbered according to Table 1.

Taxon	*S. spiniflora*				*S. chacoënsis*			
Character/value	M	Std	CV	Min–Max	M	Std	CV	Min–Max
1	4.34	±0.66	15.24	3.00–5.10	4.38	±0.49	11.13	3.75–5.00
2	2.90	±0.60	20.53	2.25–4.00	2.90	±0.82	28.22	2.50–4.00
3	14.7	±2.20	14.95	11.0–17.0	13.85	±1.97	14.24	9.00–17.0
4	1.75	±2.55	145.67	0.00–6.00	0.78	±1.99	255.17	0.00–7.00
5	85.3	±4.75	5.56	75.0–90.0	80.39	±11.3	14.13	50.0–90.0
6	10.03	±2.47	24.68	7.20–14.0	11.11	±1.28	12.64	7.00–13.0
7	15.5	±3.46	22.35	10.0–20.0	13.17	±5.19	39.44	6.00–24.0
8	3.79	±0.68	17.93	2.50–4.50	2.85	±0.97	34.15	1.20–4.50
9	0.72	±0.24	34.15	0.50–1.00	0.85	±0.17	19.45	0.50–1.00
10	5.56	±1.05	18.88	4.00–7.50	5.11	±1.01	19.72	3.00–7.00
11	5.78	±2.91	50.40	0.75–10.0	6.75	±1.77	26.19	4.00–10.0
12	4.91	±1.86	37.93	2.50–8.00	3.81	±2.50	65.6	1.50–11.0
13	1.80	±0.21	11.52	1.50–2.00	1.83	±0.18	9.74	1.50–2.00
14	1.10	±0.23	20.9	0.75–1.50	1.19	±0.27	22.41	0.96–1.75
15	8.25	±3.15	38.2	4.00–12.0	0.11	±0.47	424.26	0.00–2.00

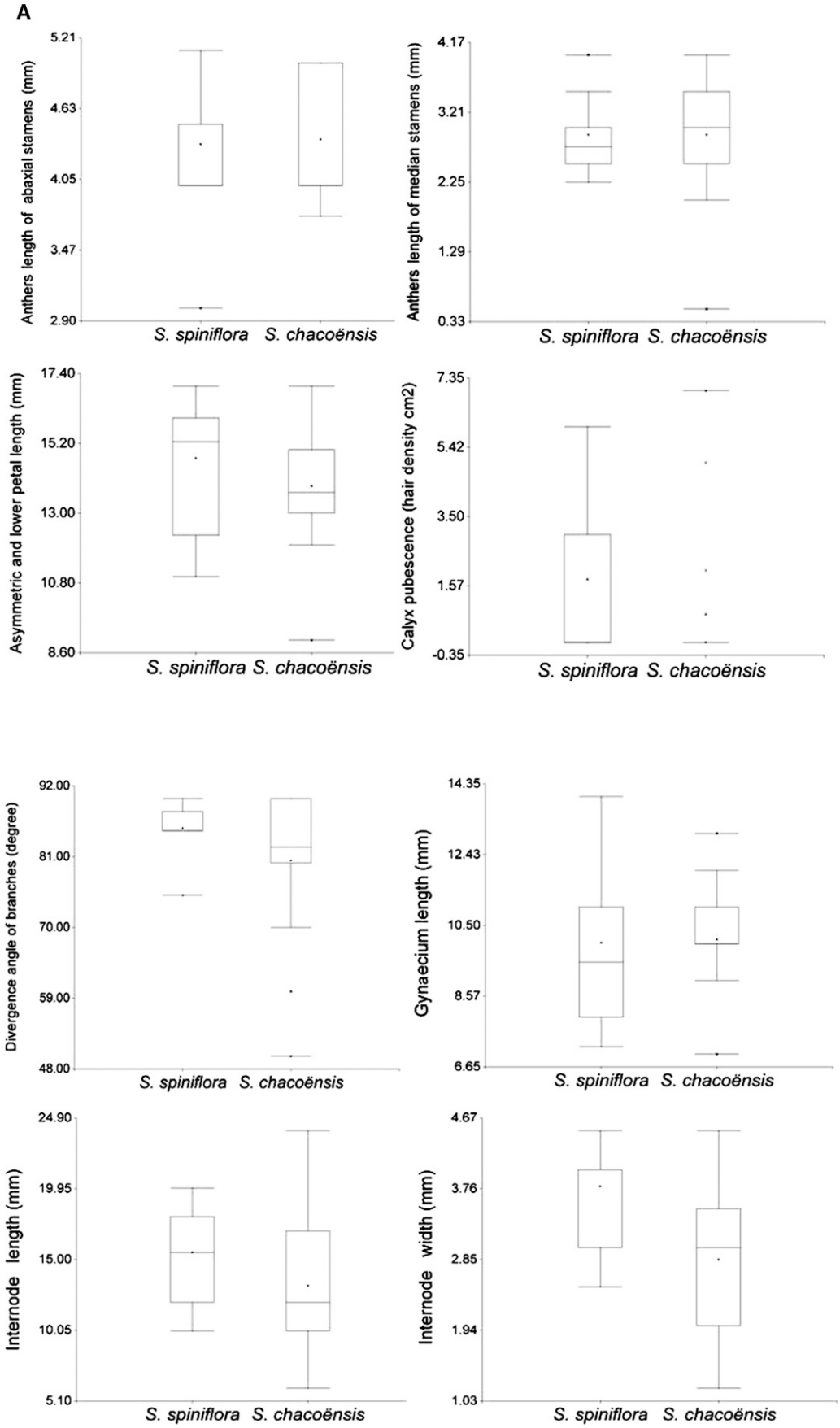

FIG. 1A. Box plots representing the variability of the quantitative characters in *S. spiniflora* and *S. chacoënsis*. The box represents the interquartile range; upper horizontal line (bar) is the uppermost value; lower horizontal line is the lowermost value; circle within the box and the bar in the middle of the box represent the mean and the median, respectively. Points represent outliers.

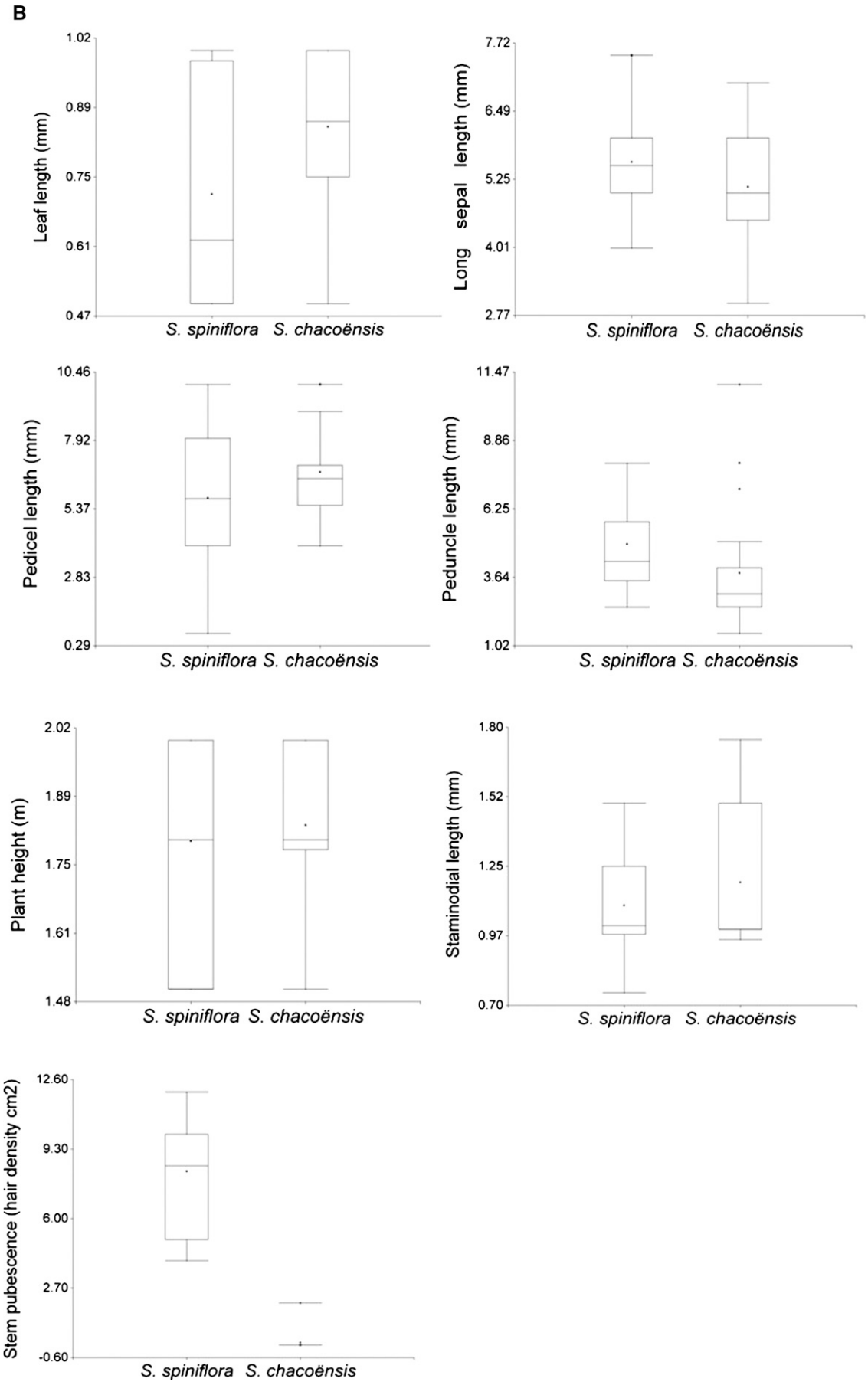

FIG. 1B. Continuation of Fig. 1A.

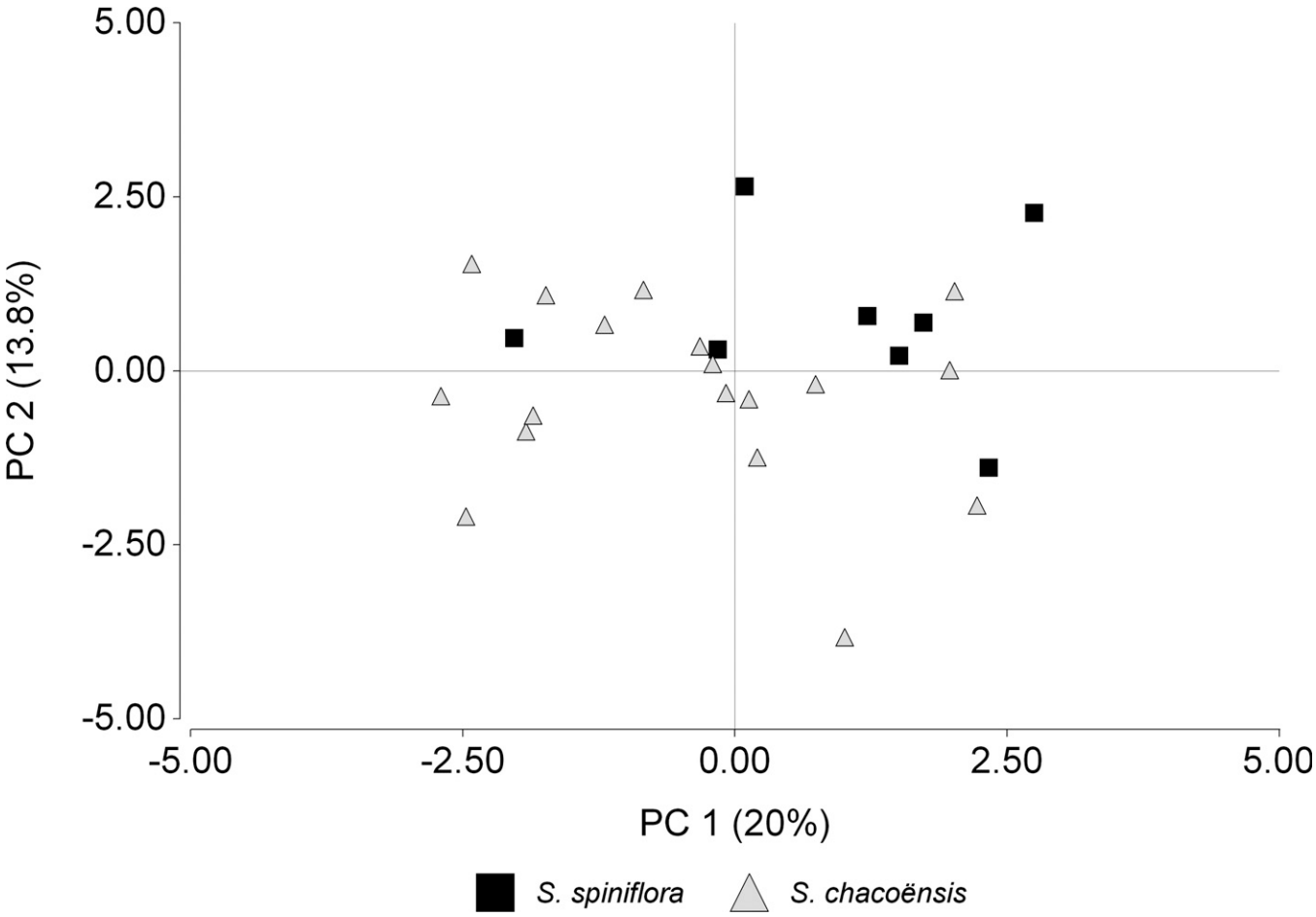

FIG. 2. Principal components analysis (PCA) scatter plots of the first two components. The squares represent *S. spiniflora* samples and the triangles represent *S. chacoënsis* samples. The morphological characters used in this analysis are listed in Table 1.

Boquerón: Entre Toba Quemado y Magariños, Sector Pilcomayo, Sept. 1938, *Rojas 8269* (holotype: SI!).

Cassia aphylla Cav. var. *robusta* Burkart, Darwiniana 7: 237. 1946. syn. nov. *Cassia rigida* (Hieron.) Burkart var. *robusta* Burkart, Legum. Argent. (ed. 2): 544. 1952. *Cassia chacoënsis* L. Bravo, Darwiniana 21: 359. 1978. *Senna chacoënsis* (L. Bravo) H. S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 569. 1982. —TYPE: ARGENTINA. Prov. Santiago del Estero: Gral. Taboada Añatuya, 27 Jan 1944, *Soriano 571* (holotype: SI!).

TABLE 3. Contributions of individual characters to the first three multivariate axes of the principal components analysis (PCA). Characters numbered according to Table 1.

Character	PC1	PC2	PC3
1	–0.09	–0.19	0.59
2	0.27	0.23	–0.02
4	0.29	–0.37	0.27
5	0.37	–0.02	–0.09
6	0.03	–0.45	0.19
7	–0.40	0.12	–0.26
8	–0.23	0.15	0.11
9	0.41	–0.01	–0.17
10	–0.35	–0.30	0.17
11	–0.25	–0.19	–0.13
12	–0.10	0.31	0.47
13	–0.29	0.11	–0.08
14	0.02	0.51	0.33
15	0.19	0.19	0.21

Shrubs 1.5–2 m tall; branches 1.2–4.5 mm wide, glabrous to pubescent, divaricate, divergence angle 50°–90°; leaf 0.5–1 mm long, ± 0.5 mm wide. Racemes borne along the length of the flowering branchlets to crowded toward tip of branchlets. Bracts 1–1.5 mm long, 0.25–0.75 mm wide; peduncle 1.5–11 mm long, 0.25–0.5 mm wide; pedicel 0.75–10 mm long, 0.25–0.5 mm wide, both the peduncle and pedicel glabrous to pubescent. Calyx glabrous to pubescent, the 2 smaller sepals 3–4 mm long, 2–2.25 mm wide and the 3 larger sepals 3–7.5 mm long, 3–4 mm wide. Petals 9–17 mm long, 4–8 mm wide. Androecium: 3 anthers of long abaxial stamens 3–5.1 mm long, and filament 1–8 mm long; 4 anthers of median stamens 2.5–4 mm long, and filament 1–1.5 mm long and 3 staminodes 0.75–1.75 mm long, and filament 1–2 mm long. Gynoecium 7–14 mm long, 0.75–1 mm wide, glabrous. Pods 7–9 cm long, 4–5 mm wide, glabrous. Seeds 3.5–5 mm long, 2.5–3.5 mm wide.

Distribution and Habitat—*Senna spiniflora* occurs in central and northern Argentina (Córdoba, Chaco, Formosa, Salta, Santa Fe, and Santiago del Estero provinces) and southern Paraguay (Boquerón department) (Fig. 4). This species grows in Chaco Biogeographic regions usually on clay and salty soils (Cabrera 1971).

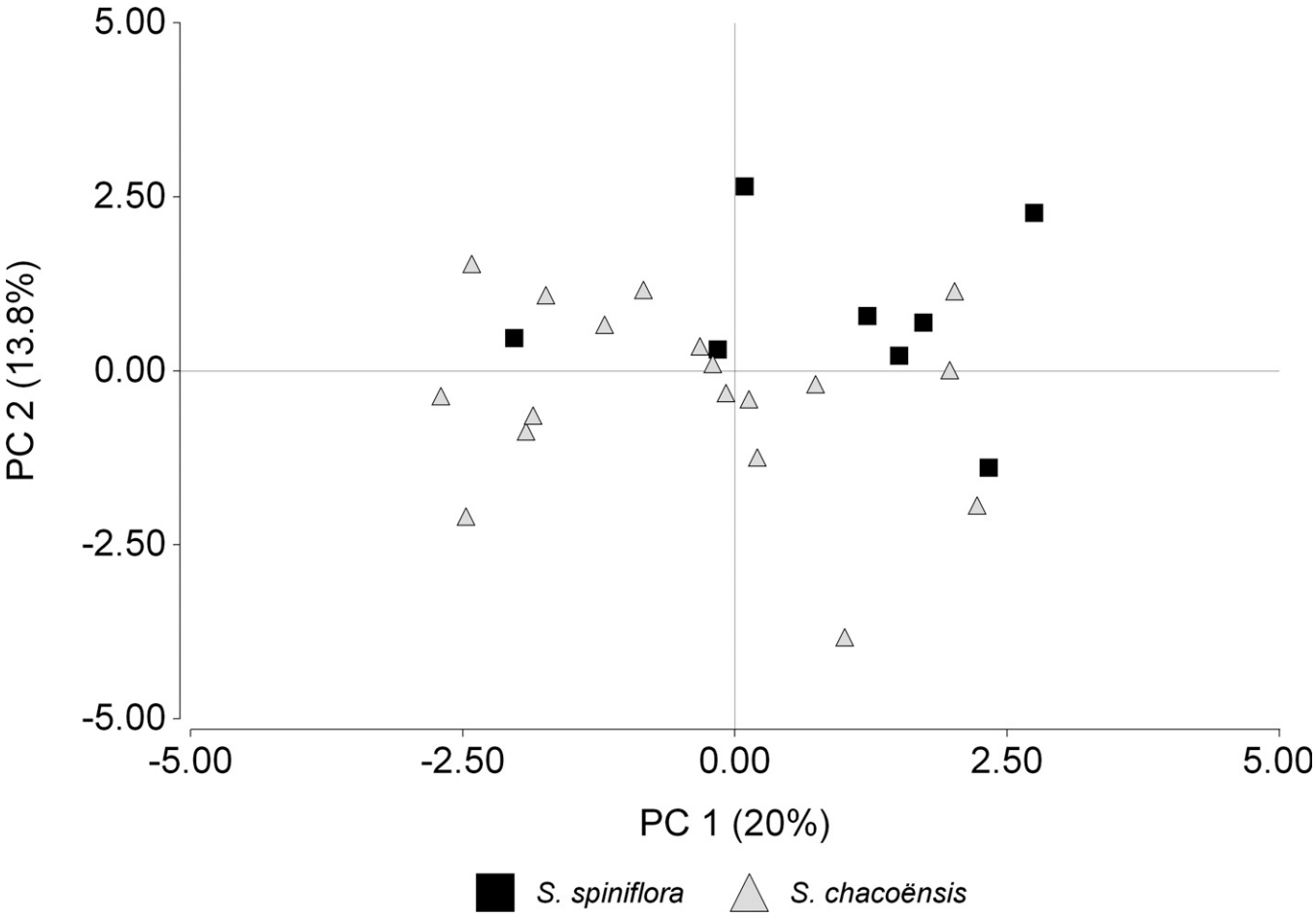

Fig. 3. Scatter plots of the first and third components. The squares represent *S. spiniflora* samples and the triangles represent *S. chacoënsis* samples. The morphological characters used in this analysis are listed in Table 1.

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Literature Cited

Bentham, G. 1871. Revision of the genus *Cassia*. *Transactions of the Linnean Society of London* 27: 503–591.

Bravo, L. 1978a. El género *Cassia* en la Argentina, I. Serie *Aphyllae*. *Darwiniana* 21: 343–391.

Bravo, L. 1978b. Estudio comparativo de las plántulas de las subespecies de *Cassia aphylla* Cav. *Darwiniana* 21: 393–399.

Bravo, L. 1982. Estudio de las semillas del género *Cassia*: Serie *Aphyllae* (Leg.). *Darwiniana* 24: 455–468.

Burkart, A. 1946. Leguminosas nuevas o críticas: Las especies áfilas de género *Cassia*. *Darwiniana* 7: 235–239.

Burkart, A. 1952. *Cassia*. Pp. 162–169 in *Las Leguminosas Argentinas silvestres y cultivadas* ed. 2. Buenos Aires: Ediciones Acme.

Cabrera, A. 1971. Fitogeografía de la República Argentina. *Boletín de la Sociedad Argentina de Botanica* 14: 1–42.

Chapman, A. D. and J. Wieczorek. 2006. Guide to Best Practices for Georeferencing. Copenhagen: Global Biodiversity Information Facility.

Fortunato, R. H. 1984. Dos Leguminosas nuevas para la Flora Argentina. *Darwiniana* 25: 267–268.

Hijmans, R. J., L. Guarino, A. Jarvis, R. O'Brien, P. Mathur, C. Bussink, M. Cruz, I. Barrantes, and E. Rojas. 2005. DIVA-GIS 7.1.7. Available in http://www.diva-gis.org.

Irwin, H. S. and R. C. Barneby. 1982. The American Cassinae: A synoptical revision of Leguminosae, tribe Cassiae subtribe Cassiinae in the New World. *Memoirs of the New York Botanical Garden* 35: 567–570.

Marazzi, B., R. H. Fortunato, P. K. Endress, and R. Spichiger. 2006. *Senna* (Cassiinae, Leguminosae) in Paraguay: synopsis, occurrence, ecological role and ethnobotany. *Candollea* 61: 315–329.

Robbiati, F. O., L. Ariza Espinar, A. M. Anton, and R. H. Fortunato. 2011. Cambios nomenclaturales en el género *Senna* Ser. *Aphyllae* (Caesalpiniodeae, Leguminosae). *Boletín de la Sociedad Argentina de Botánica* 46(Suplemento): 117.

Appendix 1. Vouchers and specimens used in the morphometric study.

Senna chacoënsis (L. Bravo) H. S. Irwin & Barneby. ARGENTINA. Prov. Córdoba: Río Seco, La Rinconada, 5 Dec 1924, *Kühlenschmidt 1* (SI); Nov 1953, *Sayago 1704* (SI). Prov. Chaco: Dpto. Almirante Brown, sobre ruta nacional 16, 66 km al NE de Monte Quemado, 6 Mar 1986, *Molina 2953* (BAB); 12 km de Taco Pozo hacia la picada Barilari, 25°33′S 63°20′W, 22 Nov 1990, *Fortunato 1552* (BAB). Dpto. Gral. Güemes, Miraflores, 15 Nov 2006, *Salgado 491* (CTES). Dpto. 9 de Julio, Las Breñas, 28 Oct 1959, *Schulz 10748* (BAB). Dpto. 12 de Octubre, 7 km al S de Pinedo, por ruta nacional 89, 27°22′ S 61°20′ W, 13 Mar 2013, *Fortunato 10156* (BAB). Prov. Formosa: Dpto. Bermejo, Pozo de Maza, 3 Feb 1986, *Maranta 983*

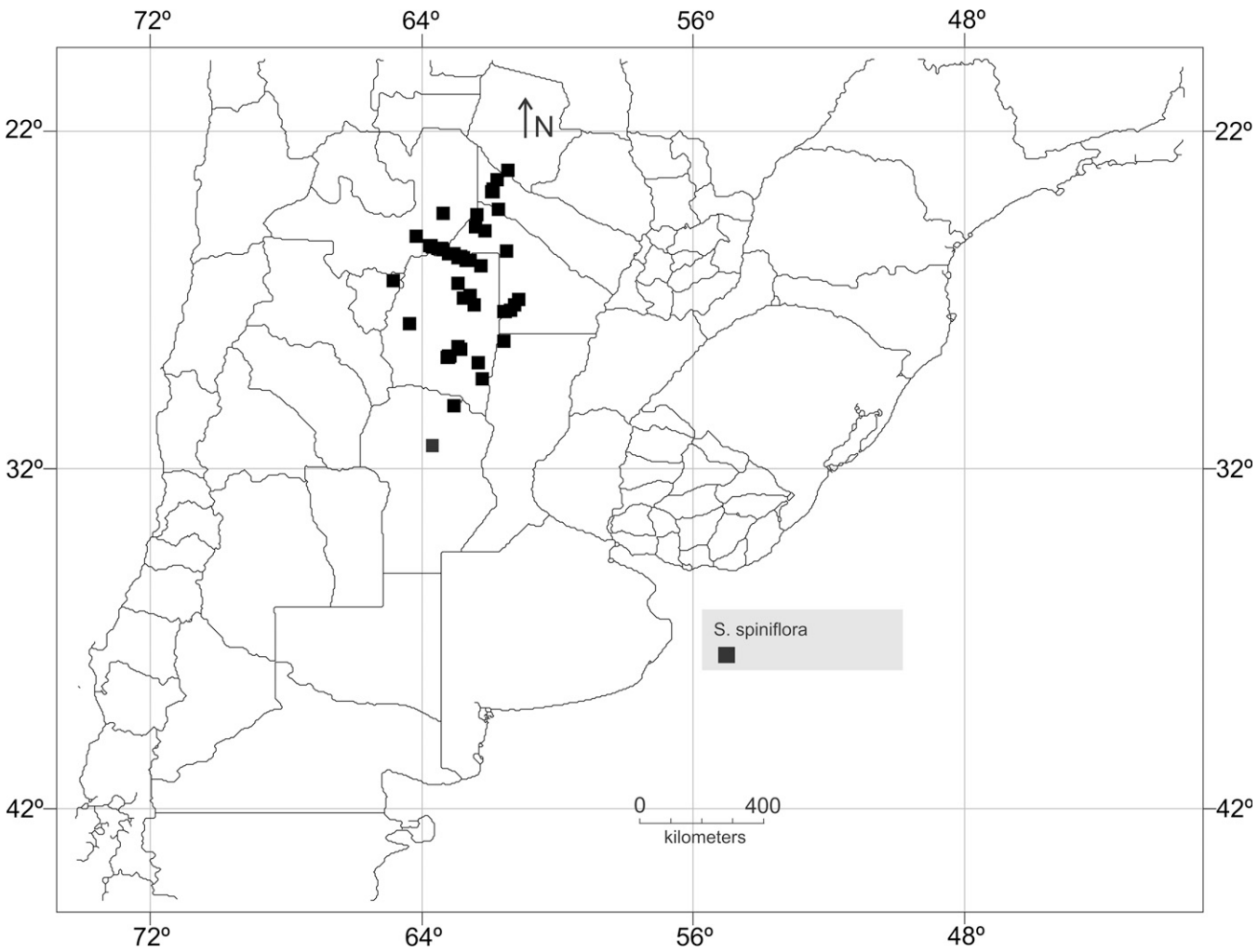

Fig. 4. Distribution map of *S. spiniflora* (Burkart) H. S. Irwin & Barneby.

(BAB). Dpto. Matacos, 15 Nov 1994, *Fortunato 4570*, *4575* (BAB). Prov. Salta: Dpto. Anta, Ibón, 40 km al SE de J. V. González, 17 Dec 1986, *Saravia Toledo 1264* (SI); San Felipe, 70 km al NO de J. V. González, por ruta 41, 10 Jan 1990, *Saravia Toledo 2281* (CTES); 40 km al O de Taco Pozo, por ruta nacional 16, 25°29′ S 63°39′ W, 16 Mar 2013, *Fortunato 10220* (BAB); 54 km de J. V. González, camino a Puerta Blanca, 22 Nov 1994, *Krapovickas 46284* (CTES). Prov. Santa Fe: Dpto. 9 de Julio, entre Boliche de Turco y el Cuadrado, 19 Dec 1937, *Ragonese 3103* (INTA). Prov. Santiago del Estero: Dpto. Aguirre, Gral. Pinto, 13 Feb 1951, *Ragonese 7702* (BAB). Dpto. Alberdi, Campo Gallo, 27 May 1949, *Soriano 3607* (BAB). Dpto. Belgrano, 10 km de Bandera camino a Cuatro Banderas, 18 Oct 1972, *Elisetch-Cano 19* (BAB). Dpto. Copo, 20 km al E de Monte Quemado por ruta nacional 16, 25°43′ S 63°07′ W, 17 Mar 2013, *Fortunato 10221* (BAB); 70 km al E de Monte Quemado por ruta nacional 16 en dirección a Taco Pozo, 26°04′ S 62°11′ W, 13 Nov 2001, *Fortunato 7237* (BAB). Dpto. Gral. Taboada, Añatuya, 17 Apr 1917, *Hosseus 258* (CORD); ruta provincial 7, a la salida de Añatuya en dirección N, 28°26′ S 62°50′ W, 16 Apr 2010, *Fortunato 9675* (BAB); 39 km al S de Añatuya, por ruta provincial 6, 28°44′ S 63°08′ W, 13 Mar 2013, *Fortunato 10154* (BAB). Dpto. Moreno, Aerolito km 633, 15 Apr 1917, *Hosseus 178* (CORD); 15 km de Tintina, 12 Nov 1984, *Kuntz-Pérez 37* (BAB). Prov. Tucumán: Dpto. Burruyacu, 27 Dec 1906, *Stuckert 16697* (CORD); 2 Dec 1906, *Stuckert 12360* (CORD).

Senna spiniflora (Burkart) H. S. Irwin & Barneby. ARGENTINA. Prov. Chaco: Dpto. Almirante Brown, 17 Nov 1994, *Fortunato 4591* (BAB). Dpto. Gral. Güemes, 11 km al O de Comandancia Frías cerca del cruce de acceso a Fte. Esperanza, 24°35′ S 62°19′ W, 13 Dec 1999, *Fortunato 6407* (BAB); Camino acceso a Sauzalito desde la ruta al Sauzal, 24°26′ S 61°40′ W, 5 Mar 2000, *Fortunato 6595* (BAB); Camino de Fuerte Esperanza a Juana Azurduy, 31 Oct 1986, *Schinini 24928* (CTES). Prov. Formosa: Dpto. Mataco, Ing. Juárez, 3 km al S del pueblo sobre la ruta que va a Bermejo y a Belgrano, 23°54′ S 61°51′ W, 25 Feb 1983, *Arenas 2331* (BAB); 3 km al S de Ing. Juárez por ruta provincial 39 en dirección a La Florencia. 23°55′ S 61°52′ W, 15 Mar 2013, *Fortunato 10204* (BAB); 10 km al O de Ing. Juárez, por ruta nacional 81 en dirección a la provincia de Salta, 23°51′ S 61°57′ W, 15 Mar 2013, *Fortunato 10211* (BAB). Prov. Salta: Dpto. Anta, Las Lajitas camino a Rivadavia a 24 km del Puerto Figueroa y 89 km de Las Lajitas, 2 Oct 1974, *Legname 10452* (LIL). Prov. Santiago del Estero: Dpto. Copo, Obraje Los Tigres, Los Hornos, 20 Nov 1971, *Meyer 23281* (LIL); 37 km al E de Monte Quemado por ruta nacional 16, 25°56′ S 62°30′ W, 11 Dec 1999, *Fortunato 6361* (BAB).