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The genus *Senna* Mill. (Leguminosae: Caesalpinioideae) in a fragment of the Ecological Station Raso da Catarina, Bahia, Brazil

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ABSTRACT. *Senna* comprises about 300 species with circuntropical distribution, widely represented in the Americas, also occurring in Africa, Australia, Asia and Oceania. The Brazil includes 80 species, of which 27 are endemic, 50 reported from Bahia and 22 recorded from the Caatinga. The floristic survey of *Senna* in the Ecological Station Raso da Catarina included analysis of specimens collected March 2010 to October 2011. The analyses were supplemented with dried collections from the following herbaria: ALCB, EAC, HRB, HUEFS and MBM. Seven taxa were recorded. The most representative taxa in the area were *Senna rizzinii* H.S.Irwin & Barneby and *S. acuruensis* (Benth.) H.S.Irwin & Barneby var. *acuruensis*. The genus can be found in a variety of environments from preserved to degraded areas and in sandy, sandy-clayey or rocky soils. The taxonomic treatment includes anidentification key, descriptions, illustrations, photos, data of the geographical distribution, reproductive phenology and comments about the taxa.

Keywords: Biodiversity, Floristics, Semiarid.

O gênero *Senna* Mill. (Leguminosae: Caesalpinioideae) em um fragmento da Estação Ecológica Raso da Catarina, Bahia, Brasil

RESUMO. *Senna* inclui cerca de 300 espécies com distribuição circuntropical, amplamente representada nas Américas, ocorrendo ainda na África, Austrália, Ásia e Oceania. O Brasil inclui 80 espécies, dentre estas 27 são endêmicas, 50 são registradas para Bahia e 22 para Caatinga. O levantamento florístico de *Senna* na Estação Ecológica Raso da Catarina incluiu a análise de espécimes coletados de março de 2010 a outubro de 2011. As análises foram complementadas com coleções dos seguintes herbários: ALCB, EAC, HRB, HUEFS e MBM. Sete táxons foram registrados. Os táxons mais representativos na área foram *Senna rizzinii* H.S.Irwin & Barneby e *S. acuruensis* (Benth.) H.S.Irwin & Barneby var. *acuruensis*. O gênero pode ser encontrado em uma variedade de ambientes de preservados até áreas degradadas e em solos arenosos, argilo-arenosos ou rochosos. O tratamento taxonômico inclui uma chave de identificação, descrições, ilustrações, fotografias, dados de distribuição geográfica, fenologia reprodutiva e comentários sobre os táxons.

Palavras-chave: Biodiversidade; Florística; Semiárido.

Introduction

Senna was established by Miller (1754), is the second largest genus of Cassiinae (Lewis, 2005). It was segregated from *Cassia s. l.* with the recognition of three distinct genera: *Cassia* L (*s.s*), *Senna* and *Chamaecrista* Moench (Irwin & Barneby, 1982).

The genus has a circumtropical distribution, occurring in the Americas, Africa, Australia, Asia and Oceania, with about 300 species (Lewis, 2005). In Brazil, *Senna* is represented by approximately 80 species of which 27 are endemic and 50 species are reported from Bahia (Flora do Brasil 2020 em construção), with 22 species recorded from the Caatinga (Queiroz, 2009).

The species of *Senna* can be identified morphologically by the absence of bracteoles on the flower pedicel, the presence of claviform to pyramidal convex extrafloralnectaries, and cylindrical or flat-compressed fruit with inert dehiscence.

The genus is subdivided into six sections: *S.* sect. *Astroites* H.S.Irwin & Barneby, *S.* sect. *Chamaefistula* (Collad.) H.S.Irwin & Barneby, *S.* sect. *Paradictyon* H.S.Irwin & Barneby, *S.* sect. *Peiranisia* (Raf.) H.S.Irwin & Barneby, *S.* sect. *Psilorhegma* (Vogel) H.S.Irwin & Barneby and *S.* sect. *Senna* Mill. (Irwin & Barneby, 1982). Of these, only the section *Psilorhegma* was recognized as monophyletic; the others, *Chamaefistula*, *Peiranisia* and *Senna,* were paraphyletic since *Astroites* and *Paradictyon* appeared

grouped in other clades according to molecular phylogenetic analysis (Marazzi, Endress, Queiroz, & Conti, 2006). Acoording to Irwin and Barneby (1982), *S*. sect. *Chamaefistula* has greater numbers of species, being the most representantive in Caatinga.

The most comprehensive taxonomic treatments for *Senna* was the review done by Irwin and Barneby (1982), who recognized 260 species to the New World. In Brazil, work has dealt with reports of new occurrences, such as Bortoluzzi, Miotto, and Reis (2007) for the flora of southern Brazil, and the descriptions of new species such as Araújo and Souza (2007) for Tocantins and Irwin and Barneby (1985) and Cardoso and Queiroz (2008) for Bahia. Among regional work with this genus in Brazil are Lewis (1987) for Bahia; Lewis (1995) for Pico das Almas (Bahia); Rodrigues, Flores, Miotto, and Baptista (2005) for Rio Grande do Sul; Dantas and Silva (2013) for *Parque Estadual da Serra Dourada* (Goiás) and Rando, Hervencio, Souza, Giulietti and Pirani (2013) for Serra do Cipó (Minas Gerais). Studies of floristic surveys for the genus in Brazil showed that the number of works remains few, especially those with descriptions and identification keys.

Given the significant representation of the genus in the flora of the state of Bahia, and especially in the Caatinga, this study aimed to better comprehend the diversity of this group in a fragment of Ecological Station Raso da Catarina (ESRC), in order to contribute to knowledge about the flora of the semiarid region of Bahia as well as to support the development of the ESRC management plan.

Material and methods

The Raso da Catarina Ecoregion comprises 30.800 km^2 and is one of the eight Ecoregions recognized for the Caatinga and includes units of conservation. In the North-south direction it is narrow and elongated. In the North, West and East it is limited to the southern hinterland depression. The northeastern portion has limits with the Borborema Plateau and the southern part of the Bahia hinterland, in the Zona da Mata. The Ecoregion is a basin with soils that are very sandy, deep and little fertile. Its relief is very flat, but with canyons in the western part (formed by sandstone outcrops). The altitudes above sea level vary from 400 to 600 m in the southern part (Bahia) and from 350 to 700 m in the northern part (Jatobá basin, Pernambuco). In the southern part (Bahia) most of the soils are composed of sand (deep, excessively drained, acid and very low fertility) and oxisol (deep, well drained, acid and low fertility) whereas in the northern part (Pernambuco) sands soils prevail. There exists little surface water in the region except in the areas of the canyons. The predominant vegetation is the sandy, bushy Caatinga, very dense and less thorny than the Caatinga of crystalline soils (Velloso, Sampaio, & Pareyn, 2002).

The ESRC is one of the protected areas of the Raso da Catarina Ecoregion. It is one of the largest areas of protected Caatinga and occupies about 105,282.00 ha., delimited by the coordinates 09º33'13" to 09º54'30" S and 38º29'20" to 38º44'00" W, limited to the North with the Pankararé aldeia, to the east with the municipalities of Rodelas and Canudos, to the South with the municipality of Jeremoabo and West with the municipalities of Paulo Afonso and Jeremoabo. The climate of the ESRC is semiarid average rainfalls of 500 mm year^{-1} and annual temperature is approximately 23º C (Szabo, Rocha, Tosato, & Barroso, 2007).The soils are generally sandy deep and very fertile relief plan with sandstone formations and the predominant vegetation is the sandy, bushy Caatinga, very dense (Velloso, Sampaio, & Pareyn, 2002).The fragment studied covers 42.112 ha (Figure 1), wich is equivalent to approximately 40% of total area, delimited by coordinates 09°39'0.30" to 09°50'98.2" S and 38°26'57.5" to 38°29'32.6" W.

The study was based on fieldwork carried out in the period between March 2010 and October 2011, besides information complemented by the analysis of specimens deposited in the herbaria: ALCB, EAC, HRB, HUEFS and MBM, acronyms according to Thiers (2017) (continuously updated). The field collections and observations were performed during random walks exploring most of the study area, totaling sixteen excursions. The herborization and material processing followed the methodology by Fosberg and Sachet (1965) and Mori, Mattos-Silva, Lisboa, and Coradin, (1989), where fertile material was collected with flowers and/or fruit. Observations were made about the distribution of the species and the type of soil (Sampaio, 2010). The specimens were deposited in the herbarium of the *Universidade do Estado da Bahia* (HUNEB-Paulo Afonso Collection) and the duplicates will be sent to the main herbaria in the state of Bahia.

The identifications were made based mainly on specialized bibliographies (e.g., Irwin & Barneby, 1982; Queiroz, 2009), protologues, photos of type collections and consulting of the collections in the herbaria that were visited. For the taxonomic descriptions, the terminologies proposed by Irwin and Barneby (1982), Harris and Harris (2001), Queiroz (2009), Gonçalves and Lorenzi (2011) were adopted. The taxonomic treatment includes an identification key of taxa, descriptions, illustrations, and data of the geographical distribution and reproductive phenology of the species.

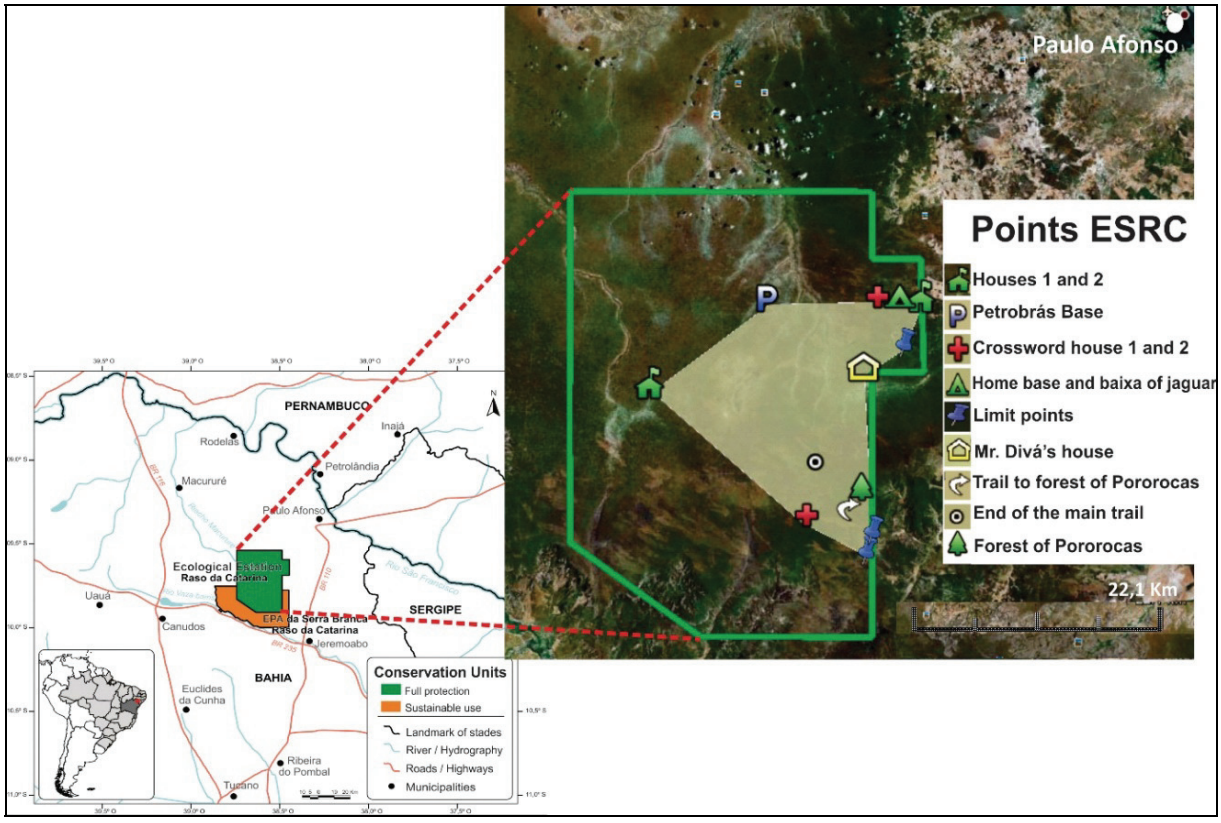

Figure 1. Location of the fragment studied in the Ecological Station Raso da Catarina (Varjão, Jardim, & Conceição, 2013, modified).

Results and discussion

Identification key for the representatives of the genus *Senna*

1. Leaves with exactly 4 pairs of leaflets; nectary located on the petiole; flowers zygomorphic ….. ……..... 4. *S. occidentalis*

1'. Leaves with 2-20 pairs of leaflets; nectary located on the rachis; flowers asymmetric.

2. Branches viscous; leaves with 18-20 pairs of leaflets …….. 1. *S. acuruensis* var. *acuruensis*

2'. Branches not viscous; leaves with 2-5 pairs of leaflets.

3. Subshrubs until 0.5 m tall; leaves with 3-5 pairs of leaflets; apex of leaflets rounded to widely obtuse; legumes dry.

4. Leaves with exactly 3 pairs of leaflets; legumes arched, 35-123 mm long ..... 3. *S. obtusifolia*

4'. Leaves with 3-5 pairs of leaflets; legumes erect, simulating one loment, 13–41 mm long …..... 7. *S. uniflora*

3'. Small tree to shrubs until 4 m tall; leaves with exactly 2 pairs of leaflets, apex of leaflets rounded or acute; legumes fleshy.

5. Leaflets 13-32 × 6-15 mm; flowers c. 4 cm diam……..... 5. *S. rizzinii*

5'. Leaflets 16-88 × 8-41 mm; flowers 6-11 cm diam.

6. Leaflets semi-succulent, 21-88 × 9-41 mm, pilose to tomentose, midrib excentric; nectary pyramidal; flowers c. 6 cm diam. ....…. 2. *S. macranthera* var. *pudibunda*

6'. Leaflets chartaceous, 16-23 × 8-29 mm, glabrous, midrib median; nectary digitiform; flowers c. 11 cm diam..... 6. *S. splendida* var. *gloriosa*

Senna Mill., Gard. Dict. Abr. ed. 4, v. 3. 1754.

Subshrubs, shrubs or trees. Indumentum constituted of trichomes glandular or tector, present or absent. Stipules entire, persistent or deciduous, oblanceolate to subulate. Leaves alternate, spiral or distichous; petiolate or subsessile, presence of pulvinus; extrafloral nectaries absent or present, convex, sessile or stipitate, located between the pairs of leaflets or on the petiole; leaflets 1-many pairs, papyraceous to coriaceous, elliptic to oblong, lanceolate to obovate, apex acuminate, rounded to mucronate, base oblique. Inflorescences axillary or terminal, racemose, 2-33-flowered; bracts persistent or deciduous; bracteoles absent; flowers zygomorphic

or asymmetric; Sepals 5, two smaller and three larger; petals 5, yellow or orange base; stamens 7, heteromorphic, 4 smaller median, subsessile, fillet erect, 2-3 abaxial larger, 2 laterals, fillets curved, twice the length of the anthers, 1 central, fillet erect, less than anther, 3-4 adaxialstaminodes or or absent, anthers dehiscent through apical sutures. Legume cylindrical, linear and oblong, plane-compressed, dehiscent or indehiscent, dehiscence inert; seeds seeds oblong, obovate, piriform or romboid.

Senna includes about 300 species circuntropical distribution, with center of diversity in the Americas, also occurring in Africa, Australia, Asia and Oceania (Lewis, 2005). For Caatinga were recorded 22 species (Queiroz, 2009). In Ecological Station Raso da Catarina were recorded seven taxa for the genus (Figure 2).

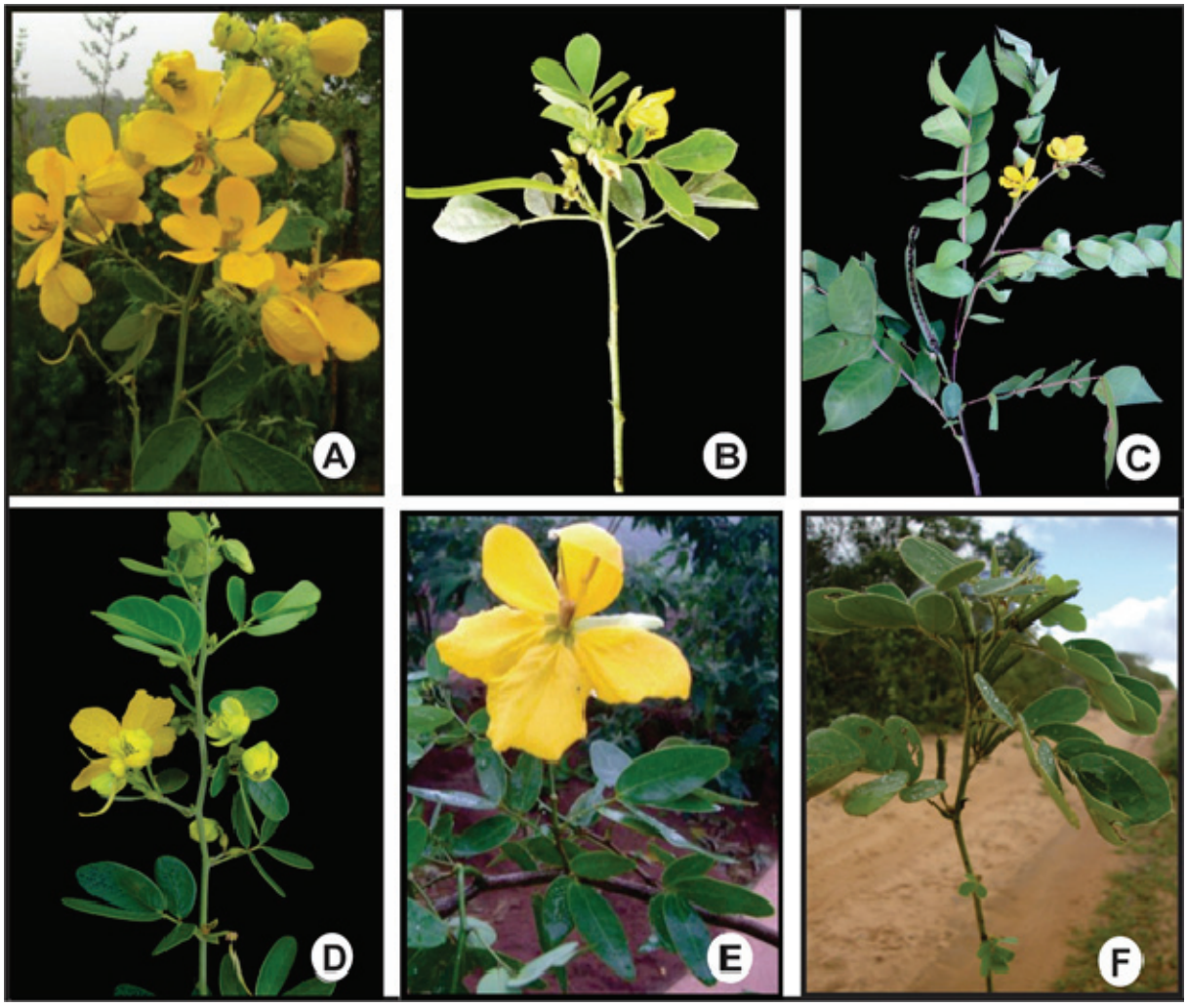

Figure 2. Representatives of the *Senna* in the ESRC. A. *S. macranthera* (Collad.) H.S.Irwin & Barneby var. *pudibunda* (Benth.) H.S.Irwin & Barneby; B. *S. obtusifolia* (L.) H.S.Irwin & Barneby; C. *S. occidentalis* (L.) Link; D. *S. rizzinii* H.S.Irwin & Barneby; E. *S. splendida* (Vogel) H.S.Irwin & Barneby var. *gloriosa* H.S.Irwin & Barneby; F. *S. uniflora* (Mill.) H.S.Irwin & Barneby. (A-F) Photos by Correia, C. L. S. B.

1. *Senna acuruensis* (Benth.) H.S.Irwin & Barneby var. ***acuruensis*,** Mem. New York Bot. Gard. 35: 508. 1982. Figure 3a-e

Shrubs erect, branched until 3 m tall; branches cylindrical, viscous, straight, epidermis green to green-vinaceous on the young branches, brown on the old branches. Indumentum hispidulous, constituted of trichomes glandular and tector, thin and stellate, colourless to whitish or orange, soft, rigid, erect, tangles, 0.5–3 mm long, distributed on the branches, pulvinus, petioles, stipite of nectary, leaflets, inflorescence axis, bracts and pedicels. Stipules green to green-vinaceous, filiform, little showy, 5–8 × c. 1 mm, caducous. Leaves 3–12.6 cm long; pulvinus vinaceous, glandular, c. 2.5 mm diam.; petiole 0.9–2.1 mm long, less than the rachis;

1–3 extrafloral nectaries, brown, stipitate, digitiform to ellipsoid, c. 1.5 mm long, located on the rachis, between the proximal pairs to leaflets; rachis 35–125 mm long; interfoliolar segments 4–8 mm long; leaflets discolorous, 18–20 pairs, chartaceous, adaxial surface glabrous, abaxial surface pilose, 10–19.5 × 4–8 mm, oblong to obovate, apex obtuse to truncate, mucronate, base oblique, venation penninervous. Inflorescences racemose, axillary, 3–9 flowered; bracts green to vinaceous, linear, 4–7 × c. 0.5 mm; pedicel 5–18 mm long. Buds green to green-yellowish, globose, 2–9 mm long. Flowers c. 2 cm diam., assimetric; sepals green with borders yellow, oblong to orbicular, abaxial surface glabrous, 6–10 × 2.5–10 mm; petals yellow, two external, oblong to ovate, 14–17 × 7.5–12 mm, two internal, oblanceolate to deltoid, 17–21 × 11–17 mm, cuculus falcate, bent around the stamens, 16–21 × 14–17.5 mm; stamens yellow, 5.5–15 mm long; staminoids yellow 4.5–6 mm long; ovary green, glabrous, 11–16 mm long; style green to yellowish, 3–4 mm long; Legumes oblong, curved, when young vinaceous, mature brown, dry, plane-compressed, 43–115 × 7–13 mm; valves chartaceous, glabrous. Seeds oblong, vinaceous, plane, 3–6 × 2–3 mm.

Material examined: BRAZIL, BAHIA: Paulo Afonso, Estação Ecológica Raso da Catarina, Trilha sentido casa abandonada, 9°43'10.04"S and 38°35'18.23"W, 625 m, 18.V.2010, fl., C.L.S.B. Correia et al. 115 (HUNEB); Trilha sentido mata da Pororoca, 9°48'32.7" S and 38°29'30.8 W, 584 m, 01.VII.2010, fl.; fr., C.L.S.B. Correia et al. 164 (HUNEB); 04.II.2011, C.L.S.B. Correia et al. 381 (HUNEB); Trilha sentido casa sede vindo da estrada principal, 09°39'16.5" S and 38°28'01.0" W, 621 m, fr., 24.XI.2010, C.L.S.B. Correia et al. 304 (HUNEB); Trilha sentido casa I do ICMbio após a encruzilhada de acesso a Pororoca, 09°44'14.9" S and 38°40'94.0" W, 585 m, 14.I.2010, fl., C.L.S.B Correia et al. 375 (HUNEB); Trilha principal próximo à entrada da ESEC, 09°39'0.30" S and 38°26'57.5" W, 635 m, 04.IV.2011, C.L.S.B Correia et al. 418 (HUNEB); Trilha sentido casa II do ICMbio vindo da Pororoca, 09°49'15.8" S and 38°29'33.6" W, 667 m, fl., 04.V.2011, C.L.S.B. Correia et al. 459 (HUNEB).

*Senna acuruensis*is a species endemic of Brazil, known only from the Northeast Region of Brazil, having been recorded in the states of Alagoas, Bahia, Pernambuco and Sergipe (Queiroz, 2009; Flora do Brasil 2020 em construção). Irwin and Barneby (1982) recognized three varieties for the species: *S. acuruensis* var. *acuruensis, S. acuruensis* var. *catingae* (Harms) H.S.Irwin & Barneby and *S. acuruensis* var. *interjecta* H.S.Irwin & Barneby, while reducing *Cassia catingae* Harms, to a variety of this species. However, research based on molecular data showed that *S. acuruensis* could be related to *S. multijuga* (Marazzi, Endress, Queiroz & Conti, 2006; Queiroz 2009). In 2009, Queiroz did not recognize the circumscription proposed by Irwin & Barneby (1982) for the species. According to this author, *S. acuruensis* differs from *Cassia catingae* in the number and dimensions of the leaflets and the indumentum, and therefore considered it a distinct species. In this study, we adopt the circunscription of *S. acuruensis* proposed by Queiroz (2009). In the study area, the species is quite common, occurring in the most degraded areas, near roadsides, on sandy soil and at altitudes below 700 m. It was collected with flowers from January to July and in November, and with fruits from June to July and in November.

The species can easily be distinguished from the other species of the area by viscous branches, leaves with 18–20 pairs of leaflets, 1–3 extra floral nectaries localized on the rachis between the proximal pairs to leaflets and dry plane-compressed fruits.

2. *Senna macranthera* (Collad.) H.S.Irwin & Barneby var. ***pudibunda*** (Benth.) H.S.Irwin & Barneby, Mem. New York Bot. Gard. 35 (1): 186. 1982. Figures 2e; 3f-h

Shrubs erect, branched until 4 m tall; cylindrical branches, straight, epidermis green on the young branches, brown on the old branches. Indumentum tomentose, constituted of trichomestector, thin, whitish, soft, erect and adpressed, uniform, c. 0.5 mm long, persistent on the old branches, intense on the young branches, distributed on the branches, stipules, petioles, leaflets, bracts, pedicels, sepals and petals. Stipules green, filiform, obsolete, 4.5–6 × 0.5–1 mm, caducous. Leaves 1.8–7.3 cm long; pulvinus green-vinaceous, pilose, c. 3.5 mm diam.; petiole 7–23 mm long, smaller than the rachis; 1 extrafloral nectary, green-vinaceous, sessile, pyramidal, 1–3 mm long, located on the rachis, between the proximal pair of leaflets; rachis 13–15 mm long; leaflets discolorous, 2 pairs, semi-succulent, adaxial surface pilose, abaxial surface tomentose, obovate to elliptic, 21–88 × 9–41 mm, apex rounded, base assimetric, venation

penninervous, midrib excentric. Inflorescences racemose, terminal, axillary, 5–14–flowered; bracts green, deltoid, 9–14 × 2–3 mm; pedicel 8–24 mm long. Buds yellow, ovoid to globular, 3–14 mm long. Flowers c. 6 cm de diam., asymmetric; sepals green, oblong or orbicular to ovate, abaxial surface pilose, 7.5–8.5 × 4–6 mm; petals yellow, two external, oblong to ovate, 16–31 × 9–26 mm, two internal, oblong to obovate, 14–30 × 9–19 mm, cuculus orbicular, bent around the androecium and gynoecium, 17–25 × 11–20 mm; stamens yellow to vinaceous, 8–18 mm long; staminoids yellow, 4–5 mm long; ovary yellow, setulose, 16–28 mm long; style green, 3–5 mm long. Legumes oblong, linear to little incurved, when young green to green-yellowish, past vinaceous to brown, fleshy, cylindrical, 38–80 × 2–4 mm; valves immature or past, not evidenced. Seeds not seen.

Material examined: BRAZIL, BAHIA: Paulo Afonso, Estação Ecológica Raso da Catarina, Trilha da Mata da Pororoca. 09°48'28.1" S and 38°29'30.9" W, 699 m, 19.V.2010, fl., M.V.V. Romão et al. 598 (HUNEB); 01.VII.10. fl.; fr., C.L.S.B. Correia et al. 170 (HUNEB); 28.V.11, fl., R.R. Varjão et al. 100 (HUNEB); 08.VI.11, fl.; fr., C.L.S.B. Correia et al. 466 (HUNEB).

Senna macranthera was reported from South America by Irwin and Barneby (1982). In Brazil occurs in the all regions, with wide diversity in the Northeast Region (Irwin & Barneby, 1982; Queiroz, 2009; Flora do Brasil 2020 em construção). According to Irwin and Barneby (1982), the species includes eight varieties, of which five occur in Bahia (Lewis, 1987) and three in the Caatinga (Queiroz, 2009). Only the variety *pudibunda* was collected in the portion of the ESRC studied; it occurs in the Northeast Region of Brazil to northern Minas Gerais and only in areas of Caatinga, making this variety endemic to this biome (Irwin & Barneby, 1982). In the study area, the taxon was collected in an ecotonal area of humid forest on sandy-clayey soil at altitudes of approximately 700 m. Flowers were observed from May to July and fruits from June to July.

In the area, the taxon can be recognized by leaves with two pairs of semi-succulent leaflets with excentric midrib and flowers with c. 6 cm in diam. It resembles *S. rizzinii* H.S.Irwin & Barneby and *S. splendida* (Vog.) H.S.Irwin & Barneby var. *gloriosa* H.S.Irwin & Barneby, by having in common leaves with two pairs of leaflets and stipitate extra floral nectaries localized on the rachis. However, *S. macranthera* var. *pudibunda* differs from the first species especially in the size of the flowers with c. 6 cm in diam. (*vs*. c. 4 in diam.), and size of the leaflets 21–88 mm long (*vs*. 13–32 mm long). The taxon can be further distinguished from *S. splendida* var. *gloriosa* by semi-succulent, pilose to tomentose leaflets with excentric midrib (*vs*. cartaceous and glabrous with medium midrib) and flowers of c. 6 cm diam. (*vs*. c. 11 in diam.)

3. *Senna obtusifolia* (L.) H.S.Irwin & Barneby, Mem. New York Bot. Gard. 35(1): 252. 1982. Figures 2b; 4a-d

Subshrubs erect, little branched until 0.5 m tall; cylindrical branches, straight, epidermis green on the young branches, green-vinaceous on the old branches. Indumentum pubescent, constituted of trichomes glandular and tector, thin, whitish brown to black, sessile an flexible, erect and wavy, sparse, 1–1.5 mm long, caducous on the old parts, eventually persistent, discreetly viscose on the young branches, distributed on the branches, stipules, petioles, margin and midrib with leaflets, bracts, sepals, ovary and legumes. Stipules green, filiform, showy, 2–12 × c. 0.2 mm, caducous. Leaves 3–10.5 cm long; pulvinus green, glabrous, c. 1.5 mm diam.; petiole 5–31 mm long, smaller than the rachis; 2 extrafloral nectaries, brown, stipitate, digitiform, 1–2 mm long, located on the rachis, between the pairs of proximal leaflets; rachis 8–25 mm long; interfoliolar segments 3–12 mm long; leaflets discolorous, 3 pairs, chartaceous, adaxial surface villose, abaxial surface canescent, 10–60 × 5–30 mm, widely obovate, apex rounded, mucronate, base cuneate, venation penninervous. Inflorescences racemose, axillary, 2–3 flowered; bracts green, filiform to lanceolate, 4–10 × 0.5–1.5 mm; pedicel 3–9 mm long. Buds green-vinaceous, globular, 3–7 mm long. Flowers 0.7–3 cm diam., asymmetric; sepals green, abaxial surface pilose, elliptic to ovate or ovate to orbicular, 5–12 × 2–9; petals yellow, two external, oblong to ovate, 6–7 × 4–6 mm, two internal, orbicular, 7–8 × 5–5.5 mm, cuculus bent around the androecium, 10–15 × 5–9 mm; stamens yellowish to vinaceous, 2.5–5.5 mm long; staminoids 0.5–2 mm long; ovary vinaceous, pilose, 5–12 mm long; style green to vinaceous, 6–11.5 mm long. Legumes linear to filiform, arched, when young green, mature not seen, dry, plane-compressed, 35–123 × 1–3.5 mm; valves chartaceous, glabrous. Seeds not seen.

Figure 3. a-e. *Senna acuruensis* var. *acuruensis*: a. flowering branch; b. rachis and nectary; c. leaflet; d. flower; e. fruit. f-h. *Senna macranthera* var. *pudibunda*: f. flowering branch; g. rachis and nectary; h. flower. a-e. from A. S. Conceição 1713; f-h. from A.S. Conceição 1717.

Material examined: BRAZIL, BAHIA: Paulo Afonso, Estação Ecológica Raso da Catarina, Trilha por trás da casa sede do ICMbio, 09°39.84.2" S and 38°28'0.06" W, 592 m, 20.VIII.2010, fl.; fr., C.L.S.B. Correia et al. 196 (HUNEB); Ao lado da casa base do ICMbio, 09°39.84.2" S and 38°28'0.06" W, 592 m, 29.V.2011, fl.; fr., R.R. Varjão et al. 98 (HUNEB); 01.VII.2011, fl.; fr., C.L.S.B. Correia et al. 497 (HUNEB); Próximo a casa base do ICMbio, 09°39'16.5" S and 38°28'01.0" W, 585 m, 20. VIII.2010, fr., C.L.S.B. Correia et al. 518.

Senna obtusifolia is an invasive species and has been recorded for the Americas (Mexico to Argentina), Africa and Asia (Irwin & Barneby, 1982; Queiroz, 2009). In Brazil, it is known from all regions and is found in the most degraded areas. In the study area it was collected in the most humid. and degraded areas on sandy-clayey soil at an altitude of 592 m, with flowers and fruits from May to August.

This species is characterized by leaves with exactly three pairs of leaflets and linear to filiform and arched fruits. In the area, *S. obtusifolia* can be confused with *S. uniflora* (Mill.) H.S.Irwin & Barneby, by both being small tall (to 0.5 m) and having largely obovate leaflets and extrafloral nectaries localized on the rachis. However, the species can be easily differentiated from *S. uniflora,* by three pairs of leaflets, arched and glabrous fruits, with 3.5–12.3 cm long (*vs*. five pairs of leaflets and erect and pilose fruits, simulating one lomentum, with 1.3–4.1 cm long).

4. *Senna occidentalis* (L.) Link, Handbuch [Link] 2:140. 1831. Figures 2f; 4e-h

Subshrubs erect, little branched until 0.8 m tall; cylindrical branches, straight, epidermis striated longitudinally, green-vinaceous on the young branches, purple on the old branches. Indumentum pubescent, constituted of trichomes tector, thin, colorless, erect, esparse, c. 1 mm long, caducous on the old branches, intense on the young branches, distributed on the pulvinus, margin with leaflets, sepals and legumes. Stipules green, lanceolate to deltoid, obsolete, 2.5–4 × 0.5–1 mm, caducous. Leaves 5.5–20.5 cm long; pulvinus green, pilose, 2–4 mm diam.; petiole 33–39 mm long, slightly larger with rachis; 1 extrafloral nectary, black, sessile, pyramidal, 1–2 mm long, located on the petiole; rachis 23–110 mm long; interfoliolar segments 13–34 mm long; leaflets discolorous, 4 pairs, membranaceous, adaxial surface glabrous to sparsely pubescent, abaxial surface pilose, lanceolate to elliptic, 17–65 × 9–37 mm, apex acute to cuneate, base assimetric to cuneate, venation penninervous. Inflorescences racemose, subumbeliform, axillary, 2–5 flowered; bracts green to vinaceous, lanceolate to deltoid, 4–6 × 2–4 mm; pedicel 7–28 mm long. Buds green-yellowish, globose, 3–9 mm long. Flowers c. 2.5 cm diam., zygomorphic; sepals green, deltoid to elliptical or obovate to oblong, abaxial surface glabrous, 6–9.5 × 3–4.5 mm; petals yellow, two external, obovate, 7–9.5 × 4–5.5 mm, two internal, oblanceolate, 7.5–9 × 3.5–5 mm, cuculus cordate to orbicular, bent around the stamens, 11–13 × 6–7 mm; stamens yellow, 6–7.5 mm long; staminoids yellow, 3–5 mm long; ovary yellow, tomentose, 5–8 mm long; style green, 3–4 mm long. Legumes oblong, little curved, when young vinaceous, mature brown with margins green-yellowish to yellowish, dry, plane-compressed, 44–120 × 2–8.5 mm; valves coriaceous, glabrous. Seeds oblong, brown to vinaceous green, plane to discreetly papillate, 3.5–6 × 1–2 mm.

Material examined: BRAZIL, BAHIA: Paulo Afonso, Estação Ecológica Raso da Catarina, trilha principal em frente a casa I do ICMbio, próximo ao portão da ESEC, 09°39'0.30" S and 38°26'57.5" W, 635 m, 29.VI.2010, fl.; fr., C.L.S.B. Correia et al. 128 (HUNEB); 19. VIII.2010, fl.; fr., C.L.S.B. Correia et al. 192 (HUNEB); 04.II.2011, fl.; fr., C.L.S.B. Correia et al. 380 (HUNEB); 25.III.2011. fl., C.L.S.B. Correia et al. 392 (HUNEB); 04.IV.2011, fl.; fr., C.L.S.B. Correia et al. 413 (HUNEB); Trilha principal próximo à casa do Sr. Divá, 09°43'12.6"S and 38°30'31.2"W, 568 m, 31.VII.2011, fl.; fr., C.L.S.B. Correia et al. 532 (HUNEB).

Senna occidentalis is an invasive species of tropical and subtropical America, Africa and Asia (Irwin & Barneby 1982; Queiroz 2009). The species is present in all of the regions of Brazil, and is found predominantly in the most degraded areas (Queiroz, 2009). In ESRC, the taxon is rare, inhabiting degraded areas on sandy-clayey soil at altitudes from 645–650 m, with the period of flowering and fruiting from February to August.

The species can easily be recognized in the area by leaves with 4 pairs of lanceolate to elliptical leaflets; petiolar extrafloral nectaries; zygomorphic flowers and dry, plane-compressed, little curved fruits.

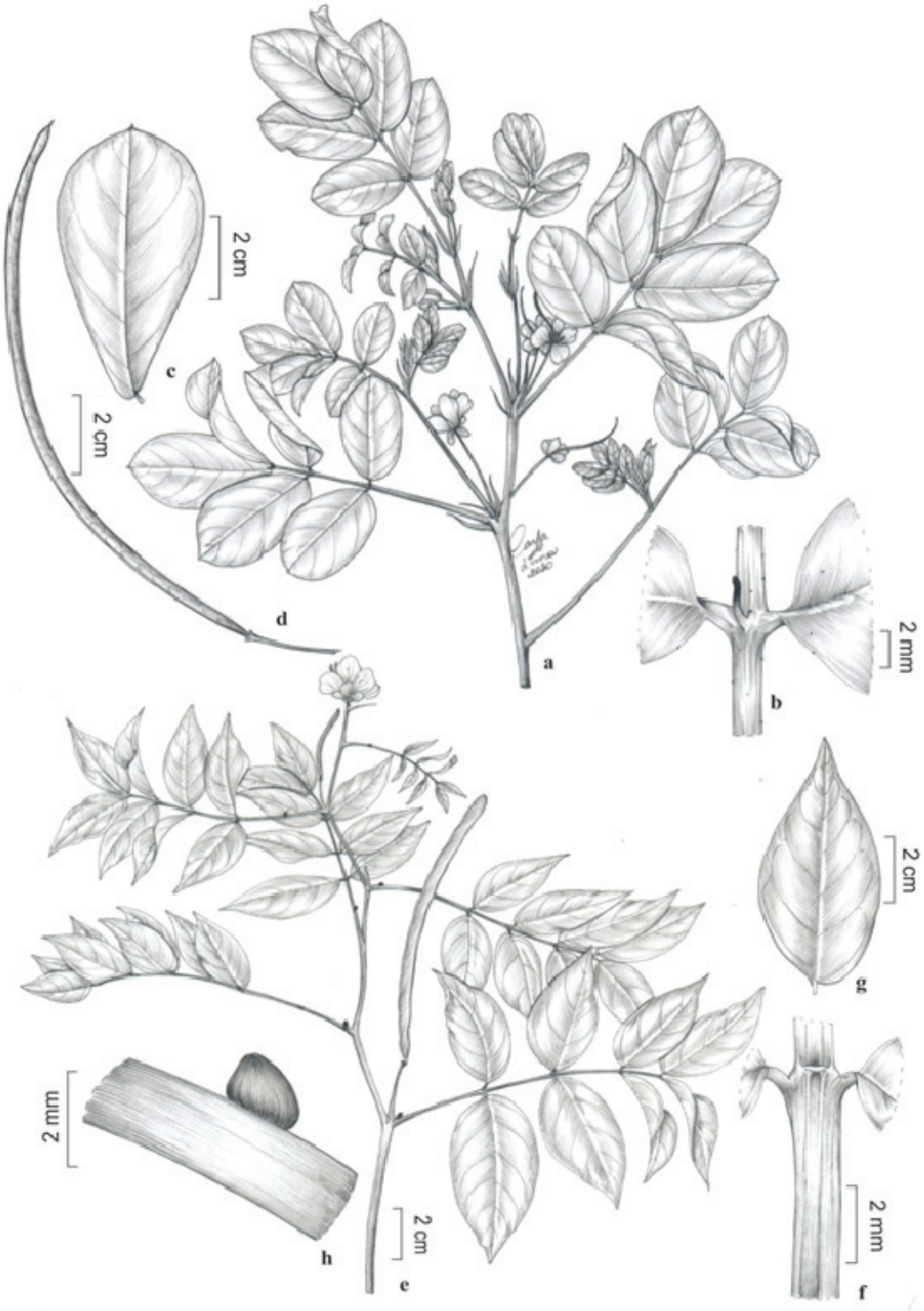

Figure 4. a-d. *Senna obtusifolia*: a. flowering branch; b. rachis and nectary; c. leaflet; d. fruit. e-h. *Senna occidentalis*: e. fertile branch; f. rachis; g. leaflet; h. detail of nectary; a-d. from A. S. Conceição 1861; e-h. from A. S. Conceição 1727.

5. *Senna rizzinii* H.S.Irwin & Barneby, Mem. New York Bot. Gard. 35(1): 174. 1982. Figures 2d; 5a-c

Shrubs erect, profusely branched until 4 m tall; cylindrical branches, straight, epidermis green on the young branches, discreetly estriated at the same time and light brown to green- greyish on the old branches. Indumentum tomentose, constituted of trichomestector, thin, white, flexible, erect and adpressed, wavy, excessive, c. 0.5 mm long, caducous on the old parts, intense on the young branches, distributed on the branches, stipules, petioles, rachis, leaflets, inflorescences, bracts, pedicels, margin with sepals and abaxial surface with the petals. Stipules vinaceous to brown, filiform, obsolete, 6–11 × 0.5–1 mm, persistent. Leaves 1.5–5.5 cm long; pulvinus brown-greyish, pilose, c. 1 mm diam.; petiole 5–18 mm long, slightly smaller or equal to rachis; 1 extrafloral nectary, vinaceous to purple, stipitate, pyramidal, located on the rachis between the proximal pair of leaflets, 1.5–2.5 mm long; rachis 4–8 mm long; leaflets discolorous, 2 pairs, chartaceous, adaxial surface puberulous, abaxial surface villose, ovate to elliptic, 13–32 × 6–15 mm, apex rounded to acute, base oblique, venation penninervous. Inflorescences racemose, axillary, 7–15 flowered; bracts green, orbicular to obovate, 2–6 × 2–4 mm; pedicel 10–13 mm long. Buds green to green-yellowish, ovate to obtuse, 4–11 mm long. Flowers c. 4 cm diam., assimetric; sepals green, deltoid to ovate or ovate to oblong, abaxial surface glabrous, 5–11 × 3–6 mm; petals yellow with ribs orange, two external, obovate to orbicular, 11–19 × 9–12 mm, two internal, obelliptic, 15–18 × 8–11 mm, cuculus cordiform to orbicular, 14–19 × 14.5–16 mm; stamens yellow, 5–13 mm long; staminoids, 2–5 mm long; ovary yellow, strigose, 8–12 mm long; style light yellow, 8–12 mm long. Legumes oblong, little curved, when young green, mature brown to vinaceous, fleshy, cylindrical, 28–74 × 3–20 mm; valves chartaceous, cylindrical, when young pilose, mature glabrous. Seeds obovate, brown to black, glossy, 6–10 × 3–5 mm.

Material examined: BRAZIL. BAHIA: Estação Ecológica Raso da Catarina, Trilha sentido casa sede, 09°39'16.5" S and 38°28'01.0" W, 621 m, 01.VII.2010, fl., C.L.S.B. Correia et al. 142 (HUNEB); 18.V.2010, fl.; fr., M.V.V. Romão et al. 572 (HUNEB); Mata da Pororoca, 09°48'28.1" S and 38°29'30.9" W, 699 m, 01.VII.2010, fl., C.L.S.B. Correia et al. 161 (HUNEB); Trilha principal sentido Mata da Pororoca, 09°48'32.7" S and 38°29'30.8" W, 624 m, 19.V.2010., fl., M.V.V. Romão et al. 617 (HUNEB); 25.X.2010, fr., C.L.S.B. Correia et al. 224 (HUNEB); 24.XI.2010, fl., C.L.S.B. Correia et al. 297 (HUNEB); Trilha por trás da casa sede do ICMbio, 09°39'16.5" S and 38°28'01.0" W, 582 m, 20.VIII.2010, fl.; fr., C.L.S.B. Correia et al. 197 (HUNEB); Trilha principal depois da Mata da Pororoca, 09°49'02.9"S and 38°29'50.6"W, 634 m, 25.X.2010, fl.; fr., C.L.S.B. Correia et al. 232 (HUNEB); 08.VI.11, fl., C.L.S.B. Correia et al. 476 (HUNEB); Trilha sentido casa II do ICMbio,09°49'15.8" S and 38°29'33.6" W, 667 m, 24.XI.2010, fl., C.L.S.B. Correia et al. 277 (HUNEB); 04.II.11, fl.; fr., C.L.S.B. Correia et al. 389 (HUNEB); Trilha principal sentido casa I do ICMbio, vindo da encruzilhada de acesso a Mata da Pororoca, 09°44'14.9" S and 38°40'94.0" W, 632 m, 14.I.11, fl., C.L.S.B. Correia et al. 377 (HUNEB); Trilha sentido casa II do ICMbio, próximo a Baixa do Caximbo, 09°49'15.8" S and 38°29'33.6" W, 606 m, 09.VI.11, fl.; fr., C.L.S.B. Correia et al. 488 (HUNEB); 09.VI.11, fl.; fr., C.L.S.B. Correia et al. 488 (HUNEB).

Senna rizzinii occurs only in the Northeast Region of Brazil, being widely distributed in all states (Irwin & Barneby, 1982; Flora do Brasil 2020 em construção). The species is most common in the Caatinga, occurring on sandy soil at altitudes of 400 a 900m (Queiroz, 2009). In ESEC, the species is very common, occurring in open and degraded areas on sandy and sandy-clayey soil at altitudes of 600–700 m., where is was found with flowers from February to May and June to August and with fruits in May, August and October.

In the study area, it can be recognized by exactly two pairs of leaflets, cylindrical fleshy fruits of 28–74 mm long and asymmetric flowers with c. 4 cm in diam. Among the species cataloged for ESRC, *S. rizzinii* can be confused with *S. macranthera* var. *pudibunda,* by both having leaves with two pars of leaflets and stipitulate extrafloral nectaries localized on the rachis, but can be differentiated mainly by the size of the flowers and leaflets (see comments for *S. macranthera* var. *pudibunda*).

6. *Senna splendida* (Vogel) H.S.Irwin & Barneby var. ***gloriosa*** H.S.Irwin & Barneby, Mem. New York Bot. Gard. 35(1): 190. 1982. Figures 2e; 5d-h

Small tree to shrubs erect, branched until 4 m tall; cylindrical branches, fractiflex, apex with branches young, epidermis striated longitudinally, green on the young branches, light brown to yellowish on the old branches. Indumentum villose, constituted of trichomes glandular and tector, thin, colorless and brown, flexible and sessile, erect and adpressed, wavy, esparse, c. 1.5 mm long, distributed on the branches, pulvinus, petioles, inflorescence axis, bracts, pedicels and young legumes. Stipules green, linear, obsolet, 4–12 × 0.5–2 mm, caducous.

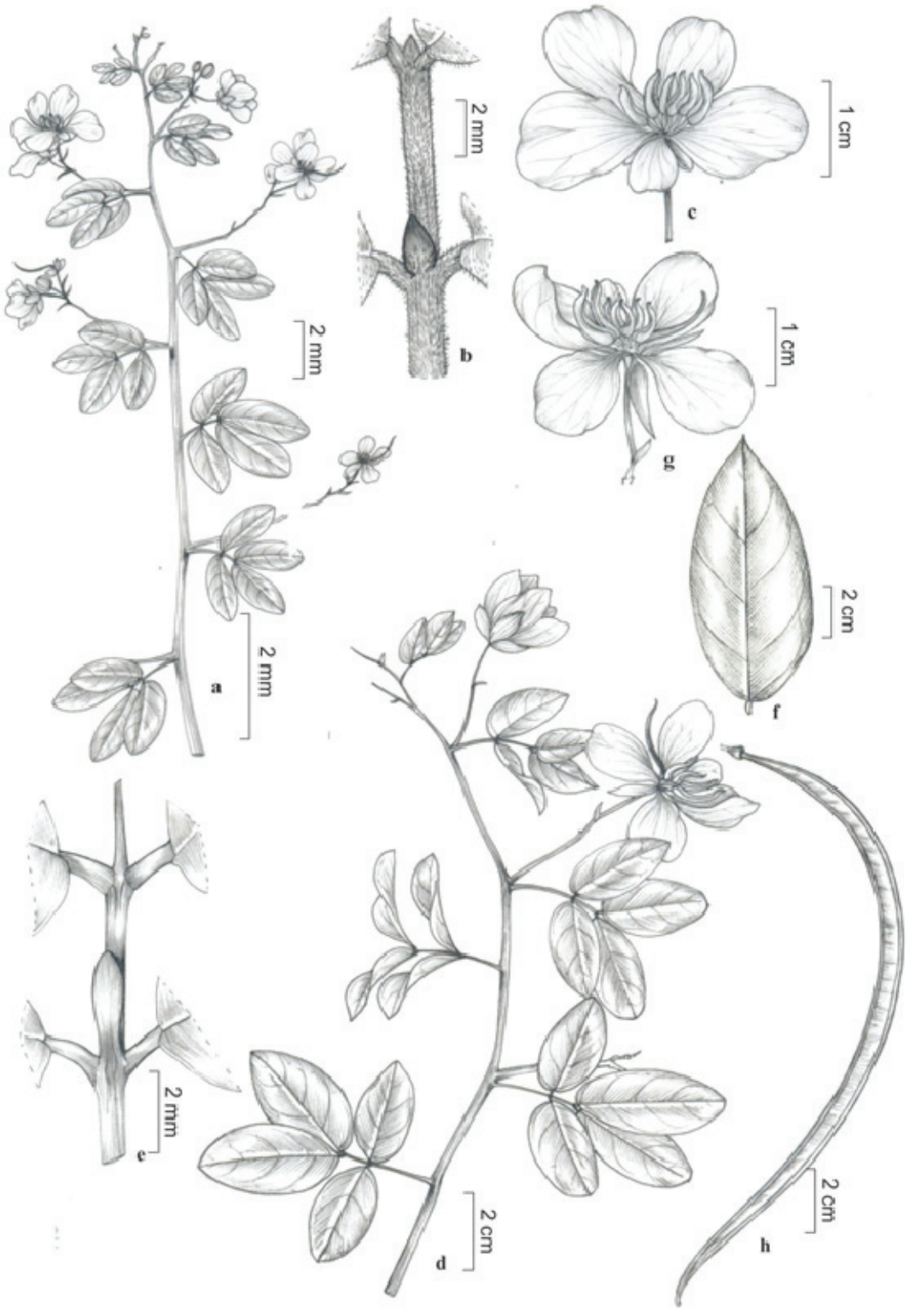

Figure 5. a-c. *Senna rizzinii*: a. flowering branch; b. rachis and nectary; c. flower; d-h. *Senna splendida* var. *gloriosa*: d. flowering branch; e. rachis and extrafloral nectary; f. leaflet; g. flower; h. fruit. a-c. from A. S. Conceição et al. 1672; d-h. from A. S. Conceição et al. 1771.

Leaves 3.4–10.5 cm long; pulvinus dark green, glabrous, 1–1.5 mm diam.; petiole 12–30 mm long, c. 2 times than the rachis; 1 extrafloral nectary, dark brown, stipitate, digitiform, 2–4 mm long, located on the rachis between the proximal pair of leaflets; rachis 6–19 mm long; leaflets discolorous, 2 pairs, chartaceous, adaxial surface and abaxial surface glabrous, elliptic to ovate, 16–23 × 8–29 mm, apex acute, base rounded, venation penninervous, midrib median. Inflorescences racemose, corimbose to umbeliform, axillary, sometimes terminal, 2–10 flowered; bracts green to vinaceous green, deltoid to lanceolate, 5–12 × 1–2 mm; pedicels 10–26 mm long. Buds green, globular, 10–16 mm long. Flowers c. 11 cm diam., assimetric; sepals green to green-vinaceous, deltoid to ovate or ovate to elliptic, abaxial surface glabrous, 18–36 × 7–18 mm; petals golden yellow, two external, ovate, 14–36 × 7–21 mm, two internal, orbicular, 12–31 × 8–22 mm, cuculus obovate to elliptic, bent around the androecium, 12–27 × 07–13 mm; stamens light yellow, 6–24 mm long; staminoids 3–5 mm long; ovary light green, pubescent, 16–33 mm long; style light green, 2–5 mm long. Legumes linear, erect to slightly curvate, when young green, mature not seen, fleshy, cylindrical, 180–255 × 4–7 mm; valves young, coriaceous, glabrous. Seed spiriform, brown, glossy, 4–6 × 2–3 mm.

Material examined: BRAZIL. BAHIA: Paulo Afonso, Estação Ecológica Raso da Catarina, Trilha em frente a casa I do ICMbio, próximo ao portão da ESEC, 09°39'0.30" S and 38°26'57.5" W, 635 m, 19.VII.2010, fl., C.L.S.B. Correia et al. 193 (HUNEB). 04.II.11, fl., C.L.S.B. Correia et al. 394 (HUNEB). 04.IV.11, fl., C.L.S.B. Correia et al. 417 (HUNEB). 01.VII.2011, fl.; fr., C.L.S.B. Correia et al. 495 (HUNEB).

Senna splendida was reported from South America (Brazil and Paraguay) by Irwin and Barneby (1982). In Brazil, it has been recorded for the state of Piauí to Paraná (Flora do Brasil 2020 em construção). Two varieties are recognized for the species: *S. splendida* (Vog.) H.S.Irwin & Barneby var. *splendida* and *S. splendida* (Vog.) H.S.Irwin & Barneby var. *gloriosa* H.S.Irwin & Barneby, both recorded for the Caatinga (Irwin & Barneby, 1982; Queiroz, 2009). *Senna splendida* var. *gloriosa* occurs between states of Alagoas and Minas Gerais, in areas of Caatinga and Cerrado (Queiroz, 2009; Flora do Brasil 2020 em construção). In the study area only the variety *gloriosa* was collected, which was reported by Irwin and Barneby (1982) for the Northeast Region of Brazil to northern Minas Gerais. The taxon was uncommon in ESRC, collected in degraded areas on clayey soil at the altitude of 590 m. It was collected with flowers in February, April and August and fruits in April, June and August.

Senna splendida var. *gloriosa,* can be easily identified in the study area by glabrous leaves with two pairs of leaflets, flowers of c. 11 cm in diam. and cylindrical fleshy fruits with 180–255 long. The species resembles *S. macranthera* var. *pudibunda* by both sharing leaves with two pairs of leaflets and stipitulate extrafloral nectaries localized on the rachis, but differs by consistency, indument and position of the midrib of the leaflets and size of the flowers (as mentioned in *S. macranthera* var. *pudibunda*).

7. *Senna uniflora* (Mill.) H.S.Irwin & Barneby, Mem. New York Bot. Gard. 35(1): 258. 1982. Figures 2c; 6a-d

Subshrubs erect, not branched, until 0.4 m tall; cylindrical branches, straight, epidermis green-yellowish on the young branches, little striated longitudinally and vinaceous on the old branches. Indumentum sericeous, constituted of trichomes tector, thin, light brown to white, flexible, erect and adpressed, intense, c. 2.5 mm long, distributed on the branches, pulvinus, petioles, stipules, margin with leaflets, bracts, pedicels and sepals. Stipules green, filiform, showy, 9–15 × c. 0.5 mm long, caducous. Leaves 2.2–11.4 cm long; pulvinus yellowish to vinaceous, pilose, c. 2 mm diam.; petiole 6–15 mm long, smaller with the rachis; 2-3 extrafloral nectaries, yellow to vinaceous, stipitate, digitiform, 2–4.5 mm long, located on the rachis between the proximal pair with leaflets; rachis 5–28 mm long; interfoliolar segments 4–11 mm long; leaflets discolorous, 3–5 pairs, chartaceous, adaxial surface sparsely pilose, abaxial surface rufous-setose, widely obovate, 9–35 × 4–21 mm, apex rounded to widely obtuse, mucronate, base cuneate, venation penninervous. Inflorescences racemose, axillary, 2–7 flowered; bracts green-vinaceous, filiform, 7–15 × 0.5–1 mm. Buds yellow to yellowish green, ovate, 2.5–5 mm long. Flowers c. 1 cm diam., asymmetric; pedicel 2–5 mm long; sepals green, oblanceolate to falcate or ovate, abaxial surface pilose, 3–6 × 2.5–5 mm; petals yellow, two internal and two external, obovate 4.5–6 x 1,5–3 mm long, cuculus oblong, bent around the androecium, 5.5–7 × 5–6 mm long; 10 stamens yellow 2–5 mm long; without staminoids; ovary yellow to white, panose, 4–9 mm long; style yellow, 2–3 mm long. Legumes linear, erect, when young green, mature vinaceous green, dry, plane-compressed, 13–41 × 2–4 mm; valves chartaceous, simulating one loment, pubescent to rufous-setose. Seeds romboid, green to green glaucous, plane, 2–4 × 1.5–2 mm.

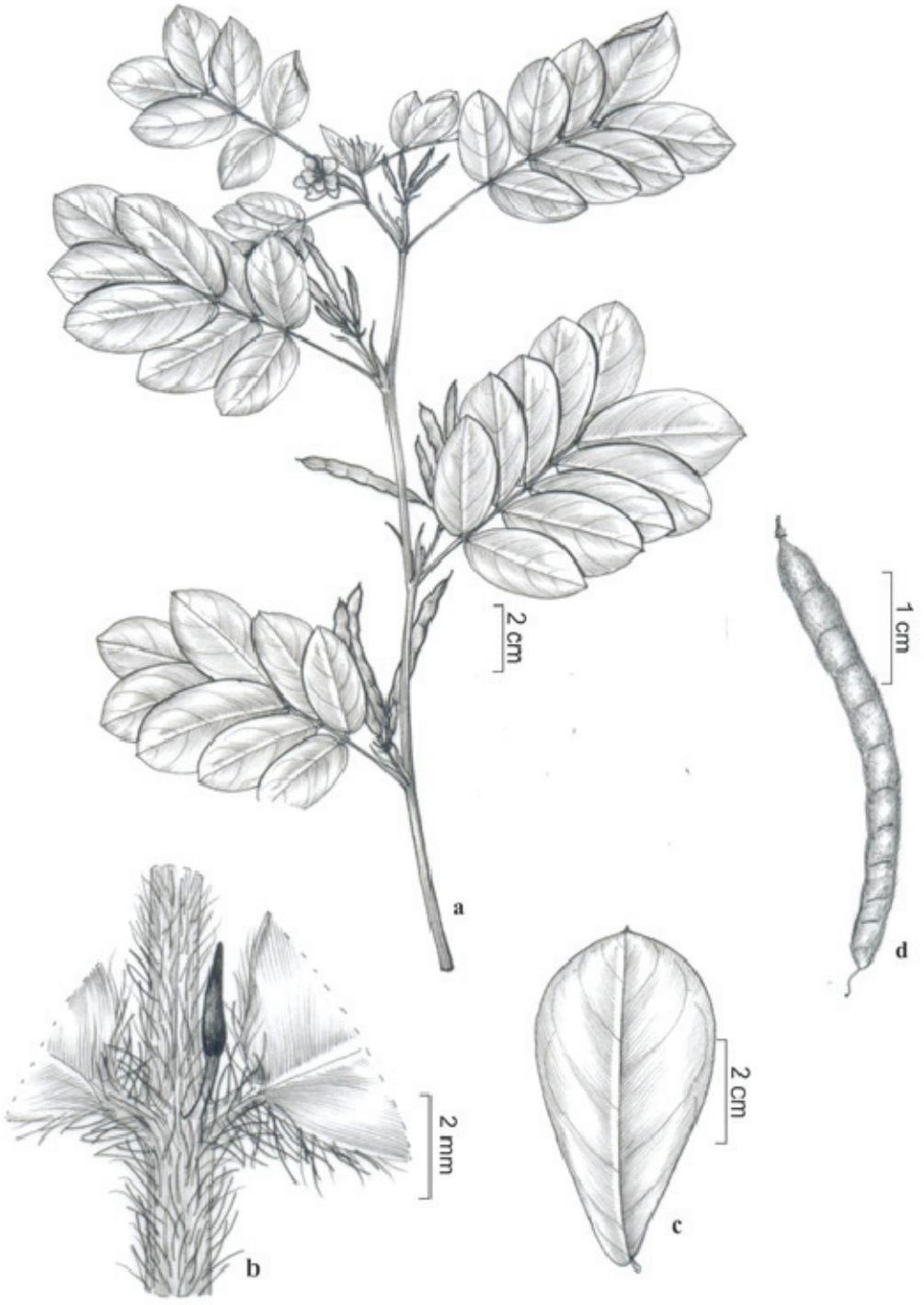

Figure 6. a-d. *Senna uniflora*: a. fertile branch; b. detail of nectary and indumentum; c. leaflet; d. fruit. a-d. from A. S. Conceição 1356.

Material examined: BRAZIL, BAHIA: Paulo Afonso, Estação Ecológica Raso da Catarina, trilha sentido casa sede do ICMbio, 09°39'84.2" S and 38°28'0.06" W, 621 m, 1.VII.2010, fl.; fr., C.L.S.B. Correia et al. 141 (HUNEB).

Senna uniflora was reported from the Americas (from Mexico to south America) by Irwin and Barneby (1982). In Brazil, the species is recorded for the North, Northeast, Center-West and Southeast Regions (Irwin & Barneby, 1982; Queiroz, 2009; Flora do Brasil 2020 em construção). In the study area, the species is uncommon, occurs in degraded areas on sandy-clayey soil, and was collected in July with flower and fruit.

The leaves have 3–5 pairs with widely obovate leaflets, pilose to rufous-setose; dry, plane-compressed fruits, simulating one loment, with 13–41 mm long, distinguishing it from the other species occurring in the area. *Senna uniflora* can be confused with *S. obtusifolia,* by both being small tall, and widely obovate leaflets, and nectaries located on the rachis. However, the two species can be differentiated by number of pairs of leaflets and form and indumentum of the fruit (see comments in *S. obtusifolia*).

Conclusion

Seven taxa of the genus *Senna* were recorded in ESRC, equivalent to 31.8% of taxa registered from the Caatinga. Among these, two mainly occur in Caatinga environments. The studied taxa can be found in a variety of environments from preserved to degraded areas and in sandy, sandy-clayey or rocky soils. The most representative taxa in the area were *Senna rizzinii* H.S.Irwin & Barneby and *S. acuruensis* (Benth.) H.S.Irwin & Barneby, occurring principally in open and degraded areas on sandy and sandy-clayey soil at altitudes of 600–700 m.

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APPENDIX

LIST OF ADDITIONAL MATERIAL EXAMINED

Bandeira, I. P.:119 (4); 207 (4); **Bastos, C. A.**:467 (3)**; Bautista, H. P.**: 473 (1); 1035 (7);**Bohrer, C. B. A.**: 18 (2); **Cardoso, D.**: 32 (6); 72 (2);120 (1); 165 (2); **Carneiro, A. S.**:12 (3);**Carvalho,A. M.**:3864 (1); 3869 (4); **Colaço, M.**:63 (1); 178 (6); **Conceição, A. A.**: 3029 (1); **Conceição, A. S.**:1036 (2); 1065 (6); 1356 (7); 1639 (6); 1643 (5); 1672 (5); 1708 (5); 1713 (1); 1717 (2); 1726 (2); 1727 (4); 1741(3); 1750 (5); 1754 (6); 1758(3); 1771 (6); 1789 (5);1821 (6);1850 (6); 1861(3); **Correia, C. L. S. B.**:96 (5); 97 (2); **Costa, A. L.**:s/n (3); **Ferreira, M. C.**: 21 (2);389 (3);391 (4);612 (5); **Figueroa, L. E.**: s/n (2); **França, F.**: 1741 (3);5611 (1); **Giulietti, A. M.**:2453 (7); **Guedes, M. L.**: 106 (3);4873 (2); 5322 (2); 10495 (2); 11477 (5); 16008 (2); **Jardim, J. G.**:3201 (7); **Harley, R. M.**:2940 (6); **Hatschbach, G.**:44155 (6); **Leal, S.**:24 (5)**; Mariano, K. R. S.**:15 (6); **Melo, E.**: 6297 (3); **Melo, T. M. S.**: 03 (5); 60 (6); 86 (3); 89 (6); 92 (1); 94 (4); **Miranda, A. M.**:817 (5); **Moreira, T.**:5 (1); **Neto, J. V.**:1(4);**Noblick, L. R. & Britto, I. C.**:3431 (6); **Nunes, T. S.**:106 (3); 378 (3); 559 (6); 912 (3);**Paraguassu, L.**: 30192 (4); **Paschoaletti, L. F. G.**:6 (6); **Pedra do cavalo, G.**:203 (3); **Pereira, A. C.**: 35 (1); **Pinto, G. C. P.**:14481 (7); **Queiroz, L. P. & Nascimento, J. G. A.**:4633 (5); **Queiroz, L. P. & Sena, T. S. N.**:3104 (5); **Queiroz, L. P.**: 460 (5); 625 (2); 2854 (4); 3721 (5); 3724 (1); 4643 (1); 5487 (7); 7163(5); 7167 (1); 7168 (1); 7277 (2);9019 (7); 9198 (1); **Ribeiro-filho, A. A.** 129 (2); **Romão,M. V. V.**:62 (5); 524 (5). 549 (1);**Santos,R. M.**:s/n (1); **Sessegolo, G. C.**: 48 (2); 175 (4); 248 (2); **Sobrinho, J. G.**: 526 (1); **Souza, E. B.**:1349 (3); **Thomas, W.**: s/n. (2); **Vieira,D. D.**: 19 (6); 51 (2); 54 (1); 60 (5); **Virgens, L. P.**:5 (4).