

# *Eremitis clarkiae* and *E. vinacea* (Poaceae, Bambusoideae): two new species of herbaceous bamboos endemic to the Atlantic Forest of southern Bahia, Brazil increase the diversity of the genus in this hotspot

Fabício Moreira Ferreira<sup>1,\*</sup>, Cassiano A. Dorneles Welker<sup>1</sup> & Reyjane P. Oliveira<sup>2</sup>

<sup>1</sup>Universidade Federal de Uberlândia, Instituto de Biologia, Programa de Pós-Graduação em Biologia Vegetal, Uberlândia, Minas Gerais, Brazil

<sup>2</sup>Universidade Estadual de Feira de Santana, Departamento de Ciências Biológicas, Programa de Pós-Graduação em Botânica, Feira de Santana, Bahia, Brazil

\*Corresponding author: [fmoreiraf@yahoo.com.br](mailto:fmoreiraf@yahoo.com.br)

**Background and aims** – We here describe two new species of *Eremitis* from Bahia, Brazil, and compare them with morphologically similar species. We also provide illustrations, photos, a distribution map, and notes on habitat and conservation status of the new species.

**Material and methods** – This study was based on fieldwork, analysis of herbarium specimens, and literature review. Specimens collected were analyzed and photographed during fieldwork and observed in cultivation in a greenhouse. The conservation assessment is based on field observations and spatial analyses, following the IUCN guidelines and criteria.

**Results** – *Eremitis clarkiae* sp. nov. occurs in southern Bahia and has been collected only twice, in the municipality of Floresta Azul. The new species is similar to *E. jardimii* and *E. robusta*, both also endemic to Bahia, but can be distinguished by several vegetative and reproductive structures longer than those observed in these species, such as leafy culms, ligules, decumbent culm inflorescences, and pedicels of the staminate spikelets of the staminate whorls. *Eremitis vinacea* sp. nov. was collected in three localities in southern Bahia, but only the type population was found during recent field trips, in the municipality of Camacã. It is similar to *E. afimbriata*, a species endemic to Espírito Santo state, being differentiated by its leaf sheaths with persistent fimbriae (vs absent), leaf blades with green adaxial surface (vs bluish green with a blue iridescence), and a single inflorescence on decumbent culms (vs multiple). Both new species are endemic to the Bahian Coastal Forests subregion and should be considered Critically Endangered (CR), according to the IUCN guidelines and criteria.

**Keywords** – Bahian Coastal Forests; diversity; grasses; IUCN Red List; Neotropics; Parianinae.

## INTRODUCTION

The Atlantic Forest was originally continuous, covering around 1.5 million km<sup>2</sup> along the Brazilian coast (Galindo-Leal & Câmara 2003; Ribeiro et al. 2009), also reaching into Paraguay and Argentina (Fundação SOS Mata Atlântica 2013). The Atlantic Forest is extremely heterogeneous, especially due to its latitudinal-longitudinal range (3–30° S and 35–60° W), altitudinal variation (0–2,900 m a.s.l.), and

soil-climatic gradients (1,000–4,200 mm annual rainfall) (Ribeiro et al. 2011). These abiotic characteristics have favoured high plant diversity and endemism (Mittermeier et al. 2004). According to the Flora do Brasil (2020), the Brazilian Atlantic Forest encompasses 15,569 species of angiosperms, of which 7,628 are endemic. Based on this high level of endemic and threatened species, associated with the destruction suffered in the past, the Atlantic Forest is considered a biodiversity hotspot (Myers et al. 2000). Despite

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this, it is now confined to only ca 11% of its original extent in Brazil (Ribeiro et al. 2009), and most of it is represented by small fragments (Ranta et al. 1998).

Based on its floristic composition (e.g. Oliveira-Filho & Fontes 2000; Oliveira-Filho et al. 2005; Martins 2011), the Atlantic Forest can be divided into two regions, North and South, with the Doce river as the limit between these two regions. Murray-Smith et al. (2009) recognized three main centres of endemism in the Atlantic Forest: the northern (Pernambuco and Alagoas states), the central (southern Bahia and Espírito Santo states), and the southern ones (from Rio de Janeiro to Santa Catarina states). Saiter et al. (2016), based on the composition of tree species, divided the central region into three subregions: Bahian Coastal Forests (BCF), Bahian Interior Forests (BIF), and Krenák-Waitaká Forests (KWF). The Bahian Coastal Forests subregion encompasses the northern extreme of Espírito Santo and most of the coast of the state of Bahia (Saiter et al. 2016), a region with a great biodiversity, presenting a high incidence of endemic species (Thomas et al. 2003; Martini et al. 2007; Ostroski et al. 2018).

The Bahian Coastal Forests (BCF) subregion encompasses a great diversity and endemism of bamboos, which are members of the grass subfamily Bambusoideae (Soderstrom et al. 1988; Clark 1990; Judziewicz et al. 1999). According to recent data (Flora do Brasil 2020), the state of Bahia, and particularly the BCF subregion, contains 23 genera and 90 species of bamboos, with 10 genera and 54 species included in the tribe Bambuseae (woody bamboos), and 13 genera and 36 species included in the tribe Olyreae (herbaceous bamboos). Four genera and 37 species of these tribes are endemic to Bahia (Flora do Brasil 2020).

Among the herbaceous bamboos, a lineage strongly supported by molecular phylogenetic analyses (Ferreira et al. 2019) occurring in Bahia is represented by the subtribe Parianinae, which includes three genera: *Eremitis* Döll with 14 described species, all of them endemic to the Atlantic Forest (five endemic to the BCF subregion) (Ferreira et al. 2013a, 2016, 2019, 2020a, 2020b, 2020c, 2020d, 2021); *Parianella* Hollowell, F.M.Ferreira & R.P.Oliveira with two species, both endemic to the BCF subregion (Ferreira et al. 2013b); and *Pariana* Aubl. with 27 species restricted to southern Central America and northern South America, especially in the Amazon region (Ferreira et al. 2013b, 2019).

*Eremitis* is a very singular genus that was poorly known until some years ago, and whose diversity has been increasing every year with the description of new species, especially from Bahia (Ferreira et al. 2016, 2020b, 2020c, 2020d, 2021). It is characterized by five morphological synapomorphies: truly underground culms, sympodial inflorescences on leafy culms, gynecandrous and staminate spikelet whorls in the same inflorescence, staminate spikelet pedicels elongated and laminar only in the terminal whorl, and pubescent styles (Ferreira et al. 2019).

During our systematic studies on *Eremitis*, two new species from Bahia, Brazil were detected and are described herein, increasing the number of species described in this genus to 16 (Ferreira et al. 2013a, 2016, 2019, 2020a, 2020b, 2020c, 2020d, 2021). In addition, these new species

increase the number of bamboo species in the state of Bahia to 92 species (Flora do Brasil 2020). These findings confirm previous propositions (Soderstrom et al. 1988; Clark 1990; Judziewicz et al. 1999) that the forests of southern Bahia hold the greatest diversity of bamboos in the Neotropics. Thus, in the present study we provide morphological descriptions, illustrations, in situ photographs, a distribution map, and notes on habitat and conservation status of the two new species.

## MATERIAL AND METHODS

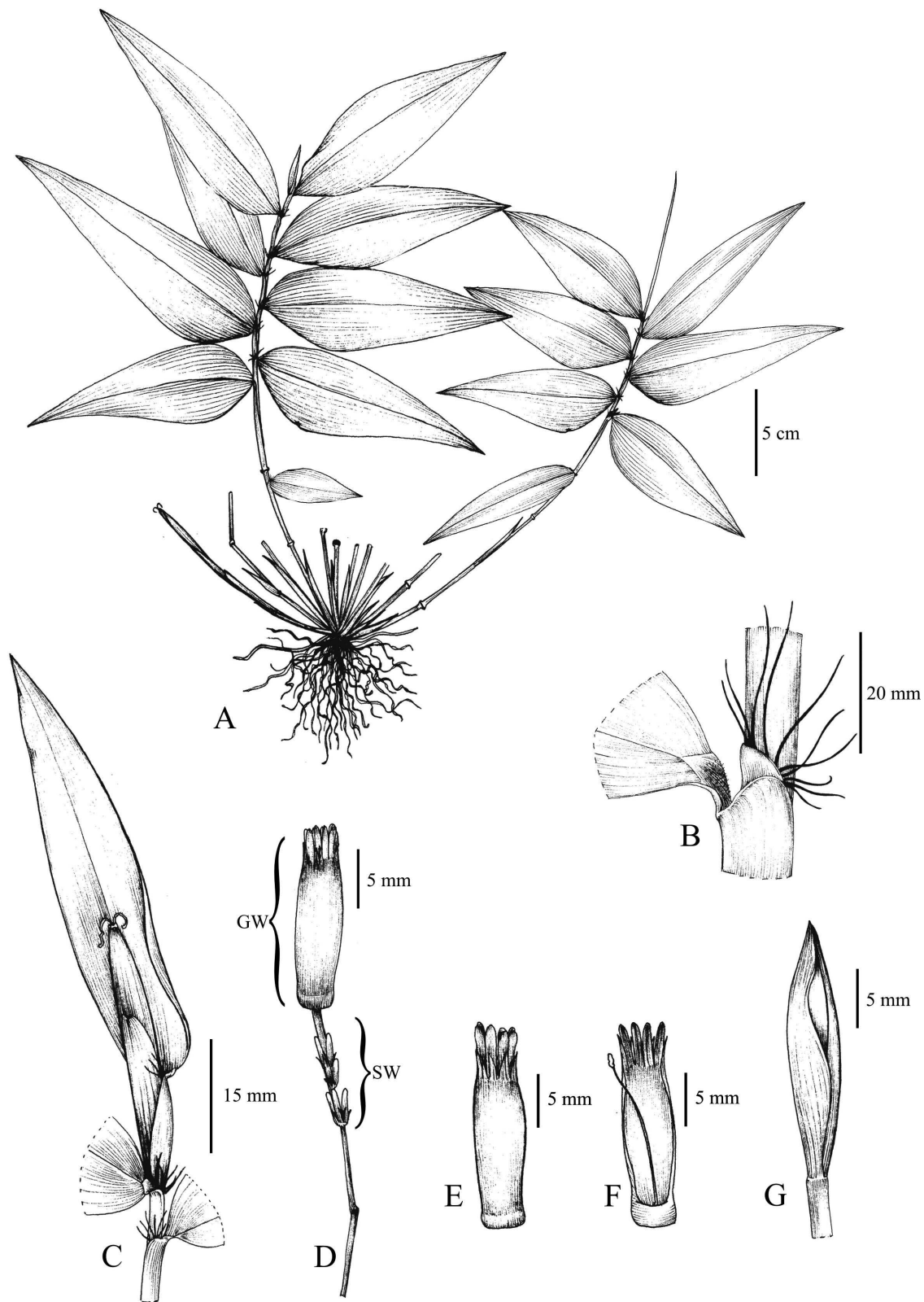
This study was based on extensive fieldwork in all known localities of occurrence of *Eremitis* in Brazil, from 2008 to 2018. In addition to the data obtained in the field, specimens were observed in cultivation since 2008 in a private greenhouse in the municipality of Baependi, Minas Gerais, Brazil. Morphological and geographical data of the described species of *Eremitis* were obtained from specimens deposited in the following herbaria: ALCB, BHCb, CEPEC, CVRD, ESA, GUA, HUEFS, HUFU, IAN, INPA, ISC, K, LE, MBM, MBML, MG, MO, NY, P, PEUFR, R, RB, RBR, SP, SPF, UEC, UESC, US, and VIC (acronyms according to Thiers continuously updated). Morphological terminology follows Hollowell (1987) and Ferreira et al. (2013a). Measurements of both vegetative and reproductive characters were made on herbarium specimens with a digital calliper with a precision of 0.1 mm. In inflorescences enclosed by spatheaceous bracts (modified leaves), measurements were taken after removing them. In addition, web-based resources such as Tropicos ([www.tropicos.org](http://www.tropicos.org)), SpeciesLink system ([www.splink.org.br](http://www.splink.org.br)), and Flora do Brasil 2020 ([www.floradobrasil.jbrj.gov.br](http://www.floradobrasil.jbrj.gov.br)) were accessed in order to check additional specimens and update the geographical distribution of the genus. The distribution map was made using ArcMap v.9.3 (ESRI 2008) and the website SimpleMappr (Shorthouse 2010). The classification adopted for the Atlantic Forest of southern Bahia followed Jardim (2003), Thomas et al. (2003), and Saiter et al. (2016).

The conservation status of the new species was assessed based on the IUCN Red List categories and criteria (IUCN Standards and Petitions Committee 2019). The extent of occurrence (EOO) and area of occupancy (AOO), using 2 × 2 km grid cells (area of 4 km<sup>2</sup>), were estimated using the Geospatial Conservation Assessment Tool (GeoCAT, see Bachman et al. 2011).

## TAXONOMIC TREATMENT

*Eremitis clarkiae* F.M.Ferreira & R.P.Oliveira, **sp. nov.** (figs 1, 2) – Type: BRAZIL • Bahia, Municipality of Floresta Azul, Florestinha, Venturosa Farm (part of the complex Senhor do Bom Fim Farm), about 9.3 km from Floresta Azul to Almadina; 14°46'47"S, 39°39'14"W; 13 Nov. 2009; *F.M. Ferreira & A.L.C. Lima 2213*; holotype: HUEFS; isotypes: BHCb, CEN, CEPEC, CVRD, HUFU, ICN, ISC, K, MBM, MO, NY, P, R, RB, SP, US.

**Description** – Leafy culms erect, 77–125(–138) cm long, 2.8–4 mm diam. near the base; internodes striate, glabrous or slightly pilose; nodes thickened, glabrous or pilose;

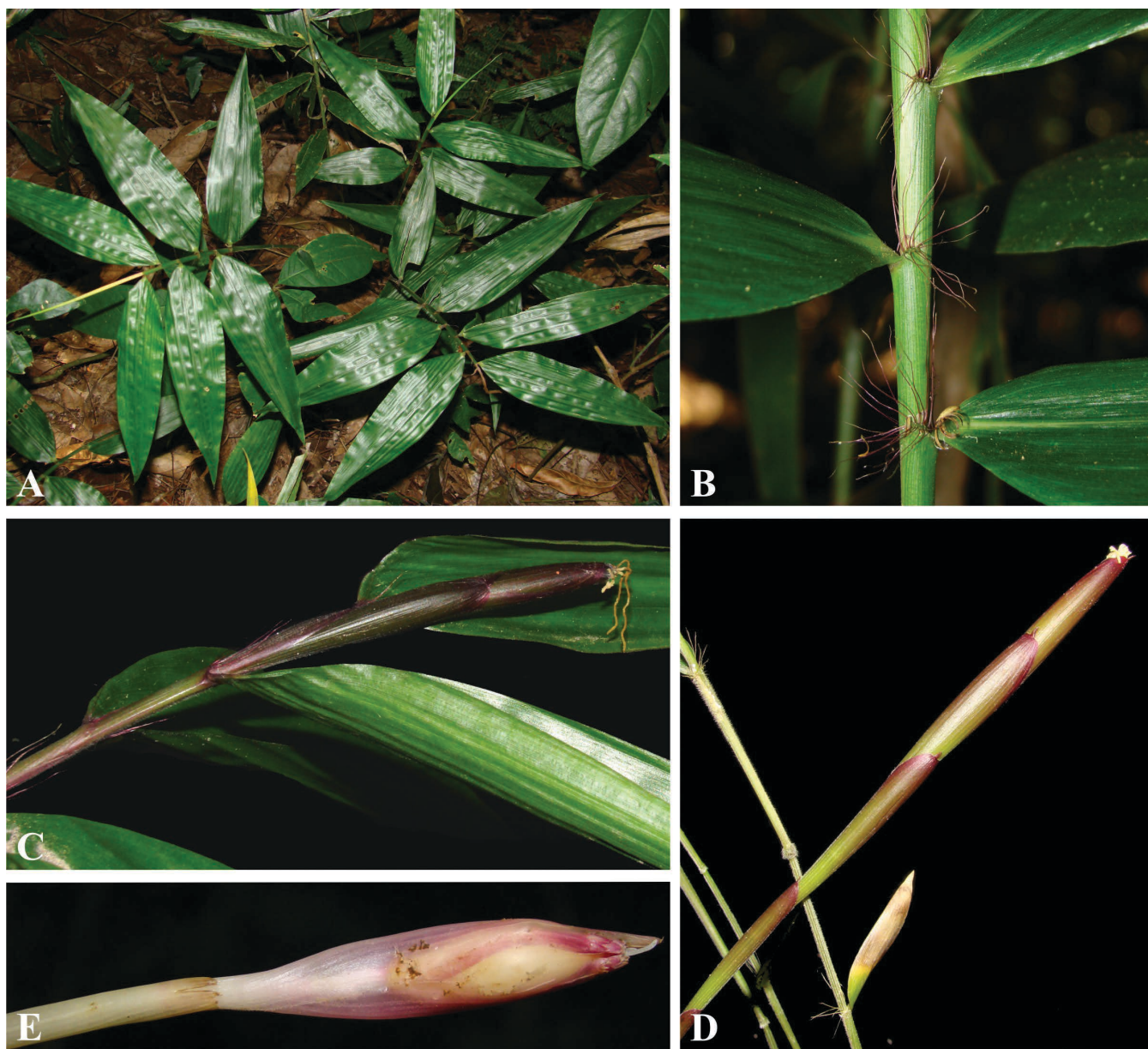


**Figure 1** – *Eremitis clarkiae*. **A.** Habit. **B.** Detail of the leafy culm showing the fimbriae at the apex of the leaf sheaths. **C.** Leafy culm inflorescence enclosed by spathaceous bracts. **D.** Decumbent culm inflorescence with spathaceous bracts removed, showing a gynecandrous whorl (GW) above and three staminate whorls (SW) below. **E–F.** Gynecandrous whorl. **E.** Abaxial view of the staminate spikelets. **F.** Adaxial view of the staminate spikelets showing the rachis prolongation. **G.** Subterranean culm inflorescence enclosed by spathaceous bracts. From Ferreira & Lima 2213 (HUEFS). Illustration by Carla Lima.

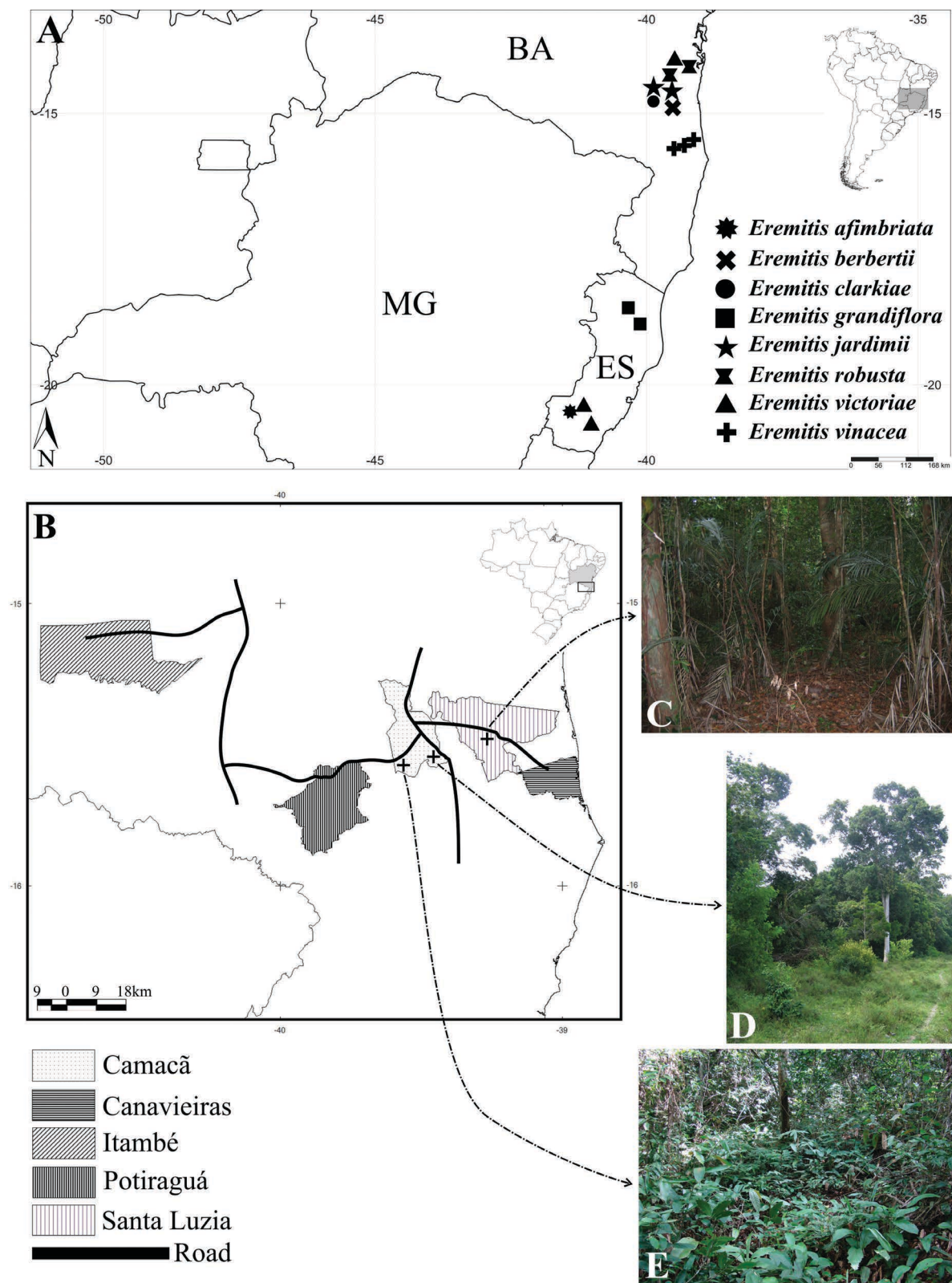


leaves 9–14 per leafy culm; leaf sheaths keeled, not inflated, glabrous to slightly scabrous, margins ciliate, fimbriae at the apex present, persistent; ligules entire, 1.8–2.5 mm long; pseudopetioles (2.2–)2.3–3.8(–4) × 1–2 mm, dark brown, adaxially and abaxially glabrous; leaf blades (13.5–)14–18 × 3.4–4.7 cm, lanceolate, base rounded, symmetric, apex acute, adaxial and abaxial surfaces green, slightly scabrous, margins scabrous. Decumbent culms 20–27 cm long; leaves 5 per culm, reduced to the sheaths or with scale-like blades, ca. 2 mm long; leaf sheaths not inflated, glabrous to slightly scabrous, green, apex purple, margins ciliate. Subterranean culms (30–)68–120 cm long. Leafy culm inflorescences 1–2 per culm, 4–6 cm long. Decumbent culm inflorescences 1 per culm, 6–8 cm long. Subterranean culm inflorescences 1

per culm, 3.5–4.5 cm long. Gynecandrous whorls 16–20 × 3.5–4.5 mm, 1 per inflorescence; rachis prolongation 14–15 mm long, glabrous at the base and pilose towards the apex; pistillate spikelets 1 per whorl; staminate spikelets 5–6 per whorl. Pistillate spikelets 12–14.5 × 3–4 mm, lanceolate or oblong, stramineous; glumes (8.7–)9–11.7 × (1.7–)2–2.8 mm, membranous, hyaline, narrowly lanceolate, apex acute, glabrous to slightly pilose, 1–3-nerved; lemma cartilaginous, oblong to lanceolate, apex acuminate, glabrous at the base to shortly scabrous at the apex, (7–)9–12-nerved; palea cartilaginous, lanceolate, apex acuminate, glabrous at the base to slightly scabrous at the apex, 6–8(–10)-nerved. Caryopsis 9–10 × 2.9–3.7 mm, stramineous. Staminate spikelets 4.5–6 × 1.3–1.5 mm, oblong; pedicels (10–)12–14(–16) mm long,



**Figure 2** – *Eremitis clarkiae* (photographs by Fabrício M. Ferreira). **A.** Habit. **B.** Detail of the leafy culm showing the fimbriae at the apex of the leaf sheaths. **C.** Leafy culm inflorescence enclosed by spathaceous bracts. **D.** Decumbent culm inflorescence enclosed by spathaceous bracts. **E.** Subterranean culm inflorescence enclosed by spathaceous bracts.



**Figure 3** – A. Geographic distribution of *Eremitis clarkiae*, *E. vinacea*, and morphologically similar species (Brazilian state abbreviations: BA – Bahia; ES – Espírito Santo; MG – Minas Gerais). Map created using SimpleMappr (<https://www.simplemappr.net/>). B. Detail of the distribution of *E. vinacea* in southern Bahia, showing the three localities where the species was collected. Map created using ArcMap v.9.3 (<https://www.arcgis.com>, © Esri and its licensors, all rights reserved). C–E. Environments in which *E. vinacea* occurs (photographs by Fabrício M. Ferreira). C. Submontane tropical moist forest in Lagoa Dourada, municipality of Santa Luzia. D. Ombrophilous forest in Jerusalém Farm, municipality of Camacã. E. Ombrophilous forest between Camacã and Potiraguá (type locality).

**Table 1** – Comparison of the morphology and geographic distribution of *Eremitis clarkiae*, *E. vinacea*, and other geographically and morphologically related species. The asterisk (\*) indicates the new species described here.

Characters	<i>E. clarkiae</i> *	<i>E. jardimii</i>	<i>E. robusta</i>	<i>E. vinacea</i> *	<i>E. afimbriata</i>	<i>E. berbertii</i>	<i>E. grandiflora</i>	<i>E. victoriae</i>
<b>Leafy culm</b>								
Height (cm)	77–125(–138)	(27–)30–62(–67)	(51–)53–108(–127)	43–83	90–121(–136)	(37–)42–88	(38–)41–61(–65)	(51–)53–108(–127)
Diameter near the base (mm)	2.8–4	(1.6–)1.9–2.9	(2–)2.4–4.5(–5.2)	1.4–2.6	2.2–3.8(–4)	(1.9–)2–3.3	(0.9–)1.3–2	(2–)2.4–4.5(–5.2)
Fimbriae	present	present	present	present	absent	present	present	present
Ligule length (mm)	1.8–2.5	0.8–1.5	1–1.5	1–1.5	1.5–2	1–1.5	1	1
Leaf blade length (cm)	(13.5–)14–18	10–13.6	(12.3–)13.5–18.2(–19)	8–13.6	12–17.5(–18.2)	(9.1–)9.4–13.1(–13.5)	8.5–11.1	(9.2–)9.5–12.1
Leaf blade width (cm)	3.4–4.7	2.5–3.2(–3.7)	(3–)3.4–4.8(–5)	1.8–3.2	(2.7–)3–4(–4.8)	(2.8–)3–4(–4.2)	1.7–2	(2.4–)2.6–4.5
Leaf blade colour on adaxial surface	green	green	green	green	bluish green with a blue iridescence	bluish green with a blue iridescence	green	green
Leaf blade colour on abaxial surface	green	green	green	purple	purple	green	green	glaucous
Inflorescence length (cm)	4–6	4–5	6–6.5	4–5.5	3.2–3.5	3.2–3.5	3–4.5	3.5–4.5
<b>Decumbent culm</b>								
Leaf number	5	3–4	3	3–4	3–5	3–4	(2–)3–4(–5)	4–5
Inflorescence number per culm	1	1	1	1	(1–)2–6	1	1	1
Inflorescence length (cm)	6–8	5.5–6	6–6.5	4–5	(3–)4.3–5(–6.5)	4.5–5	5–5.5	3.5–4.5(–5)
<b>Subterranean culm</b>								
Inflorescence length (cm)	3.5–4.5	3.5–4.5	3	2.5–3.5	2–3	2–2.7	4	2.5–3.5
<b>Gynecandrous whorl</b>								
Length (mm)	16–20	(14.9–)15.8–18	(15.5–)16–18.2	(12–)14.2–18.5	15–18	(15–)16–18.5(–19.4)	19–22.6	13–14
Pistillate spikelet: glume length (mm)	(8.7–)9–11.7	(10.7–)11–12	(7.3–)8.7–10	11–12	10–12	(9.5–)10–12	11.8–12	11–12
Pistillate spikelet: lemma nerve number	(7–)9–12	13	12–14	8	12	7–9	14–16	8
Staminate spikelet: pedicel length (mm)	(10–)12–14(–16)	12–13.4(–13.8)	(8.2–)11–13.4	(11–)12.8–14	(6–)8–11(–13)	(8–)10–13	(12–)16.7–17.3	9–11.5



**Table 1 (continued)** – Comparison of the morphology and geographic distribution of *Eremitis clarkiae*, *E. vinacea*, and other geographically and morphologically related species. The asterisk (\*) indicates the new species described here.

Characters	<i>E. clarkiae</i> *	<i>E. jardimii</i>	<i>E. robusta</i>	<i>E. vinacea</i> *	<i>E. afimbriata</i>	<i>E. berbertii</i>	<i>E. grandiflora</i>	<i>E. victorinae</i>
<b>Staminate whorl</b>								
Number per inflorescence	(1–)2–3(–4)	1–2	(3–)4–5	3–4(–5)	(1–)2–3	(1–)2–3	1	2–3
Staminate spikelet: pedicel length (mm)	1.8–2.7	0.9–1.2	(1–)1.2–1.5	1.2–1.5	(0.1–)0.4–0.5	(1–)1.2–1.5	1–1.2	0.9–1
Staminate spikelet: palea width (mm)	0.8–1	0.8–1	1.4–1.6	1–1.4	0.7–1	0.8–1.5	0.9–1.1	1.4–1.8
<b>Geographical distribution</b> (Brazilian state)	Bahia	Bahia	Bahia	Bahia	Espírito Santo	Bahia	Espírito Santo	Bahia and Espírito Santo

laterally connate in two groups, pilose at the base; glumes (3–)4–5 × (0.8–)1–1.6 mm, linear to triangular, apex acute, pilose to slightly scabrous, 1–3-nerved; lemma (3.7–)4.4–5 × 1.2–1.6 mm, oblong, apex obtuse to rounded, glabrous, slightly villous at margins and apex, 2–3-nerved; palea 4–5 × 1.2–1.5 mm, oblong, apex obtuse to rounded, glabrous, pilose to villous towards the apex, 2-nerved; anthers 1–2 mm long. **Staminate whorls** (1–)2–3(–4) per inflorescence; **staminate spikelets** (4–)5–6.5 × 1–2 mm, oblong; pedicels 1.8–2.7 mm, laterally connate or free, glabrous; glumes 1.5–2(–3.5) × 0.5–0.8 mm, linear, apex setaceous attenuate, slightly pilose, (0–)1-nerved; lemma 3.5–4.5 × 1–1.5 mm, lanceolate, apex acute, glabrous at the base, villous towards the apex, 1–3-nerved; palea 3.5–4.5 × 0.8–1 mm, oblong, apex acute, glabrous at the base, villous towards the apex, 2-nerved; anthers 1–2 mm long.

**Distribution** – *Eremitis clarkiae* is endemic to southern Bahia (BCF subregion), where it was collected only twice, in the same locality, at the municipality of Floresta Azul (fig. 3A).

**Habitat and ecology** – Understorey of semi-deciduous seasonal forest (Thomas et al. 2003), at 379 m a.s.l.

**Etymology** – The name of this new species is a tribute to Dr Lynn G. Clark, from Iowa State University (USA), who has devoted her life to study the Neotropical bamboos and has strongly collaborated in studies on bamboos from Brazil, including the formation of new taxonomists.

**Provisional IUCN conservation assessment** – Critically Endangered: CR B2ab(iii). As mentioned above, the Atlantic Forest is strongly reduced in surface (only 11% remaining) and consists of fragments isolated from each other by urban centres, plantations, and roads (Viana et al. 1997; Metzger 2000; Tabarelli et al. 2005; Metzger et al. 2009). The new species occurs in a single location, on a private property, in a forest fragment associated with a rubber plantation (*Hevea brasiliensis* (Willd. ex A.Juss.) Müll.Arg.). The population has less than 100 individuals. According to Mori et al. (1983), rubber plantations have replaced moist forests in many localities in southern Bahia. Besides producing latex, they provide shade for cocoa plantations (*Theobroma cacao* L.), in a mixture system locally called “cabruca”, where the herbaceous layer is removed in order to increase the production (Mori et al. 1983). Because of the single location, the low AOO (4 km<sup>2</sup>), and the fact that the species is threatened by habitat destruction because it occurs in a rubber plantation, it is assessed as Critically Endangered: CR B2ab(iii) (IUCN Standards and Petitions Committee 2019).

**Additional specimens studied (paratypes)** – BRAZIL – Bahia • Municipality of Floresta Azul, Florestinha, Venturosa Farm (part of the complex Senhor do Bom Fim Farm), about 9.3 km from Floresta Azul to Almadina; 14°46'47"S, 39°39'14"W; 20 Jun. 2009; A.C. Mota & L.G. Clark 296; HUEFS.

**Taxonomic notes** – *Eremitis clarkiae* is noticeable by its robust habit. Within the genus, it is more similar to *E. jardimii* F.M.Ferreira & R.P.Oliveira and *E. robusta* Hollowell, F.M.Ferreira & R.P.Oliveira, especially by the length and width of their leaf blades. *Eremitis jardimii* and *E. robusta* are also endemic to the BCF subregion (fig. 3A). The

new species usually has longer vegetative and reproductive structures than those observed in these species, such as leafy culms [77–125(–138) cm long vs (27–)30–62(–67) cm in *E. jardimii* and (51–)53–108(–127) cm in *E. robusta*] (figs 1A, 2A), ligules (1.8–2.5 mm long vs 0.8–1.5 mm in *E. jardimii* and 1–1.5 mm in *E. robusta*), decumbent culm inflorescences (6–8 cm long vs 5.5–6 cm in *E. jardimii* and 6–6.5 cm in *E. robusta*) (figs 1D, 2D), and pedicels of the staminate spikelets of the staminate whorls [1.8–2.7 mm long vs 0.9–1.2 mm in *E. jardimii* and (1–)1.2–1.5 mm in *E. robusta*] (Ferreira et al. 2020c, 2016, respectively). In addition, the new species have decumbent culms with five leaves (vs 3–4 leaves in *E. jardimii* and three in *E. robusta*) (Ferreira et al. 2020c, 2016, respectively) (see table 1).

***Eremitis vinacea*** F.M.Ferreira & R.P.Oliveira, **sp. nov.** (figs 4, 5) – Type: BRAZIL • Bahia, Municipality of Camacã, about 19 km from Camacã to Potiraguá; 15°26'20"S, 39°26'35"W; 6 Jun. 2009; F.M. Ferreira & M.L.S. Carvalho 2132; holotype: HUEFS; isotypes: BHCB, CEN, CEPEC, CVRD, HUFU, ICN, ISC, K, MBM, MO, NY, P, R, RB, SP, US.

**Description** – Leafy culms erect, 43–83 cm long, 1.4–2.6 mm diam. near the base; internodes striate, glabrous or slightly pilose; nodes thickened, pilose; leaves 8–12 per leafy culm; leaf sheaths slightly keeled, not inflated, glabrous to slightly pilose, margins ciliate, fimbriae at the apex present, persistent; ligules entire, 1–1.5 mm long; pseudopetioles 1.3–3.3 × 1–1.8 mm, dark brown, adaxially pilose, abaxially glabrous or pilose; leaf blades 8–13.6 × 1.8–3.2 cm, lanceolate, base rounded, symmetric, apex acute, adaxial surface green, glabrous, abaxial surface purple, glabrous, margins scabrous. Decumbent culms (10–) 18–31 cm long; leaves 3–4, reduced to the sheaths; leaf sheaths not inflated, glabrous to slightly scabrous, green, apex purple, margins ciliate. Subterranean culms ca 50 cm long. Leafy culm inflorescences (1–)3–5 per culm, 4–5.5 cm long. Decumbent culm inflorescences 1 per culm, 4–5 cm long. Subterranean culm inflorescences 1 per culm, 2.5–3.5 cm long. Gynecandrous whorls (12–)14.2–18.5 × 3.8–4.5 mm, 1–2 per inflorescence; rachis prolongation 12.5–14.5 mm long, glabrous at the base and pilose towards the apex; pistillate spikelets 1 per whorl; staminate spikelets 5(–6) per whorl. Pistillate spikelets 12–14.5 × 3.5–4 mm, lanceolate or oblong, stramineous; glumes 11–12 × (1.7–)2.4–2.7 mm, membranous, hyaline, triangular to lanceolate, apex acute, glabrous to slightly pilose, 1-nerved; lemma cartilaginous, oblong to lanceolate, apex acuminate, glabrous at the base to shortly scabrous at the apex, 8-nerved; palea cartilaginous, lanceolate, apex acuminate, glabrous at the base to slightly scabrous at the apex, 4–8-nerved. Caryopsis 8–9 × 3–3.5 mm, stramineous. Staminate spikelets 3.7–5 × 1.3–2 mm, oblong; pedicels (11–)12.8–14 mm long, laterally connate in two groups, pilose at the base; glumes 3.5–4 × (0.7–) 1–1.3 mm, triangular, apex acute, pilose to slightly scabrous, 1-nerved; lemma 4.3–5 × 1–1.3 mm, oblong, apex obtuse to rounded, glabrous, slightly villous at margins and apex, 3-nerved; palea 4–5 × 0.9–1.1 mm, oblong, apex obtuse to rounded, glabrous, pilose to villous towards the apex, 2-nerved; anthers 1.5–1.8 mm long. Staminate whorls

3–4(–5) per inflorescence; staminate spikelets 4–5 × 1.3–1.6 mm, oblong; pedicels 1.2–1.5 mm, laterally connate or free, glabrous; glumes 1.5–2 × 0.5–0.8 mm, linear, apex acute, slightly pilose, 1–3-nerved; lemma 4–5 × 1.3–1.6 mm, lanceolate, apex obtuse to rounded, glabrous, villous towards the apex, 1–3-nerved; palea 4–4.8 × 1–1.4 mm, oblong, apex obtuse to rounded, glabrous, villous towards the apex, 2-nerved; anthers 1–2 mm long.

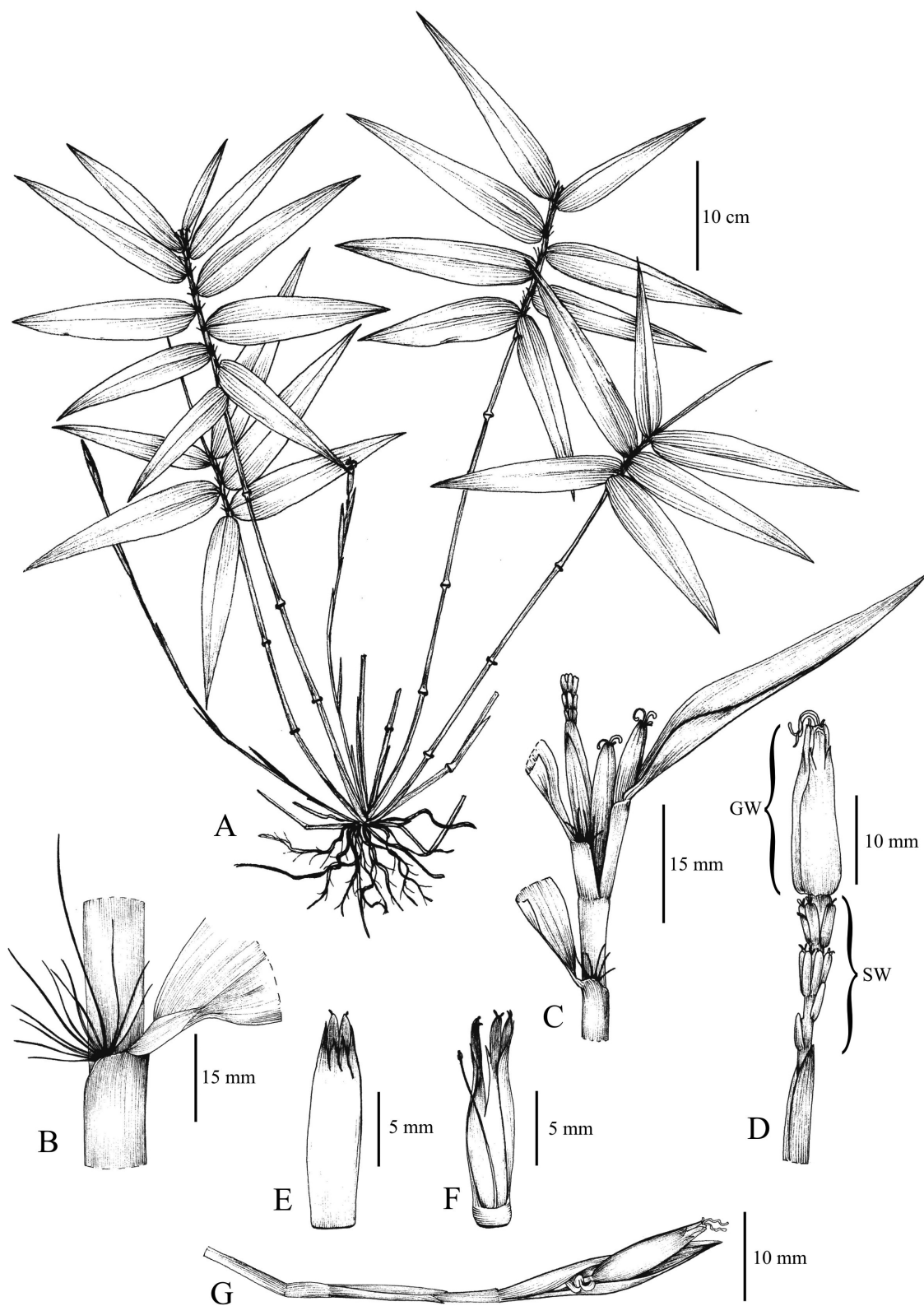
**Distribution** – *Eremitis vinacea* is only known from three localities in southern Bahia (BCF subregion). The type population occurs in the municipality of Camacã (Ferreira & Carvalho 2132), which was the only population located during recent field trips (fig. 3B, E). Cleofé E. Calderón cited, on the herbarium label of the specimen *Calderón 2054*, the locality of Camacã as belonging to Canavieiras. However, Camacã is about 88 km away from Canavieiras (fig. 3B), so it is unlikely that the locality belongs to Canavieiras. According to Dr Jomar G. Jardim (pers. comm.), Calderón's collection probably was carried out in the same location of the recent collections (*Jardim et al. 4117*, *Ferreira & Carvalho 2114*, *2132*), all in the municipality of Camacã (fig. 3B). The other Calderón collection for this species, in Lagoa Dourada, was also annotated as from Canavieiras (*Calderón & Pinheiro 2220*). Nevertheless, the locality known as Lagoa Dourada belongs to the municipality of Santa Luzia, about 58 km from Canavieiras (fig. 3B, C). No individuals of *E. vinacea* were found in either locality, Lagoa Dourada (Santa Luzia) and Jerusalém Farm (Camacã), where this new species was collected in the past (*Calderón & Pinheiro 2220*, *Mattos-Silva et al. 3056*, respectively).

**Habitat and ecology** – The vegetation in the Camacã region is composed of ombrophilous forest (Thomas et al. 2003). The type population occurs in the interior of ombrophilous forest, about 72 m a.s.l., adjacent to water courses and associated to cocoa plantations. The typical vegetation in the Lagoa Dourada region (municipality of Santa Luzia) is composed of submontane tropical moist forest (fig. 3C; Jardim 2003).

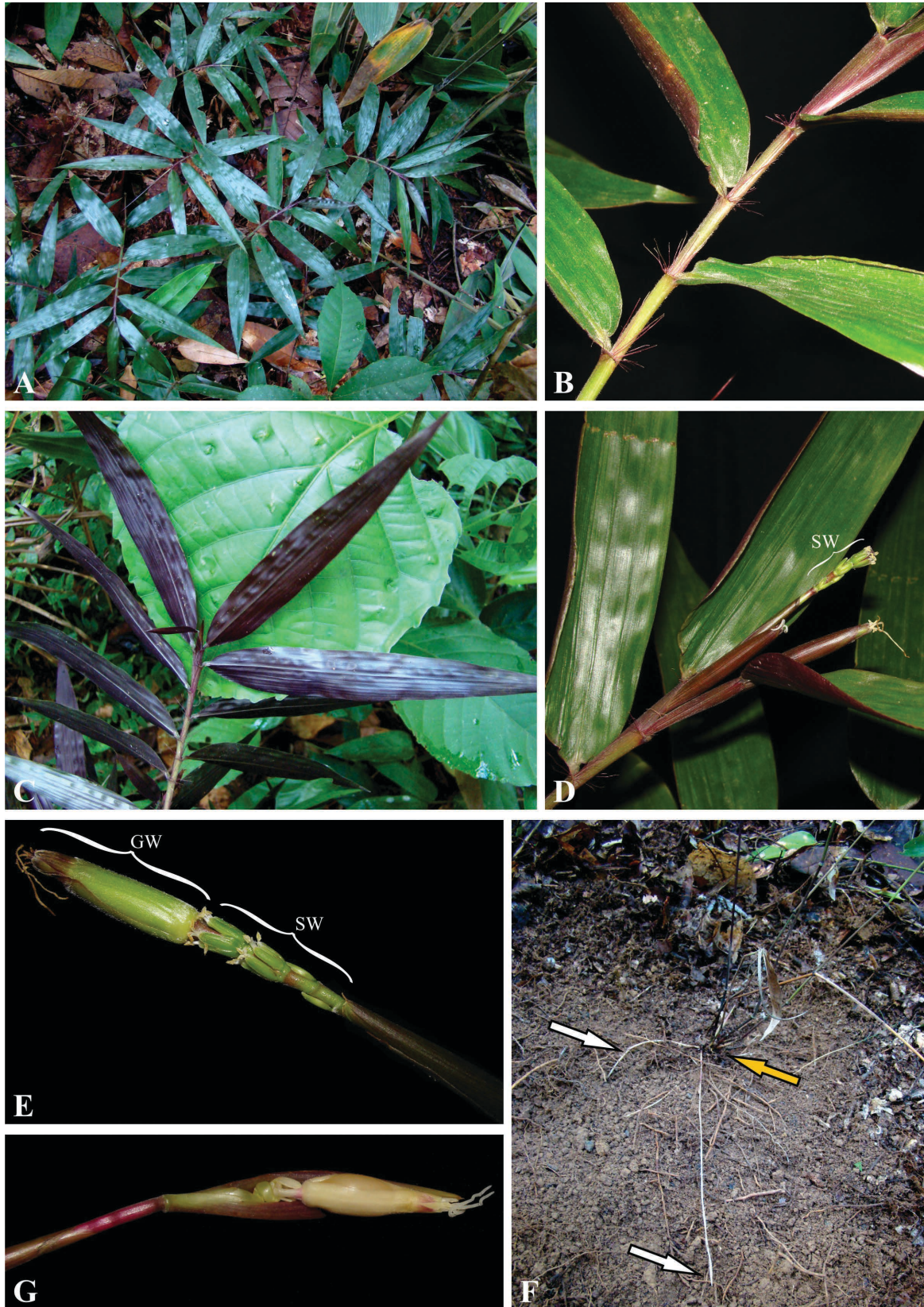
**Etymology** – The name of this new species refers to the colour of the abaxial surface of its leaf blades, distinctly purple, one of the diagnostic features of the species.

**Conservation assessment** – Critically Endangered: CR B2ab(i,ii,iii,iv,v). Due to climatic conditions in both the Camacã and Santa Luzia regions [hot and humid with 1200–1918 mm of rainfall evenly distributed throughout the year (Jardim 2003; Thomas et al. 2003; Amorim et al. 2008)], these areas are ideal for cocoa cultivation, the crop on which the economy of southern Bahia depends the most (Mori et al. 1983). This agricultural production is responsible for the destruction of the shrub/herbaceous layer, threatening many species that compose the understorey vegetation like the tree species *Andreodoxa flava* Kallunki (Kallunki 1998), and herbaceous bamboos (Oliveira et al. 2011) such as species of *Eremitis* (Ferreira et al. 2016). In the past, *E. vinacea* was present in three locations (fig. 3B). Based on all specimens ever collected, its estimated extent of occurrence (EOO) is 22,598 km<sup>2</sup> and the area of occupancy (AOO) is 12 km<sup>2</sup>. However, during recent collecting trips in 2009 and 2018 no individuals of *E. vinacea* were found in two of the





**Figure 4** – *Eremitis vinacea*. **A.** Habit. **B.** Detail of the leafy culm showing the fimbriae at the apex of the leaf sheaths. **C.** Leafy culm inflorescences enclosed by spathaceous bracts. **D.** Decumbent culm inflorescence with spathaceous bracts removed, showing a gynecandrous whorl (GW) above and three staminate whorls (SW) below. **E–F.** Gynecandrous whorl. **E.** Abaxial view of the staminate spikelets. **F.** Adaxial view of the staminate spikelets showing the rachis prolongation. **G.** Subterranean culm with inflorescence enclosed by spathaceous bracts. From *Ferreira & Carvalho 2132* (HUEFS). Illustration by Carla Lima.



**Figure 5** – *Eremitis vinacea* (photographs by Fabricio M. Ferreira). **A.** Habit. **B.** Detail of the leafy culm showing the fimbriae at the apex of the leaf sheaths. **C.** Leaf blades, abaxial view. **D.** Leafy culm inflorescences enclosed by spathaceous bracts. **E.** Decumbent culm inflorescence with spathaceous bracts removed, showing a gynecandrous whorl (GW) above and three staminate whorls (SW) below. **F.** Subterranean culms (white arrows). Yellow arrow indicates the base of the clump. **G.** Subterranean culm inflorescence enclosed by spathaceous bracts.



three locations, Lagoa Dourada (Santa Luzia) and Jerusalém Farm (Camacã), where this new species was collected in the past. These populations probably were extinguished due to uncontrolled tourism in the former and management of the cocoa crop in the latter (fig. 3C, D). As a result, *E. vinacea* is now considered to occur in a single location, and to have an AOO of 4 km<sup>2</sup>. The type population, present in the remaining location, has less than 80 individuals growing in the interior of ombrophilous forest and is close to cocoa plantations. Because of all these facts, the species is assessed as Critically Endangered: CR B2ab(i,ii,iii,iv,v) (IUCN Standards and Petitions Committee 2019).

**Additional specimens studied (paratypes)** – BRAZIL – Bahia • Municipality of Camacã [referred to as Canavieiras on the herbarium label], about 19 km from Camacã to Itambé; 21 Jan. 1968; *C.E. Calderón 2054*; CEPEC, US • about 19 km from Camacã to Potiraguá; 9 Jan. 2003; *J.G. Jardim et al. 4117*; HUEFS • same data as preceding; 6 Jun. 2009; *F.M. Ferreira & M.L.S. Carvalho 2114*; HUEFS • Jerusalém Farm, entrance on the right at 15 km from Camacã to Ventania Farm by road BR 101; 25 Aug. 1994; *L.A. Mattos-Silva et al. 3056*; CEPEC • Municipality of Santa Luzia [referred to as Canavieiras on the herbarium label], Lagoa Dourada, about 30 km SE from Camacã, road from Camacã to Canavieiras; 11 Apr. 1972; *C.E. Calderón & R.S. Pinheiro 2220*; HUEFS, US.

**Taxonomic notes** – Leaf blades purple on the abaxial surface occur in *Eremitis vinacea* (fig. 5C) and *E. afimbriata* F.M.Ferreira & R.P.Oliveira, the latter from Espírito Santo state (Ferreira et al. 2013a). However, the new species can be differentiated by its leaf sheaths with present and persistent fimbriae (vs absent in *E. afimbriata*) (figs 4B, 5B), leaf blades green on the adaxial surface (vs bluish green and iridescent) (fig. 5B), and a single inflorescence on decumbent culms (vs multiple inflorescences) (figs 4D, 5E) (Ferreira et al. 2013a).

Hollowell (1987) cited two specimens of *Eremitis vinacea* under her circumscription of *E. robusta* (Calderón 2054, Calderón & Pinheiro 2220) (see Ferreira et al. 2016). However, *E. vinacea* can be differentiated by its leaf blades purple on the abaxial surface (vs green in *E. robusta*) (fig. 5C), shorter decumbent culm inflorescences (4–5 cm vs 6–6.5 cm in *E. robusta*) (figs 4D, 5E), and longer glumes of the pistillate spikelets (11–12 mm vs (7.3–)8.7–10 mm in *E. robusta*) (see table 1).

Oliveira (2001) circumscribed these taxa differently from Hollowell (1987) in her monograph on the herbaceous bamboos from Bahia state. Oliveira (2001) cited specimens here considered as *E. vinacea* in two taxa: *Eremitis* sp.1 (Calderón & Pinheiro 2220) and *Eremitis* sp.3 (Calderón 2054, Mattos-Silva et al. 3056). Oliveira's *Eremitis* sp.1 also included specimens that belong to *E. jardimii* (Calderón 2034, Calderón & Pinheiro 2039, 2184, Hage & Santos 1667, Harley et al. 15004, Hollowell & Santos 3014, Hollowell et al. 3007; Ferreira et al. 2020c), *E. robusta* (Calderón & Pinheiro 2175, Hollowell et al. 3010, Soderstrom et al. 2182; Ferreira et al. 2016), and *E. berbertii* F.M.Ferreira & R.P.Oliveira (Jardim et al. 1956, Oliveira et al. 715; Ferreira et al. 2020d). Similarly, Oliveira's circumscription of *Eremitis* sp.3 also included *E. jardimii* (Carvalho et al.

3333; Ferreira et al. 2020c), *E. grandiflora* F.M.Ferreira & R.P.Oliveira (Santos s.n. (HUEFS 45092); Ferreira et al. 2021), *E. victoriae* F.M.Ferreira & R.P.Oliveira (Calderón & Pinheiro 2174, Hollowell et al. 3011; Ferreira et al. 2021), and another unpublished new species of *Eremitis* (Ferraz et al. 839; Ferreira 2012, Ferreira et al. in prep.). *Eremitis vinacea* can be distinguished from *E. jardimii* especially by its purple leaf blades at abaxial surface (vs green) (fig. 5C), shorter decumbent culm inflorescences (4–5 cm vs 5.5–6 cm in *E. jardimii*) (figs 4D, 5E), lemma of the pistillate spikelets 8-nerved (vs 13-nerved), and 3–4(–5) staminate whorls per inflorescence (vs 1–2) (figs 4D, 5E) (table 1). *Eremitis berbertii* can be differentiated from this new species by its leaf blades bluish green on the adaxial surface, showing a blue iridescence (vs green, without blue iridescence in *E. vinacea*), and leaf blades green on the abaxial surface (vs purple in *E. vinacea*). *Eremitis grandiflora* is characterized by its longer gynecandrous whorls (19–22.6 vs (12–)14.2–18.5 mm long in *E. vinacea*) and leaf blades green on the abaxial surface (vs purple in *E. vinacea*). *Eremitis victoriae* and *Eremitis* sp. ined. (Ferreira et al. in prep.) can be differentiated from the new species by their leaf blades glaucous on the abaxial surface (vs purple in *E. vinacea*) (table 1).

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