UNIVERSIDADE DE BRASÍLIA

INSTITUTO DE CIÊNCIAS BIOLÓGICAS - DEPARTAMENTO DE BOTÂNICA
PROGRAMA DE PÓS-GRADUAÇÃO EM BOTÂNICA

Bambusoideae (Poaceae) de vegetações ripárias em regiões do EcoMuseu do Cerrado (Goiás, Brasil)

Bambusoideae (Poaceae) from riparian vegetation in regions of the EcoMuseu do Cerrado (Goiás, Brazil)

João Victor Vendramini Gomes

Brasília, DF
Novembro, 2025

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Dissertação apresentada ao Programa de Pós-Graduação em Botânica da Universidade de Brasília, como parte dos requisitos necessários para obtenção do título de Mestre em Botânica.

Orientadora: Profa. Dra. Regina Célia de Oliveira.

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Resumo: O EcoMuseu do Cerrado (EMC) está localizado na porção central do bioma e abrange sete municípios do estado de Goiás: Abadiânia, Águas Lindas de Goiás, Alexânia, Cocalzinho de Goiás, Corumbá de Goiás, Pirenópolis e Santo Antônio do Descoberto. O EMC foi criado com o propósito principal de preservar a biodiversidade frente ao rápido avanço da ocupação humana e à escassez de estudos sobre a flora regional, além de promover o resgate e a manutenção da cultura local. A família Poaceae é uma das mais representativas do Cerrado. Entre suas subfamílias, destaca-se Bambusoideae, composta por plantas que apresentam colmos lignificados, podendo ultrapassar 20 metros de altura, pseudopecíolo, lígula externa e folhas de colmo morfologicamente distintas das folhas fotossintetizantes dos ramos. Os bambus lignificados são monocárpicos, com floração, frutificação e morte síncronas, e ciclos reprodutivos que variam de menos de uma década a quase um século. Assim, encontrar indivíduos férteis é um evento raro. Por permanecerem, em geral, estéreis, essas plantas são pouco representadas em levantamentos florísticos, dada a dificuldade de identificação baseada apenas em caracteres vegetativos. Esse cenário também é evidente no EMC, onde há poucas coletas de bambus, a maioria realizada ainda no século XX. O conhecimento sobre os bambus do Cerrado permanece limitado, uma vez que os estudos concentram-se, em sua maioria, em espécies de domínios predominantemente florestais, como a Amazônia e a Mata Atlântica. O objetivo deste trabalho é estudar a flora de Bambusoideae do EMC, fornecendo chaves de identificação, descrições, mapas de distribuição, ilustrações e comentários taxonômicos. Foram realizadas 17 coletas em Matas Ciliares e Matas de Galeria do EMC, utilizando técnicas usuais em taxonomia e o método de caminhamento aleatório. O material está incorporado ao Herbário UB, com duplicatas devidamente distribuídas. As espécies foram identificadas com base na literatura especializada, em consultas a especialistas e na comparação com espécimes de herbários. Foram registradas 14 espécies nativas de Bambusoideae no EMC, distribuídas entre os

gêneros *Actinocladum*, *Aulonemia*, *Chusquea*, *Eremocaulon*, *Guadua*, *Merostachys*, *Rhipidocladum*, *Olyra* e *Raddiella*. Este estudo amplia significativamente o conhecimento sobre Bambusoideae no Cerrado, destacando-se pelos primeiros registros dos gêneros *Chusquea* e *Merostachys* no estado de Goiás.

Palavras-chave: bambu; gramíneas; Mata Ciliar; Mata de Galeria; taquara.

Abstract: The EcoMuseu do Cerrado (EMC) is located in the central portion of the domain and encompasses seven municipalities in the state of Goiás: Abadiânia, Águas Lindas de Goiás, Alexânia, Cocalzinho de Goiás, Corumbá de Goiás, Pirenópolis, and Santo Antônio do Descoberto. The EMC was established primarily to preserve biodiversity in the face of the rapid expansion of human occupation and the scarcity of studies on the regional flora, as well as to promote the recovery and maintenance of local culture. The Poaceae family is one of the most representative in the Cerrado. Among its subfamilies, Bambusoideae stands out, comprising plants characterized by lignified culms that may exceed 20 meters in height, the presence of a pseudopetiole, an outer ligule, and culm leaves morphologically distinct from the photosynthetic branch leaves. Lignified bamboos are monocarpic, exhibiting synchronous flowering, fruiting, and death, with reproductive cycles that may range from less than a decade to nearly a century. Thus, finding fertile individuals is a rare event. Because they are generally sterile, these plants are underrepresented in floristic surveys due to the difficulty of identification based solely on vegetative features. This scenario is also evident in the EMC, where few bamboo collections exist, most of them dating back to the 20th century. Knowledge about Cerrado bamboos remains limited, as most studies focus on species from predominantly forested domains such as the Amazon and the Atlantic Forest. The objective of this study is to investigate the Bambusoideae flora of the EMC, providing identification keys,

descriptions, distribution maps, illustrations, and taxonomic comments. A total of 17 collections were conducted in Gallery and Riverine Forests of the EMC, using standard taxonomic techniques and the random walk method. The material was incorporated into the UB Herbarium, with duplicates properly distributed. Species were identified based on specialized literature, consultation with experts, and comparison with herbarium specimens. A total of 14 native species of Bambusoideae were recorded in the EMC, distributed among the genera *Actinocladum*, *Aulonemia*, *Chusquea*, *Eremocaulon*, *Guadua, Merostachys*, *Rhipidocladum*, *Olyra* and *Raddiella*. This study significantly expands the knowledge of Bambusoideae in the Cerrado, being notable for reporting, for the first time in Goiás, the occurrence of the genera *Chusquea* and *Merostachys*.

Key-words: bamboo; grasses; Gallery Forest; Riverine Forest; taquara.

1. Introduction

Bamboos are of major economic importance worldwide—most notably in Asia, where they are widely used for construction (Xu *et al.* 2022a; Xu *et al.* 2025), handicrafts (Dai & Hwang 2019), textiles (Amjad 2024; Tausif *et al.* 2015), and paper production (Chaudhary *et al.* 2024)—thanks to their high strength, flexibility, and durability (Vijayalaxmi & Vadukkumchery 2023). Beyond their practical value, bamboos also hold deep cultural significance in many societies (Clark *et al.* 2015).

In recent years, bamboos have been investigated for new applications, such as the production of charcoal, pyroligneous acid, and culm flour from *Dendrocalamus asper* (Schult. & Schult.f.) Baker ex K.Heyne (1927:301) (Felisberto *et al.* 2017; Sumanatrakul *et al.* 2015), as well as their use in green concrete (Ortega-Belmonte *et al.* 2021) and potential pharmacological applications of native species, such as *Merostachys pluriflora* Munro ex E.G. Camus (1913:77)—a Brazilian species—as a potential antioxidant and antibacterial (Anselmo-Moreira *et al.* 2021; Gagliano & Furlan 2016). These and other studies on the multiple uses of bamboos highlight their relevance to the bioeconomy, demonstrating how they and their by-products can generate new sustainable technologies and innovations (Xu *et al.* 2022b).

The grass family (Poaceae Barnhart) ranks among the largest families of angiosperms, comprising over 11,000 species in 793 genera worldwide (Stevens 2024; POWO 2024). In Brazil, it is represented by 176 native genera and around 1,300 species (Flora e Funga do Brasil 2025a). This monophyletic family is organized into 12 subfamilies, of which Bambusoideae Luerss.—the bamboos—forms the most diverse lineage in forest ecosystems (Judziewicz *et al* 1999).

Bambusoideae comprises three monophyletic tribes: Arundinarieae Asch. & Graebn., with lignified and mainly leptomorphic bamboos; Bambuseae Kunth ex Dumort., with also

lignified but mostly pachymorphic bamboos; and Olyreae Kunth ex Spenn., consisting of herbaceous bamboos with little to no lignification (Wysocki *et al.* 2015). The tribe Arundinarieae consists of species found in temperate climates and high elevations, predominantly in Asia, with no native representatives in Brazil. Meanwhile, the tribe Bambuseae consists of tropical bamboos with lignified culms that occur in the Paleotropic and Neotropic, including around 20 genera and 177 species in Brazil (Flora e Funga do Brasil 2025a). Lastly, the tribe Olyreae occurs mainly in the Americas (Clark *et al.* 2015; Bamboo Phylogeny Group 2012), with about 18 genera and 95 species in Brazil (Flora e Funga do Brasil 2025a).

The subfamily is characterized by culms with generally hollow internodes separated by septa at the nodes; branches with pseudopetiolate foliage leaves, and culm leaves (only in present in the lignified bamboos), formed by an expanded sheath with a diminutive, absent or well developed leaf blade and an inner ligule (with or without appendages). In some lignified species, culm leaves may bear outer ligules, whereas their branch leaves always bear the outer ligule; and scale-like rhizome leaves. The plants feature usually one bud per node, alternating distichously, although several taxa present two or more lateral buds per node, known as the bud complement or branch complement, when the bud differentiates into a branch. The number and position of these complements are important taxonomic traits (Judziewicz *et al.* 1999).

Bambusoideae has rhizomes classified into two main types: (i) leptomorphic, characterized by elongated underground internodes and monopodial rhizomes that do not differentiate into shoots but rather branch into aerial shoots, resulting in apparently solitary culms, as commonly observed in the tribe Arundinarieae; and (ii) pachymorphic, characterized by short underground internodes and sympodial rhizomes that differentiate into shoots and branch into new rhizomes, which in turn give rise to additional shoots that emerge

as clustered culms forming tussocks — a condition typical of the tribes Bambuseae and Olyreae. Beyond these two extremes, a wide range of intermediate rhizome types can be found, reflecting gradual transitions between the leptomorphic and pachymorphic conditions (Pereira & Beraldo 2016; Judziewicz *et al.* 1999).

Most lignified bamboos are gregarious monocarpic plants, flowering only once in their lifecycle — a process that can take over 100 years (Janzen 1976). After flowering, synchronous death occurs among individuals, which also flower isochronously (Judziewicz *et al.* 1999). This long interval between flowerings complicates the collection of fertile specimens, making identification challenging. To address this limitation, many authors have utilized comparisons of branch leaf anatomical features as an auxiliary tool for identifying genera and species within the subfamily (Calderón & Soderstrom 1973; Oliveira *et al.* 2008; Leandro *et al.* 2016; Leandro *et al.* 2017).

In Brazil, the tribes Bambuseae and Olyreae occur in all phytogeographic domains (Flora e Funga do Brasil 2025a). According to Flora e Funga do Brasil (2025b) 14 genera and 28 native species have been recorded in the Cerrado, including endemics such as *Aulonemia xerophylla* P.L. Viana & Filg. (2013:371), *Filgueirasia arenicola* (McClure) Guala (2003:3), *F. cannavieira* (Silveira) Guala (2003:3), *Guadua magna* Londoño & Filg. (2006:27), *G. virgata* (Trin.) Rupr. (1839:40), and *Merostachys filgueirasii* Send. (1995:80). For the state of Goiás, nine genera and 18 species of Bambusoideae have been recorded (Flora e Funga do Brasil 2025b). The genus *Olyra* L. (1759:1253) is represented by five species, *Guadua* Kunth (1822:150) by four species, while *Aulonemia* Goudot (1846:75) and *Filgueirasia* Guala (2003:2) are represented by two species each. The genera *Actinocladum* McClure ex Soderstr. (1981:1201), *Cryptochloa* Swallen (1942:317), *Eremocaulon* Soderstr. (1987:37), *Raddiella* Swallen (1948:89), and *Rhipidocladum* McClure (1973:101) are represented by one species each (Flora e Funga do Brasil 2025b).

The Cerrado is a South American phytogeographic domain similar to Savanna. In Brazil, it is mainly concentrated in the central region, with disjunct areas in other parts of the country. The Cerrado borders all major Brazilian phytogeographic domains (Caatinga, Amazon Forest, Atlantic Forest, and Pantanal), except for the Pampas, and occupies about 24% of the national territory, equivalent to approximately 204 million hectares (Walter *et al.* 2008; Embrapa Cerrados 2024). Although many areas of the Cerrado are used for agriculture and livestock, activities that bring economic benefits to the region and the country, they also cause severe environmental impacts, such as soil erosion, water pollution, loss of agroecosystem productive capacity, and regional climate changes (Klink & Machado 2005; Klink *et al.* 2008). By 2017, the Cerrado had lost 46% of its original coverage, and only 7.5% of its area was protected by environmental legislation (Strassburg *et al.* 2017). This highlights the urgency of restoring this domain, which is ecologically and economically essential for Brazil. Despite being threatened, the Cerrado is considered a biodiversity hotspot, hosting many endemic plant species, many of which are at risk of extinction (Myers *et al.* 2000).

The flora of the Brazilian Cerrado comprises 12,191 species of angiosperms, a number comparable to that of the Amazon (12,022 species) and the Atlantic Forest (15,157 species) (Flora e Funga do Brasil 2025b). The Cerrado consists of three main types of formations: grassland, savanna, and forest, which differ by the dominance or absence of woody components. Grassland formations are primarily composed of herbaceous species, with few shrubs and no trees. In savanna physiognomies, the herbaceous layer is also predominant but includes sparse shrubs and trees that do not form canopies. Forest formations are dominated by a tree layer, which may form continuous or discontinuous canopies, and include physiognomies such as Riverine Forest, Gallery Forest, Dry Forest, and Cerradão (Ribeiro & Walter 2008). Variations in floristic composition among these physiognomies are

influenced mainly by latitude, groundwater depth, fire frequency, grazing, and anthropogenic actions (Eiten 1994).

In the Cerrado, bamboos are primarily found in Gallery Forests, which occur as narrow strips along the courses of small rivers, streams, and creeks. In Gallery Forests, Bambusoideae exhibits a significant number of species compared to other physiognomies within the domain (Flora e Funga do Brasil 2025b). In Brazil, Gallery Forests are legally protected as Permanent Preservation Areas (PPAs). However, many of these areas are still altered or destroyed by human activities such as fires, deforestation, and mining (Rezende 1998). These forests play a crucial role as barriers against pollutants in water bodies, maintaining potable water and providing food for fauna (Kuhlmann & Ribeiro 2016). The water bodies crossing Gallery and Riverine Forests supply important aquifers that spread across the country (Durigan *et al.* 2022). Thus, the destruction of these vegetation types directly impacts water availability across nearly the entire national territory (Rezende 1998). Considering the 12 major hydrographic basins from Brazil, eight of them have parts within the Cerrado. In the Central Plateau, the presence of many springs, due to the high elevation, makes the region vulnerable to exploitation, which can result in siltation, contamination, and disputes over water use (Lima & Silva 2008).

The EMC (Figure 1) was established to promote environmental conservation of the upper Rio Corumbá basin and as a boundary between the Paraná and Tocantins river basins (IMB 2022), aiming to reconcile the protection of natural heritage with the sustainable use of local resources and the socioeconomic development of the region. The project was driven by social mobilization and the collaboration of citizens, public institutions, and private organizations, seeking a development model that preserves biodiversity, ensures equitable access to water resources, and improves the quality of life for local communities (Instituto HUAH & IBAMA 2003).

The EMC covers an area of 8066 km² and encompasses seven municipalities in the central region of the state of Goiás, located west of Distrito Federal (DF): Abadiânia, Águas Lindas de Goiás, Alexânia, Cocalzinho de Goiás, Corumbá de Goiás, Pirenópolis, and Santo Antônio do Descoberto (Nóbrega & Encinas 2006). Within the EMC's area, 0.3% corresponds to the Parque Estadual dos Pirineus, and 2.7% to the Área de Proteção Ambiental dos Pirineus, designated for sustainable use (Encinas *et al.* 2012). In addition to these protected areas, the region also includes 29 Private Natural Heritage Reserves (RPPNs) distributed across the municipalities of Alexânia (one), Cocalzinho de Goiás (two), Corumbá de Goiás (two), Pirenópolis (22), and Santo Antônio do Descoberto (two) (ICMBIO 2024).

The bamboos occurring in Cerrado play a significant ecological role and the correct identification of these species is essential for developing restoration and conservation plans for these areas. The rhizomes present in several bamboos enable the rapid formation of new culms, growing in stature and creating shade, which prevents the penetration of light necessary for the germination and growth of other plants. Thus, bamboo species might present invasive potential, especially due to inappropriate land use, making proper management of these species crucial (Oliveira-Filho *et al.* 1994; Lima *et al.* 2012; Montti *et al.* 2014; Cupertino-Eisenlohr *et al.* 2017; Buziquia *et al.* 2019). On the other hand, cultivating native species or managing areas with native vegetation may represent a viable alternative for the sustainable use and protection of the Cerrado (Tardio *et al.* 2018).

Few studies have been conducted on Bambusoideae in the Cerrado. In 1988, the first flora of the subfamily was documented in Distrito Federal (DF), recording six genera and nine species: *Actinocladum verticillatum* (Nees) McClure ex Soderstr. (1981:1204), *Filgueirasia cannavieira*, *Guadua paniculata* Munro (1868:85), *Merostachys multiramea* Hack. (1909:326), later identified as *M. filgueirasii* by the species' author (Sendulsky 1995), *Olyra ciliatifolia* Raddi (1823:19), *O. humilis* Nees (1829:304), *O. latifolia* L. (1759:1261),

O. taquara Swallen (1966:86), and *Raddiella esenbeckii* (Steud.) C.E. Calderón & Soderstr. (1980:21) (Filgueiras 1988). Recently, Mutinelli *et al.* (unpublished data) presented a new flora of Gallery Forest bamboos in the DF, recording the first occurrence of *Chusquea* cf. *attenuata* (Döll) L.G. Clark (1993:237). However, some species recorded by Filgueiras in 1988 and confirmed by Flora e Funga do Brasil (2025b), such as *Aulonemia aristulata* (Döll) McClure (1973:56), *Filgueirasia cannavieira*, *Guadua paniculata*, *G. refracta* Munro (1868:84), *Olyra glaberrima* Raddi (1823:19), *Rhipidocladum parviflorum* (Trin.) McClure (1973:105), and *Taquara micrantha* (Kunth) I.L.C. Oliveira & R.P. Oliveira (2019:78), were not recollected by Mutinelli *et al*.. The absence of new records for *Guadua* species may be related to their occurrence in Riverine Forests—vegetation accompanying large rivers without forming a continuous canopy over the watercourse—rather than in Gallery Forests, which accompany small watercourses like streams and creeks and form a partially or fully continuous canopy over the watercourse. The lack of new records for other species may suggest that these species are at risk in the Federative Unit.

There is no specific Bambusoideae flora for the state of Goiás, with species limited to those listed in the Flora e Funga do Brasil (2025b). Considering the new bamboo occurrences in DF and the lack of specific studies in Goiás, it is likely that the number of species recorded in the Flora is underestimated compared to the actual number. Furthermore, when analyzing Bambusoideae and other Poaceae collections in the SpeciesLink database (CRIA 2025), which compiles most of the herbarium data from Brazil, it becomes evident that the subfamily is underrepresented in the municipalities that make up the EcoMuseu do Cerrado (EMC) (only 24 collections of native Bambusoideae). Another point to consider is that many of these collections were made in the 20th century, which may not reflect the current distribution of the species.

The objective of this study is to survey the Bambusoideae flora of the EcoMuseu do Cerrado (EMC) and provide keys, descriptions, illustrations, distribution data, and field observations.

2. Material and Methods

Study Area

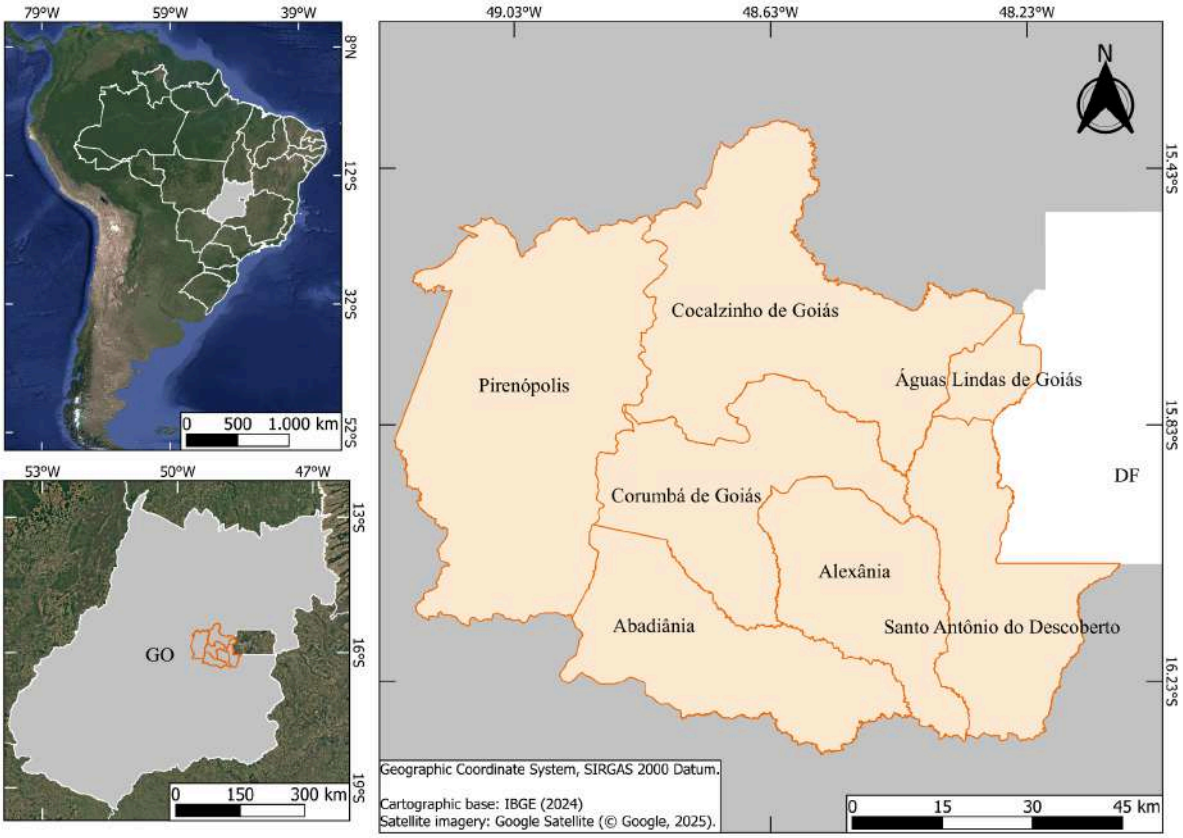

Figure 1. South America map, emphasizing the state of Goiás and the EcoMuseu do Cerrado area.

According to Köppen's climate classification, the region falls under the Aw category, characterized as tropical with a dry winter season (Alvares *et al.* 2013). It has an average annual rainfall of 1,400 to 1,600 mm, with annual mean temperatures ranging from 22–23°C in the eastern area near the DF, 23–24°C in the central, northern, and southwestern areas, and 24–25°C in the northwestern area, primarily occupied by the municipality of Pirenópolis. The

predominant soil type is Latosol, followed by Cambisol and, less commonly, Neosols (IMB 2022).

Botanical material collection

We conducted 17 field trips in the Gallery and Riverine Forests of municipalities within the EMC from December 2023 to May 2025.

Collections followed the methodology of Soderstrom and Young (1983) and the collected specimens were photographed, georeferenced, and incorporated into the UB herbarium, with duplicates distributed to other institutions. Herbarium acronyms follow Thiers (2025, continuously updated).

Identification and Descriptions

Identifications were conducted based on specialized literature and herbarium comparisons, further confirmed using databases such as SpeciesLink (CRIA 2025) and GBIF (2025). Morphological analyses were carried out using a stereomicroscope, ruler and caliper for measuring minute structures. Terminology for morphological descriptions follows Calderón and Soderstrom (1980), Judziewicz *et al.* (1999), Radford (1974) and Soderstrom and Zuloaga (1989).

Maps

Distribution maps were created using QGIS v.3.36.0 (QGIS Development Team 2024). Shapefiles of water basins, watercourses, Federative Units, and municipal boundaries were obtained from IBGE (2021, 2023, 2024). Satellite imagery was obtained from Google Earth (2025), accessed via QuickMapServices (QGIS).

3. Results and Discussion

Throughout the field trips conducted in the EMC, nine genera and 14 native species were registered: *Actinocladum verticillatum*, *Aulonemia aristulata*, *Chusquea* aff.

calderoniae, *Eremocaulon capitatum* (Trin.) Londoño (2002:714), *Guadua paniculata*, *Guadua refracta*, *Guadua* sp., *Merostachys* cf. *filgueirasii*, *Rhipidocladum parviflorum*, *Olyra ciliatifolia*, *O. fasciculata* Trin. (1834:113), *O. humilis*, *O. latifolia* and *Raddiella esenbeckii* (Table 1; Figs. 2, 3, 4). Additionally, the exotic species *Bambusa tuldoides* Munro (1868:93), *Dendrocalamus* cf. *giganteus* Munro (1868:150), and *Phyllostachys* cf. *aurea* (André) Rivière & C. Rivière (1878:716) were recorded.

Table 1. Native species of Bambusoideae and abbreviations of municipalities within the EcoMuseu do Cerrado where they were recorded: Abadiânia (Ab); Águas Lindas de Goiás (Ag); Alexânia (Al); Cocalzinho de Goiás (Cc); Corumbá de Goiás (Cr); Pirenópolis (Pi); Santo Antônio do Descoberto (Sa).

Species	Ab	Ag	Al	Cc	Cr	Pi	Sa
Actinocladum verticillatum	x	x				x	x
Aulonemia aristulata	x		x				
Chusquea aff. *calderoniae*			x	x		x	
Eremocaulon capitatum	x						
Guadua paniculata			x		x		
Guadua refracta	x		x		x		x
Guadua sp.						x	
Merostachys cf. *filgueirasii*			x	x			x
Rhipidocladum parviflorum	x						
Olyra ciliatifolia	x			x	x		x
Olyra fasciculata	x		x				x
Olyra humilis	x	x	x	x		x	
Olyra latifolia	x	x	x		x	x	x
Raddiella esenbeckii		x	x			x	x

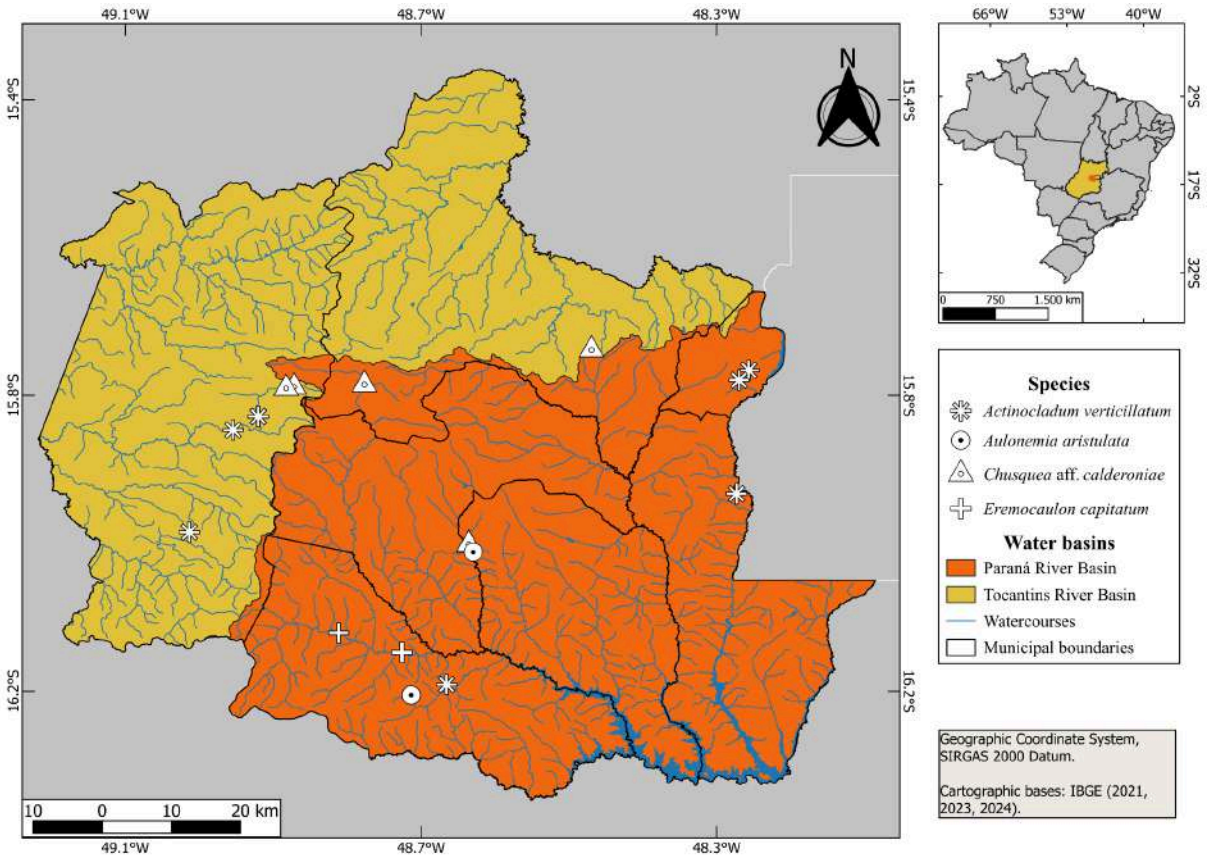

Figure 2. Distribution of *Actinocladum verticillatum*, *Aulonemia aristulata*, *Chusquea* aff. *calderoniae* and *E. capitatum* within the water basins of the EMC.

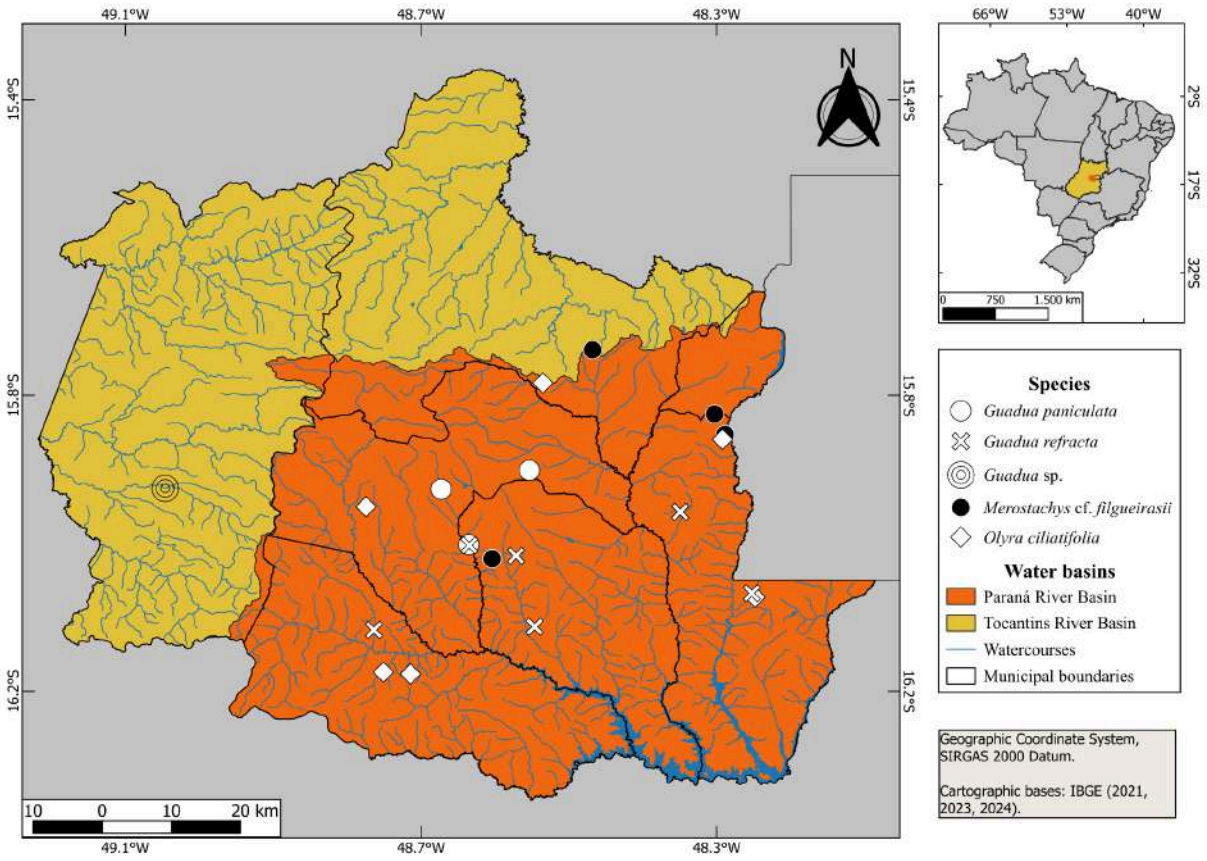

Figure 3. Distribution of *G. paniculata*, *G. refracta*, *Guadua* sp., *M.* cf. *filgueirasii* and *O. ciliatifolia* within the water basins of the EMC.

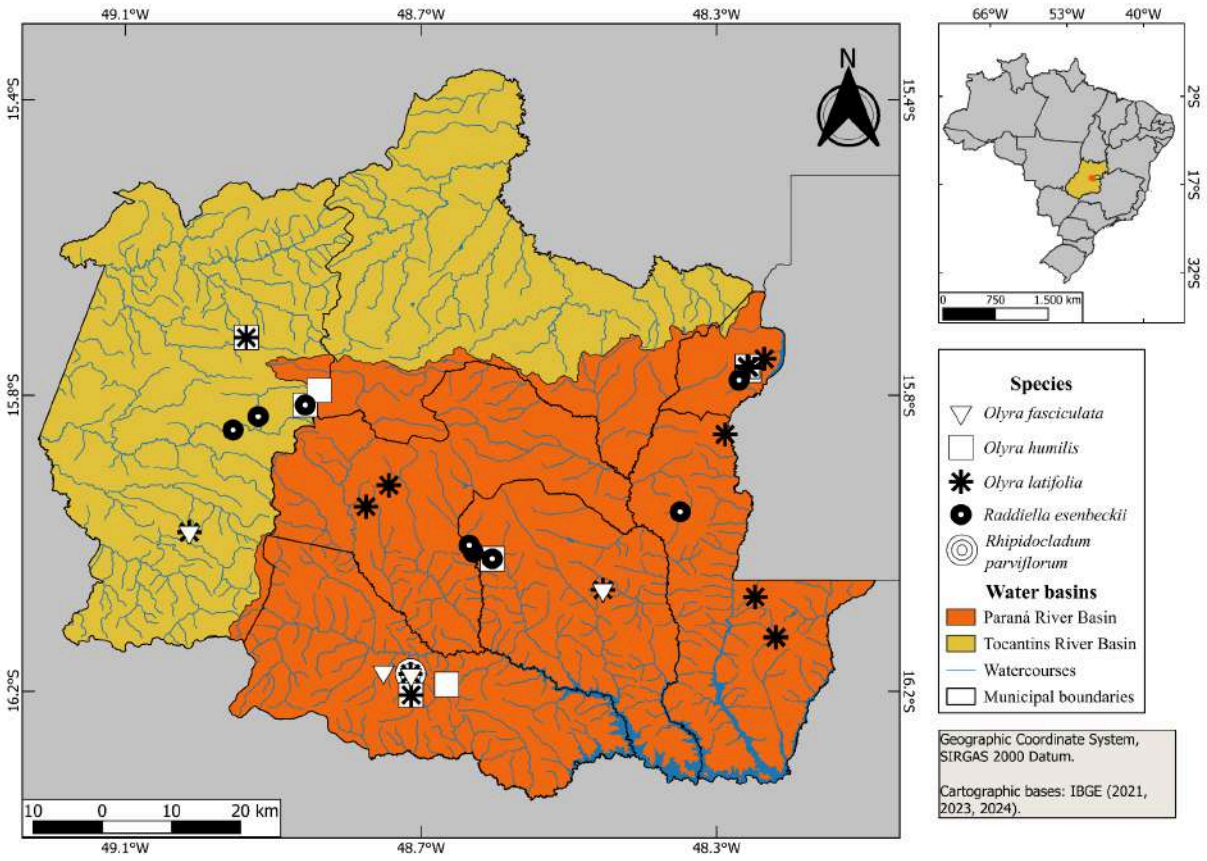

Figure 4. Distribution of *O. fasciculata*, *O. humilis*, *O. latifolia*, *Raddiella esenbeckii* and *Rhipidocladum parviflorum* within the water basins of the EMC.

The genus *Chusquea* Kunth (1822:151) has three main centers of diversity: the Andes, the Atlantic Forest, and Central America and Mexico (Clark 1997), while *Merostachys* has a single center of diversity and endemism in the Atlantic Forest of Brazil (Vinícius-Silva *et al.* 2020). The presence of these genera in the Gallery Forests of Goiás can be explained by the Cerrado's connections to the Amazon and Atlantic Forest domains, primarily through riparian vegetation (Oliveira-Filho & Ratter 1995).

Among the native Bambusoideae reported by Flora e Funga do Brasil (2025a) for the state of Goiás, *Filgueirasia cannavieira* primarily inhabits cerrado sensu lato, a phytophysiognomy not typically associated with water bodies. In contrast, although *Aulonemia xerophylla*, *Cryptochloa capillata* (Trin.) Soderstr. (1982:202), *F. arenicola*,

Guadua magna, *G. virgata* (see comments under *G. refracta*), and *Olyra taquara* are listed by Flora e Funga do Brasil (2025a) as occurring in Goiás, none of them were collected during this study, despite their preference for Gallery and Riverine Forests.

Among these species, *O. taquara* is particularly widespread throughout central Brazil (Oliveira *et al.* 2025) and has been recorded in the Distrito Federal (Mutinelli et al., unpublished data; CRIA, 2025), adjacent to the EMC. Vegetatively, its habit may resemble that of *O. latifolia*, owing to its large, oblong to lanceolate branch leaf blades with symmetrical rounded to cordate bases. However, its synflorescence is similar to that of *O. fasciculata*, characterized by digitate or fascicled branches on the lower nodes, numerous male spikelets positioned below the female ones, and a glabrous female anthecium with shallow surface excavations. It can be readily distinguished from *O. fasciculata*, however, by its symmetrical leaf blade base, as opposed to the strongly asymmetrical one in the latter species.

Regarding species distribution within the basins, it is noteworthy that *Guadua paniculata* and *G. refracta* were collected exclusively in the Paraná River Basin (Fig. 3), suggesting that their distribution might be associated with the water bodies forming this basin. However, other specimens available in online databases (CRIA, 2025) and the distribution data provided by Flora e Funga do Brasil (2025c) indicate that these species also occur in other Brazilian river basins.

Guadua sp. was collected only once in this study, in the municipality of Pirenópolis, within the Tocantins River Basin (Fig. 3). Although a single record may not accurately represent the taxon's full distribution, according to Afonso (pers. comm., 2025), two additional specimens morphologically similar to the EMC material were collected in the states of Tocantins and Maranhão—both entirely or partially encompassed by this basin.

Therefore, in this case, the taxon's distribution may indeed be linked to the Tocantins River Basin.

In *Rhipidocladum parviflorum* and *Guadua* spp. specimens collected at the EMC, the presence of a mucus-like secretion inside the internodes was observed (Figure 22 a). Judziewicz *et al.* (1999) mention that Clark and Londoño reported a white, gelatinous substance, known as Tabashir, occurring inside the internodes of some native Bambusoideae species, though without specifying which taxa. Tabashir is a siliceous deposit that may accumulate within the internodes of lignified bamboos (Liese 1998). The author further described it as loose, solid lumps of silica that generally occur above the nodal septa, although they may appear as a viscous fluid before hardening. Considering these descriptions, the mucus-like secretion found in *Guadua* spp. and *R. parviflorum* might correspond to the early, liquid form of Tabashir.

Davidse (1987) reported the occurrence of enlarged portions in the spikelets of species within the tribe Olyreae containing elaiosomes. Olyreae specimens collected at the EMC exhibited an unusual structure at the apex of the pedicel which, based on Davidse's findings, may indicate the presence of secretory glands in this region. He also noted the presence of elaiosomes in spikelets of several *Olyra* species, suggesting that the EMC specimens might share similar adaptations.

To date, no such reports have been found for native Bambusoideae taxa, which could hold considerable interest for biomedical, materials science, and cosmetic applications. Further anatomical and histochemical investigations—particularly targeting the internodal tissues and spikelet appendages—may provide valuable insights into the composition, function, and potential uses of these intriguing secretions.

Tribe Arundinariae: Comprising bamboos with mainly leptomorph rhizomes, forming scattered shoots. The culms are lignified and may be erect or climbing and feature nodes that can develop complex non-apsidate (without a space below the base of the branches, with at least one main branch) branching. Internodes interiors are hollow. The nodes are septate. Culm leaves possess an expanded sheath and reduced or absent, non-photosynthetic blades. Branch leaves are pseudopetiolate, bearing both outer and inner ligules. These plants are perennial and monocarpic, with long flowering cycles spanning years to decades. Flowering is generally gregarious, occurring only once, followed by fruiting and death. Inflorescences are spikelets or pseudospikelets, as observed in *Phyllostachys* Siebold & Zucc. (1843:745), containing one or more bisexual anthecia. The fruit is a basic caryopsis, uncommonly a baccate caryopsis, observed in *Ferrocalamus* Hsueh & Keng f. (1982:3) (Bamboo Phylogeny Group 2012). It is represented in the area by *Phyllostachys* cf. *aurea*, a cultivated invasive species native to Asia.

Tribe Bambuseae: Comprising bamboos usually with pachymorph rhizomes that form large clumps. The culms are lignified and may be erect or climbing and feature nodes that can develop complex, apsidate (with a rounded or triangular space below the base of the branches, without a main branch) or non-apsidate branching. Internodes interiors are generally hollow but can also be solid, as in *Chusquea*, or spongy, as in *Actinocladum*. The nodes are septate. Culm leaves possess an expanded sheath and reduced or absent, non-photosynthetic blades. Branch leaves are pseudopetiolate, bearing both outer and inner ligules. These plants are perennial and monocarpic, with long flowering cycles spanning years to decades. Flowering is generally gregarious, occurring only once, followed by fruiting and death. Inflorescences are spikelets or pseudospikelets, as observed in *Guadua*, containing one or more bisexual anthecium. The fruit is a caryopsis, which may be achene-like (as in *Actinocladum* and

Merostachys Spreng. (1825:132, 249)) or a baccate caryopsis (as in *Alvimia* C.E.Calderón ex Soderstr. & Londoño (1988:833) and *Olmeca* Soderstr. (1982:161)) (Judziewicz *et al.* 1999). It is represented in the area by the native species *Actinocladum verticillatum*, *Aulonemia aristulata*, *Chusquea* aff. *calderoniae*, *Eremocaulon capitatum*, *Guadua paniculata*, *G. refracta*, *Guadua* sp., *Merostachys* cf. *filgueirasii* and *Rhipidocladum parviflorum,* and additionally, by the cultivated *Bambusa tuldoides* and *Dendrocalamus* cf. *giganteus*.

Tribe Olyreae: Comprising bamboos with pachymorph rhizomes forming clumps. The culms are slightly to non-lignified, varying from a few centimeters to 6 m in stature, and can be stoloniferous or tufted/climbing. The nodes lack branching entirely or rarely have simple branching (one or two branches per node). Internodes are hollow, and the nodes are septate. Culm leaves are absent. Branch leaves are pseudopetiolate with sheath and blade typical of Poaceae, featuring an inner ligule, lacking an outer ligule, and usually without fimbriae. These plants are generally perennial and pluricarpic. The spikelets are uniflorous and unisexual, usually exhibiting dimorphism: female spikelets are usually larger than the male ones, which may lack glumes. The female anthecium is typically hardened, with the lemma enclosing the palea, whereas the male anthecium is membranous. The fruit is a basic caryopsis (sensu Judziewicz *et al.* 1999). It is represented in the area by the native species *Olyra ciliatifolia*, *O. fasciculata*, *O. humilis*, *O. latifolia*, and *Raddiella esenbeckii*.

Identification Key

1. Lignified bamboos that can exceed 10 m tall. Culm leaves with sheaths and blades distinct from those of the branch leaves (Figure 7 g) (absent in *Aulonemia aristulata*). Branch leaves bearing both inner and outer ligules (Figure 9 a)……..…….... **2**

1’. Herbaceous bamboos up to 5–6 m tall. Culm leaves absent. Branch leaves bearing only an inner ligule (outer ligule absent)……..……..…….....**13**

2. Leptomorph rhizome (Figure 19 h)...……. **3**

2’. Pachymorph rhizome (Figure 12 g)..……..…… **4**

3. Groove present on the culm internodes above the bud (Figure 19 d). Culm hollow. Branch complement with up to 3 branches. Branch leaves fimbriate (Figure 19 b).....***Phyllostachys* cf. *aurea***

3’. Groove absent on the culm internodes above the bud. Culm solid (Figure 8 d). Branch complement with up to more than 40 branches. Branch leaves non-fimbriate (Figure 8 b)..... ***Chusquea* aff. *calderoniae***

4. Branch complement apsidate (Figure 14 f), if not, then one single branch per node and culm leaf absent…….. **5**

4’. Branch complement non-apsidate (Figure 11 f), with one to several branches per node, culm leaf present……..……...……**8**

5. One single branch per node. Culm leaf absent……...…..……*Aulonemia aristulata*

5’. Multiple branches per node. Culm leaf present……..…… **6**

6. Culm interior filled with spongy tissue (Figure 5 c)…….. ***Actinocladum verticillatum***

6’. Culm interior hollow (Figure 19 d)..…….…….…**7**

7. Culm internode surface scabrous (Figure 14 i), green and mottled (Figure 14 c, g). Culm leaf blade reflexed (Figure 14 d)..…… ***Merostachys* cf. *filgueirasii***

7’. Culm internode surface smooth, entirely green, not mottled. Culm leaf blade erect (Figure d, g)……..... ***Rhipidocladum parviflorum***

8. Culm nodes armed with thorns (Figure 11 f).....**9**

8’. Culm nodes unarmed with thorns (Figure 10 h)..……..……..…. **11**

9. Branch leaf sheath abaxial surface glabrous, rarely bearing a few sparse trichomes; auricles absent.……...……...…… ***Guadua paniculata***

9’. Branch leaf sheath abaxial surface puberulent to pubescent; auricles present or not... **10**

10. Culm leaf blade erect, its base as wide as the sheath apex, less than half the sheath length……..……...…… ***Guadua refracta***

10’ Culm leaf blade reflexed, its base narrower than the sheath apex, more than half the sheath length……..…… ***Guadua* sp.**

11. Branch leaf blade linear, up to 8.3 mm wide, with a length:width ratio of 29.3–88.3…….. ***Eremocaulon capitatum***

11’ Branch leaf blade lanceolate to linear, up to 79.5 mm wide, with a length:width ratio of 5.6–16.3……... **12**

12. Auricles present on culm leaf……...…. ***Bambusa tuldoides***

12’ Auricles absent on culm leaf……...…. ***Dendrocalamus* cf. *giganteus***

13. Plant less than 40 cm tall, with oval-deltate leaf blades up to 22 mm long. Terminal synflorescences bearing male spikelets only (Figure 20 b, c)..…..…… ***Raddiella esenbeckii***

13’. Plants more than 40 cm tall, with lanceolate to oval-lanceolate leaf blades at least 40 mm long. Terminal synflorescences bearing both male and female spikelets (Figure 16 g), rarely with female spikelets only (Figure 15 f)…… **14**

14. Branch leaf blade margin scabrous and ciliate (Figure 15 c). Female anthecium surface entirely pubescent (Figure 15 b)……..……...…...…….... ***Olyra ciliatifolia***

14’. Branch leaf blade margin scabrous to long scabrous, sometimes sparsely ciliate toward the base. Female anthecium surface not entirely pubescent……...……**15**

15. Female anthecium surface villous only toward the basal and apical margins, glabrous on the remainder (Figure 17 e)…… ***O. humilis***

15’. Female anthecium surface entirely glabrous……...…….....……**16**

16. Female anthecium surface smooth (Figure 18 b)..……..***O. latifolia***

16’. Female anthecium surface marked with oblong excavations (Figure 16 a, b).....……. ***O. fasciculata***

***Actinocladum verticillatum* (Nees) McClure ex Soderstr**, Amer. J. Bot. 68: 1204 (1981) (Figure 3).

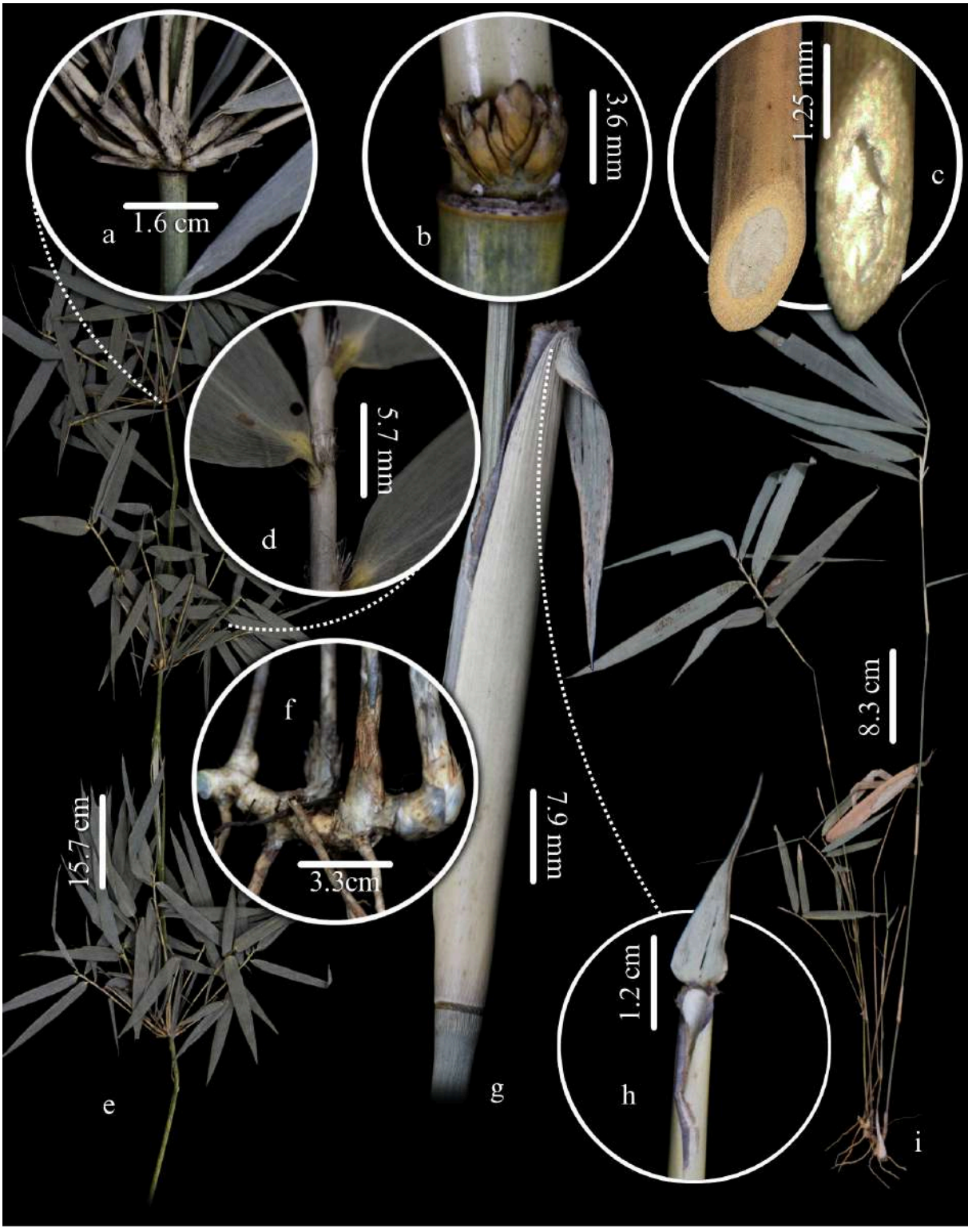

Figure 5. *Actinocladum verticillatum* branch complements (a); bud complement (b); pithy and

hollow internodes (c); branch leaves (d); mature habit (e); rhizome (f); culm leaf (g); culm leaf in detail (h); and young habit (i).

Rhizome pachymorph. **Culm** lignified, 53–300 cm tall; internode 2–5.5 mm in diameter, glabrous to sparsely short-strigose, wax deposition absent, pithy with white spongy pith or rarely hollow, light green to stramineous, possibly with blackened spots, terete; wall 0.25–1.5 mm thick; node unarmed with thorns, prominent, stramineous to brown or blackened, fringe of trichomes along the nodal line absent, supranodal ridge absent; branch complement apsidate, with 3–30 branches, without a main branch, nodes green, stramineous, brown or blackened. **Culm leaf** with sheath 26.5–96 × 8–29 mm, abaxial surface glabrous, adaxial surface glabrous, stramineous to light green; auricles absent; inner ligule 0.1–0.6 mm long, membranous, with ciliate apex; outer ligule 0.2–0.5 mm long, membranous, with ciliolate to ciliate apex; fimbriae 2–4 mm long, fused along the basal half, with free apices, forming fimbriate ruffles, with the overlapping margin ones more extensive than the underlapping margin ones, grayish green, with a darker base and stramineous apex; blade sessile, erect to reflexed, 10.5–53 × 3.5–14.5 mm, margin ciliate to scabrous, abaxial surface glabrous or with occasional setose trichomes, adaxial scabrous to short-strigose, lanceolate, light green to stramineous. **Branch leaf** with sheath 20.5–65 mm long, overlapping margin ciliate, underlapping margin glabrous or both ciliate, abaxial surface glabrous or short-setose, light green to stramineous; auricles absent; inner ligule 0.1–0.6 mm long, membranous, with ciliolate apex; outer ligule 0.1–0.5 mm long, membranous, with glabrous to ciliolate apex; fimbriae 3–6.5 mm long, fused at the base, stramineous to golden brown; pseudopetiole 2.5–7 mm long, abaxial surface glabrous, scabrous or short-strigose, adaxial surface glabrous, short-strigose or setose, stramineous to yellow; blade 94–205 × 10–31.5 mm, abaxial surface scabrous to short-strigose, adaxial scabrous to short-strigose, lanceolate to linear-lanceolate,

length:width ratio of 5–11.45, base attenuate or rounded-attenuate, apex acuminate, margin scabrous to strigose, light green to grayish green, with or without abaxial dark-green stripe on one of the margins; midrib most prominent abaxially, becoming indistinct among the other veins along the basal one-third to three-quarters of the blade. **Synflorescences** not observed. **Spikelet** not observed. **Caryopsis** not observed.

Sampled material: BRAZIL. GOIÁS: Abadiânia, 16º11'26.98"S 48º39'55.34"W, 22.II.2025, *J.V. Vendramini-Gomes et al. 83* (UB); Águas Lindas de Goiás, 15º45'57.82"S 48º15'23.90"W, 30.III.2024, *J.V. Vendramini-Gomes et al. 29* (UB); 15º46'45.45"S 48º16'11.46"W, 10.VIII.2024, *J.V. Vendramini-Gomes & C.O. Castro 60* (UB); 15º46'45.45"S 48º16'11.46"W, 10.VIII.2024, *J.V. Vendramini-Gomes & C.O. Castro 62* (UB); Pirenópolis, Fazenda Caiçara Camping e Cachoeiras, 15º59'05.42"S 49º00'48.08"W, 18.V.2025, *J.V. Vendramini-Gomes & V.P. Moreira 114* (UB)*;* Rio das Almas, 15º49'42.89"S 48º55'12.27"W, 30.IV.2024, *J.V. Vendramini-Gomes et al. 35* (UB); 15º49'42.89"S 48º55'12.27"W, Cachoeira Meia-Lua, 30.IV.2024, *J.V. Vendramini-Gomes et al. 36* (UB); 15º49'42.89"S 48º55'12.27"W, 30.IV.2024, *J.V. Vendramini-Gomes et al. 37* (UB); 15º49'42.89"S 48º55'12.27"W, 30.IV.2024, *J.V. Vendramini-Gomes et al. 38* (UB); 15º49'42.89"S 48º55'12.27"W, 30.IV.2024, *J.V. Vendramini-Gomes et al. 39* (UB); 15º49'42.89"S 48º55'12.27"W, 30.IV.2024, *J.V. Vendramini-Gomes et al. 40* (UB); Santo Antônio do Descoberto, 15º55'58.55"S 48º16'23.86"W, 18.II.2024, *J.V. Vendramini Gomes & C.O. Castro 7* (UB).

Comments: *Actinocladum verticillatum* can be identified by the presence of a continuous band of fused, ruffled fimbriae along the culm leaf margins (Figure 5 g, h)—extensive at the base and progressively reduced toward the apex, eventually transitioning into typical free

fimbriae—as well as by the culm internodes filled with spongy white pith (Figure 5c), a unique feature among the species analyzed in this study.

During the field trips, many young individuals less than 50 cm tall were observed. In this case it may resemble members of the tribe Olyreae, as they lacked morphologically differentiated culm leaves (Figure 5 i). However, they can be easily identified as belonging to the tribe Bambuseae by the presence of an outer ligule on their culm leaves.

Actinocladum verticillatum was found both inside and at the edge of Gallery Forests. Interestingly, all young individuals were collected exclusively at the edges of the Gallery Forests, suggesting that the presence of light is essential for the germination and early development of seedlings. On the other hand, adult individuals were found both at the edges and inside the forests.

The species might present invasive potential due to its rapid growth and vegetative propagation via rhizomes, competing for space and light with other species. This behavior is exacerbated by deforestation of native vegetation, especially due to fires, as *A*. *verticillatum* is fire-adapted, quickly resprouting from rhizomes. This pattern is even more evident in dense populations, where rhizomes are larger and deeper, making the species less susceptible to disturbances such as deforestation (Silvério *et al.* 2010).

It was not possible to determine a flowering period for the species, as no fertile individuals were collected in this study. However, Soderstrom (1981) suggests that flowering occurs in cycles of 30 to 40 years.

Filgueiras and Pereira (1988) discussed the flowering of populations in DF, reporting that blooming in these populations began in October 1984 and lasted just over a year. The authors also observed that the anthesis of the spikelets occurs early in the morning, with the anthers remaining exposed for several days. Surprisingly, they also observed the visitation of various insect species during flowering, attracted by a sweet, watery exudate present at the

base of the ovaries, possibly nectar. This characteristic remains undescribed in Poaceae, as its species are predominantly wind-pollinated.

***Aulonemia aristulata* (Döll) McClure**, Smithsonian Contr. Bot. 9: 56 (1973).

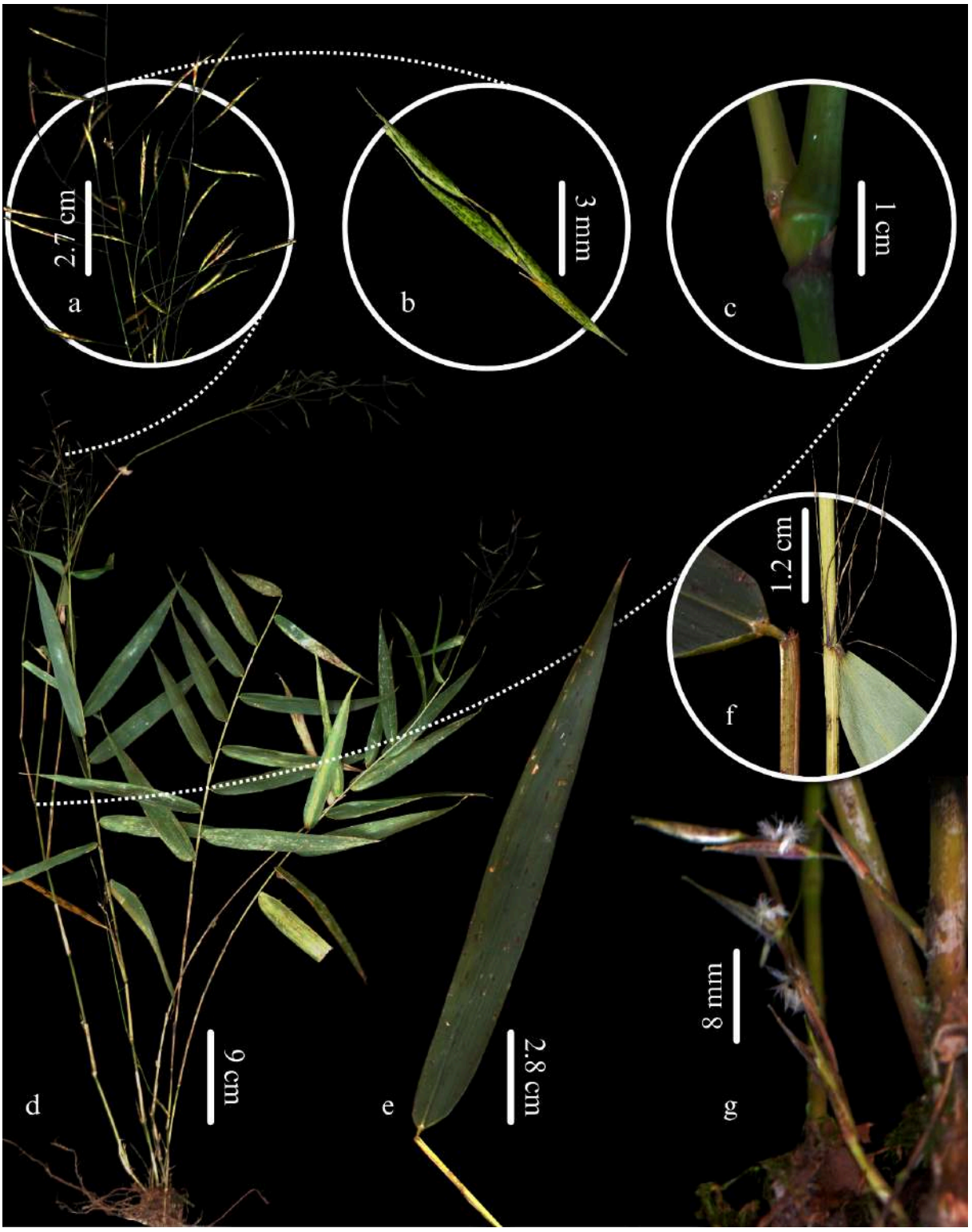

Figure 6. *Aulonemia aristulata* synflorescences in detail (a); spikelet in detail (b); simple branching in detail (c); habit (d); branch leaf (e); branch leaf fimbriae in detail (f); and basal spikelets (g).

Rhizome pachymorph. **Culm** lignified, 90–250 cm tall; internode 2.5–2.8 mm in diameter, wholly glabrous to papillose or only on the lower half of the internode, short pubescent on the remainder, wax deposition absent, hollow, light green, with yellow or dark-green spots, terete; wall 0.57–0.8 mm thick; node unarmed with thorns, prominent or barely prominent, stramineous to blackened, fringe of trichomes along the nodal line absent or present, supranodal ridge present; branch complement non-apsidate, with 1–2 branches, with 1 main branch, nodes dark green to blackened. **Culm leaf** absent. **Branch leaf** with sheath 46.5–63.7 mm long, both margins scabrous to ciliate, abaxial surface glabrous to papillose, occasionally with few puberulent tufts, adaxial surface glabrous, yellowish green with green spots; auricles absent; inner ligule 0.1–0.6 mm long, membranous, with ciliolate apex; outer ligule 0.15–0.25 mm long, membranous, with ciliolate to ciliate apex; fimbriae 2.5–36.3 mm long, entirely free, not extending to the margins, light green, stramineous or vinaceous; pseudopetiole 2–3.7 mm long, abaxial surface glabrous to papillose, adaxial surface pubescent, yellowish green to stramineous, with occasionally blackened margins; blade 73–205.6 × 11.8–20.7 mm, abaxial surface glabrous to papillose, adaxial glabrous to papillose, with the three last marginal veins in one margin scabrous, mainly toward the apex, lanceolate to linear-lanceolate, length:width ratio of 6.1–11, base rounded to attenuate, apex attenuate to caudate, margin scabrous, pale light green, with or without abaxial dark-green stripe on one of the margins; midrib most prominent abaxially, becoming indistinct among the other veins along the basal three-quarters of the blade. **Synflorescences** terminal with bisexual spikelets bearing 2–5 fertile florets; axillary with bisexual spikelets bearing 2–5 fertile florets; basal with small unisexual female

spikelets bearing 1 sterile or fertile floret. **Spikelet** 25.1–30.6 × 1.5–1.6 mm; glume I (lower) 3.1–3.7 × 0.95–1.2 mm, abaxial surface glabrous, 3–nerved, light green with occasional dark-green spots; mucronate or not; awned or not, awn up to 1.1 mm long, glabrous to scabrous; glume II (upper) 5.5–6.1 × 1.3–1.7 mm, abaxial surface scabrous to ciliate apically and adjacent to the upper margins, 5– or 7–nerved, light green with occasional dark-green spots; non-mucronate; awned, awn 0.9–1 mm long, glabrous or scabrous; lemma 8.5–9.4 × 2–2.4 mm, abaxial surface pubescent, especially at the base, light green with occasional dark-green spots; non-mucronate; awned, awn 1.86–2.4 mm, scabrous; palea 6.8–7.5 × 1.1–1.3 mm, abaxial surface glabrous, apically scabrous, stramineous or light green with occasional dark-green spots. **Caryopsis** not observed.

Sampled material: BRAZIL. GOIÁS: Abadiânia, 16º12'18.58"S 48º42'47.95"W, 22.II.2025, *J.V. Vendramini-Gomes et al. 78* (UB); 22.II.2025, *J.V. Vendramini-Gomes et al. 80* (UB); Alexânia, 16º00'42.46"S 48º37'45.37"W, 18.V.2025, *J.V. Vendramini-Gomes & V.P. Moreira 106* (UB).

Comments: *Aulonemia aristulata* is primarily identified by its scandent habit, the absence of differentiated culm leaves, and the presence of only one or two branches per branch complement (Figure 6 d), which gives it a resemblance to members of the tribe Olyreae. However, it is confirmed as belonging to Bambuseae by the presence of outer ligules on its leaves and by the occurrence of bisexual spikelets (Figure 6 a, b)—features not found in Olyreae. Its leaf blades also present the distinctive dark-green marginal band on the abaxial surface, typical of the Arthrostylidiinae subtribe .

The species is endemic to Brazil, distributed across the Cerrado and Atlantic Forest domains. Although its occurrence in the state of Goiás has already been confirmed (Viana *et*

al. 2025), this study provides the first documented record and collection of the species in the municipalities comprising the EMC. All three collected specimens were found in the understory of Gallery Forests.

While woody bamboos are generally known for their synchronous flowering, the specimen collected in the municipality of Alexânia was completely sterile, whereas the two specimens collected in Abadiânia were fertile three months earlier.

Grombone-Guaratini *et al.* (2011) discussed the presence of basal axillary synflorescences with incomplete, functionally female spikelets—which is observed in the flowering specimens from the EMC (Figure 6 g). However, unlike what was reported by Grombone-Guaratini *et al.* (2011), the spikelets from these basal synflorescences were smaller and had only one or no fertile florets, in contrast to the terminal synflorescences. Additionally, many basal spikelets were completely sterile, with an underdeveloped gynoecium.

Earlier fertile collections — from 1965 *(HS Irwin 9524*) and 1992 (*TS Filgueiras 2006*) — were made in Brasília, DF, which is geographically close to the EMC. Based on these collections and those from the present study, it is plausible that *A. aristulata* follows a flowering cycle of approximately 30 years, on average. This corresponds to one of the flowering patterns proposed by Viana (2010), although he concluded that, based on several fertile specimens, the cycle might actually be closer to 15 years. Viana (2010) also discussed the highly variable fimbriae of *A. aristulata*, which range from just a few millimeters to up to five centimeters in length — a characteristic also observed in the EMC specimens.

***Bambusa tuldoides* Munro**, Trans. Linn. Soc. London 26: 93 (1868)

Figure 7. *Bambusa tuldoides* fresh pseudospikelets with hanging stamens (a); dry pseudospikelets (b); branch leaf auricles (c); abaxial surface junction between culm leaf sheath and blade, without outer ligule (d); culm leaf auricle and fimbriae (e); branch leaf

sheath apex with fimbriae and pseudopetiole (f); culm leaf (g); irritating brown hairs on the abaxial surface of the culm leaf sheath in detail (h); bud (i); and wax deposition on the culm surface (j).

Rhizome pachymorph. **Culm** lignified, 800–1000 cm tall; internode 3.7–24 mm in diameter, glabrous, wax deposition present, hollow, yellow, light green or dark green, terete; wall 1.6–2.9 mm thick; node unarmed with thorns, prominent, stramineous to blackened, fringe of trichomes along the nodal line absent, supranodal ridge present or absent; branch complement non-apsidate, with 6–13 branches, with one main branch, nodes stramineous to blackened. **Culm leaf** with sheath 194–262 × 135–223 mm, abaxial surface glabrous with irritating brown hairs, adaxial glabrous, stramineous; auricles present; inner ligule 0.9–3 mm long, membranous, with glabrous to ciliate apex; outer ligule absent; fimbriae 1.8–6.9 mm long, entirely free, not extending to the margins, stramineous; blade sessile, erect, 102.3–253 × 58–109.5 mm, margin ciliate to scabrous, abaxial surface glabrous or pubescent with irritating brown hairs, adaxial surface pubescent to puberulent toward the apex, rarely with irritating brown hairs, deltate to shallowly deltate, triangular to narrowly triangular or lanceolate, stramineous. **Branch leaf** with sheath 24.4–56.6 mm long, overlapping margin ciliate to scabrous, underlapping margin glabrous, abaxial surface glabrous, light green; auricles present; inner ligule 0.5–1.2 mm long, membranous, with ciliolate to ciliate apex; outer ligule 0.6–1.3 mm long, membranous, with ciliolate or glabrous apex; fimbriae 1.2–8.6 mm long, free, stramineous to light green; pseudopetiole 1.5–3.4 mm long, abaxial surface glabrous, adaxial surface glabrous, puberulent or rarely pubescent, yellowish green; blade 53.6–178 × 6.9–15.3 mm, abaxial surface puberulent to pubescent, adaxial glabrous, lanceolate to linear, length:width ratio of 6.8–16.3, base oblique to cuneate or rounded, apex acuminate, margin scabrous, green to light green, without abaxial dark-green stripe on one of the margins;

midrib most prominent abaxially, becoming indistinct from other veins along the basal two-fifths to four-fifths of the blade. **Synflorescences** not observed. **Spikelet** not observed. **Caryopsis** not observed.

Sampled material: BRAZIL. GOIÁS: Santo Antônio do Descoberto, Fazenda Cantão da Lagoinha, 16º07'38.2"S 48º13'12.92"W, fl., 16.V.2025, *J.V. Vendramini-Gomes & V.P. Moreira 97* (UB); Sol Campo e Lazer, 16º05'24.40"S 48º17'09.58"W, 24.VII.2024, *J.V. Vendramini-Gomes & C.O. Castro 50* (UB); Alexânia, Olhos D'Água, 16º01'34.81"S 48º36'02.94"W, 25.VII.2024, *J.V. Vendramini-Gomes & C.O. Castro 58* (UB).

Comments: *Bambusa tuldoides* is one of the most common exotic Bambusoideae species in Brazil and can be primarily distinguished from *B. vulgaris* Schrad. ex J.C.Wendl. (1808:26)—another very common exotic species in the country—by its culm leaf auricles (Figure 7 e, g), which are clearly connected to the blade (vs. loosely connected to, or visibly separated from, the blade in *B. vulgaris*) and its branch leaves, which can be glabrous or pubescent adaxially and pubescent abaxially (vs. abaxially and adaxially glabrous in *B. vulgaris*) (Shi *et al.* 2021a).

The exotic genus *Bambusa* Schreb. (1789:236) is highly similar to the native *Guadua*, as both genera share a non-apsidate branch complement, pseudospikelets with gemmiparous glume-like bracts (Figures 7 a, b; 12b) (McClure 1966; Soderstrom & Londoño 1987; Shi *et al.* 2021a), irritating brown hairs on the culm leaf sheaths abaxial surface (Figures 7 h; 13 e, g), and a waxy deposition on the culm internode surface (Figure 7 j), especially when young. The main differences between the two are the presence of conspicuous auricles on the culm leaves (Figure 7 e, g) (vs. absent or inconspicuous in *Guadua*) and the absence of thorns (vs. their presence in *Guadua*). Members of *Bambusa* subgenus *Bambusa* may also bear thorns,

but only a few species of this subgenus have been introduced in Brazil, and none is known to occur in the state of Goiás (Flora e Funga do Brasil 2025d; CRIA 2025).

The genus can be distinguished from the exotic *Phyllostachys* by its pachymorph rhizome and branch complement with one main branch and several branchlets (vs. leptomorph rhizome and a branch complement with one main branch and 1–2 branchlets in *Phyllostachys*). The latter genus can also be easily separated from *Bambusa* by the presence of longitudinal grooves or flattenings on the internode surface above the nodal buds. Finally, *B. tuldoides* differs primarily from the exotic *Dendrocalamus* cf. *giganteus* by the absence of irritating brown hairs on the internode surface (Figure 7 j) and by its branch leaves bearing auricles and fimbriae (Figure 7 f) (vs. presence of irritating brown hairs on the internode surface and absence of auricles and fimbriae on the branch leaves of *D.* cf. *giganteus*).

Although one of the specimens collected at the EMC was observed flowering (Figure 7 a, b), a close examination of its pseudospikelets revealed no florets; only gemmiparous bracts and buds were present. In the field, however, we observed hanging stamens in some pseudospikelets (Figure 7 a), confirming that the plant was indeed flowering, though these structures may have been lost during transportation or specimen preparation. Another noteworthy morphological feature is the presence of supranodal ridges on younger culms and branches, which are nearly absent on older, larger culms.

Chusquea* aff. *calderoniae

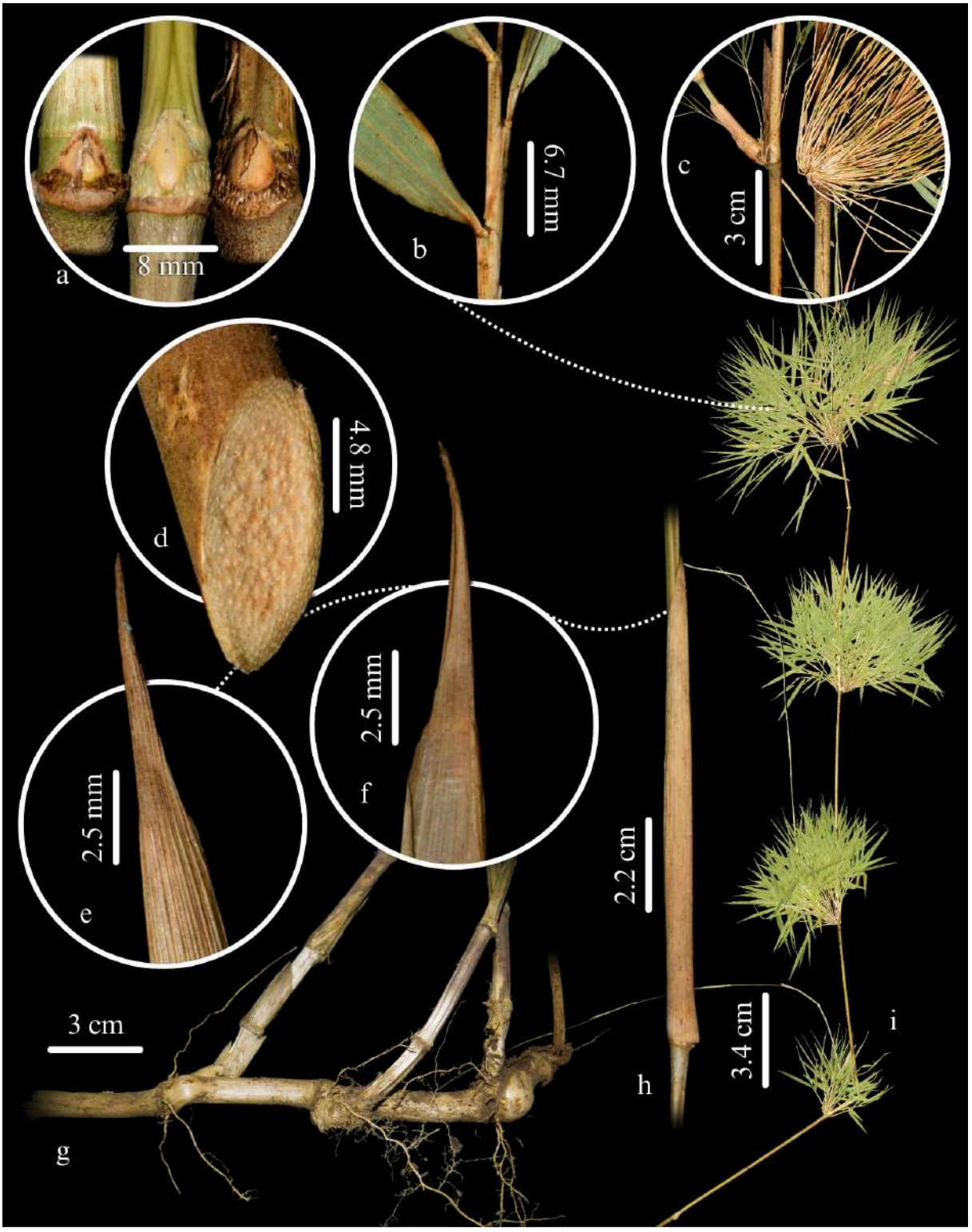

Figure 8. *Chusquea* aff. *calderoniae* bud complements (a); non-fimbriate branch leaves in detail (b); branch complements (c); solid internode (d); culm leaf sheath and blade abaxial

junction in detail (e); culm leaf sheath and blade adaxial junction in detail (f); leptomorph rhizome (g); culm leaf (h); and habit (i).

Rhizome leptomorph. **Culm** lignified, 100–200 cm tall; internode 2.5–7.9 mm in diameter, short-setose, puberulent or sparsely papillose below the nodes, glabrous on the remainder, wax deposition absent, rarely present, solid, green to stramineous, occasionally with vinaceous spots, terete; wall thickness not observed; node unarmed with thorns, prominent, dark green, stramineous or blackened, fringe of trichomes along the nodal line absent or present, supranodal ridge present; branch complement non-apsidate, with 21–40+ branches, with 1–3 main branches, usually dormant (prophyll), nodes green or stramineous. **Culm leaf** with sheath 44.7–90.2 × 7–19 mm, abaxial surface extremely scabrous or glabrous, with small papillae that become scabrous near the margins, adaxial surface glabrous to scabrous, stramineous; auricles absent; inner ligule 0.2–0.36 mm long or absent, membranous, with ciliate apex; outer ligule absent; fimbriae absent; blade sessile, erect, measuring 3.15–12 × 0.75–2.55 mm, margin short-scabrous, abaxial surface scabrous, short-scabrous or short-strigose with setose apex, adaxial surface short-scabrous to strigose, triangular, stramineous. **Branch leaf** with sheath 13.7–39.1 mm long, both margins glabrous, serrulate or glabrous and ciliate apically, abaxial surface glabrous or sparsely floccose, adaxial surface glabrous, green to stramineous; auricles absent; inner ligule 0.43–0.85 mm long, membranous, with ciliolate to ciliate apex; outer ligule 0.1–0.6 mm long, membranous, with ciliolate apex; fimbriae absent; pseudopetiole 0.4–2.6 mm long, abaxial surface glabrous, short-setose and short-strigose or sparsely floccose, adaxial surface glabrous, short-strigose, scabrous and floccose or sparsely floccose, dark green to yellowish green; blade 48–121 × 3.8–9.9 mm, abaxial surface entirely glabrous, glabrous and sparsely short-setose near the base or sparsely setose and short-scabrous, adaxial surface glabrous with sparse papillae,

scabrous, sparsely short-strigose or sparsely floccose at the base, short-scabrous on the remainder, lanceolate to linear, length:width ratio of 11.57–13.02, base attenuate or attenuate-cuneate, apex acuminate, margin setose or scabrous, green, without abaxial dark-green stripe on one of the margins; midrib most prominent abaxially, becoming indistinct among the other veins along the basal three-quarters of the blade or only so at the apex. **Synflorescences** not observed. **Spikelet** not observed. **Caryopsis** not observed.

Sampled material: BRAZIL. GOIÁS: Alexânia, Olhos D'água, Pousada Cachoeira do Ouro, 16º00'09.29"S 48º38'04.46"W, 25.VII.2024, *J.V. Vendramini-Gomes & C.O. Castro 53* (UB); 16º00'05.19"S 48º38'06.98"W, 25.VII.2024, *J.V. Vendramini-Gomes & C.O. Castro 55* (UB), 16º04'22.58"S 48º15'00.46"W, 18.V.2025, *J.V Vendramini-Gomes & V.P. Moreira 105* (UB); Cocalzinho de Goiás, 15º47'07.11"S 48º46'35.28"W, 01.V.2024, *J.V. Vendramini-Gomes et al. 41* (UB)*;* Girassol, 15º44'18.3"S 48º28'09.7"W, 24.XI.2024, *Z.B. Sena 6* (UB); Pirenópolis, 15º47'18.40"S 48º52'17.96"W, 01.V.2024, *J.V. Vendramini-Gomes et al. 43* (UB); 15º47'25.24"S 48º52'56.68"W, 01.V.2024, *J.V. Vendramini-Gomes et al. 45* (UB).

Comments: The genus *Chusquea* had not yet been recorded as occurring in the state of Goiás, although it is present in other states within the Cerrado phytogeographic domain. The few species known to inhabit this domain are *C. nutans* L.G. Clark (1992: 398), *C. pinifolia* (Nees) Nees (1835: 490), and *C. tenuiglumis* Döll (1880: 190).

Chusquea aff. *calderoniae* can be identified primarily by its solid internodes (Figure 8 d), the absence of fimbriae on its branch leaves (Figure b), culm leaf blades that are nearly indistinguishable from the sheath (Figure 8 e, f), and non-apsidate branch complements with numerous branches (Figure 8 c).

Most specimens collected were probably young, because of the maximum height (200 cm) and maximum diameter (7.9 mm) of the culms, compared to (100–)200–1000(–1500) cm in stature and (1–)2–20 mm in diameter described for the genus by Clark (1997).

Despite being geographically close to the new occurrence of *C.* cf. *attenuata* in DF (Mutinelli *et al.* unpublished data), the specimens found in EMC lack infravaginal branching, a characteristic of *C. attenuata*. Additionally, they may exhibit a row of trichomes below the nodes, a feature not observed in the aforementioned species (Clark *et al.* 2025). Vidal et al. (2023) observed that numerous herbarium specimens closely resembling *C. attenuata*, as well as others annotated as *C.* aff. *attenuata*, actually represent distinct and yet undescribed species.

Using the taxonomic key for the genus available in Flora e Funga do Brasil (Clark *et al.* 2025), the specimens found in the EMC can be identified as *C. gouveiensis* K. Vidal & L. G. Clark (2018: 78) or *C. gracilis* McClure & L. B. Sm. (1967:43), mainly due to their extravaginal branching and culm leaf blades that are undifferentiated from the sheath. However, the species could not be determined with certainty, as the specimens present characteristics intermediate between *C. gouveiensis* and *C. gracilis*, such as a branch leaf blade length:width ratio of 11.57–13.02 (consistent with 7.7–12(–13) in *C. gouveiensis*) and the presence of puberulence just below the nodes, similar to—but not quite corresponding to—the pilose band 0.5–1(–3) cm long just below the nodes in *C. gracilis*.

Vidal et al. (2018) discussed that, although *C. gouveiensis* and *C. gracilis* are morphologically very similar, the former belongs phylogenetically to the *C. meyeriana* Rupr. ex Döll (1880:203) informal group, while the phylogenetic placement of *C. gracilis* remains uncertain. Among other distinctions, species of the *C. meyeriana* group consistently exhibit a conspicuous wax band just below the nodes (Andrade *et al.* 2019)—a feature absent in the

Chusquea from the EMC, except for one individual (Sena, ZB 6), which showed the entire internode covered in wax, differing markedly from the typical nodal wax band.

Upon detailed examination of the EMC material, Vidal (2025, pers. comm.) confirmed its morphological affinity with *C. gouveiensis*, a member of the *C. meyeriana* group (which also includes *C. attenuata*), but noted a closer resemblance to the recently described *C. calderoniae* K.V.A. Vidal & L.G. Clark (2023:257)—also part of the *C. meyeriana* group and endemic to the Espinhaço Range in Bahia and Minas Gerais.

Compared with *C. calderoniae*, the EMC specimens exhibit markedly smaller culm diameters (0.25–0.79 cm vs. (0.65–)0.9–1.2 cm) and lack the distinctive white wax band below the nodes characteristic of the group. Their culm internodes are generally glabrous to variably papillose or setose beneath the nodes. The culm leaf inner ligule is usually absent or, when present, short (0.2–0.36 mm vs. 0.2–0.5(–1) mm in *C. calderoniae*, with no record of its absence in that species). Likewise, the branch leaf outer ligule is slightly shorter in the EMC specimens (0.1–0.6 mm vs. 0.2–0.8 mm), and their branch leaf blades have scabrous apices (vs. long-setose in *C. calderoniae*). Despite these distinctions, both *C. calderoniae* and the EMC specimens share attenuate leaf bases, slightly excentric midribs, and scabrous margins, supporting their morphological affinity within the same complex.

Overall, these morphological differences and similarities suggest that further investigation is needed to assess whether the specimens identified as *C. cf. attenuata* from DF (Mutinelli *et al.*, unpublished data)—which were not compared with those from the EMC—belong to the same taxon as the EMC specimens and whether they represent new distributional records of *C. calderoniae* far beyond its currently known endemic range, or alternatively, an undescribed taxon closely related to it.

***Dendrocalamus* cf. *giganteus* Munro**, Trans. Linn. Soc. London 26: 150 (1868).

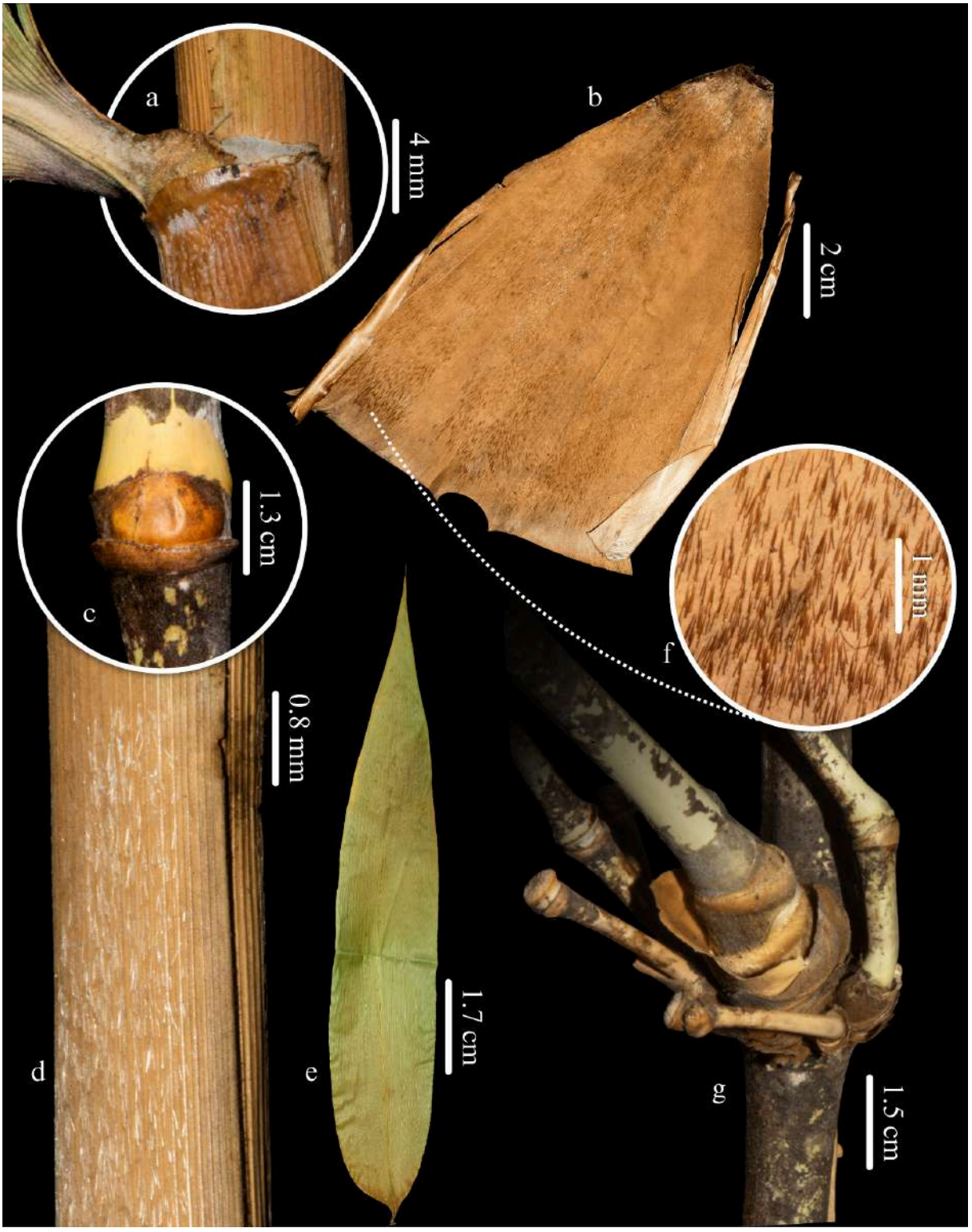

Figure 9. *Dendrocalamus* cf. *giganteus* branch leaf outer ligule in detail (a); culm leaf sheath (b); bud (c); branch leaf sheath abaxial surface with irritating white hairs (d); branch leaf

blade (e); culm leaf sheath abaxial surface with irritating brown hairs in detail (f); and branch complement (g).

Rhizome pachymorph. **Culm** lignified, 180–300 cm tall; internode 3.5–17 mm in diameter, pubescent between the nodal line and the supranodal ridge and above the supranodal ridge, pubescent with irritating brown hairs below the nodal line, papillose on the remainder or wholly glabrous, wax deposition present, hollow, whitish and golden brown below the nodes, green on the remainder, terete; wall 2.5–6.2 mm thick; node unarmed with thorns, prominent, stramineous to blackened, fringe of trichomes along the nodal line absent, supranodal ridge present; branch complement non-apsidate with 1–15 branches, with 1 main branch, nodes stramineous to blackened. **Culm leaf** with sheath 151.6–161 × 126.5–139.1 mm, abaxial surface puberulent with irritating brown hairs, adaxial surface glabrous, stramineous; auricles absent; inner ligule 3.1–3.8 mm long, membranous, apex not observed; outer ligule 0.7–1.9 mm long, membranous, with ciliolate apex; fimbriae 1–1.6 mm long, fused at the base, not extending to the margins, stramineous; blade not observed. **Branch leaf** with sheath 79.5–206 mm long, overlapping margin ciliate, underlapping margin glabrous or both glabrous, abaxial surface glabrous with irritating white hairs, light stramineous to dark stramineous; auricles absent; inner ligule 0.5–3.2 mm long, membranous, with ciliolate to ciliate apex; outer ligule 1–1.9 mm long, membranous, with glabrous to ciliolate apex; fimbriae absent; pseudopetiole 5.8–9.7 mm long, abaxial surface glabrous or puberulent to pubescent, adaxial surface glabrous or puberulent and scabrous, brown or yellowish green to blackened; blade 160–486 × 14.9–79.5 mm, abaxial surface glabrous to papillose or pubescent and scaberulous, adaxial surface glabrous or scabrous over 2–3 veins to the right of the midrib, glabrous on the remainder, lanceolate to linear-lanceolate, length:width ratio of 5.6–10.7, base rounded-attenuate or oblique-attenuate, apex acuminate, margin scabrous to strigose, light

green to brownish green, without abaxial dark-green stripe on one of the margins; midrib most prominent abaxially, becoming indistinct among the other veins along the basal three to four-fifths of the blade. **Synflorescences** not observed. **Spikelet** not observed. **Caryopsis** not observed.

Sampled material: BRAZIL. GOIÁS: Alexânia, Olhos D'Água, 16º01'37.67"S 48º36'05.57"W, *J.V. Vendramini-Gomes & C.O. Castro 57* (UB); Pirenópolis, Rio das Almas, 15º50'48.52"S 48º57'15.36"W, *J.V. Vendramini-Gomes et al. 33* (UB).

Comments: One specimen was collected from a resprouting plant and the other was a solitary culm, young and growing under harsh sunlight, so the features observed above may not fully represent the typical characteristics of the species. Another important observation is that the culm leaves collected were old and brittle, resulting in incomplete inner ligule apices, as well as the loss of most fimbriae. Only the smaller fimbriae remained fully attached to the sheath, while the larger ones were preserved only at their fused bases, indicating that their original length was likely greater than described above.

Dendrocalamus asper and *D. giganteus* are the most common *Dendrocalamus* Nees (1835:476) species in Brazil, and both occur in the state of Goiás (Flora e Funga do Brasil 2025e). Although the descriptions of both species in Shi *et al.* (2021b) mention the presence of auricle-bearing culm leaf sheaths, none were observed in the collected specimen. However, as noted above, the culm leaves were old and brittle, so the delicate auricles may have been destroyed or lost. Despite the absence of some taxonomically important structures, the specimen is more consistent with *D. giganteus*, mainly due to: (I) the absence of auricles and fimbriae in its branch leaves (Figure 9 a) (vs. their presence in *D. asper*), and (II) the length of branch leaf blades (Figure 9 e), reaching 48 cm in the specimen, which corresponds to *D.*

giganteus (vs. (10–)20–30(–35) cm in *D. asper*). On the other hand, some features of one of the specimens are more consistent with *D. asper*, such as the presence of irritating brown hairs (procumbent light-brown setae in Shi *et al.* 2021b) on the internode surface, especially below the nodal line and between it and the supranodal ridge, and the presence of irritating white hairs (procumbent setae) on the branch leaf sheath (Figure 9 d)—both of which are not reported for *D. giganteus* by Shi *et al.* (2021b).

***Eremocaulon capitatum* (Trin.) Londoño**, Syst. Bot. 27: 714 (2002).

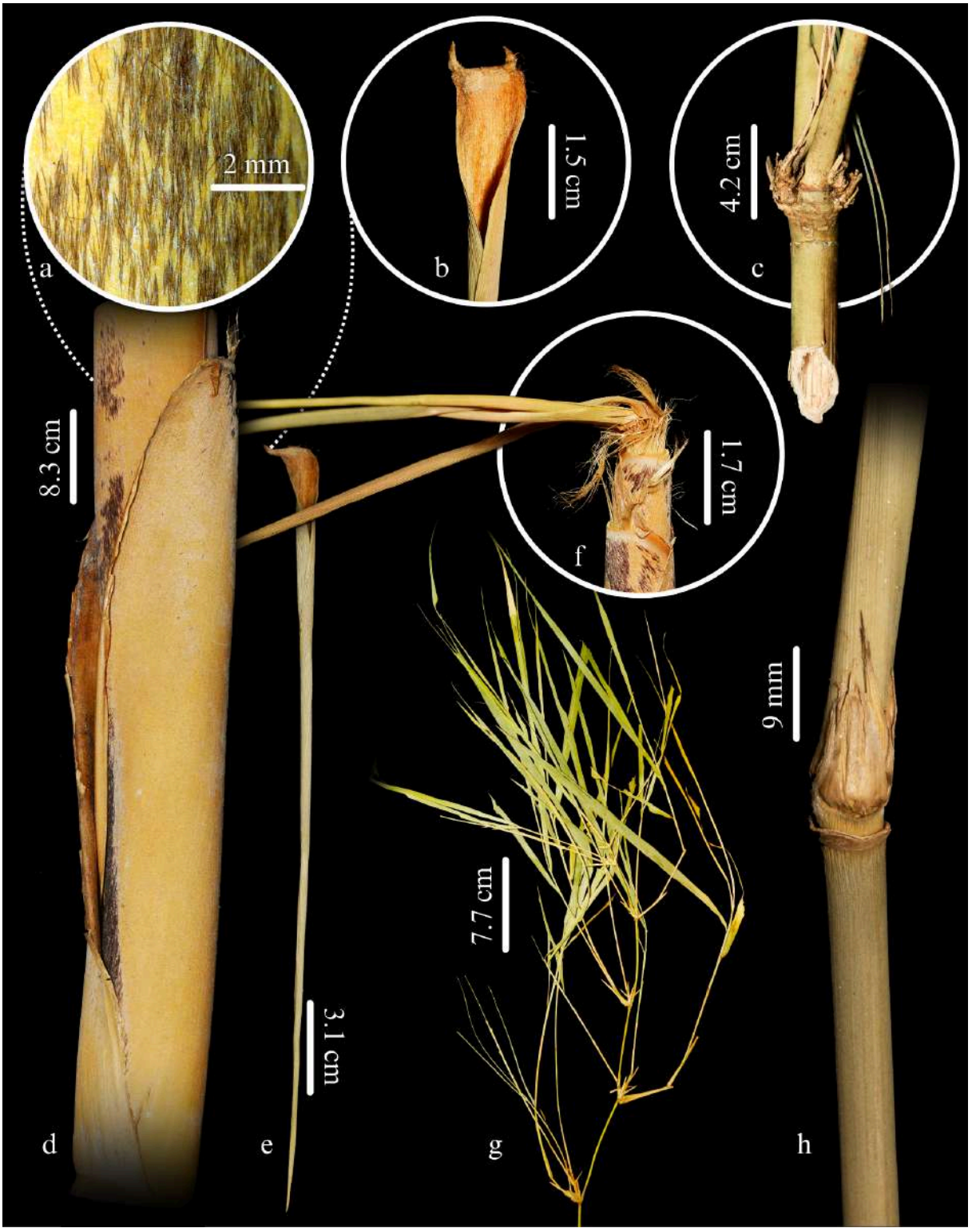

Figure 10. *Eremocaulon capitatum* culm leaf sheath abaxial surface with irritating brown hairs in detail (a); culm leaf blade base in detail (b); branch complement and hollow internode

in detail (c); culm leaf sheath (d); culm leaf blade (e); culm leaf sheath apex with fimbriate auricles in detail (f); branch with branch leaves (g); and bud (h).

Rhizome pachymorph. **Culm** lignified, 600–1000 cm tall; internode 16.23–26.2 mm in diameter, glabrous, sparsely pubescent close to the apex or wholly finely pubescent, wax deposition not observed, hollow or pithy, green to light green, terete; wall 2.7–7.6 mm thick; node unarmed with thorns, prominent, stramineous, green or yellow, fringe of trichomes along the nodal line absent, supranodal ridge present; branch complement non-apsidate, with 10+ branches, with 1 main branch, nodes stramineous, green or yellow. **Culm leaf** with sheath 235 × 176 mm, abaxial surface pubescent, with irritating brown hairs, adaxial surface glabrous, stramineous; auricles present; inner ligule 0.55 mm long, membranous, with ciliate apex; outer ligule absent; fimbriae 20.7 mm long, entirely free, not extending to the margins, whitish stramineous; blade sessile, reflexed, measuring 250 × 11.5 mm, margin ciliate at the base, scabrous on the remainder, abaxial surface glabrous, adaxial surface densely pubescent, linear-triangular, greenish stramineous. **Branch leaf** with sheath 75.8–95.3 mm long, both margins glabrous, ciliate at the apex, abaxial surface glabrous or sparsely pubescent with clear trichomes, adaxial surface glabrous, light green to stramineous; auricles present or absent; inner ligule 0.4 mm long, membranous, with ciliolate to ciliate apex; outer ligule 0.25–0.4 mm long, membranous, with ciliolate to ciliate apex; fimbriae 4–10.4 mm long, free or fused at the base, white; pseudopetiole 2.1–3 mm long, abaxial surface glabrous, adaxial surface pubescent, light green; blade 255–340 × 3.85–8.7 mm, abaxial surface glabrous or scabrous only over the veins, adaxial surface glabrous with occasional hispid trichomes or scabrous only over the veins, linear, length:width ratio of 29.3–88.3, base attenuate, apex acuminate, margin ciliate to scabrous, green, without abaxial dark-green stripe on one of the margins; midrib most prominent abaxially, remaining largely distinct from the other veins

along the blade. **Synflorescences** not observed. **Spikelet** not observed. **Caryopsis** not observed.

Sampled material: BRAZIL. GOIÁS: Abadiânia, 16º08'50.45"S 48º43'32.59"W, 11.II.2025, *J.V. Vendramini-Gomes et al. 75* (UB); 16º07'16.06"S 48º48'40.83"W, 22.II.2025, *J.V. Vendramini-Gomes et al. 81* (UB).

Comments: *Eremocaulon capitatum* can be primarily identified by its tall stature and by its culm leaves, which bear large, conspicuously fimbriate auricles (Figure 10 f); irritating brown hairs on the abaxial surface (Figure 10 a); and long, reflexed blades that are as long as or longer than the sheath (Figure 10 b, f, e). Additionally, its branch leaves are thin, flexible, and densely arranged, giving the plant a flowing appearance as they are swayed by the wind.

The presence of irritating brown hairs can also be observed in species of the genus *Guadua*, as well as in the exotic genera *Bambusa* and *Dendrocalamus*. However, *E. capitatum* is mainly distinguished by its long (250 × 11.5 mm), reflexed culm leaf blade—and by the absence of thorns, unlike *Guadua*—in contrast to *Bambusa* and *Dendrocalamus*, where the blade is erect (or erect to reflexed in *Dendrocalamus*) and shorter than half the length of the sheath. Another important feature that differentiates *E. capitatum* from these genera is the shape of the culm leaf sheath apex (Figure 10 d), which is broader and not confluent with the base of the blade—unlike what is observed in the other genera. The species is highly similar to the *Guadua* sp. specimen found in the municipality of Pirenópolis (see comments under that species).

Eremocaulon capitatum is here recorded and collected for the first time in the municipalities comprising the EMC, although its presence had already been confirmed in the state of Goiás. The species is endemic to Brazil and occurs mainly in the Cerrado and

Pantanal domains, where it is typically found in Riverine and Gallery Forests (Lopes-Neto *et al.* 2025); in the present study, however, it was only observed in Riverine Forests along wide rivers, under conditions of abundant sunlight.

***Guadua paniculata* Munro**, Trans. Linn. Soc. London 26: 85 (1868).

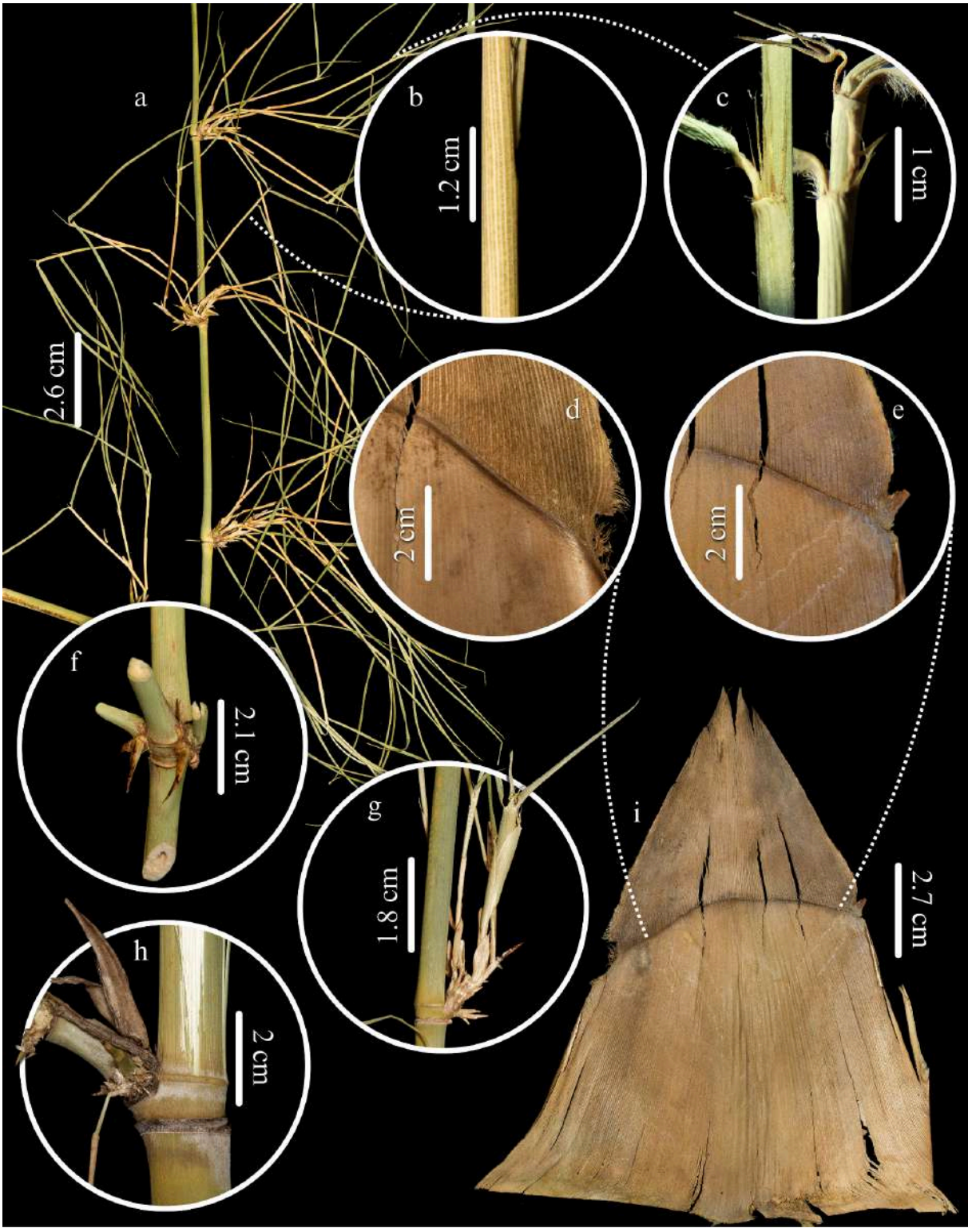

Figure 11. *Guadua paniculata* branch and branch leaves (a); branch leaf sheath in detail (b); branch leaf fimbriae in detail (c); culm leaf inner ligule in detail (d); culm leaf outer ligule in

detail (e); node armed with thorns and branch complement (f); teratology (g); nodal and internodal surface (h); and culm leaf abaxial surface (i).

Rhizome pachymorph. **Culm** lignified, 250–600 cm tall; internode 6.4–17.7 mm in diameter, glabrous to pubescent under the nodal line, pubescent between the nodal line and the supranodal ridge, pubescent to glabrous above the supranodal ridge, glabrous on the remainder, wax deposition not observed, hollow, green, white green or yellowish green, terete; wall 1.3–3.6 mm thick; node armed with thorns, prominent, stramineous to blackened, fringe of trichomes along the nodal line absent, supranodal ridge present; branch complement non-apsidate, with 1–4 branches, with 1 main branch, nodes stramineous to blackened. **Culm leaf** with sheath 92.2–96.5 × 131.2–161.7 mm, abaxial surface glabrous to tomentose and pubescent, adaxial surface glabrous, stramineous; auricles present; inner ligule 1.2–1.8 mm long, membranous, with ciliate apex; outer ligule 0.1 mm long, membranous, with ciliate apex; fimbriae ca. 1.9 mm long, entirely free, not extending to the margins, stramineous; blade sessile, erect, measuring 60.1–65.5 × 75.6–75.7 mm, margin ciliate, abaxial surface puberulent, adaxial surface puberulent and pubescent, denser at the base, triangular to deltate, stramineous. **Branch leaf** with sheath 19.7–71.1 mm long, overlapping margin ciliate, underlapping margin ciliolate or both ciliate, abaxial surface glabrous or with occasional 10 or less long trichomes close to the apex, light green, stramineous or yellowish green; auricles absent, rarely present; inner ligule 0.1–0.5 mm long, membranous, with glabrous to ciliolate apex; outer ligule 0.1–0.75 mm long, membranous, with ciliolate to ciliate apex; fimbriae 0.6–5.8 mm long, fused at the base or free, stramineous; pseudopetiole 1.7–4.2 mm long, abaxial surface densely pubescent, adaxial surface sparsely pubescent and scabrous, yellowish stramineous to pale light green; blade 41–194 × (3.4–) 6.3–21.2 mm, abaxial surface pubescent at the base, puberulent to scabrous on the remainder, adaxial surface

pubescent toward the apex, sparsely puberulent or papillose with occasional sparse long trichomes on the remainder, lanceolate to linear, length:width ratio of 6.9–20.3, base attenuate-oblique to almost truncate, apex acuminate, margin scabrous, green to light green, without abaxial dark-green stripe on one of the margins; midrib most prominent abaxially, remaining largely distinct from the other veins along the blade. **Synflorescences** not observed. **Spikelet** not observed. **Caryopsis** not observed.

Sampled material: BRAZIL. GOIÁS: Alexânia, Olhos D'água, Pousada Cachoeira do Ouro, 16º00'05.19"S 48º38'06.98"W, 25.VII.2024, *J.V. Vendramini-Gomes & C.O. Castro 56* (UB); Corumbá de Goiás, "Prainha", Rio Corumbá, 15º55'36"S 48º40'22"W, 14.XII.2023, *R.C. Oliveira et al. 3935* (UB); 15º54'04.03"S 48º33'12"W, 14.XII.2023, *R.C. Oliveira et al. 3936* (UB).

Comments: The genus *Guadua* can be primarily identified by the presence of thorns at the nodes (Figures 11 a, f, h; 11 c, e; 12 b, c). The only other genus of the Guaduinae subtribe found in the EMC is *Eremocaulon*. In addition to the presence of thorns, *Guadua* can be differentiated from *Eremocaulon* by its erect culm leaf blades, whose base is as wide as the sheath apex (Figures 11 i; 12 h). In contrast, *Eremocaulon* has reflexed blades with a much narrower base than the sheath apex.

Within the EMC, *G. paniculata* can be distinguished from other *Guadua* species by its predominantly glabrous branch leaf sheaths (Figure 11 b), contrasting with the pubescent sheaths of *G. refracta* and *Guadua* sp. (Figure 12 d).

Like *Eremocaulon capitatum* and the other *Guadua* species, specimens of *G. paniculata* bear irritating brown hairs on the abaxial surface of the culm leaves, especially in young individuals.

Londoño & Judziewicz (1991) reported that *G. paniculata* lacks an outer ligule on its culm leaves. However, in the specimens studied, the culm leaves clearly exhibit short but distinct outer ligules (Figure 11 e), although this observation is based on only two specimens bearing culm leaves.

Despite only sterile specimens having been collected in the EMC, some showed teratologies resembling pseudospikelets (Figure 11 g); however, these structures bear branch leaves, which have auricles, instead of gemmiparous bracts. Auricles are a rare feature among the true branch leaves of the collected specimens (Figure 11 c), and the specimen presenting the teratology actually did not show auricles on its regular branch leaves, only on the teratological structure.

The species is widely distributed, ranging from Mexico to Argentina, and is found across most Brazilian states, occurring in both humid and seasonally dry habitats (POWO 2025; Flora e Funga do Brasil 2025c). Most of the specimens in the EMC were found in open Riverine Forests along rivers, where sunlight is abundant.

***Guadua refracta* Munro**, Trans. Linn. Soc. London 26: 84 (1868).

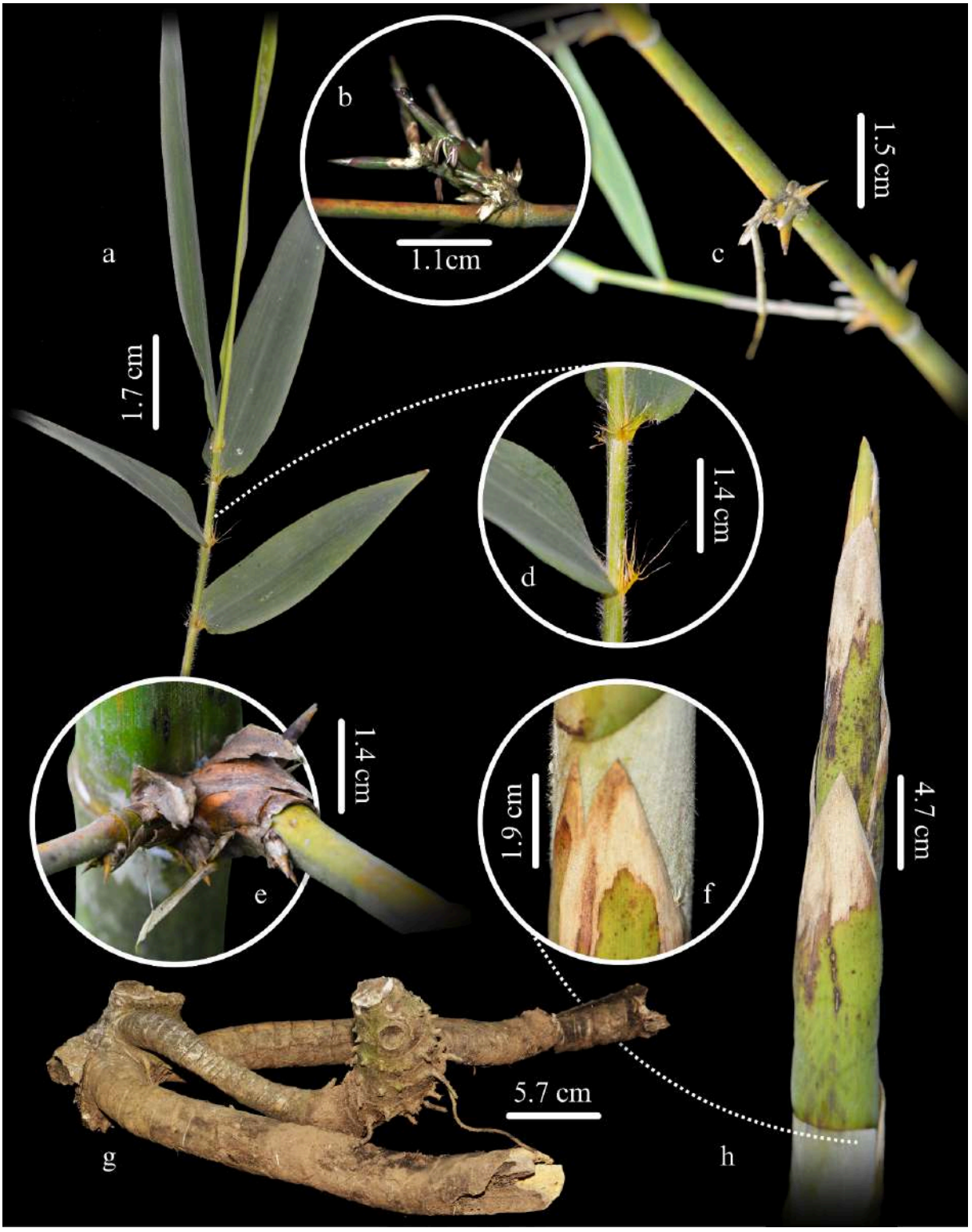

Figure 12. *Guadua refracta* branch leaves (a); pseudospikelets (b); branch node armed with thorns (c); branch leaf auricles and fimbriae in detail (d); branch complement (e); shoot culm leaves abaxial surface in detail (f); rhizome (g); and shoot (h).

Rhizome pachymorph. **Culm** lignified, 300–500 cm tall; internode 3–25.4 mm in diameter, puberulent to pubescent below the nodal line and between the nodal line and the supranodal ridge, glabrous to occasionally puberulent on the remainder, wax deposition present, hollow or rarely solid, green to yellow, terete; wall 1–3.2 mm thick; node armed with thorns, prominent, stramineous to blackened, fringe of trichomes along the nodal line absent, supranodal ridge present; branch complement non-apsidate, with 1–20+ branches, with 1 main branch, nodes stramineous to blackened. **Culm leaf** with sheath 65.7–156 × 42–113.7 mm, abaxial surface puberulent to pubescent, rarely glabrous, adaxial surface glabrous, green to stramineous; auricles present; inner ligule 0.4–0.9 mm long, membranous, with ciliolate to ciliate apex; outer ligule 0.1–0.4 mm long, membranous, with ciliolate to ciliate apex; fimbriae 2.1–8.6 mm long, entirely free or fused at the base, not extending to the margins, stramineous; blade sessile, erect, measuring 54.4–190 × 34.9–115.3 mm, margin ciliate, abaxial surface glabrous to puberulent, adaxial surface pubescent or rarely densely pubescent, triangular to deltate, stramineous. **Branch leaf** with sheath 21–68.6 mm long, overlapping margin ciliate, underlapping margin glabrous to ciliate, abaxial surface puberulent to pubescent or rarely glabrous with puberulent line, light green to stramineous; auricles present or absent; inner ligule 0.2–0.6 (–1.6) mm long, membranous, with ciliolate apex; outer ligule 0.2–0.8 (–1.1) mm long, membranous, with glabrous to ciliate apex; fimbriae 1.8–9 (–13) mm long, free or fused at the base, light green, stramineous, yellow or vinaceous; pseudopetiole 1.6–3.9 (–7) mm long, abaxial surface densely pubescent, adaxial surface puberulent to pubescent, rarely glabrescent or scabrous, yellow to light green; blade 38.8–221 × 3.9–22.5 mm, abaxial surface puberulent to pubescent, occasionally scabrous, adaxial surface puberulent to pubescent, rarely glabrous, linear to lanceolate, rarely linear-triangular, length:width ratio of 6–19.1, base attenuate to truncate, rarely oblique, apex acuminate, margin scabrous, green to pale light green, rarely bluish green, without abaxial dark-green

stripe on one of the margins; midrib most prominent abaxially, becoming indistinct among the other veins along the basal three-quarters of the blade or remaining largely distinct from the other veins along the blade. **Synflorescences** terminal with bisexual spikelets, bearing 3–5 fertile florets; axillary with bisexual spikelets, bearing 3–5 fertile florets; basal not observed. **Spikelet** 7.3–13.1 × 1.1–1.6 mm; glume I (lower) not observed; glume II (upper) not observed; lemma 4.3 × 2.3 mm, abaxial surface sparsely puberulent, green to stramineous; mucronate; awnless; palea 3.6 × 2.3 mm, abaxial surface densely pubescent toward the apex, densely puberulent on the remainder, pale light green. **Caryopsis** not observed.

Sampled material: BRAZIL. GOIÁS: Abadiânia, 16º07'01.62"S 48º45'49.15"W, 11.II.2025, *J.V. Vendramini-Gomes et al. 76* (UB)*;* Alexânia, Olhos D'Água, Pousada Cachoeira do Ouro, 16º00'09.29"S 48º38'04.46"W, 25.VII.2024, *J.V. Vendramini-Gomes & C.O. Castro 54* (UB); 16º06'45.85"S 48º32'46.51"W, 01.II.2025, fl, *J.V. Vendramini-Gomes & C.O. Castro 64* (UB); 16º01'0.5"S 48º34'17.5"W, 14.XII.2023, *R.C. Oliveira et al. 3943* (UB); Santo Antônio do Descoberto, 15º57'26.86"S 48º20'57.56"W, 18.II.2024, *J.V. Vendramini-Gomes & C.O. Castro 1* (UB); 15º57'26.86"S 48º20'57.56"W, 18.II.2024, *J.V. Vendramini-Gomes & C.O. Castro 3* (UB); 15º57'26.86"S 48º20'57.56"W, 18.II.2024, *J.V. Vendramini-Gomes & C.O. Castro 6* (UB); 16º04'02.32"S 48º15'09.32"W, 17.V.2025, *J.V. Vendramini-Gomes & V.P. Moreira 101* (UB).

Comments: Although *Guadua* sp. also bears pubescent branch leaf sheaths (see comments under *G. paniculata*), it exhibits several distinctive features that clearly separate it from *G. refracta*, such as its long, very narrow (178–181 × 28–29 mm vs. 54.4–190 × 34.9–115.3 mm in *G. refracta*), reflexed culm leaf blade (Figure 13 e); its very long and narrow branch leaf blade (98–352.4 × 4.6–10.6 mm vs. 38.8–221 × 3.9–22.5 mm); and its stature and

habit—reaching approximately 10 m tall and being predominantly erect, whereas *G. refracta* reaches about 6 meters and is erect or slightly scandent.

Using the taxonomic key provided in Flora e Funga do Brasil (2025c), the specimens could also be identified as *G. virgata*, a species highly similar to *G. refracta*, whose circumscription remains unclear. According to Afonso (2025, pers. comm.), *G. virgata* is currently known from only two populations in the state of Minas Gerais. Although Flora e Funga do Brasil (2025c) reports its occurrence in the state of Goiás, there are no known herbarium specimens collected from that state. Afonso (2025, pers. comm.) also stated that both species are part of the *G. paniculata* complex and that, depending on the results of forthcoming studies, they may eventually be synonymized under *G. paniculata*.

The flowering specimen presented spikelets with a morphology unique among all native Bambusoideae examined (Figure 12 b). Judziewicz *et al.* (1999) refer to these structures as pseudospikelets, due to a combination of features such as the presence of basal prophylls and several gemmiparous bracts within each pseudospikelet. These bracts bear axillary buds, resulting in repeated branching that gives the entire synflorescence the appearance of dense aggregate clusters of spikelets. The fertile *G. refracta* specimen presents 5–7 gemmiparous bracts.

***Guadua* sp.**

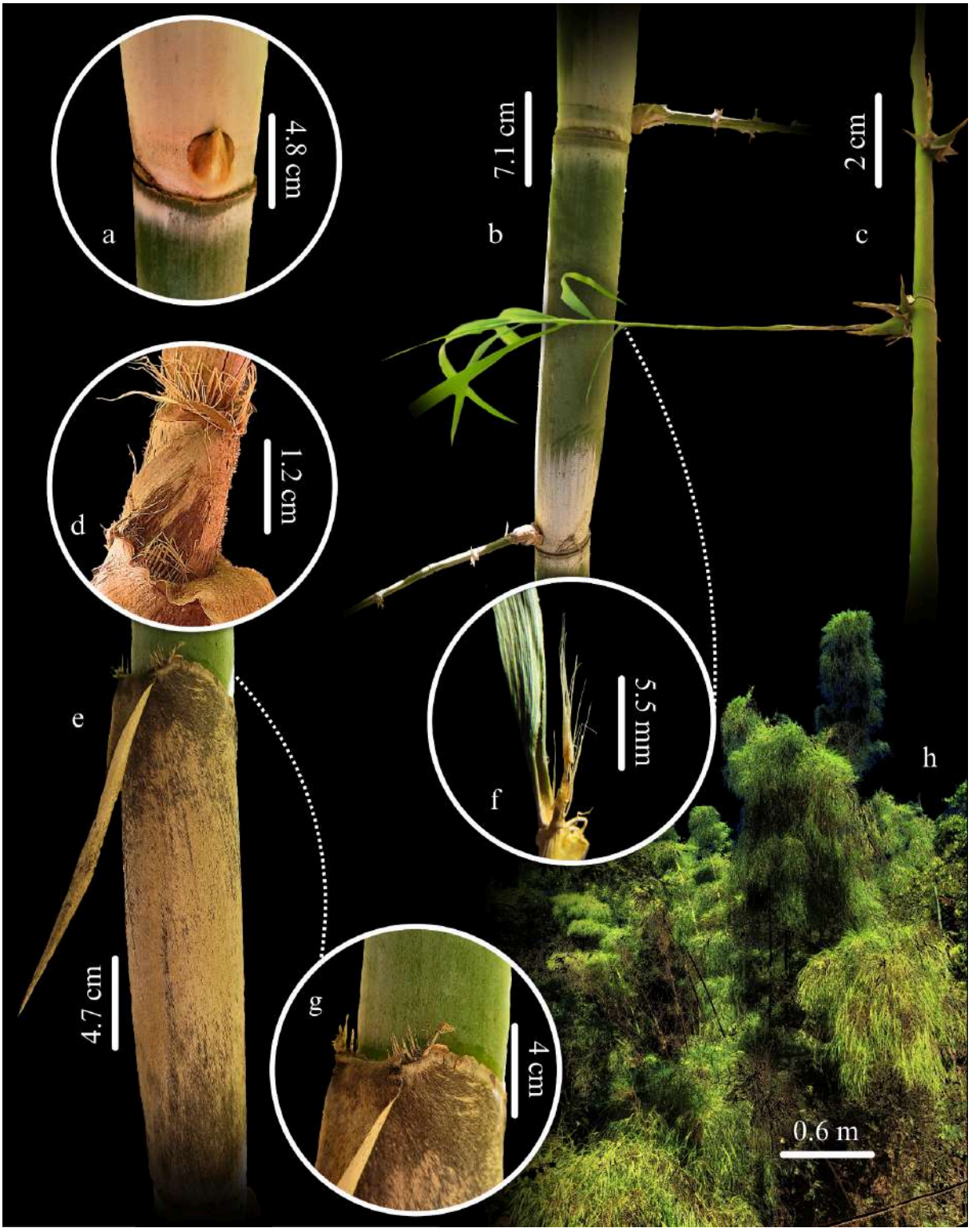

Figure 13. *Guadua* sp. bud complement in detail (a); culm and branching (b); branch with leaves and nodes armed with thorns (c); shoot culm leaf auricle and fimbriae in detail (d);

culm leaf (e); culm leaf sheath apex in detail (f); branch leaf auricle and fimbriae in detail (g); habit (h).

Rhizome pachymorph. **Culm** lignified, ca. 400 cm tall; internode ca. 11 mm in diameter, glabrous to puberulent between the nodal line and the supranodal ridge, glabrous with occasional patches of long, thin appressed trichomes on the remainder, wax deposition present, hollow, green, terete; wall 1.8–2 mm thick; node armed with thorns, prominent, stramineous, fringe of trichomes along the nodal line absent, supranodal ridge present; branch complement non-apsidate, with 2–7 branches, with 1 main branch, nodes stramineous. **Culm leaf** with sheath 287–306.2 × 290–320 mm, abaxial surface puberulent and pubescent with irritating brown-vinaceous hairs, adaxial surface glabrous with sparse short, straight, white trichomes, stramineous; auricles present; inner ligule ca. 2.2 mm long, membranous, with ciliolate apex; outer ligule 0.4 mm long, membranous, with glabrous apex; fimbriae 4.6–13.2 mm long, entirely free or fused at the base, not extending to the margins, stramineous; blade sessile, reflexed, measuring 178–181 × 28–29 mm, margin ciliate, abaxial surface puberulent, adaxial surface densely pubescent, linear-triangular, stramineous. **Branch leaf** with sheath 57.3–113.6 mm long, both margins glabrous, abaxial surface pubescent along the midrib sides and occasionally below the auricles, glabrous on the remainder, light green; auricles present; inner ligule 0.7–1.7 mm long, membranous, with ciliolate apex; outer ligule 1–1.4 mm long, membranous, with ciliolate apex; fimbriae 4–10.9 mm long, free or fused at the base, whitish yellow to white; pseudopetiole 2–4.3 mm long, abaxial surface glabrous with occasional puberulent patches in the marginal bases, adaxial surface adaxial surface pubescent and scabrous or puberulent and scabrous, yellowish green; blade 98–352.4 × 4.6–10.6 mm, abaxial surface scabrous at the apex, glabrous on the remainder, adaxial surface occasionally sparsely puberulent at the base, glabrous on the remainder with sparse long, with curved clear

trichomes close to the apex, linear, length:width ratio of 21.3–33.2, base attenuate, apex acuminate, margin scabrous, green, without abaxial dark-green stripe on one of the margins; midrib most prominent abaxially, becoming indistinct among the other veins along the basal three-quarters of the blade. **Synflorescences** not observed. **Spikelet** not observed. **Caryopsis** not observed.

Sampled material: BRAZIL. GOIÁS: Pirenópolis, 15º55'32.42"S 49º02'45.56"W, 18.V.2025, *J.V. Vendramini-Gomes & V.P. Moreira 111* (UB).

Comments: The collected specimen exhibits a unique combination of traits that clearly distinguishes it from any known *Guadua* species. It shares certain characteristics with *G. paniculata* and *G. refracta*, particularly the thorns at the nodes (Figure 13 b, c) and branch leaf fimbriae that may be free or fused at the base (Figure 13 f). However, in *Guadua* sp. these fimbriae are simply stramineous, while in those species they are typically paler and differ slightly in texture. Other distinctive feature is the larger culm leaf, which further separates *Guadua* sp. from its congeners.

Despite some similarities to other *Guadua* from the EMC, this taxon bears a closer resemblance to *Eremocaulon capitatum*, mainly due to its culm leaf long, thin and reflexed blade; conspicuous culm leaf fimbriate auricles (Figure 13 d); and its long, thin, flexible and densely arranged branch leaf blades (Figure 13 h). It differs from that species primarily by the presence of thorns at the nodes and by the fimbriae structure—free or fused at the base in *Guadua* sp., whereas consistently free in *E. capitatum*. The fimbriae coloration also contrasts, being whitish stramineous in *E. capitatum* and simply stramineous in *Guadua* sp., although this feature may be somewhat influenced by herborization factors such as drying time and temperature, considering the limited material available for both taxa. Additional differences

include the irritating hairs on the abaxial surface of the culm leaves, brown in *E. capitatum* and brown-vinaceous in *Guadua* sp., as well as the leaf blade vestiture, glabrous in the former but puberulent in the latter.

Although its relationship to *Eremocaulon* and *Guadua* remains uncertain, the specimen is here considered part of the genus *Guadua* due to the presence of thorns at the nodes—a feature not described for any species of *Eremocaulon*. Its unique morphological characteristics further distinguish it from other described *Guadua* species, and it may therefore represent a new, undescribed taxon.

The combination of this specimen's morphological features and its collection in an open Riverine Forest—a type of habitat where *Guadua paniculata*, *G. refracta* and *E. capitatum* have also been recorded in the EMC—highlights the complex relationship between *Eremocaulon* and *Guadua*, as reflected in the historical circumscription of these genera. *Eremocaulon* was initially monotypic, while *E. capitatum* was originally placed within *Guadua* as *G. capitata* (Trin.) Munro (1868:81, 123), despite presenting a distinct set of traits—notably the absence of thorns and a reflexed culm leaf blade—that justify its reclassification (Londoño & Clark 2002). Further investigations, such as a phylogenetic analysis would help clarify their true relationships.

***Merostachys* cf. *filgueirasii* Send.**, Novon 5: 80 (1995).

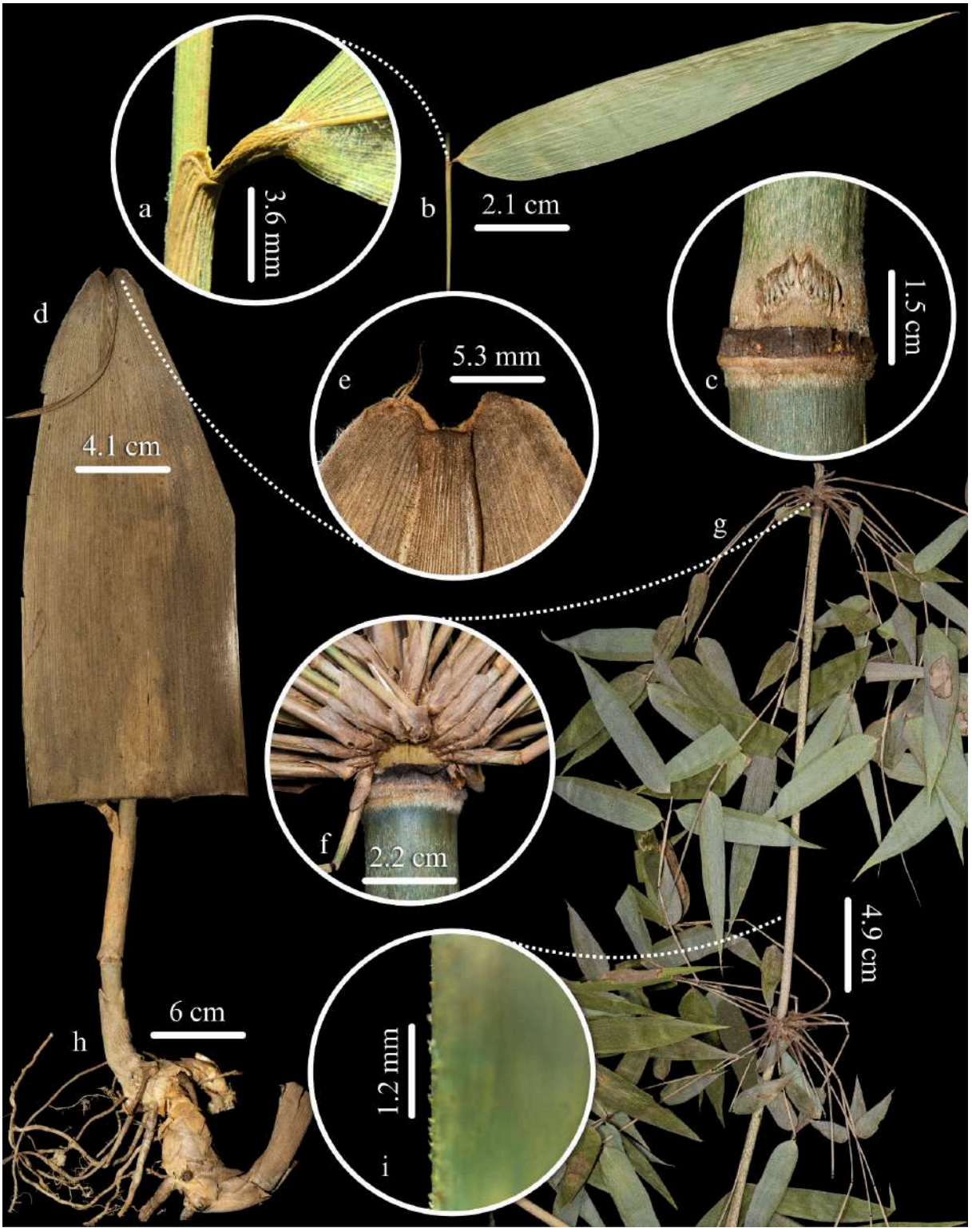

Figure 14. *Merostachys* cf. *filgueirasii* branch leaf sheath apex in detail (a); branch leaf (b); bud complement in detail (c); culm leaf (d); culm leaf sheath apex in detail (e); branch complement in detail (f); young habit (g); rhizome (h); and internode surface in detail (i).

Rhizome pachymorph. **Culm** lignified, 100–800 cm in height; internode 3.6–22.3 in diameter, scabrous and pubescent or puberulent above the nodes, glabrous below the nodes, scabrous to sparsely pubescent on the remainder, wax deposition absent, hollow, green with pale spots, an entirely dark-green ring 3.2–6.5 mm long below the nodes, interrupted on the side opposite to the bud by a densely pubescent white band, terete; wall 0.2–2 mm thick; node prominent, stramineous, fringe of trichomes along the nodal line present, supranodal ridge absent; branch complement apsidate, with 4–38 branches, without a main branch, nodes stramineous to blackened. **Culm leaf** with sheath 56.4–295 × 6.7–96.5 mm, margins ciliate, abaxial surface papillose to scabrous or occasionally sparsely pubescent, puberulent to pubescent at the base, adaxial surface glabrous, dark stramineous abaxially, dark brown adaxially; auricles absent; inner ligule 0.36–2.2 mm long, membranous, with ciliate apex; outer ligule 0.12–1 mm long, membranous, with glabrous to ciliate apex; fimbriae 3.1–6.3 mm long, entirely free, not extending to the margins, stramineous; blade sessile, reflexed, 18–48.3 × 4.1–4.7 mm, margin scabrous, abaxial surface glabrous to puberulent, adaxial surface puberulent to pubescent at the base, glabrous on the remainder, stramineous. **Branch leaf** with sheath 26.9–51.6 mm long, overlapping margin ciliate, underlapping margin glabrous, abaxial surface glabrous, adaxial surface glabrous, light green to dark green, yellow or stramineous; auricles absent; inner ligule 0.5–1.7 mm long, membranous, with ciliate apex; outer ligule 0.06–0.5 mm long, membranous, with ciliolate apex; fimbriae 2.4–4.4 mm long, free, stramineous; pseudopetiole 1.6–5.2 mm long, abaxial surface glabrous, adaxial surface glabrous or pubescent to scabrous, stramineous to blackened; blade 53.6–177.4 × 12.2–28.1 mm, abaxial surface pubescent at the base, papillose to scabrous at the apex, glabrous on the remainder, dark-green marginal band papillose to scabrous, sparsely puberulent or glabrous at the apex, adaxial surface with three scabrous marginal veins on one margin, papillose to scabrous at the apex, glabrous to papillose on the remainder, lanceolate to linear-lanceolate,

length:width ratio 4.3–6.3 (–9.1), base attenuate-oblique, apex acuminate, margin scabrous, light green occasionally with pale spots; midrib most prominent, becoming indistinct among the other veins along the basal half of the blade. **Synflorescences** not observed. **Spikelet** not observed. **Caryopsis** not observed.

Sampled material: BRAZIL. GOIÁS: Alexânia, Olhos D'Água, Rua Paraná, 16º1'14,9"S 48º36'13,2"W, 14.XII.2023, *R.C. Oliveira et al. 3926* (UB); 16º1'13.40"S 48º36'13.48"W, 24.VII.2024, *J.V. Vendramini-Gomes & C.O. Castro 51* (UB); Cocalzinho de Goiás, 15º44'18.3"S 48º28'04.9"W, 18.V.2025, *J.V. Vendramini-Gomes & V.P. Moreira 115* (UB); Santo Antônio do Descoberto, 15º49'30.40"S 48º18'11.10"W, 10.VIII.2024, *J.V. Vendramini-Gomes & C.O. Castro 63* (UB); 15º51'10.04"S 48º17'19.25"W, 16.V.2025, *J.V Vendramini-Gomes & V.P. Moreira 91* (UB); 16.V.2025, *J.V Vendramini-Gomes & V.P. Moreira 92* (UB).

Comments: *Merostachys* cf. *filgueirasii* can be identified by its hollow, thin-walled, scabrous (Figure 14 i), and mottled internodes (Figure 14 c, g), as well as by its culm leaves (Figure 14 d), which are brown, dull, and scabrous abaxially, but shiny and glabrous adaxially, typically bearing long and conspicuous fimbriae. Its branch leaves are also conspicuously and densely fimbriate. However, most specimens found in the EMC did not exhibit this pattern (Figure 14 a). These leaves may also present a dark-green marginal band on the abaxial surface (Figure 14 b, g), a characteristic feature of the Arthrostylidiinae subtribe.

The specimens collected at EMC were initially identified as *M. fistulosa* Döll (1880:209) using the taxonomic key available in Flora e Funga do Brasil (Vinícius-Silva *et al.* 2025). This identification was based on the presence of a scabrous culm and the absence of

fimbriae on the branch leaves. However, the subsequent observation of one or two fimbriae on most collected specimens challenged the initial identification.

Upon reevaluating the taxonomic key and considering the presence of fimbriae, the specimens were identified as *M. multiramea*. This identification is supported by the literature, as Filgueiras (1988) also recorded specimens from DF as belonging to this species. However, Sendulsky (1995) later described a new species, *M. filgueirasii*, using Filgueiras' *M. multiramea* collections from DF as the type, raising questions about the identification at EMC.

Given that EMC is adjacent to DF, it is suggested that the collected specimens, although preliminarily identified as *M. multiramea*, may actually correspond to *M. filgueirasii* or even another species within the *M. multiramea* complex. The absence of multiple conspicuous fimbriae on the branch leaves, a notable characteristic of this complex, reinforces the need for more detailed analyses, including other morphological aspects or molecular studies, for a more precise species circumscription. This study corroborates the challenges pointed out by Sendulsky (1995) regarding the identification of species within this complex based solely on vegetative characteristics, highlighting the importance of complementary taxonomic approaches for the proper delimitation of the species in the Cerrado.

***Olyra ciliatifolia* Raddi**, Agrostogr. Bras.: 19 (1823).

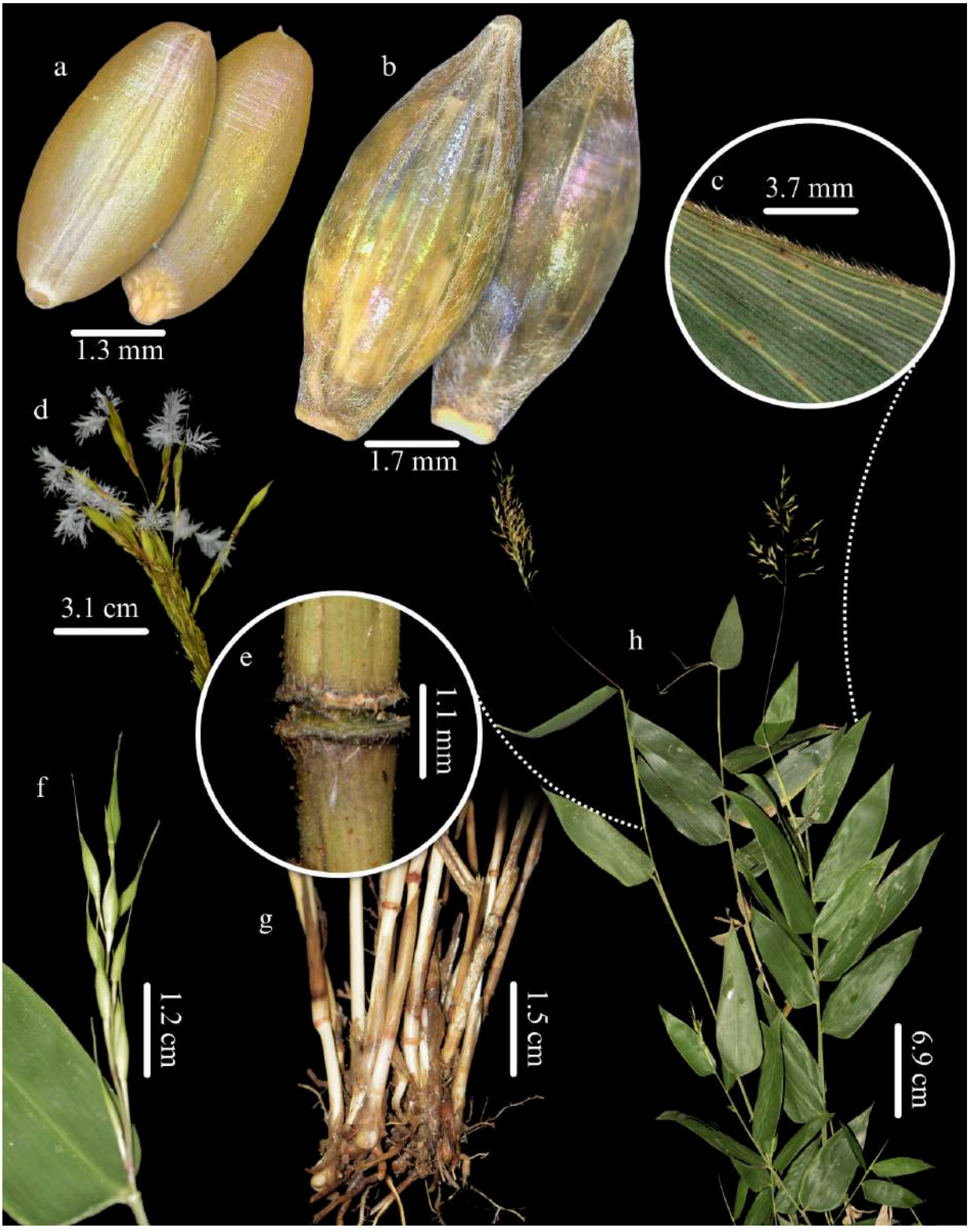

Figure 15. *Olyra ciliatifolia* caryopsis ventral and dorsal surfaces (a); female athecium ventral and dorsal surfaces (b); branch leaf margin in detail (c); bisexual synflorescence (d); node in detail (e); unisexual female synflorescence (f); rhizome and culms (g); and habit.

Herbaceous culm, 42–119 cm tall; internode 0.5–2.3 mm in diameter, glabrous to puberulent, wax deposition absent, hollow, light green to stramineous; wall 0.1–0.3 mm thick; node prominent, green, vinaceous or black, fringe of trichomes along the nodal line present, supranodal ridge absent; branch complement absent. **Culm leaf** absent. **Branch leaf** with sheath 25.3–122.6 mm long, overlapping margin long ciliate, underlapping margin glabrous, abaxial surface glabrous to puberulent, green to greenish stramineous; auricles absent; inner ligule 0.1–0.7 mm long, membranous, with ciliolate to ciliate apex; outer ligule absent; fimbriae absent; pseudopetiole 1–3.3 mm long, abaxial surface glabrous to puberulent, adaxial surface densely puberulent to densely pubescent, pale green to brownish green, rarely vinaceous; blade 52.1–183.4 × 15.9–42.3 mm, abaxial surface scabrous apically, glabrous on the remainder, rarely sparsely puberulent, adaxial surface glabrous to scabrous or puberulent siding the midrib, scabrous over the last 1–2 veins on one margin, glabrous on the remainder, lanceolate, rarely triangular, length:width ratio of 2.3–4.3, base truncate-oblique to obtuse-oblique, rarely rounded-oblique, apex acuminate, margin scabrous and ciliate, especially ciliate toward the apex, green to greenish-stramineous, without abaxial dark-green stripe on one of the margins; midrib most prominent adaxially, rarely both abaxially and adaxially, becoming indistinct among the other veins along the basal one-third to three-quarters of the blade. **Synflorescences** terminal with unisexual male and female spikelets bearing 1 fertile floret or only unisexual female spikelets bearing 1 fertile floret; axillary with unisexual male and female spikelets bearing 1 fertile floret or only unisexual female spikelets bearing 1 fertile floret; basal absent. **Female spikelet** 8.8–19.6 × 1–5.6 mm; glume I (lower) 8.8–19.6 × 1.9–3 mm, abaxial surface scabrous close to the margins and toward the apex, glabrous on the remainder, otherwise, entirely glabrous, 5–7-nerved, light green to vinaceous; non-mucronate; awned, awn up to 12.6 mm long, scabrous; glume II (upper) 6.2–10.5 × 1.7–2.8 mm, abaxial surface slightly scabrous toward the apex, glabrous

on the remainder, otherwise entirely glabrous, (3–)5-nerved, light green to vinaceous; mucronate; awnless; lemma 5.3–7 × 1.2–2.4 mm, abaxial surface pubescent, pale green to white, dark stramineous with black spots when mature; non-mucronate; awnless; palea 4.4–6.3 × 0.7–2.1 mm, abaxial surface pubescent dorsally, glabrous on the remainder, pale green to white, dark stramineous with black spots when mature. **Male spikelet** 3.8–9.3 × 0.4–0.7 mm; lemma 3.8–9 × 0.8–1.3 mm, abaxial surface glabrous to pubescent toward the apex, glabrous on the remainder, green over the veins, pale green to vinaceous on the remainder; non-mucronate; awned, awn up to 2.8 mm long, scabrous; palea 3.3–6.9 × 0.7–1.1 mm, abaxial surface slightly puberulent to slightly pubescent toward the apex, glabrous on the remainder, green over the veins, pale green to vinaceous on the remainder. **Caryopsis** 4.5–4.7 × 1.9–2.2 mm, elliptic, stramineous to amber.

Sampled material: BRAZIL. GOIÁS: Abadiânia, 16º10'35.8"S 48º42'50.89"W, 01.II.2025, fl, *J.V. Vendramini-Gomes & C.O. Castro 67* (UB); 16º10'35.8"S 48º42'50.89"W, 01.II.2025, fl, *J.V. Vendramini-Gomes & C.O. Castro 69* (UB); 16º10'35.8"S 48º42'50.89"W, 11.II.2025, fr, *J.V. Vendramini-Gomes et al. 70* (UB); Cocalzinho de Goiás, Edilândia, 15º46'59.30"S 48º32'06.31"W, 01.V.2024, fl, *J.V. Vendramini-Gomes et al. 47* (UB); Corumbá de Goiás, 15º57'01.18"S 48º46'27.64"W, 18.V.2025, fl, *J.V. Vendramini-Gomes & V.P. Moreira 109* (UB); 18.V.2025, fl, *J.V. Vendramini-Gomes & V.P. Moreira 110* (UB); Santo Antônio do Descoberto, 15º51'33.42"S 48º17'32.06"W, 16.V.2025, fl, *J.V. Vendramini-Gomes & V.P. Moreira 93* (UB); 16.V.2025, fl, *J.V. Vendramini-Gomes & V.P. Moreira 94* (UB); 16º04'21.82"S 48º14'52.98"W, 17.V.2025, fl, *J.V. Vendramini-Gomes & V.P. Moreira 104* (UB).

Comments: *Olyra ciliatifolia* can be readily distinguished by the margins of its branch leaf blades, which are both scabrous and ciliate (Figure 15 c), whereas in all other Bambusoideae genera occurring in the EMC the margins are mainly scabrous only. Another diagnostic feature is the female anthecium, whose surface is entirely pubescent and smooth (Figure 15 b), in contrast with the anthecia of the other *Olyra* species in the EMC, which may be glabrous, partially villous, or marked with oblong excavations (table 2).

Table 2. Comparison of female anthecium surface characteristics among *Olyra* species within the EMC.

Species/female anthecium surface	*O. ciliatifolia*	*O. fasciculata*	*O. humilis*	*O. latifolia*
Vestiture	entirely pubescent	entirely glabrous	villous only at the apical and basal margins, glabrous on the remainder	entirely glabrous
Surface ornamentation	smooth	with oblong excavation	smooth	smooth

A particularly noteworthy feature of this species is the occurrence of sexual dimorphism in the synflorescences of the same plant. While most synflorescences bear both male and female spikelets (Figure 15 d, h), some produce exclusively female spikelets (Figure 15 f). These female-only synflorescences may occur either terminally or axillarily, like the bisexual ones, but are usually shorter, more slender, and with fewer spikelets. Soderstrom & Zuloaga (1989) also reported such synflorescences in some specimens, suggesting that this feature may hold taxonomic significance as a potential diagnostic character.

The sheath apex of *O. ciliatifolia* is also strikingly asymmetrical: one side extends well beyond the other and projects further than the ligule, forming an auricle-like structure. This projection is scabrous to puberulent on its adaxial surface. Moreover, the apical margin

of the sheath is ciliate, in some cases resembling short fimbriae, which further emphasizes the unique appearance of the species compared to other *Olyra*.

***Olyra fasciculata* Trin.**, Mém. Acad. Imp. Sci. Saint-Pétersbourg, Sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 3(2): 113 (1834).

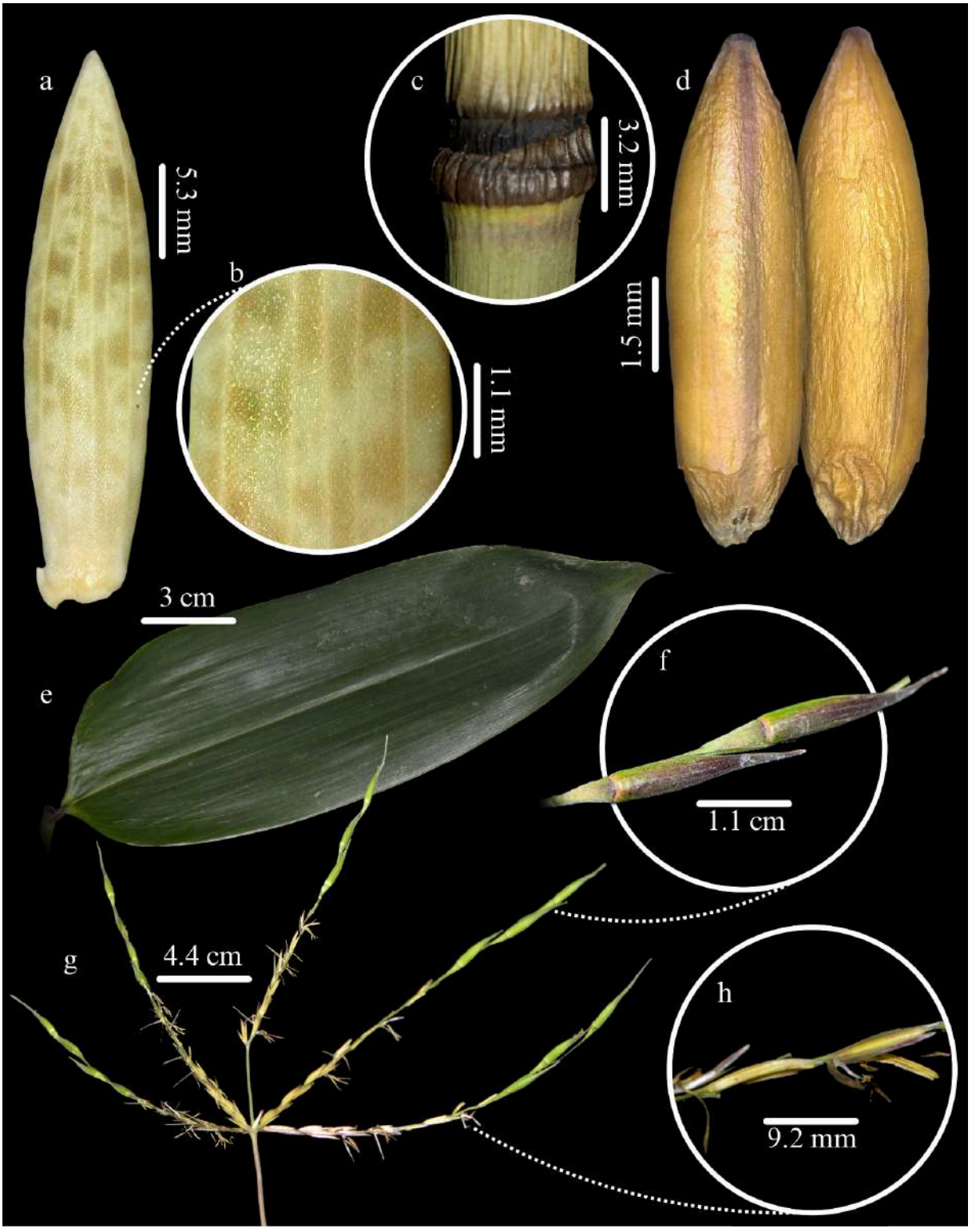

Figure 16. *Olyra fasciculata* female anthecium dorsal surface (a); female anthecium dorsal surface in detail (b); node (c); caryopsis ventral and dorsal surfaces (d); branch leaf blade (e); female spikelets in detail (f); synflorescence (g); and male spikelets in detail.

Herbaceous culm, 86.5–20 cm tall; internode 1.4–5.4 mm in diameter, glabrous to puberulent, wax deposition absent, hollow, green to yellowish green; wall 0.2–0.7 mm thick; node prominent, green to black, fringe of trichomes along the nodal line absent, supranodal ridge absent; branch complement absent. **Culm leaf** absent. **Branch leaf** with sheath 64.7–264 mm long, overlapping margin ciliate, underlapping margin glabrous, abaxial surface glabrous to scabrous, green; auricles absent; inner ligule 0.6–2.1 mm long, membranous, with ciliolate to ciliate apex; outer ligule absent; fimbriae absent; pseudopetiole 1.6–5.5 mm long, abaxial surface glabrous to puberulent, adaxial surface glabrous to puberulent, light green to blackened; blade 105.6–310.6 × 22.3–80.4 mm, abaxial surface scaberulous toward one of the margins, scabrous apically, glabrous to sometimes scaberulous on the remainder, adaxial surface scabrous to sparsely pubescent close to the pseudopetiole, scabrous over the last 1–3 veins on one margin, sometimes on both margins, scabrous toward the apex, glabrous to papillose on the remainder, ovate-lanceolate to lanceolate, length:width ratio of 2.6–5.2, base attenuate-oblique, cuneate-truncate, cuneate-oblique or rounded, apex acuminate, margin scabrous to long scabrous, sometimes sparsely ciliate toward the base, green, without abaxial dark-green stripe on one of the margins; midrib most prominent abaxially, becoming indistinct among the other veins along the basal one-third to three-quarters of the blade. **Synflorescences** terminal with unisexual male and female spikelets bearing 1 fertile floret; axillary absent; basal absent. **Female spikelet** 14.5–31.4 × 2.7–3.3 mm; glume I (lower) 15.4–31.4 × 3–3.8 mm, abaxial surface scabrous toward the apex, glabrous to scabrous on the remainder, (6–)7-nerved, light green to vinaceous; mucronate or not; awned or not, awn up to

8.7 mm long, scabrous; glume II (upper) 13.3–21.6 × 3–3.8 mm, abaxial surface scabrous toward the apex, glabrous to scabrous on the remainder, (6–)7-nerved, light green to vinaceous; mucronate or not; awnless; lemma 9.3–12 × 2–3.2 mm, abaxial surface glabrous, pale green to white, whitish with dark spots when mature; non-mucronate; awnless; palea 8.4–10.5 × 1.2–2.4 mm, abaxial surface glabrous, pale green to white, whitish with dark spots when mature. **Male spikelet** 5.1–11.3 × 0.5–0.8 mm; glume I (lower) absent; glume II (upper) absent; lemma 5.1–11.2 × 1–1.5 mm, abaxial surface scaberulous to scabrous, light green to green over the veins, pale green to vinaceous on the remainder; mucronate or not; awnless; palea 4.4–10.9 × 1–1.4 mm, abaxial surface glabrous to scaberulous, light green to green over the veins, pale green to vinaceous on the remainder. **Caryopsis** 8.4 × 2.3 mm, elliptic, amber.

Sampled material: BRAZIL. GOIÁS: Abadiânia, 16º10'39.73"S 48º42'48.1"W, 11.II.2025, fr., *J.V. Vendramini-Gomes et al. 71* (UB); 16º10'26.82"S 48º45'02.52"W, fr., *J.V. Vendramini-Gomes et al. 73* (UB); Alexânia, 16º03'46.81"S 48º27'13.91"W, 17.V.2025, fr., *J.V. Vendramini-Gomes & V.P. Moreira 98* (UB); 17.V.2025, fr., *J.V. Vendramini-Gomes & V.P. Moreira 99* (UB); Pirenópolis, Fazenda Caiçara Camping e Cachoeiras, 15º59'05.42"S 49º00'48.08"W, 18.V.2025, fr., *J.V. Vendramini-Gomes & V.P. Moreira 113* (UB).

Comments: *Olyra fasciculata* can be readily recognized by its digitate or fasciculate synflorescences (Figure 16 g), in which the lower branches arise from a single node of the panicle, whereas the upper branches are alternate, each emerging from a distinct node. The synflorescence branches bear several lateral male spikelets (Figure 16 h) and one to three terminal female spikelets (Figure 16 f). It is also noteworthy that both male and female

spikelets are markedly larger (5.1–11.3 × 0.5–0.8 mm and 14.5–31.4 × 2.7–3.3 mm, respectively) than in any other *Olyra* species found in the EMC.

Beyond its strikingly different synflorescence, *O. fasciculata* is the only *Olyra* species in the EMC that bears glabrous female anthecium with oblong excavations (Figure 16 a, b) (vs. smooth in the other *Olyra* species from the EMC; see Table 2 in the comments under *O. ciliatifolia*). Its branch leaf blades (Figure 16 e) are also usually much larger (105.6–310.6 × 22.3–80.4 mm) than those of *O. ciliatifolia*, *O. humilis*, and *O. latifolia*. Another distinctive feature of the branch leaves is their scabrous to long-scabrous margins, sometimes ciliate toward the base (vs. scabrous in *O. humilis* and *O. latifolia*, and scabrous and ciliate along the entire margin in *O. ciliatifolia*).

The species shares with *O. ciliatifolia* an asymmetrical leaf sheath apex, but differs in that it does not extend beyond the inner ligule, which always exceeds the sheath apex.

***Olyra humilis* Nees**, C.F.P.von Martius, Fl. Bras. Enum. Pl. 2: 304 (1829).

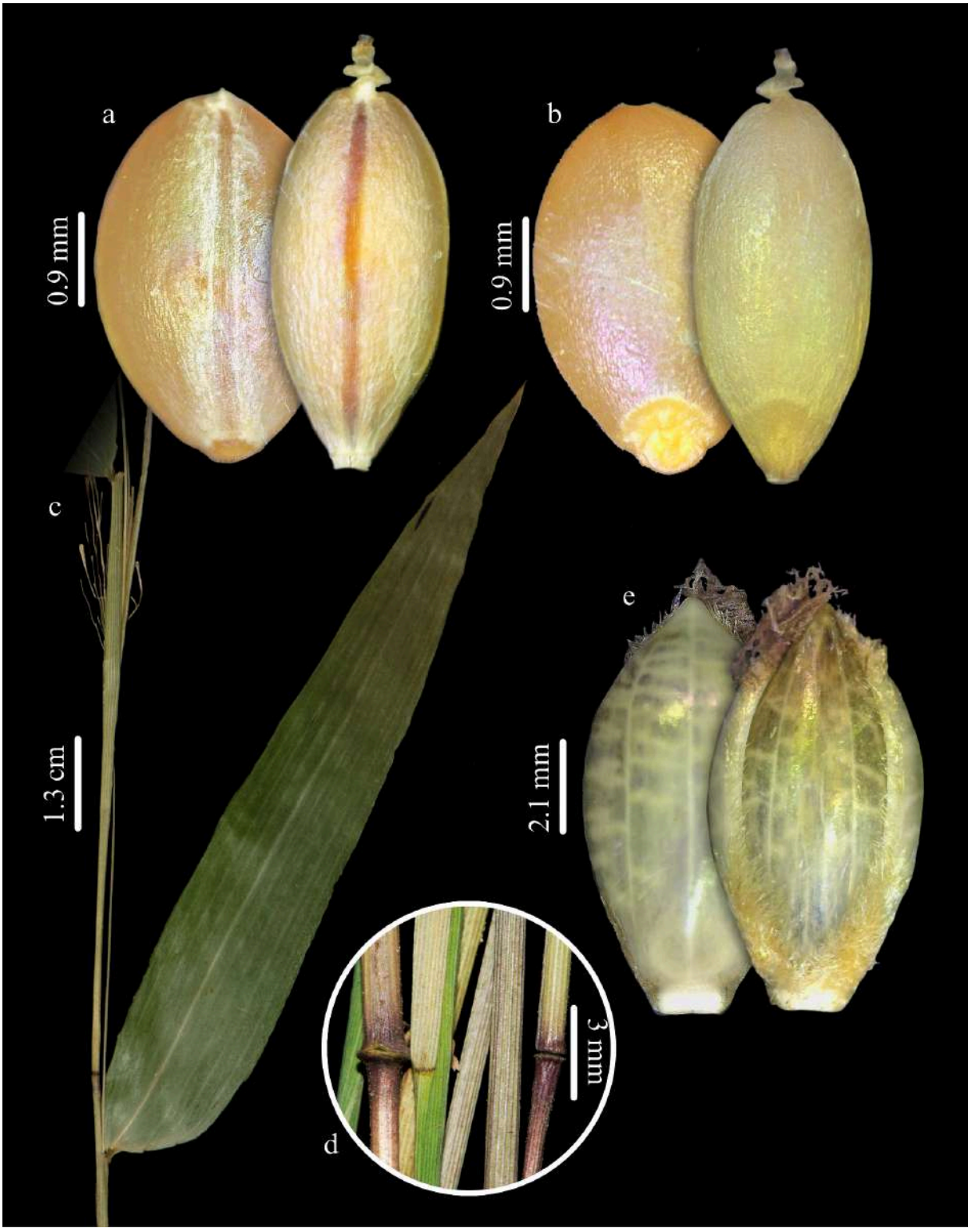

Figure 17. *Olyra humilis* caryopses ventral surface (a); caryopses dorsal surface (b); branch leaves (c); nodes in detail (d); and female anthecium dorsal and ventral surfaces (e).

Herbaceous culm, 54–170 cm tall; internode 0.5–1.9 mm in diameter, glabrous or scabrous to puberulent, wax deposition absent, hollow, green to stramineous; wall 0.1–0.4 mm thick; node prominent, stramineous, green, vinaceous or black, fringe of trichomes along the nodal line absent, supranodal ridge absent; branch complement absent. **Culm leaf** absent. **Branch leaf** with sheath 24.3–73 mm long, overlapping margin ciliate, underlapping margin glabrous, abaxial surface papillose to scaberulous between the veins, glabrous to puberulent and sparsely setose on the remainder, green to light green; auricles absent; inner ligule 0.2–0.8 mm long, membranous, with ciliolate to ciliate apex; outer ligule absent; fimbriae absent; pseudopetiole 0.8–2.5(–2.7) mm long, abaxial surface puberulent to densely long pubescent, adaxial surface densely pubescent to densely long pubescent, green, yellowish or brownish green; blade 68.7–139.2 × 9.1–23.9 mm, abaxial surface glabrous to scaberulous, rarely puberulent, adaxial surface glabrous to scabrous, lanceolate to linear-lanceolate, length:width ratio of 4.9–7.5, base oblique-cuneate, apex acuminate, margin scabrous, green, without abaxial dark-green stripe on one of the margins; midrib most prominent adaxially, becoming indistinct among the other veins along the basal one-fifth to two-thirds of the blade. **Synflorescences** terminal with unisexual male and female spikelets bearing 1 fertile floret; axillary with unisexual male and female spikelets bearing 1 fertile floret; basal absent. **Female spikelet** 10.6–19.9 × 0.8–4.1 mm; glume I (lower) 10.6–19.8 × 1.7–2.9 mm, abaxial surface glabrous to scabrous, 3–5-nerved, green to light green; non-mucronate; awned, awn up to 12.9 mm long, scabrous; glume II (upper) 5.8–8.8 × 1.6–2.9 mm, abaxial surface glabrous to scabrous, 3–5-nerved, green to pale green; mucronate; awnless; lemma 4.3–5.4 × 0.6–2.5 mm, abaxial surface densely villose only close to the apical and basal margins, glabrous on the remainder, pale green to white, white with blackened spots when mature; non-mucronate; awnless; palea 3.8–5.4 × (0.2–)0.5–1.7 mm, abaxial surface slightly villous apically, glabrous on the remainder, pale green to white, white with blackened spots when

mature. **Male spikelet** 3.4–10.1 × 0.5–1.5 mm; lemma 3.2–10 × 0.8–1.4 mm, abaxial surface glabrous, green to pale green over the veins, vinaceous to pale vinaceous on the remainder; non-mucronate; awned, awn up to 2.7 mm long, scabrous; palea 3.3–8.2 × 0.5–1.1 mm, abaxial surface glabrous, green to pale green over the veins, vinaceous to pale vinaceous on the remainder. **Caryopsis** 3.4–3.8 × 1.5–2.2 mm, elliptic, stramineous, amber when mature.

Sampled material: BRAZIL. GOIÁS: Abadiânia, 16º12'18.58"S 48º42'47.95"W, 22.II.2025, fr, *J.V. Vendramini-Gomes et al. 79* (UB); 16º11'26.98"S 48º39'55.34"W, 22.II.2025, fl, *J.V. Vendramini-Gomes et al. 82* (UB); Águas Lindas de Goiás, 15º45'40.59"S 48º15'32.84"W, 03.III.2024, fl, *J.V. Vendramini-Gomes et al. 9* (UB); 15º45'40.59"S 48º15'32.84"W, 03.III.2024, fr, *J.V. Vendramini-Gomes et al. 10* (UB); 15º45'40.59"S 48º15'32.84"W, 03.III.2024, fr, *J.V. Vendramini-Gomes et al. 12* (UB); 15º45'40.56"S 48º15'31.94"W, 03.III.2024, fr, *J.V. Vendramini-Gomes et al. 17* (UB); 15º45'39.07"S 48º15'29.90"W, 03.III.2024, fr, *J.V. Vendramini-Gomes et al. 22* (UB); 15º45'43.85"S 48º15'24.16"W, 03.III.2024, fl, *J.V. Vendramini-Gomes et al. 27* (UB); 15º45'57.80"S 48º15'21.45"W, 30.III.2024, fl, *J.V. Vendramini-Gomes et al. 30* (UB); Alexânia, Olhos D'Água, Rua Paraná, 16º01'14.9"S 48º36'13.2"W, 14.XII.2023, fl, *R.C. Oliveira et al. 3925* (UB); Pirenópolis, Cidade de Pedra, 15º43'18.5"S 48º56'09.95"W, 15.III.2025, fl, *J.V. Vendramini-Gomes et al. 85* (UB); Parque Estadual dos Pireneus, 15º48'46.98"S 48º51'23.03"W, 17.IV.2024, fl, *R.C. Oliveira & J.V. Vendramini-Gomes 3945* (UB); 15º47'35.83"S 48º50'14.75"W, 17.IV.2024, fl, *R.C. Oliveira & J.V. Vendramini-Gomes 3949* (UB).

Comments: *Olyra humilis* can be primarily distinguished by its female anthecia, which are densely villous along the margins, especially at the apex and base, while the remainder of the

abaxial surface of the female lemma is glabrous and smooth (Figure 17 e) (see Table 2 in the comments under *O. ciliatifolia*). In addition to the reproductive traits, the species also exhibits the shortest and most slender leaf blades (Figure 17 c) (68.7–139.2 × 9.1–23.9 mm) and stature (54–170 cm tall) among the *Olyra* of the EMC.

As in *O. ciliatifolia*, conspicuous free cilia occur at the apex of the leaf sheath in *O. humilis*; however, they are not regarded as fimbriae, in line with Judziewicz *et al.* (1999), who stated that most Olyreae, including *Olyra*, lack fimbriae.

The flowering period reported by Soderstrom & Zuloaga (1989), from October to May, is confirmed by the phenological state observed in the collected specimens.

***Olyra latifolia* L.**, Syst. Nat., ed. 10. 2: 1261 (1759).

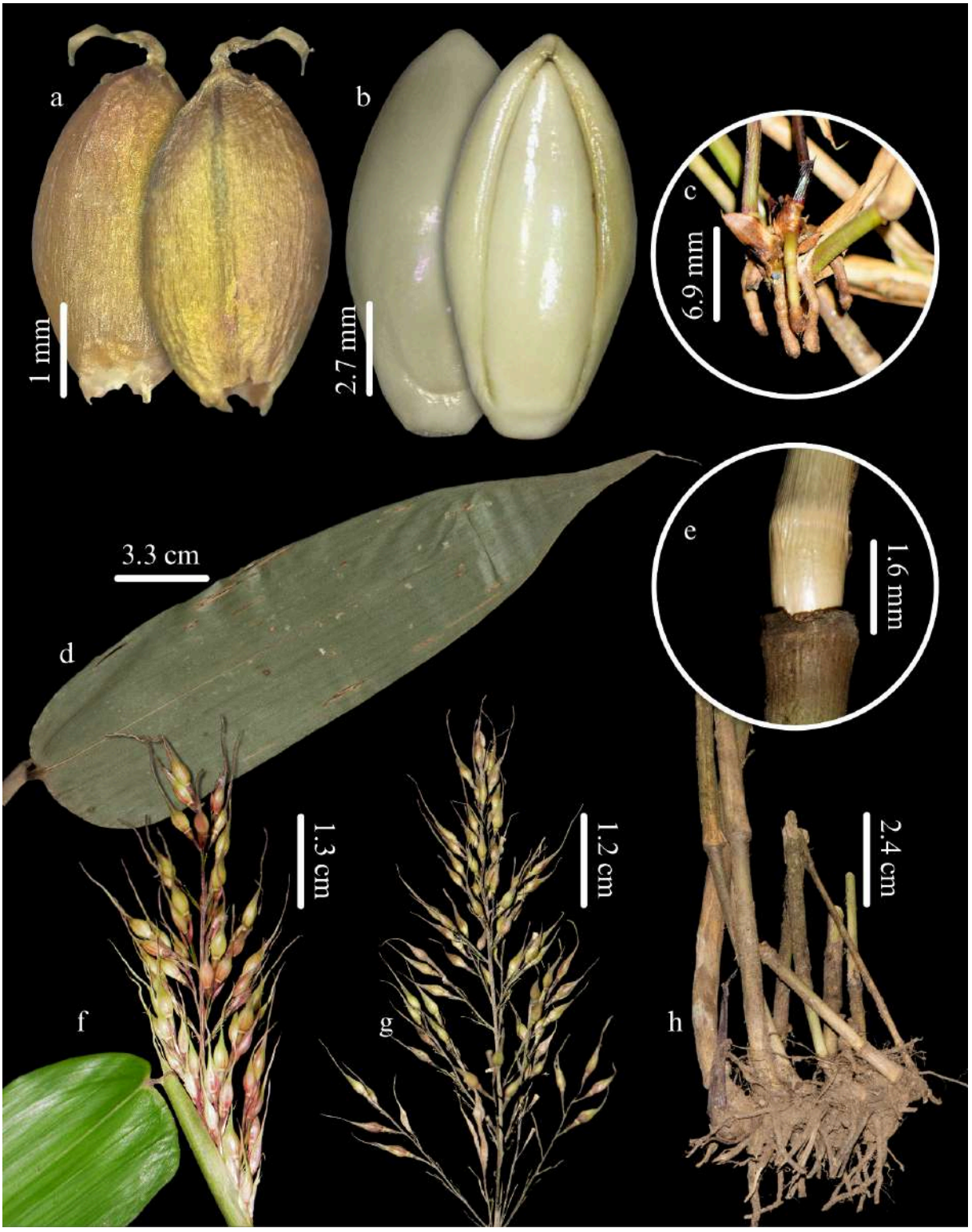

Figure 18. *Olyra latifolia* caryopsis dorsal and ventral surfaces (a); female anthecium dorsal and ventral surfaces (b); branching (c); branch leaf blade (d); node and supranodal ridge (e); synflorescence (f, g); and rhizome (h).

Herbaceous culm, 54–180 cm tall; internode 0.9–6.7 mm in diameter, wholly sparsely to densely pubescent, or pubescent below the nodes and glabrous on the remainder, wax deposition absent, hollow, rarely solid, vinaceous or green with or without vinaceous spots; wall 0.1–1.4 mm thick; node prominent or not, green, stramineous or blackened, fringe of trichomes along the nodal line present or absent, supranodal ridge absent or a faint line; branch complement non-apsidate, 0–2(–4) branches, without a main branch, nodes stramineous to black or inconspicuously colored. **Culm leaf** absent. **Branch leaf** with sheath 22.3–151.1 mm long, overlapping margin ciliate, underlapping margin glabrous or both glabrous, abaxial surface glabrous to scaberulous, pubescent or not, green to brownish green, with or without vinaceous spots; auricles absent; inner ligule 0.5–6.7 mm long, membranous, with ciliolate to ciliate apex; outer ligule absent; fimbriae absent; pseudopetiole 0.76–6.8 mm long, abaxial surface puberulent to densely long pubescent, sometimes scabrous, rarely glabrous to puberulent, adaxial surface puberulent to densely long pubescent, yellowish green to brownish green; blade (35.1–)55.6–380.5 × 13–88.7 mm, abaxial surface glabrous to scaberulous toward the apex, glabrous to pubescent toward the pseudopetiole, glabrous to sparsely puberulent on the remainder, adaxial surface glabrous to scaberulous toward the apex, bristly to scabrous over the midrib, glabrous to sparsely puberulent on the remainder, ovate-lanceolate to lanceolate, sometimes ovate, length:width ratio of 2–5.8, base rounded, rounded-oblique, rounded-truncate or slightly cordate, apex acuminate, margin scabrous, green, without abaxial dark-green stripe on one of the margins; midrib most prominent abaxially, becoming indistinct among the other veins along the basal one-third to three-quarters of the blade. **Synflorescences** terminal with unisexual male and female spikelets bearing 1 fertile floret; axillary with unisexual male and female spikelets bearing 1 fertile floret or absent; basal absent. **Female spikelet** 10.1–24.6 × 1.7–4.3 mm; glume I (lower) 9.8–26.6 × 1.9–5.4 mm, abaxial surface glabrous to scabrous, sometimes pubescent at

the base, (3–)4–9-nerved, stramineous, vinaceous or light green, with or without vinaceous spots; non-mucronate; awned, awn up to 20.2 mm long, scabrous; glume II (upper) 6.2–16 × 2–4.8 mm, abaxial surface papillose, scabrous or puberulent, sometimes pubescent at the base, 3–7-nerved, stramineous, vinaceous or light green, with or without vinaceous spots; non-mucronate; awned, awn up to 9.4 mm long, scabrous; lemma 4.1–6.8 × 1.5–3.3 mm, abaxial surface glabrous, white; non-mucronate; awnless; palea 2.9–6.3 × 0.6–2.2 mm, abaxial surface glabrous, white. **Male spikelet** 3.7–9 × 0.4–1.2 mm; glume I (lower) absent; glume II (upper) absent; lemma 3.7–9 × 0.9–1.9 mm, abaxial surface glabrous to scabrous, light green to vinaceous or stramineous; non-mucronate; awned, awn up to 3.6 mm long, scabrous; palea 2.7–6.3 × 0.7–2 mm, abaxial surface glabrous to scaberulous, light green to deep vinaceous or stramineous. **Caryopsis** 3.2–4.4 × 1.8–2.4 mm, ovate to elliptic, brown to amber brown.

Sampled material: BRAZIL. GOIÁS: Abadiânia, 16º10'35.8"S 48º42'50.89"W, 01.II.2025, fr *J.V. Vendramini-Gomes & C.O. Castro 68* (UB), 16º12'18.58"S 48º42'47.95"W, 22.II.2025, fl, *J.V. Vendramini-Gomes et al. 77* (UB); Águas Lindas de Goiás, 15º45'40.56"S 48º15'31.94"W, 03.III.2024, fr, *J.V. Vendramini-Gomes et al. 14* (UB); 15º45'40.56"S 48º15'31.94"W, 03.III.2024, fl, *J.V. Vendramini-Gomes et al. 16* (UB); 15º45'40.56"S 48º15'31.94"W, 03.III.2024, fl, *J.V. Vendramini-Gomes et al. 19* (UB); 15º45'40.06"S 48º15'30.11"W, 03.III.2024, fl, *J.V. Vendramini-Gomes et al. 21* (UB); 15º45'42.18"S 48º15'26.75"W, 30.III.2024, fl, *J.V. Vendramini-Gomes et al. 23* (UB); 15º45'43.39"S 48º15'26.30"W, 30.III.2024, fr, *J.V. Vendramini-Gomes et al. 24* (UB); 15º45'43.85"S 48º15'24.16"W, 30.III.2024, fl, *J.V. Vendramini-Gomes et al. 25* (UB); 15º45'43.85"S 48º15'24.16"W, 30.III.2024, fl, *J.V. Vendramini-Gomes et al. 26* (UB); 15º45'02.39"S 48º14'08.65"W, 10.VIII.2024, fl, *J.V. Vendramini-Gomes & C.O. Castro 59* (UB); Alexânia,

16º03'46.81"S 48º27'13.91"W, 17.V.2025, fr, *J.V. Vendramini-Gomes & V.P. Moreira 100* (UB); Corumbá de Goiás, 15º55'17.38"S 48º44'36.46"W, 30.IV.2024, fl, *J.V. Vendramini-Gomes et al. 31* (UB); próximo à Capela Nossa Senhora Aparecida, 15º57'01.18"S 48º46'27.64"W, 18.V.2025, fr, *J.V. Vendramini-Gomes & V.P. Moreira 108* (UB); Pirenópolis, Cidade de Pedra, 15º43'18.5"S 48º56'09.95"W, 15.III.2025, fl, *J.V. Vendramini-Gomes et al. 87* (UB); Fazenda Caiçara Camping e Cachoeiras, 15º59'05.42"S 49º00'48.08"W, 18.V.2025, fl, *J.V. Vendramini-Gomes & V.P. Moreira 112* (UB); Santo Antônio do Descoberto, Fazenda Capão Grosso, 15º51'10.04"S 48º17'19.25"W, 16.V.2025, fl, *J.V. Vendramini-Gomes & V.P. Moreira 90* (UB); Fazenda Cantão da Lagoinha, 16º07'36.84"S 48º13'10.66"W, 16.V.2025, fl, *J.V. Vendramini-Gomes & V.P. Moreira 95* (UB); 16º07'38.2"S 48º13'12.92"W, 16.V.2025, fl, *J.V. Vendramini-Gomes & V.P. Moreira 96* (UB); 16º04'20.86"S 48º14'52.87"W, 17.V.2025, fl, *J.V. Vendramini-Gomes & V.P. Moreira 102* (UB).

Comments: *Olyra latifolia* can be readily distinguished from the other *Olyra* species found in the EMC by its entirely smooth and glabrous female anthecium (Figure 18 b) (see Table 2 in the comments under *O. ciliatifolia*). In addition, it usually bears larger leaves (Figure 18 d) than *O. ciliatifolia* and *O. humilis*, but smaller than those of *O. fasciculata*. Its spikelets (Figure 18 f, g) are also typically larger than those of *O. ciliatifolia* and *O. humilis*. Unlike the two latter species, however, *O. latifolia*—although primarily herbaceous—may also develop sublignified culms, allowing individuals to reach greater heights in the forest.

Other distinctive features of this species include the presence of a supranodal ridge (Figure 18 e) and branching (Figure 18 c), both of which were not observed in any other *Olyra* species from the EMC. *Olyra latifolia* also exhibits the thickest culms and internode walls (0.9–6.7 mm in diameter and 0.1–1.4 mm thick, respectively) among the EMC *Olyra*, while its nodes are less prominent than those of the remaining species. Additionally, the

nodes may bear a fringe of trichomes along the nodal line, a feature otherwise found only in *O. ciliatifolia* (Figure 15 e).

An important feature described by Soderstrom & Zuloaga (1989) is the presence of auricles on the leaves, but this character was not observed in the material examined in the present study, nor has it been reported in other floristic surveys. In some specimens, the tissue connecting the pseudopetiole to the sheath apex extends slightly outward, forming small lobes that may have been misinterpreted as auricles by Soderstrom & Zuloaga (1989).

The species has a wide distribution, ranging from Mexico to Argentina, and also occurs in parts of Africa, including Madagascar (Judziewicz *et al.* 1999). Soderstrom & Zuloaga (1989) suggested that Old World populations were introduced by human activity, a hypothesis later supported by the phylogeny of Ruiz-Sanchez *et al.* (2019), which analyzed populations from both American and African continents.

***Phyllostachys* cf. *aurea* (André) Rivière & C.Rivière**, Bull. Soc. Acclim. France, sér. 3, 5: 716 (1878).

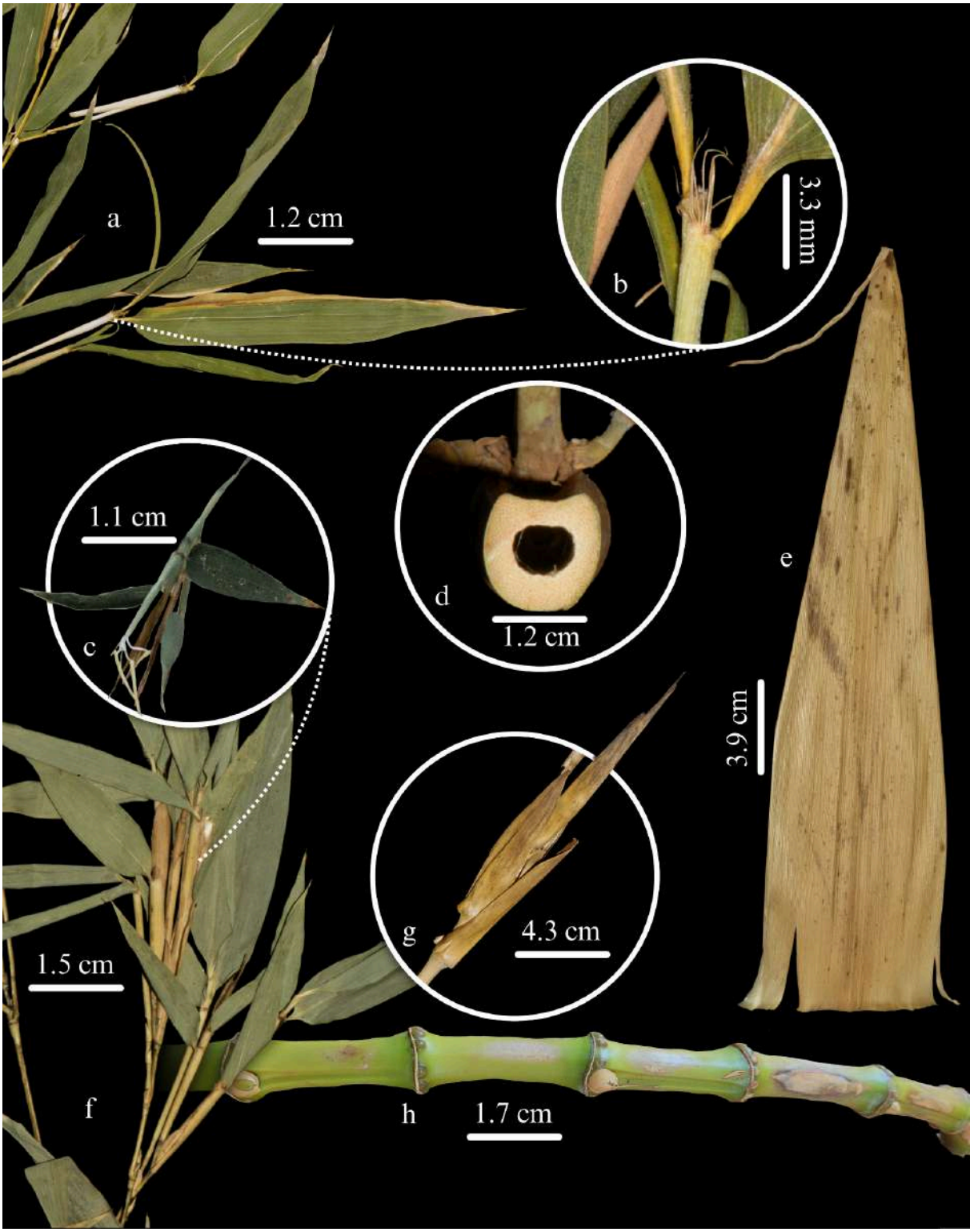

Figure 19. *Phyllostachys* cf. *aurea* branch leaves (a); branch leaf fimbriae in detail (b); fresh pseudospikelet in detail (c); internode cross section in detail (d); culm leaf (e); pseudospikelets (f); rhizome leaves (g); and rhizome (h).

Lignified culm, 300–400 cm tall; internode 9.3–10.2 mm in diameter, glabrous to glabrescent between the nodal line and the supranodal ridge, glabrous on the remainder, wax deposition absent, hollow, green to pale yellowish green; wall 1.9–4.7 mm thick; node prominent, stramineous, fringe of trichomes along the nodal line present, supranodal ridge present; branch complement non-apsidate, with 1–3 branches, with 1 main branch, nodes stramineous. **Culm leaf** not observed. **Branch leaf** with sheath 18.3–24.4 mm long, overlapping margin ciliate apically, glabrous on the remainder, underlapping margin glabrous, abaxial surface pubescent, light green; auricles absent; inner ligule 0.4–1.1 mm long, membranous, with ciliate apex; outer ligule 0.4–0.5 mm long, membranous, with ciliate apex; fimbriae 3.1–4.3 mm long, free, stramineous; pseudopetiole 1.5–3.5 mm long, abaxial surface glabrous to pubescent, adaxial surface puberulent to pubescent, yellowish green; blade 38.1–65.8 × 8.6–11.3 mm, abaxial surface densely pubescent toward the pseudopetiole, puberulent to pubescent on the remainder, adaxial surface glabrous, lanceolate, length:width ratio of 4.4–5.8, base rounded-truncate to attenuate, apex acuminate, margin scabrous, green to pale green, without abaxial dark-green stripe on one of the margins; midrib most prominent abaxially, becoming indistinct among the other veins along the basal half to three-quarters of the blade. **Synflorescences** not observed. **Spikelet** 38.4 × 3 mm; glume I (lower) 23.5 × 3.6 mm, abaxial surface glabrous to pubescent, 12-nerved, light green; non-mucronate; awnless; glume II (upper) absent; lemma 22.9 × 2.9 mm, abaxial surface glabrous to scaberulous, light green; non-mucronate; awnless; palea 20.6 × 2.3 mm, abaxial surface scabrous toward the apex, scaberulous on the remainder, light green. **Caryopsis** not observed.

Sampled material: BRAZIL. GOIÁS: Santo Antônio do Descoberto, Sol Campo e Lazer, 16º05'24.40" S 48º17'09.58" W, 24.VII.2024, fl., *J.V. Vendramini-Gomes & C.O. Castro 49* (UB).

Comments: Two species of *Phyllostachys* occur in Goiás: *P. aurea* and *P. bambusoides* (1843:746) (Flora e Funga do Brasil 2025a). Although *P. bambusoides* usually attains much greater stature and culm diameter than *P. aurea* (and than the specimen from the EMC), it is described (Shi *et al.* 2021c) as having a rachilla extension, whereas no information is provided regarding its presence or absence in *P. aurea*. The EMC specimen presents a rachilla extension, which is puberulent to scabrous, in contrast with the description of *P. bambusoides*, where it is glabrous. The specimen also has pubescent rachilla internodes, in agreement with *P. bambusoides* (vs. glabrous in *P. aurea*). The most diagnostic feature to separate the two species is the presence of auricles on culm leaves (Figure 19 e was obtained by a specimen from DF), but these were not collected, preventing a conclusive identification.

As in *Bambusa* and *Guadua*, the genus presents pseudospikelets (Figure 19 c, f), which strongly resemble branching buds or teratological structures, since their bracts may bear a pseudopetiole, sheath and blade. This makes it difficult to identify the true pseudospikelets and to confirm whether the specimen is fertile.

The genus is the only representative of the tribe Arundinarieae at the EMC and can be readily distinguished from all other species in the area by its leptomorphic (monopodial) rhizomes (Figure 19 h), from which culms arise separately rather than forming clumps—often resulting in walls of erect culms—and by its hollow culm internodes (Figure 19 d). Although *Chusquea* aff. *calderoniae* also has leptomorphic rhizomes (Figure 8 g), its culm internodes are solid (Figure 8 d). Another remarkable feature is a groove starting behind the bud

complement and running through the entire length of every internode in the culm and branches (Figure 19 d, h).

Some species, such as *Guadua refracta*, may also appear leptomorphic because of their elongated rhizome necks (Figure 12 g), but can be easily recognized as pachymorphic by the presence of rhizomes proper, which differentiate into culms (vs. culms arising upright directly from rhizome-node buds in leptomorph rhizomes).

It is worth noting that only a flowering culm was collected at the EMC. Its branch leaves are distinctly smaller than those of vegetative culms, meaning the measurements presented here may not reflect the usual dimensions of the species. Moreover, the flowering culm was smaller and more slender than vegetative ones, at least in the collected specimen, and thus does not represent the maximum stature and diameter that vegetative culms can reach.

***Raddiella esenbeckii* (Steud.) C.E.Calderón ex Soderstr.**, Smithsonian Contr. Bot. 44: 21 (1980) (Figures 4 and 5).

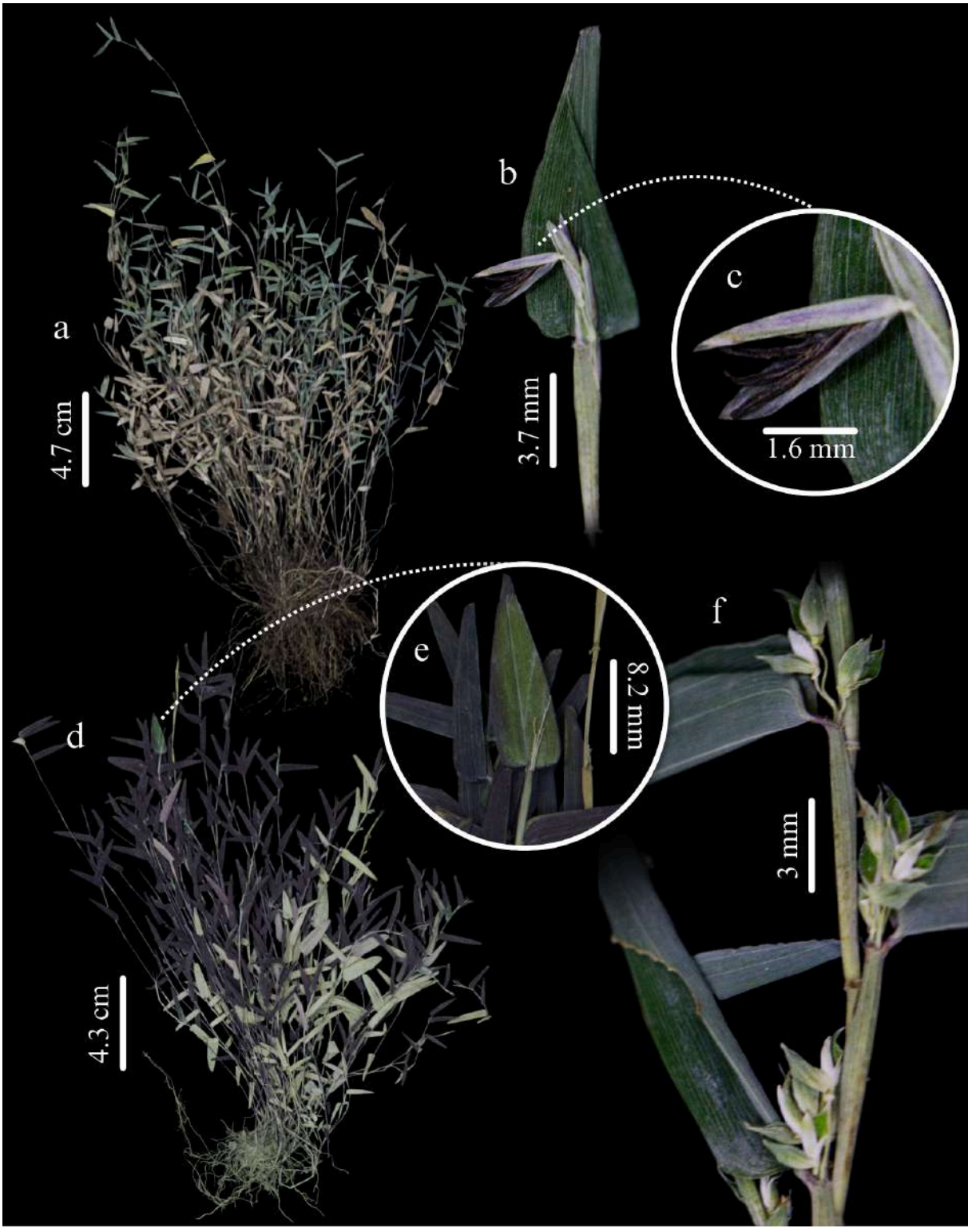

Figure 20. *Raddiella esenbeckii* habit (a); branch leaf and male spikelets (b); male spikelet in detail; purple colored specimen habit (d); branch leaf in detail (e); and branch leaves and female spikelets (f).

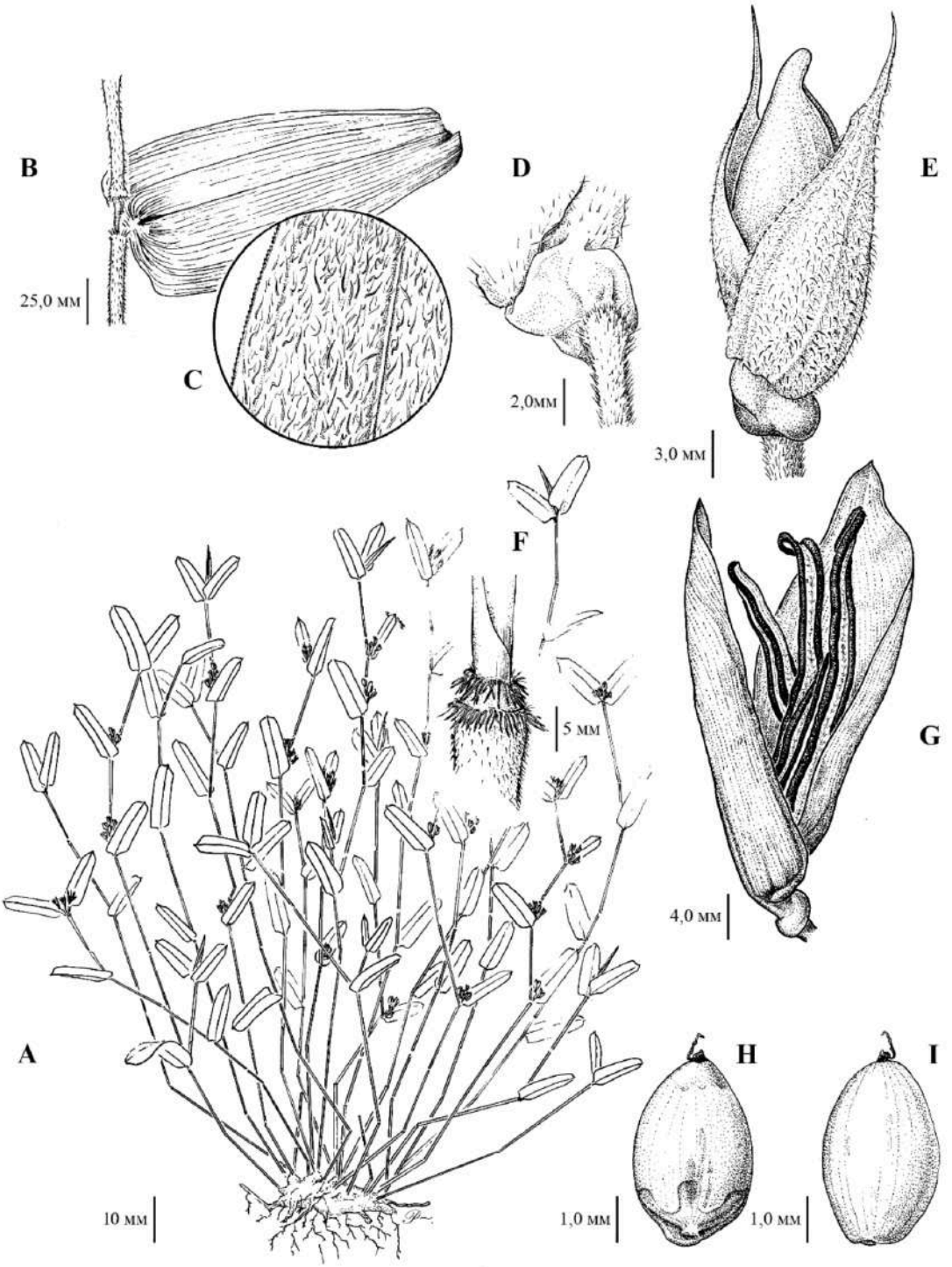

Figure 21. *Raddiella esenbeckii* habit (a); branch leaf (b); branch leaf abaxial surface (c); pulvinus (swollen rachis disarticulation) below female spikelet (d); female spikelet (e); fringe of trichomes along the nodal line (f); male spikelet (g); mature caryopsis (h, i). Illustration by Peñaloza H.

Herbaceous culm, 14–30 cm tall; internode 0.3–0.5 mm in diameter, glabrous to sparsely puberulent, wax deposition absent, hollow, stramineous to blackened; wall ca. 0.2 mm thick; node prominent, stramineous or greenish brown, fringe of trichomes along the nodal line present, supranodal ridge absent; branch complement non-apsidate, with 1–2 branches, with 1 main branch, nodes stramineous or not conspicuously colored. **Culm leaf** absent. **Branch leaf** with sheath 7.5–9.1 mm long, overlapping margin glabrous, underlapping margin ciliolate, abaxial surface puberulent, strigose, scabrous, with sparse long trichomes, larger and denser trichomes toward the base, light green to stramineous; auricles absent; inner ligule ca. 0.2 mm long, membranous, with ciliolate apex; outer ligule absent; fimbriae absent; pseudopetiole 0.5–0.75 mm long, abaxial surface puberulent to pubescent, adaxial surface puberulent to strigose, light green to greenish red; blade 6.5–21 × 5.5–8 mm, abaxial surface puberulent, strigose, setose or glabrous, adaxial surface scabrous over the veins and sparsely puberulent at the base, glabrous on the remainder, or wholly sparsely puberulent to glabrous, deltate to narrowly triangular, length:width ratio of 1.1–3.25, base truncate, apex acuminate, sharp, cuspidate or mucronate, margin scabrous, light green to dark green, without abaxial dark-green stripe on one of the margins; midrib most prominent abaxially, becoming indistinct among the other veins along the basal one-quarter of the blade. **Synflorescences** terminal with unisexual male spikelets bearing 1 fertile floret; axillary with unisexual female spikelets bearing 1 fertile floret; basal absent. **Female spikelet** 2 × 0.7–1.2 mm; glume I (lower) 1.75–2.5 × ca. 1 mm, abaxial surface puberulent, 3-nerved, light green to

stramineous; mucronate; awnless; glume II (upper) 1.6–2.5 × 0.5–1 mm, abaxial surface glabrous to puberulent, 3-nerved, light green to stramineous; mucronate; awnless; lemma 1.5–1.9 × 0.5–1 mm, abaxial surface glabrous, light green or whitish; non-mucronate; awnless; palea 1.5–1.75 × 0.6–0.8 mm, abaxial surface glabrous, light green or whitish. **Male spikelet** 3.5(–4.5) × 0.5–1 mm; glume I (lower) absent; glume II (upper) absent; lemma 3.5–4 × 1–1.5 mm, abaxial surface glabrous, light green, whitish or pale vinaceous; non-mucronate or rarely mucronate; awnless; palea 3.5–4 × 1–1.25 mm, abaxial surface glabrous, light green to whitish or pale vinaceous. **Caryopsis** 1–1.2 × 0.5–0.6 mm, elliptic to ovate, amber brown.

Sampled material: BRAZIL. GOIÁS: Águas Lindas de Goiás, Vale Encantado, 15º46'45.45"S 48º16'11.46"W, 10.VIII.2024, fl., *J.V. Vendramini-Gomes & C.O. Castro 61* (UB); Alexânia, Olhos D'Água, Rua Paraná, 16º1'14,9"S 48º36'13,2"W, 14.XII.2023, *R.C. Oliveira et al. 3924* (UB); Pousada Cachoeira do Ouro, 16º00'09.29"S 48º38'04.46"W, 25.VII.2024, *J.V. Vendramini-Gomes & C.O. Castro 52* (UB); Trilha para cachoeira "Proibidão", 16º00'42.46"S 48º37'45.37"W, 18.V.2025, fr., *J.V. Vendramini-Gomes & V.P. Moreira 107* (UB), Pirenópolis, 15º48'46.98"S 48º51'23.03"W, 17.IV.2024, fl. & fr., *R.C. Oliveira & J.V. Vendramini-Gomes 3948* (UB); Cachoeira Meia-Lua, 15º49'42.89"S 48º55'12.27"W, 30.IV.2024, fl. & fr., *J.V. Vendramini-Gomes et al. 42* (UB); Rio das Almas, 15º50'48.20"S 48º57'14.78"W, 30.IV.2024, fl. & fr., *J.V. Vendramini-Gomes et al. 34* (UB); Santo Antônio do Descoberto, 15º57'26.86"S 48º20'57.56"W, 18.II.2024, fl., *J.V. Vendramini-Gomes & C.O. Castro 2* (UB).

Comments: *Radiella esenbeckii* can be readily distinguished by: (i) its small stature—the tallest individuals reaching only about 30 cm (Figures 20 a, d; 21 a), which is shorter than even the smallest *Olyra* specimens found in the EMC; and (ii) its deltate to narrowly

triangular branch leaf blades (Figures 20 b, e; 21 b), a feature unique among the Olyreae occurring in the EMC. In addition to these vegetative traits, this species is the only one in the area exhibiting sexually dimorphic synflorescences, with terminal male (Figure 20 b, c) and axillary female ones (Figure 20 f).

This species preferentially inhabits the margins of water bodies, edges, and the interior of forests, where it frequently forms dense populations. Although the literature mentions the presence of an auricle on only one side of the sheath apex (Zuloaga & Judziewicz 1991), none of the collections made in this study confirmed this characteristic.

Regarding the trichomes, the abaxial surface of the sheath showed variations. In two specimens, sparse puberulent trichomes were found, arranged in rows parallel to the veins. Additionally, in one of the specimens, the presence of a mucronate male lemma was recorded, a characteristic that differs from the other specimens analyzed. A swollen rachilla articulation can be observed below each spikelet (Figures 21 d, e, g), larger in the female ones, a character not described for the species. Some species of *Olyra* possess a similar structure, named pulvinus by Soderstrom and Zuloaga (1989).

The individuals exhibit leaf coloration that varies between shades of green and stramineous, with possible vinaceous spots. However, one specimen was recorded with the whole abaxial surface of the leaf blade purple (Figure 20 d), a markedly distinct characteristic compared to the vinaceous spots. This specimen was found on a steep terrain, within a large population.

All individuals observed in this population displayed folded leaf blades during the day, possibly indicating water stress. The literature mentions nyctinastic movements, such as the leaf blade folding at night or under water stress conditions (Zuloaga & Judziewicz 1991). Thus, it is suggested that the marked purple coloration observed may also be associated with this condition, although such an aspect has not been previously reported.

Based on the material examined, the flowering period was identified between February and August, while fruiting occurs between April and May.

***Rhipidocladum parviflorum* (Trin.) McClure**, Smithsonian Contr. Bot. 9: 105 (1973).

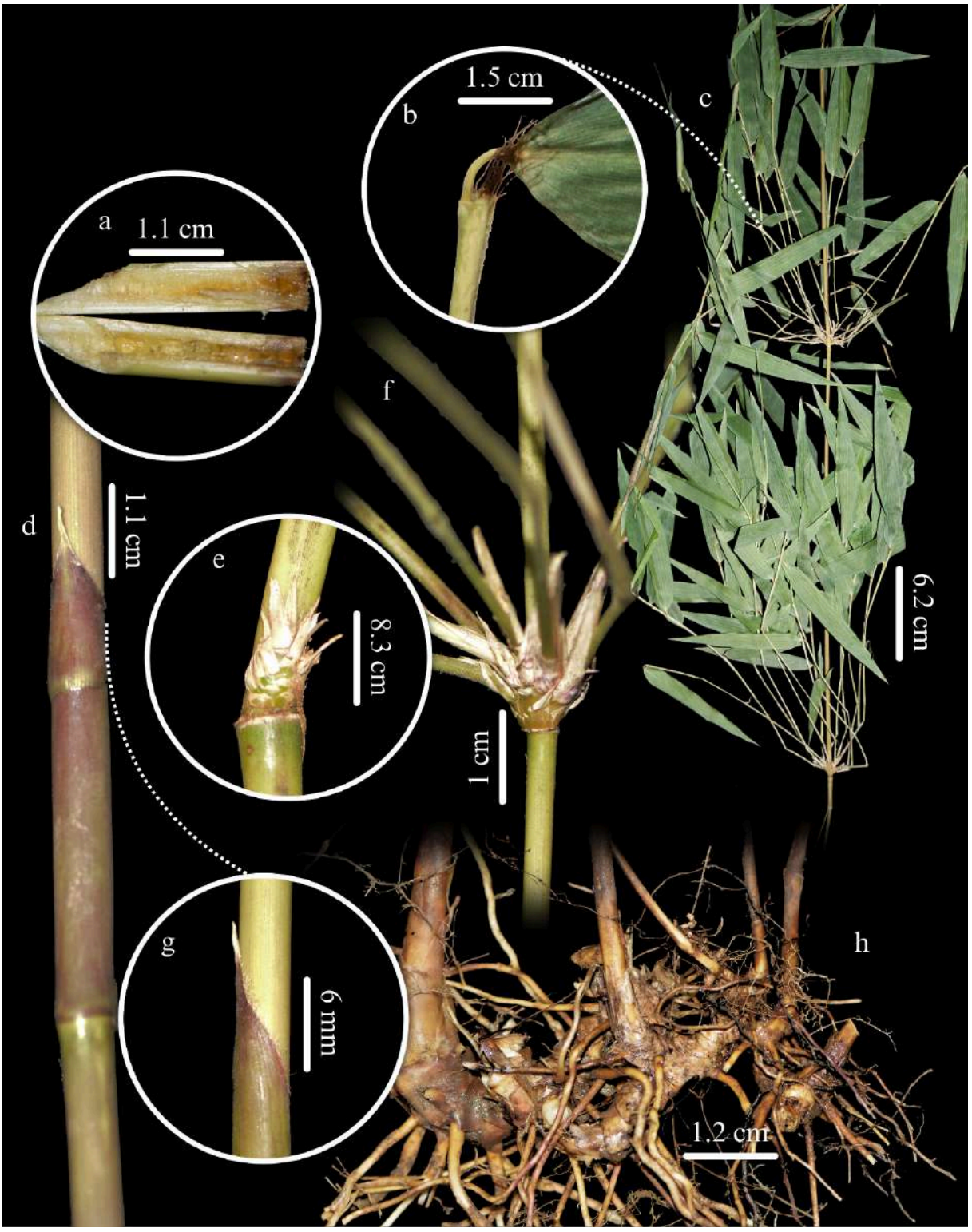

Figure 22. *Rhipidocladum parviflorum* Tabashir-filled internode (a); branch leaf fimbriae (b); habit (c); culm leaf (d); bud complement (e); branch complement (f); culm leaf in detail (g); and rhizome (h).

Lignified culm, 95–361.2 cm tall; internode 1.1–5.6 mm in diameter, wholly glabrous or pubescent just above the nodal line and rarely below the nodes, wax deposition absent, hollow, pale green; wall 0.4–1.2 mm thick; node prominent, stramineous, fringe of trichomes along the nodal line absent, supranodal ridge absent or sometimes slightly present within nodes of the same plant; branch complement apsidate, with 4–20+ branches, without a main branch, stramineous. **Culm leaf** with sheath 31.4–38.5 × 22.6–26.6 mm, abaxial surface pubescent near the margins, occasionally puberulent apically, glabrous on the remainder, adaxial surface glabrous, light green to stramineous; auricles absent; inner ligule 0.6 mm long, membranous, with ciliate apex; outer ligule absent; fimbriae absent or few up to 2 mm long, entirely free or fused, not extending to the margins, blackened; blade sessile, erect, measuring 9.7–33.7 × 17–22.6 mm, margin ciliate, abaxial surface glabrous to papillose, adaxial surface densely puberulent apically, sparsely puberulent on the remainder, triangular, vinaceous or pale green with vinaceous apex. **Branch leaf** with sheath 19–26.9 mm long, overlapping margin ciliate, underlapping margin glabrous, abaxial surface densely pubescent to glabrous, adaxial surface glabrous, light green; auricles absent; inner ligule 0.3–0.7 mm long, membranous, with ciliolate to ciliate apex; outer ligule 0.2–0.3 mm long, membranous, with ciliolate to ciliate apex; fimbriae 2–6.8 mm long, free, stramineous to brown-vinaceous; pseudopetiole 1.4–2.6 mm long, abaxial surface glabrous or pubescent, adaxial surface puberulent, yellowish green; blade 48.9–91.1 × 7.8–14.4 mm, abaxial surface densely pubescent at the base, pubescent to scabrous on the remainder, dark-green marginal band papillose, adaxial surface scaberulent to papillose, lanceolate to linear-lanceolate,

length:width ratio of 6.3–8, base cuneate, apex acuminate, margin scabrous, green to light green, with abaxial dark-green marginal stripe on one of the margins; midrib most prominent abaxially, becoming indistinct among the other veins along the basal one-third to three-quarters of the blade. **Synflorescences** not observed. **Spikelet** not observed. **Caryopsis** not observed.

Sampled material: BRAZIL. GOIÁS: Abadiânia, 16º10'35.8"S 48º42'50.89"W, 01.II.2025, *J.V. Vendramini-Gomes & C.O. Castro 65* (UB); 16º10'35.8"S 48º42'50.89"W, 01.II.2025, *J.V. Vendramini-Gomes & C.O. Castro 66* (UB).

Comments: The species resembles *A. verticillatum*, owing to the presence of an apsidate branch complement (Figure 22 e, f) and the abaxial marginal dark-green stripe on one margin of the branch leaves—a characteristic shared among members of the Arthrostylidiinae subtribe (represented in the EMC by the genera *Actinocladum, Aulonemia, Merostachys,* and *Rhipidocladum*). However, it can be readily distinguished by the absence of an outer ligule and of fimbriate ruffles on the shoulders of the culm leaf sheaths (Figure 22 d, g), by its smaller branch leaf blades (48.9–91.1 × 7.8–14.4 mm vs. 94–205 × 10–31.5 mm in *A. verticillatum*), and by its scandent habit (Figure 22 c)(vs. the mainly erect or slightly arching habit of *A. verticillatum*).

Similarly, *A. aristulata* and *M.* cf. *filgueirasii* also resemble the species, sharing the abaxial dark-green stripe on one margin of the branch leaves and a scandent habit. *Merostachys* cf. *filgueirasii*, however, typically exhibits initially erect culms that arch toward the apex when fully mature, although young scandent individuals have also been recorded in the EMC. These two species can be distinguished from *R. parviflorum* by (i) the absence of culm leaves (vs. presence) and a non-apsidate branch complement with only one or two

branches in *A. aristulata* (vs. apsidate and numerously branched); and (ii) in *M.* cf. *filgueirasii*, scabrous and mottled internodes (vs. smooth and wholly pale-green), the presence of an outer ligule on the culm leaves (vs. absence), and reflexed culm-leaf blades (vs. erect).

Lastly, *Chusquea* aff. *calderoniae* also resembles *R. parviflorum* by its scandent habit and its numerously branched branch complements. In *C*. aff. *calderoniae*, however, the complements are non-apsidate and usually bear a dormant main branch, whereas in *R. parviflorum* the branch complement is apsidate, thus lacking a main branch. Moreover, *C*. aff. *calderoniae* differs by having solid internodes and non-fimbriate branch leaves, in contrast to the hollow internodes and fimbriate branch leaves (Figure 22 b) of *R. parviflorum*.

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