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Inventory

Wood-inhabiting corticioid and poroid fungi (Basidiomycota) from Reserva Ecológica da Universidade Estadual de Goiás, a remnant of the Brazilian Cerrado

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Abstract: Corticioid and poroid fungi are traditional morphological groups composed of ligninolytic species. Due to their efficiency in wood decomposition process, many species have great ecological importance, especially in nutrient cycling, as well as for their biotechnological properties. Nevertheless, knowledge about these fungi is scarce in many phytogeographic regions of Brazil, as is the case of the Cerrado, since mycodiversity studies in this biome are mainly focused on areas of the São Paulo state. Here we present the taxonomic inventory of corticioid and poroid fungi from the Reserva Ecológica da Universidade Estadual de Goiás (REC-UEG), a Cerrado remnant in Anápolis, Goiás, Brazil. The area is covered by three typical Cerrado landscapes (cerrado *stricto sensu*, mesophilic forest, and gallery forest), widely explored for scientific and educational purposes by the academic and regional community which seeks to learn about and preserve its biodiversity. Exsiccates deposited in the fungarium of the Universidade Estadual de Goiás (HUEG-Fungi) were analyzed. They are the result of collections made over 20 years, in approximately 103 ha of the reserve. Samples were characterized macro and microscopically and identified based on specialized literature. 51 species were recognized, which are distributed in 33 genera, 15 families, and five orders. Species were most frequent in forested areas and among them, six are new occurrence records for the Cerrado, nine for the Midwest region, and nine for the Goiás state. These results contribute to increase the knowledge of these fungi in the Cerrado, as well as geographic distribution, and show the relevance of preserving the reserve for the regional Funga representativity.
Keywords: *Hymenochaetaceae; inventory; macrofungi; Polyporaceae; wood decayers.*

Fungos corticioides e poroides (Basidiomycota) que habitam madeira da Reserva Ecológica da Universidade Estadual de Goiás, um remanescente do Cerrado Brasileiro

Resumo: Fungos corticioides e poroides são assim agrupados com base em aspectos morfológicos e compostos por espécies essencialmente lignícolas. Por sua eficiência no processo de decomposição da madeira, muitas espécies desses grupos apresentam grande importância ecológica, especialmente na ciclagem de nutrientes, além de propriedades para aplicações biotecnológicas. Entretanto, o conhecimento sobre esses fungos é escasso em algumas regiões fitogeográficas do Brasil, como é o caso do Cerrado, uma vez que os estudos da micodiversidade no bioma estão focados principalmente em áreas do estado de São Paulo. Portanto, aqui apresentamos o inventário taxonômico de fungos corticioides e poroides da Reserva Ecológica da Universidade Estadual de Goiás (REC-UEG), um remanescente de Cerrado no município de Anápolis, Goiás, Brasil. A área é formada por três fitofisionomias típicas do Cerrado (cerrado *stricto sensu*, mata mesófila e mata de galeria) e é amplamente explorada para fins científicos e educacionais pela comunidade acadêmica regional, que buscam conhecer e preservar sua biodiversidade. Foram analisadas exsicatas depositadas no fungário da Universidade Estadual de Goiás (HUEG-Fungos), cujo acervo é fruto de coletas realizadas ao longo de 20 anos nos cerca de 103 hectares da reserva. As amostras foram caracterizadas macro e microscopicamente e identificadas com base na literatura especializada. Foram reconhecidas 51 espécies, distribuídas em 33 gêneros, 15 famílias e cinco ordens. As espécies são mais frequentes em áreas de mata na reserva e entre elas seis configuram novos registros de ocorrência

para o Cerrado, nove para região Centro-Oeste e nove para o estado de Goiás. Desse modo, esses resultados contribuem para ampliar o conhecimento desses fungos no Cerrado, assim como da distribuição geográfica das espécies, além de mostrar a importância da preservação da reserva para a representatividade da Funga regional.
Palavras-chave: *Hymenochaetaceae; inventário; macrofungos; Polyporaceae; decompositores de madeira.*

Introduction

Brazil is a forest country, with approximately 58% of its territory covered by natural and planted forests (SNIF 2016). It is known that the large availability of woody resources in tropical forests promotes the presence of several species of macrofungi, as they are predominantly lignocellulolytic organisms (Zmitrovich et al. 2015, Medeiros et al. 2015).

Fungi that are associated with this substrate at some stage in their life cycle are named "wood-inhabiting fungi". The main diversity of wood-inhabiting fungi is represented by some groups of Basidiomycota (Zmitrovich et al. 2015). The decomposition of woody substrates by these fungi is possible due to enzyme production that degrades the constituents of wood (Lundell et al. 2010). For this reason, some species have been used in biotechnological processes to obtain new sources of bioproducts and in bioremediation activity (Salvachúa et al. 2013, Olicón-Hernández et al. 2017, Grassi et al. 2018, Wehaidy et al. 2018).

Within the phylum Basidiomycota, several groups are traditionally defined according to morphological criteria and life habits (Ghobad-Nejhad 2011). Among these are the corticioid and poroid fungi, which are characterized by annual or perennial, resupinate to stipitate basidiomata and exposed hymenium. The resupinated habit (usually) is characteristic of corticioid fungi, while the presence of pores (and variants) on the hymenium is found in poroid fungi (Ryvarden 2004, Larsson 2007). They have worldwide distribution (He et al. 2019) and in Brazil, they occur in all six biomes (Maia et al. 2015). Most of these occurrence records come from long-term surveys, inventories, research made in important remnants of these biomes, or environmental protection areas (conservation units) (Bononi 1984, Bononi et al. 2008, Drechsler-Santos et al. 2013, Motato-Vásquez et al. 2015, Bononi et al. 2017, Xavier et al. 2018).

In the Cerrado (Brazilian savanna), one of the richest and most threatened biomes in the world (Myers et al. 2000, Lahsen et al. 2016, Colli et al. 2020), inventories of corticioid and poroid fungi started in the 1960s, mainly focused on areas in the state of São Paulo (Fidalgo et al. 1965). Since that, research was conducted in other regions of the biome within the states of Goiás (Leonardo-Silva et al. 2020) and Mato Grosso do Sul (Bononi et al. 2017). However, the lack of species inventories in large areas leads to a significant gap in knowledge about the presence and distribution of the taxa.

Over two decades, collections have been made frequently in the Reserva Ecológica da Universidade Estadual de Goiás (REC-UEG), a remnant of Cerrado, located in Central Brazil. These samples are the result of academic-scientific activities carried out by both undergraduate and graduate students, also educational and recreational activities focused on environmental education for elementary school students. The collected species are presented in this study and compose the inventory of corticioid and poroid fungi from the REC-UEG, contributing to increase the knowledge about these fungi groups around the Cerrado and Midwest regions of Brazil.

Material and Methods

1. Study area

The REC-UEG is located in the Campus Central-Sede da Universidade Estadual de Goiás, Anápolis, Goiás, Brazil (Figure 1). It comprises 134 ha while 103 ha is covered by the reserve. The REC-UEG is limited by the University Campus (north), the agro-industrial district of Anápolis (south), rural properties and cargo airport (east), and clothing industries (west).

The region's weather is classified as tropical Cwb type according to Köppen-Geiger climate classification, with a dry cold season (April to September) and a rainy warm season (October to March). The average annual temperature is 25 °C, altitude between 1000 and 1200 m (Cardoso et al. 2014). The area is composed almost entirely of savanna native vegetation (cerrado *stricto sensu*) and forest type (mesophilic forest or semideciduous dry forest and gallery forest) (Figure 2), which Myrtaceae, Rubiaceae, Leguminosae, and Asteraceae are the most dominant families. The cerrado *stricto sensu* has a shrub-arboreal vegetation characteristic of the phytophysiognomy. The mesophilic forest is observed as denser vegetation, where plant species are predominant with various levels of deciduousness in the dry season and is not associated with watercourses. The gallery forest is also composed of dense vegetation and evergreen following small rivers and stream courses (Ribeiro & Walter 2008). Lastly, a vegetation corridor is formed over the Barreiro stream inside the reserve.

Due to the strong environmental impact and reduction of native biodiversity caused by anthropic actions, in 2016 an area management plan was proposed by UEG. Thus, the reserve represents a means to preserve and conserve local biodiversity, native vegetation, springs, and waterways in the area encouraging academic-scientific activities; restoration of degraded areas, recompose native vegetation, and promote environmental education activities including both university community and the regional population.

2. Data collection and analysis

Collections were carried out randomly between 2001 and 2021, in and around REC-UEG. All basidiomata found in wood and leaf litter were photographed and we took information, such as substrate type (living or dead wood) and environment (phytophysiognomy). Preservation and herborization of collected material followed the standard techniques for fungi (Gadelha-Neto et al. 2013) and were deposited at the fungarium of the Universidade Estadual de Goiás (HUEG-Fungi) (Thiers 2021 [continuously updated]).

The dried material was identified taxonomically by macro and microscopic analysis using relevant taxonomic identification keys (Ryvarden 2001, Núñez & Ryvarden 2001, Ryvarden 2004, 2015, 2016, Ţura et al. 2008, Abrahão et al. 2009, Gomes-Silva et al. 2010, Nogueira-Melo et al. 2012, Zmitrovich et al. 2012, Gorjón 2020). For macroscopic characters, we considered the shape, consistency, texture, color, dimension, hymenophore morphology, and the number

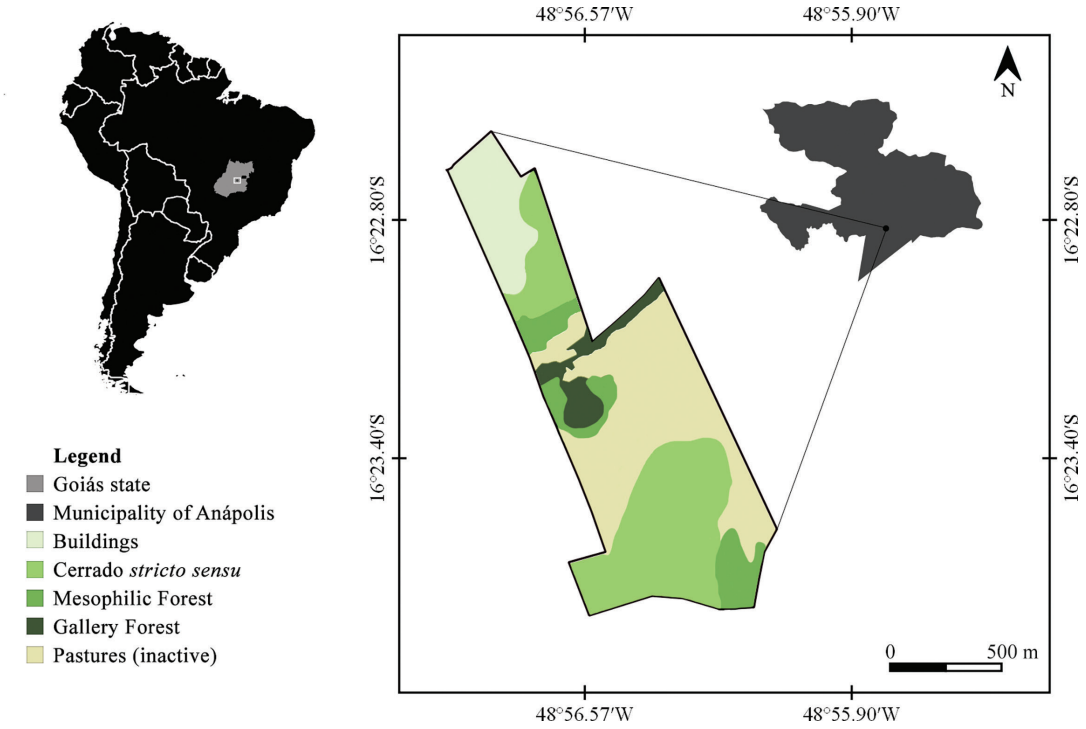

Figure 1. Location of the study area showing typical Cerrado vegetation where the samples were collected in the Reserva Ecológica da Universidade Estadual de Goiás (REC-UEG), Goiás, Brazil.

Figure 2. Phytophysiognomies of the collection area in the rainy season of the Reserva Ecológica da Universidade Estadual de Goiás (REC-UEG), Goiás, Brazil. A-C: Cerrado *stricto sensu*. D-F: Mesophilic Forest. G-I: Gallery Forest.

of pores per mm (in poroid species) of basidiomata. For observations and measurements of microscopic characters, freehand sections were made from dried basidiomata and mounted in 2% potassium hydroxide (KOH) and 1% phloxine (Teixeira 1995). The hyphal system, basidia, basidiospores, and cystidia were observed in Olympus CX31 optical microscope while measurements were performed using the Piximètre software version 5.10 R 1541 (Henriot & Cheype 2017). Melzer's reagent and cotton blue were used to test the amyloid or dextrinoid and cyanophilic reactions of the microscopic structures, respectively. The color classification was based on Kornerup & Wansher (1978). Nomenclature and classification system followed Index Fungorum (http://www.indexfungorum.org) and Mycobank (https://www.mycobank.org/) databases. Global Geographical distribution was based on recent literature, and, in Brazil, we used the List of Brazilian Algae, fungi, and plants (http://floradobrasil.jbrj.gov.br).

We performed the interpolation and extrapolation curve for the data for the area. The curve was based on specimen's abundance (Hill number q = 0; 95% confidence interval), and the extrapolation estimated for double sample size (Chao et al. 2014). The analysis was performed using the iNEXT package (Hsieh et al. 2016) in R software version 3.6.1 (R Core Team 2017) and RStudio environment version 1.2.1335 (RStudio Team, 2019).

Results

We found 253 specimens, 51 species, distributed in 33 genera, 15 families, and five orders (Figure 3). Polyporales (39 species) and Hymenochaetales (6 species) were the most representative orders, comprising 88% of the total. Polyporaceae was the most frequent family (47% of occurrences; 24 species), followed by Hymenochaetaceae (10%; 5 species), Ganodermataceae (8%; 4

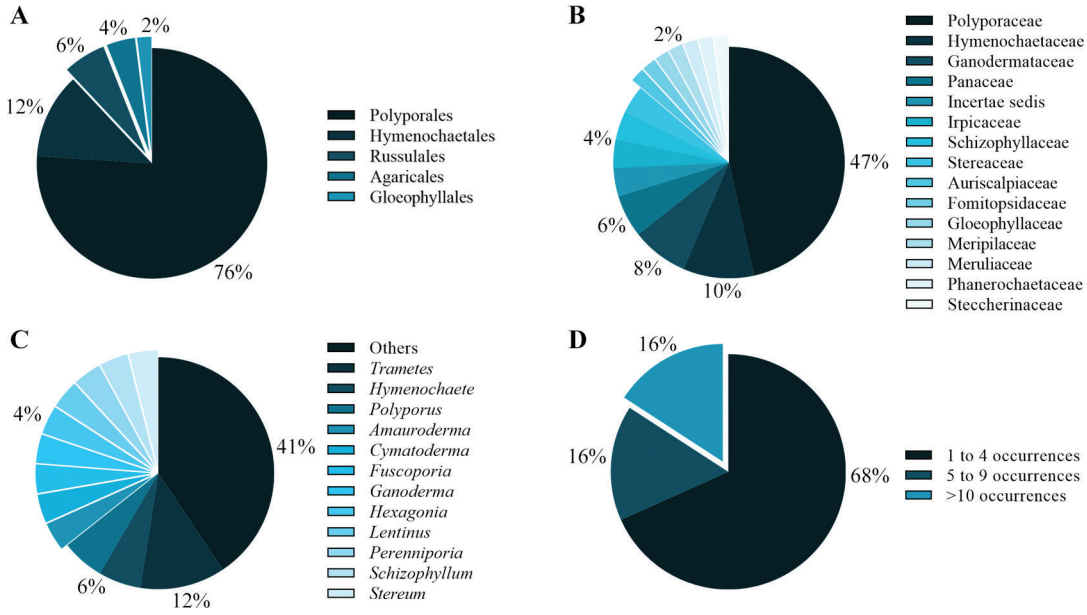

Figure 3. Distribution of corticoid and poroid fungi specimens recorded in the Reserva Ecológica da Universidade Estadual de Goiás (REC-UEG), Goiás, Brazil, according to order (A), family (B), genus (C) and occurrence (D).

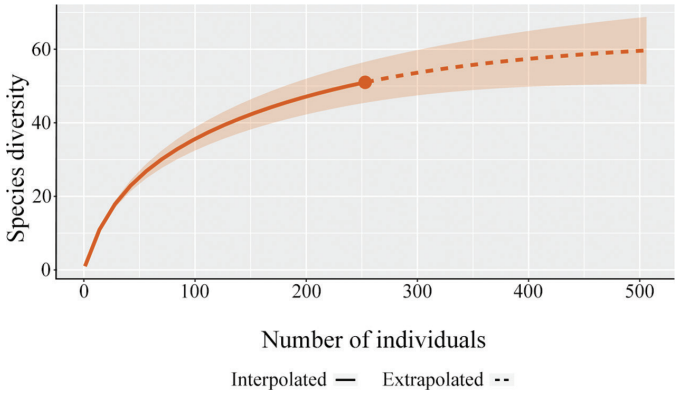

Figure 4. Accumulation curve and extrapolation with 95% confidence interval (shaded area) of corticoid and poroid fungi in the Reserva Ecológica da Universidade Estadual de Goiás (REC-UEG), Goiás, Brazil.

species), and Panaceae (6%; 3 species). *Trametes* was the best-represented genus (12%; 6 species) and the most common species with 10 or more occurrences are *Funalia caperata*, *Lentinus berteroi* (both with 9.5%; 24 specimens), *Pycnoporus sanguineus* (8%; 20 specimens), *Coriolopsis floccosa*, *Favolus brasiliensis* (both with 6%; 15 specimens), *Hymenochaete rheicolor, Polyporus tricholoma* (both with 4.7%; 12 specimens), and *Hexagonia variegata* (4.3%; 11 specimens) (Figure 3). Six of the sampled species are new occurrences for the Cerrado, nine for the Midwest region, and nine for the state of Goiás. We observed that 98% of the species occurred in forest formations, and the rarefaction and extrapolation curve suggest that sampling in the area was satisfactory, although new collections indicate an increase in diversity (Figure 4).

The list of corticioid and poroid fungi species occurring in the REC-UEG is described below. Following we provide data on substrates, occurring phytophysiognomy, and fungarium voucher of each species, as well as taxonomic remarks of those cited for the first time for the Cerrado or with nomenclatural conflicts. An asterisk (*) before the name of the species indicates that the taxon is reported for the first time for the Cerrado, two asterisks (**) Midwestern region, or three asterisks (***) Goiás state.

Agaricales
Schizophyllaceae

Schizophyllum commune Fr.
Description: Cooke (1961).
Substrate: dead wood.
Phytophysiognomy: gallery forest and mesophilic forest.
Material examined HUEG: 3989, 4721, 8126, 8133, 8606, 9615, 10646.

****Schizophyllum umbrinum*** Berk.
Description: Cooke (1961).
Substrate: dead wood.
Phytophysiognomy: mesophilic forest.
Material examined HUEG: 8613.

Gloeophyllales
Gloeophyllaceae

Gloeophyllum striatum (Fr.) Murrill
Basionym: *Daedalea striata* Fr.
Description: Núñez & Ryvarden (2001).
Substrate: dead wood.
Phytophysiognomy: gallery forest.
Material examined HUEG: 159, 10799, 15108.

Hymenochaetales
Hymenochaetaceae

Fuscoporia callimorpha (Lév.) Groposo, Log.-Leite & Góes-Neto
Basionym: *Polyporus callimorphus* Lév.
Description: Groposo et al. (2007).
Substrate: dead wood.

Phytophysiognomy: mesophilic forest.
Material examined HUEG: 8531, 8533, 8567, 10775.

Fuscoporia gilva (Schwein.) T. Wagner & M. Fisch.
Basionym: *Boletus gilvus* Schwein.
Description: Ryvarden (2004) as *Phellinus gilvus* (Schwein.) Pat.
Substrate: dead wood.
Phytophysiognomy: gallery forest.
Material examined HUEG: 4720, 8552.

****Hymenochaete damicornis*** (Link) Lév.
Basionym: *Stereum damicorne* Link.
Description: Parmasto (2001).
Substrate: leaf litter.
Phytophysiognomy: mesophilic forest.
Material examined HUEG: 1573, 15109.

*****Hymenochaete iodina*** (Mont.) Baltazar & Gibertoni
Basionym: *Polyporus iodinus* Mont.
Description: Ryvarden (2004) as *Cyclomyces iodinus* (Mont.) Pat.
Substrate: dead wood.
Phytophysiognomy: gallery forest.
Material examined HUEG: 4020, 10708.

Hymenochaete rheicolor (Mont.) Lév.
Basionym: *Stereum rheicolor* Mont.
Description: Parmasto (2001).
Substrate: living and dead wood.
Phytophysiognomy: gallery forest and mesophilic forest.
Material examined HUEG: 4030, 9305, 10639, 14098, 14602, 14626, 14628, 14639, 14646, 14647, 15110, 15111.

Incertae sedis

Trichaptum perrottetii (Lév.) Ryvarden
Basionym: *Trametes perrottetii* Lév.
Description: Ryvarden (2016).
Substrate: dead wood.
Phytophysiognomy: mesophilic forest.
Material examined HUEG: 10765.

Polyporales
Fomitopsidaceae

Daedalea ryvardeniana Drechsler-Santos & Robledo
Description: Drechsler-Santos et al. (2012).
Substrate: dead wood.
Phytophysiognomy: gallery forest and mesophilic forest.
Material examined HUEG: 4022, 4432, 4477, 4772, 4982, 10732.

Ganodermataceae

Amauroderma aurantiacum (Torrend) Gibertoni & Bernicchia
Basionym: *Ganoderma aurantiacum* Torrend.
Description: Ryvarden (2004).
Substrate: leaf litter.
Phytophysiognomy: mesophilic forest.
Material examined HUEG: 15126, 15127, 15128, 15129.

Amauroderma calcigenum (Berk.) Torrend
Basionym: *Polyporus calcigenus* Berk.
Description: Ryvarden (2004).
Substrate: leaf litter.
Phytophysiognomy: mesophilic forest.
Material examined HUEG: 10640, 15123, 15124, 15125.

Ganoderma multiplicatum (Mont.) Pat.
Basionym: *Polyporus multiplicatus* Mont.
Description: Ryvarden (2004).
Substrate: dead wood.
Phytophysiognomy: gallery forest and mesophilic forest.
Material examined HUEG: 11881, 15134.

Ganoderma testaceum (Lév.) Pat.
Basionym: *Polyporus testaceus* Lév.
Description: Bhosle et al. (2010).
Substrate: dead wood.
Phytophysiognomy: gallery forest and mesophilic forest.
Material examined HUEG: 4367, 10659, 10685, 10781.

Incertae sedis

*****Rickiopora latemarginata*** (Rick) Westph., Tomšovský & Rajchenb. (Figure 5A).
Basionym: *Daedalea latemarginata* Rick.
Description: Westphalen et al. (2016).
Substrate: dead wood.
Phytophysiognomy: mesophilic forest.
Material examined HUEG: 10643.

Remarks: The genus *Rickiopora* Westph., Tomšovský & Rajchenb. was described by Westphalen et al. (2016) to accommodate the species *Daedalea latemarginata* and *Antrodiella angulatopora* Ryvarden, previously considered synonymous (Rajchenberg 1987), in *R. latemarginata*. The species is characterized by pileate to effused-reflex basidiomata, rigid and curled when dried, poroid hymenophore with larger angular to irregular pores (2–4 per mm), sometimes forming daedaloid to hydnoid areas in old, dried specimens; monomitic to pseudo-dimitic hyphal system, and subglobose, hyaline, smooth, thin-walled basidiospores.

Our specimen was found only once in the collection area, even after years of sampling, growing on dead wood from an unidentified angiosperm. Currently, *R. latemarginata* is recorded in Argentina, Brazil, Costa Rica, and Venezuela (Rajchenberg 1987, Ryvarden 2015, Westphalen et al. 2016). Previously cited for Brazil in the Amazonia and Atlantic Forest biomes (Maia et al. 2015, Motato-Vásquez et al. 2015), the occurrence in the present study is the first for the Cerrado.

Irpicaceae

*****Gloeoporus thelephoroides*** (Hook.) G. Cunn.
Basionym: *Boletus thelephoroides* Hook.
Description: Ryvarden (2015).
Substrate: dead wood.
Phytophysiognomy: gallery forest and mesophilic forest.
Material examined HUEG: 4010, 4717, 8524, 8525, 8560, 10730, 14631.

*****Vitreoporus dichrous*** (Fr.) Zmitr.
Basionym: *Polyporus dichrous* Fr.
Description: Ryvarden (2015) as *Gloeoporus dichrous* (Fr.) Bres.
Substrate: dead wood.
Phytophysiognomy: gallery forest.
Material examined HUEG: 4773, 10736.

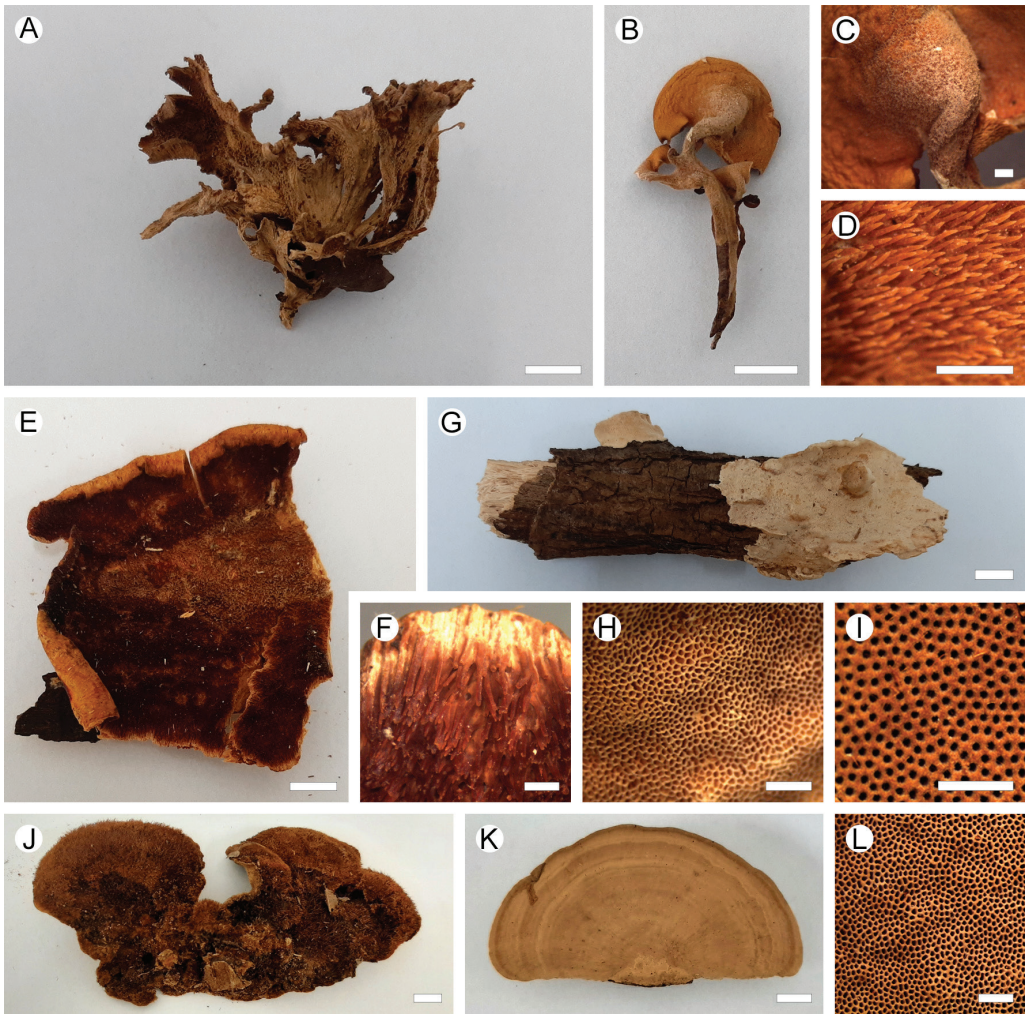

Figure 5. Species cited for the first time in the Cerrado. *Rickiopora latemarginata* (A). *Auriscalpium villipes* (B) with velutine pilear surface near the union with the stipe (C) and hydnoid hymenial surface (D). *Climacodon pulcherrimus* (E) and hydnoid hymenial surface (F). *Perenniporiella micropora* (G) and poroid hymenial surface (H). *Trametes psila* (J) and poroid hymenial surface (I). *Trametes marianna* (K) and poroid hymenial surface (L). Bar = 1 cm (A, B, E, G, J, K); 1 mm (C, D, F, H, I, L).

Meripilaceae

****Rigidoporus microporus** (Sw.) Overeem
Basionym: *Boletus microporus* Sw.
Description: Ryvarden (2016).
Substrate: dead wood.
Phytophysiognomy: mesophilic forest.
Material examined HUEG: 10798.

Meruliaceae

***Climacodon pulcherrimus** (Berk. & M.A. Curtis) Nikol. (Figure 5E, F).
Basionym: *Hydnum pulcherrimum* Berk. & M.A. Curtis.
Description: Moreno et al. (2007).
Substrate: dead wood.
Phytophysiognomy: gallery forest.
Material examined HUEG: 10626.

Remarks: *Climacodon pulcherrimus* is characterized by the dimidate and flattened basidioma; pilear surface light orange (5A4), finely tomentose; hymenial surface light orange (5A4) becoming reddish orange (7A8) in some parts, hydnoid, spines up to 4 mm long, 2–5 per mm; basidiospores ellipsoid, hyaline, smooth, thin-walled (4) 4.6 – 5.6 (6.7) × (1.8) 2 – 3 (3.1) µm. We found our species strongly attached to decaying wood near the stream. Interestingly, after a long herborization period, some regions of the hymenial surface show darker regions (caramelized appearance). *Climacodon pulcherrimus* has a cosmopolitan distribution (Bononi 1979, Moreno et al. 2007) and, in Brazil, occurs in the Amazonia and Atlantic Forest biomes (Maia et al. 2015), and is now cited for the first time for the Cerrado.

Panaceae

Cymatoderma caperatum (Berk. & Mont.) D.A. Reid
Basionym: *Thelephora caperata* Berk. & Mont.
Description: Welden (1960).
Substrate: dead wood and leaf litter.
Phytophysiognomy: gallery forest and mesophilic forest.
Material examined HUEG: 4003, 4099, 8582, 9307, 10619, 10766, 10767.

******Cymatoderma dendriticum*** (Pers.) D.A. Reid
Basionym: *Thelephora dendritica* Pers.
Description: Welden (1960).
Substrate: dead wood.
Phytophysiognomy: mesophilic forest.
Material examined HUEG: 8568, 8576, 14634.

Panus strigellus (Berk.) Overh.
Basionym: *Lentinus strigellus* Berk.
Description: Ryvarden (2015).
Substrate: dead wood.
Phytophysiognomy: gallery forest.
Material examined HUEG: 2245, 8614.

Phanerochaetaceae

******Phlebiopsis amethystea*** (Hjortstam & Ryvarden) Chikowski & C.R.S. Lira
Basionym: *Porostereum amethysteum* Hjortstam & Ryvarden.
Description: Hjortstam & Ryvarden (1990).
Substrate: dead wood.
Material examined HUEG: 8138.

Polyporaceae

Coriolopsis floccosa (Jungh.) Ryvarden
Basionym: *Polyporus floccosus* Jungh.
Description: Ryvarden & Johansen (1980).
Substrate: dead wood.
Phytophysiognomy: gallery forest and mesophilic forest.
Material examined HUEG: 4034, 8129, 8130, 8523, 8538, 8547, 8550, 8556, 10707, 10718, 14567, 14576, 14580, 14582, 14601.

*****Earliella scabrosa*** (Pers.) Gilb. & Ryvarden
Basionym: *Polyporus scabrosus* Pers.
Description: Ryvarden (2015).
Substrate: dead wood.
Phytophysiognomy: gallery forest and mesophilic forest.
Material examined HUEG: 1698, 3990, 3996.

*****Echinochaete brachypora*** (Mont.) Ryvarden
Basionym: *Polyporus brachyporus* Mont.
Description: Ryvarden (2015).
Substrate: dead wood.
Phytophysiognomy: gallery forest.
Material examined HUEG: 10688.

Favolus brasiliensis (Fr.) Fr.
Basionym: *Daedalea brasiliensis* Fr.
Description: Palacio et al. (2021).
Substrate: living and dead wood.
Phytophysiognomy: cerrado *stricto sensu*, gallery forest, and mesophilic forest.
Material examined HUEG: 2230, 4775, 4974, 8124, 8520, 8534, 8569, 8580, 10630, 10652, 10743, 10768, 14094, 14622, 15112.

Fomes fasciatus (Sw.) Cooke
Basionym: *Boletus fasciatus* Sw.
Description: Ryvarden (2015).
Substrate: dead wood.
Phytophysiognomy: gallery forest.
Material examined HUEG: 8546, 11435.

Funalia caperata (Berk.) Zmitr. & Malysheva
Basionym: *Polyporus caperatus* Berk.
Description: Ryvarden & Johansen (1980) as *Coriolopsis caperata* (Berk.) Murrill.
Substrate: dead wood.
Phytophysiognomy: gallery forest and mesophilic forest.
Material examined HUEG: 3994, 4031, 8526, 8528, 8548, 8551, 8558, 8559, 8563, 8573, 10616, 10723, 14569, 14572, 14574, 14575, 14588, 14591, 15115, 15116, 15117, 15118, 15119. 15120.

Hexagonia hydnoides (Sw.) M. Fidalgo
Basionym: *Boletus hydnoides* Sw.
Description: Ryvarden (2015).
Substrate: dead wood.
Phytophysiognomy: gallery forest and mesophilic forest.
Material examined HUEG: 8147, 8154, 8156, 8157, 8541, 8555, 10627, 10722, 14624.

Hexagonia variegata Berk.
Description: Ryvarden (2015) as *H. papyracea* Berk.
Substrate: living and dead wood.
Phytophysiognomy: gallery forest and mesophilic forest.
Material examined HUEG: 4774, 8127, 8536, 8544, 8564, 10699, 10734, 14155, 14640, 15113, 15114.

Lentinus berteroi (Fr.) Fr.
Basionym: *Agaricus berteroi* Fr.
Description: Ryvarden (2015).
Substrate: dead wood.
Phytophysiognomy: cerrado *stricto sensu*, gallery forest, and mesophilic forest.
Material examined HUEG: 4018, 4465, 4760, 4968, 8132, 8137, 8150, 8506, 8516, 8591, 8602, 10609, 10629, 10755, 10770, 10789, 11433, 14607, 14609, 14610, 14613, 14615, 14617, 14618.

Lentinus velutinus Fr.
Description: Ryvarden (2015).
Substrate: dead wood.
Material examined HUEG: 8530.

*****Microporellus obovatus*** (Jungh.) Ryvarden
Basionym: *Polyporus obovatus* Jungh.
Description: Ryvarden (2015) as *Flabellophora obovata* (Jungh.) Corner.
Substrate: dead wood.
Phytophysiognomy: mesophilic forest.
Material examined HUEG: 14632.

Neodictyopus dictyopus (Mont.) Palacio, Robledo & Drechsler-Santos
Basionym: *Polyporus dictyopus* Mont.
Description: Ryvarden (2016) as *Po. dictyopus.*
Substrate: living and dead wood.
Phytophysiognomy: gallery forest and mesophilic forest.
Material examined HUEG: 4724, 4747, 8532, 8578, 14092, 14592, 15122.

Remarks: *Polyporus dictyopus* was placed in *Neodictyopus* Palacio, Robledo, Reck & Drechsler-Santos based on morphological and phylogenetic analyses (Palacio et al. 2017), and recently transferred to *Picipes* Zmitr. & Kovalenko by Ji et al. (2022). Despite that, we will use *N. dictyopus* as the current name since Ji et al. (2022) did not include South American specimens of the specie in their analyses.

******Perenniporia martia*** (Berk.) Ryvarden
Basionym: *Polyporus martius* Berk.
Description: Ryvarden (2016).
Substrate: dead wood.
Phytophysiognomy: gallery forest.
Material examined HUEG: 8549, 10645.

****Perenniporiella micropora*** (Ryvarden) Decock & Ryvarden (Figure 5G, H).
Basionym: *Perenniporia micropora* Ryvarden.
Description: Decock & Ryvarden (2003).
Substrate: dead wood.
Phytophysiognomy: mesophilic forest.
Material examined HUEG: 10641.

Remarks: The genus *Perenniporiella* was proposed in 2003 by Decock and Ryvarden segregated from *Perenniporia* Murrill (Decock & Ryvarden 2003). Currently, the genus has six species and *P. micropora* differs from the others by the thin, flexible, effused reflexed basidioma, smaller pores, circular to irregular, 8–10 per mm, and basidiospores globose, thick-walled (4.4) 4.5 – 5.6 (5.8) × (3) 3.1 – 4.4 (4.5) µm. The species has been recorded in Belize, Brazil, Costa Rica, Cuba, and Peru (Decock & Ryvarden 2003, Drechsler-Santos et al. 2015). In Brazil, it is cited for the Amazonia and Atlantic Forest biomes (Drechsler-Santos et al. 2015, Maia et al. 2015) and the occurrence reported here is the first for the Cerrado.

Polyporus guianensis Mont.
Description: Ryvarden (2016).
Substrate: dead wood.
Phytophysiognomy: mesophilic forest.
Material examined HUEG: 8575, 8581, 9308, 14088, 14093, 15121.

*****Polyporus leprieurii*** Mont.
Description: Ryvarden (2016).
Substrate: dead wood.
Phytophysiognomy: mesophilic forest and gallery forest.
Material examined HUEG: 2255, 4014.

Polyporus tricholoma Mont.
Description: Ryvarden (2016).
Substrate: dead wood.
Phytophysiognomy: gallery forest and mesophilic forest.
Material examined HUEG: 8565, 8566, 8570, 8579, 10642, 10667, 10716, 10759, 10795, 14099, 14598, 14599.

Pycnoporus sanguineus (L.) Murrill.
Basionym: *Boletus sanguineus* L.
Description: Ryvarden (2016).
Substrate: living and dead wood.
Phytophysiognomy: gallery forest and mesophilic forest.
Material examined HUEG: 8135, 8155, 8158, 8159, 8504, 8505, 8507, 8508, 8535, 8537, 8554, 10621, 10647, 10729, 10731, 10733, 10751, 10782, 10784, 14585.

******Trametes elegans*** (Spreng.) Fr.
Basionym: *Daedalea elegans* Spreng.
Description: Ryvarden (2016).
Substrate: dead wood.
Phytophysiognomy: gallery forest.
Material examined HUEG: 8134, 8140, 8542, 10636, 14649.

****Trametes marianna*** (Pers.) Ryvarden (Figure 5K, L).
Basionym: *Polyporus mariannus* Pers.
Description: Ryvarden (2016).
Substrate: dead wood.
Phytophysiognomy: mesophilic forest.
Material examined HUEG: HUEG 10769.

Remarks: *Trametes marianna* is characterized by the pileate, flattened, semicircular to flabeliform basidioma; pilear surface light orange (5B4) to light brown (5D4), concentrically zoned with sulcate zones; hymenial surface greyish orange (5B3) to brownish orange (5C3), pores circular to irregular, 6–7 per mm; basidiospores cylindrical to ellipsoid, hyaline, smooth, thin-walled (6.5) 7.4 – 9.4 (10.2) × 4 – 5.1 (5.8) µm. A tropical species (Ryvarden 2016) and, in Brazil, occurs in Amazonia and Atlantic Forest biomes (Maia et al. 2015) and is now cited for the first time for the Cerrado.

Trametes pavonia (Hook.) Ryvarden
Basionym: *Boletus pavonius* Hook.
Description: Ryvarden (2016).
Substrate: dead wood.
Phytophysiognomy: gallery forest and mesophilic forest.
Material examined HUEG: 10735, 10739, 10791.

Remarks: *Trametes pavonia* (Hook.) Ryvarden is an illegitimate name because this binomial was already used since 1851: *T. pavonia* (Berk.) Fr [= *T. elegans* (Spreng.) Fr.]. Despite that, we have chosen to use the name since some authors have frequently used it as current. Although the focus of our paper is to explore the fungal diversity in the study area, and not to solve nomenclatural problems of specific taxa, we point out that a new name should be proposed for the species after a review of the type material.

******Trametes polyzona*** (Pers.) Justo
Basionym: *Polyporus polyzonus* Pers.
Description: Núñez & Ryvarden (2001) as *Coriolopsis polyzona* (Pers.) Ryvarden.
Substrate: dead wood.
Material examined HUEG: 8128.

****Trametes psila*** (Lloyd) Ryvarden (Figure 5I, J).
Basionym: *Fomes psila* Lloyd.
Description: Nogueira-Melo et al. (2012) as *Coriolopsis psila* (Lloyd) Ryvarden.
Substrate: dead wood.
Phytophysiognomy: mesophilic forest.
Material examined HUEG: 4035, 10676.

Remarks: A dense layer of thick, matted, light orange (6A5) to reddish brown (8D4) tomentum covering the pileus and small pores (6–7 per mm) invisible to the naked eye on the hymenial surface are characteristic of the species. *Trametes psila* was described in 1915 by Lloyd as *Fomes psila* Lloyd from material collected in Brazil and, currently, it is also recorded in Mexico. In Brazil, its occurrence was known for the Amazon and Atlantic Forest biomes (Nogueira-Melo et al. 2012), and the record of the present study is the first for the Cerrado.

******Trametes versicolor*** (L.) Lloyd
Basionym: *Boletus versicolor* L.
Description: Ryvarden (2016).
Substrate: dead wood.
Phytophysiognomy: mesophilic forest.
Material examined HUEG: 8131.

Steccherinaceae

Antrodiella versicutis (Berk. & M.A. Curtis) Gilb. & Ryvarden
Basionym: *Polyporus versicutis* Berk. & M.A. Curtis.
Description: Ryvarden (2015).
Substrate: living wood.
Phytophysiognomy: gallery forest.
Material examined HUEG: 10625.

Russulales
Auriscalpiaceae

****Auriscalpium villipes*** (Lloyd) Snell & E.A. Dick (Figure 5B-D).
Basionym: *Hydnum villipes* Lloyd.
Description: Ryvarden (2001).
Substrate: dead wood.
Phytophysiognomy: mesophilic forest.
Material examined HUEG: 14876.

Remarks: *Auriscalpium* is a genus described by Gray in 1821 based on *Hydnum auriscalpium* L. Currently, the genus comprises 10 widely distributed species, some of which are known to grow on pinecones (Ryvarden 2001, Wang & Yang 2019). Of these, *A. villipes* is characterized by the central or laterally stipitate basidioma, flabelliform to reniform pileus; pilear surface greyish orange (5B4) to light bown (5D5), velutine near the union with the stipe, becoming glabrous towards the margin; hymenial surface concolor to pilear surface, hydnoid, spines up to 80 mm long, stipe cylindrical, velutine to tomentose; dimitic hyphal system and basidiospores ellipsoid, hyaline and finely ornamented (3.8) 4.1 – 4.9 (5.1) × (3) 3.3 – 3.9 (4.3) µm. It is a species of neotropical distribution (Ryvarden 2001, Wang & Yang 2019) and the only one of the genus that occurs in Brazil. The records in the country come from studies carried out in the Atlantic Forest (Gibertoni et al. 2004), which is the first record for the Cerrado biome.

Stereaceae

*****Stereum hirsutum*** (Willd.) Pers.
Basionym: *Thelephora hirsuta* Willd.
Description: Ţura et al. (2008).
Substrate: dead wood.
Phytophysiognomy: mesophilic forest.
Material examined HUEG: 8522, 8561.

*****Stereum ostrea*** (Blume & T. Nees) Fr.
Basionym: *Thelephora ostrea* Blume & T. Nees.
Description: Chamuris (1988).
Substrate: dead wood.
Material examined HUEG: 4098.

Discussion

The corticioid and poroid Funga of the Cerrado is historically recognized as one of the less studied in the country, a result of poor sampling efforts and few trained taxonomists in the region. According to our recent studies 223 species are known in the biome and the present inventory has about 19% of these species. Furthermore, these records add 24 new species known in Goiás and rank the state as the second richest in corticioid and poroid fungi in the Cerrado, just behind the state of São Paulo.

The diversity of these fungal groups in the REC-UEG is higher in the number of families, genera, and species than those recorded by other inventories of Cerrado macrofungi that included the same taxa (Quevedo et al. 2012, Bononi et al. 2017, Leonardo-Silva et al. 2020). Although the area is formed by a fragment of the biome and part of it has been deforested by anthropic actions, its species richness may be influenced by the varied vegetation found in the Cerrado physiognomic forms, especially the forest formations, and the sampling period, showing the importance of long-term studies to evidence the regional diversity.

Although there is a wide variety of wood-inhabiting corticioid and poroid fungi species, most belong to the orders Hymenochaetales and Polyporales (Kirk et al. 2008). Both orders have species widely distributed worldwide and are known for their wood degrading ability (Lundell et al. 2010, He et al. 2019). These fungi obtain their energy demands by metabolizing the constituents of wood, living or dead, such as cellulose and lignin. This process is only possible due to the broad enzymatic profile of these species, evidencing the potential for biotechnological applications (Zmitrovich et al. 2015, El-Gendi et al. 2022). Currently, some genera and species found in the corticioid and poroid Funga of the REC-UEG are already considered as having potential for biotechnological processes. *Trametes* and *Polyporus* are largely used (or studied) for obtaining enzymes and degrading potential environmental pollutants (Cruz-Morató et al. 2013, Olicón-Hernández et al. 2017, Wehaidy et al. 2018). In addition, previous studies focusing on biotechnological aspects of some species from the reserve have shown potential results (Leonardo-Silva et al. 2018, Naves et al. 2019).

Species widely distributed in Brazil (Maia et al. 2015) also dominated the data recorded at the REC-UEG. On the other hand, 32% of the low-occurrence species in the area, including all the new records reported here, may be related to substrate specificity; production of inconspicuous basidiomata, especially the corticioid fungi; physiological and nutritional aspects of each species for basidioma development, which reduce their sampling on the field. The higher richness found in forest formations was expected since this vegetation presents ideal environmental conditions and varied substrate availability for fungi growth. Differently, the herbaceous vegetation of cerrado *stricto sensu* exposes the community to high temperatures, low humidity levels, and the entrance of winds, reducing the growth and colonization of species that are more sensitive to these climatic variations.

Although the REC-UEG suffers a strong environmental impact due to its location, it is still possible to observe expressive biodiversity that resists. Besides the richness of corticioid and poroid fungi that we reported, previous studies in the area also presented new occurrences for the Cerrado (Alvarenga & Xavier-Santos 2017, Camilo-Cotrim et al. 2020, Ferreira-Sá et al. 2023). Thus, the number of specimens collected over the years, as well as the species richness shows the importance of preservation for regional Funga representativeness. Ditto, it is necessary to establish measures to protect the area, which is also used as a didactic resource by graduate, undergraduate and elementary school students who carry out research activities and educational excursions. In addition, some species collected in the area have been identified, conserved *ex situ,* and represent part of the genetic and biotechnological heritage of the Cerrado.

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Author Contributions

Lucas Leonardo-Silva: Substantial contribution in the concept and design of the study, to data collection, analysis, and interpretation; to manuscript preparation.

Geovane Pereira-Silva: Contribution to data collection, analysis, and interpretation.

Izabel Cristina Moreira: Contribution to data collection and manuscript preparation.

Robson Bernardo Silveira-Silva: Contribution to data collection and manuscript preparation.

Solange Xavier-Santos: Substantial contribution in the concept and design of the study; Contribution to data collection and critical revision, adding intellectual content.

Conflicts of Interest

The authors declare that they have no conflict of interest related to the publication of this manuscript.

Data Availability

The data resulting from this research has been archived in the public data repository Biota Neotropica Dataverse: https://doi.org/10.48331/scielodata.ELHOOR.

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