



Inventory of cyanobacteria and microalgae cited for the National Park of the Chapada dos Guimarães (MT) and 80 new records from the region

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Abstract: Cyanobacteria and microalgae make up a very diverse group and exhibit diverse morphological, biochemical and physiological differences. The knowledge of these organisms that inhabit epicontinental waters in Brazil is extremely heterogeneous in relation to the geographic region and the taxonomic group. Taxonomically there is much more knowledge about the algae of the South and Southeast regions of the country than there is about the algae of the North and Central-West regions. Therefore, this research presents a revised and updated knowledge of the algae that occur in the National Park of the Chapada dos Guimarães (PNCG) and surrounding areas. Our area of study is located in the state of Mato Grosso, in the center-west region of Brazil. The database was obtained from published literature related to taxonomic and ecological inventories, as well as new collections carried out in the area. The collection methods were quite diverse to cover all types of organisms, in plankton, periphyton, filamentous masses, sludge and water accumulated in bromeliads, the new collections are samples collected exclusively in the plankton. They were listed 182 taxa, distributed in 83 genera, 45 families, 11 classes and seven taxonomic divisions. In total, 89 taxa were found in the new samplings, of which nine taxa were already registered in the existing literature, so 80 taxa are new records for the region. A large number of taxa previously mentioned in the literature were not recorded in the sampled environments, most of them composed of Bacillariophyceae, Conjugatophyceae and Euglenophyceae. As well as three species of cyanobacteria of great sanitary importance were registered. Therefore, CGNP has great importance in the maintenance of aquatic biodiversity and to know this community becomes increasingly important to support management measures.

Keywords: cerrado, algae, Planktothrix, taxonomy, streams.

Inventário de cianobactérias e microalgas citadas para o Parque Nacional da Chapada dos Guimarães (MT) e 80 novos registros da região

Resumo: As cianobactérias e as microalgas compõem um grupo bastante diversificado e exibem diversas diferenças morfológicas, bioquímicas e fisiológicas. O conhecimento desses organismos que habitam as águas epicontinentais no Brasil é extremamente heterogêneo em relação à região geográfica e ao grupo taxonômico. Taxonomicamente, há muito mais conhecimento sobre as algas das regiões Sul e Sudeste do país do que sobre as algas das regiões Norte e Centro-Oeste. Portanto, esta pesquisa apresenta um conhecimento revisado e atualizado das algas que ocorrem no Parque Nacional da Chapada dos Guimarães (PNCG) e arredores. Nossa área de estudo está localizada no estado de Mato Grosso, na região centro-oeste do Brasil. O banco de dados foi obtido a partir de literatura publicada relacionada a inventários taxonômicos e ecológicos, assim como novas coletas realizadas na área. Os métodos de coletas foram bastante diversos de modo que abrangesse todo tipo de organismos, no plâncton,

perifiton, massas filamentosas, lodo e água acumulada em bromélias, as novas coletas são amostras coletadas exclusivamente no plâncton. Foram listados 182 táxons, distribuídos em 83 gêneros, 45 famílias, 11 classes e sete divisões taxonômicas. No total, 89 táxons foram encontrados nas novas amostragens realizadas, destes, nove táxons, já haviam sido registrados na literatura existente, portanto 80 táxons são novos registros para a região. Um grande número de táxons citados anteriormente na literatura, não foram registrados nos ambientes amostrados, na sua grande maioria constituído por Bacillariophyceae, Conjugatophyceae e Euglenophyceae. Como também foram registradas três espécies de cianobactérias de grande importância sanitária. Sendo assim o PNCG possui grande importância na manutenção da biodiversidade aquática e conhecer essa comunidade torna-se cada vez mais importante para embasar medidas de manejo.

Palavras-chave: cerrado, algas, Planktothrix, taxonomia, riachos.

Introduction

Cyanobacteria and microalgae comprise a very diverse group of forms, sizes and strategies (Nishimura et al. 2015). However, knowledge about cyanobacteria and microalgae species number and distribution in the epicontinental waters of Brazil is extremely heterogeneous. Taxonomically there is much more knowledge about cyanobacteria and algae of the South and Southeast regions of the country than there is about the algae of the North and Central-West regions (Bicudo & Menezes 2010), nonetheless Menezes et al (2015) showed increase in species numbers from 2010 to 2015, for state of Mato Grosso.

The Upper Paraguay River Basin (UPB), located in the states of Mato Grosso and Mato Grosso do Sul in the Central-West region of Brazil, is divided into three geomorphologically distinct portions: the plateaus, the depressions and the Pantanal plain. Located in the region of the plateaus is Chapada dos Guimarães National Park (CGNP), an important conservation unit of the Cerrado biome. The CGNP possesses great biological diversity and numerous water sources that form several tributaries of the Pantanal, in particular the Coxipó river, which drains more than 55% of the total area of CGNP (Lima & Lima 2009). The CGNP has a fundamental role in conserving the aquatic biota and preserving the water quality of the rivers of the region, whose downstream uses include irrigation, water supply to small farms, fish farming and bathing, as well as the dilution of domestic effluents. Furthermore, the Coxipó river provides more than 30% of the total water supply of the city of Cuiabá, the capital of Mato Grosso (Gomes-Silva 2015). Even in light of the social and environmental relevance of the rivers that drain CGNP, there have been few studies on its aquatic biota, especially the algal community.

Studies on cyanobacteria and microalgae in state Mato Grosso are scarce, being concentrated in the region of the Pantanal wetland (Freitas & Loverde-Oliveira 2013; Menezes et al. 2015; Marçal & Loverde-Oliveira 2015), which makes comparative studies difficult. The first studies carried out in the Chapada dos Guimarães region contributed records of 14 species; *Closterium gracile*, *Closterium tumidum* and *Pleurotaenium maximum* cataloged by Borge (1903a); three of the genus *Spirogyra* and one of the genus *Zygogonium* cataloged by Dias (1986); and seven species of pigmented Euglenaceae cataloged by Menezes (1986).

Dias (1986) employed a variety of techniques and sampling of plankton from different types of substrates, reporting the importance of the watercourses present in the region. Three years after the publication of Dias (1986), CGNP was created by Federal Decree 97.656 on 12 April, 1989, when several local groups and civil entities began to

develop environmental education projects in an attempt to revert the current situation of degradation that was visible in several areas of the region (Teixeira de Oliveira & Haridoim 2010).

In the same year that CGNP was created, Sophia and Silva (1989) contributed to the knowledge of Conjugatophyceae by recording six species. Among these was *Desmidium grevillei* (Syn.: *Desmidium cylindricum*), whose occurrence was not reported again until 25 years later by Fonseca et al. (2014) from the urban area of the municipality of Chapada dos Guimarães. Menezes and Fernandes (1990) are the only ones to have recorded the class Dinophyceae in plankton samples of the region; no other work has since reported the occurrence of this group.

After the work of Menezes & Fernandes (1990), two course-completion papers recorded new occurrences of microalgae in the region, Bazanella (2003; unpublished data), with 32 species of Bacillariophyceae, from plankton samples, and Souza (2004; unpublished data) with 34 taxa of Bacillariophyceae found in phytotelmatic environments of bromeliads. In 2014, Fonseca and collaborators published a list of species from the Quineira river in the Casca river basin, recording 19 species of Zygnematophyceae. The authors did not provide a description of the taxa but presented photographic records of the identified species. As far as we know, there is no synthesis work with registration of cyanobacteria and microalgae for the CGNP region. The data are fragments in articles, dissertations, and course completion papers.

Here we provide an inventory of the cyanobacteria and microalgae recorded in the literature for CGNP and the surrounding area. In doing so, we also reported 80 new records of occurrences from new collections for the park region.

Materials and Methods

1. Study site

The Chapada dos Guimarães National Park (CGNP) is one of the principal conservation and protection units of the Cerrado biome in Brazil. It is located in the Central-West region of the country in the state of Mato Grosso, within the municipalities of Chapada dos Guimarães and Cuiabá. It encompasses approximately 32.630 ha (Lopes et al. 2009), and includes numerous springs, trails, streams, rivers, backwaters and waterfalls, and whose rivers flow into the Cuiabá river, one of the main tributaries of Pantanal (Figure 1). The CGNP is buffered from the intense anthropogenic activities that occur in the region by an Environmental Protection Area (EPA).



Edition: Silva, S.P. Adapted from Gomes-Silva, 2015

Figure 1. Illustrative map indicating the location of the planktonic algae sampling stations in the watercourses of Chapada dos Guimarães National Park (CGNP) - MT, Brazil, and its surrounding area. (Map adapted from Gomes-Silva 2015).

The region experiences two very different, well-defined seasons with regard to rainfall; a drought (dry season) from May to September, and rains (rainy season) from November to April. According to the Koppen classification, the predominant climate type of the region is included in the categories AW and CW (Padilha Junior & Nunes 2014).

2. Data collection

This research was developed from literature related to taxonomic and ecological inventories, what included articles published in scientific journals, course-completion papers, dissertations and theses that have a list of species of algae from CGNP and the surrounding area. The authors of these works applied the following methods: phytoplankton was collected with a plankton net (25 μ m); periphyton and sludge was removed from substrates by scraping; filamentous masses and the waters accumulated in bromeliads was collected directly. In all studies, samples were fixed with Transeau solution. Due to the scarcity of work done in the region, all of these sampling methods were considered, however, only taxa identified to species level were included in the current list.

Aiming to broaden the knowledge about cyanobacteria and microalgae taxa already registered for the area, we carried out a taxonomic inventory at ten collection stations in the region (E1 a E10),

between August and October of 2013 and in the months of March and June of 2014. We analyzed a total of 44 samples of plankton from Claro, Coxipó, Coxipozinho, Paciência and Mutuca rivers (Figure 1; Table 1).

Samples were collected using a plankton net (20- μ m mesh) in the subsurface of the water and preserved in 500 mL flasks containing 4% formalin solution (Bicudo & Menezes 2006). Species identification was based on morphological and metric characteristics of the populations by observing at least 20 individuals of each species on slides with coverslips. Observations were made using a Carl Zeiss optical microscope coupled to an Axiocam 105 color LAB.A1 with maximum resolution of 400X and a digital camera.

For taxonomic analysis of diatoms, samples were oxidized with heated hydrogen peroxide (H_2O_2) and hydrochloric acid (HCl), according to the protocol of the European Committee for Standardization. For the observation of frustules, permanent slides were mounted with Naphrax as an inclusion medium. Measurements of length, width, and number of striations in a range of 10 μ m were taken. Identification of diatoms, when possible, was based on population analysis.

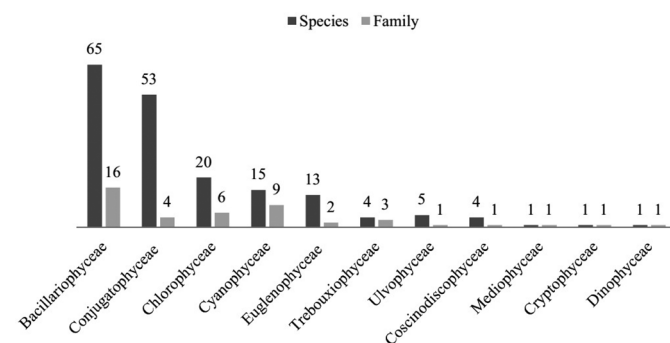
The classification systems used were Komárek (2014) and Rugiero et al. (2015), and the analyzed material was deposited in the liquid phycological collection of the Herbário Central da Universidade Federal de Mato Grosso (UFMTAlgae), campus Cuiabá.

Table 1. Rivers, sampling station, registration number and geographic coordinates of the planktonic microalgae collection areas of the Chapada dos Guimarães National Park - MT, Brazil, and surrounding area.

Rivers	Sampling station	Register N°	Geographic coordinates
Claro	E1	UFMTAlgae 01,06, 08 e 11	15°18'55,00"S, 055°52'57,00"W
Claro	E2	UFMTAlgae 09,13 e 622	15°18'36,90"S, 055°53'23,30"W
Claro	E3	UFMTAlgae 03,15,657, 658, 623 e 624.	15°18'30,70"S, 055°53'08,60"W
Claro	E4	UFMTAlgae 17,626,627e 628	15°18'52,31"S, 055°52'31,84"W
Claro	E5	UFMTAlgae 05, 19,20,629,630 e 631	15°19'23,81"S, 055°52'04,15"W
Coxipozinho	E6	UFMTAlgae 82,98,276 e 637	15°24'33,5"S, 055°49'54,548"W
Claro	E7	UFMTAlgae 97,268,636	15°21'13,151"S, 055°54'52,375"W
Paciência	E8	UFMTAlgae 82,98,276,637	15°21'13"S, 055°54'52"W
Mutuca	E9	UFMTAlgae 83,158,239,284 e 638	15°21'52"S; 055°57'21"W
Coxipó	E10	UFMTAlgae 76,96,152, 258 e 635.	15° 22'25"S; 055°57'50"W

Results and Discussion

Our dataset totaled 182 taxa distributed among 83 genera, 45 families, 11 classes and 7 taxonomic divisions. The most representative class in terms of number of families was Bacillariophyceae (16 families), followed by Cyanophyceae (9 families). The largest number of taxa was from Bacillariophyceae, with 65 taxa (35.71%), followed by Conjugatophyceae with 53 taxa (29.12%), Chlorophyceae with 20 taxa (10.98%), Cyanophyceae with 15 taxa (8.24%), and Euglenophyceae with 13 taxa (7.14%) (Figure 2). A total of 102 taxa were acquired from six published articles and two course-conclusion papers (56.04%). Figure 3 presents some representatives of the groups found in new collections carried out in the park.

**Figure 2.** Number of family and species distributed by classes.

In total, 89 taxa were found in the new sampling performed in the study area, of which nine (*Eunotia camelus*, *Gomphonema gracile*, *Aulacoseira granulata*, *Bambusina borneri*, *Cosmarium pseudoconnatum*, *Cosmarium obsoletum*, *Cosmarium contractum* and *Micrasterias papillifera*) had already been recorded in the literature and 80 representing new records for the region (43.95%) (Table 2). Ninety-three previously cited taxa were not recorded in the sampled environments, most of which were of Bacillariophyceae (45 taxa), Conjugatophyceae (23 taxa) and Euglenophyceae (9 taxa). The high representation of Bacillariophyceae in the literature is due to the different types of environments sampled that favor the development of diatomaceous species.

Bacillariophyceae are one of the most common and dominant groups in both plankton and periphyton (Stevenson 1996; Bellinger & Sigeo 2010), due to their variety of forms that allows colonization of different types of substrates. They also have high species richness, play an important role as primary producers and are considered bioindicators of the trophic state of these aquatic environments (Bellinger & Sigeo 2010). With regard to diatom diversity in general, the Neotropics is considered quite rich compared to the well-studied temperate regions of Europe and North America, and each new published flora results in dozens of new proposed taxa, some of which are particularly endemic (Cavalcante et al. 2014), but no endemism was found in CGNP for this group of algae. Although the occurrence of diatoms is related to water flow and success of substrate colonization, the ability of these organisms to survive in these environments depends on factors associated with their distribution, such as nutrients, light, temperature, among others (Reynolds et al. 2006).

The families with the greatest species richness were Desmidiaceae, with 35 taxa (19.23%), and Eunotiaceae, with 19 taxa (10.44%). Desmids are remarkable because of the great diversity of species that are distributed in a variety of different environments, such as plankton, periphyton and metaphyton (Menezes et al. 2011), and their preference for acidic environments – oligotrophic to eutrophic (Bicudo & Menezes 2006), characteristics that favor the development of the group in the region with its crystalline waters, rivers with waterfalls and preserved riparian vegetation. As with desmids, representatives of the family Eunotiaceae are favored by acidic and nutrient poor environments (Round et al. 1990), prevailing conditions in the rivers and streams sampled in this study (Gomes-Silva 2015).

There was an increase in the records of cyanobacteria in the region, with two species described by Bazanella (2003; unpublished data), *Kamptomena proteus* and *Pseudanabaena galeata*, and 13 species found in current collections (*Cylindrospermopsis raciborskii*, *Asterocapsa submersa*, *Chroococcus dispersus*, *Chroococcus minor*, *Snowella lacustris*, *Komvophoron crassum*, *Komvophoron schmidlei*, *Merismopedia tenuissima*, *Planktothrix agardhii*, *Microcystis aeruginosa*, *Sphaerocavum brasiliense*, *Lyngbya major* and *Pseudanabaena galeata*). Three cyanotoxin-producing species of major public health importance were recorded in the study area, *Cylindrospermopsis raciborskii*, *Planktothrix agardhii* and

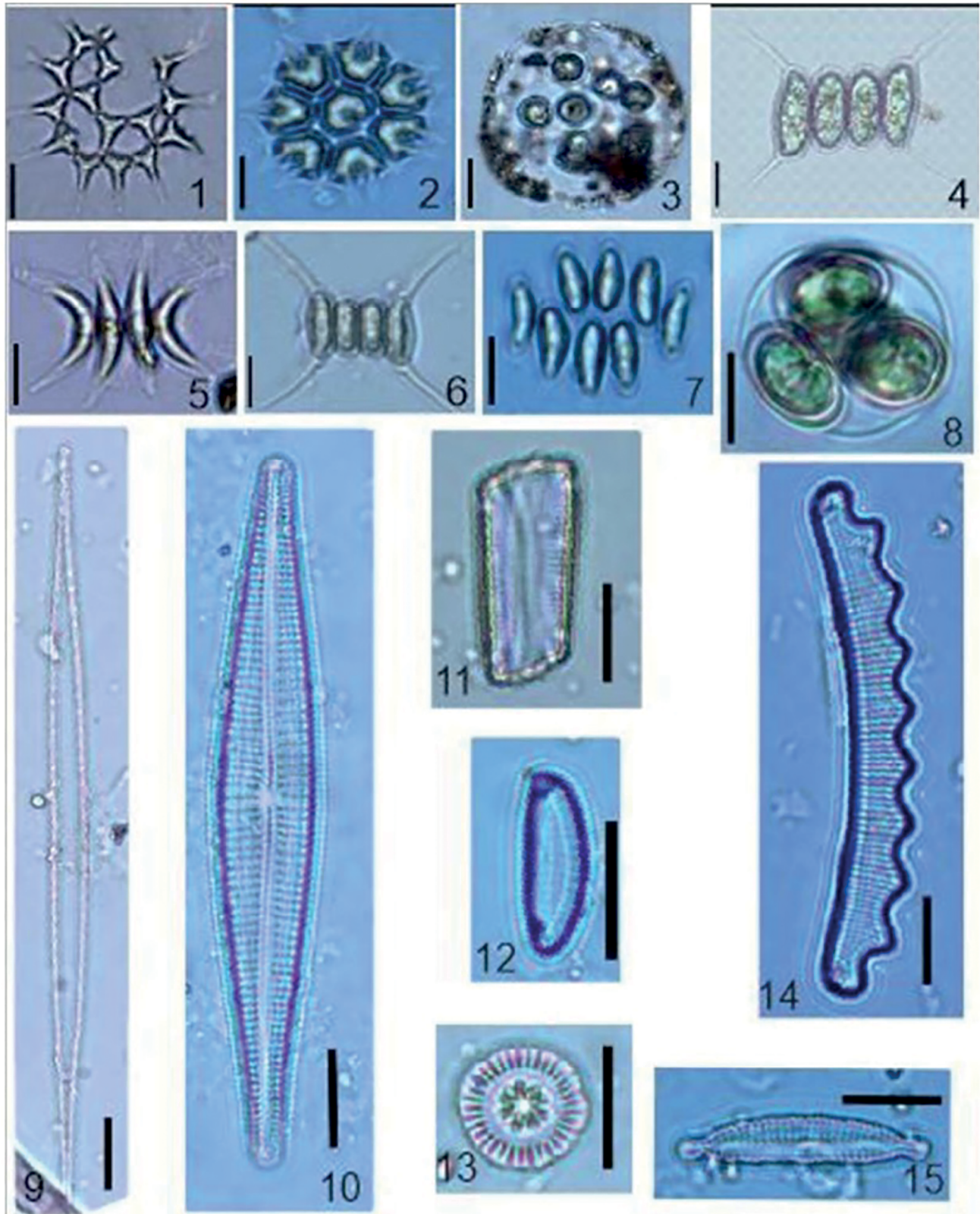


Figure 3. 1. *Monactinus simplex*, 2. *Stauridium tetras*, 3. *Sphaerocystis planctonica*, 4. *Desmodesmus communis*, 5. *Acutodesmus acuminatus*, 6. *Desmodesmus opoliensis*, 7. *Scenedesmus obtusus*, 8. *Oocystis borgei*, 9. *Stenopterobia delicatissima*; 10. *Gomphonema gracile*; 11-12. *Eunotia botuliformis*; 13. *Discostella pseudostelligera*; 14. *Eunotia georgii*; 15. *Encyonema angustecapitatum*. Scale bar: 10 μ m.

Table 2. List of microalgae recorded in the Chapada dos Guimarães National Park and surroundings, Mato Grosso, Central-West Brazil. * new records for the Chapada dos Guimarães National Park and surroundings.

Division/Class/Family/Species	References	Occurrence
Bacillariophyta/ Bacillariophyceae		
Achnantheaceae		
<i>Achnanthes longipes</i> C. Agardh	S.I. Bazanella, 2003, unpublished data	--
Achnanthidiaceae		
<i>Planothidium lanceolatum</i> (Brébisson ex Kützing) Lange-Bertalot, cited as <i>Achnanthes lanceolata</i> (Brébisson ex Kützing) Grunow	S.I. Bazanella, 2003, unpublished data	--
Amphipleuraceae		
<i>Frustulia rhomboides</i> (Ehrenberg) De Toni	S.I. Bazanella, 2003, unpublished data	--
Bacillariaceae		
<i>Denticula thermalis</i> Kützing	S.F. Sousa, 2004, unpublished data	--
<i>Nitzschia linearis</i> W. Smith	S.F. Sousa, 2004, unpublished data	--
<i>Nitzschia modesta</i> Hustedt	S.I. Bazanella, 2003, unpublished data	--
<i>Nitzschia palea</i> (Kützing) W. Smith	S.F. Sousa, 2004, unpublished data	--
<i>Nitzschia sigma</i> (Kützing) W. Smith	S.I. Bazanella, 2003, unpublished data	--
Diadesmidaceae		
<i>Diadesmis confervacea</i> Kützing, cited as <i>Navicula confervacea</i> (Kützing) Grunow	S.I. Bazanella, 2003, unpublished data	--
Eunotiaceae		
<i>Actinella curvatula</i> Kociolek *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E2, E4
<i>Actinella guianensis</i> Grunow *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1
<i>Eunotia bidentula</i> W. Smith	S.I. Bazanella, 2003, unpublished data	--
<i>Eunotia botuliformis</i> F. Wild, Nörpel & Lange-Bertalot *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E2, E3, E4, E5
<i>Eunotia camelus</i> Ehrenberg	S.I. Bazanella, 2003, unpublished data; Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014), ; S.F. Sousa, 2004, unpublished data	E2, E3, E5
<i>Eunotioforma curvula</i> (Hustedt) J.P.Kociolek & A.L.Burliga *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1, E2, E3, E4, E5
<i>Eunotia diadema</i> Ehrenberg, citado como <i>Eunotia serra</i> var. <i>diadema</i> (Ehrenberg) R. M. Patrick	S.F. Sousa, 2004, unpublished data	--
<i>Eunotia faba</i> (Ehrenberg) Grunow	S.I. Bazanella, 2003, unpublished data	--
<i>Eunotia georgii</i> Metzeltin & Lange-Bertalot *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E2, E3, E4, E5, E10
<i>Eunotia guyanensis</i> (Ehrenberg) De Toni	S.I. Bazanella, 2003, unpublished data	--
<i>Eunotia intricans</i> H. Lange-Bertalot & D. Metzeltin *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E2, E3, E4
<i>Eunotia monodon</i> Ehrenberg	S.I. Bazanella, 2003, unpublished data	--
<i>Eunotia pseudoserra</i> P. E. De Oliveira & M. Steinitz-Kannan *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1, E3, E4
<i>Eunotia robusta</i> Ralfs	S.I. Bazanella, 2003, unpublished data S.F. Sousa, 2004, unpublished data	--
<i>Eunotia serra</i> Ralfs *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E2, E3, E4
<i>Eunotia sphagnophila</i> Krasske *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1, E3

Continued Table 2.

Division/Class/Family/Species	References	Occurrence
<i>Eunotia subrobusta</i> Hustedt *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E3, E4
<i>Eunotia trigibba</i> Hustedt *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E2, E3, E4
<i>Eunotia triodon</i> Ehrenberg	S.F. Sousa, 2004, unpublished data	--
Fragilariaceae		
<i>Fragilaria crotonensis</i> Kitton	S.I. Bazanella, 2003, unpublished data	--
<i>Fragilaria rolandschmidtii</i> Metzeltin & Lange-Bertalot *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E2, E3
<i>Fragilariforma virescens</i> (Ralfs) D. M. Williams & Round, citado como <i>Fragilaria virescens</i> Ralfs	S.I. Bazanella, 2003, unpublished data	--
Gomphonemataceae		
<i>Encyonema angustecapitatum</i> Krammer *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E2, E3, E4, E5
<i>Encyonopsis frequentis</i> Krammer *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E2, E4
<i>Gomphonema angustatum</i> (Kützing) Rabenhorst	S.I. Bazanella, 2003, unpublished data	--
<i>Gomphonema brasiliense</i> Grunow	S.I. Bazanella, 2003, unpublished data	--
<i>Gomphonema gracile</i> Ehrenberg *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014); S.F. Sousa, 2004, unpublished data	E1, E2, E3, E4, E10
<i>Gomphonema martini</i> F. Fricke	S.F. Sousa, 2004, unpublished data	--
<i>Gomphonema olivaceum</i> (Hornemann) Brébisson	S.I. Bazanella, 2003, unpublished data	--
<i>Gomphonema parvulum</i> (Kützing) Kützing	S.F. Sousa, 2004, unpublished data	--
<i>Gomphonema turris</i> Ehrenberg citado como <i>Gomphonema augur</i> var. <i>turris</i> (Ehrenberg) Lange-Bertalot	S.F. Sousa, 2004, unpublished data	--
<i>Placoneis pseudanglica</i> E. J. Cox *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E2, E3
Naviculaceae		
<i>Navicula cryptocephala</i> Kützing *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E2, E4, E5
<i>Navicula oblonga</i> (Kützing) Kützing	S.I. Bazanella, 2003, unpublished data	--
<i>Navicula cuspidata</i> (Kützing) Kützing	S.I. Bazanella, 2003, unpublished data	--
Neidiaceae		
<i>Neidium affine</i> var. <i>ceylonicum</i> (Skvortsov) Reimer *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E2, E3
Pinnulariaceae		
<i>Pinnularia gibba</i> var. <i>sancta</i> (Grunow ex Cleve) F. Meister	S.F. Sousa, 2004, unpublished data	--
<i>Pinnularia lata</i> (Brébisson) W. Smith	S.F. Sousa, 2004, unpublished data	--
<i>Pinnularia mayeri</i> Krammer, citado como <i>Pinnularia braunii</i> var. <i>amphicephala</i> (Ant. Mayer) Hustedt	S.F. Sousa, 2004, unpublished data	--
<i>Pinnularia viridis</i> (Nitzsch) Ehrenberg	S.I. Bazanella, 2003, unpublished data	--
Rhopalodiaceae		
<i>Epithemia adnata</i> (Kützing) Brébisson citado como <i>Epithemia zebra</i> (Ehrenberg) Ehrenberg	S.F. Sousa, 2004, unpublished data	--
<i>Epithemia argus</i> (Ehrenberg) Kützing	S.I. Bazanella, 2003, unpublished data	--
<i>Epithemia argus</i> var. <i>longicornis</i> (Ehrenberg) Grunow	S.F. Sousa, 2004, unpublished data	--

Continued Table 2.

Division/Class/Family/Species	References	Occurrence
Surirellaceae		
<i>Iconella curvula</i> (Smith) Ruck & Nakov cited as <i>Stenopterobia curvula</i> (W. Smith) Krammer *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E2, E4
<i>Iconella delicatissima</i> (F.W.Lewis) Ruck & Nakov cited as <i>Stenopterobia delicatissima</i> (F. W. Lewis) Brébisson ex Van Heurck *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1, E2, E4
<i>Surirella elegans</i> Ehrenberg	S.I. Bazanella, 2003, unpublished data	--
<i>Iconella guatimalensis</i> (Ehrenberg) Ruck & Nakov cited as <i>Surirella guatimalensis</i> Ehrenberg	S.I. Bazanella, 2003, unpublished data	--
<i>Surirella minuta</i> Brébisson ex Kützing, citado como <i>Surirella ovata</i> Kützing	S.I. Bazanella, 2003, unpublished data	--
<i>Surirella robusta</i> Ehrenberg	S.I. Bazanella, 2003, unpublished data	--
Stauroneidaceae		
<i>Craticula cuspidata</i> (Kützing) D. G. Mann, citada como <i>Navicula cuspidata</i> (Kützing) Kützing	S.I. Bazanella, 2003, unpublished data	--
<i>Stauroneis deperdita</i> Manguin	S.I. Bazanella, 2003, unpublished data	--
Tabellariaceae		
<i>Diatoma anceps</i> (Ehrenberg) Kirchner	S.I. Bazanella, 2003, unpublished data	--
<i>Diatoma vulgare</i> Bory	S.I. Bazanella, 2003, unpublished data	--
<i>Tabellaria fenestrata</i> (Lyngbye) Kützing	S.I. Bazanella, 2003, unpublished data	--
Ulnariaceae		
<i>Hannaea arcus</i> (Ehrenberg) R. M. Patrick, citado como <i>Ceratoneis arcus</i> (Ehrenberg) Kützing	S.I. Bazanella, 2003, unpublished data	--
<i>Ulnaria capitata</i> (Ehrenberg) Compère, citado como <i>Synedra capitata</i> Ehrenberg	S.I. Bazanella, 2003, unpublished data	--
Bacillariophyta/Coscinodiscophyceae		
Aulacoseiraceae		
<i>Aulacoseira distans</i> (Ehrenberg) Simonsen	S.F. Sousa, 2004, unpublished data	--
<i>Aulacoseira granulata</i> (Ehrenberg) Simonsen	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014); S.F. Sousa, 2004, unpublished data	E1, E2, E3, E4, E5, E9
<i>Aulacoseira herzogii</i> (Lemmermann) Simonsen	S.I. Bazanella, 2003, unpublished data S.F. Sousa, 2004, unpublished data	--
<i>Aulacoseira italica</i> (Ehrenberg) Simonsen	S.I. Bazanella, 2003, unpublished data ; S.F. Sousa, 2004, unpublished data	--
Bacillariophyta/Mediophyceae		
Stephanodiscaceae		
<i>Discostella pseudostelligera</i> (Hustedt) Houk & Klee *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014);	E1, E2, E4
Chlorophyta/Chlorophyceae		
Hydrodictyaceae		
<i>Lacunastrum gracillimum</i> (West & G. S. West) H. McManus *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
<i>Monactinus simplex</i> (Meyen) Corda *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E4, E5
<i>Stauridium tetras</i> (Ehrenberg) E. Hegewald *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
Microsporaceae		
<i>Microspora membranacea</i> Wang	S.F. Sousa, 2004, unpublished data	--

Continued Table 2.

Division/Class/Family/Species	References	Occurrence
Neochloridaceae		
<i>Golenkinia radiata</i> Chodat *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
Scenedesmaceae		
<i>Acutodesmus acuminatus</i> (Lagerheim) P. M. Tsarenko *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
<i>Coelastrum proboscideum</i> Bohlin *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
<i>Coelastrum sphaericum</i> Nägeli, citado como <i>Coelastrum verrucosum</i> (Reinsch) Reinsch *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
<i>Desmodesmus armatus</i> var. <i>bicaudatus</i> (Guglielmetti) E. Hegewald *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
<i>Desmodesmus communis</i> (E. Hegewald) E. Hegewald *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
<i>Desmodesmus opoliensis</i> (P.G. Richter) E. Hegewald *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E4, E5
<i>Dimorphococcus lunatus</i> A. Braun *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
<i>Pectinodesmus javanensis</i> (Chodat) E. Hegewald, C. Bock & Krienitz *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
<i>Scenedesmus obtusus</i> Meyen *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
<i>Westella botryoides</i> (West) De Wildeman *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
Selenastraceae		
<i>Ankistrodesmus arcuatus</i> Korshikov *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
<i>Messastrum gracile</i> (Reinsch) T.S.Garcia, citado como <i>Ankistrodesmus gracilis</i> (Reinsch) Korshikov *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
<i>Monoraphidium contortum</i> (Thuret) Komárková-Legnerová *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E8, E9, E10
<i>Monoraphidium intermedium</i> Hindák *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E6, E7, E8, E9, E10
Sphaerocystidaceae		
<i>Sphaerocystis planctonica</i> (Korshikov) Bourrelly *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
Chlorophyta/Trebouxiophyceae		
Chlorellaceae		
<i>Mucidosphaerium pulchellum</i> (H.C.Wood) C.Bock, Proschold & Krienitz *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
Oocystaceae		
<i>Oocystis borgei</i> J. W. Snow *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
Trebouxiophyceae Família incertae sedis		
<i>Lemmermannia komarekii</i> (Hindák) C.Bock & Krienitz *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
<i>Lemmermannia triangularis</i> (Chodat) C. Bock & Krienitz *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9

Continued Table 2.

Division/Class/Family/Species	References	Occurrence
Chlorophyta/Ulvophyceae		
Ulotrichaceae		
<i>Ulothrix bipyrenoidosa</i> F. E. Fritsch & M. F. Rich	S.F. Sousa, 2004, unpublished data	--
<i>Ulothrix implexa</i> (Kützing) Kützing	S.F. Sousa, 2004, unpublished data	--
<i>Ulothrix limnetica</i> Lemmermann	S.F. Sousa, 2004, unpublished data	--
<i>Ulothrix tenerrima</i> (Kützing) Kützing, citado como <i>Ulothrix variabilis</i> Kützing	S.F. Sousa, 2004, unpublished data	--
<i>Ulothrix zonata</i> (F. Weber & Mohr) Kützing	S.F. Sousa, 2004, unpublished data	--
Charophyta/Conjugatophyceae		
Closteriaceae		
<i>Closterium acutum</i> var. <i>variabile</i> (Lemmermann) Willi Krieger *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1
<i>Closterium cornu</i> Ehrenberg ex Ralfs	Fonseca et al. (2014)	--
<i>Closterium costatum</i> var. <i>borgei</i> (Willi Krieger) Ruzicka *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E5
<i>Closterium ehrenbergii</i> Meneghini ex Ralfs	Fonseca et al. (2014)	--
<i>Closterium gracile</i> Brébisson ex Ralfs	Borge (1903a)	--
<i>Closterium intermedium</i> Ralfs	S.F. Sousa, 2004, unpublished data	--
<i>Closterium jenneri</i> var. <i>cynthia</i> (De Notaris) Petlovany, citado como <i>Closterium cynthia</i> De Notaris	Fonseca et al. (2014)	--
<i>Closterium juncidum</i> Ralfs	S.F. Sousa, 2004, unpublished data	--
<i>Closterium moniliferum</i> var. <i>moniliferum</i> f. <i>gracile</i> Kurt Förster *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E5
<i>Closterium navicula</i> (Brébisson) Lütkenmüller *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1, E3
<i>Closterium tumidum</i> L. N. Johnson	Borge (1903a)	--
<i>Closterium venus</i> Kützing ex Ralfs	S.F. Sousa, 2004, unpublished data	--
Desmidiaceae		
<i>Actinotaenium cruciferum</i> var. <i>cruciferum</i> (De Bary) Teiling *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1, E5
<i>Actinotaenium globosum</i> (Bulnheim) Kurt Förster ex Compère *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E2, E5
<i>Actinotaenium silvae-nigrae</i> (Rabanus) Kouwets & Coesel, citado como <i>Penium silvae-nigrae</i> Rabanus	S.F. Sousa, 2004, unpublished data	--
<i>Actinotaenium wollei</i> (West & G. S. West) Teiling	Fonseca et al. (2014)	--
<i>Bambusina borreri</i> (Ralfs) Cleve, cited in (1) as <i>Bambusina brebissonii</i> Kützing ex Kützing ¹	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014), ¹ Sophia & Silva (1989)	E1
<i>Cosmarium circulare</i> Reinsch, citado em freitas como <i>C. candianum</i> *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E4
<i>Cosmarium connatum</i> Brébisson ex Ralfs	Fonseca et al. (2014)	--
<i>Cosmarium contractum</i> O. Kirchner	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014); Fonseca et al. (2014)	E1, E2, E3, E4, E5
<i>Cosmarium furcatospermum</i> West & G. S. West	Fonseca et al. (2014)	--
<i>Cosmarium obsoletum</i> (Hantzsch) Reinsch	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014); Fonseca et al. (2014)	E3

Continued Table 2.

Division/Class/Family/Species	References	Occurrence
<i>Cosmarium pseudoconnatum</i> Nordstedt	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014); Fonseca et al. (2014)	E9
<i>Cosmarium pyramidatum</i> var. <i>stephanii</i> (Irénée-Marie) Willi Krieger & Gerloff *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1, E5
<i>Cosmarium quadratum</i> Ralfs ex Ralfs *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1
<i>Cosmarium quadrum</i> P. Lundell	Fonseca et al. (2014)	--
<i>Desmidium grevillei</i> (Kützing ex Ralfs) De Bary, citado como <i>Desmidium cylindricum</i> Greville	Sophia & Silva (1989) Fonseca et al. (2014)	--
<i>Desmidium swartzii</i> C. Agardh ex Ralfs *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E3, E4
<i>Euastrum brasiliense</i> Borge	Fonseca et al. (2014)	--
<i>Euastrum sinuosum</i> var. <i>sinuosum</i> Archerk *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1, E2, E4, E5
<i>Hyalotheca dissiliens</i> Brébisson ex Ralfs	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014); Fonseca et al. (2014)	E1, E2
<i>Hyalotheca dissiliens</i> (Smith) Bréb. var. <i>hians</i> Wolle	Sophia & Silva (1989)	--
<i>Micrasterias decemdentata</i> (Nägeli) W. Archer	Fonseca et al. (2014)	--
<i>Micrasterias denticulata</i> Brébisson ex Ralfs *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E4
<i>Micrasterias laticeps</i> var. <i>acuminata</i> Willi Krieger *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1, E2
<i>Micrasterias papillifera</i> Brébisson ex Ralfs	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014); Fonseca et al. (2014)	E1, E3, E4
<i>Micrasterias rotata</i> Ralfs *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1, E3
<i>Micrasterias torreyi</i> var. <i>nordstedtiana</i> (Hyeronimus) Schmidle *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E3
<i>Micrasterias truncata</i> Brébisson ex Ralfs *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1, E5
<i>Pleurotaenium maximum</i> (Reinsch) P. Lundell	Borge (1903a)	--
<i>Sphaerosozma desmidiiforme</i> Borge citado como <i>Spondylosium desmidiiforme</i> (Borge) G.S. West	Sophia & Silva (1989)	--
<i>Spondylosium pulchrum</i> (Bail.) Archer var. <i>pulchrum</i> , in Pritch	Sophia & Silva (1989)	--
<i>Staurastrum margaritaceum</i> Meneghini ex Ralfs	Fonseca et al. (2014)	--
<i>Staurastrum excavatum</i> West & G. S. West *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
<i>Staurodesmus convergens</i> (Ehrenberg ex Ralfs) S. Lillieroth *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1
<i>Staurodesmus validus</i> (West & G. S. West) Thomasson	Fonseca et al. (2014)	--
<i>Teilingia granulata</i> (J.Roy & Bisset) Bourrelly	Sophia & Silva (1989)	--
Mesotaeniaceae		
<i>Netrium digitus</i> (Brébisson ex Ralfs) Itzigsohn & Rothe	Fonseca et al. (2014)	--
<i>Netrium parvum</i> (Borge) Petlovany *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1, E3, E5

Continued Table 2.

Division/Class/Family/Species	References	Occurrence
Zygnemataceae		
<i>Spirogyra irregularis</i> Nägeli ex Kützing	Dias (1986)	--
<i>Spirogyra macrospora</i> (C. B. Rao) Krieger	Dias (1986)	--
<i>Spirogyra neglecta</i> (Hassall) Kützing	Dias (1986)	--
<i>Zygonium ericetorum</i> Kützing	Dias (1986)	--
Cryptophyta/Cryptophyceae		
Cryptomonadaceae		
<i>Cryptomonas marssonii</i> Skuja *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E8, E9
Cyanobacteria/Cyanophyceae		
Aphanizomenonaceae		
<i>Cylindrospermopsis raciborskii</i> (Woloszynska) Seenayya & Subba Raju *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
Chroococcaceae		
<i>Asterocapsa submersa</i> Azevedo, Sant'Anna, Senna, Komárek & Komárková *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1
<i>Chroococcus dispersus</i> (Keissler) Lemmermann *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1
<i>Chroococcus minor</i> (Kützing) Nägeli *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
Coelosphaeriaceae		
<i>Snowella lacustris</i> (Chodat) Komárek & Hindák *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
Gomontiellaceae		
<i>Komvophoron crassum</i> (Vozzhennikova) Anagnostidis & Komárek *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1, E3
<i>Komvophoron schmidlei</i> (Jaag) Anagnostidis & Komárek *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1, E4, E10
Merismopediaceae		
<i>Merismopedia tenuissima</i> Lemmermann *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
Microcoleaceae		
<i>Planktothrix agardhii</i> (Gomont) Anagnostidis & Komárek *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1, E3, E6, E8, E9, E10
Microcystaceae		
<i>Microcystis aeruginosa</i> (Kützing) Kützing *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1, E5
<i>Sphaerocavum brasiliense</i> De Azevedo & C.L.Sant'Anna *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
Oscillatoriaceae		
<i>Lyngbya major</i> Meneghini ex Gomont *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1, E2
<i>Oscillatoria proteus</i> Skuja	S.I. Bazanella, 2003, unpublished data	--
Pseudanabaenaceae		
<i>Pseudanabaena galeata</i> Böcher *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E8, E9, E10
<i>Pseudanabaena limnetica</i> (Lemmermann) Komárek, citado como <i>Oscillatoria limnetica</i> Lemmermann	S.I. Bazanella, 2003, unpublished data	--

Continued Table 2.

Division/Class/Family/Species	References	Occurrence
Euglenophyta/Euglenophyceae		
Euglenaceae		
<i>Trachelomonas volvocina</i> (Ehrenberg) Ehrenberg *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E6, E7, E8, E9
<i>Trachelomonas volvocinopsis</i> Svirenko *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E9
Phacaceae		
<i>Lepocinclis globulus</i> Perty, citado como <i>Lepocinclis ovum</i> (Ehrenberg) Lemmermann var. <i>globula</i> (Perty) Lemmermann	Menezes (1986)	--
<i>Lepocinclis ovum</i> var. <i>dimidio-minor</i> (Deflandre) Conrad.	Menezes (1986)	--
<i>Lepocinclis ovum</i> (Ehrenberg) Lemmermann, citado como <i>Lepocinclis ovum</i> (Ehrenberg) Lemmermann var. <i>ovum</i>	Menezes (1986)	--
<i>Phacus anomalus</i> F. E. Fritsch & M. F. Rich	Menezes (1986)	--
<i>Phacus hamatus</i> Pochmann	Menezes (1986)	--
<i>Phacus hamelii</i> P.Allorge & M.Lefèvre	Menezes (1986)	--
<i>Phacus longicauda</i> (Ehrenberg) Dujardin *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E1, E2, E3, E4, E5
<i>Phacus orbicularis</i> K. Hübner	Menezes (1986)	0
<i>Phacus pleuronectes</i> (O. F. Müller) Nitzsch ex Dujardin *	Taxonomic inventory of Parque Nacional Chapada dos Guimarães-MT (2013-2014)	E3, E5, E9
<i>Phacus pusillus</i> Lemmermann	Menezes (1986)	--
<i>Phacus raciborskii</i> Drezepolski	Menezes (1986)	--
Miozoa/Dinophyceae		
Peridiniopsidaceae		
<i>Parvodinium umbonatum</i> (Stein) S. Carty, citado como <i>Peridinium umbonatum</i> Stein var. <i>umbonatum</i> .	Menezes & Fernandes (1990)	--

Microcystis aeruginosa, although records of the occurrence the toxic species were not expected. These species are successful in shallow eutrophic ecosystems (Bittencourt-Oliveira et al. 2014), different from the region in question, which has environments considered as oligotrophic and slightly acidic (Teixeira-Oliveira & Haridoim 2010). The occurrence of these species may be associated with the presence of mammalian waste from the region, or even the existence of small farms and the very intense tourism that occurs in the studied rivers. This was a concern previously reported by Dias in 1986, and needs to be monitored, including in areas associated with effluents from the urban area of Chapada dos Guimarães, located upstream of the CGNP.

The high concentration of these species in aquatic ecosystems can trigger the production of toxins such as cylindrospermopsin and microcystin, resulting in health problems such as diarrhea, vomiting and weakness, and reaching organs such as the kidneys and the liver. Costa et al. (2017) reports the existence of these potentially toxic species in fishponds in the state of Mato Grosso. Currently in Brazil, microcystins were included as a monitoring parameter in *Portaria 1469* legislation (Brasil 2000) and have been used in water quality control ever since (Guerra et al. 2015).

The CGNP is of vital importance to the maintenance of aquatic biodiversity of the region, and understanding this community is becoming increasingly important for management measures. National

parques are required to undertake inventories of their biodiversity, which serve as sources of reference data (Moresco & Rodrigues 2013). The Cerrado network and the Pró Centro-Oeste-REMISA network have developed projects for the diagnosis, analysis and synthesis of biodiversity data concerning CGNP. The studies of these projects have supported the exchange of technical information, as well as decision-making by the central manager of CGNP for the management and conservation of the aquatic ecosystems of the park.

The results from this work demonstrate an important increase of 80 species in the list of taxa existing in the region, an important advance for the knowledge of the ficology in the Center-West region of Brazil in recent years. However, 93 previously recorded taxa in the region were not sampled again. We believe that part of this loss in our studies is due to the exclusive collect made in the plankton and that other works that cover a greater number of habitats are important to evidence if there was loss of diversity.

Reducing the time interval between species inventories in watercourses is important to monitor the effect of land occupation and the impact of tourism on local biodiversity. For this, the monitoring of species in the region becomes a tool that is closely related to the integrity of the aquatic ecosystems existing in the park and its surroundings. We emphasize the importance of specialized taxonomist professionals for a better understanding of these microorganisms. Due to the great extension

of water drainage of the CGNP, we conclude with the certainty that there are still gaps to be filled regarding studies of cyanobacteria and microalgae for the region studied.

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Author Contributions

Gisele Fernanda Pereira Assis: Substantial contribution in the concept and design of the study; Contribution to data collection; Contribution to data analysis and interpretation; Contribution to manuscript preparation; Contribution to critical revision, adding intellectual content.

Samiris Pereira da Silva: Contribution to data collection; Contribution to data analysis and interpretation; Contribution to manuscript preparation.

Ludmylla Fernanda de Siqueira Silva: Contribution to data collection; Contribution to data analysis and interpretation.

Regiane Luiza da Costa: Contribution to data collection; Contribution to data analysis and interpretation.

Luany Weiler da Fonseca: Contribution to data collection.

Ermelinda Maria De-Lamonica-Freire: Contribution to data collection; Contribution to critical revision, adding intellectual content.

Daniela Maimoni de Figueiredo: Contribution to data collection; Contribution to critical revision, adding intellectual content.

Márcia Teixeira de Oliveira: Substantial contribution in the concept and design of the study; Contribution to data collection; Contribution to data analysis and interpretation; Contribution to manuscript preparation; Contribution to 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.

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