

# ENVIRONMENTAL IMPACT STUDY (EIA-RIMA)

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**LD Celulose S.A.**

**Dissolving pulp mill in Indianópolis and Araguari, Minas Gerais**

## VOLUME II – ENVIRONMENTAL DIAGNOSIS

### TOMO II – BIOTIC ENVIRONMENT

Content

Annex

Distribution

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### 8.3 Biotic Environment

Minas Gerais State is located in the south-central portion of the Brazilian territory and it occupies an area of 588,384 km<sup>2</sup>, representing approximately 7% of the total national territory. Approximately 33.8% of its area is represented by remaining natural vegetation, divided in three major phytogeographic areas (IEF 2018). One of these phytogeographic areas, is Cerrado, it is the area that presents the largest preserved area, representing approximately 20% of the total remaining vegetation (IEF 2018) occupying the west-central portion of the State (Drummond et al. 2005). The Atlantic forest phytogeographic area is located at the eastern portion of the State (Drummond et al. 2005) and it represents approximately 10.3% of the remnants natural vegetation. The smallest of the three phytogeographic areas in Minas Gerais is Caatinga, it represents 3.5% of the remnants natural vegetation (IEF 2018) and is restricted to the northern region of the State (Drummond et al. 2005). The vegetation in each of these regions is not homogeneous, and may occur in different typologies, conditioned to the specificities of climate, relief, soil, and water availability, creating an extraordinary variety of landscapes and ecosystems (Herrmann 2012). This occurs due to the great extension of the State and due to its privileged location, where different climate contexts occur in its interior. These different contexts define the abiotic environment, and it interferes the biotic environment (Salty 2012). With Minas Gerais different reliefs and the specific features of its soils, it represents various landscapes with unique environments to be preserved. The wide surface area, climate, topography and water resources of the territory, it led the development of vegetation extremely rich and diverse, and, therefore, an exuberant fauna (Drummond et al. 2009).

Two of the biomes presented in the State, Cerrado and Atlantic forest, are considered *hotspots* of biodiversity, characterized by their rich biodiversity, high concentration of endemic and threatened species in the highest degree (Mittermeier et al. 2004). The State has just 34% of Cerrado and 12.5% of Atlantic forest, from its original areas (Machado et al., 2004, 2015 SOSMA). The region of the Triângulo Mineiro (at west in Minas Gerais State) is located completely within the domain of Cerrado, with relevant physiognomies to this type of biome, as is the case of vereda ecosystem (Aguilar et al. 2002), seasonal deciduous forest (Silva et al. 2007, 2014) and riparian forest (Rao et al. 2010). In addition to these, there are found also the formations of Cerradão, Cerrado "sensu stricto" and paludosa forest. However, according to Brandão (2000) *apud* Drummond et al. (2005) the Cerrado area in this region is reduced and confined in areas not mechanized.

The inventory the flora and fauna of a particular portion of an ecosystem is the first step to their conservation and rational use. Without a minimum knowledge about which organisms occur in certain location, and about how many species can be found in it, it is virtually impossible to develop any conservation project (Santos, 2003).

#### 8.3.1 Objective

The studies held for the preparation of this document intended to characterize the current situation of the region where the dissolving pulp mill of LD Celulose S.A. will be installed, from secondary and primary data collection, used as reference to assess the impacts of the mill implementation and operation at the region.

In this sense, this diagnosis aimed specially to highlight the existing vegetation formations types and their associated fauna in the cities of Indianópolis (mill site) and Araguari (water intake and treated effluent disposal pipelines), at Minas Gerais State, through primary data collection, being the field surveys studies conducted during the rainy season as well as during the dry season. The first campaign field activities of the vertebrates groups and flora were held from 29th March to 3rd April 2018. The second campaign was held between 13th and 20th May and from 11th to 14th July of the same year. The effort of each group was in total 13 field days.

The vector insects study was held from 8th to 19th July 2018. The aquatic biota collections were from 18th to 20th July 2018. Therefore, this report includes only a field survey campaign in the dry period of insects and aquatic biota, as soon as the works are completed with a new campaign during the rainy season, the report will be forwarded to the competent environmental agency to be an integral part of this licensing process.

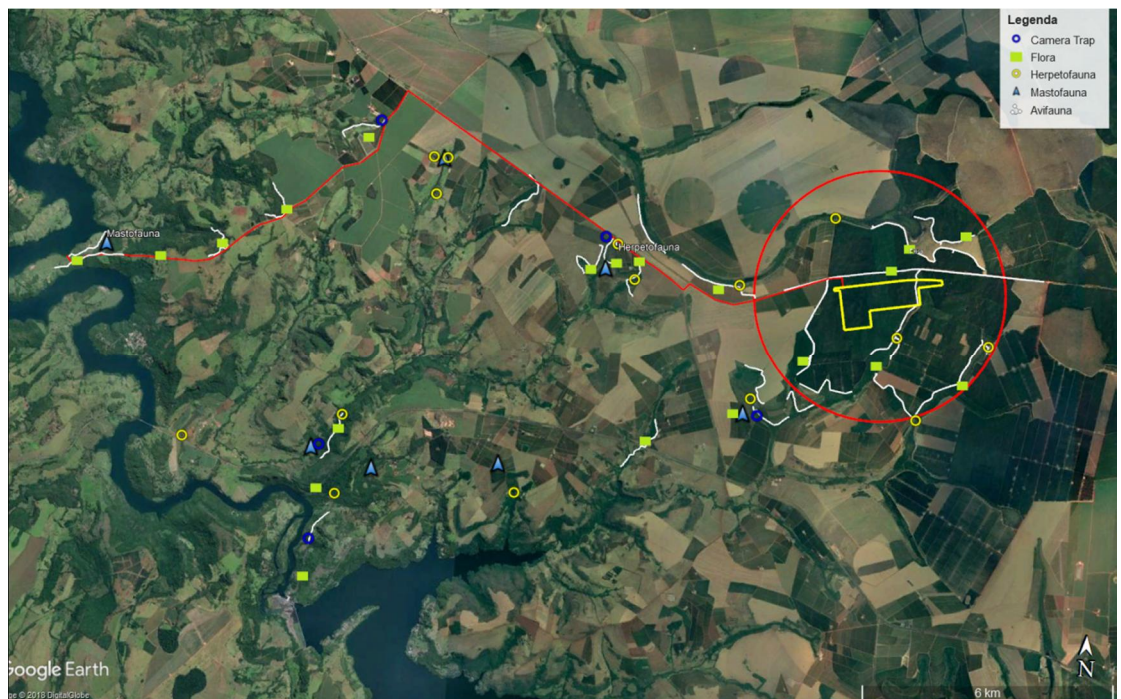
### 8.3.2 Studied Area

In relation to the terrestrial flora and fauna study, the inventory occurred in the cities of Araguari-MG and Indianópolis-MG, in the remnants of vegetation located near the right bank of the Araguari river. There were carried out samplings in the areas of influence of the project, where it was observed remnants of native vegetation and Eucalyptus spp plantations. for commercial purposes, within the region corresponding to the basin of Middle-lower course of the Rio Araguari, according to the classification proposed in the Master Plan of the Araguari River Basin (Parker et al., 2008).

The map with sampling points of flora, herpetofauna, birds and mammals in the studied area near Araguari and Indianópolis cities, in Minas Gerais is shown in the following figure. By the fact that, in the area of direct influence of the enterprise there are no remnants of native vegetation enough to this study, there were also considered other nearby areas with remnants of native vegetation in order to enrich this study.

In order to held the aquatic biota study there were considered two sampling points, located in the rio Araguari in the hydroelectric power plant reservoir Amador Aguiar I, previously named Capim Branco I. Points 1 and 2 are located, respectively, at 18 ° 50 '39.64 S 48°6'43.42" W and 18° 49' 46.46"S 48° 5' 39.94" W. During the execution of field work and also in the ten days immediately preceding samples dates, there was no incidence of rainfall in the region of interest (bancodedados.cptec.inpe.br).





**Figure 1 – Flora, reptiles and amphibians, birds and mammals sampling points map at the studied area near Araguari and Indianópolis cities, MG.**

The vegetation found is within Cerrado forests domain. The vegetation related to watercourses is: riparian forests, paludosa forests and vereda ecosystem. On the other hand, in drier environments, there are found remnants of cerradões (savanna forest, according to IBGE 2012), the cerrado "sensu strictu" (or wooded savanna, according to IBGE 2012) and seasonal deciduous forest. However, the whole area presents anthropogenic influence. According to Rosa et al. (2006), about 50% of the land in this region consists of grasslands, however, these same authors, highlight the existence of approximately 22% of forest areas, and approximately 3.8% are consisted natural regeneration vegetation areas. The entire sampled area features of remnants vegetation. However, these are few areas, the vast majority being composed of areas with some degree of disturbance, mainly with the presence of invasive grass species (*Urochloa decumbens* – Braquiária), that decharacterizes Cerrado areas, once they are occupying the place of native herbaceous species.

In the studied region of the Middle-lower course of the Araguari river, the lower temperatures are generally lower than 18° C in cold months, while in the warmer months, it is superior than 24° C, with approximately 1500 mm annual rainfall (Fisher 2005). The climate of this region can be framed as "Aw", according to the Köppen classification (Alvarez et al. 2014), i.e. it has two distinct and well defined seasons, being the rainy summer and dry winters, influencing the local flora and fauna.

### 8.3.3 Regional Context

The wide diversity of environments found in Minas Gerais provides the largest Brazilian flora species richness, harboring approximately 11,239 Angiosperms,

including 2,245 which are endemic (BGF 2015). The same can be seen to the ferns and lycophytes, where there are found 657 species and 23 of these are endemic (Prado et al. 2015). Only for Gymnosperms species richness is smaller, being registered only four species which none of them are endemic at the State (BFG 2015). However, all the biological diversity is highly threatened in the State due to historical processes of disordered growth (Drummond et al. 2005).

Information about the flora is relevant to understand the species distribution and mechanisms of succession and structure, of the remaining native vegetation. Besides this, knowing the flora of particular region allows measures to be taken for maintenance, conservation and preservation of the remnants and endangered species.

The fauna study aims to provide information about the local biodiversity and with the obtained results, it will be possible a comprehensive and integrative analysis of variations that may occur in the communities and so propose measures that contribute to the conservation of local wild species.

The herpetofauna is the group formed by amphibians and reptiles. Although animals with large morphological differences, they share many similarities in their habits and habitats. Both are excellent indicators of environmental quality due to their sensitivity with the anthropogenic changes (Vitt & Caldwell 2009). Amphibians have a permeable skin vulnerable to various biological or chemical agents; they present eggs and larvae dependent from water or damp environments with diverse life cycles in different places (Wells 2007). The reptiles instead are dependent on external sources of heat to regulate their body temperature, they have little ability to shift and high habitat specificity (Rao, 2005 Vitt & Caldwell 2009).

Brazil has the world richest herpetofauna with records of approximately 1,800 species and new species are discovered every year. There are 1,008 species of amphibians (14% of the world richness) divided into 1,039 frogs and toads (Anura order), five salamanders (Caudata order) and 36 caecilians (Gymnophiona order) (Segalla et al 2016); and 795 of reptile species (7% of world richness) divided into 36 turtles (Testudines order), six alligators (Crocodylia order) and 753 species of the Squamata order, subdivided into 276 lizards, 72 amphisbaena and 405 snakes species (Costa & Bérnils 2018).

The herpetofauna of Minas Gerais is rich with more than 400 species (200 amphibians and reptiles 221) (Nascimento et al. 2009, Bérnils et al. 2009).

The knowledge of the herpetofauna in the Triângulo Mineiro have been increasing in recent times, but it is still restricted to primarily studies of frogs (Giaretta & Menin 2004; Menin et al. 2004, Silva et al. 2005, Giaretta et al. 2008, Malik & Giaretta 2009, Conte et al. 2013, Bang & Giaretta 2016, Nascimento et al. 2016, Maffei et al. 2017) and snakes (Brites & Bauab, 1988, Costa et al. 2014, Nascimento et al. 2017). The work developed by professor Antonio Giaretta in Uberlândia city and its region resulted in the description of various species (*Pseudopaludicola facureae* and *Ischnocnema penaxavantino*, for example), which shows the zoo-geographical importance. The importance of herpetofauna species as good indicators of environmental quality, makes local inventories important to direct conservation and/or to mitigate impacts generated by human activities.

The taxon of birds is extremely diverse and consists of approximately 11,000 species, being 1,919 that occur in Brazil (Piacentini et al. 2015). This group of vertebrates

presents various trophic levels species that uses a wide variety of habitats, especially the terrestrial (Verner 1981). Their diversity, food habits, foraging strata and the behavior of the birds species make this group usually used in monitoring of environmental impacts, because they respond quickly to changes in the environment (Uezu & Metzger 2011).

In Minas Gerais State there are about of 864 species of birds (Lepage 2017) and this richness is due to the variety of vegetable formations in the State, among them, the Cerrado. This biome has the third largest richness of life bird among the Brazilians phytogeographic domains (Silva 1995; Silva & Santos 2005; Pinheiro & Dornas 2009; Malacco et al. 2013), and the region of Triângulo Mineiro, at west of Minas Gerais, is inside this hotspot. In the Brazilian conservationist context, Cerrado stands out for being a little-known biome in terms of birds (Junior et al. 2009), what justifies the need of carrying out inventories on bird communities in this region.

The biggest threats to the maintenance of the diversity of the Brazilian birds are fragmentation and habitat loss (Marini & Garcia 2005). They are associated with the expansion of the agricultural frontier with the urban houses, making the animal and plant communities suffer major changes, often irreversible (Carvalho 1991; Tubelis & Cavalcanti 2000). These influences will undertake the composition of the birds, particularly the ones that are associated with dense vegetation (Cavalcanti 1988; Marini & Cavalcanti 1996; Tubelis & Cavalcanti 2000).

The mammalian fauna is represented by the group of mammals, one of the groups with the most extensive distribution, practically not existing only in habitat where there can't occur, however, their greatest diversity are presented in tropical areas. They are endothermic vertebrates that differ from other groups for many structural characteristics, including the presence of mammary, sweat and sebaceous glands (Orr, 2009). One of the factors that work to control this temperature is the hairs, which are also used in camouflage because they have similar coloration to the environment (Reis et al. 2006).

In Brazil there were found more than 700 species of mammals from 541 non-flying species, of which 200 are medium and large, and 341 being small mammals (like marsupials and small rodents) (Paglia et al. 2012). Bats and primates, are the four most numerous orders in Brazil. The mammalian fauna of southeastern Brazil is, in some ways, less known than other regions such as the Amazon in the north. Among the main Brazilian ecosystems, the Atlantic forest and the Cerrado have a huge biodiversity, and most of them suffered from the degradation as a function of human activities (Silva & Passamani 2009).

The vertebrate fauna of the Atlantic forest is estimated to be approximately 2,000 species, of which about 270 are mammals species being 89 endemic (CI-Brasil et al. 2000). The Cerrado presents vertebrates diversity and endemism smaller than in the Atlantic forest, but the diversity is still quite high (CI-Brasil & MMA 1999), with more than 1,300 species, of which 195 are mammals, 18 being endemic (Fonseca et al. 2004).

Minas Gerais has over 236 species of mammals (about 35% of the species presented in the country), in the various biomes of the State: Atlantic forest, Caatinga, Campos Rupestres e de Altitude and Cerrado (Chiarello et al. 2008). The mammals species of Minas Gerais are divided into ten of the twelve orders of mammals that occur in



Brazil, being the orders Rodentia and Chiroptera the most diverse (Paglia et al. 2009), following the neotropical pattern.

The mammal's studies in tropical environments are difficult due to the characteristics of the species, where most of them have nocturnal habits, they live in relatively huge areas and with low population density (Cullen Jr. et al. 2012). In addition to this, the environmental degradation and habitat fragmentation lead the restriction of population size and isolation of local populations. (Cheida et al. 2014; Pardini et al. 2012). However, among the vertebrates, the Group of mammals is one of those that have comparatively greater volume of information available to support assessments of the conservation status of the species (Paglia et al. 2009). The response of the terrestrial mammals species to the anthropogenic impacts, makes this group an important environmental indicator, and they can be used in the analysis of the effects of human activities on the environment.

According to the Federal Normative Statement nº 141 from IBAMA, the synanthrope fauna are animal populations of wild native or exotic species, which use anthropogenic areas resources, as a transitory form, such as passage way or resting place, or as a permanent form, using them as a living area. It should be noted that among these animals, those that can transmit diseases or cause damages to human health or to other animals and which are present in the cities, such as rats, pigeons, bats, cockroaches, flies, fleas, ticks, ants, scorpions, spiders, caterpillars, centipedes, bees, wasps and hornets should be studied.

The deforestation of the natural areas can change the behavior of many arthropods species that feed on blood causing them to approach and adapt to the human environment. The Culicidae Family consists of three Subfamilies, but only two of them have medical importance: Culicinae and Anophelinae (Consoli & Lourenço-de-Oliveira, 1994). The culicidae, popularly known as midges, mosquitoes, gnats or "carapanãs", are of great importance in public health, since they are vetoras species and cause great nuisance to human populations due to their hematophageal habit. The Subfamily Culicinae is the largest of them, with approximately 3,000 species (Consoli & Lourenço-de-Oliveira, 1994, Forattini, 2002) and it features transmitters of etiological agents causing diseases such as yellow fever, dengue fever and other arboviruses.

The Anophelinae Subfamily is represented by species described as Plasmodia transmitting causing malaria (Maciel, 1962). The Psychodidae family (Flebotominae), popularly known as mosquito-straw, asa-branca, cangalhinha, is represented by two genera in Brazil: Brumptomyia and Lutzomyia (Young & Duncan, 1994) and only the last one presents medical-veterinarian importance, because they include species transmitters of causative agents of leishmaniasis in cutaneous, visceral and Mucocutaneous forms (Adler & Theodor, 1957, Rangel & Lainson's, 2003). In several parts of Brazil this disease, in its various forms, is presented endemic over time which shows that people live with the disease for different reasons (Costa et al., 2007).

With the natural environment modification and the high adaptability ability of many species in the anthropized areas, there is an increase of human contact with these insects groups producing new diseases outbreaks like malaria, yellow fever and leishmaniasis (Costa et al., 2007). So it's vital to know the enterprise erection risks to the human population health that lives in the vicinity of the future mill area.

The limnological conditions and water quality of rivers, lakes and reservoirs suffer great influence of drainage network, due to the biogeophysics characteristics of basin and the conservation status of the ecosystems. Differences in the concentration of dissolved solids or particulates in the water, for example, reflect variations of geological nature, in the use and occupation of land and rainfall/evaporation rate. The characteristics of the riparian vegetation along the hydrographic net, can be responsible for differences in water temperature and in its amount and distribution of the organic particles transported by size (Rice et al., 2001). Recent studies show that the effects of different types of environmental impacts, and their local and regional variations, are fundamental for Limnological conditions and quality drainage water, influencing largely in reservoirs and on the main river of the basin (Oliveira *et al.*, 2014).

In relation to aquatic communities, highlights the increase trend of primary producers, both algae and cyanobacteria, due to the continuous process of eutrophication that are submitted at the aquatic ecosystems. This is due to nutrient loading increase in the rivers, lakes and reservoirs as a result of anthropogenic actions at the drainage basins. In the dammed river systems, with lower rates of circulation and water mass renewal, the growth of aquatic plants and phytoplankton is even more pronounced. In the specific case of cyanobacteria, these can produce toxins that are harmful to humans and animals. The toxins can be classified as hepatotoxins, cytotoxins and endotoxin, being difficult to remove because of their stability and resistance to chemical hydrolysis or oxidation (Tundisi, 2003).

The zooplanktonic community of continental waters consists by protozoans and metazoans, and among these there are the rotifers, cladocerans, copepods and larvae of diptera of Chaoboridae family (Esteves, 2011). This community presents a great importance in the food chain, because they connect the primary producers and higher trophic levels, in addition they respond rapidly to environmental changes related to climate and water quality (Margalef, 1983; Matsumura-Tundisi & walnut, 1996; Pinto-Coelho, 1998).

The benthic macroinvertebrates are organisms that act in important ecological processes, because they participate in the aquatic and adjacent terrestrial food chains and in phosphorus and nitrogen exchange between the sediment and the interface water through the excavation activities and metabolism/decomposition of organic matter (Esteves, 2011). In general, the benthos study as a bioindicator is advantageous, since this is composed of organisms that have different degrees of tolerance to environmental conditions, low mobility, relatively long life cycle, and are easy to collect, with simple and inexpensive equipment (Rosenberg & Resh, 1993).

The fish group represents approximately 50% of aquatic biota vertebrates species, including about 32,000 species which occupy the most diverse aquatic environments (Nelson, 2006). Brazil is considered a privileged region by presenting a large hydrographic network, with the major waterways of the world (Stevaux et al., 1997). This vast hydrographic network provides a huge range amount of microhabitats, ranging from springs, Rapids, waterfalls and pools at high altitudes, to temporary puddles and swamps at lower altitudes. In response, the fish exhibit a wide variety of adaptations that reflect directly on their morphology and behavior. (Oyakawa et al., 2006).

Researches made indicate that there are approximately 6,000 fish species in Neotropical freshwater environments, with 4,475 species already described and at least 1,550 species still to be described (Reis et al., 2003). The ecological characteristics of Brazil, qualified the country status with the richest fish fauna of the world, with approximately 2,587 species (Buckup et al., 2007).

However, various anthropogenic actions such as dams, deforesting the riparian vegetation, domestic and industrial effluents disposal, fishing for trade and introduction of new species, endanger the diversity of fishes (Agostinho et al., 2007). The events mentioned above, promote significant environmental changes, considered as the main causes of threat to aquatic diversity and may lead to the decline or local extinction of many species (Buckup, 1999, Collares-Pereira & Cowz, 2004).

In response to these changes, the differences in the structure and composition of fish assemblies may occur, causing the Ichthyofauna to be organized spatially according to their tolerance limits and preferences in relation to new formed environments (Thornton, 1990; Carvalho et al., 1998).

### 8.3.4 Terrestrial Flora and Fauna

#### 8.3.4.1 Flora

##### 8.3.4.1.1 Secondary Data

The secondary data inventory was performed for the cities of Araguari and Indianópolis, using the Splink database ([www.splink.org.br](http://www.splink.org.br)) with search of the city and the species kingdom, adopted for this study the "Plantae". So, for both cities, there were found 699 species, after checking for synonyms on the Brazilian list of Flora species (2018) (as shown in the following table).

**Table 1 – List of species obtained from secondary data presented in the Splink database (2018), to the cities of Araguari and Indianópolis.**

Family	Species	Popular Brazilian Name
Acanthaceae	<i>Aphelandra longiflora</i> (Lindl.) Profice	-
	<i>Lepidagathis floribunda</i> (Pohl) Kameyama	-
	<i>Ruellia brevifolia</i> (Pohl) C.Ezcurra	-
	<i>Ruellia elegans</i> Poir.	-
	<i>Ruellia geminiflora</i> Kunth	-
	<i>Ruellia jussieuoides</i> Schltld. & Cham.	-
Adoxaceae		

Family	Species	Popular Brazilian Name
	<i>Sambucus nigra</i> L.	Sabugueiro-preto
Amaranthaceae	<i>Alternanthera brasiliana</i> (L.) Kuntze	-
	<i>Gomphrena pohlii</i> Moq.	-
Anacardiaceae	<i>Astronium fraxinifolium</i> Schott	Gonçalo-alves
	<i>Astronium nelson-rosae</i> Santin	Gonçalo
	<i>Lithrea molleoides</i> (Vell.) Engl.	Aroeira-branca
	<i>Myracrodruon urundeuva</i> Allemão	Aroeira-preta
	<i>Tapirira guianensis</i> Aubl.	Peito-de-pombo
	<i>Tapirira obtusa</i> (Benth.) J.D.Mitch.	Peito-de-pombo
Anemiaceae	<i>Anemia clinata</i> Mickel	-
	<i>Anemia phyllitidis</i> (L.) Sw.	-
Annonaceae	<i>Annona cacans</i> Warm.	Araticum-cagão
	<i>Annona coriacea</i> Mart.	Araticum
	<i>Annona cornifolia</i> A.St.-Hil.	-
	<i>Annona dolabripetala</i> Raddi	Biriba-do-mato
	<i>Annona neosericea</i> H.Rainer	Cortiça
	<i>Annona sylvatica</i> A.St.Hil.	Cortiça-amarela
	<i>Cardiopetalum calophyllum</i> Schltld.	Embira
	<i>Duguetia fufuracea</i> (A.St.-Hil.) Saff.	Ata-do-mato
	<i>Duguetia lanceolata</i> A.St.-Hil.	Pindaíba
	<i>Porcelia macrocarpa</i> (Warm.) R.E.Fr.	Pixirixum
	<i>Unonopsis guatterioides</i> (A.DC.) R.E.Fr.	Pindaíva-do-brejo
	<i>Xylopiya aromatica</i> (Lam.) Mart.	Pimenta-de-macaco
	<i>Xylopiya emarginata</i> Mart.	Pindaíba-d'água
	<i>Xylopiya frutescens</i> Aubl.	Envira-preta
	<i>Xylopiya sericea</i> A.St.-Hil.	Pindaíba-branca

Family	Species	Popular Brazilian Name
Apiaceae	<i>Foeniculum vulgare</i> Mill.	Funcho
Apocynaceae	<i>Aspidosperma australe</i> Müll.Arg.	Guatambu
	<i>Aspidosperma brasiliense</i> A.S.S.Pereira & A.C.D.Castello	-
	<i>Aspidosperma cuspa</i> (Kunth) S.F.Blake	Peroba-de-goias
	<i>Aspidosperma cylindrocarpon</i> Müll.Arg.	Peroba-rosa
	<i>Aspidosperma subincanum</i> Mart.	Guatambu-do-cerrado
	<i>Aspidosperma tomentosum</i> Mart.	Guatambu-do-cerrado
	<i>Aspidosperma verbascifolium</i> Müll.Arg.	Guatambu-do-campo
	<i>Barjonia erecta</i> (Vell.) K.Schum.	-
	<i>Forsteronia pubescens</i> A.DC.	-
	<i>Hancornia speciosa</i> Gomes	Mangaba
	<i>Himatanthus obovatus</i> (Müll.Arg.) Woodson	Pau-de-leita
	<i>Mandevilla pohliana</i> (Stadelm.) A.H.Gentry	-
	<i>Oxypetalum erianthum</i> Decne.	-
	<i>Prestonia coalita</i> (Vell.) Woodson	-
	<i>Prestonia erecta</i> (Malme) J.F.Morales	-
	<i>Prestonia lagoensis</i> (Müll.Arg.) Woodson	-
	<i>Prestonia riedelii</i> (Müll.Arg.) Markgr.	-
	<i>Schubertia grandiflora</i>	-
	<i>Tassadia propinqua</i> Decne.	-
Araliaceae	<i>Dendropanax cuneatus</i> (DC.) Decne. & Planch.	Maria-mole
	<i>Schefflera macrocarpa</i> (Cham. & Schltldl.) Frondin	Mandiocão

Family	Species	Popular Brazilian Name
Arecaceae	<i>Schefflera morototoni</i> (Aubl.) Maguire et al.	Caixeta
	<i>Attalea phalerata</i> Mart. ex Spreng.	Bacuri
Aristolochiaceae	<i>Aristolochia esperanzae</i> Kuntze	-
	<i>Aristolochia labiata</i> Willd.	-
Aspleniaceae	<i>Asplenium auritum</i> Sw.	-
	<i>Asplenium dimidiatum</i> Sw.	-
	<i>Asplenium formosum</i> Willd.	-
	<i>Asplenium serra</i> Langsd. & Fisch.	-
Asteraceae	<i>Acilepidopsis echitifolia</i> (Mart. ex DC.) H.Rob.	-
	<i>Aldama robusta</i> (Gardner) E.E.Schill. & Panero	-
	<i>Baccharis rivularis</i> Gardner	-
	<i>Baccharis trinervis</i> Pers.	Casadinha-preta
	<i>Bidens gardneri</i> Baker	Picão-vermelho
	<i>Bidens segetum</i> Mart. ex Cola	Picão
	<i>Calea nitida</i> Less.	-
	<i>Chresta sphaerocephala</i> DC.	-
	<i>Chromolaena cylindrocephala</i> (Sch.Bip. ex Baker) R.M.King & H.Rob.	-
	<i>Chromolaena laevigata</i> (Lam.) R.M.King & H.Rob.	Cambará-falso
	<i>Chromolaena maximiliani</i> (Schrad. ex DC.) R.M.King & H.Rob.	Mata-pasto
	<i>Chromolaena squalida</i> (DC.) R.M.King &	-

Family	Species	Popular Brazilian Name
	H.Rob.	
	<i>Chrysanthellum indicum</i> DC.	-
	<i>Chrysolaena obovata</i> (Less.) Dematt.	-
	<i>Cosmos caudatus</i> Kunth	-
	<i>Dasyphyllum brasiliense</i> (Spreng.) Cabrera	Açoite
	<i>Dasyphyllum flagellare</i> (Casar.) Cabrera	Cambará-de-espinho
	<i>Dasyphyllum sprengelianum</i> (Gardner) Cabrera	Cambará-de-espinho
	<i>Dasyphyllum vagans</i> (Gardner) Cabrera	Cambará-de-espinho
	<i>Elephantopus biflorus</i> (Less.) Sch.Bip.	Erva-de-colégio
	<i>Emilia sonchifolia</i> (L.) DC. ex Wight	Falsa-serralha
	<i>Jungia floribunda</i> Less.	-
	<i>Lepidaploa aurea</i> (Mart. ex DC.) H.Rob.	Assa-peixe
	<i>Lepidaploa canescens</i> (Kunth) H.Rob.	Assa-peixe
	<i>Leptostelma tweediei</i> (Hook, & Arn.)	-
	D.J.N.Hind & G.L.Nesom	-
	<i>Lessingianthus obtusatus</i> (Less.) H.Rob.	-
	<i>Melampodium divaricatum</i> (Rich. ex Pers.)	-
	DC.	-
	<i>Mikania cordifolia</i> (L.f.) Willd.	Erva-de-cobra
	<i>Mikania micrantha</i> Kunth	-
	<i>Mikania psilostachya</i> DC.	-
	<i>Piptocarpha macropoda</i> (DC.) Baker	Cambará
	<i>Piptocarpha rotundifolia</i> (Less.) Baker	Coração-de-negro
	<i>Praxelis kleinoides</i> (Kunth) Sch.Bip.	-
	<i>Solidago chilensis</i> Meyen	Arnica-brasileira
	<i>Symphyopappus compressus</i> (Gardner)	Vassoura
	B.L.Rob	
	<i>Tilesia baccata</i> (L.f.) Pruski	-
	<i>Vernonanthura brasiliiana</i> (L.) H.Rob.	Caminho-da-roça

Family	Species	Popular Brazilian Name
Begoniaceae	<i>Vernonanthura ferruginea</i> (Less.) H.Rob.	Assa-peixe
	<i>Begonia cucullata</i> Willd.	Begônia
Bignoniaceae	<i>Adenocalymma bracteatum</i> (Cham.) DC.	-
	<i>Adenocalymma nodosum</i> (Silva Manso) L.G.Lohmann	Carobinha-do-campo
	<i>Bignonia corymbosa</i> (Vent.) L.G.Lohman	Cipó-de-cruz
	<i>Cuspidaria pulchra</i> (Cham.) L.G.Lohmann	-
	<i>Fridericia florida</i> (DC.) L.G.Lohmann	-
	<i>Fridericia platyphylla</i> (Cham.) L.G.Lohmann	Tinteiro
	<i>Fridericia speciosa</i> Mart.	-
	<i>Fridericia triplinervia</i> (Mart. ex DC.) L.G.Lohmann	-
	<i>Handroanthus impetiginosus</i> (Mart. ex DC.) Mattos	Ipê-roxo
	<i>Handroanthus ochraceus</i> (Cham.) Mattos	Ipê-amarelo-do-cerrado
	<i>Handroanthus serratifolius</i> (Vahl) S.Grose	Ipê-amarelo
	<i>Handroanthus vellosi</i> (Toledo) Mattos	Ipê-amarelo
	<i>Jacaranda acutifolia</i> Bonpl.	Jacarandá
	<i>Jacaranda brasiliiana</i> (Lam.) Pers.	Jacaranda-boca-de-sapo
	<i>Jacaranda cuspidifolia</i> Mart.	Caroba
	<i>Pyrostegia venusta</i> (Ker Gawl.) Miers	Flor-de-são-joão
	<i>Stizophyllum perforatum</i> (Cham.) Miers	-
<i>Stizophyllum riparium</i> (Kunth) Sandwith	-	
<i>Tabebuia rosea</i> (Bertol.) Bertero ex A.DC.	Ipê-de-el-salvador	
<i>Tabebuia roseoalba</i> (Ridl.) Sandwith	Ipê-branco	



Family	Species	Popular Brazilian Name
	<i>Tanaecium pyramidatum</i> (Rich.) L.G.Lohmann	-
	<i>Tynanthus cognatus</i> (Cham.) Miers	-
	<i>Zeyheria montana</i> Mart.	Bolsa-de-pastor
Bixaceae		
	<i>Cochlospermum regium</i> (Mart. ex Schrank) Pilg.	Algodão-do-cerrado
Brassicaceae		
	<i>Brassica napus</i> L.	Couve-nabiça
	<i>Lepidium virginicum</i> L.	Mastruço
Bromeliaceae		
	<i>Dyckia minarum</i> Mez	-
Burmanniaceae		
	<i>Burmannia flava</i> Mart.	-
Burseraceae		
	<i>Protium heptaphyllum</i> (Aubl.) Marchand	Breu-branco-verdadeiro
Cactaceae		
	<i>Pereskia aculeata</i> Mill.	Ora-pra-nóbis
Calophyllaceae		
	<i>Calophyllum brasiliense</i> Cambess.	Guanadi
	<i>Kielmeyera coriacea</i> Mart. & Zucc.	Pau-santo
	<i>Kielmeyera rubriflora</i> Cambess.	Rosa-do-cerrado
Campanulaceae		
	<i>Centropogon cornutus</i> (L.) Druce	
Cannabaceae		
	<i>Celtis iguanaea</i> (Jacq.) Sarg.	Grão-de-galo
	<i>Trema micrantha</i> (L.) Blume	Pau-pólvora
Cardiopteridaceae		
	<i>Citronella paniculata</i> (Mart.) R.A.Howard	Congonha

Family	Species	Popular Brazilian Name
Caricaceae	<i>Carica papaya</i> L.	Mamoeiro
Celastraceae	<i>Anthodon decussatus</i> Ruiz & Pav.	-
	<i>Cheiloclinium cognatum</i> (Miers) A.C.Sm.	Bacupari-da-mata
	<i>Maytenus gonoclada</i> Mart.	Cafézinho
	<i>Monteverdia floribunda</i> (Reissek) Biral	Cafézinho-seco
	<i>Peritassa campestris</i> (Cambess.) A.C.Sm.	Capicurú
	<i>Pristimera celastroides</i> (Kunth) A.C.Sm.	-
	<i>Salacia elliptica</i> (Mart. ex Schult.) G.Don	Saputa
Chrysobalanaceae	<i>Couepia uiti</i> (Mart. & Zucc.) Benth. ex Hook.f.	Pateiro
	<i>Hirtella glandulosa</i> Spreng.	Coco-de-bode
	<i>Hirtella gracilipes</i> (Hook.f.) Prance	Bosta-de-cabra
	<i>Hirtella racemosa</i> Lam.	Merda-de-raposa
	<i>Licania apetala</i> (E.Mey.) Fritsch	Ajuru
	<i>Licania gardneri</i> (Hook.f.) Fritsch	Oiti
	<i>Licania humilis</i> Cham. & Schldl.	Marmélito-do-campo
Clusiaceae	<i>Clusia criuva</i> Cambess.	Mangue-do-mato
	<i>Garcinia gardneriana</i> (Planch. & Triana) Zappi	Bacupari
	<i>Tovomitopsis saldanhae</i> Engl.	Landim
Combretaceae	<i>Combretum hilarianum</i> D.Dietr.	Escova-de-macaco
	<i>Terminalia argentea</i> Mart.	Capitão-do-mato
	<i>Terminalia glabrescens</i> Mart.	Capitãozinho
	<i>Terminalia phaeocarpa</i> Eichler	Capitão
Commelinaceae		

Family	Species	Popular Brazilian Name
Convolvulaceae	<i>Dichorisandra hexandra</i> (Aubl.) C.B.Clarke	-
	<i>Ipomoea brasiliiana</i> (Choisy) Meisn.	-
	<i>Ipomoea indivisa</i> (Vell.) Hallier f.	Carriola
	<i>Ipomoea procurrens</i> Meisn.	-
	<i>Ipomoea quamoclit</i> L.	Campainha-vermelha
	<i>Ipomoea saopaulista</i> O'Donnel	-
	<i>Ipomoea tubata</i> Nees	-
	<i>Jacquemontia blanchetii</i> Moric.	-
	<i>Merremia tomentosa</i> (Choisy) Hallier f.	Rosa-pau
	<i>Turbina cordata</i> (Choisy) D.F.Austin & Staples	Jetirana-rosa
Cordiaceae	<i>Cordia alliodora</i> (Ruiz & Pav.) Cham.	Freijó
	<i>Cordia sellowiana</i> Cham.	Louro-mole
	<i>Cordia trichotoma</i> (Vell.) Arráb. ex Steud.	Louro-pardo
	<i>Varronia polycephalla</i> Lam.	
Costaceae	<i>Costus spicatus</i> (Jacq.) Sw.	Cana-de-macaco
Cucurbitaceae	<i>Cucumis sativus</i> L.	Pepino
	<i>Momordica charantia</i> L.	Melão-de-são- caetano
	<i>Sicyos edulis</i> Jacq.	Chuchuzeiro
	<i>Wilbrandia hibiscoides</i> Silva Manso	Taiuiá-de-cipó
Cunoniaceae	<i>Lamanonia ternata</i> Vell.	Cangalheiro
Cyatheaceae	<i>Cyathea degaldii</i> Sternb.	Samambaiçú

Family	Species	Popular Brazilian Name
Cyperaceae		
	<i>Cyperus lanceolatus</i> Poir.	Tiririca
	<i>Cyperus sellowianus</i> (Kunth) T.Koyama	-
	<i>Rhynchospora corymbosa</i> (L.) Britton	Tiririca-do-brejo
	<i>Rhynchospora nervosa</i> (Vahl) Boeckeler	Tiririca
	<i>Scleria gaertneri</i> Raddi	-
Dilleniaceae		
	<i>Curatella americana</i> L.	Sambaíba
	<i>Davilla elliptica</i> A.St.-Hil.	Lixeirinha
	<i>Doliocarpus dentatus</i> (Aubl.) Standl.	Cipó-vermelho
Dioscoreaceae		
	<i>Dioscorea hassleriana</i> Chodat	-
	<i>Dioscorea multiflora</i> Mart. ex Griseb.	Japecanga
Droseraceae		
	<i>Drosera communis</i> A.St.-Hil.	Planta-carnívora
Dryopteridaceae		
	<i>Bolbitis serratifolia</i> Schott	-
	<i>Cyclodium meniscioides</i> (Willd.) C.Presl	-
	<i>Polybotrya goyazensis</i> Brade	-
Ebenaceae		
	<i>Diospyros inconstans</i> Jacq.	Marmelinho
	<i>Diospyros lasiocalyx</i> (Mart.) B.Wall.	Caqui-do-cerrado
Elaeocarpaceae		
	<i>Sloanea hirsuta</i> (Schott) Planch. & Benth.	Sapopema
	<i>Solanea lasioma</i> K.Schum.	Sapopema
Eriocaulaceae		
	<i>Eriocaulon ligulatum</i> (Vell.) L.B.Sm.	-
	<i>Syngonanthus caulescens</i> (Poir.) Ruhland	-
	<i>Syngonanthus densiflorus</i> (Körn.) Ruhland	-
Erythroxylaceae		

Family	Species	Popular Brazilian Name
	<i>Erythroxylum daphnites</i> Mart.	Muxiba
	<i>Erythroxylum deciduum</i> A.St.-Hil.	Joveve
	<i>Erythroxylum suberosum</i> A.St.-Hil.	Mercúrio-do-campo
	<i>Erythroxylum subracemosum</i> Turcz.	Cabelo-de-negro
Euphorbiaceae		
	<i>Acalypha diversifolia</i> Jacq.	-
	<i>Acalypha gracilis</i> Spreng.	-
	<i>Acalypha villosa</i> Jacq.	-
	<i>Alchornea glandulosa</i> Poepp. & Endl.	Tapiá
	<i>Cnidoscolus urens</i> (L.) Arthur	Urtigão
	<i>Croton rottlerifolius</i> Baill.	-
	<i>Croton urucurana</i> Baill.	Sangra-d'água
	<i>Dalechampia pentaphylla</i> Lam.	-
	<i>Dalechampia stipulacea</i> Müll.Arg.	-
	<i>Euphorbia heterophylla</i> L.	Leiteira
	<i>Jatropha gossypifolia</i> L.	Pinhão-roxo
	<i>Mabea fistulifera</i> Mart.	Canudeiro
	<i>Manihot anomala</i> Pohl	Mandioca-de-veado
	<i>Maprounea guianensis</i> Aubl.	Bonifácio
	<i>Micrandra elata</i> (Didr.) Müll.Arg.	Mamoninha
	<i>Sebastiania brasiliensis</i> Spreng.	Branquilha
	<i>Tragia friesii</i> Pax & K.Hoffm.	-
Fabaceae		
	<i>Aeschynomene falcata</i> (Poir.) DC.	-
	<i>Aeschynomene paniculata</i> Willd. ex Vogel	-
	<i>Albizia niopoides</i> (Spruce ex Benth.) Burkart	Farinha-seca
	<i>Anadenanthera colubrina</i> (Vell.) Brenan	Angico
	<i>Andira anthelmia</i> (Vell.) Benth.	Angelim
	<i>Andira fraxinifolia</i> Benth.	Angelim-doce

Family	Species	Popular Brazilian Name
	<i>Apuleia leiocarpa</i> (Vogel) J.F.Macbr.	Garapa
	<i>Arachis prostrata</i> Benth.	-
	<i>Bauhinia brevipes</i> Vogel	Unha-de-vaca
	<i>Bauhinia rufa</i> (Bong.) Steud.	Pata-de-vaca
	<i>Bauhinia unguolata</i> L.	Pata-de-vaca
	<i>Bowdichia virgilioides</i> Kunth	Sucupira-preta
	<i>Cajanus cajan</i> (L.) Huth	Feijão-guandú
	<i>Calliandra foliolosa</i> Benth.	Tapete-de-cardeal
	<i>Calliandra parvifolia</i> (Hook. & Arn.) Speg.	Angiquinho
	<i>Cassia ferruginea</i> (Schrad.) Schrad. ex DC.	Canafístula
	<i>Chamaecrista flexuosa</i> (L.) Greene	Peninha
	<i>Chamaecrista lomatomoda</i> (Benth.) H.S.Irwin & Barneby	-
	<i>Chamaecrista neesiana</i> (Mart. ex Benth.) H.S.Irwin & Barneby	-
	<i>Copaifera langsdorffii</i> Desf.	Copaíba
	<i>Dalbergia frutescens</i> (Vell.) Britton	Rabo-de-bugio
	<i>Desmodium affine</i> Schldl.	Pega-pegá
	<i>Desmodium barbatum</i> (L.) Benth.	Pega-pegá
	<i>Desmodium incanum</i> (Sw.) DC.	Mata-pasto
	<i>Dioclea violacea</i> Mart. ex Benth.	Olho-de-boi
	<i>Enterolobium contortisiliquum</i> (Vell.) Morong	Timboril
	<i>Enterolobium gummiferum</i> (Mart.) J.F.Macbr.	Timburi-do-cerrado
	<i>Hymenaea courbaril</i> L.	Jatobá
	<i>Indigofera suffruticosa</i> Mill.	Anileira
	<i>Inga edulis</i> Mart.	Ingá-de-metro
	<i>Inga laurina</i> (Sw.) Willd.	Ingá-mirim
	<i>Inga sessilis</i> (Vell.) Mart.	Ingá-ferradura

Family	Species	Popular Brazilian Name
	<i>Inga thibaudiana</i> DC.	Ingá-pequeno
	<i>Inga vera</i> Willd.	Ingá-do-brejo
	<i>Leptolobium dasycladum</i> Vogel	Perobinha-do-campo
	<i>Leptolobium elegans</i> Vogel	Peroba
	<i>Machaerium amplum</i> Benth.	Esporão
	<i>Machaerium nyctitans</i> (Vell.) Benth.	Bico-de-pato
	<i>Machaerium oblongifolium</i> Vogel	-
	<i>Machaerium paraguariense</i> Hassl.	Sapuva
	<i>Machaerium ruddianum</i> C.V.Mendonça & A.M.G.Azevedo	-
	<i>Machaerium sericiflorum</i> Vogel	-
	<i>Machaerium stipitatum</i> Vogel	Jacarandá-branco
	<i>Mimosa debilis</i> Humb. & Bonpl. ex Willd.	-
	<i>Mimosa diplotricha</i> C.Wright ex Sauvalle	-
	<i>Mimosa distans</i> Benth.	-
	<i>Mimosa gemmulata</i> Barneby	-
	<i>Mimosa gracilis</i> Benth.	-
	<i>Mimosa setosa</i> Benth.	-
	<i>Mimosa skinneri</i> Benth.	-
	<i>Mimosa somnians</i> Humb. & Bonpl. ex Willd.	-
	<i>Mimosa suburbana</i> Barneby	-
	<i>Mimosa velloziana</i> Mart.	-
	<i>Mimosa xanthocentra</i> Mart.	-
	<i>Phanera radiata</i> (Vell.) Vaz	Escada-de-macaco
	<i>Piptadenia gonoacantha</i> (Benth.) J.F.Macbr.	Pau-jacaré
	<i>Plathymenia reticulata</i> Benth.	Vinhático-do-campo
	<i>Platypodium elegans</i> Vogel	Amendoim-do-campo
	<i>Senegalia multipinnata</i> (Ducke) Seigler &	-

Family	Species	Popular Brazilian Name
	Ebinger	
	<i>Senegalia polyphylla</i> (DC.) Britton & Rose	Monjoleiro
	<i>Senna alata</i> (L.) Roxb.	Fedegoso-gigante
	<i>Senna cernua</i> (Balb.) H.S.Irwin & Barneby	-
	<i>Senna hirsuta</i> (L.) H.S.Irwin & Barneby	-
	<i>Senna macranthera</i> (DC. ex Collad.) H.S.Irwin & Barneby	Fedegoso
	<i>Senna multijuga</i> (Rich.) H.S.Irwin & Barneby	Pau-cigarra
	<i>Senna obtusifolia</i> (L.) H.S.Irwin & Barneby	Fedegoso
	<i>Senna pendula</i> (Humbl. & Bonpl. ex Willd.) H.S.Irwin & Barneby	Canudo-de-pito
	<i>Senna pilifera</i> (Vogel) H.S.Irwin & Barneby	-
	<i>Senna rostrata</i> (Mart.) H.S.Irwin & Barneby	-
	<i>Senna rugosa</i> (G.Don) H.S.Irwin & Barneby	Casiruba
	<i>Senna silvestris</i> (Vell.) H.S.Irwin & Barneby	Abotinha
	<i>Senna spectabilis</i> (DC.) H.S.Irwin & Barneby	Cássia-do-nordeste
	<i>Senna splendida</i> (Vogel) H.S.Irwin	Besouro
	<i>Stryphnodendron adstringens</i> (Mart.) Coville	Barbatimão
	<i>Stylosanthes guianensis</i> (Aubl.) Sw.	Estilosantes
	<i>Swartzia apetala</i> Raddi	Fruto-de-aracuaá
	<i>Vatairea macrocarpa</i> (Benth.) Ducke	Pau-amargoso
Heliotropiaceae		
	<i>Myriopus paniculatus</i> (Cham.) Feuillet	-



Family	Species	Popular Brazilian Name
Lacistemataceae	<i>Lacistema aggregatum</i> (P.J.Bergius) Rusby	Mata-calado
	<i>Lacistema hasslerianum</i> Chodat	Gorogoia
Lamiaceae	<i>Aegiphila integrifolia</i> (Jacq.) Moldenke	Tamanqueiro
	<i>Aegiphila verticillata</i> Vell.	-
	<i>Cantinoa mutabilis</i> (Rich.) Harley & J.F.B.Pastore	-
	<i>Cyanocephalus lippioides</i> (Pohl ex Benth.) Harley & J.F.B.Pastore	-
	<i>Cyanocephalus rugosus</i> (Benth.) Harley & J.F.B.Pastore	-
	<i>Hyptis lantanifolia</i> Poit.	-
	<i>Medusantha crinita</i> (Benth.) Harley & J.F.B.Pastore	-
	<i>Medusantha eriophylla</i> (Pohl ex Benth.) Harley & J.F.B.Pastore	-
	<i>Ocimum basilicum</i> L.	-
	<i>Vitex polygama</i> Cham.	Tarumã
	Lauraceae	<i>Aniba desertorum</i> (Nees) Mez
<i>Cryptocarya aschersoniana</i> Mez		Canela-fogo
<i>Cryptocarya moschata</i> Nees & Mart.		Batalha
<i>Endlicheria paniculata</i> (Spreng.) J.F.Macbr.		Canela-amarela
<i>Licaria armeniaca</i> (Nees) Kosterm.		Canela
<i>Nectandra cissiflora</i> Nees		Canela-fedida
<i>Nectandra megapotamica</i> (Spreng.) Mez		Canelinha
<i>Nectandra membranacea</i> (Sw.) Griseb.		Canela-branca
<i>Ocotea corymbosa</i> (Meins.) Mez		Canela-de-corvo

Family	Species	Popular Brazilian Name
	<i>Ocotea glaziovii</i> Mez	Canela-amarela
	<i>Ocotea minarium</i> (Nees & Mart.) Mez	Canela-vassoura
	<i>Ocotea pulchella</i> (Nees & Mart.) Mez	Canela-preta
	<i>Ocotea spixiana</i> (Ness) Mez	Canelão
Lecythidaceae		
	<i>Cariniana estrellensis</i> (Raddi) Kuntze	Jequitibá-branco
Lindsaeaceae		
	<i>Lindsaea lancea</i> (L.) Bedd.	-
Loganiaceae		
	<i>Antonia ovata</i> Pohl	-
	<i>Strychnos pseudoquina</i> A.St.-Hil.	Quina-verdadeira
Loranthaceae		
	<i>Psittacanthus robustus</i> (Mart.) Mart.	-
	<i>Tripodanthus acutifolius</i> (Ruiz & Pav.) Tiegh.	-
Lythraceae		
	<i>Cuphea carthagenensis</i> (Jacq.) J.F.Macbr.	Sete-sangriaas
	<i>Cuphea linarioides</i> Cham. & Schltdl.	-
	<i>Cuphea micrantha</i> Kunth	-
	<i>Diplusodon lanceolatus</i> Pohl	-
	<i>Diplusodon virgatus</i> Pohl	-
	<i>Lafoensia pacari</i> A.St.-Hil.	Dedaleiro
	<i>Punica granatum</i> L.	Romãzeiro
Magnoliaceae		
	<i>Magnolia ovata</i> (A.St.-Hil.) Spreng.	Pinha-do-brejo
Malpighiaceae		
	<i>Amorimia rigida</i> (A.Juss.) W.R.Anderson	Tingui
	<i>Banisteriopsis anisandra</i> (A.Juss.) B.Gates	-
	<i>Banisteriopsis argyrophylla</i> (A.Juss.) B.Gates	-

Family	Species	Popular Brazilian Name
	<i>Banisteriopsis laevifolia</i> (A.Juss.) B.Gates	-
	<i>Banisteriopsis malifolia</i> (Nees & Mart.) B.Gates	-
	<i>Banisteriopsis oxyclada</i> (A.Juss.) B.Gates	Cipó-prata
	<i>Banisteriopsis stellaris</i> (Griseb.) B.Gates	-
	<i>Banisteriopsis variabilis</i> B.Gates	-
	<i>Byrsonima affinis</i> W.R.Anderson	Murici
	<i>Byrsonima basiloba</i> A.Juss.	Murici
	<i>Byrsonima clauseniana</i> A.Juss.	Murici-do-cerrado
	<i>Byrsonima coccolobifolia</i> Kunth	Murici-rosa
	<i>Byrsonima crassifolia</i> (L.) Kunth	Murici-da-praia
	<i>Byrsonima intermedia</i> A.Juss.	Murici
	<i>Byrsonima laxiflora</i> Griseb.	Murici-da-mata
	<i>Byrsonima pachyphylla</i> A.Juss.	-
	<i>Byrsonima salzmanniana</i> A.Juss.	-
	<i>Byrsonima verbascifolia</i> (L.) DC.	Murici-do-cerrado
	<i>Diplopterys lutea</i> (Griseb.) W.R.Anderson & C.C.Davis	-
	<i>Diplopterys pubipetala</i> (A.Juss.) W.R.Anderson & C.C.Davis	-
	<i>Heteropterys campestris</i> A.Juss.	-
	<i>Heteropterys cochleosperma</i> A.Juss.	-
	<i>Heteropterys eglandulosa</i> A.Juss.	-
	<i>Heteropterys pteropetala</i> A.Juss.	-
	<i>Hiraea cuiabensis</i> Griseb.	-
	<i>Malpighia glabra</i> L.	Acerola
	<i>Mascagnia cordifolia</i> (A.Juss.) Griseb.	Timbó
	<i>Niendenzuella acutifolia</i> (Cav.) W.R.Anderson	-
	<i>Niendenzuella multiglandulosa</i> (A.Juss.)	-

Family	Species	Popular Brazilian Name
	W.R.Anderson	
	<i>Peixotoa reticulata</i> Griseb.	Cipó-de-ouro
	<i>Peixotoa tomentosa</i> A.Juss.	Cipó-de-ouro
	<i>Pterandra pyroidea</i> A.Juss.	-
Malvaceae		
	<i>Apeiba tibourbou</i> Aubl.	Pau-jangada
	<i>Ceiba pubiflora</i> (A.St.-Hil.) K.Schum.	Paineira
	<i>Ceiba speciosa</i> (A.St.-Hil.) Ravenna	Paineira
	<i>Cienfuegosia affinis</i> (Kunth) Hochr.	
	<i>Eriotheca candolleana</i> (K.Schum.)	Catuaba-branca
	A.Robyns	
	<i>Eriotheca gracilipes</i> (K.Schum.) A.Robyns	Paineira-do-cerrado
	<i>Gossypium hirsutum</i> L.	Algodão
	<i>Guazuma ulmifolia</i> Lam.	Mutambu
	<i>Helicteres brevispira</i> A.St.-Hil.	Saca-rolha
	<i>Helicteres sacarolha</i> A.St.-Hil.	Saca-rolha
	<i>Luehea divaricata</i> Mart. & Zucc.	Açoita-cavalo-miúdo
	<i>Luehea grandiflora</i> Mart. & Zucc.	Açoita-cavalo-graúdo
	<i>Pavonia malacophylla</i> (Link & Otto)	-
	Garcke	
	<i>Pavonia sidifolia</i> Kunth	-
	<i>Pseudobombax tomentosum</i> (Mart.)	Imbiruçu
	A.Robyns	
	<i>Sida rhombifolia</i> L.	Chá-bravo
	<i>Sida ulmifolia</i> Mill.	-
	<i>Sterculia striata</i> A.St.-Hil & Naudin	Chicha-do-cerrado
	<i>Urena lobata</i> L.	Malva-roxa
	<i>Waltheria indica</i> L.	Douradinha
	<i>Wissadula hernandioides</i> (L.Hér.) Garcke	Paco-paco
Marantaceae		

Family	Species	Popular Brazilian Name
	<i>Geoppertia sellowii</i> (Körn.) Borchs. & S.Suárez	-
	<i>Maranta incrassata</i> L.Anderson	-
Melastomataceae		
	<i>Acisanthera alsinaefolia</i> (DC.) Triana	
	<i>Chaetogastra gracilis</i> (Bonpl.) DC.	
	<i>Clidemia hirta</i> (L.) D.Don	Meleca-de-cachorro
	<i>Macairea radula</i> (Bonpl.) DC.	Capuchinha
	<i>Miconia affinis</i> DC.	-
	<i>Miconia albicans</i> (Sw.) Triana	Canela-de-velho
	<i>Miconia chamissois</i> Naudin	Jacatirão
	<i>Miconia elegans</i> Cogn.	Pixirica
	<i>Miconia fallax</i> DC.	Pixirica
	<i>Miconia leucocarpa</i> DC.	-
	<i>Miconia minutiflora</i> (Bonpl.) DC.	-
	<i>Miconia nervosa</i> (Sm.) Triana	Pixirica
	<i>Miconia paucidens</i> DC.	Lixinha
	<i>Miconia rubiginosa</i> (Bonpl.) DC.	Pixirica
	<i>Miconia sellowiana</i> Naudin	Pixirica
	<i>Miconia stenostachya</i> DC.	-
	<i>Microlicia cordata</i> (Spreng.) Cham.	-
	<i>Microlicia fasciculata</i> Mart. ex Naudin	-
	<i>Mouriri chamissoana</i> Cogn.	Mandapuçá
	<i>Pleroma candolleianum</i> (Mart. ex DC.) Naudin	Quaresmeirinha
	<i>Pleroma granulosum</i> (Desr.) D.Don	Quaresmeira
	<i>Pleroma heteromallum</i> (D.Don) D.Don	Orelha-de-onça
	<i>Pleroma stenocarpum</i> (Schrank & Mart. ex DC.) Triana	Manacá
	<i>Pterolepis perpusilla</i> (Naudin) Cogn.	-

Family	Species	Popular Brazilian Name
	<i>Rhynchanthera grandiflora</i> (Aubl.) DC.	-
	<i>Tibouchina aegopogon</i> (Naudin) Cogn.	Jacatrião
	<i>Tibouchina barbiger</i> (Naudin) Baill.	-
	<i>Tococa guianensis</i> Aubl.	Planta-formiga
	<i>Trembleya parviflora</i> (D.Don) Cogn.	Quaresmeira
	<i>Trembleya phlogiformis</i> DC.	-
Meliaceae		
	<i>Cabrlea canjerana</i> (Vell.) Mart.	Cajarana
	<i>Cedrela fissilis</i> Vell.	Cedro-rosa
	<i>Guarea guidonia</i> (L.) Sleumer	Marinheiro
	<i>Guarea kunthiana</i> A.Juss.	Figo-do-mato
	<i>Guarea macrophyla</i> Vahl	Café-bravo
	<i>Trichilia catigua</i> A.Juss.	Catiguá
	<i>Trichilia elegans</i> A.Juss.	Pau-de-ervilha
	<i>Trichilia hirta</i> L.	Catiguá-de-arco-de-peneira
	<i>Trichilia pallida</i> Sw.	Baga-de-morcego
Metteniusiaceae		
	<i>Emmotum nitens</i> (Benth.) Miers	Sôbre
Monimiaceae		
	<i>Mollinedia widgrenii</i> A.DC.	Capixim
Moraceae		
	<i>Brosimum gaudichaudii</i> Trécul	Mama-cadela
	<i>Ficus adhatodifolia</i> Schott in Spreng.	Figueira-purgante
	<i>Ficus clusiifolia</i> Schott	Figueira-vermelha
	<i>Ficus enormis</i> Mart. ex Miq.	Figueira-da-pedra
	<i>Ficus guaranitica</i> Chodat	Figueira-branca
	<i>Ficus insipida</i> Willd.	Figueira-do-brejo
	<i>Ficus obtusifolia</i> Kunth	Apuí
	<i>Ficus obtusiuscula</i> (Miq.) Miq.	Figueira-de-

Family	Species	Popular Brazilian Name
		barranco
	<i>Ficus pertusa</i> L.f.	Figueira
	<i>Ficus trigona</i> L.f.	Gameleira
	<i>Ficus trigonata</i> L.	Gameleira-preta
	<i>Maclura tinctoria</i> (L.) D.Don ex Steud.	Taíuva
	<i>Sorocea bonplandii</i> (Baill.) W.C.Burger et al.	Chincho
	<i>Sorocea sprucei</i> (Baill.) J.F.Macbr.	-
Myristicaceae	<i>Virola sebifera</i> Aubl.	Bacuyba-preta
Myrtaceae	<i>Calyptranthes widgreniana</i> O.Berg	-
	<i>Campomanesia adamantium</i> (Cambess.) O.Berg	Guavira
	<i>Campomanesia guazumifolia</i> (Cambess.) O.Berg	Sete-capotes
	<i>Campomanesia pubescens</i> (Mart. ex DC.) O.Berg	Guavirova-do-cerrado
	<i>Campomanesia velutina</i> (Cambess.) O.Berg	Guabiroba
	<i>Eugenia aurata</i> O.Berg	Pitangobí
	<i>Eugenia dysenterica</i> (Mart.) DC.	Cagaita
	<i>Eugenia florida</i> DC.	Pitanga-preta
	<i>Eugenia hiemalis</i> Cambess.	Aperta-cú
	<i>Eugenia involucrata</i> DC.	Pitanga-do-cerrado
	<i>Eugenia ligustrina</i> (Sw.) Willd.	Guapi-nhem
	<i>Eugenia longipedunculata</i> Nied.	Pitanga-laranja
	<i>Eugenia paracatuana</i> O.Berg	Guamirim-de-sombra
	<i>Eugenia pluriflora</i> DC.	Jabuticaba-do-campo
	<i>Eugenia puniceifolia</i> (Kunth) DC.	Pitanga-do-campo
	<i>Eugenia ramboi</i> D.Legrand	-

Family	Species	Popular Brazilian Name
	<i>Eugenia subavenia</i> O.Berg	-
	<i>Eugenia subterminalis</i> DC.	Cambuí-pitanga
	<i>Myrcia bella</i> Cambess.	Mercurinho-branco
	<i>Myrcia guanensis</i> (Aubl.) DC.	Guamirim
	<i>Myrcia laruotteana</i> Cambess.	-
	<i>Myrcia lasiantha</i> DC.	-
	<i>Myrcia pubiflora</i> DC.	Cambuí-do-cerrado
	<i>Myrcia selloi</i> (Spreng.) N.Silveira	Camboim
	<i>Myrcia splendens</i> (Sw.) DC.	Guamirm
	<i>Myrcia tomentosa</i> (Aubl.) DC.	Araçazinho
	<i>Myrcia uberavensis</i> O.Berg	-
	<i>Myrcia variabilis</i> DC.	-
	<i>Myrcianthes punges</i> (O.Berg) D.Legrand	Guabijú
	<i>Myrciaria glanduliflora</i> (Kiaersk.) Mattos & D.Legrand	
	<i>Pimenta pseudocaryophyllus</i> (Gomes) Landrum	Cravo-do-mato
	<i>Psidium grandifolium</i> Mart. ex DC.	Araçá-felpudo
	<i>Psidium guajava</i> L.	Goiabeira
	<i>Psidium laruotteanum</i> Cambess.	Araçá-cascudo
	<i>Psidium longipetiolatum</i> D.Legrand	Araçá-vermelho
	<i>Psidium rufum</i> Mart. ex DC.	Araçá-cagão
	<i>Psidium salutare</i> (Kunth) O.Berg	Araçá-rasteiro
	<i>Psidium sartorianum</i> (O.Berg) Nied.	Cambuí
	<i>Siphoneugena densiflora</i> O.Berg	Maria-preta
	<i>Syzygium cumini</i> (L.) Skeels	Jambolão
Nyctaginaceae		
	<i>Guapira areolata</i> (Heimerl) Lundell	Farinha-seca
	<i>Neea hermaphrodita</i> S.Moore	Pão-de-cobra
Ochnaceae		



Family	Species	Popular Brazilian Name
	<i>Ouratea castaneifolia</i> (DC.) Engl.	Farinha-seca
	<i>Ouratea hexasperma</i> (A.St.-Hil.) Baill.	Vassoura-de-bruxa
	<i>Ouratea spectabilis</i> (Mart.) Engl.	Folha-de-serra
Olecaceae		
	<i>Heisteria ovata</i> Benth.	Brinco-de-mulata
Onagraceae		
	<i>Ludwigia elegans</i> (Cambess.) H.Hara	-
Opiliaceae		
	<i>Agonandra brasiliensis</i> Miers ex Benth. & Hook.f.	Tinge-cuia
	<i>Agonandra excelsa</i> Griseb.	Saputá
Orchidaceae		
	<i>Sacoila lanceolata</i> (Aubl.) Garay	-
Orobanchaceae		
	<i>Buchnera juncea</i> Cham. & Scldl.	-
Oxalidaceae		
	<i>Oxalis physocalyx</i> Zucc. ex Progel	-
Papaveraceae		
	<i>Argemone mexicana</i> L.	Cardo-santo
Passifloraceae		
	<i>Passiflora alata</i> Curtis	Maracujá-doce
	<i>Passiflora edulis</i> Sims	Maracujá
Peraceae		
	<i>Pera glabrata</i> (Schott) Poepp. ex Baill.	Cabeluda-do-mato
Phyllanthaceae		
	<i>Phyllanthus acuminatus</i> Vahl	Quebra-pedra
	<i>Phyllanthus orbiculatus</i> Rich.	Conambi
	<i>Margaritaria nobilis</i> L.f.	Sobragirana
	<i>Richeria grandis</i> Vahl	Santa-rita
Phytolaccaceae		

Family	Species	Popular Brazilian Name
	<i>Petiveria alliacea</i> L.	Guiné
Picramnaceae	<i>Picramnia sellowii</i> Planch.	Pau-amargo
Piperaceae	<i>Piper aduncum</i> L.	Pimenta-de-macaco
	<i>Piper amalago</i> L.	Pariparoba
	<i>Piper arboreum</i> Aubl.	Fruto-de-morcego
	<i>Piper dilatatum</i> Rich.	Pariparoba-murta
	<i>Piper gaudichaudianum</i> Kunth	Jaborandi
	<i>Piper glabratum</i> Kunth	-
	<i>Piper hispidum</i> Sw.	-
	<i>Piper macedoi</i> Yunck.	-
	<i>Piper umbellatum</i> L.	Jaborandi
Poaceae	<i>Andropogon fastigiatus</i> Sw.	Capim-andropogon
	<i>Digitaria longiflora</i> (Retz.) Pers.	-
	<i>Eriochrysis cayennensis</i> P.Beauv.	-
	<i>Guadua paniculata</i> Munro	Taquara
	<i>Lasiacis sorghoidea</i> (Desv. ex Ham.) Hitchc. & Chase	-
	<i>Loudetiopsis chrysothrix</i> (Nees) Conert	-
	<i>Olyra latifolia</i> L.	Capim-taquara
	<i>Panicum cayennense</i> Lam.	Capim-caiana
	<i>Paspalum pilosum</i> Lam.	-
	<i>Rugoloa pilosa</i> (Sw.) Zuloaga	-
	<i>Setaria parviflora</i> (Poir.) Kerguélen	Capim-rabo-de-raposa
	<i>Urochloa decumbens</i> (Stapf) R.D.Webster	Braquiária
Polygalaceae	<i>Asemeia rhodoptera</i> (Mart. ex A.W.Benn.)	-

Family	Species	Popular Brazilian Name
	J.F.B.Pastore & J.R.Abbott	
	<i>Bredemeyera floribunda</i> Willd.	Guiné-do-campo
	<i>Polygala subtilis</i> Kunth	-
	<i>Polygala tenuis</i> DC.	-
Polygonaceae		
	<i>Coccoloba mollis</i> Casar.	Falso-novateiro
Primulaceae		
	<i>Clavija nutans</i> (Vell.) B.Ståhl	-
	<i>Geissanthus ambiguus</i> (Mart.) G.Agostini	-
	<i>Myrsine guianensis</i> (Aubl.) Kuntze	Capororoca-branca
	<i>Myrsine leuconeura</i> Mart.	-
	<i>Myrsine umbellata</i> Mart.	Capororoca
Proteaceae		
	<i>Roupala montana</i> Aubl.	Carne-de-vaca
Pteridaceae		
	<i>Adiantopsis radiata</i> (L.) Fée	-
	<i>Adiantum deflectens</i> Mart.	Avenquinha
	<i>Adiantum diogoanum</i> Glaz. ex Baker	-
	<i>Hemionitis tomentosa</i> (Lam.) Raddi	-
	<i>Pityrogramma calomelanos</i> (L.) Link	-
	<i>Pityrogramma trifoliata</i> (L.) R.M.Tryon	-
	<i>Pteris denticulata</i> Sw.	-
Rhamnaceae		
	<i>Rhamnidium elaeocarpum</i> Reissek	Saguaragi-amarelo
Rosaceae		
	<i>Prunus myrtifolia</i> (L.) Urb.	Pessegueiro-bravo
Rubiaceae		
	<i>Amaioua guianensis</i> Aubl.	Cedro-bravo
	<i>Borreria poaya</i> (A.St.-Hil.) DC.	-
	<i>Borreria verticillata</i> (L.) G.Mey.	Vassourinha-de-botão

Family	Species	Popular Brazilian Name
	<i>Chiococca alba</i> (L.) Hitchc.	Cainca
	<i>Chomelia pohliana</i> Müll.Arg.	Mentholzinho
	<i>Chomelia ribesoides</i> Benth. ex A.Gray	Comélia
	<i>Chomelia sericea</i> Müll.Arg.	-
	<i>Coffea arabica</i> L.	-
	<i>Condaminea corymbosa</i> (Ruiz& Pav.) A.DC.	-
	<i>Cordia concolor</i> (Cham.) Kuntze	Tipo-jasmim
	<i>Cordia macrophylla</i> (K.Schum) Kuntze	Mermelada-rugosa
	<i>Cordia sessilis</i> (Vell.) Kuntze	Marmelada
	<i>Coussarea hydrangeifolia</i> (Benth.) Müll.Arg.	Quina-branca
	<i>Coutarea hexandra</i> (Jacq.) K.Schum.	Murta-do-mato
	<i>Declieuxia fruticosa</i> (Willd. ex Roem. & Schltdl.) Kuntze	Maria-preta
	<i>Faramea hyacinthina</i> Mart.	-
	<i>Genipa americana</i> L.	Jenipapeiro
	<i>Guettarda pohliana</i> Müll.Arg.	Veludinho-vermelho
	<i>Guettarda uruguensis</i> Cham. & Schltdl.	Veludo
	<i>Guettarda viburnoides</i> Cham. & Schltdl.	Veludinho-branco
	<i>Ixora brevifolia</i> Benth.	-
	<i>Ixora gardneriana</i> Benth.	-
	<i>Ixora venulosa</i> Benth.	Ixora-do-mato
	<i>Margaritopsis cephalantha</i> (Müll.Arg.) C.M.Taylor	-
	<i>Morinda citrifolia</i> L.	Noni
	<i>Palicourea crocea</i> (Sw.) Roem. & Schltdl.	-
	<i>Palicourea marcgravii</i> A.St.Hil.	Erva-de-rato
	<i>Palicourea rigida</i> Kunth	Bate-caixa
	<i>Psychotria carthagenensis</i> Jacq.	Caffeiro-do-mato

Family	Species	Popular Brazilian Name
	<i>Psychotria deflexa</i> DC.	-
	<i>Psychotria gracilentata</i> Müll.Arg.	-
	<i>Psychotria hoffmannseggiana</i> (Willd. ex Schltld.) Müll.Arg.	-
	<i>Psychotria iodotricha</i> Müll.Arg.	-
	<i>Psychotria platypoda</i> DC.	-
	<i>Psychotria prunifolia</i> (Kunth) Steyerm.	-
	<i>Psychotria trichophora</i> Müll.Arg.	-
	<i>Randia armata</i> (Sw.) DC.	Guaticuruzú-uma
	<i>Rudgea sessilis</i> (Vell.) Müll.Arg.	-
	<i>Rudgea viburnoides</i> (Cham.) Benth.	Congonha
	<i>Rustia formosa</i> (Cham. & Schltld.) Klotzsch	Caapeba
	<i>Simira sampaioana</i> (Standl.) Steyerm.	Maiate
	<i>Simira viridiflora</i> (Allemão & Saldanha) Steyerm.	Pereiro-de-tinta
	<i>Sipanea pratensis</i> Aubl.	
	<i>Tocoyena formosa</i> (Cham. & Schltld.) K.Schum.	Jenipapo-bravo
Rutaceae		
	<i>Esenbeckia grandiflora</i> Mart.	Pau-de-cutia
	<i>Galipea jasminiflora</i> (A.St.Hil.) Engl.	Carrapateiro
	<i>Hortia oreadica</i> Groppo et al.	Para-tudo
	<i>Metrodorea nigra</i> A.St.-Hil.	Chupa-ferro
	<i>Metrodorea stipularis</i> Mart.	-
	<i>Pilocarpus pennatifolius</i> Lem.	Jaborandi
	<i>Pilocarpus spicatus</i> A.St.-Hil.	Ipeca
	<i>Zanthoxylum petiolare</i> A.St.-Hil. & Tul.	Laranjinha-do-mato
	<i>Zanthoxylum rhoifolium</i> Lam.	Mamica-de-porca-graúda

Family	Species	Popular Brazilian Name
Salicaceae	<i>Zanthoxylum riedelianum</i> Engl.	Mamica-de-porca
	<i>Prockia crucis</i> P.Browne ex L.	Cambroé
	<i>Casearia gossypiosperma</i> Briq.	Pau-de-espeto
	<i>Casearia grandiflora</i> Cambess.	Pindaíba-de-rabo-grande
	<i>Casearia mariquitensis</i> Kunth	Limãozinho
	<i>Casearia obliqua</i> Spreng.	Guaçatunga-vermelha
	<i>Casearia rupestris</i> Eichler	Cú-de-pinto
	<i>Casearia sylvestris</i> Sw.	Guaçatonga
	<i>Xylosma ciliatifolia</i> (Clos) Eichler	Sucará
	<i>Xylosma prockia</i> (Turcz.) Turcz.	Sucará
Santalaceae	<i>Phoradendron crassifolium</i> (Pohl ex DC.) Eichler	-
	<i>Phoradendron dipterum</i> Eichler	-
Sapindaceae	<i>Allophylus edulis</i> (A.St.-Hil. et al.) Hieron. ex Niederl.	Vacum
	<i>Allophylus racemosus</i> Sw.	Mama-de-cachorro
	<i>Cardiospermum grandiflorum</i> Sw.	Balãozinho
	<i>Cupania vernalis</i> Cambess.	Arco-de-barril
	<i>Dilodendron bipinnatum</i> Radlk.	Maria-pobre
	<i>Magonia pubescens</i> A.St.-Hil.	Tingui-do-cerrado
	<i>Matayba elaeagnoides</i> Radlk.	Cuvantã
	<i>Matayba guianensis</i> Aubl.	Camboatã
	<i>Paullinia rhomboidea</i> Radlk.	Uaraná-timbó
	<i>Serjania caracasana</i> (Jacq.) Willd.	Tingui-da-mata
	<i>Serjania erecta</i> Radlk.	Cinco-folhas
	<i>Serjania glutinosa</i> Radlk.	-

Family	Species	Popular Brazilian Name
	<i>Serjania lethalis</i> A.St.-Hil.	Cipó-timbó
	<i>Serjania mansiana</i> Mart.	-
	<i>Serjania meridionalis</i> Cambess.	Cipó-timbó
	<i>Serjania ovalifolia</i> Radlk.	-
	<i>Serjania perulacea</i> Radlk.	Cucum
	<i>Serjania pinnatifolia</i> Radlk.	Fruta-de-pombo
	<i>Serjania platycarpa</i> Benth.	Cucum
	<i>Urvillea ulmacea</i> Kunth	-
Sapotaceae		
	<i>Chrysophyllum gonocarpum</i> (Mart. & Eichler ex Miq.) Engl.	Aguaí
	<i>Chrysophyllum marginatum</i> (Hook. & Arn.) Radlk.	Aguaí
	<i>Micropholis venulosa</i> (Mart. & Eichler) Pierre	Uvinha
	<i>Pouteria caimito</i> (Ruiz & Pav.) Radlk.	Abieiro
	<i>Pouteria gardneri</i> (Mart. & Miq.) Baehni	Sapotinha
	<i>Pouteria guianensis</i> Aubl.	Guajará
	<i>Pouteria ramiflora</i> (Mart.) Radlk.	Fruta-de-veado
Siparunaceae		
	<i>Siparuna guianensis</i> Aubl.	Limão-bravo
Smilacaceae		
	<i>Smilax fluminensis</i> Steud.	salsaparilha
Solanaceae		
	<i>Atropa belladonna</i> L.	Beladona
	<i>Cestrum intermedium</i> Sendtn.	Coerana
	<i>Cestrum velutinum</i> Hiern	-
	<i>Sessea regnellii</i> Taub.	Peroba-d'água
	<i>Solanum laxum</i> Spreng.	Joá-cipó
	<i>Solanum lycocarpum</i> A.St.-Hil.	Fruta-do-lobo

Family	Species	Popular Brazilian Name
	<i>Solanum schizandrum</i> Sendtn.	-
	<i>Solanum schlechtendalianum</i> Walp.	-
	<i>Solanum seafortianum</i> Andr.	Trepadeira-doce-amarga
	<i>Solanum viscosissimum</i> Sendtn.	Joá-cipó-melado
Styracaceae		
	<i>Styrax acuminatus</i> Pohl	Pau-de-remo
	<i>Styrax camporum</i> Pohl	Laranjinha-do-mato
	<i>Styrax ferrugineus</i> Nees & Mart.	Benjoeiro
	<i>Styrax pohlii</i> A.DC.	Árvore-de-bálsamo
Symplocaceae		
	<i>Symplocos nitens</i> (Pohl) Benth.	Congonha-do-campo
Talinaceae		
	<i>Talinum paniculatum</i> (Jacq.) Gaertn.	Beldroega-grande
Thelypteridaceae		
	<i>Amauropelta mosenii</i> (C.Chr.) Salino & T.E.Almeida	-
	<i>Amauropelta opposita</i> (Vahl) Pic.Serm.	-
	<i>Christella conspersa</i> (Schrad.) Á.Löve & D.Löve	-
	<i>Christella dentata</i> (Forssk.) Brownsey & Jermy	-
	<i>Cyclosorus interruptus</i> (Willd.) H.Ito	-
	<i>Macrothelypteris torresiana</i> (Gaudich.) Ching	-
	<i>Meniscium arborescens</i> Humb. & Bonpl. ex Willd.	-
Urticaceae		
	<i>Cecropia pachystachya</i> Trécul	Embaúba
	<i>Urera baccifera</i> (L.) Gaudich. ex Wedd.	Urtiga



Family	Species	Popular Brazilian Name
Verbenaceae	<i>Urera caracasana</i> (Jacq.) Griseb.	Urtiga
	<i>Aloysia virgata</i> (Ruiz & Pav.) Juss.	Lixeira
	<i>Duranta erecta</i> L.	Pingo-de-ouro
	<i>Lantana camara</i> L.	Camara
	<i>Lantana cujabensis</i> Schauer	-
	<i>Lantana trifolia</i> L.	-
	<i>Stachytarpheta cayennensis</i> (Rich.) Vahl	Gervão
	<i>Lippia alba</i> (Mill.) N.E.Br. Ex P.Wilson	Erva-cidreira-brasileira
	<i>Lippia brasiliensis</i> (Link) T.R.S.Silva	-
Vitaceae	<i>Cissus duarteana</i> Cambess.	-
	<i>Cissus erosa</i> Rich.	Uvinha-do-cerrado-de-flor-vermelha
	<i>Clematicissus simsiana</i> (Schult. & Schult.f.) Lombardi	Uva-do-mato-de-cinco-folhas
Vochysiaceae	<i>Callisthene fasciculata</i> Mart.	Carvão-branco
	<i>Callisthene major</i> Mart.	Jacaré
	<i>Qualea dichotoma</i> (Mart.) Warm.	Pau-terra-multiflora
	<i>Qualea grandiflora</i> Mart.	Pau-terra
	<i>Qualea multiflora</i> Mart.	Pau-terra-liso
	<i>Qualea parviflora</i> Mart.	Pau-terra-do-cerrado
	<i>Salvertia convallariodora</i> A.St.-Hil.	Colher-de-vaqueiro
	<i>Vochysia cinnamomea</i> Pohl	-
	<i>Vochysia rufa</i> Mart.	-
	<i>Vochysia tucanorum</i> Mart.	Pau-tucano
Xyridaceae		
	<i>Xyris jupicai</i> Rich.	-

Family	Species	Popular Brazilian Name
	<i>Xyris savanensis</i> Miq.	-
	<i>Xyris tortula</i> Mart.	-
Zingiberaceae		
	<i>Hedychium chrysoleucum</i> Hook.	Lírio-amarelo-do-brejo

### 8.3.4.1.2 Field Primary Data Collection

#### Methodological Approach

In this study, it was decided to evaluate the species found in three physiognomies, due to its floristic similarities to facilitate the viewing on the occurrence of the species in the area, which are:

Riparian forest: composed in the studied area by paludosa forests and vereda. Paludosa forests are areas with outcrop of groundwater, being the soil wet basically during all year long (Torres et al. 1994, Ivanauskas et al. 1997) and they present unique flora, what separates them from other riparian vegetation formations (Torres et al. 1994, Toniato et al. 1998), furthermore, the trees component are conspicuous and constitute a continuous closed canopy. In the Vereda, the outcrop of groundwater process also occurs, making the soil wet, being the Palms species the typical elements, among them the Buriti (*Mauritia flexuosa* L.f.) (IBGE 2007, 2009), with shrubs and herbaceous species group and they do not form a continuous canopy (Ferreira 2009). These areas have great complexity, with greatest floristic similarity with the areas of Cerrado Campo Limpo and Campo Sujo (Walter 2006).

Cerrado: in the studied area it is represented by cerradão and cerrado "stricto sensu". The first one is characterized by the presence of trees representing approximately 70% of the covered vegetation, ranging from 8-15 m in height and almost continuous canopy (Ferreira 2009). The cerrado "sensu stricto", according to Ferreira (2009), can display four different types of formations; they differ by the tree density, which may vary from 5-70%, with about of 2-8 m height. According to this same author, the herbaceous strata vary from thin where the tree density is huge, to uppermost where the tree density is small.

Seasonal Deciduous Forest: are forests where more than 50% of the tree individuals lose their leaves in the dry season (Espírito-Santo et al. 2006). The canopy can range from 10-40 m, depending on the soil's depth (Oliveira-Filho et al. 2006, Espírito-Santo et al. 2006). They can occur in steep terrain, with rocky outcrops (Gonçalves 2015), as noted in the studied area.

The floristic inventory occurred in 17 different sections within the studied area, and it is presented in the table and figure below.

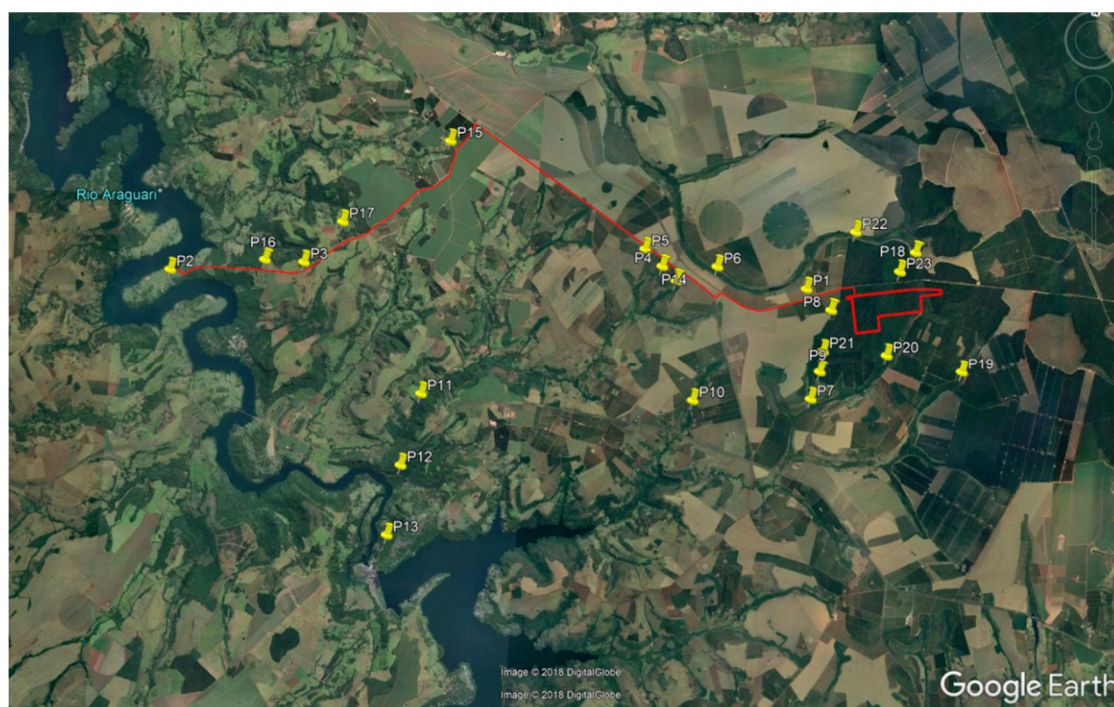
**Table 2 – Flora sampling points in the studied area between Araguari and Indianópolis cities, MG. Coordinates Zone 22 and 23 S. Datum Sirgas 2000.**

Point	Coordinates	Characterization
1	23K 190659 7914763	Area with predominance of Eucalyptus and coffee plantations, being found cerrado regenerating forest, trees with 2-8 m height that do not constitute canopy.
2	22K 805614 7914183	Area near the Araguari river, consisting predominantly of seasonal deciduous forest, the soil presents little depth, with rocks outcropping. The trees reach 10-15 m height, with some emerging trees and they form a continuous canopy. It presents shrubs forests with 1-3 m height and with herbaceous species.
3	22K 809255 7914564	Cerradão area along with the pasture area, that extends till a stream, where vegetation becomes closer, forming a continuous canopy, with trees of 10-15 m height. In more distant points and closer to the pasture areas, the trees become more distant, with average height of 8 m.
4	23K 186679 7915044	Vereda area, permanently flooded field with vegetation exclusively herbaceous, with few shrubby individuals and predominance of Buriti species ( <i>Mauritia flexuosa</i> L.f.).
5	23K 186176 7915468	Cerrado “stricto sensu” sampling point with predominance of trees with 5-7 m height, not forming a canopy. With woody herbaceous continuous stratum. This point is adjacent to the vereda area sampled under point 4, where its surroundings have agricultural areas.
6	23K 188180 7915159	Regeneration cerrado area, with predominance of African invasive grass ( <i>Urochloa decumbens</i> -Braquiária) and arboreal regenerating individuals, far between each other and not exceeding 4-5 m height.
7	23K 191026 7911774	Paludosa forest area, with trees reaching 10-15 m height, continuous canopy, occurring the shrub formation with species of 1-2 m height and a few herbaceous components, represented by ferns. The soil is predominantly wet.
8	23K 191379 7914247	Cerradão area, formed by trees with 8-10 m height, a few emerging trees and continuous canopy. Forest consisting of sparse bushes with 1-3 m height. Localized in area consisting of eucalyptus plantations.

Point	Coordinates	Characterization
9	23K 191209 7912538	Adjacent to the previous point, showing the same characteristics as point 8.
10	23K 187821 7911464	Area consisting of cerrado, with trees reaching 6-8 m height. Immersed area in eucalyptus plantations.
11	22K 812632 7911142	Gallery forest in the lower portions of the area, as it rises to the highest points, the vegetation becomes "seasonal deciduous forest". These are areas of secondary forest in good condition of conservation, with bushes formation and continuous canopy, with 12-15 m height.
12	22K 812176 7909173	Seasonal deciduous forest point, stony soil, trees with 12-15 m height, forming a continuous canopy, but drain. Presence of little diverse bushes.
13	22K 811896 7907259	Seasonal deciduous forest area, however, at this point probably occurred human intervention with trees plantation, especially near the highway. The trees range from 8-12 m height, forming a continuous canopy and the bushes are little dense.
14	23K 187091 7914688	Under regeneration cerrado area, with points dominated by <i>Urochloa decumbens</i> (Braquiária) and others in a better state of preservation, without the invasion of grasses. It presents trees with 2-6 m height, spaced and not forming a canopy.
15	22K 813090 7918044	Seasonal deciduous forest area in the highest points of land, being found at the bottom of Valley a watercourse. The trees present 8-10 m height, forming a continuous canopy, bushes with sparse individuals.
16	22K 808189 7914581	Seasonal deciduous forest area, stony soil, trees with approximately 12-15 m height, forming a continuous canopy. Bushes composed by sparse individuals, mainly of regenerating tree species.
17	22K 810259 7915712	Under regeneration cerrado area and presented by grasses invasion and in some places the trees can reach over 8 meters height and there is a continuous canopy. However, the predominance in the area is of sparse trees, ranging from 2-5 m height.

Point	Coordinates	Characterization
18	23 K 193547/ 7915996	The initial portion of the area with predominance of exotic invasive grass, practically devoid of arboreal individuals. However, the West, arboreal individuals of species typical of the cerrado are abundant, reaching to 2-6 m in height, does not occur to the formation of canopy, or laminate, with Grass Braquiária in the herbaceous component domain. Next to the stream there are verede formations (dried in the sampled period) and riparian forest paths with tall trees 6-8 m height and typical of this formation.
19	23 K 195080/ 7912860	Area of cerrado, with presence of trees with a height ranging from 6-7 m, forming canopy, with some individuals emerging (8-9 m height) forming the upper stratum. Understorey composed of shrubs and regenerating species, with individuals reaching 1.5-4 m height and lower strata formed by native grasses and by herbaceous eudicots. The species are typical of cerrado and some are generalists from forest formations as cerradão and transition areas.
20	23 K 192995/ 7913147	The presence of tree species of 7-8 m height, with closed and continuous canopy, with few clearings and few individuals emerging (10-11 m height). The understory is composed of regenerating individuals and shrubs species, with heights ranging from 2-5 m, being dense in mostly all of the area. When approaching the stream the forest height increases. In the wettest stretches the lower stratum is dominated by ferns species, while in the drier spots occur native grasses.
21	23 K 191250/ 7913118	Tree species with 10-11 m height, forming a continuous closed canopy, with individuals emerging (12-13 m height). The understory is thick, formed mainly by shrubs species, but also occur regenerating canopy species, ranging from 2-6 m in height. Practically there is no formation of a lower stratum herbaceous, except in the vicinity of the border, where there are native and exotic grasses. Near the border there is also found some clusters of woody climbers. The species that make up this path is typical of cerrado, but also appear the generalists species that occupy transition areas and cerradão.

Point	Coordinates	Characterization
22	23 K 194867/ 7916410	Stretch formed mainly by exotic grass species, with much of the tree component composed by <i>Pinus SP.</i> , in various stages of development and that competes with the native flora by preventing its regeneration. Woody flora native individuals occur, but these are sparse and reach, in general, 4-6 m height.
23	23 K 193161/ 7915443	The ADA of dissolving pulp mill area, is composed primarily by plantations of <i>Eucalyptus spp.</i> ( <i>Eucalyptus</i> ), with native species regeneration in the thin or absent understory.



**Figure 2 – Flora sampling points location.**

The species identification was made preferentially on the field, however, in case of doubt; the botanical material was collected and botanized following the usual techniques described by Fidalgo & Bononi (1984). The identification was made from specific literature and by comparisons in herbaria, when necessary, there were made consultations with experts of the taxonomy in question. It is worthy to note that only fertile individuals were taken into consideration in this study, or those which, even sterile, could not allow doubts about their determination.

The taxonomic treatment adopted for Magnoliophyta (flowering plants) was the APG IV (2016), for Pinophyta (Gymnosperms) it was adopted Christenhuz et al. (2011) and for Monilophyta (ferns) and Lycophyta (lycophytes) was based on PPG I (2016)



methods. The taxonomy name, as well as the spelling of the names followed the authors methods proposed by The International Plant Name Index – IPNI (2018).

The degree of threatness to extinction has been verified for all the species found, taking into account the State list (Biodiversitas 2018), the Brazilian list (CNCflora 2018) and the global list (IUCN 2017).

The species were classified according to their habit observed in field, being divided into: trees, palms, shrubs, herbs, vines and epiphytes. There was followed the proposed terminology by Gautam & Lorenzi (2011) for these categories. In addition, it was noted the geographical distribution of the species, being considered native to Brazil, the species identified by the Species List in the Brazilian Flora (2018) and exotic species, those naturalized, spontaneous, cultivated or, even considered exotic, in this database.

### **Results and discussion**

During the first field campaign (rainy season) there were found 296 species (72,3%), distributed in 82 families (87,2%), of which 78 families (19.1%) were exclusively found in this campaign. During the second field campaign (dry season), there were registered 330 species (80,6%), belonging to 84 families (89.3%), of which 113 (27.3%) were exclusively found in this campaign (as shown in the following table). There were registered 409 vascular flora species, as well as three varieties and two subspecies, belonging to 94 botanical families and four divisions (or phyla). Magnoliophyta (Angiosperms) was the division with the largest number of species and families found, corresponding to 355 and 79 species, respectively. For Monilophytes (ferns) there were recorded 49 species, distributed in 12 families, the Lycophyta (lycophytes) presented 3 species in a single family and Pinophyta (Gymnosperms) was represented by two species within two families. These data show a higher number of species found than in other studies conducted in the Triangulo Mineiro region by Araújo et al. (2002) for vereda areas and by Silva et al. (2014) and Siqueira (2007) in seasonal deciduous forest areas and Giacomo et al. (2015) in cerrado and seasonal deciduous forest areas at ecological station of Pirapitinga. In fact, the large expressive number of species found in the present study, reflects the great diversity of habitats studied, which led to a sharp richness of species, unlike the above-mentioned works that inventoried in general only one phytophysiognomy.

**Table 3 – List of species found in the remnants of vegetation at sampled areas, between Araguari and Indianópolis cities, Minas Gerais, Brazil. Division (Phylum): Magnoliophyta (Angiosperms); Monilophytes (Ferns); Lycophyta (Lycophytes); Pinophyta (Gymnosperms). Camp. 1 – 1<sup>st</sup> Campaign; Camp. 2 – 2<sup>nd</sup> Campaign. Habit: Ar-tree; Bt-Bush; Ev-Weed; Tp-Creeper; Pm-Palm Tree; Pf-endemic; Hf-Hemiepífita. Vegetation: Fc-Riparian Forest (including vereda and paludosa forest); Cr-Cerrado "lato sensu"; Ed-seasonal deciduous forest. Dist. Geo – Geographical Distribution.**

Division	Family	Species	Brazilian Popular name	Camp. 1	Camp.2	Habit	Vegetation	Origin
<i>Lycophyta</i>								
	Lycopodiaceae							
		<i>Lycopodiella longipes</i> (Grev. & Hooker) Holub	-	X		Ev	Fc	Native
		<i>Palhinhaea camporum</i> (B.Øllg. & P.G.Windisch) Holub	-		X	Ev	Fc	Native
		<i>Palhinhaea cernua</i> (L.) Franco & Vasc.	-	X	X	Ev	Fc	Native
<i>Monilophyta</i>								
	Anemiaceae							
		<i>Anemia ferruginea</i> Humb. & Bonpl. ex Kunth	-		X	Ev	Cr	Native
		<i>Anemia hirsuta</i> (L.) Sw.	-	X	X	Ev	Ed	Native
		<i>Anemia phyllitidis</i> var. <i>phyllitidis</i> (L.) Sw.	-	X	X	Ev	Ed	Native
		<i>Anemia tenera</i> Pohl	-	X		Ev	Fc	Native
		<i>Anemia tomentosa</i> var. <i>anthriscifolia</i> (Schrad.) Mickel	-	X		Ev	Cr/Ed	Native
		<i>Anemia tomentosa</i> var. <i>tomentosa</i> (Sav.) Sw.	-	X		Ev	Cr/Ed	Native
	Blechnaceae							
		<i>Blechnum occidentale</i> L.	-		X	Ev	Fc	Native
		<i>Blechnum polypodioides</i> Raddi	-		X	Ev	Fc	Native
		<i>Lomariocyas schomburgkii</i> (Klotzsch) Gasper & A.R.Sm.			X	Ev	Fc	Native
		<i>Salpichlaena volubilis</i> (Kaulf.) J.Sm.			X	Tp	Fc	Native
		<i>Telmatoblechnum serrulatum</i> (Rich.) Perrie, D.J.Ohlsen & Brownsey	-	X	X	Ev	Fc	Native
	Cyatheaceae							
		<i>Cyathea delgadii</i> Sternb.	Samambaiçu-de-espinho		X	Ar	Fc	Native
		<i>Cyathea poeppigii</i> (Hook.) Domin	Samambaiçu-de-espinho	X	X	Ar	Fc	Native



Division	Family	Species	Brazilian Popular name	Camp. 1	Camp.2	Habit	Vegetation	Origin
		<i>Cyathea</i> sp.	Samambaiçu-de-espinho	X	X	Ar	Fc	-
	Dennstaedtiaceae							
		<i>Dennstaedtia cicutaria</i> (Sw.) T.Moore	-		X	Ev	Fc	Native
		<i>Pteridium arachnoideum</i> (Kaulf.) Maxon	Samambaia-do-campo	X	X	Ev	Cr	Native
	Dryopteridaceae							
		<i>Bolbitis serratifolia</i> Schott	-		X	Ev	Fc	Native
		<i>Cyclodium meniscioides</i> (Willd.) C.Presl	-	X	X	Ev	Fc	Native
		<i>Elaphoglossum glaziovii</i> (Fée) Brade	-		X	Ev	Fc	Native
		<i>Elaphoglossum pteropus</i> C.Chr.	-		X	Ev	Fc	Native
		<i>Polybotrya goyazensis</i> Brade	-		X	Hp	Fc	Native
	Gleicheniaceae							
		<i>Dicranopteris flexuosa</i> (Schrad.) Underw.	Samambaia-de-barranco	X	X	Ev	Fc/Cr	Native
		<i>Gleichenella pectinata</i> (Willd.) Ching	-		X	Ev	Fc	Native
		<i>Sticherus lanuginosus</i> (Fée) Nakai	-	X	X	Ev	Ed/Fc	Native
	Hymenophyllaceae							
		<i>Trichomanes cristatum</i> Kaulf.	-		X	Ev/Ep	Fc	Native
		<i>Trichomanes pinnatum</i> Hedw.	-		X	Ev	Fc	Native
	Lindsaeaceae							
		<i>Lindsaea divaricata</i> Klotzsch	-	X		Ev	Fc	Native
		<i>Lindsaea lancea</i> (L.) Bedd.	-		X	Ev	Fc	Native
		<i>Lindsaea portoricensis</i> Desv.	-		X	Ev	Fc	Native
		<i>Lindsaea quadrangularis</i> Raddi	=		X	Ev	Fc	Native
	Lygodiaceae							
		<i>Lygodium venustum</i> Sw.	Abre-caminho	X	X	Tp	Ed	Native
	Osmundaceae							
		<i>Osmunda spectabilis</i> Willd.	-		X	Ev	Fc	Native

Division	Family	Species	Brazilian Popular name	Camp. 1	Camp.2	Habit	Vegetation	Origin
	Pteridaceae							
		<i>Adiantum curvatum</i> Kaulf.	Avenção		X	Ev	Ed	Native
		<i>Adiantum deflexens</i> Mart.	Avenquinha	X	X	Ev	Fc/Ed	Native
		<i>Adiantum intermedium</i> Sw.	-		X	Ev	Fc	Native
		<i>Adiantum lorentzii</i> Hieron.	Avenca		X	Ev	Fc	Native
		<i>Adiantum platyphyllum</i> Sw.	-		X	Ev	Fc	Native
		<i>Adiantum serratodentatum</i> Willd.	-		X	Ev	Fc	Native
		<i>Lytoneuron lomariaceum</i> (Klotzsch) Yesilyurt	-		X	Ev	Fc	Native
		<i>Pityrogramma calomelanos</i> (L.) Link	-	X	X	Ev	Fc	Native
		<i>Pityrogramma trifoliata</i> (L.) R.M.Tryon	-		X	Ev	Fc	Native
	Thelypteridaceae							
		<i>Amauropelta heineri</i> (C.Chr.) Sallino & T.E.Almeida	-		X	Ev	Fc	Native
		<i>Amauropelta mosenii</i> (C.Chr.) Salino & T.E.Almeida	-	X		Ev	Fc	Native
		<i>Amauropelta opposita</i> (Vahl) Pic.Serm.	-		X	Ev	Fc	Native
		<i>Amauropelta pachyrhachis</i> (Kunze ex Mett.) Salino & T.E.Almeida	-		X	Ev	Fc	Native
		<i>Amauropelta</i> sp.	-	X		Ev	Fc	-
		<i>Christella conspersa</i> (Schrad.) Á.Löve & D.Löve	-	X	X	Ev	Fc	Native
		<i>Macrothelypteris torresiana</i> (Gaudich.) Ching	-	X	X	Ev	Fc	Exotic
		<i>Meniscium longifolium</i> Desv.	-	X	X	Ev	Fc	Native
		<i>Meniscium</i> sp.	-	X	X	Ev	Fc	-
<b>Pinophyta</b>								
	Pinaceae							
		<i>Pinus</i> sp.	Pinus		X	Ar	Fc/Cr	Exotic
	Podocarpaceae							
		<i>Podocarpus sellowii</i> Klotzsch ex Endl.	-	X		Ar	Fc	Native
<b>Magnolipohyta</b>								

Division	Family	Species	Brazilian Popular name	Camp. 1	Camp.2	Habit	Vegetation	Origin
	Acanthaceae							
		<i>Justicia</i> sp.	-		X	Ev	Ed	Native
		<i>Ruellia elegans</i> Poir.	-	X		Ev	Ed	Native
		<i>Ruellia</i> sp.			X	Ev	Fc	Native
	Anacardiaceae							
		<i>Anacardium humile</i> A.St.-Hil.	Cajuzinho-do-campo		X	Bt	Cr	Native
		<i>Anacardium occidentale</i> L.	Cajueiro		X	Ar	Ed	Native
		<i>Astronium graveolens</i> Jacq.	Guarítá	X		Ar	Fc	Native
		<i>Lithraea molleoides</i> (Vell.) Engl.	Aroeira-branca	X	X	Ar	Cr	Native
		<i>Myracrodruon urundeuva</i> Allemão	Aroeira-preta	X	X	Ar	Cr/Ed	Native
		<i>Tapirira guianensis</i> Aubl.	Peito-de-pombo	X	X	Ar	Fc/Cr	Native
		<i>Tapirira obtusa</i> (Benth.) J.D.Mitch.	Pombeiro		X	Ar	Fc	Native
	Annonaceae							
		<i>Annona coriacea</i> Mart.	Araticum	X	X	Ar	Cr	Native
		<i>Annona crassiflora</i> Mart.	Araticum-gigante	X	X	Ar	Cr	Native
		<i>Annona monticola</i> Mart.	Marolo-do-campo	X	X	Bt	Cr	Native
		<i>Duguetia furfuracea</i> (A.St.-Hil.) Saff.	Ata-do-mato	X	X	Ar	Cr	Native
		<i>Xylopia aromatica</i> (Lam.) Mart.	Pimenta-de-macaco	X	X	Ar	Cr/Fc	Native
		<i>Xylopia brasiliensis</i> Spreng.	Pindaíba	X	X	Ar	Fc	Native
		<i>Xylopia sericea</i> A.St.-Hil.	Pindaíba-branca	X	X	Ar	Cr	Native
	Apocynaceae							
		<i>Aspidosperma tomentosum</i> Mart.	Guatambú-do-cerrado	X	X	Ar	Cr	Native
		<i>Aspidosperma verbascifolium</i> Müll.Arg.	Peroba-do-campo		X	Ar	Cr	Native
		<i>Blephoradon pictum</i> (Vahl) W.D.Stevens	-	X		Tp	Fc	Native
		<i>Forsteronia thyrsoidea</i> (Vell.) Müll.Arg.	-	X	X	Tp	Ed	Native
		<i>Hancornia speciosa</i> Gomes	Mangaba		X	Ar	Cr	Native

Division	Family	Species	Brazilian Popular name	Camp. 1	Camp.2	Habit	Vegetation	Origin
		<i>Himatanthus obovatus</i> (Müll.Arg.) Woodson	Pau-de-leita	X	X	Ar	Cr	Native
		<i>Marsdenia</i> cf. <i>hilariana</i> E.Fourn.	-	X		Tp	Cr	Native
		<i>Odontadenia lutea</i> (Vell.) Markgr.	-	X		Tp	Cr	Native
		<i>Prestonia riedelii</i> (Müll.Arg.) Markgr.	-	X		Tp	Fc	Native
		<i>Schubertia grandiflora</i> Mart.	Cipó-de-leite	X	X	Tp	Cr/Fc	Native
	Araliaceae							
		<i>Dendropanax cuneatus</i> (DC.) Decne. & Planch.	Maria-mole	X		Ar	Fc	Native
		<i>Schefflera macrocarpa</i> (Cham. & Schltdl.) Frondin	Mandiocão	X	X	Ar	Cr	Native
		<i>Schefflera morototoni</i> (Aubl.) Maguire, Steyerl. & Frodin	Caixeta		X	Ar	Ed	Native
	Arecaceae							
		<i>Acrocomia aculeata</i> (Jacq.) Lodd. ex Mart.	Macaúba	X	X	Pm	Fc/Cr	Native
		<i>Attalea phalerata</i> Mart. ex Spreng.	Bacuri		X	Pm	Ed/Fc	Native
		<i>Butia archeri</i> (Glassman) Glassman	Butiá	X		Pm	Cr	Native
		<i>Euterpe edulis</i> Mart.	Palmito-juçara	X		Pm	Fc	Native
		<i>Geonoma pohliana</i> Mart.	Guaricanga	X	X	Pm	Fc	Native
		<i>Mauritia flexuosa</i> L. F.	Buriti	X	X	Pm	Fc	Native
		<i>Syagrus flexuosa</i> (Mart.) Becc.	Coquinho-babão	X	X	Pm	Ed/Fc/Cr	Native
		<i>Syagrus loefgrenii</i> Glassman	Acumã-rasteiro	X	X	Pm	Cr	Native
		<i>Syagrus romanzoffiana</i> (Cham.) Glassman	Jerivá	X		Pm	Cr/Ed	Native
	Aristolochiaceae							
		<i>Aristolochia esperanzae</i> Kuntze	Jarrinha-do-cerrado	X	X	Tp	Cr	Native
	Asparagaceae							
		<i>Furcraea foetida</i> (L.) Haw.	Pita		X	Ev	Fc	Exotic
	Asteraceae							
		<i>Acanthospermum australe</i> (Loefl.) Kuntze	Carrapicho-rasteiro	X	X	Ev	Cr/Ed/Fc	Native
		<i>Achyrocline alata</i> (Kunth) DC.	Macela	X	X	Ev	Cr	Native

Division	Family	Species	Brazilian Popular name	Camp. 1	Camp.2	Habit	Vegetation	Origin
		<i>Achyrocline satureioides</i> (Lam.) DC.	Macela	X	X	Ev	Cr	Native
		<i>Ageratum conzoydes</i> L.	Mentrasto	X	X	Ev	Cr	Native
		<i>Baccharis dracunculifolia</i> DC.	Alecrim-do-campo	X	X	Bt	Ed/Cr/Fc	Native
		<i>Chaptalia integerrima</i> (Vell.) Burkart	Língua-de-vaca	X	X	Ev	Ed/Cr/Fc	Native
		<i>Conyza canadensis</i> (L.) Cronquist	Buva	X		Ev	Cr/Fc	Native
		<i>Dasyphyllum brasiliense</i> (Spreng.) Cabrera	Açoite	X	X	Ar/Bt	Ed	Native
		<i>Elephantopus mollis</i> Kunth	Erva-de-lagarto	X	X	Ev	Ed/Fc	Native
		<i>Mikania cordifolia</i> (L.f.) Willd.	Erva-de-cobra	X		Tp	Cr/Ed/Fc	Native
		<i>Piptocarpha rotundifolia</i> (Less.) Baker	Coração-de-negro	X	X	Ar	Cr	Native
	Bignoniaceae							
		<i>Adenocalymma nodosum</i> (Silva Manso) L.G.Lohmann	Carobinha-do-campo	X	X	Tp	Cr	Native
		<i>Adenocalymma peregrinum</i> (Miers) L.G.Lohmann	Ciganinha	X	X	Tp	Cr	Native
		<i>Anemopaegma arvense</i> (Vell.) Stellfeld ex de Souza	Catuaba	X	X	Bt	Cr	Native
		<i>Anemopaegma glaucum</i> Mart. ex DC.	Catuaba		X	Bt	Cr	Native
		<i>Cybistax antisiphilitica</i> (Mart.) Mart.	Ipê-verde	X	X	Ar	Cr	Native
		<i>Fridericia florida</i> (DC.) L.G.Lohmann	-	X	X	Tp	Ed	Native
		<i>Fridericia platyphylla</i> (Cham.) L.G.Lohmann	Tinteiro		X	Bt	Cr	Native
		<i>Handroanthus ochraceus</i> (Cham.) Mattos	Ipê-amarelo-do-cerrado	X	X	Ar	Ed/Cr	Native
		<i>Jacaranda caroba</i> (Vell.) DC.	Caroba		X	Bt	Cr	Native
		<i>Jacaranda cuspidifolia</i> Mart.	Caroba	X		Ar	Ed	Native
		<i>Jacaranda decurrens</i> Cham.	Carobinha	X		Bt	Cr	Native
		<i>Jacaranda rufa</i> Silva Manso	Caroba-do-campo		X	Bt	Cr	Native
		<i>Pyrostegia venusta</i> (Ker Gawl.) Miers	Flor-de-são-joão		X	Tp	Cr	Native
		<i>Tabebuia roseoalba</i> (Ridl.) Sandwith	Ipê-branco	X	X	Ar	Ed	Native
		<i>Zeyheria montana</i> Mart.	Bolsa-de-pastor	X	X	Bt	Cr	Native
	Bixaceae							

Division	Family	Species	Brazilian Popular name	Camp. 1	Camp.2	Habit	Vegetation	Origin
	Bromeliaceae	<i>Bixa orellana</i> L.	Urucum	X		Ar/Bt	Cr	Native
	Bromeliaceae	<i>Ananas ananassoides</i> (Baker) L.B.Sm.	Abacaxi-do-cerrado	X	X	Ev	Cr	Native
	Bromeliaceae	<i>Billbergia</i> sp.	-		X	Pf	Ed	Native
	Bromeliaceae	<i>Tillandsia tricholepis</i> Baker	-		X	Pf	Ed	Native
	Burmanniaceae	<i>Burmannia flava</i> Mart.	-	X		Ev	Fc	Native
	Burseraceae	<i>Protium heptaphyllum</i> (Aubl.) Marchand	Almacéga		X	Ar	Fc	Native
	Burseraceae	<i>Protium ovatum</i> Engl.	Breu		X	Bt	Fc/Cr	Native
	Cactaceae	<i>Brasiliopuntia brasiliensis</i> (Willd.) A.Berger	Cacto-pé-de-mamão		X	Ar	Ed	Native
	Cactaceae	<i>Epiphyllum phyllanthus</i> (L.) Haw.	Pitainha	X	X	Pf	Cr	Native
	Cactaceae	<i>Rhipsalis</i> sp.	-	X	X	Pf	Fc	Native
	Calophyllaceae	<i>Calophyllum brasiliense</i> Cambess.	Guanandi	X		Ar	Fc	Native
	Calophyllaceae	<i>Kielmeyera coriacea</i> Mart. & Zucc.	Pau-santo	X	X	Ar	Cr	Native
	Calophyllaceae	<i>Kielmeyera rubriflora</i> Cambess.	Rosa-do-campo	X	X	Ar	Cr	Native
	Cannabaceae	<i>Celtis iguanaea</i> (Jacq.) Sarg.	Grão-de-galo	X	X	Ar/Bt	Ed/Fc	Native
	Cannabaceae	<i>Trema micrantha</i> (L.) Blume	Pau-pólvora	X	X	Ar	Ed/Fc	Native
	Caricaceae	<i>Carica papaya</i> L.	Mamoeiro		X	Ar	Ed	Exotic
	Caryocaraceae	<i>Caryocar brasiliense</i> Cambess.	Pequiheiro	X	X	Ar	Cr	Native
	Celastraceae							

Division	Family	Species	Brazilian Popular name	Camp. 1	Camp.2	Habit	Vegetation	Origin
		<i>Monteverdia floribunda</i> (Reissek) Biral	Cafezinho-seco	X	X	Ar	Fc/Ed	Native
		<i>Peritassa campestris</i> (Cambess.) A.C.Sm.	Bacupari-do-campo		X	Bt	Cr	Native
		<i>Plenckia populnea</i> Reissek	Marmelo-do-campo		X	Ar	Ed/Cr	Native
	Chloranthaceae							
		<i>Hedyosmum brasiliense</i> Mart. ex Miq.	Chá-de-bugre	X		Ar/Bt	Fc	Native
	Chrysobalanaceae							
		<i>Hirtella glandulosa</i> Spreng.	Vermelhão		X	Ar	Cr	Native
		<i>Hirtella gracilipes</i> (Hook.f.) Prance	Bosta-de-cabra		X	Ar	Cr	Native
		<i>Licania humilis</i> Cham. & Schltdl.	Marmelito-do-campo	X	X	Ar	Cr	Native
		<i>Parinari obtusifolia</i> Hook.f.	Fruta-de-ema	X		Bt	Cr	Native
	Combretaceae							
		<i>Terminalia argenta</i> Mart.	Capitão-do-mato	X	X	Ar	Ed/Cr	Native
		<i>Terminalia glabrescens</i> Mart.	Capitãozinho	X	X	Ar	Ed/Cr	Native
	Connaraceae							
		<i>Connarus suberosus</i> Planch.	Araruta-do-campo	X	X	Ar/Bt	Cr	Native
		<i>Rourea induta</i> Planch.	Pau-de-porco	X	X	Bt	Cr	Native
	Convolvulaceae							
		<i>Ipomoea alba</i> L.	Boa-noite	X	X	Tp	Ed	Native
		<i>Ipomoea cairica</i> (L.) Sweet	Corda-de-viola	X	X	Tp	Ed	Native
		<i>Ipomoea indica</i> (Burm.) Merr.	Corda-de-viola	X	X	Tp	Cr	Native
		<i>Ipomoea indivisa</i> (Vell.) Hallier f.	Carriola	X	X	Tp	Cr	Native
		<i>Ipomoea nil</i> (L.) Roth	Amarra-amarra	X		Tp	Ed	Exotic
		<i>Ipomoea purpurea</i> (L.) Roth	Bons-dias	X	X	Tp	Cr	Native
		<i>Ipomoea</i> sp.	-	X		Tp	Ed	-
		<i>Ipomea triloba</i> L.	Campainha	X	X	Tp	Ed	Native
		<i>Merremia macrocalyx</i> (Ruiz & Pav.) O'Donnell	Flor-de-pau	X	X	Tp	Cr	Exotic

Division	Family	Species	Brazilian Popular name	Camp. 1	Camp.2	Habit	Vegetation	Origin
	Cordiaceae							
		<i>Cordia trichotoma</i> (Vell.) Arráb. ex Steud.	Louro-pardo		X	Ar	Ed	Native
		<i>Varronia polycephala</i> Lam.	-	X	X	Bt	Ed	Native
	Costaceae							
		<i>Costus spicatus</i> (Jacq.) Sw.	Cana-de-macaco	X		Ev	Fc	Native
	Cucurbitaceae							Native
		<i>Momordica charanthia</i> L.	Melão-de-são-caetano	X	X	Tp	Ed	Exotic
	Cunoniaceae							
		<i>Lamanonia ternata</i> Vell.	Cangalheiro	X	X	Ar	Cr	Native
	Cyperaceae							
		<i>Calyptrocarya glomerulata</i> (Brongn.) Urb.	-	X		Ev	Fc	Native
		<i>Cyperus luzulae</i> (L.) Retz.	Capim-de-botão	X	X	Ev	Fc	Native
		<i>Cyperus meyenianus</i> Kunth	Tiririca	X	X	Ev	Fc/Ed	Native
		<i>Cyperus surinamensis</i> Rottb.	Junça	X		Ev	Fc/Cr	Native
		<i>Fimbristylis autumnalis</i> (L.) Roem. & Schult.	Falso-alecrim-da-praia	X		Ev	Fc/Ed	Native
		<i>Fimbristylis dichotoma</i> (L.) Vahl	Falso-alecrim	X		Ev	Fc	Native
		<i>Kyllinga odorata</i> Vahl	Capim-santo	X	X	Ev	Fc	Native
		<i>Rhynchospora nervosa</i> (Vahl) Boeckeler	Capim-estrela	X	X	Ev	Fc	Native
	Dilleniaceae							
		<i>Curatella americana</i> L.	Sambaíba	X		Ar	Cr	Native
		<i>Davilla elliptica</i> A.St.-Hil.	Lixeirinha	X	X	Bt/Tp	Cr	Native
	Droseraceae							
		<i>Drosera communis</i> A.St.-Hil.	Planta-carnívora	X		Ev	Fc	Native
	Ebenaceae							
		<i>Diospyros inconstans</i> Jacq.	Marmelinho	X	X	Ar	Fc	Native
		<i>Diospyros lasiocalyx</i> (Mart.) B.Walln.	Caqui-do-cerrado	X	X	Ar	Fc/Cr	Native



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	Eriocaulaceae	<i>Paepalanthus</i> sp.	-	X		Ev	Fc	-
	Erythroxylaceae	<i>Erythroxylum deciduum</i> A.St.-Hil.	Joveve	X	X	Ar	Ed/Cr	Native
		<i>Erythroxylum suberosum</i> A.St.-Hil.	Mercúrio-do-campo		X	Ar	Cr	Native
	Euphorbiaceae	<i>Acalypha diversifolia</i> Jacq.	-		X	Bt	Fc	Native
		<i>Alchornea glandulosa</i> Poepp. & Endl.	Tapiá	X	X	Ar	Ed	Native
		<i>Cnidioscolus urens</i> (L.) Arthur	Urtigão	X		Bt	Ed	Native
		<i>Croton gracilipes</i> Baill.	-	X	X	Ar/Bt	Ed	Native
		<i>Croton lundianus</i> (Didr.) Müll.Arg.	Gervão-branco	X	X	Bt	Ed	Native
		<i>Croton ururcurana</i> Baill.	Sangra-d'água	X	X	Ar	Fc	Native
		<i>Manihot anomala</i> Pohl	Mandioca-de-veado	X	X	Ar/Bt	Ed	Native
		<i>Manihot caerulescens</i> Pohl	-	X		Bt	Cr	Native
		<i>Maprounea brasiliensis</i> A.St.-Hil.	Mata-berne		X	Bt	Cr	Native
		<i>Maprounea guianensis</i> Aubl.	Bonifácio	X	X	Ar	Cr	Native
		<i>Sebastiania brasiliensis</i> Spreng.	Branquilha	X	X	Ar/Bt	Ed/Cr/Fc	Native
	Fabaceae	<i>Albizia niopoides</i> (Spruce ex Benth.) Burkart	Farinha-seca	X		Ar	Ed	Native
		<i>Anadenanthera colubrina</i> (Vell.) Brenan	Angico	X	X	Ar	Ed	Native
		<i>Andira vermifuga</i> (Mart.) Benth	Angelim-branco	X	X	Ar	Cr	Native
		<i>Bauhinia catingae</i> Harms	Unha-de-vaca	X		Ar/Bt	Cr	Native
		<i>Bauhinia holophylla</i> (Bong.) Steud.	Pata-de-vaca	X	X	Bt	Cr	Native
		<i>Bauhinia longifolia</i> (Bong.) Steud.	Pata-de-vaca	X	X	Ar	Cr	Native
		<i>Bauhinia pulchella</i> Benth.	Unha-de-boi	X	X	Ar	Ed	Native
		<i>Bowdichia virgilioides</i> Kunth	Sucupira-preta	X	X	Ar	Cr	Native

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		<i>Copaifera langsdorffii</i> Desf.	Copaíba	X	X	Ar	Ed/Cr	Native
		<i>Chamecrista cathartica</i> (Mart.) H.S.Irwin & Barneby	-	X		Bt	Cr	Native
		<i>Chamaecrista desvauxii</i> (Collad.) Killip	Mimosa	X	X	Bt	Cr	Native
		<i>Chamaecrista flexuosa</i> (L.) Greene	Peninha	X	X	Bt	Cr	Native
		<i>Dahlstedtia muehlbergiana</i> (Hassl.) M.J.Silva & A.M.G.Azevedo	Embira-de-sapo		X	Ar	Ed	Native
		<i>Dalbergia miscolobium</i> Benth.	Caviúna-do-cerrado	X	X	Ar	Cr	Native
		<i>Dimorphandra mollis</i> Benth.	Barbatimão-falso	X	X	Ar	Cr	Native
		<i>Dipteryx alata</i> Vogel	Cumarú		X	Ar	Ed	Native
		<i>Enterolobium contortisiliquum</i> (Vell.) Morong	Timboril	X	X	Ar	Ed	Native
		<i>Enterolobium gummiferum</i> (Mart.) J.F.Macbr.	Timbori-do-cerrado		X	Ar	Cr	Native
		<i>Holocalyx balansae</i> Micheli	Alecrim-de-campinas		X	Ar	Ed	Native
		<i>Hymenaea courbaril</i> L.	Jatobá		X	Ar	Ed	Native
		<i>Hymenaea stigonocarpa</i> Mart. ex Hayne	Jatobazeiro	X	X	Ar	Cr	Native
		<i>Inga laurina</i> (Sw.) Willd.	Ingá-mirim	X	X	Ar	Fc	Native
		<i>Inga marginata</i> Willd.	Ingá-feijão		X	Ar	Fc	Native
		<i>Inga vera</i> Willd.	Ingá-do-brejo	X	X	Ar	Fc	Native
		<i>Leptolobium dasycarpum</i> Vogel	Perobinha-do-campo	X	X	Ar	Cr	Native
		<i>Leptolobium elegans</i> Vogel	Peroba	X	X	Ar	Cr	Native
		<i>Leucaena leucocephala</i> (Lam.) de Wit	Leucena	X		Ar	Cr/Ed	Exotic
		<i>Macherium acutifolium</i> Vogel	Jacarandá-do-campo	X	X	Ar	Cr	Native
		<i>Machaerium amplum</i> Benth.	Esporão	X		Tp	Ed	Native
		<i>Machaerium hirtum</i> (Vell.) Stellfeld	Jacarandá-de-espinho	X	X	Ar	Ed	Native
		<i>Machaerium opacum</i> Vogel	Jacaranda-muchiba	X	X	Ar	Cr	Native
		<i>Machaerium stipitatum</i> Vogel	Jacarandá-branco	X	X	Ar	Ed	Native
		<i>Mimosa clausenii</i> Benth.	Mimosa		X	Bt	Cr	Native
		<i>Mimosa diplotricha</i> C.Wright ex Sauvalle	Mimosa	X		Bt	Cr	Native

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		<i>Peltophorum dubium</i> (Spreng.) Taub.	Canafístula	X		Ar	Ed	Native
		<i>Periandra mediterranea</i> (Vell.) Taub.	Alcaçuz	X		Ar	Cr	Native
		<i>Piptadenia macradenia</i> Benth.	-	X	X	Ar	Ed	Native
		<i>Plathymenia reticulata</i> Benth.	Vinhático-do-campo	X	X	Ar	Cr	Native
		<i>Pterodon pubescens</i> (Benth.) Benth.	Faveiro	X	X	Ar	Cr	Native
		<i>Senegalia polyphylla</i> (DC.) Britton & Rose	Monjoleiro	X	X	Ar	Ed	Native
		<i>Senna alata</i> (L.) Roxb.	Fedegoso-gigante	X	X	Bt	Ed	Native
		<i>Senna occidentalis</i> (L.) Link	Fedegoso	X		Bt	Ed	Native
		<i>Senna pendula</i> (Humb. & Bonpl. ex Willd.) H.S.Irwin & Barneby	Canudo-de-pito	X	X	Bt	Ed/Cr	Native
		<i>Senna rugosa</i> (G.Don) H.S.Irwin & Barneby	Casiruba	X	X	Bt	Cr	Native
		<i>Stryphnodendron adstringens</i> (Mart.) Coville	Barbatimão	X	X	Ar	Cr	Native
		<i>Stryphnodendron rotundifolium</i> Mart.	Barbatimão-de-folha-miúda		X	Ar	Cr	Native
		<i>Tachigali vulgaris</i> L.G.Silva & H.C.Lima	Carvoeiro	X	X	Ar	Cr	Native
	Gentianaceae							
		<i>Deianira pallescens</i> Cham. & Schltld.	-		X	Ev	Cr	Native
	Lamiaceae							
		<i>Aegiphila integrifolia</i> (Jacq.) Moldenke	Tamanqueira	X	X	Ar	Ed/Fc/Cr	Native
		<i>Cyanocephalus</i> sp.	-	X		Bt	Cr	Native
		<i>Hypenia macrantha</i> (A.St.-Hil. ex Benth.) Harley	-	X		Bt	Cr	Native
		<i>Mesosphareum suaveolens</i> (L.) Kuntze	Cheirosa	X	X	Bt	Ed	Native
	Lauraceae							
		<i>Nectandra cissiflora</i> Nees	Canela-fedida	X	X	Ar	Ed	Native
		<i>Ocotea corymbosa</i> (Meisn.) Mez	Canela-de-corvo	X	X	Ar	Cr	Native
		<i>Ocotea pulchella</i> (Nees & Mart.) Mez	Canela-preta	X	X	Ar	Cr	Native
		<i>Ocotea spixiana</i> (Nees) Mez	Canelão	X	X	Ar	Fc/Cr	Native
		<i>Ocotea tristis</i> (Nees & Mart.) Mez	Canela-do-brejo		X	Bt	Fc	Native

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	Loganiaceae							
		<i>Strychnos pseudoquina</i> A.St.-Hil.	Quina-verdadeira		X	Ar	Cr	Native
	Lythraceae							
		<i>Diplusodon lanceolatus</i> Pohl	-		X	Bt	Cr	Native
		<i>Diplusodon virgatus</i> Pohl	-	X	X	Bt	Fc/Cr	Native
		<i>Lafoensia pacari</i> A.St.-Hil.	Dedaleiro	X	X	Ar	Cr	Native
	Magnoliaceae							
		<i>Magnolia ovata</i> (A.St.-Hil.) Spreng.	Pinha-do-brejo	X	X	Ar	Fc	Native
	Malpighiaceae							
		<i>Banisteriopsis campestris</i> (A.Juss.) Little	-	X	X	Bt	Cr/Fc	Native
		<i>Banisteriopsis</i> sp.	-	X		Tp	Cr	Native
		<i>Banisteriopsis stellaris</i> (Griseb.) B.Gates	-		X	Tp	Cr	Native
		<i>Byrsonima affinis</i> W.R.Anderson	Murici	X	X	Ar	Cr	Native
		<i>Byrsonima basiloba</i> A.Juss.	Murici	X	X	Ar/Bt	Cr	Native
		<i>Byrsonima clauseniana</i> A.Juss.	Murici-do-cerrado	X		Ar/Bt	Cr	Native
		<i>Byrsonima intermedia</i> A.Juss.	Murici	X	X	Bt	Cr	Native
		<i>Mascagnia cordifolia</i> (A.Juss.) Griseb.	-		X	Tp	Cr	Native
		<i>Peixotoa reticulata</i> Griseb.	-	X	X	Bt	Cr	Native
	Malvaceae							
		<i>Ceiba pubiflora</i> (A.St.-Hil.) K.Schum.	Paineira	X	X	Ar	Ed	Native
		<i>Eriotheca gracilipes</i> (K.Schum.) A.Robyns	Paineira-do-cerrado	X	X	Ar	Cr	Native
		<i>Helicteres brevispira</i> A.St.-Hil.	Saca-rolha	X		Ar/Bt	Cr/Fc	Native
		<i>Helicteres sacarolha</i> A.St.-Hil.	Saca-rolha	X		Bt	Cr	Native
		<i>Luehea divaricata</i> Mart. & Zucc.	Açoita-cavalo-miúdo	X	X	Ar	Cr/Ed	Native
		<i>Luehea grandiflora</i> Mart. & Zucc.	Açoita-cavalo-graúdo	X	X	Ar	Cr/Ed	Native
		<i>Guazuma ulmifolia</i> Lam.	Mutambu	X	X	Ar	Cr/Ed	Native

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		<i>Pavonia rosa-campestris</i> A.St.-Hil.	Rosa-do-campo		X	Bt	Cr	Native
		<i>Peltaea</i> cf. <i>polymorpha</i> (A.St.-Hil.) Krapov. & Cristóbal	-	X		Bt	Cr	Native
		<i>Pseudobombax grandiflorum</i> (Cav.) A.Robyns	Embiruçu	X	X	Ar	Cr	Native
		<i>Pseudobombax tomentosum</i> (Mart.) A.Robyns	Imbiruçu	X		Ar	Cr	Native
		<i>Sterculia striata</i> A.St.-Hil. & Naudin	Chicha-do-cerrado	X	X	Ar	Cr	Native
	Melastomataceae							
		<i>Clidemia hirta</i> (L.) D.Don	Meleca-de-cachorro		X	Bt	Fc	Native
		<i>Desmoscelis villosa</i> (Aubl.) Naudin	-		X	Bt	Fc	Native
		<i>Leandra erostrata</i> (DC.) Cogn.	-		X	Bt	Fc	Native
		<i>Miconia albicans</i> (Sw.) Triana	Canela-de-velho	X	X	Ar/Bt	Cr	Native
		<i>Miconia chamissois</i> Naudin	Jacatirão	X	X	Bt	Fc	Native
		<i>Miconia cuspidata</i> Naudin	Pixirica		X	Ar	Cr	Native
		<i>Miconia ferruginata</i> DC.	Pixirica		X	Ar	Cr	Native
		<i>Miconia ligustroides</i> (DC.) Naudin	Jacatirão		X	Ar	Cr	Native
		<i>Miconia rubiginosa</i> (Bonpl.) DC.	-	X	X	Ar/Bt	Cr	Native
		<i>Microlicia</i> sp.	-		X	Bt	Fc	Native
		<i>Rhynchanthera grandiflora</i> (Aubl.) DC.	-		X	Bt	Fc	Native
		<i>Tococa guianensis</i> Aubl.	Planta-formiga	X		Ar/Bt	Fc	Native
		<i>Trembleya parviflora</i> (D.Don) Cogn.	Quaresmeira		X	Bt	Fc	Native
		<i>Trembleya phlogiformis</i> DC.	-		X	Bt	Fc	Native
	Meliaceae							
		<i>Cabralea canjerana</i> (Vell.) Mart. subsp. <i>canjerana</i>	Cajarana	X	X	Ar	Fc	Native
		<i>Cabralea canjerana</i> subsp. <i>polytricha</i> (A.Juss.) T.D.Penn.	Cajarana	X	X	Ar	Cr	Native
		<i>Cedrela fissilis</i> Vell.	Cedro-rosa	X	X	Ar	Fc/Ed	Native
		<i>Cedrela odorata</i> L.	Cedro-do-brejo		X	Ar	Fc	Native
		<i>Guarea guidonia</i> (L.) Sleumer	Marinheiro		X	Ar	Fc	Native

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		<i>Guarea kunthiana</i> A.Juss.	Figo-do-mato		X	Ar	Fc	Native
		<i>Guarea macrophylla</i> Vahl	Café-bravo	X	X	Ar	Fc	Native
		<i>Trichilia clausenii</i> C.DC.	Catiguá-vermelho	X	X	Ar	Ed/Fc	Native
		<i>Trichilia elegans</i> A.Juss.	Pau-de-ervilha	X	X	Ar/Bt	Ed	Native
	Monimiaceae							
		<i>Mollinedia widgrenii</i> A.DC.	Capixim		X	Ar	Ed	Native
	Menispermaceae							
		<i>Cissampelos ovalifolia</i> DC.	Orelha-de-onça	X		Bt	Cr	Native
	Moraceae							
		<i>Brosimum gaudichaudii</i> Trécul	Mama-cadela		X	Ar	Cr	Native
		<i>Ficus guaranítica</i> Chodat	Figueira-branca		X	Ar	Ed	Native
		<i>Ficus pertusa</i> L.f.	Figueira	X		Ar	Ed	Native
		<i>Maclura tinctoria</i> (L.) D.Don ex Steud.	Taiúva	X	X	Ar	Ed	Native
		<i>Sorocea bonplandii</i> (Baill.) W.C.Burger et al.	Chincho		X	Ar	Fc	Native
	Myristicaceae							
		<i>Virola sebifera</i> Aubl.	Bacuyba-preta	X	X	Ar	Fc	Native
	Myrtaceae							
		<i>Campomanesia adamantium</i> (Cambess.) O.Berg.	Guabiroba		X	Bt	Cr	Native
		<i>Campomanesia pubescens</i> (Mart. ex DC.) O.Berg	Guabiroba		X	Bt	Cr	Native
		<i>Eucalyptus</i> sp.	Eucalipto		X	Ar	-	Exotic
		<i>Eugenia aurata</i> O.Berg	Pitangobí	X	X	Ar	Cr	Native
		<i>Eugenia bimarginata</i> DC.	Jamelão-do-campo		X	Bt	Cr	Native
		<i>Eugenia florida</i> DC.	Pitanga-preta		X	Ar	Fc	Native
		<i>Eugenia involucrata</i> DC.	Pitanga-do-cerrado	X		Bt	Cr	Native
		<i>Eugenia punicifolia</i> (Kunth) DC.	Pitanga-do-campo		X	Bt	Cr	Native
		<i>Eugenia</i> sp. 1	-	X		Ar	Ed	Native

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		<i>Eugenia</i> sp. 2	-		X	Ar	Cr	-
		<i>Myrcia guianensis</i> (Aubl.) DC.	Guamirim		X	Ar	Cr	Native
		<i>Myrcia splendens</i> (Sw.) DC.	Guamirim	X	X	Ar	Cr	Native
		<i>Myrcia tomentosa</i> (Aubl.) DC.	Araçazinho		X	Ar	Fc/Cr	Native
		<i>Myrcia variabilis</i> DC.	-	X		Ar	Cr	Native
		<i>Psidium grandifolium</i> Mart. ex DC.	Araçá-felpudo	X		Bt	Cr	Native
		<i>Psidium guajava</i> L.	Goiabeira	X	X	Ar	Cr	Exotic
		<i>Syzygium jambos</i> (L.) Alston	Jambolão		X	Ar	Ed	Exotic
	Nyctaginaceae							
		<i>Guapira noxia</i> (Netto) Lundell	Pau-judeu		X	Ar	Cr	Native
	Ochnaceae							
		<i>Ouratea spectabilis</i> (Mart.) Engl.	Folha-de-serra	X	X	Ar	Cr	Native
	Opiliaceae							
		<i>Agonandra brasiliensis</i> Miers ex Benth. & Hook.f.	Pau-marfim-do-cerrado		X	Ar	Cr	Native
	Orchidaceae							
		<i>Cyrtopodium paludicolum</i> Hoehne	-	X		Ev	Fc	Native
		<i>Oeceoclades maculata</i> (Lindl.) Lindl.	-	X	X	Ev	Fc/Ed	Exotic
	Passifloraceae							
		<i>Passiflora foetida</i> L.	Maracujá-fedido	X		Tp	Ed	Native
	Piperaceae							
		<i>Piper aduncum</i> L.	Pimenta-de-macaco	X	X	Bt	Ed/Fc	Nativa
		<i>Piper arboreum</i> Aubl.	Fruto-de-morcego	X	X	Bt	Fc	Nativa
		<i>Piper</i> sp.	-	X		Bt	Fc	Nativa
		<i>Piper umbellatum</i> L.	Pariparoba	X	X	Bt	Fc	Nativa
	Phyllanthaceae							
		<i>Phyllanthus orbiculatus</i> Rich.	Conambi	X	X	Ev	Cr	Native

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	Poaceae							
		<i>Andropogon bicornis</i> L.	Rabo-de-burro	X	X	Ev	Cr/Fc	Native
		<i>Andropogon leucostachyus</i> Kunth	Capim-membeca	X	X	Ev	Cr/Fc	Native
		<i>Echinolaena inflexa</i> (Poir.) Chase	Capim-flecha	X	X	Ev	Fc	Native
		<i>Megathyrsus maximus</i> (Jacq.) B.K.Simon & S.W.L.Jacobs	Colonião	X	X	Ev	Ed/Fc	Exotic
		<i>Melinis minutiflora</i> P.Beauv.	Capim-gordura	X	X	Ev	Fc/Cr	Exotic
		<i>Melinis repens</i> (Willd.) Zizka	Capim-bandeira	X	X	Ev	Cr/Fc	Exotic
		<i>Urochloa bizantha</i> (Hochst. ex A.Rich.) R.D.Webster	Braquiarão	X	X	Ev	Cr	Exotic
		<i>Urochloa decumbens</i> (Stapf) R.D.Webster	Braquiária	X	X	Ev	Ed/Fc/Cr	Exotic
		<i>Urochloa humidicola</i> (Rendle) Morrone & Zuloaga	Capim-agulha	X	X	Ev	Fc	Exotic
	Polygalaceae							
		<i>Bredemeyera floribunda</i> Willd.	Guiné-do-campo	X	X	Tp	Cr	Native
		<i>Polygala appendiculata</i> Vell.	-	X	X	Ev	Cr	Native
	Primulaceae							
		<i>Clavija nutans</i> (Vell.) Ståhl	-		X	Bt	Fc	Native
		<i>Geissanthus ambiguus</i> (Mart.) G.Agostini	-	X		Bt	Fc	Native
		<i>Myrsine guianensis</i> (Aubl.) Kuntze	Capororoca-branca		X	Ar	Cr	Native
		<i>Myrsine umbellata</i> Mart.	Capororoca	X	X	Ar	Fc/Ed/Cr	Native
	Proteaceae							
		<i>Roupala montana</i> Aubl.	Carne-de-vaca	X	X	Ar	Cr	Native
	Rhamnaceae							
		<i>Gouania virgata</i> Reissek	-	X	X	Tp	Ed	Native
		<i>Rhamnidium elaeocarpum</i> Reissek	Saguragi-amarelo	X	X	Ar	Ed/Cr	Native
	Rosaceae							
		<i>Rubus brasiliensis</i> Mart.	Amora-do-mato	X	X	Tp	Fc	Native
	Rubiaceae							



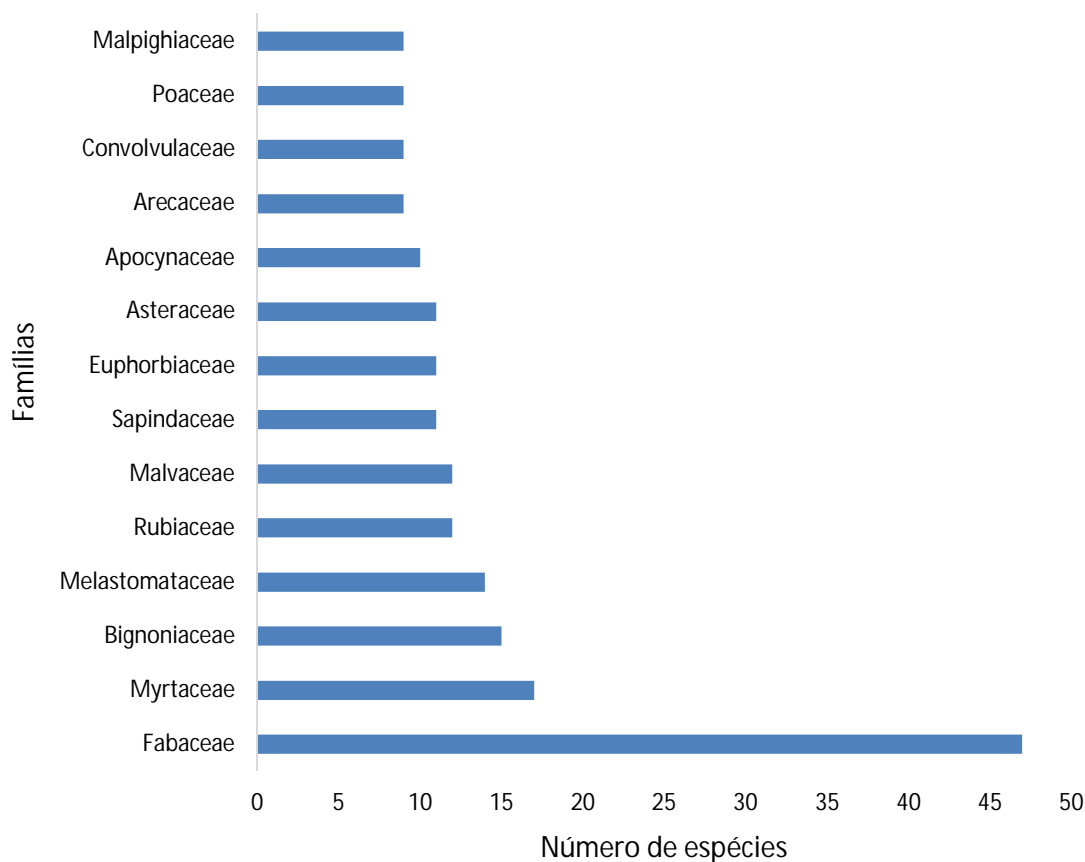
Division	Family	Species	Brazilian Popular name	Camp. 1	Camp.2	Habit	Vegetation	Origin
		<i>Alibertia edulis</i> (Rich.) A.Rich.	Marmeleiro		X	Ar/Bt	Cr	Native
		<i>Amaioua guianensis</i> Aubl.	Cedro-bravo		X	Bt	Fc	Native
		<i>Chomelia obtusa</i> Cham. & Schltl.	Viuvinha		X	Ar/Bt	Fc	Native
		<i>Declieuxia fruticosa</i> (Willd. ex Roem. & Schltl.) Kuntze	Maria-preta	X		Ev	Cr	Native
		<i>Genipa americana</i> L.	Jenipapeiro	X		Ar	Ed	Native
		<i>Guettarda pohliana</i> Müll.Arg.	Veludinho-vermelho	X	X	Ar/Bt	Ed/Fc	Native
		<i>Guettarda viburnoides</i> Cham. & Schltl.	Veludo-branco	X	X	Ar/Bt	Ed/Cr	Native
		<i>Palicourea rigida</i> Kunth	Bate-caixa	X	X	Bt	Cr	Native
		<i>Psychotria carthagenensis</i> Jacq.	Cafeeiro-do-mato	X	X	Ar/Bt	Fc	Native
		<i>Psychotria prunifolia</i> (Kunth) Steyerm.	-		X	Bt	Fc	Native
		<i>Rudgea viburnoides</i> (Cham.) Benth.	Congonha	X	X	Ar/Bt	Cr	Native
		<i>Tocoyena formosa</i> (Cham. & Schltl.) K.Schum.	Jenipapo-bravo	X	X	Bt	Cr	Native
	Rutaceae							
		<i>Hortia oreadica</i> Groppo et al.	Para-tudo	X	X	Bt	Cr	Native
		<i>Zanthoxylum petiolare</i> A.St.-Hil. & Tul.	Laranjinha-do-mato	X		Ar	Ed	Native
		<i>Zanthoxylum riedelianum</i> Engl.	Mamica-de-porca-gráuda	X		Ar	Ed	Native
		<i>Zanthoxylum rhoifolium</i> Lam.	Mamica-de-porca	X	X	Ar	Ed/Cr	Native
	Salicaceae							
		<i>Casearia gossypiosperma</i> Briq.	Pau-de-espeto	X	X	Ar	Ed	Native
		<i>Casearia grandiflora</i> Cambess.	Pindaíba-rabo-de-bandeira	X	X	Ar	Ed/Cr	Native
		<i>Casearia rupestris</i> Eichler	Cú-de-pinto	X		Ar	Ed	Native
	Sapindaceae							
		<i>Allophylus racemosus</i> Sw.	Mama-de-cachorro		X	Ar	Ed	Native
		<i>Cupania vernalis</i> Cambess.	Arco-de-barril	X	X	Ar	Fc	Native
		<i>Dilodendron bipinnatum</i> Radlk.	Maria-pobre	X	X	Ar	Ed/Fc	Native
		<i>Matayba elaeagnoides</i> Radlk.	Cuvantã	X	X	Ar/Bt	Fc	Native

Division	Family	Species	Brazilian Popular name	Camp. 1	Camp.2	Habit	Vegetation	Origin
		<i>Matayba guianensis</i> Aubl.	Camboatã	X	X	Ar/Bt	Ed/Fc/Cr	Native
		<i>Serjania erecta</i> Radlk.	Cinco-folhas	X		Tp	Cr	Native
		<i>Serjania marginata</i> Casar.	Barbasco	X		Tp	Cr	Native
		<i>Serjania meridionalis</i> Cambess.	Cipó-timbó	X	X	Tp	Ed/Fc	Native
		<i>Serjania reticulata</i> Cambess.	Timbó-vermelho	X	X	Tp	Fc	Native
		<i>Talisia sculenta</i> (Cambess.) Radlk.	Pitombeira	X		Ar	Ed	Native
		<i>Urvillea laevis</i> Radlk.	Mata-fome	X	X	Tp	Fc	Native
	Sapotaceae							
		<i>Chrysophyllum marginatum</i> (Hook. & Arn.) Radlk.	Aguaí	X		Ar	Cr	Native
		<i>Micropholis venulosa</i> (Mart. & Eichler) Pierre	Uvinha	X	X	Ar	Cr	Native
		<i>Pouteria ramiflora</i> (Mart.) Radlk.	Fruta-do-veado	X	X	Ar	Cr	Native
		<i>Pouteria torta</i> (Mart.) Radlk.	Abiu-peludo		X	Ar	Cr	Native
	Siparunaceae							
		<i>Siparuna guianensis</i> Aubl.	Limão-bravo	X	X	Ar/Bt	Fc	Native
	Solanaceae							
		<i>Solanum americanum</i> Mill.	Maria-pretinha	X	X	Ev	Ed	Native
		<i>Solanum lycocarpum</i> A.St.-Hil.	Fruta-do-lobo	X	X	Ar/Bt	Cr	Native
		<i>Solanum mauritianum</i> Scop.	Fumo-bravo	X		Ar/Bt	Ed/Fc	Native
		<i>Solanum palinacanthum</i> Dunal	Joá	X	X	Bt	Cr	Native
		<i>Solanum paniculatum</i> L.	Jurubeba	X	X	Bt	Cr	Native
	Styracaceae							
		<i>Styrax camporum</i> Pohl	Laranjinha-do-mato	X	X	Ar	Cr/Fc	Native
		<i>Styrax ferrugineus</i> Nees & Mart.	Benjoeiro	X	X	Ar	Cr	Native
	Urticaceae							
		<i>Cecropia pachystachya</i> Trécul	Embaúba	X	X	Ar	Ed/Fc	Native
	Verbenaceae							

Division	Family	Species	Brazilian Popular name	Camp. 1	Camp.2	Habit	Vegetation	Origin
		<i>Aloysia virgata</i> (Ruiz & Pav.) Juss.	Lixeira	X	X	Ar	Ed	Native
		<i>Lantana camara</i> L.	Camará	X	X	Bt	Ed	Native
	Vitaceae							
		<i>Cissus erosa</i> Rich.	Uva-do-cerrado-de-flor-vermelha	X		Tp	Cr	Native
		<i>Cissus gongylodes</i> (Baker) Planch.	-	X		Tp	Ed	Native
		<i>Cissus tinctoria</i> Mart.	Uva-de-pintar		X	Tp	Ed/Fc	Native
		<i>Cissus verticillata</i> (L.) Nicolson & C.E.Jarvis	Anil-trepador	X	X	Tp	Ed/Fc	Native
	Vochysiaceae							
		<i>Qualea grandiflora</i> Mart.	Pau-terra	X	X	Ar	Cr	Native
		<i>Qualea multiflora</i> Mart.	Pau-terra-liso	X	X	Ar	Cr	Native
		<i>Salvertia convallariodora</i> A.St.-Hil.	Colher-de-vaqueiro		X	Ar	Cr	Native
		<i>Vochysia rufa</i> Mart.	-	X	X	Ar	Cr	Native
		<i>Vochysia tucanorum</i> Mart.	Pau-tucano	X	X	Ar	Cr	Native
	Xyridaceae							
		<i>Xyris jupicai</i> Rich.	-	X	X	Ev	Fc	Native
	Zingiberaceae							
		<i>Hedychium coronarium</i> J.Koenig	Lírio-do-brejo	X	X	Ev	Fc	Exotic

Among the Angiosperms, the most expressive family was Fabaceae with 47 species (corresponding to 11.5% from the total species), followed by Myrtaceae (17 spp. – 4,1%), Bignoniaceae (15 spp. – 3,6%), Melastomataceae (14 spp. – 3,4%), Rubiaceae and Malvaceae (12 spp. – 2,9%, each), Asteraceae, Euphorbiaceae and Sapindaceae (11 spp. – 2,7%, each), Apocynaceae (10 spp. – 2,4%,) and Arecaceae, Convolvulaceae, Malpighiaceae and Poaceae (9 spp. – 2,2%, each). These families together represent 48% (196 spp.) from the total Angiosperms richness found, all other families presented eight species or less. For the ferns, the families with greater representativeness were Thelypteridaceae and Pteridaceae with nine species (corresponding to 2,2% each, of the total samples species), Anemiaceae, Blechnaceae and Dryopteridaceae (5 spp. – 1,2%, each) and Lindasaeaceae (4 spp. – 0,9%), all other families presented only three species or less. The lycophytes presented only the family Lycopodiaceae and the gymnosperms presented only two families (Podocarpaceae and Pinaceae).

These results are consistent to those found in various floristic inventories carried out in various phytogeographic areas of the country. The predominance of Fabaceae, front the other families is probably a reflection of the great diversity of this family in basically all plant formations in Brazil, and also being the greatest family richness in the country (BGF 2015). For the ferns, Thelypteridaceae and Pteridaceae families are also among those with greater richness in the country (Prado et al. 2015). The lycophytes are plants found in Ombrophyllous forest areas, with few found in the interior of the country, in the cerrado areas which can be seen in several studies in such areas as, for example, Arantes et al. (2010) and Mazziere & Nonato (2015). Among the gymnosperms, Podocarpaceae is the only family that inhabits gallery forests in the interior of the country, being the others restricted to dense Ombrophyllous forest areas and Pinaceae is a family introduced in Brazil for commercial and/or ornamental purposes.



**Figure 3 – Species distribution among the ten families with greater richness found in remaining areas of influence of the enterprise, between Araguari and Indianópolis cities, Minas Gerais, Brazil.**

In addition, the results obtained are similar to several studies carried out near the studied region or in the same physiognomy, as for example at Silva et al. (2014) that found Fabaceae as the most representative family in regeneration seasonal deciduous forest areas, Siqueira (2007) also recorded the Fabaceae family, with greater richness, but also highlighted Malvaceae, Rubiaceae and Bignoniaceae families for seasonal deciduous forest areas in the Triângulo Mineiro region. Giácomo et al. (2015) found Fabaceae family as the most como representative family within a cerrado area. The Cerrado areas also presented the families with greater richness, close to the results obtained in this study, as in the case of Weiser & Godoy (2001) for cerrado area and Pé-de-Gigante and Ishara et al. (2008) for a remnant in Botucatu, both studies carried out in the State of São Paulo. For vereda areas, families with predominantly woody herbaceous species are highlighted, such as Asteraceae, Cyperaceae and Poaceae (Araújo et al. 2002), families that there were also well represented in this study.

Seven found species are listed in some category as threat to extinction, either locally, or in Brazil or in the world. *Anemopaegma arvense* (Vell.) Stellfeld ex de Souza species, popularly known as Catuaba, is a threatened species due to its high exploitation for medicinal purposes and absence of its cultivation (Cncflora 2018). The Palmito juçara (*Euterpe edulis* Mart.) presents plenty of individuals in their populations, however, the intense exploitation of the species for Palm removal, puts them among the endangered species in the country (Cncflora 2018). Also according to Cncflora (2018) the species *Xylopia brasiliensis* Spreng (Pindaíba), has presented population growth evidenced by several studies, however, because it is high wood value, it is currently considered among the endangered species. *Cedrela fissilis* Vell species (Cedar), *Cedrela odorata* L. (Cedro-do-brejo) and *Myracrodruon urundeuva* Allemão (Aroeira-preta) are species that historically have been affected by wood exploration and habitat reduction (Cncflora, IUCN 2018 2018). It is worth noting here that according to IBAMA order n° 83N/1991 the species *Myracrodruon urundeuva* (Aroeira-preta) is immune to the cut down. In addition to this species, the species *Caryocar brasiliense* (Pequiizeiro) is also protected by the law n° 20,308 from Minas Gerais.

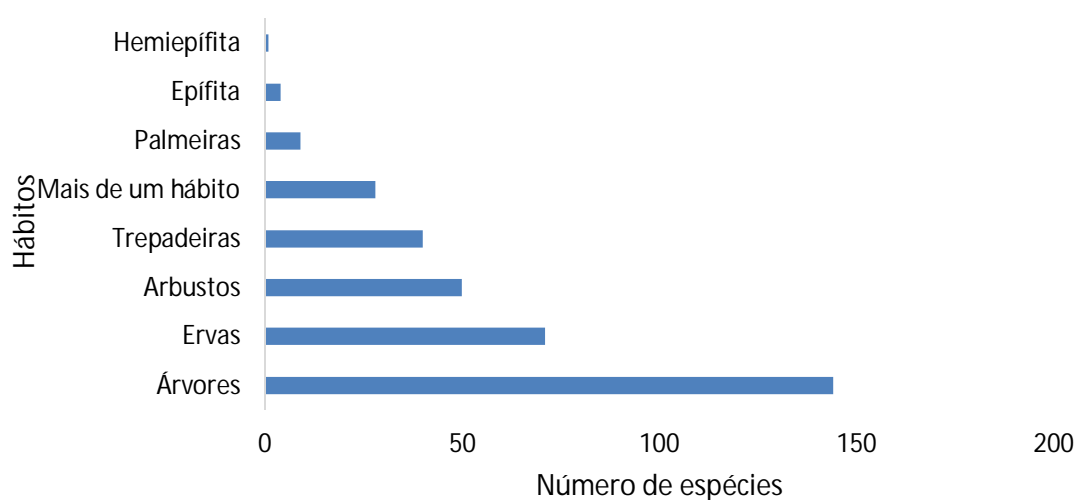
**Table 4 – List of endangered species in local, national and global scope, found between Araguari and Indianópolis cities, Minas Gerais, Brazil. NT – near threatened; VU – vulnerable; EN – endangered.**

<b>FAMILY/SPECIES</b>	<b>MG</b>	<b>BR</b>	<b>IUCN</b>
<b>Anacardiaceae</b>			
<i>Myracrodruon urundeuva</i> Allemão	VU		
<b>Annonaceae</b>			
<i>Xylopia brasiliensis</i> Spreng.		NT	
<b>Arecaceae</b>			
<i>Euterpe edulis</i> Mart.	VU	VU	
<b>Bignoniaceae</b>			
<i>Anemopaegma arvense</i> (Vell.) Stellfeld ex de Souza		EN	
<b>Fabaceae</b>			
<i>Dipteryx alata</i> Vogel			VU
<b>Meliaceae</b>			
<i>Cedrela fissilis</i> Vell.		VU	EN
<i>Cedrela odorata</i> L.		VU	VU

It is worth mentioning that *Syagrus loefgrenii* Glassman (Acumã rasteiro) species is a Palm tree without a stalk and with bud growth, found only in the Cerrado of the São Paulo, Minas Gerais States and possible to occur at Mato Grosso do Sul State

(Leitman et al. 2015; Noblick 2017), the species despite being found in Minas Gerais, presents few records in the State, being registered in only two other locations (Splink 2018).

The trees species were the predominant species found, representing 41.2% (144 spp.) of the total sampled, followed by herbs with 20.9% (73 spp.), bushes with 14.3% (50 spp.), climbing plant with 11.5% (40 spp.), species with more than one habit totaled 8% (28 spp.), palm trees represented 2.5% (nine species), Epiphytic with 1.2% (four species) and hemiphyte with 0.3% (one species), as shown in the following figure. In spite of the herbaceous species set among the most relevant habit in cerrado areas, they were figured here in second place, which could be related to the presence of exotic and invasive species, like *Urochloa decumbens* (Brachiaria) that dominate many points at the studied area, and can take native species populations to decline due to competition (Filippo & Ribeiro 2010). For the seasonal deciduous forest areas and paludosa forest, the trees represent the dominant component, presenting great species richness, as seen here and reinforced by other studies at these formations (i.e. Siqueira 2007, Silva et al. 2014, Ivanauskas et al. 1997, Toniato et al. 1998).

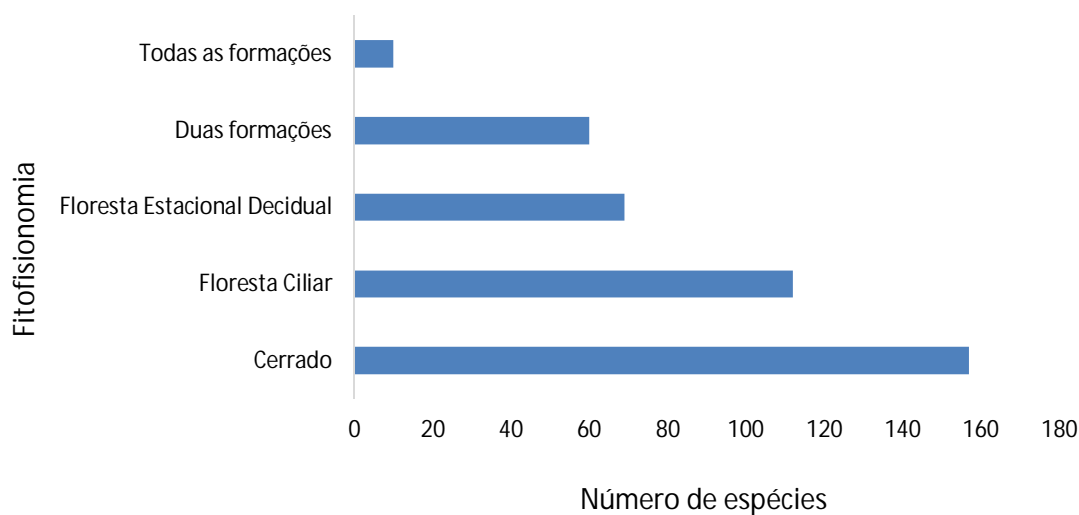


**Figure 4 – Species distribution among the habits found in remaining enterprise areas of influence, between Araguari and Indianópolis cities, Minas Gerais, Brazil.**

According to the species origin, there were found 19 species (4.6%) that are exotic species in Brazil, being some of them invasive and potentially problematic to natural native areas. Invasive grasses are one of the main problems, among the species found there are the *Urochloa* spp. (Braquiárias) and *Melinis* spp. (Capim-gordura). These species are extremely aggressive in spontaneous competition with native flora, mainly in cerrado areas (Rossi et al. 2010). One of the exotic tree species, *Leucaena leucocephala* (Lam.) de Wit (Leucena), can become a problem, because even if it's not considered an invasive plant it can make difficult the establishment of native species (Costa & Durigan 2010). In the sampled area inside the Nova Monte Carmelo farm, it has been possible to ascertain that in several parts of veredas and the cerrado areas,

*Pinus* sp. (Pinaceae) species which features natural regeneration and dominates some points in these areas. The species of this genus commonly invade open areas like cerrados and natural lands in Brazil (Espíndola et al. 2005) and makes difficult the regeneration of areas by native species, due to its thick layer of needles that accumulate on the soil and, generally, form a community dominated by a few species (Bechara 2003). It should be noted that this budding is the result of old plantation and that Duratex does not plant this species. Furthermore, Duratex already performs the ringing of these individuals, to eradicate this species and avoid its spread. With the withdrawal of this species, it is possible that the regeneration processes happen in the remnants of native vegetation.

Cerrado areas presented the largest number of species, being 157 (38.3%) unique to this formation. This may be related with the sampling data, since much of the studied area consists of this formation. Riparian forest was the second in number of species presenting 27.3% (112 spp.), followed by the seasonal deciduous forest with 16.8% (69 spp.). Few species were presented in all three formations among the studied area, ten species (2.4%) were found in three types of formations, 60 species (14.6%) were found in two formations, being a relatively low number, which helped to highlight the differences between the abiotic formations that select distinct groups of species, as shown in the following figure. The species composition showed for each phytophysionomy matches to the species found in other studies, especially with regard to woody tree species (i.e. Siqueira Silva et al. 2007, 2014, Ivanauskas et al. 1997, Toniato et al. 1998, Weiser & Godoy 2001, Ishara et al. 2001).



**Figure 5 – Species distribution among the physiognomies found in remaining sampled areas.**

Although it was not the focus of this study, it was possible to find out that some woody species were extremely frequently found in some areas. In the seasonal deciduous forest, it was possible to observe, the canopy, the predominance of *Anadenanthera colubrina* (Vell.), Brenan (Angico), *Myracrodruon urundeuva* Allemão (Aroeira-preta), *Piptadenia macradenia* Benth. and *Ceiba publiflora* (A. St.-



Hil.) K. Schum. (Paineira). In the bushes areas there were the predominance of regenerating species of the trees component, however, there were also recorded woody species common to these areas, mainly, *Croton gracilipes* Baill., *Manihot anomala* Pohl and *Celtis iguanaea* (Jacq.) Sarg. In the herbaceous areas there were highlighted some species of ferns as *Adiantum deflectans* Mart. (Avvenquinha) and *Anemia tomentosa* (Sav.) Sw., besides *Ruellia elegans* Poir.

The riparian forest areas were more heterogeneous, however, some areas showed the predominance of species such *Calophyllum brasiliense* Cambess. (Guanandi), *Magnolia ovata* (A. St.-Hil.) Spreng. (Pinha-do-brejo), *Guarea guidonia* (L.) Sleumer (Marinheiro) and *Dendropanax cuneatus* (DC.) Decne. & Planch. (Maria-mole). The shrub stratum is formed mainly by *Piper arboreum* Aubl. (Fruto-de-morcego) and *Cyathea* sp. (Samambaiçu) regenerating of *Matayba elaeagnoides* Radlk. (Cuvantã). The herbaceous portion of these areas showed the predominance of ferns, among them *Cyclodium meniscioides* (Willd.) C. Presl, *Polybotrya goyazensis* Brade and *Amauropelta mosenii* (C. Chr.) Salino & T.E. Almeida.

Cerrado areas present greater difficulty in representing the most common species, because it is a very extensive area, the predominance of species varies a lot. However, it was possible to observe the presence of *Luehea divaricata* Mart. & Zucc. (Açoita-cavalo-miúdo), *Qualea grandiflora* Mart. (Pau-terra), *Sturax ferrugineus* Nees & Mart. (Benjoeiro), *Plathymania reticulata* Benth. (Vinhático-do-campo), *Machaerium acutifolium* Vogel (Jacarandá-do-campo) and *Stryphnodendron adstringens* (Mart.) Coville (Barbatimão) in almost all sampled areas, with such formation. The highlight of the lower stratum are the *Peixotoa reticulata* Griseb. and *Cissampelos ovalifolia* DC. (Orelha-de-onça) species.

The high number of species found in this study, coupled with the presence of seven endangered species, highlights the importance of remaining flora in the conservation and preservation areas.

The following figures present some vegetation species recorded in field monitoring campaign.

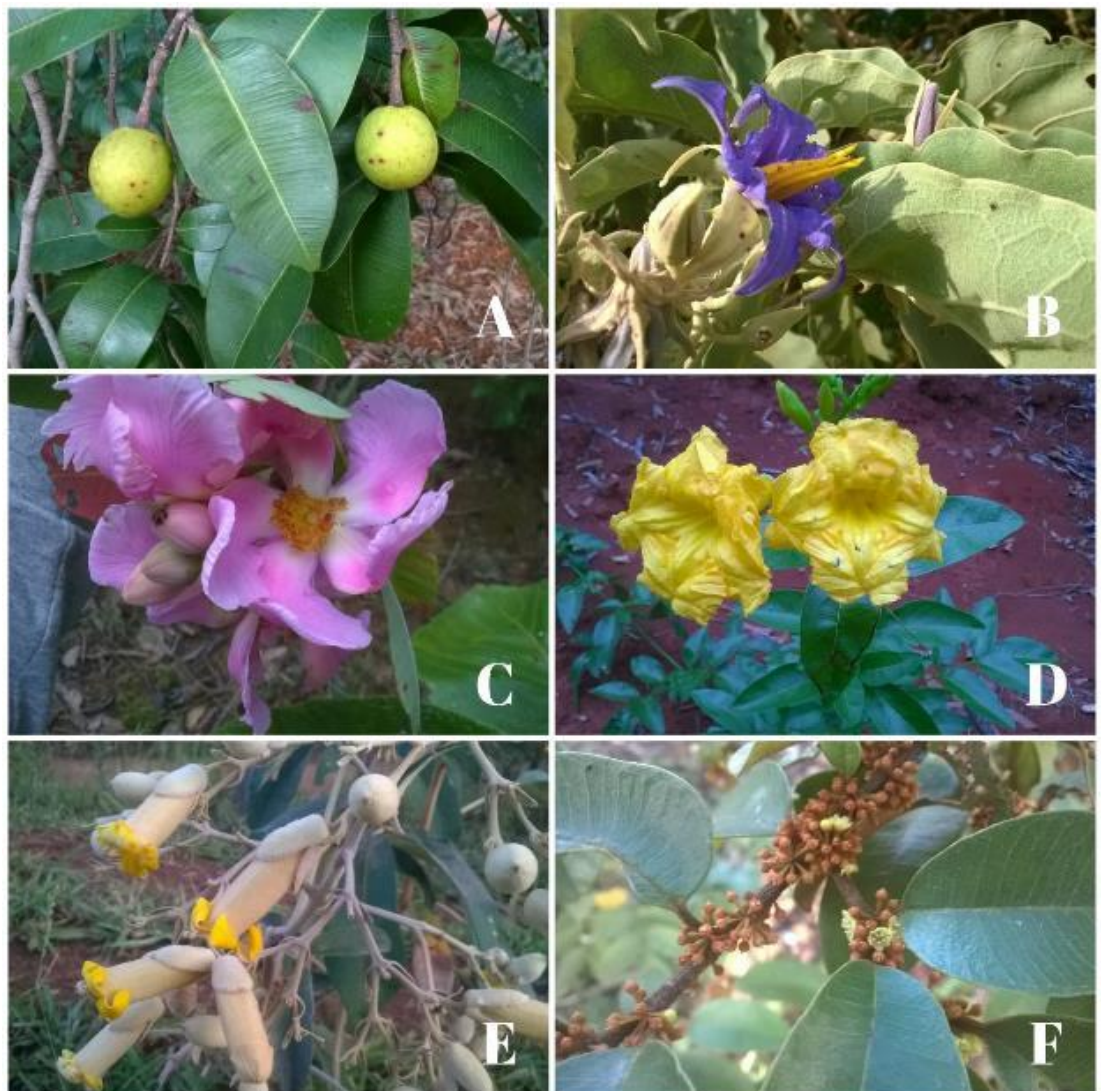


**Figure 6 – Photographic record of the species found in the remnants of vegetation at sampled areas. A – *Styrax ferrugineus*; B – *Leucaena leucocephala*; C – *Guettarda virbunoides*; D – *Ficus pertusa*; E and F – *Passiflora foetida*.**



**Figure 7 – Photographic record of the species found in the remnants of vegetation at the sampled area. A – *Adiantum deflexans*; B – *Davilla elliptica*; C – *Duguetia furfuracea*; D – *Vochysia rufa*.**





**Figure 8 – Photographic record of the species found in the remnants of vegetation at the sampled areas. A – *Micropholis venulosa*; B – *Solanum lycocarpum*; C – *Kielmeyera rubriflora*; D – *Adenocalymma peregrinum*; E – *Zeyheria montana*; F – *Chrysophyllum marginatum*.**

The area where the mill will be installed is currently occupied predominantly by large fields of *Eucalyptus* spp. (*Eucalyptus*) plantations for commercial purposes. These conditions do not favor the presence of native species, being found a few of these on this area and mostly were found associated with border area, with few presence of native arboreal individuals evident inside the area, thus, there is no stratification and no formation of understory. The species registered at this area are presented in the following table. All species found were also recorded in the areas surrounding the project area.

Studies have shown that the presence of *Eucalyptus* is not a hindrance to regeneration, and can often act as a pioneer enabling the regeneration of native flora in the understory (Neri et al., 2005; Alencar et al. 2011). In addition, several factors can be related to regeneration of these areas, as for example, the presence of remnants in the

surroundings, the dispersal of propagules and, especially in the cerrado areas, the sprouting of underground organs (Aubert & Oliveira Filho 1994). The presence few species found in the ADA may be related to time of planting that composes the area, once the Eucalyptus plantations appear to be young (6-7 years old). Areas with older Eucalyptus plantations with more than 30 years old, as studied by Neri et al. (2005), showed floristic composition in more advanced stages, moreover, in these studies probably no relevant maintenance of the cultural practices in the areas occurs, as there are in the ADA of the enterprise (at Nova Monte Carmelo farm).

Among the species found *Miconia albicans* (Sw.) Triana (Canela-de-velho) and *Casearia grandiflora* Cambess. (Pindaíba-tail flag) deserve to be highlighted, which even if not the focus of this study, is visible the predominance of these species in the Eucalyptus plantations. The first species occur mainly in the border areas, areas where they can form agglomerates, being more dispersed their distribution inside the eucalyptus plantation and the second species presents individuals scattered within the eucalyptus plantation. Both species are widely distributed in the surrounding areas, moreover, they are zoochore (Barbosa et al. 2015), attracting mainly birds, which would explain the arrivals of them in these areas. Besides, *M. Albicans* is a pioneer species, while, *C. grandiflora* is not a pioneer species (Barbosa et al. 2015) which would explain their distribution inside the plantation fields.

**Table 5 – List of flora species registered in the ADA. \* exotic species from Brazil.**

Family Species	Brazilian popular name	Habit
<b>Annonaceae</b>		
<i>Duguetia furfuracea</i> (A.St.-Hil.) Saff.	Ata-do-mato	Árvore
<i>Xylopia aromatica</i> (Lam.) Mart.	Pimenta-de-macaco	Árvore
<b>Araliaceae</b>		
<i>Schefflera macrocarpa</i> (Cham. & Schltld.) Frondin	Mandiocão	Árvore
<b>Arecaceae</b>		
<i>Syagrus flexuosa</i> (Mart.) Becc.	Coquinho-babão	Palmeira
<b>Asteraceae</b>		
<i>Baccharis dracunculifolia</i> DC.	Alecrim-do-campo	Arbusto
<b>Bromeliaceae</b>		
<i>Ananas ananosoides</i> (Baker) L.B.Sm.	Abacaxi-do-cerrado	Erva
<b>Burseraceae</b>		
<i>Protium ovatum</i> Engl.	Breu	Arbusto
<b>Cannabaceae</b>		
<i>Celtis iguanaea</i> (Jacq.) Sarg.	Grão-de-galo	Árvore/Arbusto
<b>Celastraceae</b>		
<i>Peritassa campestris</i> (Cambess.) A.C.Sm.	Bacupari-do-campo	Arbusto
<b>Connaraceae</b>		
<i>Rourea induta</i> Planch.	Pau-de-porco	Arbusto
<b>Cordiaceae</b>		
<i>Varronia polycephala</i> Lam.	-	Arbusto
<b>Euphorbiaceae</b>		
<i>Maprounea guianensis</i> Aubl.	Bonifácio	Árvore
<b>Fabaceae</b>		

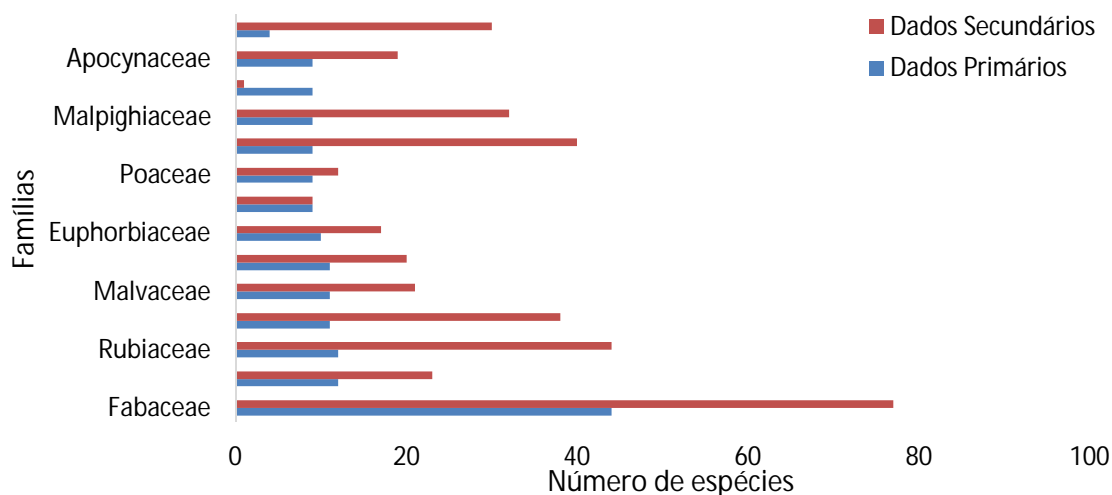
Family <i>Species</i>	Brazilian popular name	Habit
<i>Dimorphandra mollis</i> Benth.	Barbatimão-falso	Árvore
<i>Senna occidentalis</i> (L.) Link	Fedegoso	Arbusto
<i>Stryphnodendron adstringens</i> (Mart.) Coville	Barbatimão	Árvore
<b>Lamiaceae</b>		
<i>Aegiphila integrifolia</i> (Jacq.) Moldenke	Tamanqueira	Árvore
<b>Lauraceae</b>		
<i>Ocotea corymbosa</i> (Meisn.) Mez	Canela-de-corvo	Árvore
<b>Malvaceae</b>		
<i>Eriotheca gracilepis</i> (K.Schum.) A.Robyns	Paineira-do-cerrado	Árvore
<i>Luehea divaricata</i> Mart. & Zucc.	Açoita-cavalo-miúdo	Árvore
<b>Melastomataceae</b>		
<i>Miconia albicans</i> (Sw.) Triana	Canela-de-velho	Árvore/Arbusto
<b>Myrtaceae</b>		
<i>Eucalyptus</i> sp.*	Eucalipto	Árvore
<i>Eugenia aurata</i> O.Berg	Pitangobí	Árvore
<i>Eugenia puniceifolia</i> (Kunth) DC.	Pitanga-do-campo	Arbusto
<b>Poaceae</b>		
<i>Andropogon boicornis</i> L.	Rabo-de-burro	Erva
<i>Melinis minutiflora</i> P.Beauv.*	Capim-gordura	Erva
<i>Melinis repens</i> (Willd.) Zizka*	Capim-bandeira	Erva
<i>Urochloa decumbens</i> (Stapf) R.D.Webster*	Braquiária	Erva
<b>Primulaceae</b>		
<i>Myrsine umbellata</i> Mart.	Capororoca	Árvore
<b>Salicaceae</b>		
<i>Casearia grandiflora</i> Cambess.	Pindaíba-rabo-de-bandeira	Árvore
<b>Sapindaceae</b>		
<i>Cupania vernalis</i> Cambess.	Arco-de-barril	Árvore
<i>Matayba guianensis</i> Aubl.	Camboatã	Árvore/Arbusto
<i>Serjania meridionalis</i> Cambess.	Cipó-timbó	Trepadeira
<b>Urticaceae</b>		
<i>Cecropia pachystachya</i> Trécul	Embaúba	Árvore

#### 8.3.4.1.3 Final Considerations

The high number of species found in this study, coupled with the presence of seven endangered species and two immune to cut down, demonstrate the importance of remaining vegetation in the conservation and preservation of flora in areas surrounding the project. In the area where it will be installed the dissolving pulp mill, few species were recorded, with the vast majority of individuals belonging to only two of species, in addition no endangered flora species were found.

The species raised in the secondary data inventory are distributed in 110 botanical families, 23 more families than those found in the field survey. The families richness distribution among primary and secondary data were similar between them, however, in the primary data, the Arecaceae family presented as the richest, while in the secondary data, the Melastomataceae family also stood out among the most diverse

families, as shown in the following figure. From the total number of species found in secondary data, 505 were not found in the present field study. Although in the two field campaigns there were recorded 155 species that are new flora species known at these cities.



**Figure 9 – Comparison between families richness found in the primary and secondary data.**

### 8.3.4.2 Reptiles and Amphibians fauna

#### 8.3.4.2.1 Secondary Data

From the national and international journals available data, a list of reptiles and amphibians species was made with the possible species occurrence at the studied area. There were recorded 103 species, being 52 amphibians and 51 reptiles (according to the following table).

**Table 6 – Reptiles and amphibians species likely of occurrence in the area raised by secondary data. Source: 0-this study; 1-Giaretta et al., 2008; 2-Maffei et al., 2017; 3-Nascimento et al., 2016; 4- Nascimento et al., 2017; 5-Conte et al., 2013; 6-Costa et al., 2014; 7- Brites & Bauab, 1988; 8-Maffei et al 2016.**

Taxonomy	Common Brazilian name	Source
<b>Amphibia</b>		
<b>Bufonidae</b>		
<i>Rhinella granulosa</i>	sapo-cururu	1
<i>Rhinella rubescens</i>	sapo-cururu	
<i>Rhinella schneideri</i>	sapo-cururu	1, 5

<b>Taxonomy</b>	<b>Common Brazilian name</b>	<b>Source</b>
<i>Rhinella cf. veredas</i>	sapo-cururu	1
<b>Brachycephalidae</b>		
<i>Ischnocnema penaxavantinho</i>	rãzinha-da-mata	1
<b>Craugastoridae</b>		
<i>Barycholos ternetzi</i>	rãzinha-da-mata	1, 5
<b>Dendrobatidae</b>		
<i>Ameerega flavopicta</i>	sapo-flecha	1
<b>Hylidae</b>		
<i>Boana albopunctata</i>	perereca-cabrinha	5
<i>Boana lundii</i>	perereca-da-mata	5
<i>Boana paranaiba</i>	perereca	5
<i>Boana raniceps</i>	perereca-da-coxa-listrada	5
<i>Dendropsophus cruzi</i>	perereca	5
<i>Dendropsophus jimi</i>	perereca	5
<i>Dendropsophus minutus</i>	perereca-ampulheta	5
<i>Dendropsophus rubicundulus</i>	pererequina-verde	5
<i>Dendropsophus cf. melanargyreus</i>	perereca	5
<i>Dendropsophus nanus</i>	pererequina-do-brejo	5
<i>Pseudis bolbodactyla</i>	rã-d'água	
<i>Phyllomedusa azurea</i>	perereca-das-folhagens	5
<i>Ololygon berthae</i>	perereca	3
<i>Scinax cf. similis</i>	perereca-de-banheiro	5
<i>Scinax fuscovarius</i>	perereca-de-banheiro	5
<i>Scinax rogerioi</i>	perereca	2
<i>Trachycephalus typhonius</i>	perereca-grudenta	5
<b>Leptodactylidae</b>		
<i>Adenomera sp.</i>	rãzinha-da-mata	5
<i>Leptodactylus aff. andreae</i>		1
<i>Leptodactylus chaquensis</i>	rã-do-chaco	1
<i>Leptodactylus cunicularis</i>		1
<i>Leptodactylus furnarius</i>	rã-assobiadora	1, 5



<b>Taxonomy</b>	<b>Common Brazilian name</b>	<b>Source</b>
<i>Leptodactylus fuscus</i>	rã-assobiadora	1, 5
<i>Leptodactylus labyrinthicus</i>	rã-pimenta	1, 5
<i>Leptodactylus latrans</i>	rã-manteiga	5
<i>Leptodactylus mystaceus</i>	rã	1, 5
<i>Leptodactylus mystacinus</i>	rã-de-bigode	1, 5
<i>Leptodactylus podicipinus</i>	rã-goteira	1, 5
<i>Leptodactylus sertanejo</i>	rã	1, 5
<i>Leptodactylus syphax</i>	rã-vinho	1, 5
<i>Physalaemus centralis</i>	rãzinha	1, 5
<i>Physalaemus cuvieri</i>	rã-cachorro	1, 5
<i>Physalaemus marmoratus</i>	rãzinha	1, 5
<i>Physalaemus nattereri</i>	rã-quatro-olhos	1, 5
<i>Pseudopaludicola aff. canga</i>	rã-pulga	1
<i>Pseudopaludicola falcipes</i>	rã-pulga	5
<i>Pseudopaludicola mystacalis</i>	rã-pulga	1, 5
<i>Pseudopaludicola saltica</i>	rã-pulga	1
<i>Pseudopaludicola ternetzi</i>	rã-pulga	1, 5
<b>Odontophrynidae</b>		
<i>Odontophrynus cultripes</i>	sapo-boi	1, 5
<i>Proceratophrys aff. goyana</i>	sapo-boi	1
<i>Proceratophrys</i> sp. (gr. <i>cristiceps</i> )	-	5
<b>Microhylidae</b>		
<i>Chiasmocleis albopunctata</i>	rã-grilo	1, 5
<i>Dermatonotus muelleri</i>	rã-escavadora	1, 5
<i>Elachistocleis bicolor</i>	rã-assobiadora	1, 5
<i>Elachistocleis cesarii</i>	rã-assobiadora	5
<b>Chelidae</b>		
<i>Mesoclemmys</i> cf. <i>vanderhaegei</i>	cágado-de-barbela	8
<b>Scincidae</b>		
<i>Notomabuya frenata</i>	calango-estriado	
<b>Tropiduridae</b>		

Taxonomy	Common Brazilian name	Source
<i>Tropidurus cf. torquatus</i>	calango	
<b>Anomelepididae</b>		
<i>Liotyphlops ternetzii</i>	cobra-cega	6, 7
<b>Boidae</b>		
<i>Boa constrictor</i>	jiboia	6
<i>Corallus hortulanus</i>	cobra-veadeira	6
<i>Epicrates crassus</i>	salamanta	6
<b>Colubridae</b>		
<i>Chironius exoletus</i>	cobra-cipó	6
<i>Chironius flavolineatus</i>	cobra-cipó	6, 7
<i>Chironius quadricarinatus</i>	cobra-cipó	6
<i>Drymoluber brazili</i>	cobra-cipó	6
<i>Drymoluber dichorus</i>	cobra-cipó	6
<i>Mastigodryas bifossatus</i>	jararacuçu-do-brejo	7
<i>Oxybelis aeneus</i>	bicuda	6
<i>Simophis rhinostoma</i>	coral-falsa	6, 7
<i>Spilotes pullatus pullatus</i>	caninana	6
<b>Dipsadidae</b>		
<i>Apostolepis assimilis</i>	-	6
<i>Atractus albuquerquei</i>	cobra-preta	4
<i>Boiruna maculata</i>	muçurana	6
<i>Clelia clelia</i>	muçurana	7
<i>Erythrolamprus aesculapii venustissimus</i>	cobra-coral	6, 7
<i>Erythrolamprus almadensis</i>	cobra-d'água	6, 7
<i>Erythrolamprus jaegari jaegari</i>	cobra-d'água	6
<i>Erythrolamprus miliares orinus</i>	cobra-d'água	6
<i>Erythrolamprus poecilogyrus schotti</i>	cobra-d'água	6, 7
<i>Erythrolamprus reginae macrosoma</i>	cobra-d'água	6, 7
<i>Oxyrhopus clathratus</i>	falsa-coral	6
<i>Oxyrhopus guibei</i>	falsa-coral	6

<b>Taxonomy</b>	<b>Common Brazilian name</b>	<b>Source</b>
<i>Oxyrhopus rhombifer rhombifer</i>	falsa-coral	6, 7
<i>Oxyrhopus trigeminus</i>	falsa-coral	6, 7
<i>Leptodeira annulata pulchriceps</i>	dormideira	6
<i>Philodryas agassizii</i>	-	6, 7
<i>Philodryas aestiva</i>	cobra-verde	6, 7
<i>Philodryas mattogrossensis</i>	cobra-cipó	6
<i>Philodryas nattereri</i>	corre-campo	6
<i>Philodryas olfersii</i>	cobra-verde	6, 7
<i>Philodryas patagoniensis</i>	corre-campo	6, 7
<i>Phimophis guerini</i>	bicuda	7
<i>Pseudoboa nigra</i>	muçurana	7
<i>Sibynomorphus mikanii</i>	dormideira	7
<i>Sibynomorphus turgidus</i>	dormideira	7
<i>Taeniophallus occipitalis</i>	-	6
<i>Thamnodynastes hypoconia</i>	jararaca-falsa	6, 7
<i>Thamnodynastes rutilus</i>	jararaca-falsa	6
<i>Xenodon merremii</i>	boipeva	6, 7
<i>Xenodon undulatus</i>	boipeva	6
<b>Elapidae</b>		6, 7
<i>Micrurus frontalis</i>	coral-verdadeira	6, 7
<i>Micrurus lemniscatus</i>	coral-verdadeira	6, 7
<b>Viperidae</b>		
<i>Bothrops alternatus</i>	urutu-cruzeiro	6, 7
<i>Bothrops itapetiningae</i>	jararaca	6
<i>Bothrops moojeni</i>	jararaca-caiçaca	6, 7
<i>Bothrops neuwiedi</i>	jararaca	7
<i>Bothrops pauloensis</i>	jararaca-pintada	6
<i>Crotalus durissus</i>	cascavel	6, 7

### 8.3.4.2.2 Field Primary Data Collection

#### Methodological Approach

For the amphibians record, there were used complementary and simultaneous methods: reproductive sites research (Scott Jr. & Woodward 1994) and hearing areas (Zimmerman 1994). The data collection was made with vocalization during the beginning of the sunset (at 6:00 pm) and ending at 11:00 pm, for five consecutive nights by a researcher, for each campaign. There were traveled 11 water bodies perimeters (as shown in the table and following figure), estimating the abundance of each amphibian species by males vocalization. The individuals that were only observed have been also added in the final count. All information relating to the reproductive activity of the species (e.g.: females eggs, embraced couples, spawns, tadpoles and young recently metamorphosed individuals) were recorded as additional information.

The reptiles search was held by visual demand limited by time (Campbell & Christman 1982), also called active search, which consisted of walking slowly, looking in all accessible microenvironments, specimens hidden under logs, stones, twigs, leaf, leaf litter, etc. The daytime active search was made during five days in each campaign in the morning (from 10:00am till 12:00pm) totaling 20 man hours work. Specimens found moving toward the roads, anthropized areas etc., were registered as occasional findings. Records made by other teams present in the studied area were also added as occasional findings.

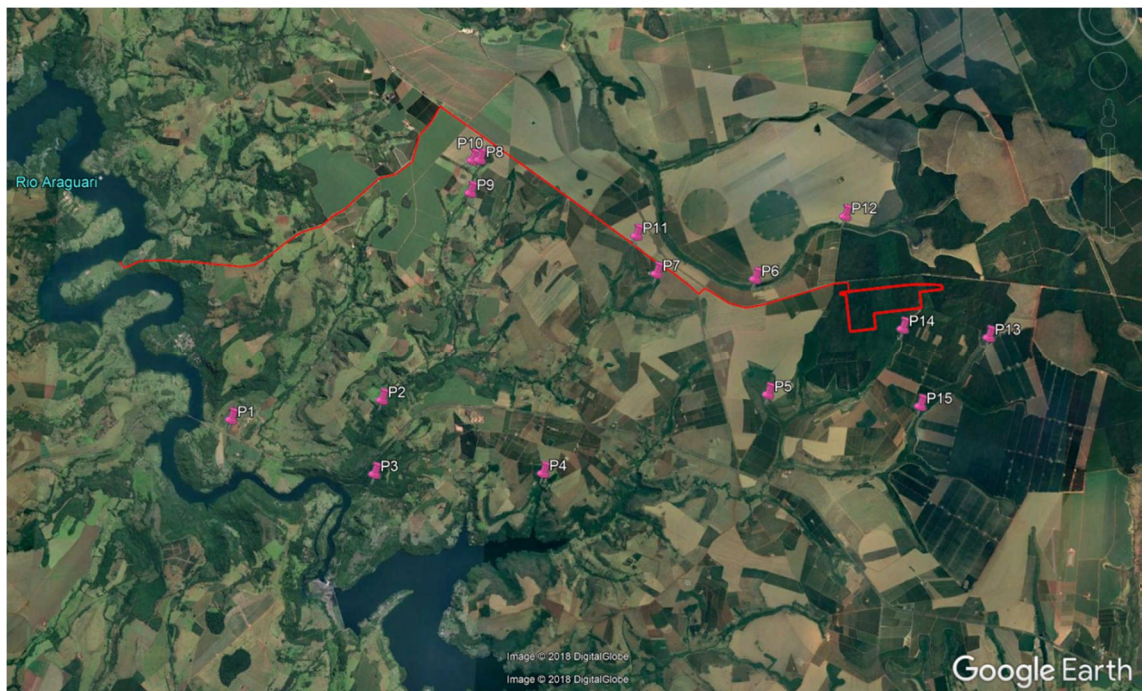
**Table 7 – Points and geographic coordinates (UTM, WGS 84 Datum) of the reptiles and amphibians inventory sampled points.**

Point	Environment	Location	Description
Point 1	Swamp	22K 808852/ 7910370	Permanent swamp in open area, inserted into an agricultural matrix (pasture, bananas and other crops cultivation), near BR-365 highway. The marginal vegetation is predominantly composed by grasses, only a small portion presents arboreal and shrubby vegetation. The water blade is practically taken by Cattails and Macrophytes with floating leaves ( <i>Nymphaea</i> sp.).

Point	Environment	Location	Description
Point 2	Stream/ Waterfall/ Forest	22K 812644/ 7911056	Secondary forest (Seasonal Deciduous Forest) in steep slope, with very little leaf litter, bushes regeneration, anthropized area (a lot of garbage, used by the population for recreation at 20 m height waterfall). The waterfall is formed by a small river (+/-5 m wide) with stony bottom and strong currents. The marginal vegetation of stream is composed predominantly of lírio do brejo ( <i>Hedychium coronarium</i> ).
Point 3	Stream	22K 812552/ 7909184	Permanent small stream (+/-2 m wide) within the forest (seasonal semideciduous forest), bedrock with lentic and lotic parts. The banks are covered with small rocks and portions with exposed bounds. The marginal vegetation is composed by large trees, bushes in regeneration which makes difficult to move inside it. The soil is moist with dense leaf litter.
Point 4	Weir	23K 184654/ 7909444	Permanent weir between two forest fragments, used to irrigate the coffee plantation and to fish. Steep banks with predominance of grass and tall trees. Water blade without Macrophytes or emerging grasses. Marginal anthropized vegetation, dry soil and few leaf litter.
Point 5	Vereda	23K 190169/ 7911911	Small vereda area with few sparse buriti species and tree species and marginal shrubs. The vereda area is crossed by a small stream of muddy bed that forms an inaccessible swamp due to its depth. The swamp is full of shrubs and emerging grasses. The stream adjacent to the vereda area evidences secondary riparian forest composed by medium size trees and bushes in regeneration with dense and moist leaf litter.
Point 6	Vereda	23K 189593/ 7914802	Vereda anthropized area within agricultural matrix, crossed by a small stream with muddy bottom and Macrophytes and emerging grasses. The marginal vegetation is composed predominantly by grass, shrubs, pioneers and exotic trees (Orchard).

Point	Environment	Location	Description
Point 7	Weir	23K 187088/ 7914724	Permanent artificial weir with constant water exchange in a Cerrado fragment. The marginal vegetation is composed predominantly by grass, shrubs and trees species. The banks are sandy and steep, with portions of submerged Macrophytes.
Point 8	Weir	23K 814809/ 7917250	Permanent artificial weir with constant water exchange, used for coffee plantation irrigation. The marginal vegetation is composed predominantly by grass, and only the bottom of the dam there are arboreal vegetation, area that makes up a small fragment of forest (seasonal semideciduous forest).
Point 9	Weir	23K 814617/ 7916405	Permanent weir with constant water exchange located adjacent to the farm owner's property. The marginal vegetation consists of grass and bamboo. The water that flows out the lake forms a small stream that runs by the Orchard owner and disembogues in a small forest. The lake is used for ducks and teals creation.
Point 10	Weir	23k 814626/ 7917227	Permanent small water reservoir (approx. 20 m. X 10 m.) with constant water exchange. Marginal vegetation with trees, shrubs and grasses. Many aquatic Macrophytes.
Point 11	Vereda	23K 186498/ 7915630	Vereda area near LMG-748 highway with large amount of Buritis in addition to sparse typical trees of cerrado. It has a small watercourse in its interior with sandy bottoms and marginal vegetation composed mainly by grasses.
Point 12	Stream	23K 191732/ 7916571	Small stream in open Cerrado area nearby the eucalyptus plantations and coffee fields. Presence of buritis and crystal clear water with plenty of underwater vegetation. Location changed to water outlet.
Point 13	Weir	23K 195621/ 7913838	Small weir in the Cerrado area surroundings with eucalyptus plantations. Area with sandy and exposed soil. Water outlet location for fires.

Point	Environment	Location	Description
Point 14	Weir	23K 193430/ 7913868	Small, narrow and long weir in riparian area surrounding with eucalyptus plantations. Water with enough silting process and with ferruginous water.
Point 15	Weir	23K 194043/ 7911941	Large weir in riparian area with surrounding areas of eucalyptus plantations. Plenty of buritis and Macrophytes. Location on the border of the Nova Monte Carmelo Farm.



**Figure 10 – Reptiles and amphibians sampling points location.**





Point 1



Point 2



Point 3



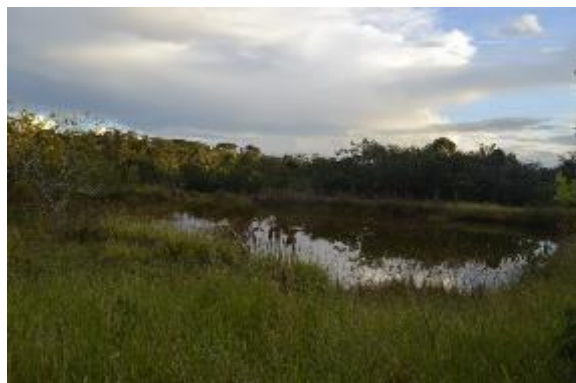
Point 4



Point 5



Point 6



Point 7



Point 10





**Figure 11 – Reptiles and amphibians sampling points photographic record.**

The sampling efficiency was evaluated by rarefaction curves based on 1000 randomisations, considering the effort of each day of a sample field. Estimation of species richness was made with the non-parametric estimator Jackknife1 using the program EstimateS 9.1.0 (COLWELL 2013).

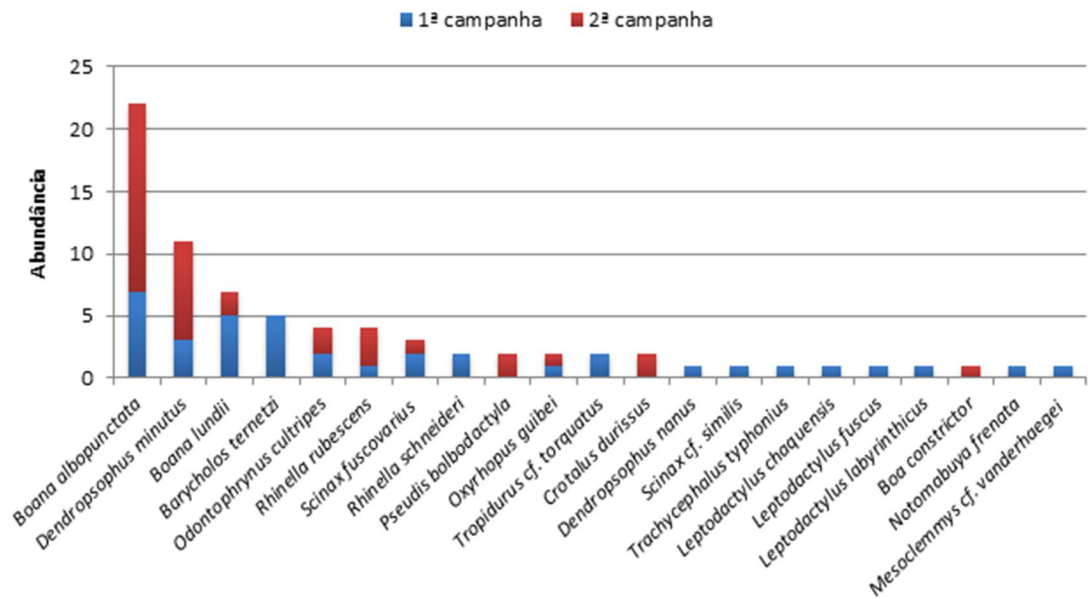
The species conservation status was defined based on the list of endangered Brazilian Fauna (ICMBio 2016), on the red list of endangered Fauna of the International Union for nature conservation (IUCN, 2017) and on the list of threatened Fauna Extinction of Minas Gerais (COPAM 2010). There were also identified species that have commercial interest, and being susceptible to exploitation, based on the list of the Convention on international trade endangered species of wild Fauna and Flora - CITES, whose criteria fit the species in Appendices I, II and III (CITES 2017). The scientific terminology used was adopted by the Brazilian Society of Herpetology for amphibians (SEGALLA et al 2016) and reptiles (COSTA & BÉRNILS 2018).

### **Results and discussion**

During the first campaign there were recorded 18 species, being 14 amphibians and four reptiles (according to the following table). The recorded amphibians were all belonged to the order Anura divided into five families: Bufonidae, Hylidae, Leptodactylidae, Odontophrynidae and Craugastoridae. The reptiles recorded were divided into two orders: Testudines with a representative of the Chelidae family; and Squamata with three species belonging to the families Dipsadidae, Mabuyidae and Tropiduridae. The overall abundance was 38 records, being 33 amphibians records and only five reptiles records. The most abundant species was *Boana albopunctata* with 7 records, followed by *Boana lundii* and *Barycholos ternetzi* with 5 records (as shown in the following figure).

In the second campaign, there were recorded seven species being four Anura order amphibians and three reptiles. The Anura order amphibians belong to the Hylidae family. The reptiles belong to the order Squamata and are distributed in three families (Boidae, Colubridae and Viperidae). At the end of the study it was registered a total of 22 species of reptiles and amphibians components, being 16 of these amphibians (order Anura) and six of these being reptiles (Orders Testudines and Squamata). The



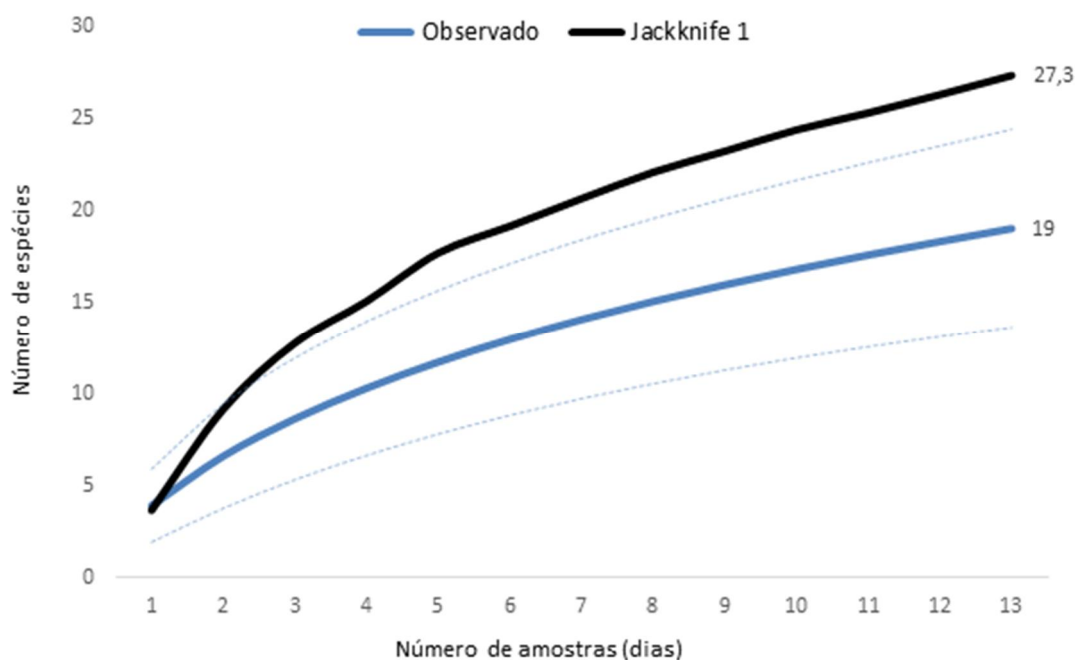


**Figure 12 – Abundance of species recorded in the reptiles and amphibians sample, during the first campaign (blue) and the second campaign (red).**

The overall recorded abundance was 75 individuals, being 66 amphibians and nine reptiles. The most abundant species among the amphibians was *B. albopunctata* with twenty two registered individuals followed by *D. minutus* with eleven individuals, *B. lundii* with seven individuals and *B. ternetzi* with five individuals. Among the registered reptiles species, three of them were found with more than one exemplar (*Crotalus durissus*, *Tropidurus torquatus* and *Oxyrhopus guibei*) both with two individuals. The rest of the registered reptiles species was represented by only one specimen.

Comparing both campaigns, the first one obtained a greater richness and abundance mainly in relation to amphibians. This was already expected since these animals exhibit greater activity in warm and wet season when they aggregate for reproduction during the rainy season (first campaign), making their records greater when compared to the dry season (second campaign). The same fact applies to expressive diversity of amphibians when compared to the reptiles richness since this group presents cryptic habits and in general little capacity of displacement (Vitt & Caldwell 2009). This superiority of amphibians sampling is due to the fact that these animals are aggregate for breeding, making their records in higher abundance when compared to reptiles.

None of the rarefaction and estimated richness curves reached the asymptote (as shown in following figure), indicating that theoretically there were not sampled all reptiles and amphibians species during the 13 days of study. It was estimated 27.3 species richness by the Jackknife 1 estimator. The effort employed in sampling (disregarding the species registered only by occasional findings) resulted in 19 recorded species corresponding to 70% of the total estimated species.



**Figure 13 – Rarefaction (blue) and estimated richness (black) curves of the recorded species. A 95% confidence interval is established with respect to the collector curve (the dotted lines).**

The *Mesoclemmys cf. vanderhaegei* species was recorded through a dead individual, where only the bones (Plastron) were found. Thus this species remained in doubt in the present study taxonomic, but the same species was recorded in the region inside Fazenda Nova Monte Carmelo (Maffei et al 2016). Then the material was sent to a specialist and it was a taxon considered "Near Threatened" on the IUCN list (Tortoise & Freshwater Turtle Specialist Group 1996). In the Endangered Brazilian Fauna List from 2005, this species has already been assessed as "Deficient Data", but currently it is considered as "Least Concern" (Vogt et al. 2015). The same situation happened in Brazilian State of Minas Gerais Endangered Fauna List, where the species was evaluated as "Deficient Data" in 2007 (Biodiversitas 2007), but currently it is not on the list. This species is also presented in the State of São Paulo List, in category "Deficient Data" (São Paulo 2014) and in Paraguay it is considered "Insufficiently Known" species (Prado et al. 2012). In spite of the huge extent occurrence of the species (Marques et al. 2014), there are few known records of *M. vanderhaegei* and it is necessary to study about the geographic and dynamics distribution, and species population structure (Vogt et al. 2015).

One registered species (*Boa constrictor*) is listed in Appendix II of CITES (Convention on International Trade of Flora and Wild Fauna Species in Danger of Extinction), and it is on the list for trade control (CITES, 2018). It is a common and abundant species throughout all national territory, its international trade can occur due to its skin and/or for pet trade, this is a situation that should not occur in the sampled area. The other sampled species are not present in the lists of threatens.

Other two species presented taxonomic uncertainties that deserve better analysis. The frog *Scinax cf. similis* is part of a species complex group called "*ruber*". It is a species

hard to diagnose, but since there was no other record of the species during the second campaign it was retained as the same "confer". Another study conducted in the Tijuco basin, a tributary of the Paranaíba river, located near the studied area in the Triângulo Mineiro region, also treats the species under this title (Conte et al. 2013). The same applies for *Tropidurus cf. torquatus*.

Most of reptiles and amphibians sampled are formed by common and widely distributed species through the national territory. Some species are probably more common in basically all biomes (*Dendropsophus minutus*, *D. nanus*, *Leptodactylus fuscus*, *Trachycephalus typhonius*, *Crotalus durissus terrificus*). However, the studied region has some endemic species at the Cerrado biome (*Rhinella rubescens*, *Odontophrynus cultripes*, *Barycholos ternetzi* and probably *Mesoclemmys cf. vanderhaegei*), all of them have extensive occurrence within the biome.

Diversity patterns associated with the landscape provide a much more precise evaluation of the importance of wildlife conservation. The highways and monocultures across the studied area, historically led a landscape change, favoring generalists species, as opposed to those most sensitive to changes in the environment. The maintenance of stable populations over time is related to the resources availability in the ecological niche.

None of the sampled species has specializations in habitat use or can be considered an indicator of environmental quality. The aquatic environments sampled houses typical Anurans species in open environments. The forest fragments constitute an important part of the species habitat, either as refuge areas during the dry season, either as shelters during the reproduction season or as foraging areas. Although these species occurs both in forested areas, as in open air areas, the perereca-martelinho (*Hypsiboas lundii*) has its presence associated to the forests.

The associated weirs with the native areas also form important environments for local reptiles and amphibians conservation. The turtle registration called *Mesoclemmys cf. vanderhaegei* is little known and it was important for expanding the knowledge of this species. This species has already been recorded near the studied area in Fazenda Nova Monte Carmelo (Maffei et al 2016) and Fazenda Santana (Nova Ponte, MG), about 60 km away of the studied area. The reptiles and amphibians of those places have greater richness than in the sampled field work, but the results obtained in both campaigns were satisfactory. Considerations about the real effects of the project implementation in the local reptiles and amphibians populations may be more robust with more intensive studies, with more frequent sampling and with seasonal occurrence, since the effects of these changes are cumulative, therefore perceived more clearly in subsequent fauna generations. The presented data here deal only with two field campaigns and without the presence of passive methods (for example: interception and pitfall traps).

The following figure presents some reptiles and amphibians species recorded in the field monitoring work.





*Rhinella schneideri*



*Rhinella rubescens*



*Dendropsophus nanus*



*Boana albopunctata*



*Boana lundii*



*Leptodactylus chaquensis*



*Leptodactylus fuscus*



*Leptodactylus labyrinthicus*





*Barycholos ternetzi*



*Scinax fuscovarius*



*Notomabuya frenata*



*Tropidurus cf. torquatus*



*Oxyrhopus guibei*



*Boa constrictor*



*Crotalus durissus*



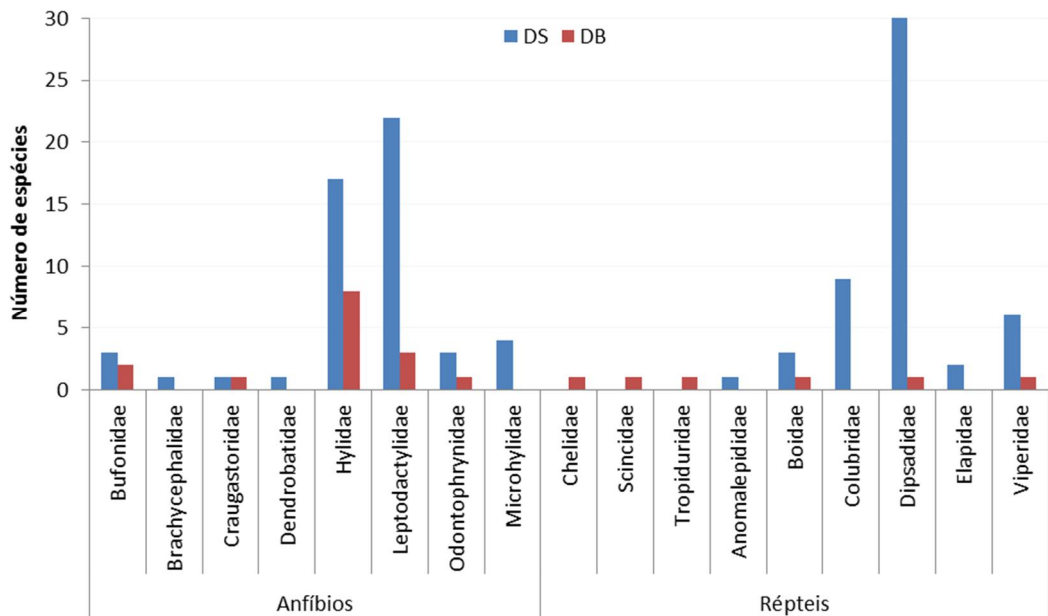
Plastrão de *Mesoclemmys* cf. *vanderhaegei*

**Figure 14 – Photographic register of the reptiles and amphibians species found in the remnants of vegetation at sampled areas.**

**8.3.4.2.3 Final Considerations**

From the species raised via secondary data analysis, 22 were recorded in this field work study. Among them, two amphibians species, *Rhinella rubescens* and *Pseudis bolbodactyla*, and two reptiles species, *Notomabuya frenata* and *Tropidurus cf. torquatus*, were recorded only in the present study and were not found in the consulted bibliographies at this region. They are common species, but absent in the works used as the secondary survey.

The families with the highest number of species found, and with potential occurrences at the site are: Dipsadidae (n = 30), Leptodactylidae (n = 22) and Hylidae (n = 18), as shown in the following figure. The families Brachycephalidae, Craugastoridae, Dendrobatidae, Anomalepididae, as well as the Chelidae, Scincidae and Tropiduridae families, were recorded only during the realization of this study, and present only one species with possible occurrence at the location. Therefore, the inclusion of those in secondary data, raises speculatively way the richness of 21 species of reptiles and amphibians registered so far, to a total of 108 species. The areas of the present study are possible of occurrence for most of them. Only in the Nova Monte Carmelo Farm, in previous studies there have already been registered 85 species, being 38 amphibians and 47 reptiles.



**Figure 15 – Species richness per reptiles and amphibians families in the area of influence via secondary data (DS) and via raw data (DB).**

**8.3.4.3 Birds fauna**

**8.3.4.3.1 Secondary Data**

From the secondary data, there were observed 363 species of birds in the region (as following table).



**Table 9 – Bird species most likely of occurrence in the area between Uberlândia and Araguari, MG. Source: 1 – WikiAves; 2-Taxeus.**

<b>Family</b>	<b>Species</b>	<b>Common Brazilian name</b>	<b>Source</b>
<b>Rheidae</b>	<i>Rhea americana</i>	ema	1
<b>Tinamidae</b>	<i>Crypturellus obsoletus</i>	inambuguaçu	1
	<i>Crypturellus undulatus</i>	jaó	1
	<i>Crypturellus parvirostris</i>	inhambu-chororó	1,2
	<i>Rhynchotus rufescens</i>	perdiz	1
	<i>Nothura maculosa</i>	codorna-amarela	1
<b>Anhimidae</b>	<i>Anhima cornuta</i>	anhuma	1
<b>Anatidae</b>	<i>Dendrocygna viduata</i>	irerê	1
	<i>Dendrocygna autumnalis</i>	marreca-cabocla	1
	<i>Cairina moschata</i>	pato-do-mato	1,2
	<i>Amazonetta brasiliensis</i>	pé-vermelho	1,2
<b>Cracidae</b>	<i>Penelope superciliaris</i>	jacupemba	1
	<i>Penelope obscura</i>	jacuaçu	1
	<i>Crax fasciolata</i>	mutum-de-penacho	1
<b>Podicipedidae</b>	<i>Tachybaptus dominicus</i>	mergulhão-pequeno	1
<b>Ciconiidae</b>	<i>Jabiru mycteria</i>	tuiuiú	1
	<i>Mycteria americana</i>	cabeça-seca	1
<b>Phalacrocoracidae</b>	<i>Nannopterum brasilianus</i>	biguá	1,2
<b>Anhingidae</b>	<i>Anhinga anhinga</i>	biguatinga	1,2
<b>Ardeidae</b>	<i>Tigrisoma lineatum</i>	socó-boi	1
	<i>Ixobrychus exilis</i>	socoí-vermelho	1
	<i>Nycticorax nycticorax</i>	savacu	1,2
	<i>Butorides striata</i>	socozinho	1,2
	<i>Bubulcus ibis</i>	garça-vaqueira	1
	<i>Ardea cocoi</i>	garça-moura	1
	<i>Ardea alba</i>	garça-branca-grande	1,2
	<i>Syrigma sibilatrix</i>	maria-faceira	1,2
	<i>Pilherodius pileatus</i>	garça-real	1,2
	<i>Egretta thula</i>	garça-branca-pequena	1,2

Family	Species	Common Brazilian name	Source
<b>Threskiornithidae</b>	<i>Mesembrinibis cayennensis</i>	coró-coró	1,2
	<i>Phimosus infuscatus</i>	tapicuru	1
	<i>Theristicus caudatus</i>	curicaca	1,2
	<i>Platalea ajaja</i>	colhereiro	1
<b>Cathartidae</b>	<i>Cathartes aura</i>	urubu-de-cabeça-vermelha	1,2
	<i>Cathartes burrovianus</i>	urubu-de-cabeça-amarela	1
	<i>Coragyps atratus</i>	urubu-de-cabeça-preta	1,2
	<i>Sarcoramphus papa</i>	urubu-rei	1
<b>Pandionidae</b>	<i>Pandion haliaetus</i>	águia-pescadora	1
<b>Accipitridae</b>	<i>Leptodon cayanensis</i>	gavião-de-cabeça-cinza	1
	<i>Chondrohierax uncinatus</i>	gavião-caracoleiro	1
	<i>Gampsonyx swainsonii</i>	gaviãozinho	1,2
	<i>Elanus leucurus</i>	gavião-peneira	1
	<i>Circus buffoni</i>	gavião-do-banhado	1
	<i>Ictinia plumbea</i>	sovi	1,2
	<i>Busarellus nigricollis</i>	gavião-belo	1
	<i>Rostrhamus sociabilis</i>	gavião-caramujeiro	1
	<i>Geranoospiza caerulescens</i>	gavião-pernilongo	1,2
	<i>Heterospizias meridionalis</i>	gavião-caboclo	1
	<i>Urubitinga urubitinga</i>	gavião-preto	1
	<i>Urubitinga coronata</i>	águia-cinzenta	1
	<i>Rupornis magnirostris</i>	gavião-carijó	1,2
	<i>Geranoaetus albicaudatus</i>	gavião-de-rabo-branco	1,2
	<i>Buteo brachyurus</i>	gavião-de-cauda-curta	1
	<i>Spizaetus tyrannus</i>	gavião-pega-macaco	1
<b>Aramidae</b>	<i>Aramus guarauna</i>	carão	1
<b>Rallidae</b>	<i>Micropygia schomburgkii</i>	maxalalagá	1
	<i>Aramides cajaneus</i>	saracura-três-potes	1,2

<b>Family</b>	<b>Species</b>	<b>Common Brazilian name</b>	<b>Source</b>
	<i>Amaurolimnas concolor</i>	saracura-lisa	1
	<i>Laterallus viridis</i>	sanã-castanha	1
	<i>Laterallus melanophaius</i>	sanã-parda	1
	<i>Laterallus exilis</i>	sanã-do-capim	1
	<i>Mustelirallus albicollis</i>	sanã-carijó	1
	<i>Pardirallus nigricans</i>	saracura-sanã	1,2
	<i>Gallinula galeata</i>	frango-d'água-comum	1
	<i>Porphyrio martinicus</i>	frango-d'água-azul	1
<b>Charadriidae</b>	<i>Vanellus chilensis</i>	quero-quero	1,2
	<i>Pluvialis dominica</i>	batuiriçu	1
<b>Recurvirostridae</b>	<i>Himantopus melanurus</i>	pernilongo-de-costas-brancas	1
<b>Scolopacidae</b>	<i>Gallinago paraguaiae</i>	narceja	1
	<i>Gallinago undulata</i>	narcejão	1
	<i>Tringa solitaria</i>	maçarico-solitário	1
	<i>Tringa melanoleuca</i>	maçarico-grande-de-perna-amarela	1
	<i>Tringa flavipes</i>	maçarico-de-perna-amarela	1
	<i>Calidris fuscicollis</i>	maçarico-de-sobre-branco	1
	<i>Phalaropus tricolor</i>	pisa-n'água	1
<b>Jacanidae</b>	<i>Jacana jacana</i>	jaçanã	1
<b>Sternidae</b>	<i>Sternula superciliaris</i>	trinta-réis-pequeno	1
	<i>Phaetusa simplex</i>	trinta-réis-grande	1
<b>Rynchopidae</b>	<i>Rynchops niger</i>	talha-mar	1
<b>Columbidae</b>	<i>Columbina minuta</i>	rolinha-de-asa-canela	1
	<i>Columbina talpacoti</i>	rolinha-roxa	1,2
	<i>Columbina squammata</i>	fogo-apagou	1,2
	<i>Columba livia</i>	pombo-doméstico	1,2

<b>Family</b>	<b>Species</b>	<b>Common Brazilian name</b>	<b>Source</b>
	<i>Patagioenas picazuro</i>	pomba-asa-branca	1,2
	<i>Patagioenas cayennensis</i>	pomba-galega	1,2
	<i>Patagioenas plumbea</i>	pomba-amargosa	2
	<i>Zenaida auriculata</i>	avoante	1,2
	<i>Leptotila verreauxi</i>	juriti-pupu	1,2
	<i>Leptotila rufaxilla</i>	juriti-gemeadeira	1,2
<b>Cuculidae</b>	<i>Piaya cayana</i>	alma-de-gato	1,2
	<i>Coccyzus melacoryphus</i>	papa-lagarta-acanelado	1
	<i>Coccyzus americanus</i>	papa-lagarta-de-asa-vermelha	1
	<i>Crotophaga major</i>	anu-coroca	1
	<i>Crotophaga ani</i>	anu-preto	1,2
	<i>Guira guira</i>	anu-branco	1,2
	<i>Tapera naevia</i>	saci	1
<b>Tytonidae</b>	<i>Tyto furcata</i>	suindara	1
<b>Strigidae</b>	<i>Megascops choliba</i>	corujinha-do-mato	1,2
	<i>Bubo virginianus</i>	jacurutu	1
	<i>Glaucidium brasilianum</i>	caburé	1,2
	<i>Athene cunicularia</i>	coruja-buraqueira	1,2
	<i>Asio clamator</i>	coruja-orelhuda	1
	<i>Asio flammeus</i>	mocho-dos-banhados	1
<b>Nyctibiidae</b>	<i>Nyctibius griseus</i>	mãe-da-lua	1,2
	<i>Nyctibius leucopterus</i>	urutau-de-asa-branca	2
<b>Caprimulgidae</b>	<i>Antrostomus rufus</i>	joão-corta-pau	1
	<i>Nyctidromus albicollis</i>	bacurau	1,2
	<i>Hydropsalis parvula</i>	bacurau-chintã	1
	<i>Hydropsalis anomala</i>	curiango-do-banhado	1,2
	<i>Hydropsalis maculicaudus</i>	bacurau-de-rabo-maculado	1
	<i>Hydropsalis torquata</i>	bacurau-tesoura	1

Family	Species	Common Brazilian name	Source
	<i>Nannochordeiles pusillus</i>	bacurauzinho	1
	<i>Podager nacunda</i>	coruçã	1
	<i>Chordeiles minor</i>	bacurau-norte- americano	1
<b>Apodidae</b>	<i>Cypseloides senex</i>	taperuçu-velho	1
	<i>Streptoprocne zonaris</i>	taperuçu-de-coleira- branca	1
	<i>Chaetura meridionalis</i>	andorinhão-do- temporal	1
	<i>Tachornis squamata</i>	andorinhão-do-buriti	1,2
<b>Trochilidae</b>	<i>Phaethornis pretrei</i>	rabo-branco-acanelado	1
	<i>Eupetomena macroura</i>	beija-flor-tesoura	1,2
	<i>Aphantochroa cirrochloris</i>	beija-flor-cinza	1
	<i>Florisuga fusca</i>	beija-flor-preto	1
	<i>Colibri serrirostris</i>	beija-flor-de-orelha- violeta	1,2
	<i>Anthracothorax nigricollis</i>	beija-flor-de-veste- preta	1
	<i>Chrysolampis mosquitus</i>	beija-flor-vermelho	1
	<i>Chlorostilbon lucidus</i>	besourinho-de-bico- vermelho	1,2
	<i>Thalurania furcata</i>	beija-flor-tesoura- verde	1,2
	<i>Hylocharis chrysura</i>	beija-flor-dourado	1
	<i>Polytmus guainumbi</i>	beija-flor-de-bico- curvo	1
	<i>Amazilia versicolor</i>	beija-flor-de-banda- branca	1
	<i>Amazilia fimbriata</i>	beija-flor-de-garganta- verde	1,2

<b>Family</b>	<b>Species</b>	<b>Common Brazilian name</b>	<b>Source</b>
	<i>Amazilia lactea</i>	beija-flor-de-peito-azul	1
	<i>Heliomaster squamosus</i>	bico-reto-de-banda-branca	1
	<i>Heliomaster furcifer</i>	bico-reto-azul	1
	<i>Calliphlox amethystina</i>	estrelinha-ametista	1
<b>Trogonidae</b>	<i>Trogon surrucura</i>	surucuá-variado	1
<b>Alcedinidae</b>	<i>Megaceryle torquata</i>	martim-pescador-grande	1
	<i>Chloroceryle amazona</i>	martim-pescador-verde	1,2
	<i>Chloroceryle americana</i>	martim-pescador-pequeno	1
<b>Momotidae</b>	<i>Baryphthengus ruficapillus</i>	juruva	1
	<i>Momotus momota</i>	udu-de-coroa-azul	1
<b>Galbulidae</b>	<i>Galbula ruficauda</i>	ariramba-de-cauda-ruiva	1,2
<b>Bucconidae</b>	<i>Nystalus chacuru</i>	joão-bobo	1,2
	<i>Nystalus maculatus</i>	rapazinho-dos-velhos	1
	<i>Monasa nigrifrons</i>	chora-chuva-preto	1,2
<b>Ramphastidae</b>	<i>Ramphastos toco</i>	tucanuçu	1,2
	<i>Pteroglossus castanotis</i>	araçari-castanho	1
<b>Picidae</b>	<i>Picumnus cirratus</i>	pica-pau-anão-barrado	1
	<i>Picumnus albosquamatus</i>	pica-pau-anão-escamado	1,2
	<i>Melanerpes candidus</i>	pica-pau-branco	1,2
	<i>Melanerpes flavifrons</i>	benedito-de-testa-amarela	1
	<i>Veniliornis passerinus</i>	picapauzinho-anão	1
	<i>Veniliornis mixtus</i>	pica-pau-chorão	1
	<i>Colaptes melanochloros</i>	pica-pau-verde-barrado	1,2
	<i>Colaptes campestris</i>	pica-pau-do-campo	1

Family	Species	Common Brazilian name	Source
	<i>Dryocopus lineatus</i>	pica-pau-de-banda-branca	1,2
	<i>Campephilus melanoleucos</i>	pica-pau-de-topete-vermelho	1,2
<b>Cariamidae</b>	<i>Cariama cristata</i>	seriema	1,2
<b>Falconidae</b>	<i>Caracara plancus</i>	carcará	1,2
	<i>Milvago chimachima</i>	carrapateiro	1,2
	<i>Herpetotheres cachinnans</i>	acauã	1
	<i>Falco sparverius</i>	quiriquiri	1
	<i>Falco femoralis</i>	falcão-de-coleira	1
	<i>Falco peregrinus</i>	falcão-peregrino	1
<b>Psittacidae</b>	<i>Anodorhynchus glaucus</i>	arara-azul-pequena	2
	<i>Ara ararauna</i>	arara-canindé	1
	<i>Orthopsittaca manilatus</i>	maracanã-do-buriti	1,2
	<i>Diopsittaca nobilis</i>	maracanã-pequena	1,2
	<i>Psittacara leucophthalmus</i>	periquitão-maracanã	1,2
	<i>Aratinga auricapillus</i>	jandaia-de-testa-vermelha	1
	<i>Eupsittula aurea</i>	periquito-rei	1,2
	<i>Forpus xanthopterygius</i>	tuim	1,2
	<i>Brotogeris chiriri</i>	periquito-de-encontro-amarelo	1,2
	<i>Alipiopsitta xanthops</i>	papagaio-galego	1
	<i>Amazona amazonica</i>	curica	1
	<i>Amazona ochrocephala</i>	papagaio-campeiro	2
	<i>Amazona aestiva</i>	papagaio-verdadeiro	1,2
<b>Thamnophilidae</b>	<i>Formicivora rufa</i>	papa-formiga-vermelho	1
	<i>Herpsilochmus atricapillus</i>	chorozinho-de-chapéu-preto	1

Family	Species	Common Brazilian name	Source
	<i>Herpsilochmus longirostris</i>	chorozinho-de-bico-comprido	1,2
	<i>Thamnophilus doliatus</i>	choca-barrada	1,2
	<i>Thamnophilus torquatus</i>	choca-de-asa-vermelha	1
	<i>Thamnophilus pelzelni</i>	choca-do-planalto	1
	<i>Thamnophilus caerulescens</i>	choca-da-mata	1
	<i>Taraba major</i>	choró-boi	1
<b>Melanopareiidae</b>	<i>Melanopareia torquata</i>	tapaculo-de-colarinho	1
<b>Rhinocryptidae</b>	<i>Scytalopus novacapitalis</i>	tapaculo-de-brasília	1
<b>Scleruridae</b>	<i>Geositta poeciloptera</i>	andarilho	1
<b>Dendrocolaptidae</b>	<i>Lepidocolaptes angustirostris</i>	arapaçu-de-cerrado	1,2
<b>Xenopidae</b>	<i>Xenops rutilans</i>	bico-virado-carijó	1
<b>Furnariidae</b>	<i>Berlepschia rikeri</i>	limpa-folha-do-buriti	1
	<i>Furnarius figulus</i>	casaca-de-couro-da-lama	1
	<i>Furnarius rufus</i>	joão-de-barro	1,2
	<i>Lochmias nematura</i>	joão-porca	1
	<i>Clibanornis rectirostris</i>	fura-barreira	1,2
	<i>Automolus leucophthalmus</i>	barranqueiro-de-olho-branco	1
	<i>Syndactyla dimidiata</i>	limpa-folha-do-brejo	1
	<i>Phacellodomus rufifrons</i>	joão-de-pau	1
	<i>Phacellodomus ruber</i>	graveteiro	1,2
	<i>Anumbius annumbi</i>	cochicho	1
	<i>Certhiaxis cinnamomeus</i>	curutié	1
	<i>Synallaxis frontalis</i>	petrim	1,2
	<i>Synallaxis albescens</i>	uí-pi	1
	<i>Synallaxis spixi</i>	joão-teneném	1
	<i>Synallaxis hypospodia</i>	joão-grilo	1
	<i>Synallaxis scutata</i>	estrelinha-preta	1



<b>Family</b>	<b>Species</b>	<b>Common Brazilian name</b>	<b>Source</b>
	<i>Asthenes moreirae</i>	garrincha-chorona	2
	<i>Cranioleuca vulpina</i>	arredio-do-rio	1,2
<b>Pipridae</b>	<i>Neopelma pallescens</i>	fruxu-do-cerradão	1
	<i>Pipra fasciicauda</i>	uirapuru-laranja	1
	<i>Antilophia galeata</i>	soldadinho	1,2
<b>Tityridae</b>	<i>Schiffornis virescens</i>	flautim	1
	<i>Tityra inquisitor</i>	anambé-branco-de-bochecha-parda	1
	<i>Tityra cayana</i>	anambé-branco-de-rabo-preto	1
	<i>Pachyramphus polychopterus</i>	caneleiro-preto	1
	<i>Pachyramphus validus</i>	caneleiro-de-chapéu-preto	1
<b>Platyrrinchidae</b>	<i>Platyrrinchus mystaceus</i>	patinho	1
<b>Rhynchocyclidae</b>	<i>Leptopogon amaurocephalus</i>	cabeçudo	1,2
	<i>Corythopsis delalandi</i>	estalador	1
	<i>Tolmomyias sulphurescens</i>	bico-chato-de-orelha-preta	1,2
	<i>Todirostrum cinereum</i>	ferreirinho-relógio	1,2
	<i>Poecilatriccus latirostris</i>	ferreirinho-de-cara-parda	1
	<i>Hemitriccus margaritaceiventer</i>	sebinho-de-olho-de-ouro	1
<b>Tyrannidae</b>	<i>Hirundinea ferruginea</i>	gibão-de-couro	1
	<i>Camptostoma obsoletum</i>	risadinha	1,2
	<i>Elaenia flavogaster</i>	guaracava-de-barriga-amarela	1,2
	<i>Elaenia spectabilis</i>	guaracava-grande	1,2
	<i>Elaenia parvirostris</i>	guaracava-de-bico-curto	1

Family	Species	Common Brazilian name	Source
	<i>Elaenia cristata</i>	guaracava-de-topete-uniforme	1
	<i>Elaenia chiriquensis</i>	chibum	1
	<i>Elaenia obscura</i>	tucão	1
	<i>Suiriri suiriri</i>	suiriri-cinzento	1
	<i>Myiopagis caniceps</i>	guaracava-cinzenta	1
	<i>Myiopagis viridicata</i>	guaracava-de-crista-alaranjada	1
	<i>Phaeomyias murina</i>	bagageiro	2
	<i>Phyllomyias fasciatus</i>	piolhinho	1,2
	<i>Culicivora caudacuta</i>	papa-moscas-do-campo	1
	<i>Polystictus pectoralis</i>	papa-moscas-canela	1
	<i>Serpophaga nigricans</i>	joão-pobre	1
	<i>Serpophaga subcristata</i>	alegrinho	1
	<i>Legatus leucophaeus</i>	bem-te-vi-pirata	1
	<i>Myiarchus swainsoni</i>	irré	1
	<i>Myiarchus ferox</i>	maria-cavaleira	1,2
	<i>Myiarchus tyrannulus</i>	maria-cavaleira-de-rabo-enferrujado	1,2
	<i>Casiornis rufus</i>	maria-ferrugem	1
	<i>Pitangus sulphuratus</i>	bem-te-vi	1,2
	<i>Machetornis rixosa</i>	suiriri-cavaleiro	1,2
	<i>Myiodynastes maculatus</i>	bem-te-vi-rajado	1,2
	<i>Megarynchus pitangua</i>	neinei	1,2
	<i>Myiozetetes cayanensis</i>	bentevizinho-de-asa-ferrugínea	1,2
	<i>Myiozetetes similis</i>	bentevizinho-de-penacho-vermelho	1,2
	<i>Tyrannus albogularis</i>	suiriri-de-garganta-	1,2

Family	Species	Common Brazilian name	Source
		branca	
	<i>Tyrannus melancholicus</i>	suiriri	1,2
	<i>Tyrannus savana</i>	tesourinha	1,2
	<i>Griseotyrannus</i>	peitica-de-chapéu-	1,2
	<i>aurantioatrocristatus</i>	preto	
	<i>Empidonomus varius</i>	peitica	1,2
	<i>Colonia colonus</i>	viuvinha	1,2
	<i>Myiophobus fasciatus</i>	filipe	1,2
	<i>Sublegatus modestus</i>	guaracava-modesta	1
	<i>Pyrocephalus rubinus</i>	príncipe	1
	<i>Fluvicola albiventer</i>	lavadeira-de-cara- branca	1
	<i>Fluvicola nengeta</i>	lavadeira-mascarada	1,2
	<i>Arundinicola leucocephala</i>	freirinha	1
	<i>Gubernetes yetapa</i>	tesoura-do-brejo	1,2
	<i>Alectrurus tricolor</i>	galito	1
	<i>Cnemotriccus fuscatus</i>	guaracavuçu	1
	<i>Lathrotriccus euleri</i>	enferrujado	1
	<i>Knipolegus lophotes</i>	maria-preta-de- penacho	1
	<i>Satrapa icterophrys</i>	suiriri-pequeno	1
	<i>Xolmis cinereus</i>	primavera	1
	<i>Xolmis velatus</i>	noivinha-branca	1
<b>Vireonidae</b>	<i>Cyclarhis gujanensis</i>	pitiguari	1,2
	<i>Vireo chivi</i>	juruviana	1,2
<b>Corvidae</b>	<i>Cyanocorax cristatellus</i>	galha-do-campo	1,2
	<i>Cyanocorax chrysops</i>	galha-piçaça	1
<b>Hirundinidae</b>	<i>Pygochelidon cyanoleuca</i>	andorinha-pequena-de- casa	1,2
	<i>Alopochelidon fucata</i>	andorinha-morena	1

Family	Species	Common Brazilian name	Source
	<i>Stelgidopteryx ruficollis</i>	andorinha-serradora	1,2
	<i>Progne tapera</i>	andorinha-do-campo	1,2
	<i>Progne subis</i>	andorinha-azul	1
	<i>Progne chalybea</i>	andorinha-doméstica-grande	1,2
	<i>Tachycineta albiventer</i>	andorinha-do-rio	1
	<i>Tachycineta leucorrhoa</i>	andorinha-de-sobre-branco	1
	<i>Hirundo rustica</i>	andorinha-de-bando	1
	<i>Petrochelidon pyrrhonota</i>	andorinha-de-dorso-acanelado	1
<b>Troglodytidae</b>	<i>Troglodytes musculus</i>	corruíra	1
	<i>Cistothorus platensis</i>	corruíra-do-campo	1
	<i>Cantorchilus leucotis</i>	garrinchão-de-barriga-vermelha	1,2
<b>Donacobiidae</b>	<i>Donacobius atricapilla</i>	japacanim	1
<b>Polioptilidae</b>	<i>Polioptila dumicola</i>	balança-rabo-de-máscara	1,2
<b>Turdidae</b>	<i>Turdus leucomelas</i>	sabiá-barranco	1,2
	<i>Turdus rufiventris</i>	sabiá-laranjeira	1,2
	<i>Turdus amaurochalinus</i>	sabiá-poca	1,2
	<i>Turdus subalaris</i>	sabiá-ferreiro	1
<b>Mimidae</b>	<i>Mimus saturninus</i>	sabiá-do-campo	1,2
<b>Motacillidae</b>	<i>Anthus lutescens</i>	caminheiro-zumbidor	1
<b>Passerellidae</b>	<i>Zonotrichia capensis</i>	tico-tico	1,2
	<i>Ammodramus humeralis</i>	tico-tico-do-campo	1,2
	<i>Arremon flavirostris</i>	tico-tico-de-bico-amarelo	1,2
<b>Parulidae</b>	<i>Setophaga pitiayumi</i>	mariquita	2
	<i>Geothlypis aequinoctialis</i>	pia-cobra	1,2

Family	Species	Common Brazilian name	Source
	<i>Basileuterus culicivorus</i>	pula-pula	1,2
	<i>Myiothlypis flaveola</i>	canário-do-mato	1,2
	<i>Myiothlypis leucophrys</i>	pula-pula-de-sobrancelha	1,2
<b>Icteridae</b>	<i>Psarocolius decumanus</i>	japu	1,2
	<i>Icterus pyrrhopterus</i>	encontro	1,2
	<i>Icterus jamacaii</i>	corrupião	1
	<i>Gnorimopsar chopi</i>	graúna	1,2
	<i>Amblyramphus holosericeus</i>	cardeal-do-banhado	1
	<i>Agelasticus cyanopus</i>	carretão	1
	<i>Chrysomus ruficapillus</i>	garibaldi	1
	<i>Pseudoleistes guirahuro</i>	chopim-do-brejo	1
	<i>Molothrus oryzivorus</i>	iraúna-grande	2
	<i>Molothrus rufoaxillaris</i>	chupim-azeviche	1,2
	<i>Molothrus bonariensis</i>	chupim	1,2
	<i>Sturnella superciliaris</i>	polícia-inglesa-do-sul	1,2
<b>Thraupidae</b>	<i>Pipraeidea melanonota</i>	saíra-viúva	1
	<i>Neothraupis fasciata</i>	cigarra-do-campo	1
	<i>Schistochlamys melanopis</i>	sanhaçu-de-coleira	1
	<i>Tangara sayaca</i>	sanhaçu-cinzento	1,2
	<i>Tangara palmarum</i>	sanhaçu-do-coqueiro	1,2
	<i>Tangara cayana</i>	saíra-amarela	1,2
	<i>Nemosia pileata</i>	saíra-de-chapéu-preto	1,2
	<i>Conirostrum speciosum</i>	figuinha-de-rabo-castanho	1
	<i>Sicalis citrina</i>	canário-rasteiro	1
	<i>Sicalis flaveola</i>	canário-da-terra	1,2
	<i>Sicalis luteola</i>	tipio	1
	<i>Hemithraupis guira</i>	saíra-de-papo-preto	1
	<i>Volatinia jacarina</i>	tiziu	1,2

Family	Species	Common Brazilian name	Source
	<i>Eucometis penicillata</i>	pipira-da-taoca	1,2
	<i>Coryphospingus pileatus</i>	tico-tico-rei-cinza	1
	<i>Coryphospingus cucullatus</i>	tico-tico-rei	1
	<i>Tachyphonus rufus</i>	pipira-preta	1,2
	<i>Tachyphonus coronatus</i>	tiê-preto	1
	<i>Ramphocelus carbo</i>	pipira-vermelha	1
	<i>Tersina viridis</i>	saí-andorinha	1,2
	<i>Dacnis cayana</i>	saí-azul	1,2
	<i>Coereba flaveola</i>	cambacica	1,2
	<i>Sporophila lineola</i>	bigodinho	1,2
	<i>Sporophila plumbea</i>	patativa	1
	<i>Sporophila collaris</i>	coleiro-do-brejo	1
	<i>Sporophila nigricollis</i>	baiano	1,2
	<i>Sporophila ardesiaca</i>	papa-capim-de-costas-cinzas	1
	<i>Sporophila caerulescens</i>	coleirinho	1
	<i>Sporophila leucoptera</i>	chorão	1
	<i>Sporophila pileata</i>	caboclinho-branco	1
	<i>Sporophila hypoxantha</i>	caboclinho-de-barriga-vermelha	1
	<i>Sporophila palustris</i>	caboclinho-de-papo-branco	1
	<i>Sporophila cinnamomea</i>	caboclinho-de-chapéu-cinzento	1
	<i>Sporophila melanogaster</i>	caboclinho-de-barriga-preta	1
	<i>Sporophila angolensis</i>	curió	1
	<i>Coryphasiza melanotis</i>	tico-tico-de-máscara-negra	1
	<i>Emberizoides herbicola</i>	canário-do-campo	1

Family	Species	Common Brazilian name	Source
	<i>Saltatricula atricollis</i>	batuqueiro	1
	<i>Saltator maximus</i>	tempera-viola	1,2
	<i>Saltator similis</i>	trinca-ferro	1,2
	<i>Thlypopsis sordida</i>	saí-canário	1,2
	<i>Cypsnagra hirundinacea</i>	bandoleta	1
<b>Cardinalidae</b>	<i>Piranga flava</i>	sanhaçu-de-fogo	1
	<i>Cyanoloxia brissonii</i>	azulão	1
<b>Fringillidae</b>	<i>Euphonia chlorotica</i>	fim-fim	1,2
<b>Estrildidae</b>	<i>Estrilda astrild</i>	bico-de-lacre	1
<b>Passeridae</b>	<i>Passer domesticus</i>	pardal	1,2

#### 8.3.4.3.2 Field Primary Data Collection

##### Methodological Approach

For the birds sampling, it was used transects methodology (Bibby et al. 1992), where the researcher walks through a pre-established path which can be delimited either by time as by distance. It was also reported the registers that occurred outside of the sampling periods in qualitative surveys (exhaustive), aiming to complement the general list of species. The birds were also recorded by visual and/or auditory means of contacts. To sample a considerable area, 26 sampling routes (transects) were travelled, although only one route was done during the first two hours in the morning or in the afternoon, coinciding with peak biological activity of birds (according to the following table). Therefore, there were carried out 52 samples hours in the whole work.

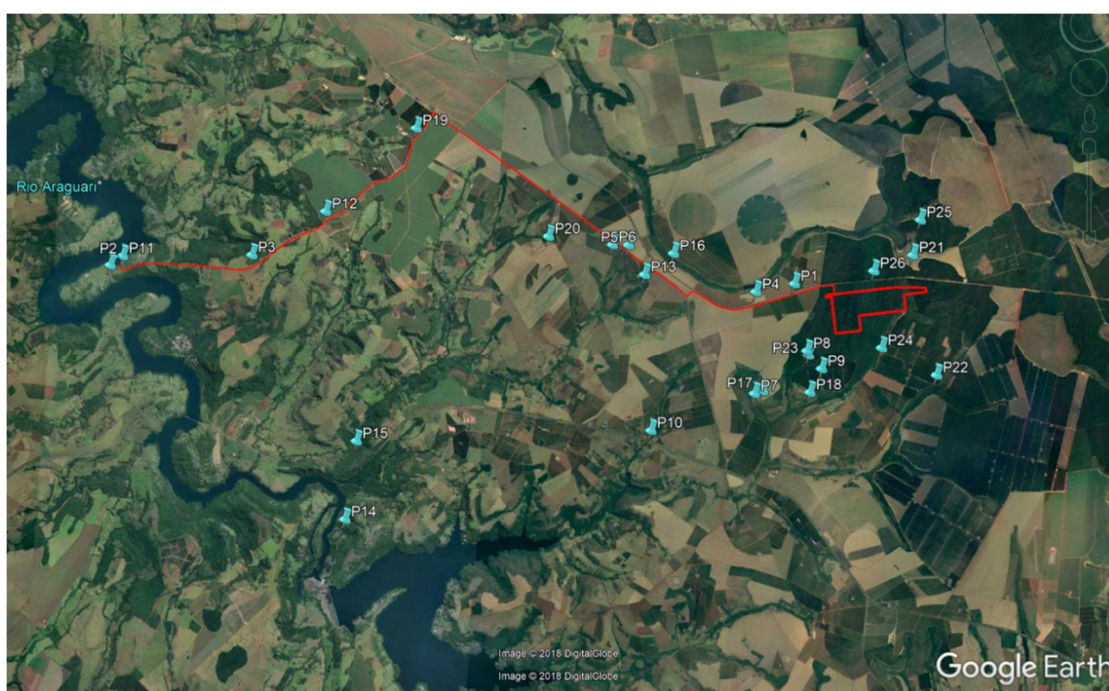
**Table 10 – Location of birds sampling transects (geographic coordinates in UTM, WGS 84 Datum).**

Transect	Location	Description
1	23K 190938 7914868	The area where predominates eucalyptus plantation associated to the Forested Savanna fragments (Cerradão).
2	22K 805613 7914209	Trail that crosses the riparian forest associated to the Araguari River.
3	22K 809254 7914654	Forested Savanna fragments (Cerradão) inserted in an agricultural area of pasture.
4	23K 189963 7914580	Track adjacent to a permanently waterlogged field (veredas), where a <i>Mauritia flexuosa</i> L.f. (buritizal) monodominant phytophysiology predominates.

Transect	Location	Description
5	23K 186585 7915495	Transition area between buritizal and Cerradão inserted into an agricultural matrix.
6	23K 186169 7915468	Cerradão area inserted into a soy agricultural matrix.
7	23K 190151 7911956	Paludosa Forest area inserted into a coffee agricultural matrix.
8	23K 191407 7913180	Transitional area between eucalyptus plantation and Forested Savanna fragments (Cerradão).
9	23K 191823 7912736	Transitional area between eucalyptus plantation and Forested Savanna fragments (Cerradão).
10	23K 187566 7910788	Riparian forest area associated with one of the tributaries of the Taquari River.
11	22K 805923 7914462	Riparian forest area associated with one of the tributaries of the Taquari River.
12	22K 811101 7915868	Contact area between Forested Savanna (Cerradão) and corn agricultural matrix.
13	23K 187060 7914777	Strict Sense Cerrado area.
14	22K 812003 7907992	Riparian forest associated with the Taquari River.
15	22K 812196 7910008	Riparian forest associated with the Taquari River.
16	23K 187761 7915381	Adjacent track to a permanently waterlogged field (veredas), where a monodominant phytophysiology of <i>Mauritia flexuosa</i> L.f. (buritizal) predominates.
17	23K 190362 7912042	Adjacent track to a permanently waterlogged field (veredas), where a monodominant phytophysiology of <i>Mauritia flexuosa</i> L.f. (buritizal) predominates.
18	23K 191576 7912110	Studied held in an area of Paludosa Forest inserted into a coffee agricultural matrix.
19	22K 813328 7918116	Forested Savanna fragment (Cerradão)
20	23K 184507 7916543	Fragment of transition between Forested Savanna (Cerradão) and Riparian forest
21	23 K 193921 7915861	Savannah countryside adjacent to an area of eucalyptus
22	23 K 194799 7912824	Savannah countryside adjacent to an area of eucalyptus
23	23 K 191456 7913601	Forested Savanna (Cerradão) Area adjacent to an area of eucalyptus



Transect	Location	Description
24	23 K 193320 7913423	Forested Savanna (Cerradão) Area adjacent to an area of eucalyptus
25	23 K 194039 7916777	Forested Savanna (Cerradão) Area adjacent to an area of eucalyptus
26	23 K 192952 7915373	Inside ADA, inside eucalyptus plantations



**Figure 16 – Birds sampling points location.**

The observations were carried out with the use of binoculars Nikon Sportstar (10x25). The photographic documentation was carried out with a camera (Canon Powershot SX HS40), while the sound documentation was made with the digital recorder Marantz PMD66 with a directional microphone Yoga HT81 coupled.

The sampling efficiency was evaluated by rarefaction curves based on 1000 randomisations, considering the effort of each route. Estimation of species richness was made with the non-parametric estimator Jackknife1 using the program EstimateS 9.1.0 (COLWELL 2013).

Taxonomic ordering and birds nomenclature follow the commented list of the Brazilian birds by Ornithological Brazilian Records Committee (Piacentini et al. 2015). The endemism status of species was based on the list of endemic birds at Cerrado proposed by Silva & Bates (2002). The sensitivity degree due to habitat modification was described according to Stotz et al. (1996), using three proposed categories: species with high, medium and low sensitivity. The species conservation status was defined based on the list of endangered Brazilian Fauna (ICMBio 2016), on

the red list of endangered Fauna of the International Union for nature conservation (IUCN, 2017) and on the list of threatened Fauna Extinction of Minas Gerais (COPAM 2010). There were also identified species that have commercial interests, and will be susceptible to exploitation, based on the list of the Convention on international trade endangered species of wild Fauna and Flora-CITES, whose criteria fit the species in Appendices I, II and III (CITES 2017).

### **Results and discussion**

Through the quantitative survey, 149 species of birds have been recorded, being distributed in 18 orders and 41 families (according to the following table). Of this total, 20 families are belonging to non-Passerines and 21 are belonging to Passerines. The qualitative complement survey diagnosed 4 additional species, totaling 153 birds species.

**Table 11 – Birds sampling species recorded list for each campaign (C1 and C2), besides the qualitative records (Qual.); sensitivity to environmental changes (STOTZ, 1996); category of threatness - IUCN (2017), ICMBIO (2016) and Minas Gerais (COPAM 2010); possible commercial exploitation species (CITES, 2017); trafficked species in Brazil (Costa & Monteiro, 2006); and endemism of Cerrado (\*), according to Silva & Bates (2002).**

Táxon	Nome Popular	C1	C2	C3	Exaus.	Sens.	IUCN	MMA	MG	CITIES	Traf.
<b>Tinamiformes Huxley, 1872</b>											
<b>Tinamidae Gray, 1840</b>											
<i>Crypturellus undulatus</i> (Temminck, 1815)	jaó	1	4	0		L	LC	LC	LC		
<i>Crypturellus parvirostris</i> (Wagler, 1827)	inambu-chororó	4	2	0		L	LC	LC	LC		
<b>Anseriformes Linnaeus, 1758</b>											
<b>Anatidae Leach, 1820</b>											
<i>Dendrocygna viduata</i> (Linnaeus, 1766)	irerê	0	0	0	X	L	LC	LC	LC		
<b>Pelecaniformes Sharpe, 1891</b>											
<b>Ardeidae Leach, 1820</b>											
<i>Bubulcus ibis</i> (Linnaeus, 1758)	garça-vaqueira	0	2	0							
<i>Ardea alba</i> Linnaeus, 1758	garça-branca	4	4	0		L	LC	LC	LC		
<i>Syrigma sibilatrix</i> (Temminck, 1824)	maria-faceira	1	4	0		M	LC	LC	LC		
<i>Egretta thula</i> (Molina, 1782)	garça-branca-pequena	0	1	0		L	LC	LC	LC		
<b>Threskiornithidae Poche, 1904</b>											
<i>Mesembrinibis cayennensis</i> (Gmelin, 1789)	coró-coró	2	2	0		L	LC	LC	LC		
<i>Theristicus caudatus</i> (Boddaert, 1783)	curicaca	9	8	2		L	LC	LC	LC		
<b>Cathartiformes Seebohm, 1890</b>											
<b>Cathartidae Lafresnaye, 1839</b>											
<i>Coragyps atratus</i> (Bechstein, 1793)	urubu	7	14	0		L	LC	LC	LC		
<b>Accipitriformes Bonaparte, 1831</b>											
<b>Accipitridae Vigors, 1824</b>											
<i>Leptodon cayanensis</i> (Latham, 1790)	gavião-gato	1	0	0		M	LC	LC	LC		
<i>Gampsonyx swainsonii</i> Vigors, 1825	gaviãozinho	0	1	0		L	LC	LC	LC		
<i>Heterospizias meridionalis</i> (Latham, 1790)	gavião-caboclo	3	1	0		L	LC	LC	LC		
<i>Rupornis magnirostris</i> (Gmelin, 1788)	gavião-carijó	7	5	1		L	LC	LC	LC		

<b>Gruiformes Bonaparte, 1854</b>								
<b>Rallidae Rafinesque, 1815</b>								
<i>Aramides cajaneus</i> (Statius Muller, 1776)	saracura-três-potes	5	1	0	H	LC	LC	LC
<i>Laterallus melanophaius</i> (Vieillot, 1819)	sanã-parda	0	1	0	L	LC	LC	LC
<i>Mustelirallus albicollis</i> (Vieillot, 1819)	sanã-carijó	0	6	0	M	LC	LC	LC
<i>Pardirallus nigricans</i> (Vieillot, 1819)	saracura-sanã	0	1	0	M	LC	LC	LC
<b>Charadriiformes Huxley, 1867</b>								
<b>Charadriidae Leach, 1820</b>								
<i>Vanellus chilensis</i> (Molina, 1782)	quero-quero	9	12	0	L	LC	LC	LC
<b>Columbiformes Latham, 1790</b>								
<b>Columbidae Leach, 1820</b>								
<i>Columbina talpacoti</i> (Temminck, 1810)	rolinha	17	24	8	L	LC	LC	LC
<i>Columbina squammata</i> (Lesson, 1831)	fogo-apagou	2	13	4	L	LC	LC	LC
<i>Patagioenas picazuro</i> (Temminck, 1813)	asa-branca	48	34	46	M	LC	LC	LC
<i>Patagioenas cayennensis</i> (Bonnaterre, 1792)	pomba-galega	2	1	2	M	LC	LC	LC
<i>Zenaida auriculata</i> (Des Murs, 1847)	avoante	26	17	8	L	LC	LC	LC
<i>Leptotila verreauxi</i> Bonaparte, 1855	juriti-pupu	7	16	2	M	LC	LC	LC
<i>Leptotila rufaxilla</i> (Richard & Bernard, 1792)	juriti-de-testa-branca	14	16	16	L	LC	LC	LC
<b>Cuculiformes Wagler, 1830</b>								
<b>Cuculidae Leach, 1820</b>								
<i>Piaya cayana</i> (Linnaeus, 1766)	alma-de-gato	5	3	2	L	LC	LC	LC
<i>Crotophaga ani</i> Linnaeus, 1758	anu-preto	10	16	0	L	LC	LC	LC
<i>Guira guira</i> (Gmelin, 1788)	anu-branco	0	9	0	L	LC	LC	LC
<b>Strigiformes Wagler, 1830</b>								
<b>Tytonidae Mathews, 1912</b>								
<i>Tyto furcata</i> (Temminck, 1827)	suindara	1	0	0	L	LC	LC	LC
<b>Strigidae Leach, 1820</b>								
<i>Megascops choliba</i> (Vieillot, 1817)	corujinha-do-mato	1	0	2	L	LC	LC	LC

<i>Bubo virginianus</i> (Gmelin, 1788)	jacurutu	3	0	0		M	LC	LC	LC	
<i>Athene cunicularia</i> (Molina, 1782)	coruja-buraqueira	2	3	0		M	LC	LC	LC	
<b>Caprimulgiformes Ridgway, 1881</b>										
<b>Caprimulgidae Vigors, 1825</b>										
<i>Nyctidromus albicollis</i> (Gmelin, 1789)	bacurau	12	17	5		L	LC	LC	LC	II
<i>Hydropsalis parvula</i> (Gould, 1837)	bacurau-chintã	0	2	0		L	LC	LC	LC	II
<i>Podager nacunda</i> (Vieillot, 1817)	coruçã	3	0	0		L	LC	LC	LC	II
<b>Apodiformes Peters, 1940</b>										
<b>Apodidae Olphe-Galliard, 1887</b>										
<i>Streptoprocne zonaris</i> (Shaw, 1796)	taperuçu-de-coleira-branca	75	0	0		L	LC	LC	LC	
<i>Chaetura meridionalis</i> Hellmayr, 1907	andorinhão-do-temporal	6	3	0		L	LC	LC	LC	
<i>Tachornis squamata</i> (Cassin, 1853)	andorinhão-do-buriti	0	0	0	X	L	LC	LC	LC	
<b>Trochilidae Vigors, 1825</b>										
<i>Phaethornis pretrei</i> (Lesson & Delattre, 1839)	rabo-branco-acanelado	3	6	1		L	LC	LC	LC	II
<i>Eupetomena macroura</i> (Gmelin, 1788)	beija-flor-tesoura	1	2	1		L	LC	LC	LC	II
<i>Florisuga fusca</i> (Vieillot, 1817)	beija-flor-preto	3	0	0		L	LC	LC	LC	II
<i>Colibri serrirostris</i> (Vieillot, 1816)	beija-flor-de-orelha-violeta	0	1	0		L	LC	LC	LC	II
<i>Thalurania furcata</i> (Gmelin, 1788)	beija-flor-tesoura-verde	1	0	0		M	LC	LC	LC	II
<i>Amazilia versicolor</i> (Vieillot, 1818)	beija-flor-de-banda-branca	0	1	0		L	LC	LC	LC	II
<i>Amazilia lactea</i> (Lesson, 1832)	beija-flor-de-peito-azul	5	7	0		L	LC	LC	LC	II
<b>Galbuliformes Fürbringer, 1888</b>										
<b>Galbulidae Vigors, 1825</b>										
<i>Galbula ruficauda</i> Cuvier, 1816	ariramba	10	3	4		L	LC	LC	LC	
<b>Piciformes Meyer &amp; Wolf, 1810</b>										
<b>Ramphastidae Vigors, 1825</b>										
<i>Ramphastos toco</i> Statius Muller, 1776	tucanuçu	15	12	33		M	LC	LC	LC	II X
<b>Picidae Leach, 1820</b>										
<i>Picumnus albosquamatus</i> d'Orbigny, 1840	picapauzinho-escamoso	5	4	0		L	LC	LC	LC	

<i>Melanerpes candidus</i> (Otto, 1796)	pica-pau-branco	9	0	1	L	LC	LC	LC		
<i>Veniliornis passerinus</i> (Linnaeus, 1766)	pica-pau-pequeno	5	3	1	L	LC	LC	LC		
<i>Colaptes campestris</i> (Vieillot, 1818)	pica-pau-do-campo	0	4	0	L	LC	LC	LC		
<i>Dryocopus lineatus</i> (Linnaeus, 1766)	pica-pau-de-banda-branca	0	1	2	L	LC	LC	LC		
<i>Campephilus melanoleucos</i> (Gmelin, 1788)	pica-pau-de-topete-vermelho	0	0	1	M	LC	LC	LC		
<b>Cariamiformes Fürbringer, 1888</b>										
<b>Cariamidae Bonaparte, 1850</b>										
<i>Cariama cristata</i> (Linnaeus, 1766)	seriema	17	20	0	L	LC	LC	LC		
<b>Falconiformes Bonaparte, 1831</b>										
<b>Falconidae Leach, 1820</b>										
<i>Caracara plancus</i> (Miller, 1777)	carcará	10	11	5	L	LC	LC	LC	II	
<i>Milvago chimachima</i> (Vieillot, 1816)	carrapateiro	4	7	6	L	LC	LC	LC	II	
<i>Herpetotheres cachinnans</i> (Linnaeus, 1758)	acauã	1	0	1	L	LC	LC	LC	II	
<i>Falco femoralis</i> Temminck, 1822	falcão-de-coleira	0	1	2	L	LC	LC	LC	II	
<b>Psittaciformes Wagler, 1830</b>										
<b>Psittacidae Rafinesque, 1815</b>										
<i>Ara ararauna</i> (Linnaeus, 1758)	arara-canindé	10	0	0	M	LC	LC	VU	II	X
<i>Orthopsittaca manilatus</i> (Boddaert, 1783)	maracanã-do-buriti	19	0	0	M	LC	LC	LC	II	
<i>Diopsittaca nobilis</i> (Linnaeus, 1758)	maracanã-pequena	13	2	3	M	LC	LC	LC	II	X
<i>Aratinga auricapillus</i> (Kuhl, 1820)	jandaia-de-testa-vermelha	6	0	0	M	NT	LC	LC	II	X
<i>Psittacara leucophthalmus</i> (Stadius Muller, 1776)	periquitão	30	5	0	L	LC	LC	LC	II	X
<i>Eupsittula aurea</i> (Gmelin, 1788)	periquito-rei	11	30	6	M	LC	LC	LC	II	X
<i>Forpus xanthopterygius</i> (Spix, 1824)	tuim	0	6	0	L	LC	LC	LC	II	X
<i>Brotogeris chiriri</i> (Vieillot, 1818)	periquito-de-encontro-amarelo	26	8	0	M	LC	LC	LC	II	X
<i>Alipiopsitta xanthops</i> (Spix, 1824)	papagaio-galego	0	3	0	M	NT	LC	LC	II	X
<i>Amazona aestiva</i> (Linnaeus, 1758)	papagaio	125	12	12	M	LC	LC	LC	II	X
<b>Passeriformes Linnaeus, 1758</b>										
<b>Thamnophilidae Swainson, 1824</b>										

<i>Herpsilochmus atricapillus</i> Pelzeln, 1868	chorozinho-de-chapéu-preto	2	0	0	M	LC	LC	LC
<i>Herpsilochmus longirostris</i> Pelzeln, 1868 *	chorozinho-de-bico-comprido	2	8	9	M	LC	LC	LC
<i>Thamnophilus doliatus</i> (Linnaeus, 1764)	choca-barrada	1	4	0	L	LC	LC	LC
<i>Thamnophilus pelzelni</i> Hellmayr, 1924	choca-do-planalto	3	4	0	L	LC	LC	LC
<i>Taraba major</i> (Vieillot, 1816)	choró-boi	1	1	0	L	LC	LC	LC
<b>Dendrocolaptidae Gray, 1840</b>								
<i>Sittasomus griseicapillus</i> (Vieillot, 1818)	arapaçu-verde	0	1	3	M	LC	LC	LC
<i>Lepidocolaptes angustirostris</i> (Vieillot, 1818)	arapaçu-de-cerrado	5	3	2	M	LC	LC	LC
<b>Furnariidae Gray, 1840</b>								
<i>Furnarius figulus</i> (Lichtenstein, 1823)	casaca-de-couro-da-lama	3	0	0	L	LC	LC	LC
<i>Furnarius rufus</i> (Gmelin, 1788)	joão-de-barro	4	7	5	L	LC	LC	LC
<i>Certhiaxis cinnamomeus</i> (Gmelin, 1788)	curutié	0	1	0	L	LC	LC	LC
<i>Synallaxis frontalis</i> Pelzeln, 1859	petrim	16	13	6	L	LC	LC	LC
<i>Synallaxis albescens</i> Temminck, 1823	uí-pi	2	0	1	L	LC	LC	LC
<i>Synallaxis hypospodia</i> Sclater, 1874	joão-grilo	1	1	0	M	LC	LC	LC
<b>Pipridae Rafinesque, 1815</b>								
<i>Neopelma pallescens</i> (Lafresnaye, 1853)	fruxu-do-cerradão	3	1	5	M	LC	LC	LC
<i>Antilophia galeata</i> (Lichtenstein, 1823) *	soldadinho	5	1	11	M	LC	LC	LC
<b>Platyrinchidae Bonaparte, 1854</b>								
<i>Platyrinchus mystaceus</i> Vieillot, 1818	patinho	8	3	2	M	LC	LC	LC
<b>Rhynchocyclidae Berlepsch, 1907</b>								
<i>Leptopogon amaurocephalus</i> Tschudi, 1846	cabeçudo	3	1	1	M	LC	LC	LC
<i>Tolmomyias sulphurescens</i> (Spix, 1825)	bico-chato-de-orelha-preta	1	1	0	M	LC	LC	LC
<i>Todirostrum cinereum</i> (Linnaeus, 1766)	ferreirinho-relógio	3	10	0	M	LC	LC	LC
<i>Hemitriccus margaritaceiventer</i> (d'Orbigny & Lafresnaye, 1837)	sebinho-de-olho-de-ouro	1	0	0	L	LC	LC	LC
<b>Tyrannidae Vigors, 1825</b>								
<i>Camptostoma obsoletum</i> (Temminck, 1824)	risadinha	2	7	4	L	LC	LC	LC
<i>Elaenia flavogaster</i> (Thunberg, 1822)	guaracava-de-barriga-amarela	15	7	7	L	LC	LC	LC



<i>Serpophaga subcristata</i> (Vieillot, 1817)	alegrinho	0	0	5		L	LC	LC	LC	
<i>Myiopagis viridicata</i> (Vieillot, 1817)	guaracava-de-crista-alaranjada	1	1	0		M	LC	LC	LC	
<i>Myiarchus swainsoni</i> Cabanis & Heine, 1859	irré	7	3	16		L	LC	LC	LC	
<i>Myiarchus ferox</i> (Gmelin, 1789)	maria-cavaleira	11	16	4		L	LC	LC	LC	
<i>Casiornis rufus</i> (Vieillot, 1816)	maria-ferrugem	0	0	3		M	LC	LC	LC	
<i>Pitangus sulphuratus</i> (Linnaeus, 1766)	bem-te-vi	15	11	2		L	LC	LC	LC	
<i>Megarynchus pitangua</i> (Linnaeus, 1766)	neinei	2	2	6		L	LC	LC	LC	
<i>Myiozetetes similis</i> (Spix, 1825)	bentevizinho-de-penacho-vermelho	0	4	1		L	LC	LC	LC	
<i>Myiozetetes cayanensis</i> (Linnaeus, 1766)	bentevizinho-de-asa-ferrugínea	0	0	1		L	LC	LC	LC	
<i>Tyrannus melancholicus</i> Vieillot, 1819	suiriri	3	7	4		L	LC	LC	LC	
<i>Colonia colonus</i> (Vieillot, 1818)	viuvinha	2	2	0		L	LC	LC	LC	
<i>Gubernetes yetapa</i> (Vieillot, 1818)	tesoura-do-brejo	5	2	0		M	LC	LC	LC	
<i>Cnemotriccus fuscatus</i> (Wied, 1831)	guaracavuçu	5	1	2		L	LC	LC	LC	
<i>Lathrotriccus euleri</i> (Cabanis, 1868)	enferrujado	4	2	3		M	LC	LC	LC	
<i>Xolmis cinereus</i> (Vieillot, 1816)	primavera	0	0	0	X	L	LC	LC	LC	
<i>Xolmis velatus</i> (Lichtenstein, 1823)	noivinha	0	2	0		L	LC	LC	LC	
<b>Vireonidae Swainson, 1837</b>										
<i>Cyclarhis gujanensis</i> (Gmelin, 1789)	pitiguari	1	4	6		L	LC	LC	LC	
<b>Corvidae Leach, 1820</b>										
<i>Cyanocorax cristatellus</i> (Temminck, 1823) *	gralha-do-campo	9	0	17		M	LC	LC	LC	X
<b>Hirundinidae Rafinesque, 1815</b>										
<i>Pygochelidon cyanoleuca</i> (Vieillot, 1817)	andorinha-pequena-de-casa	4	6	0		L	LC	LC	LC	
<i>Stelgidopteryx ruficollis</i> (Vieillot, 1817)	andorinha-serradora	0	0	2		L	LC	LC	LC	
<i>Progne chalybea</i> (Gmelin, 1789)	andorinha-grande	0	0	2		L	LC	LC	LC	
<i>Progne tapera</i> (Vieillot, 1817)	andorinha-do-campo	0	4	0		L	LC	LC	LC	
<b>Troglodytidae Swainson, 1831</b>										
<i>Troglodytes musculus</i> Naumann, 1823	corruíra	9	7	0		L	LC	LC	LC	
<i>Cantorchilus leucotis</i> (Lafresnaye, 1845)	garrinçãode-barriga-vermelha	15	13	2		L	LC	LC	LC	

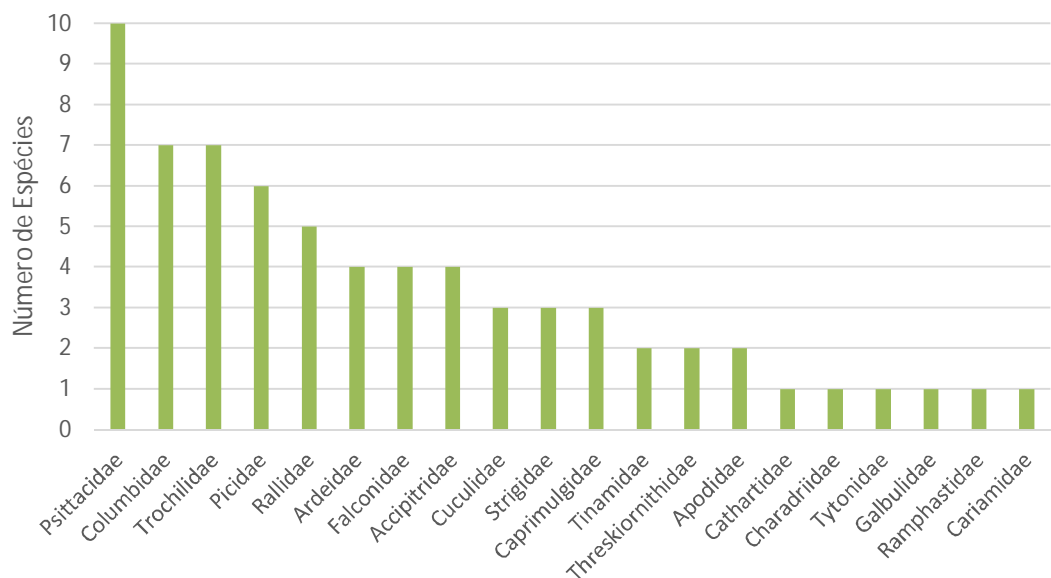
<b>Poliopitidae Baird, 1858</b>									
<i>Poliopitila dumicola</i> (Vieillot, 1817)	balança-rabo-de-máscara	0	0	2	M	LC	LC	LC	
<b>Turdidae Rafinesque, 1815</b>									
<i>Turdus leucomelas</i> Vieillot, 1818	sabiá-branco	9	17	23	L	LC	LC	LC	X
<i>Turdus rufiventris</i> Vieillot, 1818	sabiá-laranjeira	0	4	0	L	LC	LC	LC	X
<i>Turdus amaurochalinus</i> Cabanis, 1850	sabiá-poca	0	2	1	L	LC	LC	LC	X
<i>Turdus subalaris</i> (Seebohm, 1887)	sabiá-ferreiro	0	0	3	L	LC	LC	LC	X
<b>Mimidae Bonaparte, 1853</b>									
<i>Mimus saturninus</i> (Lichtenstein, 1823)	sabiá-do-campo	5	9	4	L	LC	LC	LC	
<b>Motacillidae Horsfield, 1821</b>									
<i>Anthus lutescens</i> Pucheran, 1855	caminheiro-zumbidor	0	8	0	L	LC	LC	LC	
<b>Passerellidae Cabanis &amp; Heine, 1850</b>									
<i>Zonotrichia capensis</i> (Statius Muller, 1776)	tico-tico	29	23	38	L	LC	LC	LC	X
<i>Ammodramus humeralis</i> (Bosc, 1792)	tico-tico-do-campo	0	4	0	L	LC	LC	LC	X
<i>Arremon flavirostris</i> Swainson, 1838	tico-tico-de-bico-amarelo	0	2	0	L	LC	LC	LC	X
<b>Parulidae Wetmore et al. 1947</b>									
<i>Setophaga pitiayumi</i> (Vieillot, 1817)	mariquita	0	0	3	M	LC	LC	LC	
<i>Basileuterus culicivorus</i> (Deppe, 1830)	pula-pula	14	21	10	M	LC	LC	LC	
<i>Myiothlypis flaveola</i> Baird, 1865	canário-do-mato	9	12	17	M	LC	LC	LC	
<i>Myiothlypis leucophrys</i> (Pelzeln, 1868) *	pula-pula-de-sobrancelha	4	0	0	M	LC	LC	LC	
<b>Icteridae Vigors, 1825</b>									
<i>Gnorimopsar chopi</i> (Vieillot, 1819)	pássaro-preto	105	38	9	L	LC	LC	LC	X
<i>Pseudoleistes guirahuro</i> (Vieillot, 1819)	chopim-do-brejo	0	7	0	L	LC	LC	LC	X
<i>Molothrus bonariensis</i> (Gmelin, 1789)	chupim	2	0	0	L	LC	LC	LC	X
<b>Thraupidae Cabanis, 1847</b>									
<i>Pipraeidea melanonota</i> (Vieillot, 1819)	saíra-viúva	0	0	1	L	LC	LC	LC	
<i>Schistochlamys melanopis</i> (Latham, 1790)	sanhaço-de-coleira	3	0	1	L	LC	LC	LC	X
<i>Tangara sayaca</i> (Linnaeus, 1766)	sanhaço-cinzento	22	17	26	L	LC	LC	LC	X

<i>Tangara palmarum</i> (Wied, 1821)	sanhaço-do-coqueiro	21	6	0	L	LC	LC	LC	X
<i>Tangara cayana</i> (Linnaeus, 1766)	saíra-amarela	17	14	47	L	LC	LC	LC	X
<i>Conirostrum speciosum</i> (Temminck, 1824)	figuinha-de-rabo-castanho	3	0	8	L	LC	LC	LC	
<i>Sicalis flaveola</i> (Linnaeus, 1766)	canário-da-terra	15	39	4	L	LC	LC	LC	X
<i>Volatinia jacarina</i> (Linnaeus, 1766)	tiziu	151	37	4	L	LC	LC	LC	X
<i>Coryphospingus cucullatus</i> (Statius Muller, 1776)	tico-tico-rei	9	10	12	L	LC	LC	LC	X
<i>Eucometis penicillata</i> (Spix, 1825)	pipira-da-taoca	4	2	2	M	LC	LC	LC	
<i>Cyanerpes cyaneus</i> (Linnaeus, 1766)	saíra-beija-flor	0	0	5	L	LC	LC	LC	
<i>Dacnis cayana</i> (Linnaeus, 1766)	saí-azul	0	2	6	L	LC	LC	LC	X
<i>Coereba flaveola</i> (Linnaeus, 1758)	cambacica	1	4	6	L	LC	LC	LC	
<i>Sporophila lineola</i> (Linnaeus, 1758)	bigodinho	8	1	0	L	LC	LC	LC	X
<i>Sporophila nigricollis</i> (Vieillot, 1823)	baiano	14	0	7	L	LC	LC	LC	X
<i>Sporophila ardesiaca</i> (Dubois, 1894)	papa-capim-de-costas-cinzas	53	3	0	M	LC	LC	LC	X
<i>Sporophila caerulescens</i> (Vieillot, 1823)	coleirinho	13	12	4	L	LC	LC	LC	X
<i>Saltator similis</i> d'Orbigny & Lafresnaye, 1837	trinca-ferro	2	2	4	L	LC	LC	LC	X
<b>Cardinalidae Ridgway, 1901</b>									
<i>Piranga flava</i> (Vieillot, 1822)	sanhaço-de-fogo	0	0	2	L	LC	LC	LC	X
<b>Fringillidae Leach, 1820</b>									
<i>Euphonia chlorotica</i> (Linnaeus, 1766)	fim-fim	5	13	5	L	LC	LC	LC	X

Among the non-Passerine birds families, Psittacidae presented greater richness (10 species, 6.7% of the total), followed by Columbidae and Trochilidae (with 7 species, 4.7% of the total) (according to the following figure).

The Passerine richness is probably associated with the monodominant *Arecaceae* formations in vereda ecosystems (mostly *Mauritia flexuosa* L.f.) that prevail in the region, along with the Cerrado vegetation areas. These birds generally use open cavities in the Palm trees stalk to nest (Cornelius et al. 2008), and they eat the fruits produced by these plant species, working often as seed dispersers (Sazima 2008; Forshaw & Knight, 2010), which contributes to the maintenance of the vegetation area diversity. The high number of Columbidae species found is probably due to the fact that this family species tend to have great and conspicuous vocal behavior, making their diagnosis easier in the field (Sick, 1997). In addition, these birds are predominantly seed eating (Bucher & Nores, 1976), foraging on the ground and take advantage of the large amount of grass available in open areas as in Cerrado biome (Sick, 1997).

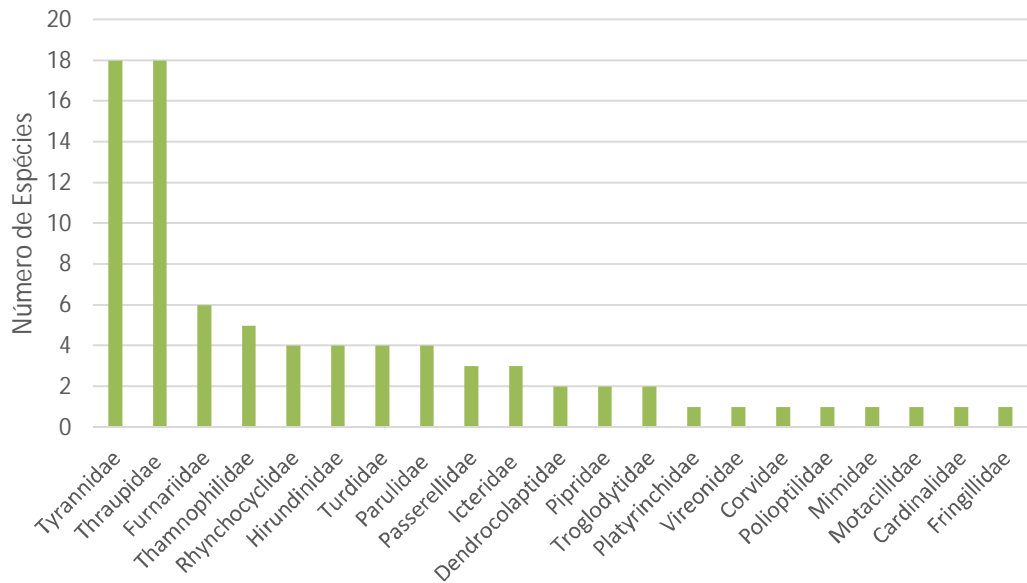
Trochilidae richness can be associated with the phenological patterns of Cerrado trees. Both campaigns were carried out during dates that coincided in part with this phytophysionomy flowering period (Pirani et al. 2009; Pilon et al. 2015). As most of this family species are, in their majority, restricted nectar eating, their detection is favored in phenological flowering periods.



**Figure 17 – Representation of non-Passerine bird species found in both campaigns at the sampled area.**

Among the Passerine birds, the families that presented the greater richness were: Tyrannidae and Thraupidae with 18 species each (121% of the total), as presented in the following figure. This pattern is typical of tropical birds communities, because the Tyrannidae is one of the largest families in the Neotropics (Ridgely & Tudor, 1994), and has a high occurrence in fauna inventories. This may be associated with the more general characteristics of this family species (Sick, 1997), promoting its occurrence in many diverse habitats, even the degraded ones. The high Thraupidae richness endorses

the recent taxonomic changes within the group, which integrated the Emberizidae and Coerebidae families' representatives. So, this fusion increases the amount of species included at the taxon (Piacentini et al. 2015). However, this dominance indicates the presence of frugivorous birds of habit specialist. As well as Columbide, Thraupide species act as seeds and fruits dispersant (Ridgely & Tudor, 1989), and it is important for maintaining the plants diversity.

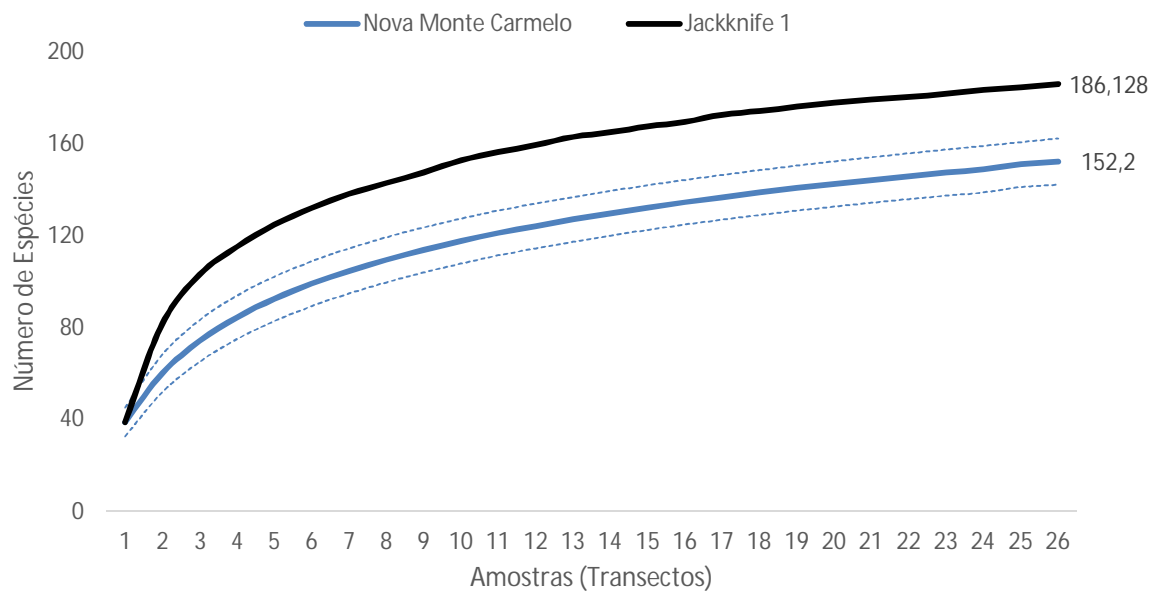


**Figure 18 – Representation of Passerine birds families found in both campaigns at the sampled area.**

There were registered 2,733 birds contacts, being *Volatinia jacarina* (Linnaeus, 1766) (tiziú) the most abundant species with 192 contacts (7.0% of the total contacts), followed by *Gnorimopsar chopi* (Vieillot, 1819) (pássaro-preto) with 152 contacts (5.5% of the total) and *Amazona aestiva* (Linnaeus, 1758) (papagaio) with 149 contacts (5.4% of the total). The abundance of these species is related to their conspicuous habit, since these species have vocalizations and showy reproductive behaviors, as well as they form flocks (Sick, 1997), which increases the number of individuals in the sampled area. In addition, *A. aestiva* are frugivore species (Ridgely & Tudor, 1989), indicating the presence of many trees and palm trees in the sampled area. *G. chopi* and *V. jacarina* are favored by the presence of vegetables and shrubs formations, which provide food and shelter for many of these species (Ridgely & Tudor, 1994). There were also found 14 species (9.3% of the total) with just one contact, which may be related to the fragmentation of the areas in which each species is inserted. In addition, the presence of various physiognomies favors the restriction of some species that lives in particular habitats.

The rarefaction curve didn't show stabilization (as shown in the following figure), which is a reflection of sampling effort to characterize the birds community in such heterogeneous environment. In addition, the presence of many species with just one contact encourages this pattern. The non-parametric estimator Jackknife 1 estimated

the presence of 183 species, so the sampled campaigns corresponded to 81.4% of the estimated richness.



**Figure 19 – Rarefaction curve (solid line) and estimated richness by Jackknife 1 (dashed line) of the birds recorded in the sampled areas. 95% of confidence interval was established with respect to the collector curve (dotted lines).**

The birds Community presented a diversity index of  $H' = 4.27$ . This is a relatively high value when compared with other surveys in areas of Cerrado. Such value can be related to the diversity of vegetation, and with different degrees of environmental heterogeneity, which promote a greater number of species through the inclusion of more general taxa. It was also found a high evenness of species index ( $J = 0.85$ ) and a low dominance index ( $D = 0.02$ ), indicating that the abundance of the species is well distributed in the community.

According to Silva & Bates (2002), from the species recorded in this study, four are classified as endemic to the cerrado biome, being: *Herpsilochmus longirostris* Pelzeln, 1868 (chorozinho-de-bico-comprido); *Antilophia galeata* (Lichtenstein, 1823) (soldadinho); *Cyanocorax cristatellus* (Temminck, 1823) (gralha-do-campo); and *Myiothlypis leucophrys* (Pelzeln, 1868) (pula-pula-de-sobrancelha). This demonstrates that the studied fragments have sufficient resources to maintain a specific fauna dependent on them. As these species are exclusively linked to the Cerrado area, thus they suffer with fragmentation and native vegetation suppression that occurred in the State of Minas Gerais. Considering all the species found in both surveys, 95 species have low sensitivity, 39 have medium sensitivity, and only *Aramides cajaneus* (Statius Muller, 1776) (saracura-três-potes) species has high sensitivity (Stotz et al. 1996) to environmental changes.

According to the threatness risks of extinction, *Aratinga auricapillus* (Kuhl, 1820) (jandaia-de-testa-vermelha) is characterized as "near threatened" (NT) by the IUCN



(2017). With regard to the national list of endangered species (ICMBIO 2016), none of the sampled species was registered with threat of extinction status. However, the local endangered species list for the State of Minas Gerais (COPAM 2010) classifies *Ara ararauna* (Linnaeus, 1758) (arara-canindé) as "Vulnerable" (VU). Finally, 34 species (24.8% from the total sampled) are listed in Trafficked Birds Identification Guide in Brazil (Costa and Monteiro, 2016) and 25 species (18.2% from the total sampled) have conservation interest for being at hunting risk pressure (CITES, 2017). Thus, these findings add biological value for the biodiversity conservation of the sampled area, since they indicate the possibility of these areas being refuges for these species.

In the following figure there are presented some birds species recorded in the field monitoring campaigns.



*Amazona aestiva*



*Nyctidromus albicollis*



*Eucometis penicillata*



*Cantorchilus leucotis*



*Tangara sayaca*



*Diopsittaca nobilis*





*Gubernetes yetapa*



*Orthopsittaca manilatus*



*Ara ararauna*



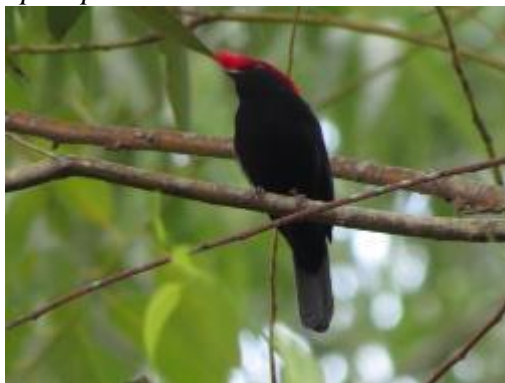
*Gnorimopsar chopi*



*Sporophila lineola*



*Myiothlypis leucophrys*



*Antilophia galeata*



*Thalurania furcata*



*Mesembrinibis cayennensis*



*Colaptes campestris*



*Athene cunicularia*



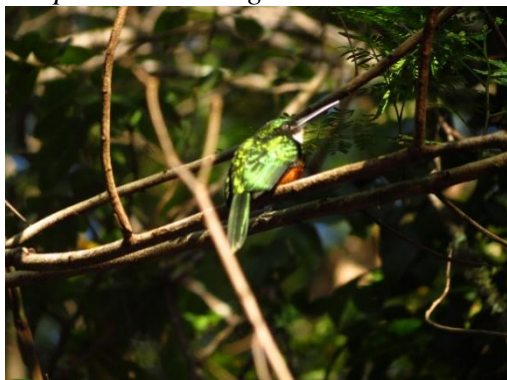
*Ramphastos toco*



*Herpsilochmus longirostris*



*Eupsittula aurea*



*Galbula ruficauda*



*Colonia colonus*





*Leptotila verreauxi*



*Pseudoleistes guirahuro*



*Colibri serrirostris*



*Dacnis cayana*



*Campephilus melanoleucos*



*Herpetotheres cachinnans*



*Turdus leucomelas*



*Cyanocorax cristatellus*



*Schistochlamys melanopis*

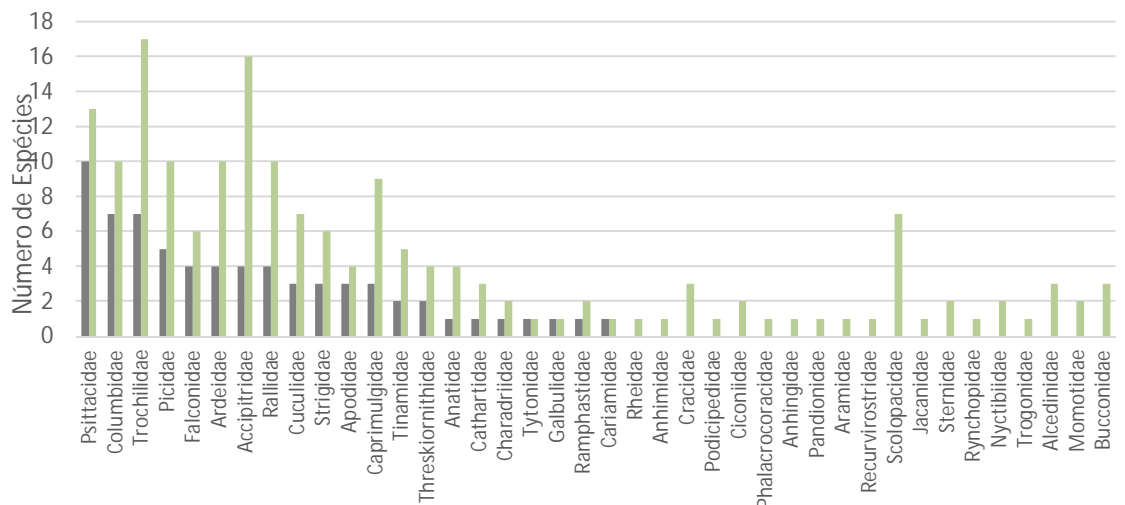


*Sporophila nigricollis*

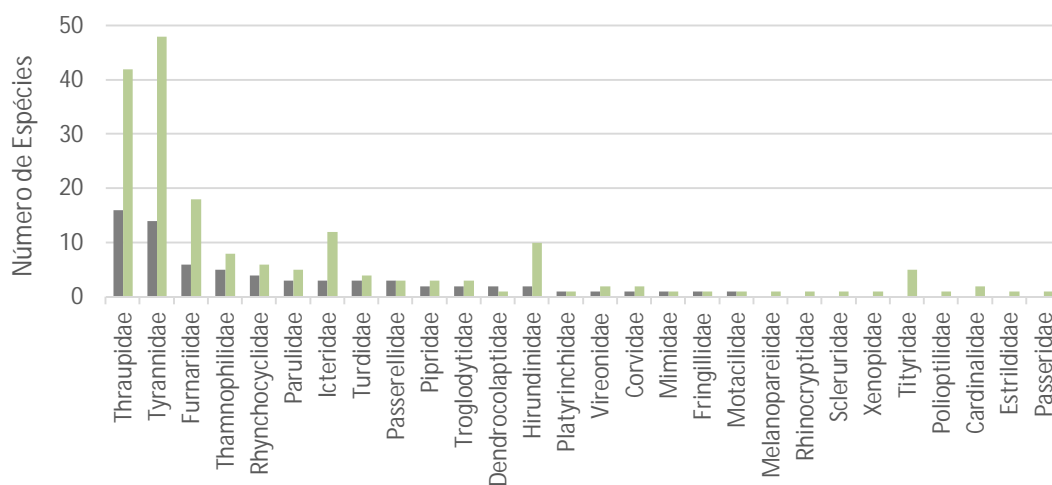
**Figure 20 – Photographic record of the birds species found in the remnants of vegetation at the sampled areas.**

**8.3.4.3.3 Final Considerations**

The species found during this survey represent 38.2% of the total regional richness according to the secondary data. Among the non-passerine birds taxa, Psittacidae family was the best represented by this survey, since 10 species have been found from the total 13 species (76.9% of the family species). However, there were 19 non-passerine families in the region that were not represented by any species in both campaigns. Among the Passerine birds, the Thamnophilidae family was the best represented, with 5 species found in a total of 8 species (62.5% of the family species). There were 9 Passerine families that were not represented by any found species. The following figures there are presented non-Passerines and Passerines birds species representativeness at the sampled area, respectively, considering the obtained data in this survey (DB-raw/primary data) and also the data obtained by the bibliographic survey (DS-secondary data).



**Figure 21 – Representation of Non-Passerine bird species at the sampled area, considering the data obtained in this survey (DB-raw/primary data) and also the data obtained through the bibliographic survey (DS-secondary data).**



**Figure 22 – Representation of Passerine bird species at the sampled area, considering the data obtained in this survey (DB-raw/primary data) and also the data obtained through the bibliographic survey (DS-secondary data).**

**8.3.4.4 Mammalian fauna**

**8.3.4.4.1 Secondary Data**

The secondary data were obtained from works carried out in other areas near the studied region, being Syngenta Experimental Station (EES) (Santiago, 2016), Experimental Glória Farm (FEG) (Alves et al., 2014) and the Panga Ecological Station (EEP) (Bruna et Al., 2010). It was possible to tabulate a list of 49 species in total (according to the following table).

**Table 12 – Mammals species likely of occurrence in Araguari and Indianópolis region, Minas Gerais, raised through secondary data. Source: 1 = EEP (Bruna et al., 2010); 2 = FEG (Alves et al., 2014); 3 = EES (Santiago, 2016).**

Taxonomy	Common Brazilian name	Source
<b>Cervidae</b>		
<i>Mazama gouazoubira</i>	veado-catingueiro	1, 3
<i>Mazama sp.</i>	veado	2
<i>Ozotoceros bezoarticus</i>	veado-do-rabo-branco	1
<b>Tayassuidae</b>		
<i>Pecari tajacu</i>	cateto	1, 2
<b>Canidae</b>		



<b>Taxonomy</b>	<b>Common Brazilian name</b>	<b>Source</b>
<i>Cerdocyon thous</i>	cachorro-do-mato	1, 2, 3
<i>Chrysocyon brachyurus</i>	lobo-guará	1, 2, 3
<i>Lycalopex vetulus</i>	raposa-do-campo	1, 2, 3
<b>Felidae</b>		
<i>Leopardus pardalis</i>	jaguaririca	1, 2
<i>Leopardus sp.</i>	gato-do-mato	1
<i>Leopardus guttulus</i>	gato-do-mato	
<i>Puma concolor</i>	onça-parda	1, 3
<i>Puma yagouaroundi</i>	gato-mourisco	1, 2
<b>Mephitidae</b>		
<i>Conepatus semistriatus</i>	jaratataca	1, 2
<b>Mustelidae</b>		
<i>Eira barbara</i>	irara	1
<i>Lontra longicaudis</i>	lontra	2
<b>Procyonidae</b>		
<i>Nasua nasua</i>	quati	1
<i>Procyon cancrivorus</i>	mão-pelada	1, 2, 3
<b>Dasypodidae</b>		
<i>Cabassous unicinctus</i>	tatu-de-rabo-mole	1
<i>Dasypus novemcinctus</i>	tatu-galinha	1, 2, 3
<i>Euphractus sexcinctus</i>	tatu-peba	1, 2, 3
<b>Didelphidae</b>		
<i>Caluromys lanatus</i>	cuíca	1
<i>Didelphis albiventris</i>	cuíca	1, 2, 3
<i>Gracilinanus agilis</i>	cuíca	1
<i>Lutreolina crassicaudata</i>	cuíca	2
<i>Thylamys karimii</i>	cuíca	1
<b>Leporidae</b>		
<i>Sylvilagus brasiliensis</i>	tapiti	1, 3
<b>Myrmecophagidae</b>		

<b>Taxonomy</b>	<b>Common Brazilian name</b>	<b>Source</b>
<i>Myrmecophaga tridactyla</i>	tamanduá-bandeira	1, 2, 3
<i>Tamandua tetradactyla</i>	tamanduá-mirim	1, 2, 3
<b>Atelidae</b>		
<i>Alouatta caraya</i>	bugio	2
<b>Callithrichidae</b>		
<i>Callithrix penicillata</i>	sagui-de-tufo-preto	1, 2, 3
<b>Cebidae</b>		
<i>Sapajus libidinosus</i>	macaco-prego	1
<b>Pitheciidae</b>		
<i>Callicebus nigrifrons</i>	guigó	1
<b>Caviidae</b>		
<i>Cavia sp.</i>	preá	1
<i>Hydrochoerus hydrochaeris</i>	capivara	2, 3
<b>Cricetidae</b>		
<i>Calomys expulsus</i>	rato-do-mato	1
<i>Calomys tener</i>	rato-do-mato	1
<i>Cerradomys subflavus</i>	rato-do-mato	1
<i>Hylaeamys megacephalus</i>	rato-do-mato	1
<i>Necromys lasiurus</i>	rato-do-mato	1
<i>Oecomys bicolor</i>	rato-do-mato	1
<i>Oligoryzomys fornesi</i>	rato-do-mato	1
<i>Oligoryzomys nigripes</i>	rato-do-mato	1
<i>Oxymycterus delator</i>	rato-do-mato	1
<i>Pseudoryzomys simplex</i>	rato-do-mato	1
<i>Rhipidomys macrurus</i>	rato-do-mato	1
<i>Rhipidomys sp.</i>	rato-do-mato	1
<b>Cuniculidae</b>		
<i>Cuniculus paca</i>	paca	1
<b>Dasyproctidae</b>		
<i>Dasyprocta azarae</i>	cotia	1, 2



Taxonomy	Common Brazilian name	Source
<b>Erethizontidae</b>		
<i>Coendou prehensilis</i>	ouriço-cacheiro	1, 2, 3

**8.3.4.4.2 Field Primary Data Collection**

**Methodological approach**

For the mammals inventory there were used the activated search in transects, tracks sampling and cameras traps. The activated search in transects (line-transect sampling; Buckland et al. 1993) was performed within the interior of native forests and between the native forests and the roads of the area. The trails in the forests were chosen randomly, and walked on foot, making visual, observing tracks and vocalization animals' record. The censuses were conducted in the early morning (from 06:00 to 09:00 am) and late afternoon (from 4:00 to 7:00 pm). Footprints sampling were conducted in all possible roads, totaling 30 hours/researcher per campaign and 60 hours/researcher in total. Five traps (camera-trap) were placed inside the native areas in alternate places (according to table below) in order to cover the largest area and all possible environments. The cameras were left turned on for five days, totaling 600 hours/trap per campaign and 1200 hours/trap in total. To increase the chances of the animals records in each station there were placed baits like: fruits, bacon, sardines, pet food and salt.



**Figure 23 – Cameras used in the mammals sampling.**

**Table 13 – Mammals sampling camera traps and crossed transects location (geographic coordinates in UTM, WGS 84 Datum).**

Point	Location	Description
Camera 1 (C1)	22K 806925 7914537	Secondary Seasonal Forest fragment approximately 200 meters from the Araguari river banks, the area is quite anthropized with direct domestic animals disruption (cattle and horse). Note the low bush vegetation component.
Camera 2 (C2)	22K 815278 7917527	Cerrado fragment of Cerradão type, less than 300 meters from the MG 748 highway, the fragment is allocated inside a property where it is predominant with soybeans plantation. The fragment is connected to a small weir that follows to a stream, which forms a corridor of this area with other permanent preservation area (APP).
Camera 3 (C3)	22K 812582 7909149	Gallery forest along the banks of a small tributary of the Araguari River, the area demonstrates few indicators of disturbance by domestic animals and human action.
Camera 4 (C4)	22K 812818 7911300	Cerrado strictu sensu fragment under regeneration near MG 748 Highway, the region is a mosaic of coffee and soybean plantations and pasture. Nearby a small weir and water bodies that form corridors linking other areas.
Camera 5 (C5)	23K 190240 7911850	Located close to the Fazenda Monte Carmelo, the fragment is composed by Cerrado remnant of Cerradão type. The area is continuous to a vereda and follows forming corridors with other humid areas.
Camera 6 (C6)	23K 191456/ 7913601	The road between the eucalyptus plantations and Cerradoforest on the border West of the Nova Monte Carmelo Farm
Camera 7 (C7)	23 K 193320/ 7913423	Cerradão fragment surrounded by eucalyptus plantations
Camera 8 (C8)	23K 194586/ 7916009	Road between the eucalyptus plantations
Camera 9 (C9)	23K 195558/ 7913880	Cerrado riparian area with sparse trees and exposed soil
Câmera 10	23K 192620/ 7916472	Vereda area recently burned

Point	Location	Description
Transect 1 (T1)	22 K 812653/ 7911153	The used path was the access road to some rural districts and also Mirandinha Waterfall. The predominant vegetation is Seasonal Forest type with sharp relief for this region. There are also parts with predominance of pastures. 5,5 km length.
Transect 2 (T2)	22 K 805763/ 7914223	The road connecting the MG 748 highway to Araguari river near the point where camera 1 was left (properly geo-referenced). Along the road there is a predominance of sugar cane plantation with a small part of soybean plantations. Small fragments of native Cerrado vegetation can be seen along the way through the arrays of sugar cane, being the last 3 km composed predominantly by Seasonal Forest. 10,3 km length.
Transect 3 (T3)	23 K 187180/ 7914882	Roads and trails presented within the same Cerrado area in which camera 4 was allocated. Most of the transect was walked within the preserved area of Cerrado with few exotic species (composed mainly by <i>Brachiaria</i> spp.). 1,4 km length.
Transect 4 (T4)	23 K 188533/ 7914958	Road within a coffee plantation in which made border with a vereda area. 2 km length.
Transect 5 (T5)	22 K 808989/ 7911141	Access road to farms and banana plantations. The array was composed mainly by pastures that had some Seasonal Forest fragments. Along the way it could observed some dams. 2,5 km length.
Transect 6 (T6)	23 K 184595/ 7909412	Permanent weir between two fragments of forest, used to irrigate the coffee plantation and for fishing. Steep banks with predominance of grass and tall trees. Water blade without Macrophytes or emerging grasses. Marginal anthropized vegetation, dry soil and few leaf litter. 0.9 km length.
Transect 7 (T7)	23 K 190223/ 7911890	Road belonging to a private property which leads to a Cerradão region. The area is continuous to a vereda and follows forming corridors with other humid areas. 1.5 km length.
Transect 8 (T8)	23 K 193921/ 7915861	Road between vereda and eucalyptus plantations inside Nova Monte Carmelo Farm. 4.16 km length.
Transect 9 (T9)	23 K 194799/ 7912824	Road between vereda and eucalyptus plantations inside Nova Monte Carmelo Farm. 3.83 km length.

Point	Location	Description
<b>Transect 10 (T10)</b>	<b>23 K 191456/ 7913601</b>	Road between Cerradão and eucalyptus plantations in the border of Nova Monte Carmelo Farm with coffee plantation area. 2.15 km length.
<b>Transect 11 (T11)</b>	<b>23 K 193320/ 7913423</b>	Road between Cerradão and eucalyptus plantations inside Nova Monte Carmelo Farm. 2,7 km length.
<b>Transect 12 (T12)</b>	<b>23 K 194039/ 7916777</b>	Road between vereda and eucalyptus plantations inside Nova Monte Carmelo Farm. 5 km length.



**Figure 24 – Mammals camera traps points location.**

In addition to these methods, there were investigated marks left in the environment such as: carcasses, hooves, horns, animal waste, hair, burrows, nails, etc. The species were treated from the specialized bibliography for taxonomic determination (Becker & Dalponte 1991, Emmons & Feer, 1997, Lima-Borges & Tomás 2005, Oliveira & Cassaro 2005, Bonvicino et al. 2008, Reis et al. 2013). Nighttime searches were made eventually in parallel to the amphibian’s samples. There were also been taken into consideration records made by other researchers, when there was certainty in the species identification.



The sampling efficiency was evaluated by rarefaction curves based on 1000 randomisations, considering the effort of each day of a sample field. The estimation of species richness was made with the non-parametric estimator Jackknife1 using the program EstimateS 9.1.0 (COLWELL 2013).

The species conservation status was defined based on the list of endangered Brazilian Fauna (ICMBio 2016), on the red list of endangered Fauna of the International Union for nature conservation (IUCN, 2017) and on the list of threatened extinction Fauna of Minas Gerais (COPAM 2010). There were also identified species that have commercial interests, and will be susceptible to exploitation, based on the list of the Convention on international trade of endangered wild Fauna and Flora species - CITES, whose criteria fit the species in Appendices I, II and III (CITES 2017). The nomenclature used follows Paglia et al. (2012).

### **Results and discussion**

There were recorded a total of 19 mammals species belonging to 12 families and 7 orders, being Carnivora order the most representative one, with seven species (as seen in the table below). From the recorded species, one was sampled by other researchers during their field activities (*Leopardus guttulus*) at MG-748 highway, where there were found two young of this species at the road margin. Besides these occasional records, it was also possible to see a group of monkeys called macacos-prego (*Sapajus libidinosus*) in the vicinity of camera 3 point location. Some species have been identified only by their genus being registered only by footprints (*Cavia* sp., *Mazama* sp.) or by the camera traps (*Gracilinanus* sp.).

**Table 14 – List of mammalian fauna species recorded in the sampled areas. M = dead; P = footprint; T = burrow; V = visual; C = Camera-trap; A = auditory. MG = COPAM (2010); BR = ICMBio (2016); IUCN = (2017); CITES = CITES (2018). Threat Categories: VU = Vulnerable; NT = Near Threatened; Appendices I, II, and III.**

Ordem/Família	Espécie	Registro	Ponto	Status			
				MG	BR	IUCN	CITES
<b>Pilosa</b>							
Myrmecophagidae	<i>Tamandua tetradactyla</i>	M	EO				
	<i>Myrmecophaga tridactyla</i>	P/V	T4/T8/T9	VU	VU	VU	II
<b>Cingulata</b>							
Dasypodidae	<i>Dasybus novemcinctus</i>	T/P/M	T3/T2/BR 365				
	<i>Euphractus sexcinctus</i>	M	EO				
	<i>Priodontes maximus</i>	T	T10/T11	EN	VU	VU	I
<b>Rodentia</b>							
Cuniculidae	<i>Cuniculus paca</i>	P/V/C	C3/T6/C2				III
Caviidae	<i>Cavia</i> sp.	P	C3				
<b>Artiodactyla</b>							
Cervidae	<i>Mazama</i> sp.	V/P	T1				
<b>Carnivora</b>							
Canidae	<i>Chrysocyon brachyurus</i>	P/C	T1/T2/T4/T7/T8/T9/C9	VU	VU	NT	II
	<i>Cerdocyon thous</i>	P/C	T1/T2/T3/T7/				II

Ordem/Família	Espécie	Registro	Ponto	Status			
				MG	BR	IUCN	CITES
			C1/C4/C6/C7/C10				
Procyonidae	<i>Procyon cancrivorus</i>	P	T4				
	<i>Nasua nasua</i>	V	T1				III
Mephitidae	<i>Conepatus semistriatus</i>	P/M/C	EO/T7/T8/T12/C10				
Felidae	<i>Puma concolor</i>	C/P	T1/ C2	VU	VU		II
	<i>Leopardus guttulus</i>	V	EO	VU	VU	VU	I
<b>Primates</b>							
Callitrichidae	<i>Callithrix penicillata</i>	V/A	T1/T2/T3/T4/T7				II
Cebidae	<i>Sapajus libidinosus</i>	V	C3				II
<b>Didelphiomorpha</b>							
Didelphidae	<i>Didelphis albiventris</i>	C/V/M	C1/C3/C4/C5/EO/T1				
	<i>Gracilinanus sp.</i>	C	C5				

The most recorded species were gambá-de-orelha-branca (*Didelphis albiventris*), lobo-guará (*Chrysocyon brachyurus*), and cachorro-do-mato (*Cerdocyon thous*). They are generalist species and adapted to men environments changes (Rocha et al. 2008; Srbek & Chiarello, 2013). The wolf called lobo-guará is an animal typical of the Cerrado area and therefore its registration was expected in the region. There are reports of its adaptation to anthropic environments by eating remains of organic waste garbage (Cheida, 2005), however the environmental changes that reduces their prey and predatory hunting put this animal under "Near Threatened" species category on the international IUCN list and as "Vulnerable" in Brazil and Minas Gerais lists (COPAM 2010, ICMBio 2016, IUCN 2017).

Other species which were also much recorded are: the paca (*Cuniculus paca*) and tamanduá-bandeira (*Myrmecophaga tridactyla*). The lowland paca is an animal that has been suffering increasingly with habitat fragmentation and, mainly, with hunting pressure exerted on this species due to the high appreciation of its meat (Fuccio et al. 2003). The species is classified as "Endangered" under the endangered species lists of Rio Grande do Sul and Paraná and as "Vulnerable" in São Paulo and Rio de Janeiro lists (ICMBio, 2016). In Minas Gerais State these species are not on the endangered list.

The anteater called tamanduá-bandeira (*Myrmecophaga tridactyla*) is listed as threatened on the global list (IUCN 2017), on the national list (ICMBIO 2016) and on the State list (COPAM 2010), it is classified in "Vulnerable" category in all the lists. This species is often found in the region. It is a species able to use agricultural crops surrounding areas (Miranda et al. 2015).

The puma called onça-parda (*Puma concolor*) has the largest distribution among mammals in the Americas, extending from the Northern Canada to the southernmost tip of South America. Pastures, monocultures and dams construction for electric power production, decharacterized and fragmented the habitat of this species. Even showing certain plasticity in occupying altered habitats, this may generated indirect impacts at its population (Maxwell 2009). It is listed as "Vulnerable" on the national threatened list (ICMBIO 2016) and also on the State list (COPAM 2010).

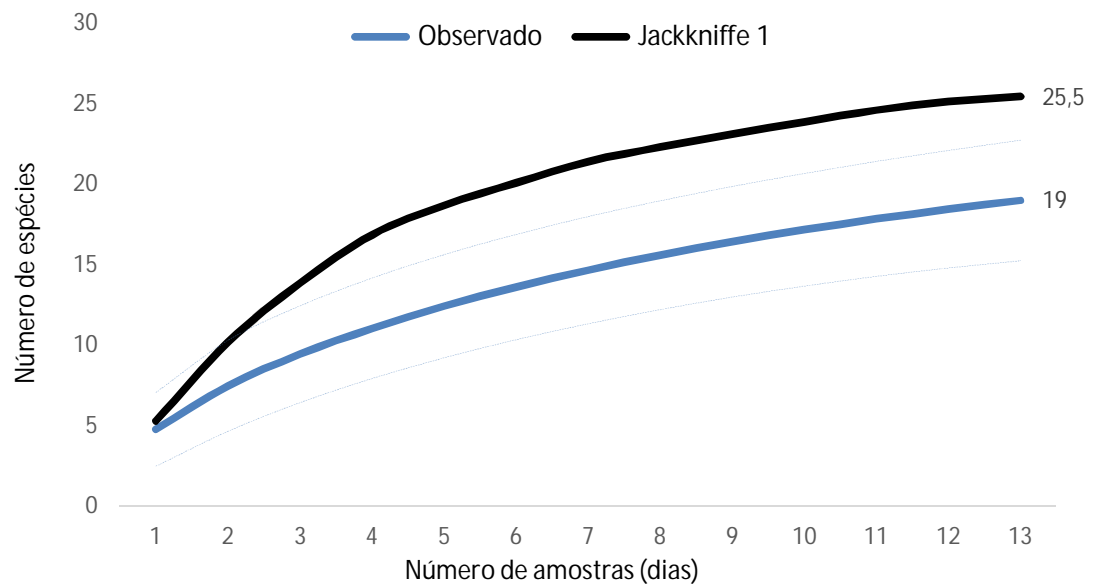


Until recently, *Leopardus guttulus* was considered a subspecies of *L. tigrinus*, but Trigo et al. (2013), comparing the genetic material of wild cats populations from Atlantic forest Southern regions and populations from Northeastern Brazil, showed that these are distinct species. The hunting for its fur trade and the forests destruction are the main causes to threat this species. Populations are severely fragmented, being severely reduced by converting the natural habitat for crops and pastures (de Oliveira et al. 2013). It is listed as "Vulnerable" on the global list (IUCN 2017), the national list (ICMBIO 2016) and on the State list (COPAM 2010).

The armadillo called tatu-canastra (*Priodontes maximus*) is classified as "endangered" species in Minas Gerais State (COPAM 2010) and as "Vulnerable" in Brazil and on the global list (ICMBIO 2016, IUCN 2017), being loss of habitat, hunting and the illegal trade market, the main threats to decline its distribution areas (Fonseca & Aguiar 2004). In the studied area the species was recorded only by the finding of two holes, one of them recently excavated. The species monitoring is being carried out with camera traps distributed in Nova Monte Carmelo farm.

Finally, ten species are present in the list of International Endangered Flora and Fauna Species Trade Convention - CITES. *Leopardus guttulus* and *Priodontes maximus* are listed on Appendix I, where there are the most endangered species whose international trade is prohibited. In Appendix II there are present *Myrmecophaga tridactyla*, *Chrysocyon brachyurus*, *Cerdocyon thous*, *Puma concolor*, *Callithrix penicillata* and *Sapajus libidinosus*. In this appendix there are presented the species under risk, if the international trade is not controlled. In Appendix III there are present *Cuniculus paca* and *Nasua nasua* which are species that depend on the cooperation of other countries to prevent their unsustainable or illegal exploitation. These listed species are common and abundant in many parts of the country territory, whose international trade can occur due to their skin use, pets purposes and meat uses (UNEP-WCMC 2015), a situation that should not occur in the sampled region.

Rarefaction curves and estimated richness did not reach an asymptote (as shown in the following figure), indicating that theoretically there were not sampled all possible species. Jackknife 1 estimator estimated a richness of 25.5 ( $\pm 2.2$ ) species. The effort employed in sampling resulted in 19 recorded species, corresponding to 75% of the total species estimated. Six species (*Tamandua tetradactyla*, *Cavia* SP., *Procyon cancrivorus*, *Leopardus guttulus*, *Sapajus libidinosus* and *Gracilinanus* SP.) were recorded only once, influencing the behavior of the curves. However, in short samplings, these unique records are already expected.



**Figure 25 – Rarefaction curve (in blue) and estimated richness by Jackknife 1 (in black) of the mammalian registered at the sampled areas. 95% confidence interval is established with respect to the collector curve (dotted lines).**

Despite the sampled number have been satisfactory when compared with other medium to large mammals studies in the same region (Moreira et al. 2008; Araújo et al. 2015, Alves et al. 2014), there are still species that may occur in the studied area, but which have not yet been inventoried like raposa-do-campo (*Lycalopex vetulus*), gato-mourisco (*Puma yagouaroundi*), among others. The mammalian fauna found has a great similarity to the mammalian fauna of the Panga Ecological Station, in Uberlândia (Bruna et al. 2010). All species found in this study also occur at the Station, except *Priodontes maximus*. This species has recent records on Natural Heritage Reserve called Vale Encantado in Uberaba (Martinelli et al. 2014).

It is important to notice the impact caused to the fauna in the region highways (BR 365 and MG 748). Five of the eighteen sampled species were found run over on the roads this is a reflection of the intense fragmentation of the landscape caused by the local roads. Silva et al. (2011), found 35 vertebrate run over species in the region, being 12 mammals species, many of which were also found during this study. The roads characteristics and the high flow of cars and, especially, loaded trucks make it constant to find run over animal on the roads.

The overall region landscape is characterized by an agricultural matrix with predominance of soybeans, sugar cane and coffee plantations. And yet, rare species such as cachorro-vinagre (*Speothos venaticus*) have been recorded in the region on the Araguari river banks (Azevedo et al. 2016), reinforcing the importance of these remnants of vegetation. In addition, the superiority in the number of carnivores species in relation to the others shows that the landscape still sustains the wildlife populations serving as prey to these, and play other ecological functions. So, it is worth mentioning the importance of Legal Reserves and Permanent Preservation Areas, because even the most general species were recorded or were in those areas, or in the array in association with most preserved fragments.

The recorded species present wide distribution on the national territory, being found in different ecosystems, both in forested areas as in open air areas. The rivers confluence provides areas favorable of occurrence of mammals such as riparian forests and fragments with connectivity. These areas are enabling the flow of these populations that need large areas to seek shelter, food and reproduction. The occurrence of threatened species shows the importance of native areas. These species denote some concern due to their status of threatness and deserve special attention, even with the wide occurrence and recurrent records in the region.

In the following figures there are shown pictures or footprints of some mammals species recorded during the field monitoring.



*Cerdocyon thous*



*Puma concolor*



*Didelphis albiventris*



*Cuniculus paca*



*Cerdocyon thous*



*Dasypus novemcinctus*



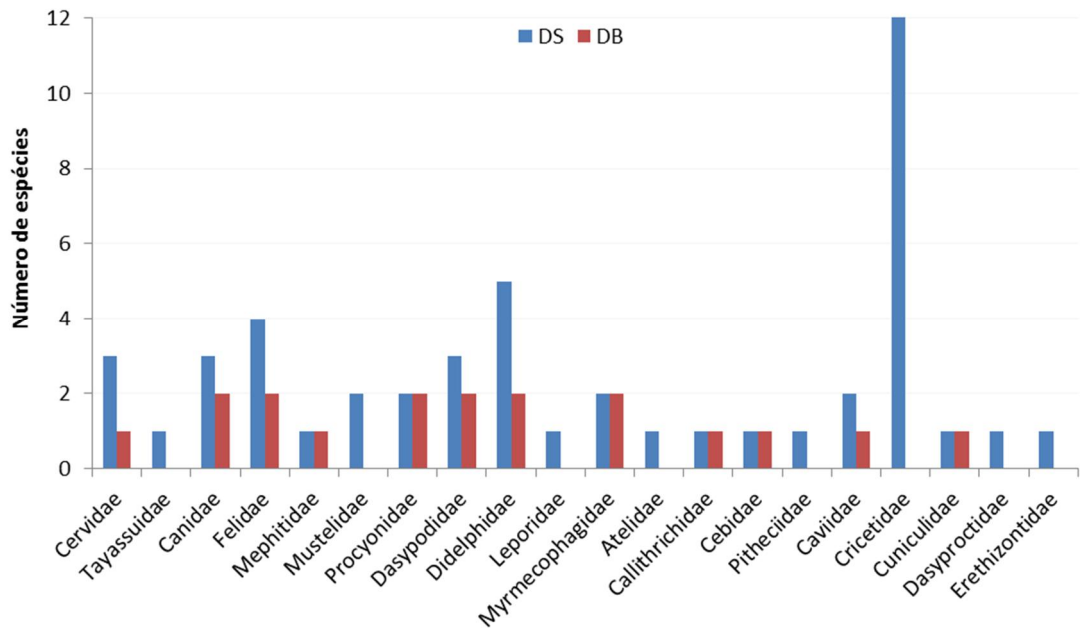


**Figure 26 – Photographic record of the mammals species found in the remnants of vegetation at the sampled areas.**

**8.3.4.4.3 Final Considerations**

The data concerning the two sampling campaigns were compared to secondary work data carried out in other areas of the region, these being: Syngenta Experimental Station (EES) (Santiago, 2016), Experimental Glória Farm (FEG) (Alves et al., 2014) and the Panga Ecological Station (EEP) (Bruna et al., 2010). From the secondary data list, 31 species were not found in both campaigns. The reason for this is that 20 of these species were sampled by traps of Sherman type conducted at EEP. There were accounted a total of 19 species in both campaigns, one of which (*Leopardus guttulus*) is unique at this region, totaling, 49 not flying mammals species to region of Uberlândia, MG.

The studied area is located in a region that was pretty much altered, with predominance of agricultural activities but it still preserves a considerable number of mammals, which is possible thanks to the remnants of vegetation belonging to the Legal Reserves areas of these agricultural properties. However, it is remarkable the impact that these animals have been suffering with the roads in surrounding. Many run over animals were observed on the highways margins and almost all the findings were in places where the road or highway cut two pieces of vegetation. Finally, only long-term studies may evaluate and better understand the mammalian fauna local dynamics.



**Figure 27 – Comparison between families with greater richness found in the primary data collection and secondary data obtained from works carried out in other areas of the region.**

**8.3.4.5 Insects fauna**

**8.3.4.5.1 Secondary Data**

Initially there were carried out surveys of secondary data in different sources, seeking to obtain data and information already produced for the region where the enterprise will be installed. The secondary data were identified, in most part, from consultations on environmental studies developed for the environmental licensing of near enterprises. Initially there were researched studies for the region between the cities of Uberlândia, Araguari, Indianapolis and Estrela do Sul, then studies that covered the Triângulo Mineiro region and finally, studies at the region of Alto Paranaíba. Other studies were used for the biological characterization of species from different target groups. These characterizations involved:

- Biological data (Wirth & Blanton 1973, Klein & Lima, 1990, Consoli & Lourenço-De-Oliveira 1994, Foratini & Massad 1998, Natal Et Al.,1998, Tubaki Et Al.,1999, Foratini 2002, Rangel & Lainson 2003, Hutchings Et Al.,2005);

- Ecological data (composition and relative abundance of species, seasonality) (Wirth & Blanton 1973, Klein & Lima, 1990, Consoli & Lourenço-De-Oliveira 1994, Foratini & Massad 1998, Natal Et Al.,1998, Tubaki Et Al.,1999, Foratini 2002, Rangel & Lainson 2003, Hutchings Et Al.,2005, Confalonieri & Costa Neto 2007, Gomes Et Al.,2010);
- Potential as vectors of different viruses (Wirth & Blanton 1973, Pinheiro Et Al.,1981 A E B, Roberts Et Al.,1981, Consoli & Lourenço-De-Oliveira 1994, Foratini 2002, Hutchings Et Al.,2005);
- Potential as transmitters of other parasitic diseases (Roberts Et Al.,1981, Klein & Lima, 1990, Consoli & Lourenço-De-Oliveira 1994, Foratini 2002, Rangel & Lainson 2003, Hutchings Et Al.,2005);
- Information about geographic distribution (Klein & Lima, 1990, Consoli & Lourenço-De-Oliveira 1994, Young & Duncan 1994, Foratini 2002, Rangel & Lainson 2003, Hutchings Et Al.,2005);
- Keys to identification (Wirth & Blanton 1973, Wirth Et Al.,1988, Consoli & Lourenço-De-Oliveira 1994, Young & Duncan 1994, Foratini 2002).

#### **8.3.4.5.2 Field Primary Data Collection**

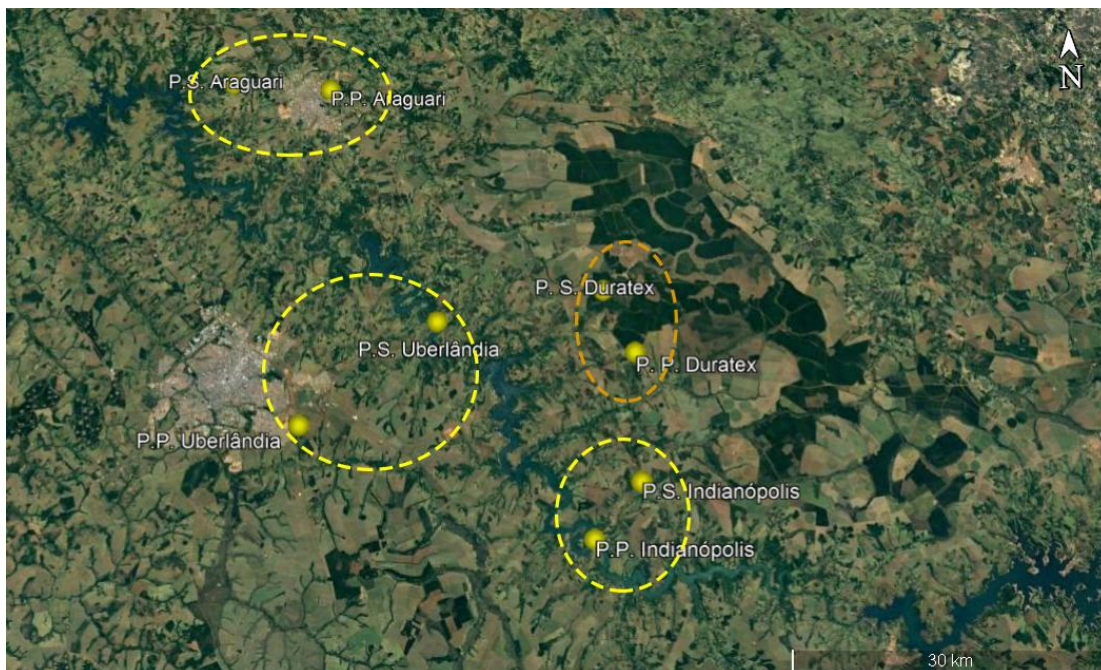
##### **Methodological approach**

In parallel to secondary data collection research, there were used images from Google Earth Pro, which served as a tool for planning the field work, in accordance with the objectives proposed in this environmental study. The field work planning considered the landscapes identified throughout the studied area, in order to establish the points of interest to be sampled. To do this, there were identified, preliminarily, points distributed over four sets of soil use and occupation:

- Rural forest areas;
- Peridomestic areas;
- Swampy areas brejosas and water bodies;
- Grazing areas, pasture, soil exposed, temporary culture, anthropogenic areas and urban areas.

The following figure presents the sampling points for the insects vectors group where there were held the field surveys.





**Figure 28 – Three control centers (CCs) in yellow dashed circles close to urban centers and one near the area of the future enterprise at Nova Monte Carmelo farm represented by the orange dotted circle.**

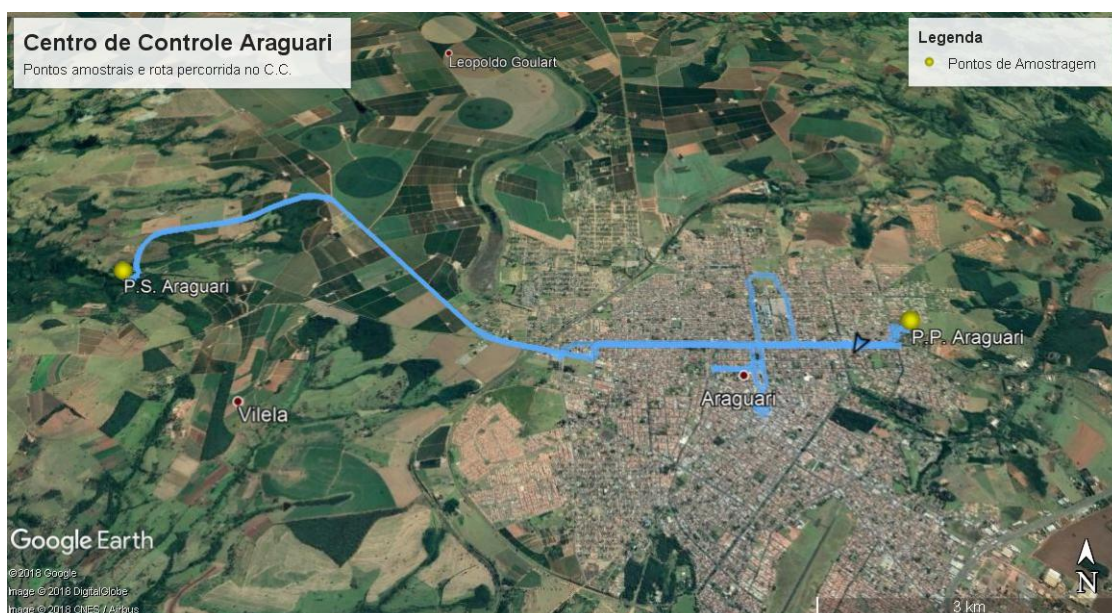
**Control Center Uberlândia**



**Figure 29 – Control Center Uberlândia – Sampling points (yellow) and path traveled in C.C. during the study (blue).**

Point	Environment	Location	Description
<b>Ponto Silvestre</b>	<b>Fragmento Florestal</b>	<b>22K 793955/7901592</b>	Fragmento florestal na Fazenda Experimental da UFU, campus Glória, área com vegetação densa, com presença de lagos e rios que desaguam no Rio Araguari.
<b>Ponto Peridomicílio</b>	<b>Mata Ciliar</b>	<b>22K 808145/7911470</b>	Ruas de condomínio fechado com área de APP nas margens do Rio Araguari, mata ciliar com alto grau de impacto ambiental e urbanização.

### Control Center Araguari



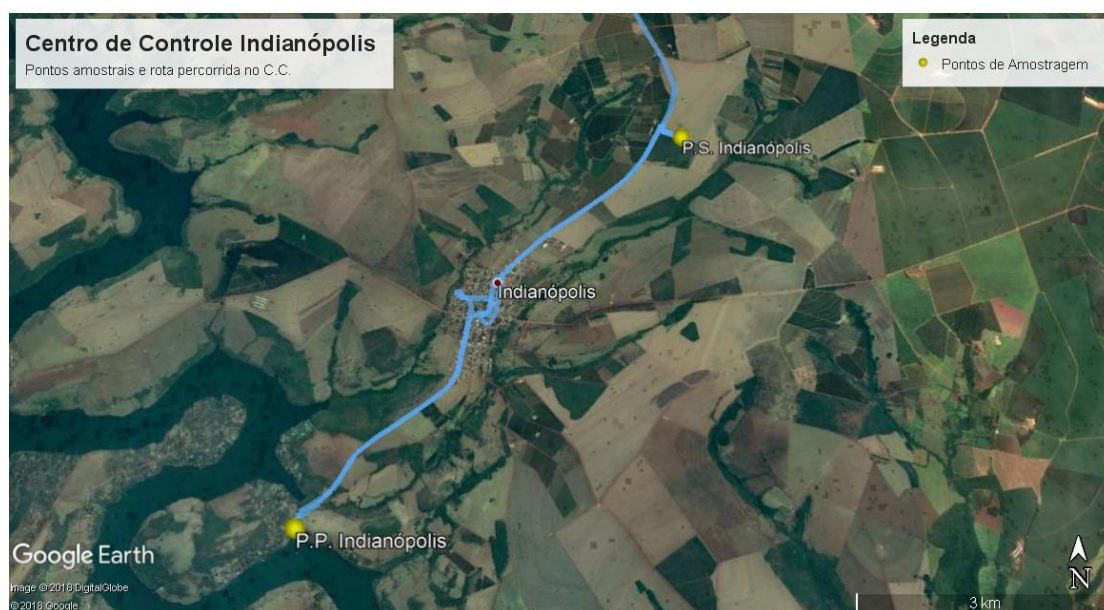
**Figure 30 – Control Center Araguari – Sampling points (yellow) and path traveled in C.C. during the study (blue).**

Point	Environment	Location	Description
<b>Ponto Silvestre</b>	<b>Fragmento Florestal</b>	<b>22K 788085/79378 62</b>	Fragmento florestal dentro de área de reserva legal, próximo a rios e cachoeiras, a mata semi-decidual apresenta estágio inicial de recuperação com sub-bosque desenvolvimento



Point	Environment	Location	Description
<b>Ponto Peridomicílio</b>	<b>Terreno baldio/ Rodoviária</b>	<b>22K 798244/79367 99</b>	Terreno baldio próximo a rodoviária de Araguari, possui espécies de cerrado, porém a área tornou-se depósito de entulhos e outros tipos de despejos.

### Control Center Indianópolis



**Figure 31 – Control Center Indianópolis – Sampling points (yellow) and path traveled in C.C. during the study (blue).**

Point	Environment	Location	Description
<b>Ponto Silvestre</b>	<b>Fragmento Cerrado</b>	<b>23K 195577/7895031</b>	Maior fragmento de Cerrado da região, localizado as margens da rodovia de acesso ao município, apresenta espécies de Cerrado <i>strictu</i> com boa cobertura vegetal, não há corpos d'água próximos
<b>Ponto Peridomicílio</b>	<b>Balsa</b>	<b>23 K 190760/7889528</b>	Porto de espera da balsa de Indianópolis, possui vegetação próxima e pouca mata ciliar, os níveis de água do rio apresentaram baixos segundo regua de referência do porto.

### Control Center Nova Monte Carmelo



**Figure 32 – Control Center Nova Monte Carmelo – Sampling points (yellow) and path traveled in C.C. during the study (blue).**

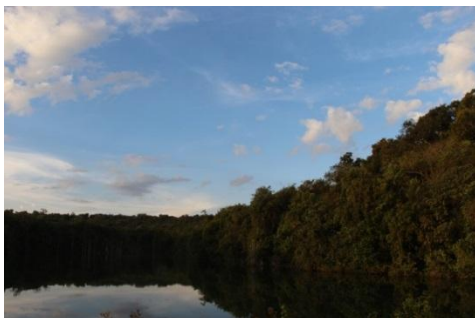
Point	Environment	Location	Description
<b>Ponto Silvestre</b>	<b>Quadra Eucalipto</b>	<b>23 K 192724/7914228</b>	O ponto de amostragem escolhido foi a quadra de plantação de Eucalipto, onde será realizada a obra do empreendimento
<b>Ponto Peridomicílio</b>	<b>Area de Convivência Duratex</b>	<b>23 K 195623/7907861</b>	Os pontos de peridomicílio deste C. C. são as áreas de uso comum, onde optou-se pela área de vivência de funcionários e próximo ao refeitório.



**Control Center Uberlândia**

Ponto de Amostragem Silvestre

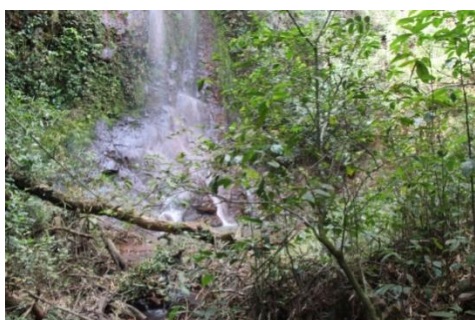
Ponto de Amostragem de Peridomicilio



**Control Center Araguari**

Ponto de Amostragem Silvestre

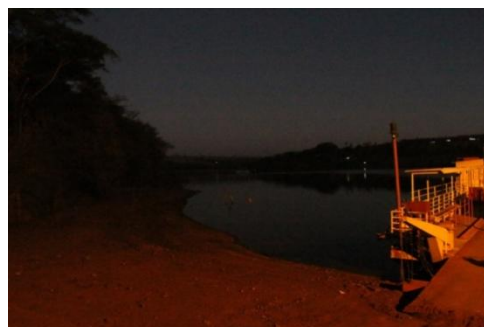
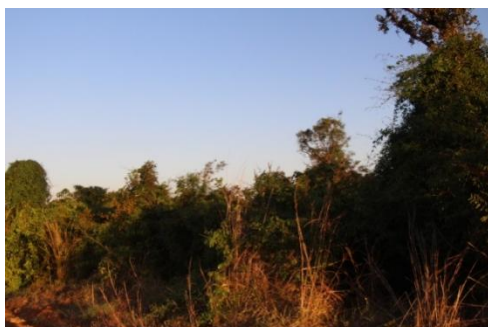
Ponto de Amostragem de Peridomicilio



**Control Center Indianópolis**

Ponto de Amostragem Silvestre

Ponto de Amostragem de Peridomicilio



**Control Center Nova Monte Carmelo**

Ponto de Amostragem Silvestre

Ponto de Amostragem de Peridomicilio



**Figure 33 – Sampling points for vector insects study.**

The insect vectors study began in incursion to the field from 08 to 19 July 2018, being the time of data collection from 6:00pm to 10:00pm. During the daytime there were conducted researches for vectors in larval stage and artificial breeding sites. In this period there were still conducted interviews with responsible department's people and agencies on disease control in the region. In the city of Indianapolis it was not found a responsible Center by diseases and it is not even known if there is one active Center. There were also observed and noted possible measures to minimize outbreaks of flies and mosquitoes. At dusk and night period adult insects collections were carried out through Shannon traps type and CDC. The temperature at the beginning and end of each night activity was checked using equipment allocated near the traps.

**Table 15 – Time, temperature and relative humidity during the field work (minimum in blue and maximum in orange).**

Points		Beginning			End		
		Hora	Temp. (C°)	UR%	Hora	Temp. (C°)	UR%
Centro de Controle - Uberlândia	P.P.	17:53	17,3	76	21:53	13,5	78
	P.S.	17:33	16,6	78	21:27	14,6	79
Centro de Controle - Araguari	P.P.	17:22	25,0	28	21:35	19,6	42
	P.S.	17:30	24,8	33	21:52	21,6	47
Centro de Controle - Indianópolis	P.P.	17:15	25,0	40	22:00	16,6	69
	P.S.	17:09	27,8	27	21:52	13,7	68
Centro de Controle - Nova Monte Carmelo	P.P.	17:55	21,2	40	21:58	17,3	53
	P.S.	17:32	23,1	23	21:23	16,8	57

The collections have had a focus on families Culicidae and Psychodidae, which are of particular interest in terms of public health. The collection of these species is of fundamental importance since only through them it is possible to perform the identification of taxa in a reliable manner. There were two consecutive days of sampling in each Control Centre, being sampled wild and/or preserved zones and zones of contact between wildlife and humans, and anthropized locations called peridomestic habitats points. In each vector insects sample period there were caught with trap "suction tube" or Entomological net without the use of human bait as attractive to the hematophagous insects. In order to complement the CDCs traps sampling, sampling with Shannon traps type, lit with 700 lumens flashlights or equivalent lighting. The traps were previously hung and connected in crepuscular time, which ranged from 5:23pm to 6:12pm by nightfall, the exposure time of the CDCs was 4 hours.

During all samples there were measured variations in temperature and relative humidity. The climate data and the Moon phase at which the capture was performed were also transcribed to the field bookmark along with description of the place and



date of sampling. All the mosquitoes captured were killed by exposure to low temperatures and packed in standard boxes according to the characteristics of each sampling. They were sequentially numbered equivalent to the corresponding field bookmark, the boxes were packed for further sorting of the mosquitoes, some were attached to small triangles of paper and stuck to the Entomological pins.

After morphotyping, the species returned to the jars to be incorporated the Entomological collection of Insect Systematics Laboratory of the Zoology Department at the University of São Paulo – USP/São Paulo-SP. The taxonomic studies were conducted by direct observation of the morphological characters evidenciáveis to stereoscopic microscope and based on dichotomous specific keys to the studied groups. The material was sent to taxonomic refinement by taxonomists of the team expert.

### **Immature breeding collection**

In this first campaign, held in the dry period, the long period of drought did not allow to observe sites with stagnant water accumulations. However, aiming the identification the locations of species posture, potential breeding sites had been raised in the surroundings of the sampled points.

### **Shannon trap type**

This type of trap was described by Shannon (1939) to capture hematophagous insects. Currently all the trappings "tent type" that collect insects are named in his honor. The trap consists of a rectangular or square tent, closed on all sides except the bottom, where the winged insect enters. At the top of the trap it is installed a light source. There were assembled lifted up the soil to allow access of insects. Once they entered into the structure they had difficult to get out, because their tendency is that individuals fly upward toward the light and heat source or to the corners of the tent. The structure was installed during the twilight and reviewed by 2 hours per day. The specimens collected were put up in jars Entomological labeled and packed in containers with 70% alcohol. The adults were packed in small jars containing silica to extract moisture and to preserve the samples.



**Figure 34 – Shannon trap type and the collector in activity**

**CDC trap (*Center of Disease Control*)**

The CDC light trap was developed by Sudia & Chamberlain (1962), this is a trap widely employed in Entomological surveys. It consists of a fan, 12V battery and a light bulb with low consumption, where a metal plate protect the structure. The trap sucks mosquitoes attracted to the light, preventing them to leave due to air flow otherwise maintained by the fan. The traps were placed for two nights in a row, armed before nightfall and exposed for 4 hours at each sampling point. So there were four sampling points (2 traps per point) by CC (4 x 4 hours = 16 hours per CC).



**Figure 35 – CDC trap type with luminous bait**

## **Results**

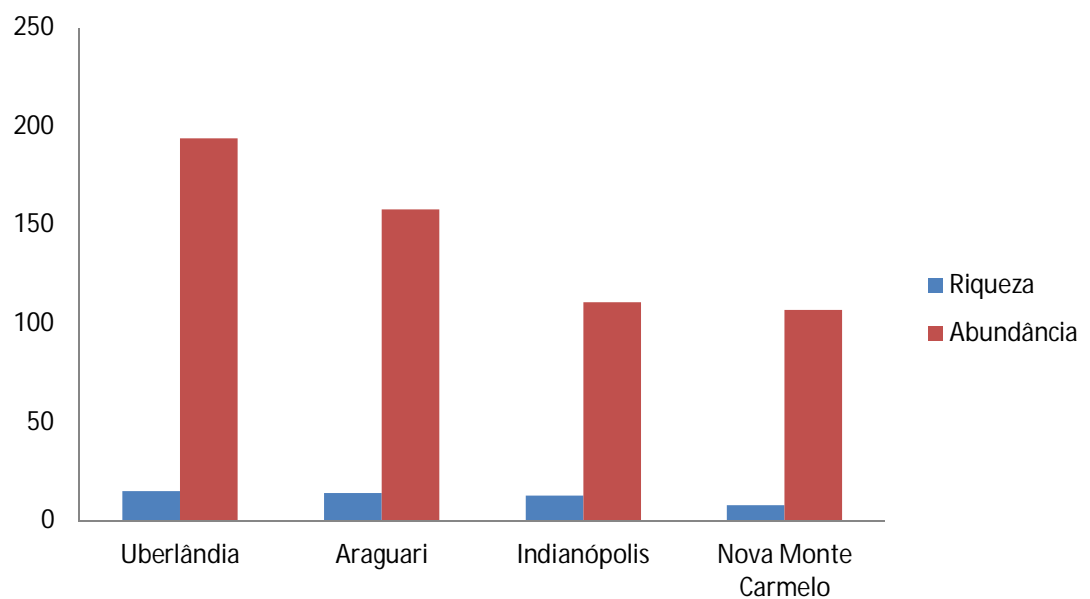
There were collected a total of 752 individuals. Of these, 104 individuals belonging to the Culicidae family and 461 individuals belonging to Psychodidae family (subfamily Phlebotominae). Among family the culicidae and sandfly, 72 individuals could not be identified for lack of morphological structures that were lost during the capture. There were still obtained 196 mosquitoes individuals belonging from other Diptera families without medical importance. For the analyses, there were considered only those individuals that were identified at least until the generic level. Therefore, it was considered, for purposes of analysis, a total of 570 collected individuals in the first campaign in July 2018. The following table shows the list of species collected in this first campaign.

**Table 16 – List of taxa recorded in the first campaign of vector insects**

TÁXON	C.C. Uberlândia				C.C. Araguari				C.C. Indianópolis				C.C. Nova Monte Carmelo			
	P.P.		P.S.		P.P.		P.S.		P.P.		P.S.		P.P.		P.S.	
	CDC	SHN	CDC	SHN	CDC	SHN	CDC	SHN	CDC	SHN	CDC	SHN	CDC	SHN	CDC	SHN
<b>Culicidae</b>																
<b>Anophelinae</b>																
<i>Anopheles</i> sp.1	0	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0
<b>Culicinae</b>																
<i>Aedeomyia</i> cf.																
<i>squamipennis</i>	1	0	1	0	0	0	2	0	1	0	1	0	0	0	0	0
<i>Aedes</i> spp.	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0
<i>Culex (Culex)</i> sp. 1	0	1	2	0	4	1	1	0	0	0	0	0	0	0	0	0
<i>Culex (Culex)</i> sp. 2	4	6	7	8	0	0	4	0	1	0	3	0	1	0	0	0
<i>Culex (Culex)</i> sp. 3	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
<i>Culicini</i> sp.1	0	0	2	0	1	0	1	0	1	1	1	0	0	0	0	0
<i>Culicini</i> sp.2	0	0	0	7	0	0	11	9	4	0	2	0	2	0	0	0
<i>Culicini</i> sp.3	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
<i>Coquillettia</i> cf.																
<i>juxtamansonia</i>	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
<i>Culex quinefastium</i>	0	0	1	0	0	0	2	0	0	0	1	0	0	0	0	0
<b>Psychodidae</b>																
<b>Phebotominae</b>																
<i>Brumptomyia</i> sp. 1	1	0	37	12	1	1	25	0	15	0	7	1	4	1	3	3
<i>Brumptomyia</i> sp. 2	0	0	0	1	0	0	5	0	1	0	0	0	1	0	0	0
<i>Lutzomyia</i> sp.1	1	1	1	1	0	0	19	0	5	2	4	2	2	1	10	5
<i>Lutzomyia</i> sp.2	1	0	5	1	0	0	7	0	2	0	2	10	1	2	4	3
<i>Lutzomyia</i> sp.3	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0
<i>Lutzomyia</i> spp.	18	1	65	0	0	0	48	0	11	2	22	2	2	0	61	0
<i>Nyssomyia neivai</i>	1	2	1	1	0	0	9	1	0	0	0	0	0	0	0	0
Outros	4	6	51	2	9	2	55	4	20	3	14	2	3	1	12	8
<b>Total</b>	<b>31</b>	<b>17</b>	<b>174</b>	<b>35</b>	<b>16</b>	<b>4</b>	<b>194</b>	<b>10</b>	<b>66</b>	<b>8</b>	<b>59</b>	<b>15</b>	<b>17</b>	<b>5</b>	<b>90</b>	<b>11</b>

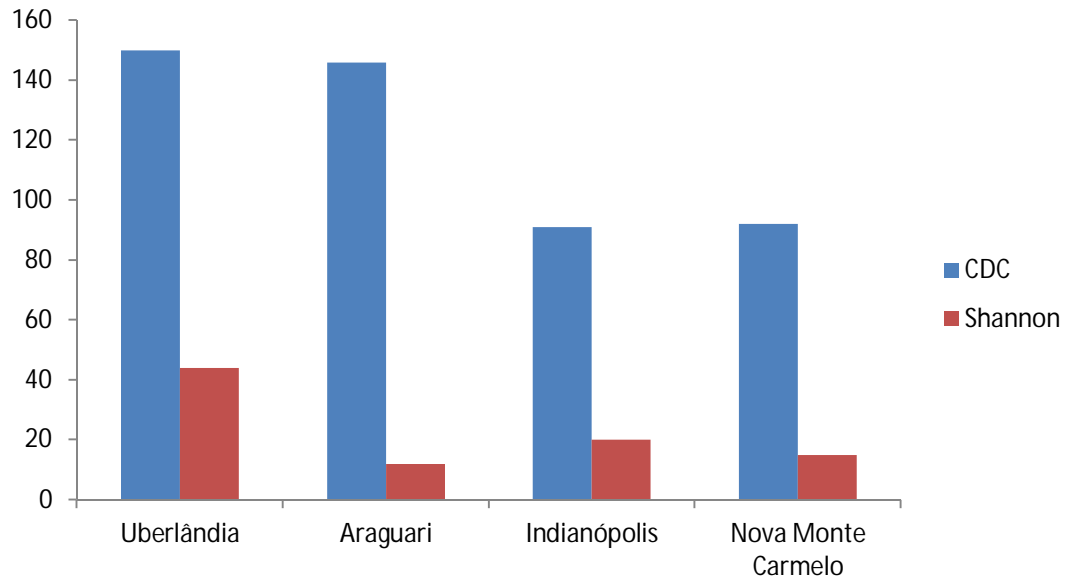
CC Uberlândia presented the highest abundance of vectors mosquitoes with 194 collected individuals, being 41 culicidae and 153 sandfly mosquitoes. The abundance of vectors insect is important, because the higher the density of mosquitoes, the higher the possibility of transmission of diseases (Console & Oliveira, 1994). CC Araguari was the second most representative with 158 individuals, followed by CC Indianapolis and Nova Monte Carmelo with 111 and 107 collected individuals, respectively.

The richness followed the same pattern, being CC Uberlandia the point which presented the highest richness with 15 morphospecies, followed by CC Araguari, Indianópolis and Nova Monte Carmelo with 14, 13 and 8 morphospecies respectively. The following figure presents the richness of species and relative abundances of the collections during this first campaign of the vectors insect study.



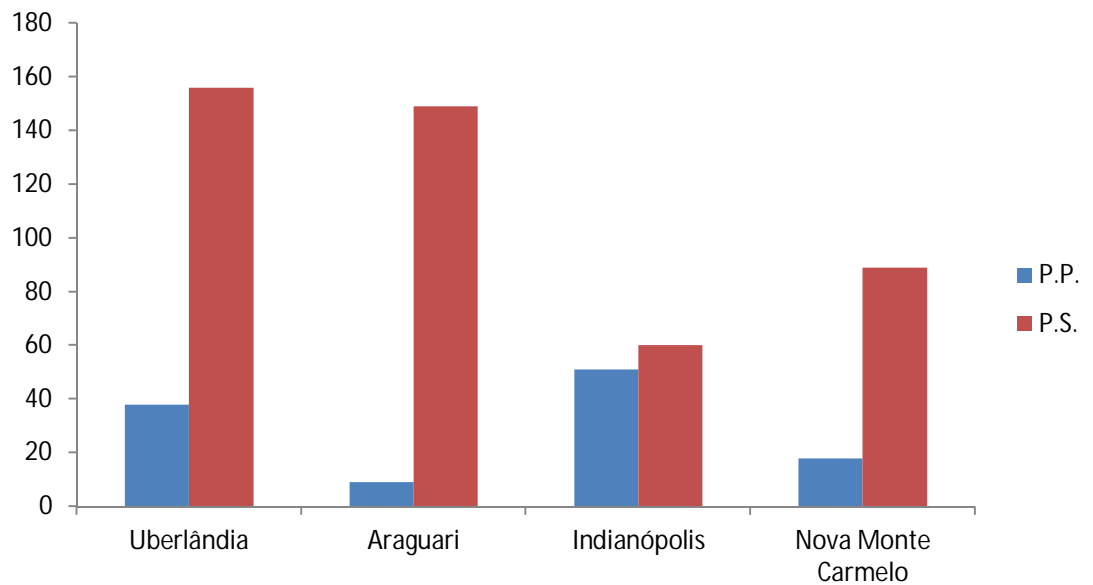
**Figure 36 – Richness and abundances registered by sampling point**

When one analyzes the methods of collection, it can be observed that the CDCs traps have a better efficiency in capturing mosquitoes, representing more than 70% of the collected material in a total of 479 individuals. Collections through Shannon traps obtained only 91 individuals from the total collected. Shannon traps type, despite not having a power to capture how the CDC does, it allows the collector to direct the collections for specific groups, which was not performed in this study, where all individuals sighted were collected. The following figure presents the capture success of each collection method employed.



**Figure 37 – Capture success by collection method employed**

When observing the figure below, the number of individuals per sampling point, it can be observed that in all Control Centres (CC) the greatest abundance was achieved in collections where in wild environment. Only CC Indianópolis had similar captures in the two sampling points, all other CC obtained more than half of the individuals collected in wild environment.

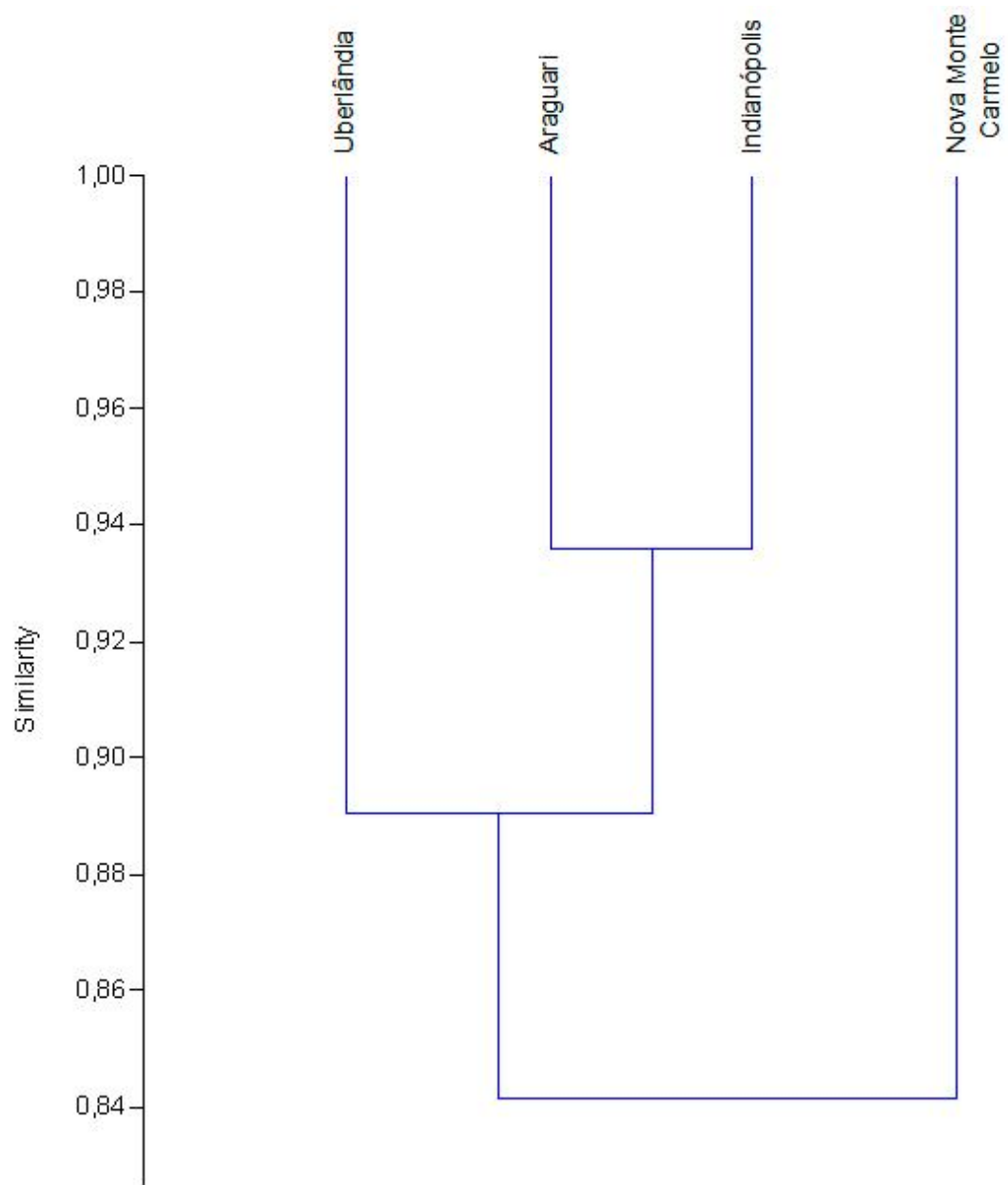


**Figure 38 – Individuals collected by sampling point (P.P. - Peridomicile sampling point; P.S. – wild environment sampling point)**

According to similarity analysis of Morisita-Horn (as the following figure) held between the sampling points, the CC Nova Monte Carmelo presented the highest distinction among the studied areas. The Control Centres of Araguari and Indianópolis



showed the greatest similarity value (0.93). C.C. Uberlândia also presented certain similarity (0.89) with the two CC aforementioned, forming a clade of three Centers with higher values of richness and abundance. The relationship between the areas requires more robust data to confirm these data, can be inferred by the following facts: (1) CC Araguari and Indianópolis obtained greater relationship of richness and abundance; (2) C.C. Araguari and Indianapolis had great random sampling points in wild environment and smaller value of dominance (dominance analysis will be confirmed after the second campaign in the rainy period); (3) CC Nova Monte Carmelo is the farthest from anthropized centres and with more homogeneous vegetation at the studied areas. However, in the next field campaign more data should be obtained to confirm if this relationship will remain the same.



**Figure 39 – Morisita-Horn similarity analysis; PAST V.2.17c (2013).**



TÁXON	C.C. Uberlândia		C.C. Araguari		C.C. Indianópolis		C.C. Nova Monte Carmelo		Enfermidade
	P.P.	P.S.	P.P.	P.S.	P.P.	P.S.	P.P.	P.S.	
<i>Lutzomyia</i> spp.	X	X		X	X	X	X	X	Leishmaniose

\* Possible transmitter, but the taxon has not yet been confirmed at the specific level.

### Malaria and Filariasis

Some of the Diptera collected at the sampled points are vectors of diseases that do not occur in the region, such as malaria, which has drawn the attention of public health-related agencies and the general public to studies in the North of the country. The mosquito *Anopheles darlingi* is the main vector of *Plasmodium* for human malaria in Brazil, with other species such as *Anopheles nuneztovari*, *Anopheles intermedius* and *Anopheles triannulatus* have been framed as secondary vectors of the disease (Consoli & Oliveira, 1994). There are no records of cases of malaria to the State of Minas Gerais, not even been introduced cases recorded near the study site. Another disease that presented the vector in the study, but there is no record of the disease is filariasis which is a disease caused by a nematode, *Wuchereria bancrofti* and, according to data from the Ministry of health, it has been prevalent in Brazil. Currently there are endemic foci located in the metropolitan region of Recife and, in less extent, in Maceió, cities where environmental and drainage conditions favor the permanence of high vector population.

### Yellow fever

Acute febrile infectious disease transmitted by vectors, which has two distinct epidemiological cycles (wild and urban). It is an extremely epidemiology important for clinical gravity and high potential for spread in urban areas. Several species of mosquitoes are vectors of Arboviruses (Consoli & Oliveira, 1994). The Arboviruses are diseases caused by a group of well-defined ecologically virus, called Arboviruses (Amazon Medicine Foundation, 1996). Yellow fever is an Arboviruses and is characterised by a frame ictero-bleeding and is caused by an arbovirus of the Group B called Flavivirus, from the family of Flaviviridae (National Health Foundation, 1998). Yellow fever in the State of Minas Gerais had the worst results in the history in the State, in the seasons of 2016/2017 and 2017/2018, the first with 475 cases and 162 deaths and the latest with 482 cases and 170 deaths (Health Department of Minas Gerais-SES). The cases were mainly around the Belo Horizonte metropolitan region and Vale do Aço region. The region of the Alto Paranaíba, just as it's specifically the region of the Triângulo Mineiro, has more recently cases of the diseases since the year 2016 and from 2017 until July 2018 the cities of the region are considered epidemic areas – areas with deaths of monkeys by disease – like Conceição das Alagoas, Pratinha, Prata, Indianópolis, Coromandel, Iturama, Santa Juliana, São Francisco de Sales, Tapira, Santa Vitória, Matutina, Rio Paranaíba, Iraí de Minas, Monte Carmelo, Nova Ponte (Health Department of Mines General-SES).

It is important to note that the spread of these diseases can be facilitated by environmental changes caused by the natural landscape changes, with the increase in vector population caused by the new breeding sites and increased the area of existing

breeding sites. Another important factor is the arrival of workers from other areas, increasing traffic and population density of the region, which increases risk of contamination. The increase in the number of migrants can also increase the chances of infected people into the region, which would increase the movement of pathogens. The habitat destruction can also result in the displacement of infected wild animals such as monkeys, to areas close to the peridomestic, which can contribute to spread the disease and lead to epidemics.

### **Dengue, Chikungunya and Zika**

Acute febrile illness, which may be benign or serious, depending on the way it is presented: unapparent infection, Classical Dengue (DC), Dengue hemorrhagic fever (DHF), or Dengue Shock Syndrome (SCD). Currently it is the most important arboviruses that affects the human being, and it constitutes a serious public health problem in the world. The disease occurs and spreads especially in tropical countries, where environmental conditions favour the development and proliferation of *Aedes aegypti*, the main mosquito vector. It has been observed a seasonal pattern of incidence coincident with the summer time, due to the higher occurrence of rainfall and temperature rise within this season. It is more common in urban centres, where there is a great amount of natural breeding sites or breeding resulting from the human being action. However, the disease can occur at any location, provided that there is a susceptible human population, vector presence and the virus is then introduced.

Until October 2016, there were recorded 1,426,005 probable cases of dengue in the country. During this period, the Southeast region registered the highest number of probable cases (841,286 cases, 59.0% of the total country's cases); followed by the Northeast region (310,161 cases, 21.8%); Midwest region (163,501 cases, 11.5%), South region (73,565 cases, 5.2%); and North region (37,492 cases, 2.6%). In the year 2018, the region of the Alto Paranaíba presented among dengue, zika and chikungunya, 900 cases suspects and confirmed cases till the month of July. According to the Health Department of Minas Gerais, those numbers should increase with the arrival of the summer time in 2018/2019 and the Triângulo Mineiro region may have even more cases. Among the municipalities included in this study, Uberlândia presented the highest number of dengue cases in the year with 262 sick people, Araguari presented seven cases, Indianópolis presented only two cases so far. Other relevant information is the number of Zika cases, in the State of Minas Gerais, with 24 suspects cases being studied, 11 cases are in Uberlândia city, which already presented 4 confirmed cases in the year. According to Chikungunya there are already more than 10,000 suspected cases in the State of Minas Gerais only in 2018, at Triângulo Mineiro region there are 43 confirmed cases where Uberlândia appears with nine cases and Araguari with seven cases. Nova Ponte is the third municipality with four registered cases.

### **Leishmaniasis**

Sandflies of *Lutzomyia* genus are the vectors of integument and visceral leishmaniasis in Brazil (Aguiar & Soucasaux, 1984). The integumentary and visceral leishmaniasis is in expansion in Brazil. Initially it was considered a zoonosis of wild animals that occasionally affected people in contact with the forest, currently it occurs in large

urban centers (Killick-Kendrick, 1999). The environmental modifications can alter the dynamics population of the fly, putting the local human population or migrants at risk of contracting diseases carried by these insects, in addition to being more exposed to the nuisance caused by the activity of sting, when in great abundance (Natal et al., 1998). The sandfly can also have their populations changed due to changes in the distribution of human habitations and their annexes (pens, sties, deposits etc.). According to DataSUS, the municipalities involved in this study do not present cases of American tegumentary leishmaniasis in human until the year 2010, but until 2016 there were registered many cases in dogs. In 2013, Paula et al. point out the presence of *L. longipalpis* in Araguari River banks region, which indicates that its urbanization may not have been random and occurs by the destruction of wild ecotopes. However other studies about its occupation in man-made environments need to be carried out.

### **Breeding sites and artificial reproduction sites**

In the first campaign of this study (in July 2018), the area was with very low rainfall volume, so artificial wetlands breeding were not observed. There were inspected the buildings in search for outbreaks of mosquitos oviposition and there were not found containers, not even sites that would be possible to accumulate water.

At C.C. Nova Monte Carmelo, for being the area directly affected in this study, surveys at the headquarters of Duratex farm were also carried out. Dependencies (offices, cafeteria and surrounding areas) were inspected and no focus or possible artificial breeding focus was found.

### **8.3.4.5.3 Final Considerations**

The diagnosis of synanthrope entomofaunal allows to know and avoid situations that favor the presence, establishment and proliferation of animals that may be harmful to the professionals health who will work in the studied area, as well as to the resident population and migrant people in the surrounding areas. It also aims to avoid conflicts with the surrounding population, which somehow can be impaired by the presence of synanthropic animals being dispersed or bein a source from the enterprises. On this picture, it is recommended the inclusion of architectural designs measures to avoid the shelter of vectors in the buildings.

As for vectors encountered, there are no specific control measures, directed to man, since there is no available vaccine nor antiviral drugs. Notification of suspected cases, the investigation of the probable location of infection, as well as the active search of cases, are important. Currently, the only epidemiological chain disease that is vulnerable to the control of infections is caused by dengue virus, vector's combact. The only guarantee, for which there is no dengue fever, is the absence of the vector. Although there were not determined the limit below which one can be sure that there will not be any outbreaks of dengue fever, this level should be very close to zero. Thus, in areas with *Aedes*, the vector monitoring should be carried out constantly to meet the infested areas and trigger the fighting measures:

- environmental management: changes in the environment that prevent or minimise the spread of vector, avoiding or destroying potential breeding sites of the Aedes;
- improvement of structures in order to contain water;
- community participation, in order to prevent the infestation of the peridomestic Aedes, through the reduction of potential breeding sites of the vector (peridomestic sanitation);
- chemical control: consists of focal treatment (eliminates larvae), perifocal (at strategic points that are difficult to access) and for ultra low volume (winged eliminates). The last one should have restricted use in epidemics, as a complement form to interrupt the transmission of dengue fever.

### 8.3.5 Aquatic fauna

#### 8.3.5.1 Limnological Communities

##### 8.3.5.1.1 Secondary Data

##### **Phytoplankton community**

The secondary data collection with emphasis on phytoplankton community found a dissertation whose sampling approach the studied area in question. In this work, the sampling occurred downstream and upstream of the hydroelectric plant Amador Aguiar I, on Araguari River – MG. There were identified a total of 11 classes and 354 taxa, of which 70 correspond to the class Bacillariophyceae, 66 to the Chlorophyceae, 2 to Chrysophyceae, 2 to Cryptophyceae, 78 belong to Cyanophyceae, 5 to Dinophyceae, 12 to Euglenophyceae, 2 to Oedogoniophyceae, 3 to Ulvophyceae, 1 to Xantophyceae and 113 to Zygnemaphyceae, in three sampling campaigns conducted between the years of 2005 and 2006 (Pizetta, 2007).

**Table 18 – Phytoplankton community list up through secondary data (Pizetta, 2007) and 2018 campaign, sampling points on Araguari River in July 2018.**

<b>Táxons</b>	<b>Campaign July 2018</b>
<b>BACILLARIOPHYCEAE</b>	
<i>Achnanthes</i>	X
<i>Amphypleura</i> sp1	
<i>Amphypleura</i> sp2	
<i>Aulacoseira</i> sp.	X
<i>Caloneis</i> sp.	
<i>Cocconeis</i> sp.	
<i>Cyclotella</i> sp1	X



<b>Táxons</b>	<b>Campaign July 2018</b>
<i>Cyclotella</i> sp2	X
<i>Cymbella</i> sp1	
<i>Cymbella</i> sp2	
<i>Eunotia</i> sp1	X
<i>Eunotia</i> sp2	X
<i>Fragilaria</i> sp1	X
<i>Frustulia rhomboides</i> (Ehrenberg) De Toni	
<i>Frustulia</i> sp1	
<i>Gomphonema constrictum</i> Ehrenberg	
<i>Gomphonema turris</i> Ehrenberg	
<i>Gomphonema</i> sp.	X
<i>Gyrosigma</i> sp.	
<i>Melosira</i> sp.	
<i>Navicula</i> sp1	X
<i>Navicula</i> sp2	
<i>Navicula</i> sp3	
<i>Navicula</i> sp4	
<i>Navicula</i> sp5	
<i>Navicula</i> sp6	
<i>Navicula</i> sp7	
<i>Navicula</i> sp8	
<i>Navicula</i> sp9	
<i>Navicula</i> sp10	
<i>Navicula</i> sp11	
<i>Nitzschia sigma</i> (Kützing) Wm. Smith	
<i>Pennales</i> NI 1	
<i>Pennales</i> NI 2	
<i>Pennales</i> NI 3	
<i>Pennales</i> NI 4	
<i>Pennales</i> NI 5	
<i>Pennales</i> NI 6	

<b>Táxons</b>	<b>Campaign July 2018</b>
<i>Pennales</i> NI 7	
<i>Pennales</i> NI 8	
<i>Pennales</i> NI 9	
<i>Pennales</i> NI 10	
<i>Pennales</i> NI 11	
<i>Pennales</i> NI 12	
<i>Pennales</i> NI 13	
<i>Pennales</i> NI 14	
<i>Pennales</i> NI 15	
<i>Pennales</i> NI 16	
<i>Pennales</i> NI 17	
<i>Pennales</i> NI 18	
<i>Pennales</i> NI 19	
<i>Pennales</i> NI 20	
<i>Pennales</i> NI 21	
<i>Pennales</i> NI 22	
<i>Pennales</i> NI 23	
<i>Pennales</i> NI 24	
<i>Pennales</i> NI 25	
<i>Pennales</i> NI 26	
<i>Pennales</i> NI 27	
<i>Pennales</i> NI 28	
<i>Pennales</i> NI 29	
<i>Pinnularia</i> sp1	
<i>Pinnularia</i> sp2	
<i>Pinnularia</i> sp3	
<i>Sellaphora</i> sp.	
<i>Surirella linearis</i> W. Smith	
<i>Surirella</i> sp1	X
<i>Surirella</i> sp2	X
<i>Synedra</i> sp1	

<b>Táxons</b>	<b>Campaign July 2018</b>
<i>Synedra</i> sp2	
<b>CHLOROPHYCEAE</b>	
<i>Actinastrum</i> sp.	
<i>Ankistrodesmus</i> sp.	
<i>Ankistrodesmus bibraianus</i> (Reinsch) Koršikov	
<i>Ankistrodesmus densus</i> Koršikov	
<i>Ankistrodesmus falcatus</i> (Corda) Ralfs	
<i>Ankistrodesmus fusiformis</i> Corda <i>sensu</i> Koršikov	
<i>Ankistrodesmus gracilis</i> (Reinsch) Koršikov	
<i>Ankistrodesmus tortus</i> Komárek & Comas Gonzáles	
<i>Botryococcus</i> sp1	
<i>Botryococcus</i> sp2	
<i>Chaetophora</i> sp.	
<i>Chlorella</i> sp.	
<i>Chlorococcales</i> NI 1	
<i>Chlorococcales</i> NI 2	
<i>Chlorococcales</i> NI 3	
<i>Chlorococcales</i> NI 4	
<i>Chlorococcales</i> NI 5	
<i>Chlorococcales</i> <u>NI 6</u>	
<i>Chlorococcales</i> NI 7	
<i>Chlorococcales</i> NI 8	
<i>Chlorococcales</i> NI 9	
<i>Chlorococcales</i> NI 10	
<i>Chlorococcales</i> NI 11	
<i>Chlorococcales</i> NI 12	
<i>Chlorococcales</i> NI 13	
<i>Chlorococcales</i> NI 14	
<i>Chlorococcales</i> NI 15	
<i>Chlorococcales</i> NI 16	
<i>Chlorococcales</i> NI 17	

<b>Táxons</b>	<b>Campaign July 2018</b>
<i>Closteriopsis</i> sp.	X
<i>Coelastrum sphaericum</i> Nägeli	
<i>Coelastrum</i> sp1	
<i>Crucigenia tetrapedia</i> (Kirchner) West & West	
<i>Crucigenia</i> sp1	
<i>Dimorphococcus lunatus</i> A. Braun	
<i>Dimorphococcus</i> sp.	
<i>Dictyosphaerium</i> sp.	
<i>Elakatothrix gelatinosa</i> Wille	
<i>Golenkinia</i> sp.	
<i>Kirchneriella lunaris</i> (Kirchner) Möbius	
<i>Kirchneriella obesa</i> (W. West) Schmidle	
<i>Monoraphidium circinale</i> (Nygaard) Nygaard	
<i>Monoraphidium contortum</i> (Thuret) Komárková- Legnerová	
<i>Monoraphidium griffithii</i> (Berkeley) Komárková- Legnerová	
<i>Monoraphidium</i> sp1	
<i>Monoraphidium</i> sp2	
<i>Monoraphidium</i> sp3	
<i>Nephrocytim agardhianum</i> Nägeli	
<i>Nephrocytim lunatum</i> W. West	
<i>Nephrocytim</i> sp1	
<i>Oocystis</i> sp1	X
<i>Oocystis</i> sp2	
<i>Pediastrum duplex</i> Meyen	
<i>Pediastrum simplex</i> Meyen	
<i>Pediastrum tetras</i> (Ehrenberg) Ralfs	
<i>Quadrigula</i> sp.	
<i>Scenedesmus acuminatus</i> (Lagerheim) Chodat	
<i>Scenedesmus bijugus</i> (Turpin) Kützing	
<i>Scenedesmus danubialis</i> Hortobágyi	
<i>Scenedesmus quadricauda</i> (Turpin) Brébisson sensu Chodat	

<b>Táxons</b>	<b>Campaign July 2018</b>
<i>Scenedesmus</i> sp1	
<i>Schizochlamys gelatinosa</i> A. Braun	
<i>Sphaerocystis schroeteri</i> Chodat	X
<i>Tetraedron caudatum</i> (Corda) Hansgirg	
<i>Tetrallantos lagerheimii</i> Teiling	
<b>CHRYSOPHYCEAE</b>	
<i>Dinobryon</i> sp.	
<i>Crysophyceae</i> NI1	
<b>CRYPTOPHYCEAE</b>	
<i>Cryptomonas ovata</i> Ehrenberg	
<i>Cryptomonas</i> sp1	
<b>CYANOPHYCEAE</b>	
<i>Anabaena</i> sp1	
<i>Anabaena</i> sp2	
<i>Aphanothece smithii</i> Komárková-Legnerová & Cronberg	
<i>Borzia</i> sp.	
<i>Chroococcales</i> NI 1	X
<i>Chroococcales</i> NI 2	
<i>Chroococcales</i> NI 3	
<i>Chroococcales</i> NI 4	
<i>Chroococcales</i> NI 5	
<i>Chroococcales</i> NI 6	
<i>Chroococcales</i> NI 7	
<i>Chroococcales</i> NI 8	
<i>Chroococcales</i> NI 9	
<i>Chroococcales</i> NI 10	
<i>Chroococcales</i> NI 11	
<i>Chroococcales</i> NI 12	
<i>Chroococcales</i> NI 13	
<i>Chroococcales</i> NI 14	
<i>Cyanophyceae</i> NI 1	

<b>Táxons</b>	<b>Campaign July 2018</b>
<i>Cyanophyceae</i> NI 2	
<i>Cyanophyceae</i> NI 3	
<i>Cyanophyceae</i> NI 4	
<i>Cyanophyceae</i> NI 5	
<i>Cyanophyceae</i> NI 6	
<i>Cyanophyceae</i> NI 7	
<i>Cylindrospermum</i> sp.	
<i>Geitlerinema</i> sp.	
<i>Limnothrix</i> sp.	
<i>Lyngbya</i> sp1	X
<i>Lyngbya</i> sp2	
<i>Merismopedia</i> sp1	
<i>Merismopedia</i> sp2	
<i>Merismopedia</i> sp3	
<i>Merismopedia</i> sp4	
<i>Merismopedia</i> sp5	
<i>Merismopedia</i> sp6	
<i>Microcystis smithii</i> Komárek & Anagnostidis	
<i>Microcystis</i> sp1	X
<i>Microcystis</i> sp2	
<i>Oscillatoria princeps</i> Vaucher ex Gomont	
<i>Oscillatoria simplicissima</i> Gomont	
<i>Oscillatoria</i> sp1	
<i>Oscillatoria</i> sp2	
<i>Oscillatoria</i> sp3	
<i>Oscillatoria</i> sp4	
<i>Oscillatoriales</i> NI 1	X
<i>Oscillatoriales</i> NI 2	
<i>Oscillatoriales</i> NI 3	
<i>Oscillatoriales</i> NI 4	
<i>Oscillatoriales</i> NI 5	



<b>Táxons</b>	<b>Campaign July 2018</b>
<i>Oscillatoriales</i> NI 6	
<i>Oscillatoriales</i> NI 7	
<i>Oscillatoriales</i> NI 8	
<i>Oscillatoriales</i> NI 9	
<i>Oscillatoriales</i> NI 10	
<i>Oscillatoriales</i> NI 11	
<i>Oscillatoriales</i> NI 12	
<i>Oscillatoriales</i> NI 13	
<i>Oscillatoriales</i> NI 14	
<i>Pseudanabaena catenata</i> Lauterborn	
<i>Pseudanabaena franquetii</i> (Bourrelly) Bourrelly	
<i>Pseudanabaena galeata</i> Böcher	
<i>Pseudanabaena limnetica</i> (Lemmermann) Komárek	
<i>Pseudanabaena minima</i> (G. S. An) Anagnostidis	
<i>Pseudanabaena</i> sp1	
<i>Pseudanabaena</i> sp2	
<i>Pseudanabaena</i> sp3	
<i>Pseudanabaena</i> sp4	
<i>Pseudanabaena</i> sp5	
<i>Pseudanabaenaceae</i> NI 1	
<i>Pseudanabaenaceae</i> NI 2	
<i>Rivularia</i> sp.	
<i>Scytonema cincinnatum</i> Thuret ex Born & Flahault	
<i>Scytonema</i> sp1	
<i>Scytonema</i> sp2	
<i>Spirulina</i> sp1	
<i>Spirulina</i> sp2	
<i>Synechococcoideae</i>	
<b>DINOPHYCEAE</b>	
<i>Gymnodinium</i> sp.	
<i>Peridinium pusillum</i> Lemmerman	

<b>Táxons</b>	<b>Campaign July 2018</b>
<i>Peridinium</i> sp1	
<i>Peridinium</i> sp2	
<i>Peridinium</i> sp3	
<b>EUGLENOPHYCEAE</b>	
<i>Euglena</i> sp1	
<i>Euglena</i> sp2	
<i>Euglena</i> sp3	
<i>Phacus longicauda</i> (Ehrenberg) Dujardin	
<i>Phacus</i> sp1	
<i>Phacus</i> sp2	
<i>Phacus</i> sp3	
<i>Phacus</i> sp4	
<i>Trachelomonas armata</i> (Ehrenberg) Steinberg	
<i>Trachelomonas volvocina</i> Ehrenberg	
<i>Trachelomonas</i> sp1	
<i>Trachelomonas</i> sp2	
<b>OEDOGONIOPHYCEAE</b>	
<i>Bulbochaete</i> sp.	
<i>Oedogoniales</i> NI1	
<i>Oedogonium</i> sp1	
<b>ULVOPHYCEAE</b>	
<i>Cladophora</i> sp1	
<i>Cladophora</i> sp2	
<i>Ulothrix</i> sp.	
<b>XANTOPHYCEAE</b>	
<i>Tetraplektion</i> sp.	
<b>ZYGNEMAPHYCEAE</b>	
<i>Actinotaenium</i> sp1	
<i>Actinotaenium</i> sp2	
<i>Actinotaenium</i> sp3	
<i>Closterium</i> sp1	

<b>Táxons</b>	<b>Campaign July 2018</b>
<i>Closterium</i> sp2	
<i>Closterium</i> sp3	
<i>Closterium</i> sp4	
<i>Closterium</i> sp5	
<i>Closterium</i> sp6	
<i>Closterium</i> sp7	
<i>Closterium</i> sp8	
<i>Cosmarium asphaerosporum</i> var. <i>strigosum</i>	
<i>Cosmarium margaritatum</i> (Lundell) Roy & Bisset	
<i>Cosmarium porrectum</i> Nordstedt	
<i>Cosmarium regnesii</i> Reinsch	
<i>Cosmarium reniforme</i> (Ralfs) Archer	
<i>Cosmarium subtumidum</i> Nordstedt	
<i>Cosmarium</i> sp1	
<i>Cosmarium</i> sp2	
<i>Cosmarium</i> sp3	
<i>Cosmarium</i> sp4	
<i>Cosmarium</i> sp5	
<i>Cosmarium</i> sp6	
<i>Cosmarium</i> sp7	
<i>Cosmarium</i> sp8	
<i>Cosmarium</i> sp9	
<i>Cosmarium</i> sp10	
<i>Cosmarium</i> sp11	
<i>Cosmarium</i> sp12	
<i>Cosmarium</i> sp13	
<i>Cosmarium</i> sp14	
<i>Cosmarium</i> sp15	
<i>Cosmarium</i> sp16	
<i>Cosmarium</i> sp17	
<i>Cosmarium</i> sp18	

<b>Táxons</b>	<b>Campaign July 2018</b>
<i>Cosmarium</i> sp19	
<i>Cosmarium</i> sp20	
<i>Cosmarium</i> sp21	
<i>Cosmarium</i> sp22	
<i>Cosmarium</i> sp23	
<i>Cosmarium</i> sp24	
<i>Cosmarium</i> sp25	
<i>Cosmarium</i> sp26	
<i>Cosmarium</i> sp27	
<i>Cosmarium</i> sp28	
<i>Cosmocladium</i> sp.	
<i>Desmidium baileyi</i> (Ralfs) Nordstedt	
<i>Desmidium grevillei</i> (Kützing ex Ralfs) De Bary	
<i>Desmidium</i> sp1	
<i>Euastrum</i> sp1	
<i>Euastrum</i> sp2	
<i>Euastrum</i> sp3	
<i>Euastrum</i> sp4	
<i>Euastrum</i> sp5	
<i>Euastrum</i> sp6	
<i>Gonatozygon pilosum</i> Wolle	
<i>Hyalotheca dissiliens</i> (Smith) Brébisson ex Ralfs	
<i>Micrasterias laticeps</i> Nordstedt	
<i>Micrasterias mahabuleshwariensis</i> Hobson	
<i>Micrasterias radiosa</i> Ralfs	
<i>Micrasterias rotata</i> (Greville) Ralfs ex Ralfs	
<i>Micrasterias truncata</i> (Corda) Brébisson ex Ralfs	
<i>Micrasterias</i> sp1	X
<i>Micrasterias</i> sp2	
<i>Micrasterias</i> sp3	
<i>Mougeotia</i> sp1	X

<b>Táxons</b>	<b>Campaign July 2018</b>
<i>Mougeotia</i> sp2	
<i>Mougeotia</i> sp3	
<i>Netrium digitus</i> (Ehrenberg) Itzighzon & Rothe	
<i>Netrium</i> sp1	
<i>Onychonema laeve</i> Nordstedt	
<i>Pleurotaenium minutum</i> (Ralfs) Delponte	
<i>Pleurotaenium nodosum</i> (Bailey) Lundell	
<i>Pleurotaenium trabécula</i> (Ehrenberg) Nägeli	
<i>Spirogyra</i> sp1	X
<i>Spirogyra</i> sp2	
<i>Spondylosium planum</i> (Wolle) West & West	
<i>Spondylosium panduriforme</i> (Heirmerl) Teiling	
<i>Staurastrum dilatatum</i> Ehrenberg ex Ralfs	
<i>Staurastrum forficulatum</i> Lundell	
<i>Staurastrum gracile</i> Ralfs ex Ralfs	
<i>Staurastrum laeve</i> Ralfs	
<i>Staurastrum leptocladum</i> Nordstedt	
<i>Staurastrum minnesotense</i> Wolle	
<i>Staurastrum pachyrhynchus</i> Nordstedt	
<i>Staurastrum rotula</i> Nordstedt Vidensk	X
<i>Staurastrum setigerum</i> Cleve	
<i>Staurastrum smithii</i> Teiling	
<i>Staurastrum subunguiferum</i>	
<i>Staurastrum tetracerum</i> (Kützing) Ralfs	
<i>Staurastrum trifidum</i> Nordstedt	
<i>Staurastrum</i> sp1	
<i>Staurastrum</i> sp2	
<i>Staurastrum</i> sp3	
<i>Staurastrum</i> sp4	
<i>Staurastrum</i> sp5	
<i>Staurastrum</i> sp6	

Táxons	Campaign July 2018
<i>Staurastrum</i> sp7	
<i>Staurastrum</i> sp8	
<i>Staurastrum</i> sp9	
<i>Staurastrum</i> sp10	
<i>Staurastrum</i> sp11	
<i>Stauroidesmus crassus</i> (West & West) Florin	
<i>Stauroidesmus</i> sp1	
<i>Stauroidesmus</i> sp2	
<i>Stauroidesmus</i> sp3	
<i>Stauroidesmus</i> sp4	
<i>Teilingia</i> sp.	
<i>Xanthidium trilobum</i> Nordstedt Vidensk	
<i>Xanthidium</i> sp1	
<i>Xanthidium</i> sp2	
<i>Zygnema</i> sp.	

### Zoobenthic community

The secondary data collection with emphasis on zoobenthic community evaluated a work submitted to a congress whose sampling approach the studied area in question. In this work, the sampling occurred upstream from the hydroelectric plant Amador Aguiar I, on Araguari river - MG during sampling campaigns conducted monthly between January 1999 and November 2000. A total of 114 taxa were identified, among which 99 correspond to the phylum Rotifera, 4 to Copepoda and 11 to Cladocera (Gomes e Souza & Von Sperling 2005).

**Table 19 – List of zooplanktonic community raised by secondary data (Gomes e Souza & Von Sperling 2005) and 2018 campaign, sampling points on Araguari River in July 2018.**

Rotifera	Campaign July 2018
<b>Bdelloidea</b>	
<i>Anuraeopsis navicula</i>	
<i>Ascomorpha ecaudis</i>	



<b>Rotifera</b>	<b>Campaign July 2018</b>
<i>Ascomorpha ovalis</i>	
<i>Ascomorpha saltans</i>	
<i>Ascomorpha</i>	
<i>Brachionus falcatus</i>	X
<i>Brachionus quadridentatus</i>	
<i>Brachionus sessilis</i>	
<i>Cephalodella</i> spp.	
<i>Cephalodella catellina</i>	
<i>Cephalodella forficula</i>	
<i>Cephalodella gibba</i>	
<i>Cephalodella mucronata</i>	
<i>Cephalodella tenuiseta</i>	
<i>Cephalodella</i> sp.	
<i>Cephalodella</i> sp1	
<i>Cephalodella</i> sp2	
<i>Cephalodella</i> sp3	
<i>Collotheca mutabilis</i>	
<i>Collotheca pelagica</i>	
<i>Collotheca</i> sp1	
<i>Colurella obtusa</i>	
<i>Colurella sulcata</i>	
<i>Colurella uncinata</i>	
<i>Colurella</i> sp1	
<i>Conochillus coenobasis</i>	
<i>Conochillus unicornis</i>	X
<i>Dicranophorus</i> sp.	
<i>Dipleuchlanis propatula</i>	
<i>Euchlanis</i> sp.	
<i>Euchlanis</i> sp1	
<i>Euchlanis</i> sp2	
<i>Filinia opoliensis</i>	

<b>Rotifera</b>	<b>Campaign July 2018</b>
<i>Filinia pjeleri</i>	
<i>Filinia saltator</i>	
<i>Gastropus</i> sp.	
<i>Hexarthra intermedia</i>	X
<i>Kellicottia bostoniensis</i>	
<i>Keratella americana</i>	
<i>Keratella cochlearis</i>	X
<i>Keratella lenzi</i>	
<i>Keratella tropica</i>	
<i>Lecane arcula</i>	
<i>Lecane bulla</i>	
<i>Lecane clara</i>	
<i>Lecane closterocerca</i>	
<i>Lecane copeis</i>	
<i>Lecane cornuta</i>	
<i>Lecane curvicornis</i>	
<i>Lecane decipiens</i>	
<i>Lecane flexilis</i>	
<i>Lecane furcata</i>	
<i>Lecane hamata</i>	
<i>Lecane hornemanni</i>	
<i>Lecane inermis</i>	
<i>Lecane lunaris</i>	
<i>Lecane monostyla</i>	
<i>Lecane obtusa</i>	
<i>Lecane pyriformis</i>	
<i>Lecane signifera</i>	
<i>Lecane stenroosi</i>	
<i>Lecane</i> sp.	
<i>Lecane</i> sp1	
<i>Lecane</i> sp2	

<b>Rotifera</b>	<b>Campaign July 2018</b>
<i>Lepadella latusinus</i>	
<i>Lepadella patella similis</i>	
<i>Lepadella</i> spp.	
<i>Lepadella</i> sp1	
<i>Lepadella</i> sp2	
<i>Lindia</i> sp.	
<i>Macrochaetus sericus</i>	X
<i>Macrothrachella</i> sp	
<i>Mytilina unguipes</i>	
<i>Mytilina</i> sp.	
<i>Notommata copeus</i>	
<i>Notommata</i> sp.	
<i>Plationus patulus patulus</i>	
<i>Platyas quadricornis brevispinus</i>	
<i>Ploesoma truncatum</i>	
<i>Polyarthra</i>	
<i>Proales</i> sp.	
<i>Ptygura libera</i>	
<i>Synchaeta</i> sp.	
<i>Synchaeta stylata</i>	
<i>Testudinella</i> sp1	
<i>Trichocerca</i> cf. <i>cavia</i>	
<i>Trichocerca chattoni</i>	
<i>Trichocerca iernis</i>	
<i>Trichocerca</i> cf. <i>longiseta</i>	
<i>Trichocerca pussila</i>	
<i>Trichocerca similis</i>	
<i>Trichocerca similis grandis</i>	
<i>Trichocerca stylata</i>	
<i>Trichocerca tenuior</i>	
<i>Trichocerca</i> cf. <i>tropis</i>	

<b>Rotifera</b>	<b>Campaign July 2018</b>
<i>Trichocerca</i> sp1	
<i>Trichocerca</i> spp.	
<b>CRUSTACEA-COPEPODA-CALANOIDA</b>	
<i>Argyrodiaptomus furcatus</i>	X
<i>Notodiatomus iheringi</i>	X
<b>CRUSTACEA-COPEPODA-CICLOPOIDA</b>	
<i>Thermocyclops decipiens</i>	
<i>Thermocyclops minutus</i>	X
<b>CLADOCERA</b>	
<i>Bosmina hagmani</i>	X
<i>Bosminiopsis deitersi</i>	
<i>Ceriodaphnia cornuta</i>	X
<i>Ceriodaphnia richardi</i>	
<i>Ceriodaphnia</i> spp.	
<i>Daphnia gessneri</i>	X
<i>Diaphanosoma birgei</i>	X
<i>Diaphanosoma spinulosum</i>	X
<i>Diaphanosoma</i> sp.	
<i>Iliocryptus</i> sp.	
<i>Moina minuta</i>	X

### **Benthic macroinvertebrates**

In the survey of secondary data with emphasis on benthic macroinvertebrates it was possible to find just one dissertation report whose sampling approach the studied area in question. In this work, the samplings took place on a stretch situated downstream of the Amador Aguiar I hydroelectric plant on rio Araguari-MG, and a total of 50 taxa (2 Mollusca, 2 Annelida and 46 Arthropoda) were found in four sampling campaigns carried out between 2005 and 2008 (Maroneze, 2010).

**Table 20 – List of Benthic macroinvertebrate taxa collected through secondary data (Maroneze, 2010) and the ones registered in this campaign.**

<b>Táxons</b>	<b>Campaign July 2018</b>
<b>Mollusca</b>	

<b>Táxons</b>	<b>Campaign July 2018</b>
Bivalvia	
Corbiculidae	
<i>Corbicula fluminea</i>	X
Gastropoda	
Thiaridae	
<i>Melanoides tuberculatus</i>	
<b>Annelida</b>	
Hirudinea	X
Oligochaeta	X
<b>Crustacea</b>	
Ostracoda	X
<b>Insecta</b>	
Ephemeroptera	
Baetidae	
Leptohyphidae	
Leptophlebiidae	
Odonata	
Gomphidae	
Libellulidae	
Heteroptera	
Coleoptera	
Elmidae	
Trichoptera	
Hydroptilidae	
Diptera	
Ceratopogonidae	
Chironomidae	
Tanypodinae	
<i>Ablabesmyia</i>	X
<i>Djalmabatista</i>	
<i>Tanypus</i>	
Chironominae	

<b>Táxons</b>	<b>Campaign July 2018</b>
<i>Aedokritus</i>	
<i>Chironomus</i>	
<i>Cladopelma</i>	
<i>Cryptochironomus</i>	
<i>Demicryptochironomus</i>	
<i>Fissimentum</i>	
<i>Goeldchironomus</i>	
<i>Pelomus</i>	
<i>Nilothauma</i>	
<i>Paralauterboniella</i>	
<i>Polypedilum</i>	
<i>Pseudochironomus</i>	X
<i>Stempellina</i>	
<i>Tanytarsus</i>	X
<i>Tribelos</i>	
<i>Zavreliella</i>	

### 8.3.5.1.2 Field Primary Data Collection

#### **Methodological approach**

For this present study, there were considered two sampling points, located on the rio Araguari in the border of the cities of Araguari and Uberlândia, MG. The sample collection was held on 18/07/18, corresponding to the dry period. Points 1 and 2 are located, respectively, at coordinates 18° 50' 39.64" S 48° 6' 43.42" W and 18° 49' 46.46" S 48° 5' 39.94" W, as shown in the following figure.





**Figure 40 –Aquatic biota sampling points location**



**Figure 41 – Sampling points on July 2018 campaign at Araguari river (Point 01 at left and Point 02 at right).**

**Phytoplankton Community**

For qualitative analysis (Taxonomic composition) there were collected samples with conical-cylindrical nets with 20 µm mesh opening, through vertical hauls of 10 metres deep till the surface (as the following figure). The collected material was packaged in glass bottles and fixed in formalin to the final concentration of 2%.



**Figure 42 – Planktonic communities collection methodology at the Araguari River on July 2018 (collects with conical-cylindrical nets at the left and fixing of phytoplankton with lugol's iodine at right)**

To identify the collected material it was used as main references: Bicudo & Bicudo (1970); Bourrelly (1968; 1970; 1972); Compère (1974; 1975 A, B; 1976 A, B; 1977); Komárek & Fott (1983); Sant'anna (1984, 1991); Krammer & Lange-Bertalot (1988; 1991); Castro *et al.* (1991); Parra & Bicudo (1995); Sant'anna & Azevedo (2000) and Azevedo *et al.* (1996). For the quantitative analysis of raw water samples, there were collected directly in the subsurface, using glass bottles of 100 ml, being the same immediately fixed with lugol's iodine.

The counts were carried out according to the method described by Uthermöhl (1958), which is based on random distribution of individuals at the bottom of settling chambers. The settled volume ranged from 2 to 40 ml, depending on the density of organisms or debris present. The sedimentation time was at minimum of 3 hours for each height centimeter of the chamber (Margalef, 1983). To the count of phytoplankton it was considered as individual: single-celled organisms, filaments, trichomes, colonies and coenobia, depending on the morphological organization of each species. The data were expressed in individual (ind.) L<sup>-1</sup>.

The count fields were distributed in parallel transects, covering practically the whole chamber area. The number of counted fields corresponded to the minimum necessary to achieve 100 individuals of the most abundant species in the sample, thus, with an error of less than 20% and a confidence interval of 95% (Lund *et al.*, 1958). In samples with few algae, there were counted as many fields as required for the stabilization of the species number added per field (minimum area method).

### **Zooplanktonic Community**

For the qualitative and quantitative analysis of zooplanktonic community there were obtained samples by vertical hauls of 10 metres deep till the surface with plankton collection nets of 55 µm mesh opening. The collected material was packaged in glass bottles and fixed in formalin to the final concentration of 4% (as the following figure).





**Figure 43 – Planktonic communities collection methodology at the Araguari River on July 2018. Zooplankton fixation with formallin**

For the quantitative analysis of groups Cladocera and Copepoda (youth and adults) thre were analyzed subsamples, arranged in an acrylic bucket with square bottom under stereoscopic microscope. It was quantified at least 100 organisms, or, in the case of low density, the total sample. For the analysis of Copepoda nauplii and organisms of Rotifer group, subsamples of 1 mL were analyzed on Sedgwick-Rafter blade under optical microscope. It was quantified at least 100 organisms, or, in the case of samples with low density, 3 subsamples of 1 mL. The counts were used to calculate the density per sample and then extrapolated to individuals/m<sup>3</sup>. Zooplanktonic organisms were identified on the basis of specific bibliography: Koste (1978a E B); Elmoor-Loureiro (1997); Pontin (1978); Reid (1985).

**Benthic macroinvertebrate community**

The sediment collection for Benthic macroinvertebrate fauna analysis was performed with the aid of a dredge of type Van Veen with 0.0198 m<sup>2</sup> sampling area, being taken one sample per point. The collected material was washed in nylon net of 250 µm mesh opening, packaged in plastic bags and fixed with 4% formalin (as shown in the following figure).



**Figure 44 – Benthic communities collection methodology at the Araguari River on July 2018 (collection with Van Veen dredge at left and with nylon net at right)**

In the laboratory, the samples were washed in metallic net of 250  $\mu\text{m}$ , transferred to a 70% alcohol solution, stained with "rose of Bengal" and triad following the Protocol to the benthic communities Biomonitoring of rivers and reservoirs (CETESB 2012). The identification of Macroinvertebrates was held according to specialized bibliography: Pennak, 1989; Brinkhurst & Marchese, 1989; Domínguez & Fernández, 1992; Lopretto & Tell, 1995; Trivinho-Strixino & Strixino, 1995; Merritt & Cummins, 1996; Mariano & Froehlich, 2007; Krantz & Walter, 2009; Mugnai et al., 2010.

With the data obtained for the count sample, density values were calculated (individuals  $\text{m}^{-2}$ ) and the relative abundance of the main taxonomic groups found (%). The Shannon diversity index ( $H'$ , -bit. individuals $^{-1}$ ) and Pielou Evenness ( $J'$ ) were determined through the program PAST v 2.03.

## Results and discussion

### **Phytoplankton Community**

There were identified 68 taxa, being 31 (45.6%) of the class Bacillariophyceae; 6 (8.8%) of class Zygnemaphyceae; 9 (13.2%) of Cyanophyceae class; 8 (11.8%) of the class Chlorophyceae; 5 (7.4%) of the class Cryptophyceae; 3 (4.4%) of the classes Euglenophyceae and Dinophyceae; 2 (2.9%) of the class Chrysophyceae; and 1 (1.5%) of the class Rhodophyceae.

**Table 21 – Relative frequency ratio of taxa (%) of all classes, found on the surface of the sample points in rio Araguari, in July 2018.**

Táxons	P01	P02	FR
<b>BACILLARIOPHYCEAE</b>			
<i>Achnantheidium minutissimum</i> (Kütz.) Czarn.		X	50
<i>Aulacoseira granulata</i> (Ehr.) Sim. var. <i>granulata</i>		X	50
A. (Ehr.) Sim. var. <i>angustissima</i> (O.Müll.) Sim.		X	50
<i>Cyclotella meneghiniana</i> Kütz.		X	50
<i>Cyclotella pseudostelligera</i> Hust.	X	X	100
<i>Cyclotella stelligera</i> Cleve & Grun.	X	X	100
<i>Cyclotella</i> sp.	X		50
<i>Eunotia camelus</i> Ehr.	X		50
<i>Eunotia flexuosa</i> (Bréb.) Kütz.	X	X	100
<i>Eunotia</i> spp	X		50
<i>Fragilaria capucina</i> Desm.		X	50
<i>Fragilaria</i> sp.		X	50
<i>Frustulia vulgaris</i> (Thw.) De Toni		X	50
<i>Gomphonema parvulum</i> var. <i>lagenula</i> Freng.		X	50

Táxons	P01	P02	FR
<i>Gomphonema parvulum</i> (Kütz.) var. <i>parvulum</i>		X	50
<i>Gomphonema</i> sp.		X	50
<i>Hantzschia amphioxys</i> (Ehr.) Grun.	X		50
<i>Navicula viridula</i> (Kütz.) Ehr.	X	X	100
<i>Navicula</i> spp.	X	X	100
<i>Nitzschia acicularis</i> (Kütz.) W.Sm.		X	50
<i>Nitzschia amphibia</i> Grun.	X		50
<i>Nitzschia palea</i> (Kütz.) W.Sm.	X		50
<i>Pinnularia neomajor</i> Kram.		X	50
<i>Pinnularia</i> spp.		X	50
<i>Stenopterobia delicatissima</i> (Lew.) L.-B & Kram.		X	50
<i>Stenopterobia sigmatella</i> (Greg.) Ross	X		50
<i>Surirella angusta</i> Kütz.		X	50
<i>Surirella guatemalensis</i> Ehren.	X	X	100
<i>Surirella</i> sp.	X	X	100
<i>Synedra delicatissima</i> W.Sm.	X	X	100
<i>Synedra ulna</i> (Nitz.) Ehr.	X	X	100
<b>ZYGNEMAPHYCEAE</b>			
<i>Micrasterias laticeps</i> Nordst. var. <i>laticeps</i>	X		50
<i>Mougeotia</i> sp.	X		50
<i>Spyrogyra</i> spp.	X		50
<i>Staurastrum leptocladum</i> Nords.	X	X	100
<i>Staurastrum rotula</i> Nordst.	X	X	100
<i>Staurastrum</i> spp.	X		50
<b>CHLOROPHYCEAE</b>			
<i>Schroederia judayi</i> Smith	X		50
<i>Chlamydomonas</i> spp.	X		50
<i>Closteriopsis acicularis</i> (Sm.)	X		50
<i>Coelastrum reticulatum</i> Dang.	X	X	100
<i>Eutetramorus fottii</i> (Hind.) Kom.	X	X	100
<i>Oocystis borgei</i> Snow	X		50
<i>Sphaerocystis schroeteri</i> Chodat	X	X	100
<i>Volvox aureus</i> Ehr.	X	X	100
<b>CYANOPHYCEAE</b>			

Táxons	P01	P02	FR
<i>Aphanocapsa elachista</i> West & West	X		50
<i>Chroococcus limneticus</i> Lemm.	X	X	100
<i>Chroococcus</i> sp.	X	X	100
<i>Lyngbya</i> spp.		X	50
<i>Microcystis aeruginosa</i> (Kütz.) Kütz.	X	X	100
<i>Microcystis</i> sp.	X	X	100
<i>Oscillatoria princeps</i> Vaucher	X		50
<i>Oscillatoria</i> spp.	X	X	100
<i>Planktothrix</i> cf. <i>agardhii</i> (Gom.) Anag. and Kom.	X		50
<b>CRYPTOPHYCEAE</b>			
<i>Chroomonas acuta</i> Utermöhl	X	X	100
<i>Chroomonas</i> spp.	X	X	100
<i>Cryptomonas marsonii</i> Skuja	X	X	100
<i>Cryptomonas ovata</i> Ehr.	X	X	100
<i>Cryptomonas</i> sp.	X	X	100
<b>EUGLENOPHYCEAE</b>			
<i>Colacium</i> sp.	X	X	100
<i>Trachelomonas volvocina</i> Ehr.		X	50
<i>Trachelomonas</i> sp.		X	50
<b>CHRYSOPHYCEAE</b>			
<i>Chromulina</i> sp.		X	50
<i>Mallomonas</i> sp.	X	X	100
<b>DINOPHYCEAE</b>			
<i>Ceratium</i> cf. <i>furcoides</i> (Levander) Langhans	X		50
<i>Peridinium volzii</i> Lemm.	X		50
<i>Peridinium</i> sp.	X		50
<b>RHODOPHYCEAE</b>			
<i>Audouinella</i> sp.		X	50
<b>TOTAL</b>	<b>48</b>	<b>47</b>	

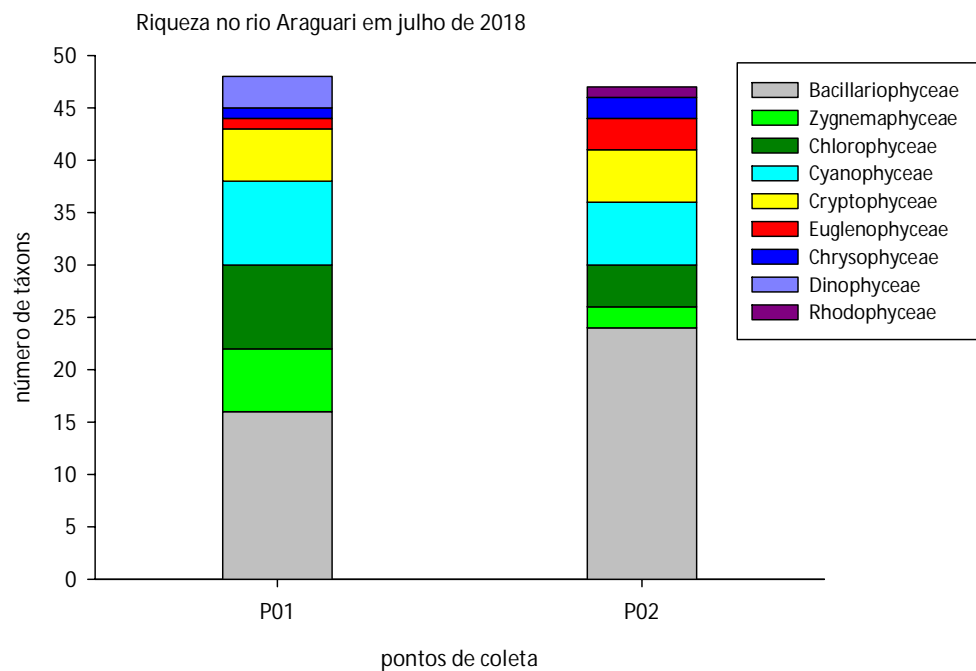


**Table 22 – Phytoplankton species richness, by class, on the collection points at rio Araguari, in July 2018.**

CLASSES	P01	P02
Bacillariophyceae	16	24
Zygnemaphyceae	6	2
Chlorophyceae	8	4
Cyanophyceae	8	6
Cryptophyceae	5	5
Euglenophyceae	1	3
Chrysophyceae	1	2
Dinophyceae	3	0
Rhodophyceae	0	1
<b>TOTAL</b>	<b>48</b>	<b>47</b>

According to (the table above and the following figure), the largest species richness occurred in point P01, 48 taxa, and the smallest number of taxa, occurred in point P02 with 47 taxa.

The classes that have the largest numbers of taxa were: Bacillariophyceae and Cyanophyceae, with values fluctuating from 16 to 24 and from six to eight taxa, respectively.



**Figure 45 – Richness of phytoplankton species at Araguari River on July 2018.**

The data of total density and relative abundance (%), showed that the point P02 had the highest overall density 1,013,133 ind./L, where 942,449 ind./L correspond to class Cryptophyceae. The point P01 presented the lower density with 997,425 ind./L, where 942,449 ind./L belong to class Cryptophyceae.

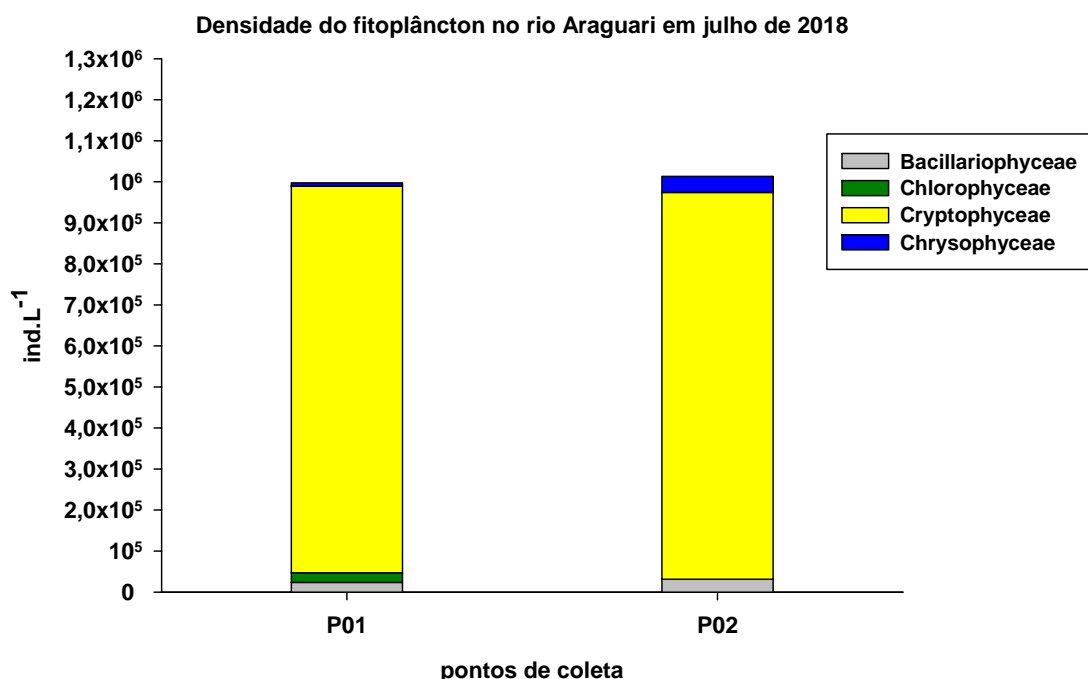
**Table 23 – Total density (ind./L) of the taxa at all classes, in the collection points at rio Araguari, on July 2018.**

Táxons	P01	P02
<b>BACILLARIOPHYCEAE</b>		
<i>Cyclotella pseudostelligera</i> Hust.	7.854	0
<i>Cyclotella stelligera</i> Cleve & Grun.	7.854	15.707
<i>Frustulia vulgaris</i> (Thw.) De Toni	0	7.854
<i>Gomphonema parvulum</i> var. <i>lagenula</i> Freng.	0	7.854
<i>Nitzschia palea</i> (Kütz.) W.Sm.	7.854	0
<b>CHLOROPHYCEAE</b>		
<i>Schroederia judayi</i> Smith	15.707	0
<i>Closteriopsis acicularis</i> (Sm.)	7.854	0
<b>CRYPTOPHYCEAE</b>		
<i>Chroomonas acuta</i> Utermöhl	196.344	15.707
<i>Chroomonas</i> spp.	251.320	298.442
<i>Cryptomonas marsonii</i> Skuja	109.952	54.976
<i>Cryptomonas ovata</i> Ehr.	15.707	109.952
<i>Cryptomonas</i> sp.	369.126	463.371
<b>CHRYSOPHYCEAE</b>		
<i>Chromulina</i> sp.	0	39.269
<i>Mallomonas</i> sp.	7.854	0
<b>TOTAL</b>	<b>997.425</b>	<b>1.013.133</b>

**Table 24 – Total density of Classes in collecting points in rio Araguari, in July 2018.**

CLASSES	P01	P02
Bacillariophyceae	23.561	31.415
Chlorophyceae	23.561	0
Cryptophyceae	942.449	942.449

CLASSES	P01	P02
Chrysophyceae	7.854	39.269
<b>TOTAL</b>	<b>997.425</b>	<b>1.013.133</b>



**Figure 46 – Total density by class in collecting points at Araguari River on July 2018.**

The highest value of the diversity index (Shannon-Wiener) was obtained in point P01, 2.31 bits/ind. and the smallest in point P02, 2.09 bits/ind. For the equability values, it was obtained the greater equability in point P01, 0.667 and less in point P02, 0.659.

### Zooplanktonic Community

In July 2018 campaign there were identified 16 zooplankton taxa. The highest richness was obtained for the Group Cladocera, with seven taxa representing 43.8% of the total. Six taxa were recorded from Rotifera (37.5%) and three from Copepoda (18.8%) (as the following table).

With respect to richness, considering the sampled points, the biggest record occurred at P01, with 16 taxa while in P02 there were sampled 15 taxa (as the following figure).

The Cladocera group was prevalent, with richness of seven taxa at both sampled points, representing approximately 45% of the total identified taxa (as the following figure). The families with the highest number of species were Daphniidae, with three taxa and Sididae with two taxa. Among the most representative species, *Daphnia gessneri* (Herbst, 1967) and *Diaphanosoma birgei* (Korinek, 1981) were those which presented higher abundance in both points.

It is worth mentioning that only one species that occurred on P01 and did not occur in P02 was *Brachionus falcatus* (Zacharias, 1898) belonging to the Group of Rotifera. In addition very similar values were obtained as of total richness, as of total abundance at both points, this may be due to the proximity of the sampling points.

**Table 25 – Absolute abundance (ind. m<sup>-3</sup>) from zooplanktonic taxa at the sampled points in Araguari river on July 2018.**

<b>Táxons</b>	<b>P01</b>	<b>P02</b>
<b>ROTIFERA</b>		
<b>Ordem Ploima</b>		
<b>Família Asplanchnidae</b>		
<i>Asplanchna priodonta</i> (Gosse, 1850)	93,4	77,2
<b>Família Brachionidae</b>		
<i>Brachionus falcatus</i> (Zacharias, 1898)	62,3	0
<i>Keratella cochlearis</i> (Gosse, 1851)	31,1	61,8
<b>Família Trichotriidae</b>		
<i>Macrochaetus sericus</i> (Thorpe, 1893)	24,9	30,9
<b>Ordem Flosculariaceae</b>		
<b>Família Conochilidae</b>		
<i>Conochilus unicornis</i> (Rousselet, 1892)	218,0	270,2
<b>Família Hexarthridae</b>		
<i>Hexarthra intermedia</i> (Wiszniewski, 1929)	49,8	38,6
<b>COPEPODA</b>		
<b>Ordem Cyclopoida</b>		
Náuplio Cyclopoida	124,6	193,0
Copepodito Cyclopoida	249,1	386,0
<b>Família Cyclopidae</b>		
<i>Thermocyclops minutus</i> (Lowndes, 1934)	218,0	270,2
<b>Ordem Calanoida</b>		
Náuplio Calanoida	112,1	154,4
Copepodito Calanoida	404,8	486,4
<b>Família Diaptomidae</b>		
<i>Argyrodiaptomus furcatus</i> (Sars G.O., 1901)	155,7	92,6
<i>Notodiaptomus iheringi</i> (Wright, 1935)	317,6	316,5
<b>CLADOCERA</b>		

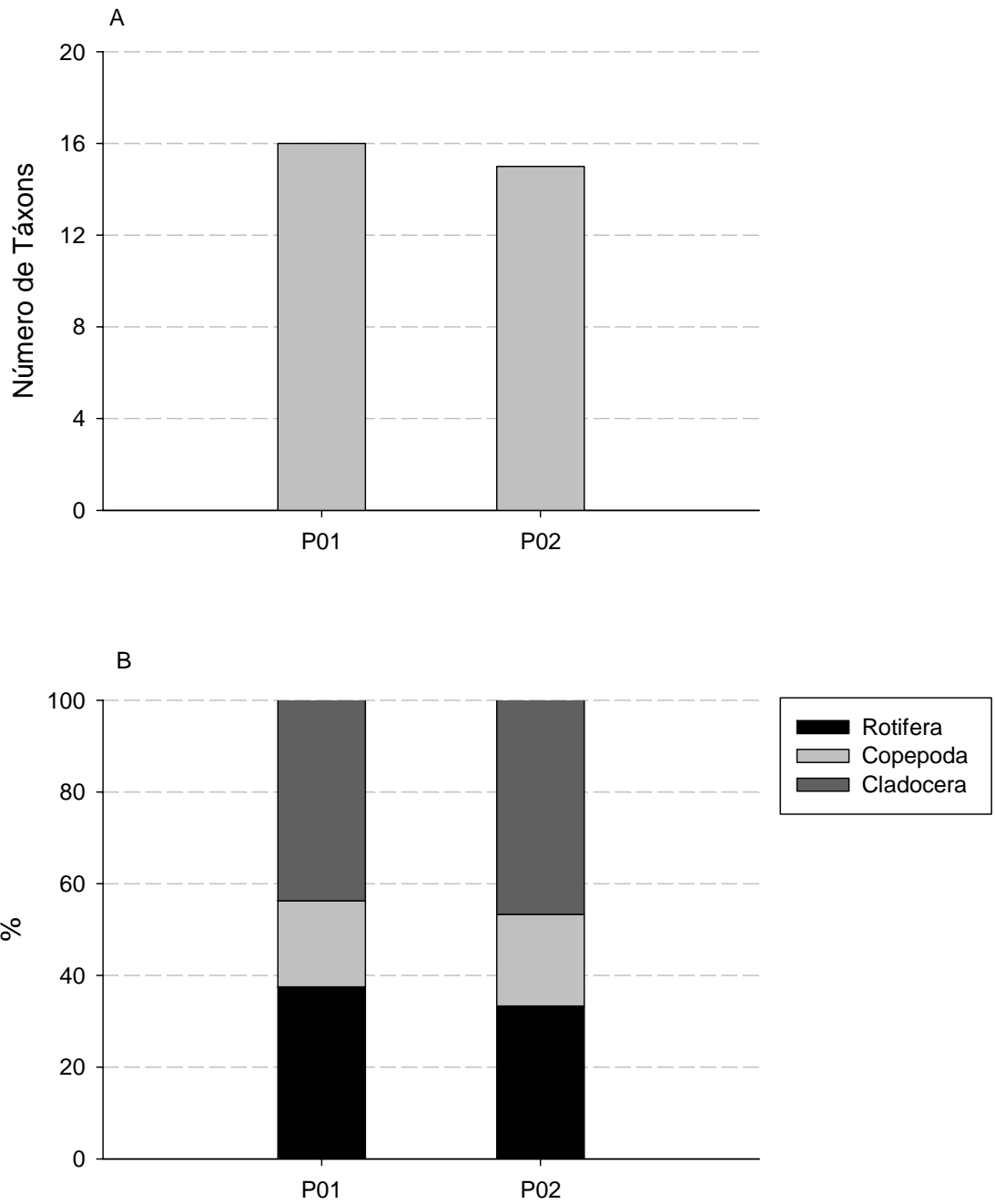
<b>Táxons</b>	<b>P01</b>	<b>P02</b>
<b>Família Bosminidae</b>		0,0
<i>Bosmina hagmanni</i> (Stingelin, 1904)	124,6	154,4
<b>Família Daphniidae</b>		
<i>Ceriodaphnia cornuta cornuta</i> (G.O. Sars, 1885)	37,4	30,9
<i>Ceriodaphnia silvestrii</i> (Daday, 1902)	155,7	162,1
<i>Daphnia gessneri</i> (Herbst, 1967)	672,6	887,9
<b>Família Moinidae</b>		
<i>Moina minuta</i> (Hansen, 1899)	49,8	38,6
<b>Família Sididae</b>		
<i>Diaphanosoma birgei</i> (Korinek, 1981)	186,8	193,0
<i>Diaphanosoma spinulosum</i> (Herbst, 1975)	24,9	23,2

**Table 26 – Total richness of the total zooplanktonic taxa at the sampled points in Araguari river on July 2018.**

<b>Grupos</b>	<b>P01</b>	<b>P02</b>
<b>Rotifera</b>	6	5
<b>Copepoda</b>	3	3
<b>Cladocera</b>	7	7
<b>Total</b>	16	15

**Table 27 – Relative richness relativa of the total zooplanktonic taxa at the sampled points in Araguari river on July 2018.**

<b>Grupos</b>	<b>P01</b>	<b>P02</b>
<b>Rotifera</b>	37,5	33,3
<b>Copepoda</b>	18,8	20,0
<b>Cladocera</b>	43,8	46,7

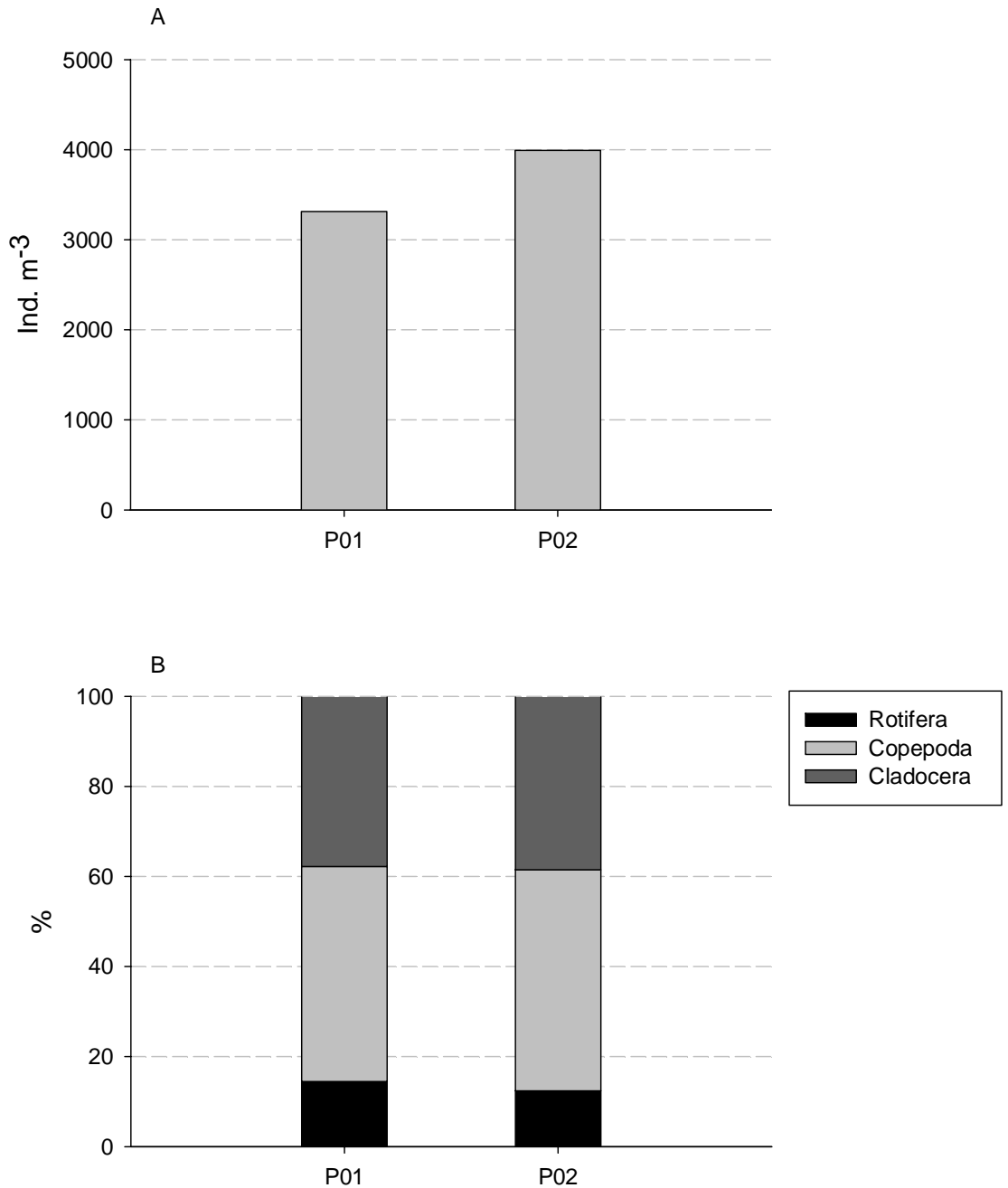


**Figure 47 – Variation of total and relative richness taxa, A and B, respectively, from zooplanktonic community at the sampling points in the Araguari River on July 2018.**

Small amplitude variation was observed in absolute and relative abundance of zooplankton, where the smallest value occurred in point P01 with 3,313 ind.m-3 compared to 3,991 ind.m-3 the P02 (as shown in following figure).



With respect to relative abundance, Copepoda was the dominant group in both points, reaching 47% of the whole community in P01 and 49% in P02 (as figure and table below), the less dominant group was the Rotifera with less than 15% for both points.



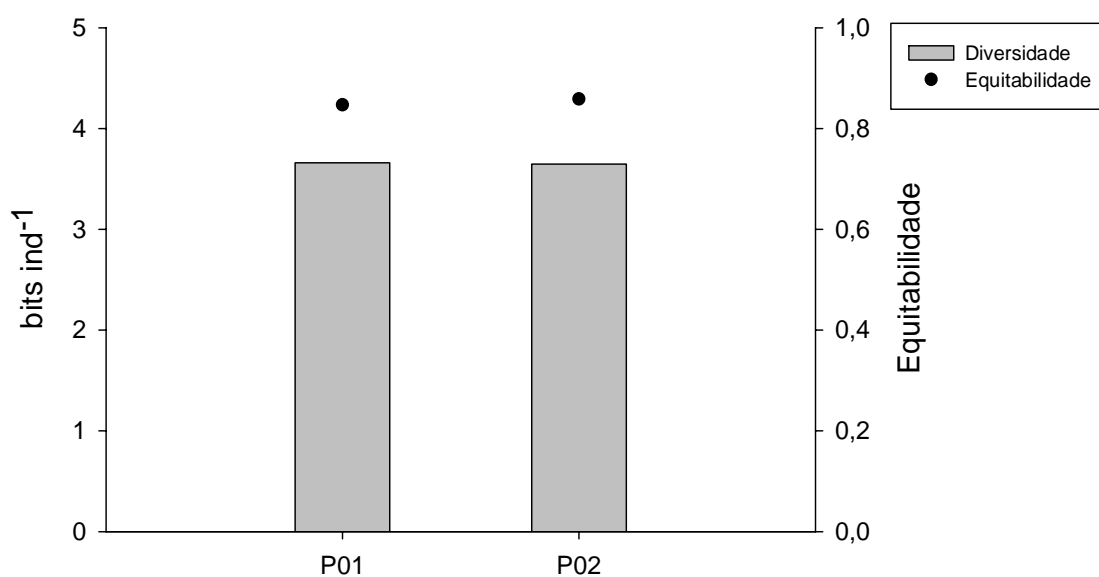
**Figure 48 – Variation of total and relative abundance, A and B figure, respectively, from zooplanktonic community at the sampling points in the Araguari River on July 2018.**

**Table 28 – Relative abundance of the zooplanktonic taxa at the sampling points in the Araguari River on July 2018**

Grupos	P01	P02
Rotifera	14,5	12,4
Copepoda	47,7	49,1
Cladocera	37,8	38,5

The results obtained for the used ecological indexes showed the occurrence of almost identical values of diversity at the sampled points, both up to 3.5 bits ind<sup>-1</sup> (as shown in the following figure). This result was due to more homogeneous distribution of abundance among the taxa.

The results obtained for the uniformity also reflected the patterns observed in the Community (as figure and table below).



**Figure 49 – Diversity index and evenness of zooplanktonic taxa at the sampling points in rio Araguari on July 2018**

**Table 29 – Diversity and evenness of zooplanktonic taxa at the sampling points in rio Araguari on July 2018**

Índices	P01	P02
Diversidade	3,66	3,65
Equitabilidade	0,85	0,86

The zooplankton species found do not differ from species raised in secondary data, being these, widely distributed by the Paranaíba River basin which the Araguari River belongs to. With respect to water quality, species recorded as *Daphnia gessneri* (Copepoda), *Notodiaptomus iheringi* (Calanoida) and the juvenile forms of Calanoida (Copepodito), found in greater abundance at both points, for being filters and normally associated with oligotrophic waters, one can infer that the Araguari River offers a good quality, for the water parameters classification.

### Benthic Macroinvertebrates Community

A total of seven taxa, belonging to the groups Mollusca (Bivalvia), Annelida (Oligochaeta and Hirudinea) and Arthropoda (Ostracod and Diptera) have been identified in sediment samples of July 2018 campaign.

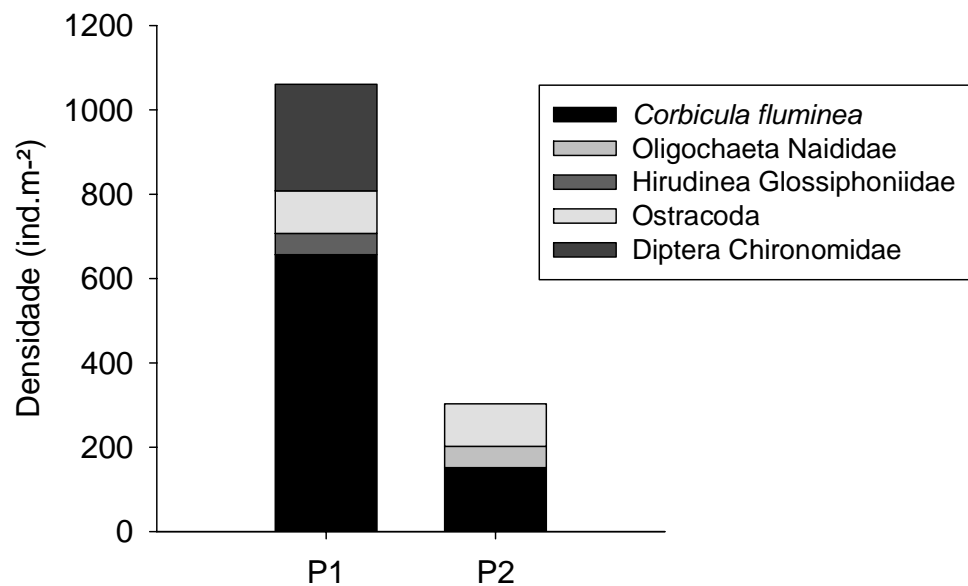
The P01 point presented the greatest richness taxa ( $S = 6$ ), whereas in P02 was observed only three taxa. *Corbicula fluminea* and Ostracod presented 100% of occurrence in the sampling points. The taxonomic list, as well as the richness values and frequency of occurrence of Macroinvertebrates found are presented in the following table.

**Table 30 – List of occurrence of benthic macroinvertebrates found at the sampled points in Amador Aguiar I hydroelectric plant on July 2018. FO = frequency of occurrence**

Táxons	P01	P02	FO (%)
<b>Filo Mollusca</b>			
<b>Classe Bivalvia</b>			
<b>Ordem Veneroida</b>			
<b>Família Corbiculidae</b>			
<i>Corbicula fluminea</i>	X	X	100
<b>Filo Annelida</b>			
<b>Classe Clitellata</b>			
<b>Subclasse Oligochaeta</b>			
<b>Ordem Haplotaxida</b>			
<b>Família Naididae</b>		X	50
<b>Subclasse Hirudinea</b>			
<b>Ordem Rhynchobdellida</b>			
<b>Família Glossiphoniidae</b>	X		50
<b>Filo Arthropoda</b>			
<b>Subfilo Crustacea</b>			
<b>Classe Maxillopoda</b>			

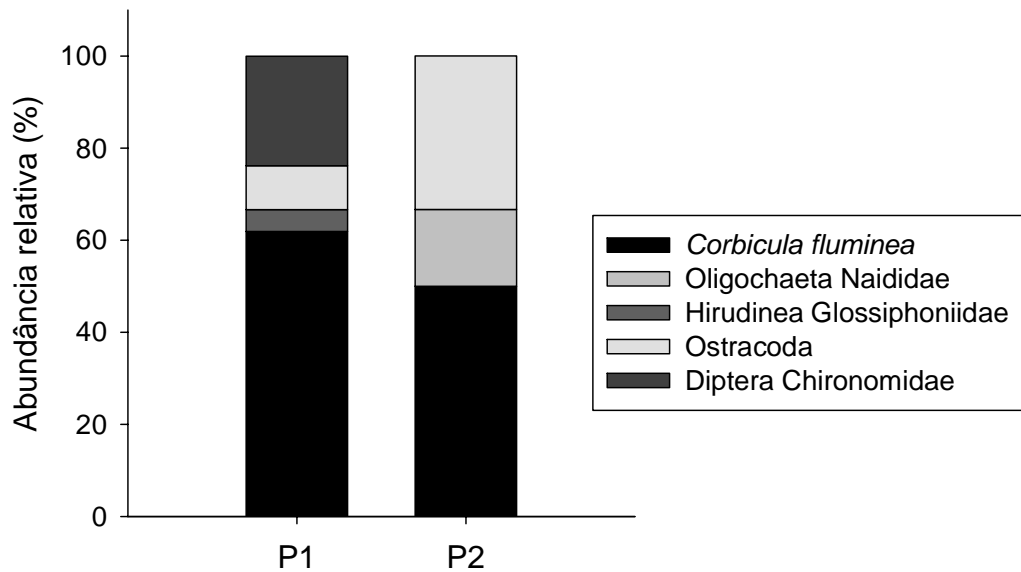
<b>Subclasse Ostracoda</b>	X	X	100
<b>Subfilo Hexapoda</b>			
<b>Classe Insecta</b>			
<b>Ordem Diptera</b>			
<b>Família Chironomidae</b>			
<b>Subfamília Chironominae</b>			
<i>Pseudochironomus</i>	X		50
<i>Tanytarsus rhabdomantis</i>	X		50
<b>Subfamília Tanypodinae</b>			
<i>Ablabesmyia</i> (Karelia) 2	X		50
<b>Taxa richness</b>	<b>6</b>	<b>3</b>	

In relation to the density of benthic macroinvertebrates, the value was also higher in P01 (1,061 ind.m<sup>-2</sup>), when compared to P02, with 303 ind.m<sup>-2</sup>. This fact is due to the high density of *Corbicula fluminea* found in P01 (as shown in figure below).



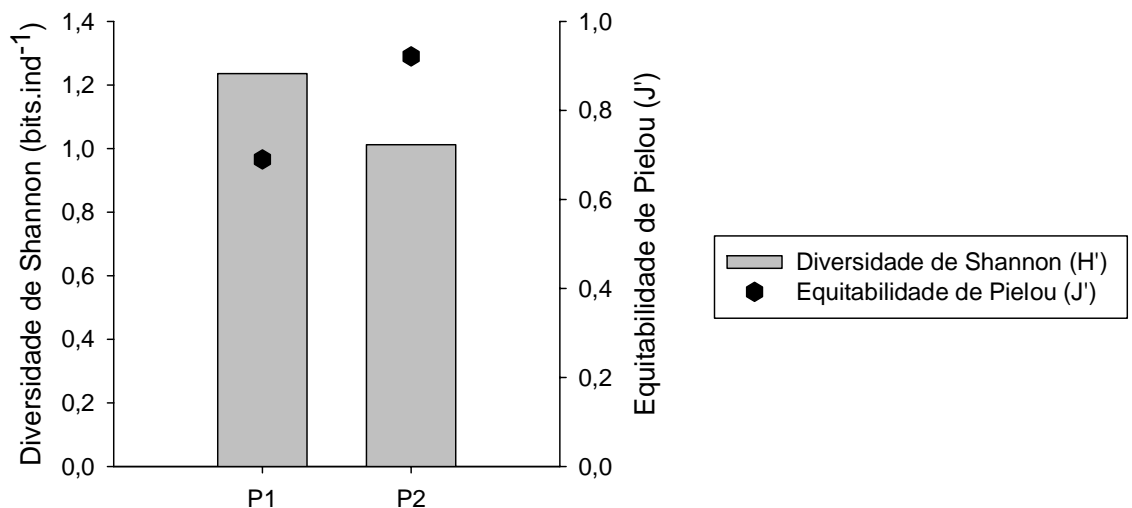
**Figure 50 – Density of benthic macroinvertebrates found at sampled points in the Araguari River on July 2018**

The following figure shows the data of relative abundance of Macroinvertebrates groups found at the sampled points. Once again, the predominance of the bivalve *Corbicula fluminea* (62% of total abundance) in point P01 is observed. In point P02, *C. fluminea* represented 50% of the taxa, followed by Ostracod with 33% and Oligochaeta Naididae (17%).



**Figure 51 – Relative abundance of benthic macroinvertebrates found at the sampled points in the Araguari River on July 2018**

This condition of one taxon dominance in the P01community was reflected in lower value of equitability for this sampling point (0.69). On the other hand, P01 showed the highest value of diversity (1.236 bits.ind-1). In P02 the smallest diversity index was observed (1.012 bits.ind-1) and greater equitability (0.9213) was found, indicating a less diverse community, however more homogeneous (as shown in figure below).



**Figure 52 – Diversity and evenness of benthic macroinvertebrates found at the sampled points in the Araguari River on July 2018**

In General, the community of benthic macroinvertebrates was characterized by a richness and diversity of taxa relatively low on July 2018. The equitability (evenness),

however, was considered high (values above 0.5), indicating an even distribution among the sampled taxa, or an environmental stability in the short period of time.

There were not found macroinvertebrate species threatened to extinction, endemic species or groups, not even sensitive species or groups. On the other hand, the bivalve clam *Corbicula fluminea*, registered in both sampled points, is an exotic invasive species, originating from China, capable of displaying populations with high densities. They can lead to ecological damage, since they move the native species through competition, and/or economic losses, when cause clogging on urban pipes and on cooling systems of hydropower plants (Darrigran, 2002).

### 8.3.5.1.3 Final Considerations

The values of richness to the phytoplankton community found in P01 and P02 on July 2018 were inferior in respect of the data obtained in the literature. Among the taxa, Rhodophyceae was identified only in this study. The Group of Cryptophyceae was greater abundance and is found throughout the year in various aquatic environments, mainly in tropical Lakes of the region. Organisms belonging to the class Cryptophyceae are opportunists and adapt to the conditions of turbulence (Nabout et al., 2006). The Group of Cyanophyceae, that presented one of the greatest richness, in contrast, showed no significant values of abundance, something that is positively associated with good water quality.

For the zoobenthic community, the values of richness found were inferior in respect of the data obtained in the literature, due to sampling effort undertaken in this work. In this study, the group Rotifera differently from the data of literature was less abundant, this may have occurred due to the amount of points sampled and due to the sampling period in the dry season, where there is a natural decrease of species abundance. Even so, the species *Asplanchna priodonta* (Gosse, 1850), belonging to the Rotifera group, was registered only in this study.

Likewise, the benthic macroinvertebrates had richness low values when compared to the data obtained in the literature, reaching only 14% of the records. Among the taxa, Ostracod was identified only in this study. The macroinvertebrate fauna was characterized by the dominance of anthropic disturbance-tolerant taxonomic groups and by the presence of the invasive bivalve *Corbicula fluminea*. However, it is noteworthy that the organisms found are mainly filters, suggesting that local waters exhibit low levels of suspended particles.

### 8.3.5.2 Fish fauna

#### 8.3.5.2.1 Secondary Data

A secondary bibliography review for the basin of the studied area showed that there are 75 species, distributed in 22 families and 7 orders (Fagundes et al., 2015; Rego, 2008; Sanches et al. 2016). The Ichthyofauna inventory study enabled the seizure of 12 total fish species, about 21% of reported at the basin where the tributaries assessed are located. This low percentage can be explained by the amount and uniformity of the sampled environments, since, in this study, there were sampled only two sections of the dam, at the same sampling points Limnological communities where, obviously, the



species richness is less than natural environments, being more heterogeneous and with greater availability of habitats. Furthermore, till the present date only one campaign in the dry season was held, being possible to have an increase of richness in the next campaign, which will be held in the rainy season.

**Table 31 – List of Ichthyofauna raised through secondary data (Fagundes et al., 2015; Rego, 2008; Sanches et al 2016) and campaign in the collecting sampled points at Araguari River on July 2018.**

Order	Family	Species	Origin	Present study	
Characiformes	Acestrorhynchidae	<i>Acestrorhynchus lacustris</i>	Nativa	X	
		<i>Leporellus vittatus</i>	Nativa		
	Anostomidae	<i>Leporinus amblyrhynchus</i>	Nativa		
		<i>Leporinus elongatus</i>	Nativa		
		<i>Leporinus friderici</i>	Nativa		
		<i>Leporinus microphthalmus</i>	Nativa		
		<i>Leporinus obtusidens</i>	Nativa		
		<i>Leporinus octofasciatus</i>	Nativa		
		<i>Schizodon nasutus</i>	Nativa		
		Bryconidae	<i>Salminus hilarii</i>	Nativa	
		Characidae	<i>Astyanax altiparanae</i>	Nativa	
			<i>Astyanax fasciatus</i>	Nativa	X
			<i>Astyanax shubarti</i>	Nativa	
			<i>Astyanax</i> sp.2		
			<i>Astyanax</i> sp.		
			<i>Bryconamericus stramineus</i>	Nativa	
	<i>Bryconamericus turiuba</i>		Nativa		
	<i>Galeocharax knerii</i>		Nativa		
	<i>Glandulocaudinae</i> sp. 1				
	<i>Hasemania</i> sp. 2				
	<i>Hemigrammus parana</i>		Nativa		
	<i>Knodus moenkhausii</i>		Nativa		
	<i>Moenkhausia costae</i>		Nativa		
	<i>Oligosarcus planaltinae</i>		Nativa		
	<i>Piabina argentea</i>	Nativa			
	Crenuchidae	<i>Characidium gomesi</i>	Nativa		
		<i>Characidium</i> sp. 2			
		<i>Characidium xanthopteron</i>	Nativa		
	Curimatidae	<i>Cyphocharax modestus</i>	Nativa		
		<i>Steindachnerina insculpta</i>	Nativa		
Erythrinidae	<i>Hoplias intermedius</i>	Nativa			
	<i>Hoplias lacerdae</i>	Nativa			
	<i>Hoplias malabaricus</i>	Nativa	X		

Order	Family	Species	Origin	Present study
	Parodontidae	<i>Apareiodon ibitiensis</i>	Nativa	
		<i>Parodon nasus</i>	Nativa	
	Prochilodontidae	<i>Prochilodus lineatus</i>	Nativa	
	Serrasalminidae	<i>Metynnis lippincottianus</i>	Nativa	
		<i>Metynnis maculatus</i>	Nativa	X
		<i>Myleus tiete</i>	Nativa	
		<i>Pygocentrus nattereri</i>	Nativa	
		<i>Serrasalmus maculatus</i>	Nativa	X
Cyprinodontiformes	Poeciliidae	<i>Phalloceros harpagos</i>	Nativa	
		<i>Poecilia reticulata</i>	Não-Nativa	
Gymnotiformes	Gymnotidae	<i>Gymnotus carapo</i>	Nativa	
		<i>Gymnotus sylvius</i>	Nativa	
Perciformes	Cichlidae	<i>Cichla ocellaris</i>	Não-Nativa	
		<i>Cichlasoma paranaense</i>	Nativa	
		<i>Crenicichla jaguarensis</i>	Nativa	
		<i>Geophagus brasiliensis</i>	Nativa	
		<i>Oreochromis niloticus</i>	Não-Nativa	X
Perciformes	Cichlidae	<i>Cichla piquiti</i>	Não-Nativa	
		<i>Cichlasoma paranaense</i>	Nativa	
		<i>Tilapia rendalli</i>	Não-Nativa	
Siluriformes	Auchenipteridae	<i>Trachelyopterus galeatus</i>	Não-Nativa	X
	Callichthyidae	<i>Corydoras difluviatilis</i>	Nativa	
	Heptapteridae	<i>Cetopsorhamdia iheringi</i>	Nativa	
		<i>Imparfinis schubarti</i>	Nativa	
		<i>Pimelodella gracilis</i>	Nativa	
		<i>Rhamdia quelen</i>	Nativa	
		<i>Rhamdiopsis</i> sp.		
	Loricariidae	<i>Hypostomus</i> sp.		
		<i>Hypostomus</i> sp. 1		
		<i>Hypostomus</i> sp. 2		
		<i>Hypostomus strigaticeps</i>	Nativa	
		<i>Microlepidogaster arachas</i>	Nativa	
		<i>Neoplecostomus</i> sp.		
	Pimelodidae	<i>Iheringichthys labrosus</i>	Nativa	
		<i>Pimelodus maculatus</i>	Nativa	X
		<i>Pseudoplatystoma corruscans</i>	Nativa	
	Pseudopimelodidae	<i>Pseudopimelodus mangurus</i>	Nativa	
	Trichomycteridae	<i>Trichomycterus brasiliensis</i>	Não-Nativa	
		<i>Trichomycterus</i> sp. 1		
		<i>Trichomycterus</i> sp. 2		
		<i>Trichomycterus</i> sp. 3		

Order	Family	Species	Origin	Present study
Synbranchiformes	Synbranchidae	<i>Synbranchus marmoratus</i>		

### 8.3.5.2.2 Field Primary Data Collection

#### Methodological approach

The reservoir of the hydroelectric power plant of Amador Aguiar I, previously called Capim Branco I, is located in Araguari River basin, between the cities of Uberlândia and Araguari, in Minas Gerais State. The power plant had its construction started on 2003, and began to operate in 2006, as part of the Energy Complex of Amador Aguiar, along with Amador Aguiar II hydroelectric power plant (Costa, 2006).

The Amador Aguiar I Hydroelectric Plant works with run-of-river system, and has three generators of 80-megawatt, with a total power of 240 megawatts. The reservoir covers an area of 18 square kilometers (Costa, 2006) where the primary data collection was conducted by Ichthyofauna sampling in two selected points, in order to contemplate the Ichthyofauna inventory of this study.

The studied area is inserted into the second most important basin in terms of diversity of Brazilian fish, the Prata basin, with approximately 500 species (Gomiero & Braga, 2006). The upper Paraná River basin, inserted inside the Prata basin, presents approximately 310 species of fishes (Langeani et al., 2007).

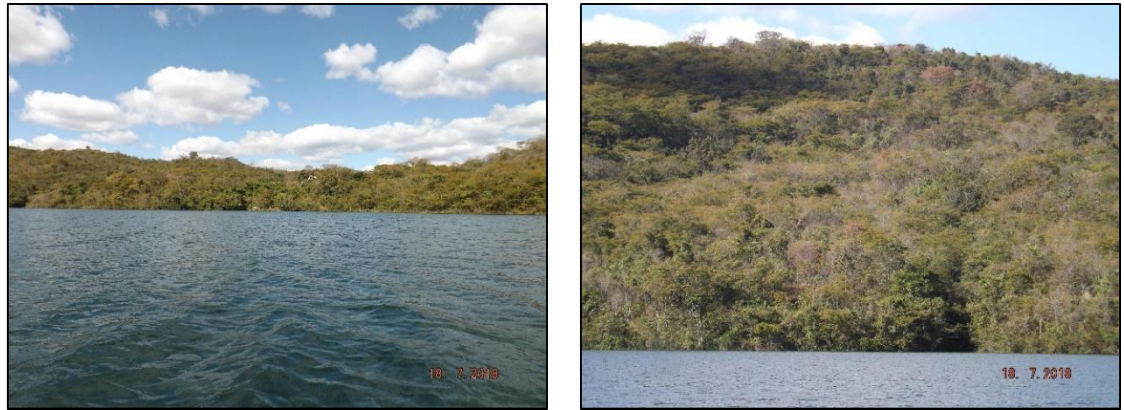
The point 1 is located in the area of the reservoir (18° 50' 39.64" S 48° 6' 43.42" W) with high transparency of the water, the next to the tanks facilities network. There is high depth—approximately 30-40 m, few Macrophytes and submerged vegetation. The surrounding areas with presence of pastures and some forest remnants (as noted in the following figure).



**Figure 53 – Fish fauna sampling at Point 1 in the reservoir of the hydroelectric power plant of Amador Aguiar I, previous Capim Branco I, on Araguari River.**

The Point 2 (49° 18' 46.46"S 48° 5' 39.94" W), located upstream of the Point 1, is also located in the area of the reservoir, showing a lot of similarity between the environmental features, highlighting the main difference, the absence of tanks network

next to the point. The section also features high water transparency, high water depth (about 30-40 m), few Macrophytes and submerged vegetation. The surrounding areas with presence of pastures and some forest remnants (as the following figure).



**Figure 54 – Fish fauna sampling at Point 2 in the reservoir of the hydroelectric power plant of Amador Aguiar I, previous Capim Branco I, on Araguari River**



**Figure 55 – Location of fish fauna sampling points**

**Capture of specimens**

The selection of the equipment and capture effort to sampling points was based on a weighting between operability/efficiency of equipment, fragility of the system to the impact of sampling activities and maximizing the detection of species within the spatio-temporal scale in the campaigns. For catching fishes, there were used two equipment, cast net and gillnets. The cast net with about 3 m in diameter, 120 mm



mesh between nodes, screens (90 x 55 cm; 3.0 mm mesh) and gillnets with different meshes (3, 5, 7, 8, 10, 12 and 14 cm between opposite nodes and 20 meters long).

The effort of each equipment, by sampling point was standardized for each point as: cast net = minimum of 10 bids; gillnet = about 16 consecutive hours of immersion, being installed at dusk and removal at dawn (as shown in figure below). The active search capture methodologies as the drag and screen, could not be performed because the environmental characteristics of the region (depth and absence of favourable banks areas).



**Figure 56 – Equipment used for the fish fauna collection. Gillnets above and cast net use below.**

After the capture, the specimens were identified, measured and returned to the water, being held only one individual of each morphotype for taxonomic laboratory confirmation. These individuals were euthanized by immersion for 10 minutes (or more if necessary) in benzocaine solution buffered pH 7.0 in 125 mg/L concentration checking operculum movement for euthanasia realization (Gimbo et al., 2008) subsequently fixed in 10% formalin and preserved in alcohol 70%.

The data obtained from gillnets sampling were standardized to catch per unit effort (CPUE), where abundances are transformed into individuals per 1000 net meters, by the following formula:  $CPUE_n = (N/EP) * 1000$ , where  $CPUE_n$  = Catch per unit effort numbers;  $N$  = total number of fish caught;  $EP$  = fishing effort, which represents the area in m<sup>2</sup> of gillnets.

The total and relative abundances by order, family and species were calculated for the data generated with the collection apparatus. The species richness ( $d$ ) was estimated by the following equation (Odum, 1985):  $d = (S-1)/\log N$ , where:  $S$  = number of species;  $N$  = number of individuals.

The diversity was estimated through the Shannon index ( $H'$ ), which is based on the proportional abundance of species. This index assumes that the individuals were sampled randomly from a population virtually infinite, and all species of a given location are represented in the sample.

The evenness ( $E$ ) distribution of species catches, estimated for each season, was based on the following equation (Pielou, 1975):  $E = H'/\log S$ , where:  $H'$  = Shannon diversity index;  $S$  = number of species.

The compositions of the communities at the collection points were compared using coefficient of similarity of Bray-Curtis applied to data of abundance of the collected species, to compare the degree of association between fish species and collection by stations .

The presence of non-native species was also evaluated by classifying the species caught as: native – naturally occurring in the studied area, not-native – from other Brazilian basins; and exotic – species from other continents (Langeani et al., 2007).

In order to assess the reproductive structure of the studied river stretches, the fish were classified according to their reproductive guilds, according to Vasconcelos E Colab. (2014). The captured species were classified into sedentary – that do not perform migrations; short-moving migratory species – species that perform small reproductive and migratory shifts and long-moving migratory species – species that move long stretches to reproduce. The trophic position of the species caught, was also determined according to the literature for the alto Paraná basin (Ximenes et al., 2011; Souto et al., 2016).

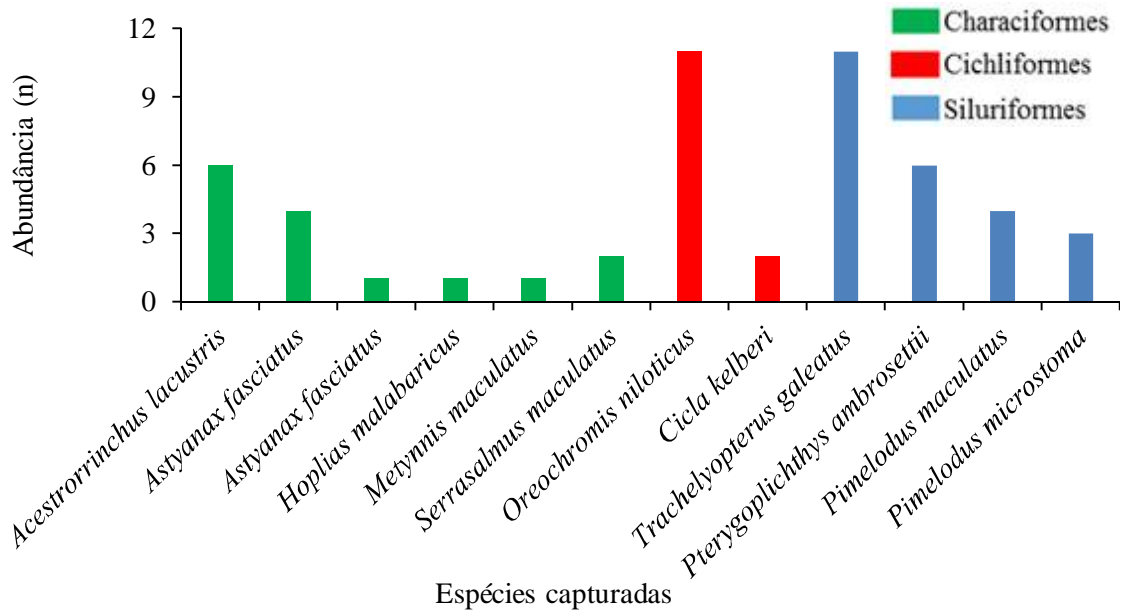
The conservation status of the species was defined based on the List of Endangered Brazilian Fauna (ICMBio 2016), on the Red List of Endangered Fauna of the International Union for Nature Conservation (IUCN, 2017) and on the List of Threatened Fauna Extinction of Minas Gerais (COPAM 2010).

## **Results**

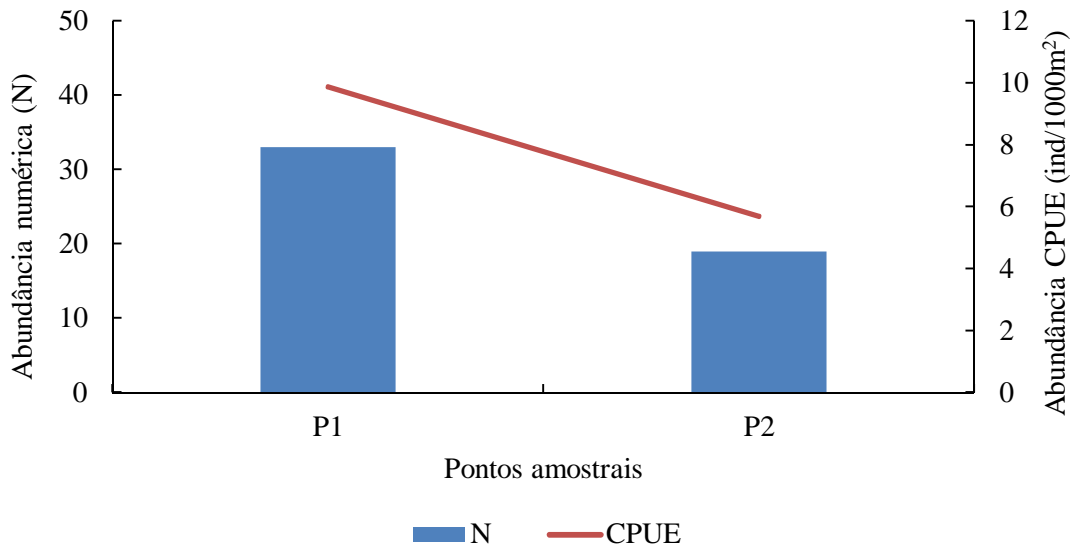
### **List of species**

In the campaign conducted for the Ichthyofauna inventory, there were captured 52 individuals, distributed in 12 species, 8 families and three orders (as figure and table below). Spatially, the 52 individuals captured, 33 (9.88 ind./1000m<sup>2</sup>) were recorded at Point 1 and 19 (5.68 ind./1000m<sup>2</sup>) at Point 2.





**Figure 57 – Abundance of individuals captured**

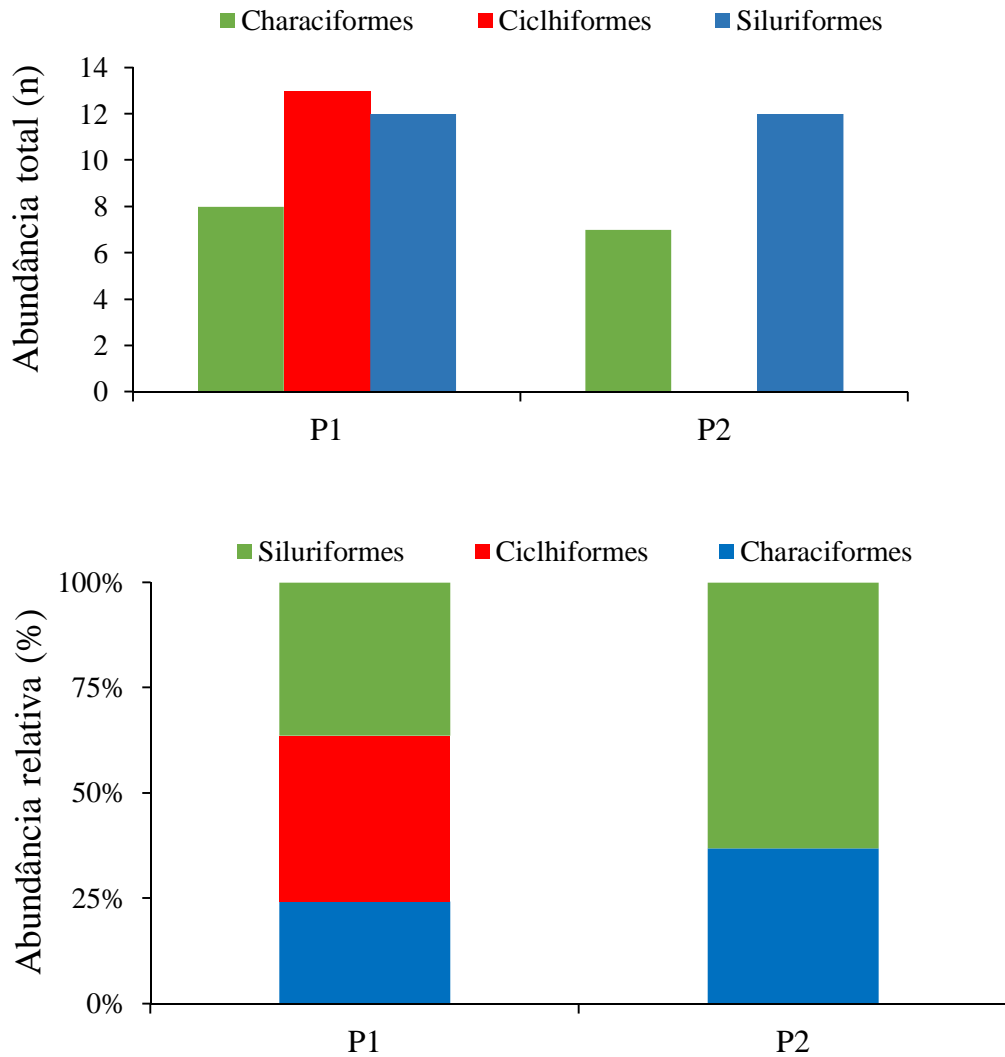


**Figure 58 – Numerical abundance and CPUE of captured individuals in the different sampling points**

**Table 32 – Taxonomic classification, acronyms, numerical abundance and CPUE of sampled Ichthyofauna.**

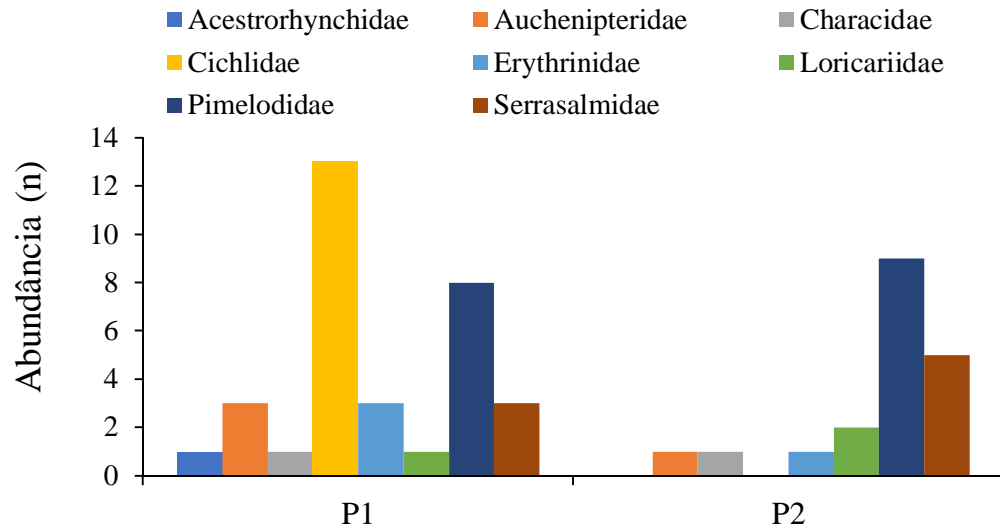
Ordem (3)	Família (8)	Espécies (12)	Nome	Abund.	CPUE
Characiformes	Acestrorhynchidae	<i>Acestrorhynchus lacustris</i>	peixe cachorro	1	0,2994
	Characidae	<i>Astyanax fasciatus</i>	lambari-do-rabo-vermelho	1	0,2994
		<i>Astyanax lacustris</i>	lambari-do-rabo-amarelo	1	0,2994
	Erythrinidae	<i>Hoplias malabaricus</i>	traíra	4	1,1976
	Serrasalmidae	<i>Metynnis maculatus</i>	pacu-cd	6	1,7964
<i>Serrasalmus maculatus</i>		piranha	2	0,5988	
Cichliformes	Cichlidae	<i>Cicla kelberi</i>	tucunaré	2	0,5988
		<i>Oreochromis niloticus</i>	tilápia-do-nilo	11	3,2934
Siluriformes	Auchenipteridae	<i>Trachelyopterus galeatus</i>	babão	4	1,1976
	Loricariidae	<i>Pterygoplichthys ambrosettii</i>	casculo	3	0,8982
		<i>Pimelodus maculatus</i>	mandi-amarelo	11	3,2934
	Pimelodidae	<i>Pimelodus microstoma</i>	mandi-prata	6	1,7964

Of the three orders recorded, Characiformes and Siluriformes occurred in both sampled points and Cichliformes was registered only in Point 1 (as shown in figure below). As expected for the Neotropical region, the orders Characiformes and Siluriformes are the most abundant reflecting the pattern observed in basically all watercourse of this region (Lowe-McConnell, 1987).



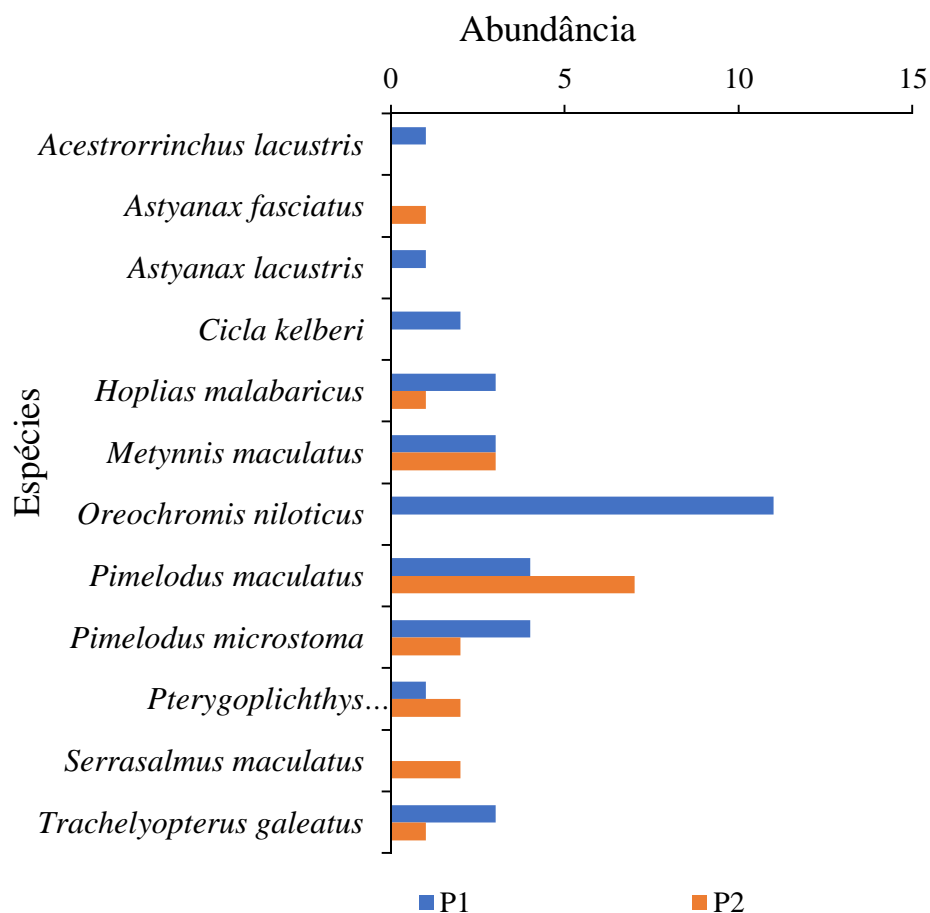
**Figure 59 – Numerical abundance (a) and Relative abundance (b) of the captured individuals in the sampling points**

The most abundant families observed in sampled points were Cichlidae and Pimelodidae in Point 1 and Pimelodidae and Serrasalmidae in Point 2 (as shown in figure below).



**Figure 60 – Abundance of individuals per family caught in sampling points**

The most abundant species observed till the present time in the river stretches were *Oreochromis niloticus* (tilápia-do-Nilo), *Pimelodus maculatus* (mandi-amarelo) and *P. microstoma* (mandi) in Point 1 and *P. maculatus* (mandi-amarelo) and *Metynnis maculatus* (pacu-cd) in Point 2 (as the following figure). The composition of species recorded is consistent with the expected for the type of environment. Generally, in the area under the effect of the impoundment, the species are of large size and with high added value population which suffer depletion, while the small size species and low added value tend to have a population increase, because they are more tolerant to undergone changes (Agostino et al., 2016). *Pimelodus maculatus* is a representative of this phenomenon, since it is one of the most abundant species in most impoundments of Alto Paraná basin (Agostino et al., 2007), with wide reproductive plasticity (Paschoalini et al., 2013).



**Figure 61 – Abundance of caught species in the two sampling points**

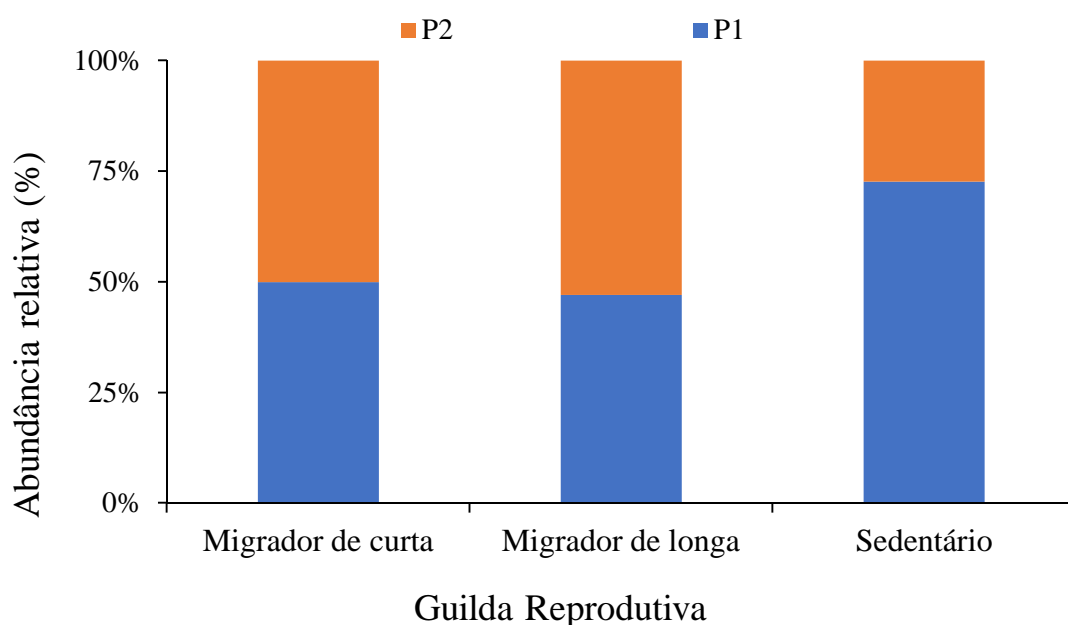
The ecological indices denote that the highest values for richness (number of species and Margalef richness) and species diversity (diversity-Shannon-H ') were observed in Point 1. However, the greatest value of Equitability was observed in Point 2 (as noted in the following table).

**Table 33 – Ecological indices calculated for the sampling points**

Ponto	N° espécies	Abundância	Riqueza	Equitabilidade	Diversidade
P1	10	33	2,574	0,8771	2,02
P2	8	19	2,377	0,8825	1,835

The similarity between the sections is of 46.54% (as shown in the following figure), considered a low value. This result may be due to the presence of the net-tanks close to Point 1, because, although they are next and are environmentally similar, the activity of fish farming in net-tanks have the potential to restructure the fish communities (NOBILE et al., 2018b ).

The data related to the biological aspects of the fish fauna of the region (see table below) report three non-native species to the studied region: *Cichla kelberi* (tucunaré), *Oreochromis niloticus* (tilápia-do-nilo) and *Pterygoplichthys ambrosetii* (cascudo). The results also showed the presence of eight species considered sedentary, two short-moving migratory species, and two long distance moving migratory species, both belonging to the genus *Pimelodus* (*P. maculatus* and *P. microstoma*). Among the evaluated points, the relative abundance of migratory species, both in short and long distance moving migratory was similar, with a difference only in the abundance of sedentary individuals.



**Figure 62 – Relative abundance of species for reproductive Guild captured in different sampling points**

**Table 34 – Popular name and biological aspects: origen, conservation status, as well reproductive and trophic guild of the captured species**

Nome popular	Origem	Status de conservação	Guilda reprodutiva	Guilda trófica
peixe cachorro	Nativo	Não-constante	Sedentário	Piscívoro
lambari-do-rabo-vermelho	Nativo	Não-constante	Migrador de curta	Onívoro
lambari-do-rabo-amarelo	Nativo	Não-constante	Migrador de curta	Onívoro
traíra	Nativo	Não-constante	Sedentário	Piscívoro
pacu-cd	Nativo	Não-constante	Sedentário	Herbívoro
piranha	Nativo	Não-constante	Sedentário	Carnívora
tucunaré	Não-Nativo	Não-constante	Sedentário	Piscívoro
tilápia	Não-Nativo	Não-constante	Sedentário	Detritívoro



<b>Nome popular</b>	<b>Origem</b>	<b>Status de conservação</b>	<b>Guilda reprodutiva</b>	<b>Guilda trófica</b>
babão	Nativo	Não-constante	Sedentário	Carnívoro
casculo	Não-Nativo	Não-constante	Sedentário	Onívoro
mandi-amarelo	Nativo	Não-constante	Migrador de longa	Onívoro
mandi-prata	Nativo	Não-constante	Migrador de longa	Onívoro

The feeding habits of the species, was investigated based on literature, being possible to identify five feeding guilds. The identified guilds which presented the highest number of species was the Guild omnivorous, with five species.

The species diet is an important aspect for understanding the processes involved in the structuring of fish fauna and its relations with its habitat. Most of the fishes in the Neotropical region exhibit different degrees of trophic flexibility, understood as the ability of fish to adjust the diet by the availability of certain food resources in the environment (Lima et al., 2018). In many cases, temporal and spatial components may interfere in the availability of food resources, leading the fish to exercise a great versatility in the form of its exploitation. So, these components can promote changes in occupation of the ecological niches available, causing direct influences in the formation of trophic guilds (Ximenes et al., 2011; Souto et al., 2016). Thus, in response to the fluctuation in food availability, many species alternate from a guild to another over time and space (Lima et al., 2018). Based on the concept above, it is important to note that some species that make up this inventory, may show seasonal variations in their feeding effective guilds, but in attention to the license, the diet of this fish fauna correspond to groups observed in the literature.

Regarding the origin of species, three are considered non-native at the studied area. These species together accounted 16 individuals, about 30.76% of total abundance. In recent decades, the introduction of non-native species has become frequent, motivated by factors such as aquaculture, aquariums or even the removal of geographic barriers (Azevedo-Santos et al., 2011; Azevedo-Santos et al., 2015). These introduced species can cause impacts on the local community and can reduce the population of some communities or even cause local extinction due to competition for food resources and reproductive sites or direct predation (Azevedo-Santos et al., 2015; Nobile et al., 2018a).

Finally, it should be noted that so far there were not reported fish species listed in the Red Book of Endangered Brazilian Fauna (2016), nor on the List of Endangered Fauna of Minas Gerais and on the Red List of Endangered Fauna of the International Union for Nature Conservation (IUCN 2017).

In the following figure there are presented some species of fish fauna recorded in the field monitoring.



*Acestrorhynchus lacustris*



*Astyanax fasciatus*



*Astyanax lacustris*



*Hoplias malabaricus*



*Metynnis maculatus*



*Serrasalmus maculatus*





*Cichla kelberi*



*Oreochromis niloticus*



*Trachelyopterus galeatus*



*Pterygoplichthys ambrosetii*



*Pimelodus maculatus*

*Pimelodus microstoma*

**Figure 63 – Photographic record of the Ichthyofauna species found**

### 8.3.5.2.3 Final Considerations

In General, the fish fauna community of this study resembles the expected for the basins of the Neotropical region with predominance of Characiformes and Siluriformes (Lowe-McConnell, 1987). Based on the results obtained, calls attention the occurrence of non-native/exotic species, mainly in Point 1, located near the fish tanks, as recurring records in the scientific literature (Azevedo-Santos et al., 2015; Nobile et al., 2018a), agents promoters of various impacts on the native fauna.

Another important point, however, positive, was the record of migratory species of short and long distances, as examples of curimba (*Prochilodus lineatus*) and piau (*Leporinus friderici*). This information gives these water bodies high degree of importance as alternatives to migration routes of species to fish reproduction (Nobile et al 2016), whereas major rivers are commonly used as energy matrix, creating physical barriers that make difficult or block the migratory routes.

The species conservation status does not report any constant species in lists of endangered species. Although not reported, it is important to monitor areas where there are anthropogenic interferences, as well as in areas where enterprises will be installed, allowing the understanding of the populations dynamics and species occurrence assessment that may present some degree of threat.

### 8.3.6 Conservation Units (UC) and Priority Areas for Biodiversity Conservation (APCB)

#### Conservation Units

The National Conservation Units System (SNUC) established by law 9,985, from 18<sup>th</sup> July 2000, defines Conservation Unit as "territorial space and its environmental resources, including jurisdictional waters, with relevant natural features, legally established by the Government, with conservation objectives and limits set under special administration regime, to which apply adequate guarantees of protection." Currently there are ten categories of Conservation Units (UCs) and Protected Areas of Integral Protection and Sustainable Use in Minas Gerais State. The Integral Protection Units goal is to preserve the nature, being admitted only the indirect use of the natural resources, named by: Ecological Station, Biological Reserve, State Park, Natural and Wildlife Refuge Monument. The Sustainable Use Units are intended to reconcile nature conservation with sustainable use of parcel of their natural resources, named by: Environmental Protection Area, State Forests, Sustainable Development Reserve and Private Natural Patrimony Reserves (IEF, 2018).

According to the Article 25 of the Federal Law No. 9,985/2000, the Conservation Units, except the Environmental Protection Area and Private Natural Patrimony Reserve, should have a buffer zone and, when appropriate, ecological corridors.

In addition, according to article 27, the Conservation Units should have a Management Plan, which should cover all conservation unit area, their buffer zone and ecological corridors, including measures to promote their integration with the economic and social life of neighboring communities.

According to the national Resolution CONAMA n° 428/2010, altered as amended by Resolution n° 473/2015, the significant environmental impacts projects licenses that may affect a Conservation Unit (UC) or a Buffer Zone (ZA) should be considered by the environmental agency licensor, on the basis of Environmental Impact Assessment and Environmental Impact Report (EIA/RIMA), and will only be granted after the UC responsible administration authorization or, in the case of Private Natural Patrimony Reserves (RPPN), the responsible creation authorization.

§2° During a period of 5 years, counted from the publication of Resolution n° 473, 11<sup>th</sup> December 2015, the significant environmental impact project licensing, located in a range of 3000 meters from the edge of UC, which ZA is not established, should also procedure as referred to in the caput, with exception of RPPNs, Environmental Protection Areas (APAs) and Consolidated Urban Areas (written by Resolution n° 473/2015).

There were found 5 Conservation Units in the project surrounding cities, according to the following table:

**Table 35 – Conservation Units in the project surrounding cities, with size in hectares, city, state or federal domain, year of creation and the cities which they are included.**

Num	Conservation Units	Size	Domain	Creation	Cities
1	RPPN Cachoeira da Sucupira	41	Federal	2007	Uberlândia
2	Parque Estadual do Pau Furado	2.184	State	2007	Araguari and Uberlândia
3	RPPN Reserva Ecológica do Panga	409	State	1986	Uberlândia
4	RPPN Reserva Britagem São Salvador	9	Federal	2008	Uberlândia
5	RPPN Reserva do Jacob	358	Federal	1997	Nova Ponte

There were not identified any Conservation Units at LD enterprise directly influenced areas. The nearest conservation unit, is called PE Pau Furado, it is located approximately 23.0 km from future dissolving pulp mill area. In addition to the PE Pau Furado, other Conservation Units closer to the LD area are: the RPPN Cachoeira da Sucupira and the RPPN Reserva do Jacob which are located approximately 30 and 33 km of the project area, respectively.

Conservation Units in the project surrounding cities map is presented in the following figure.

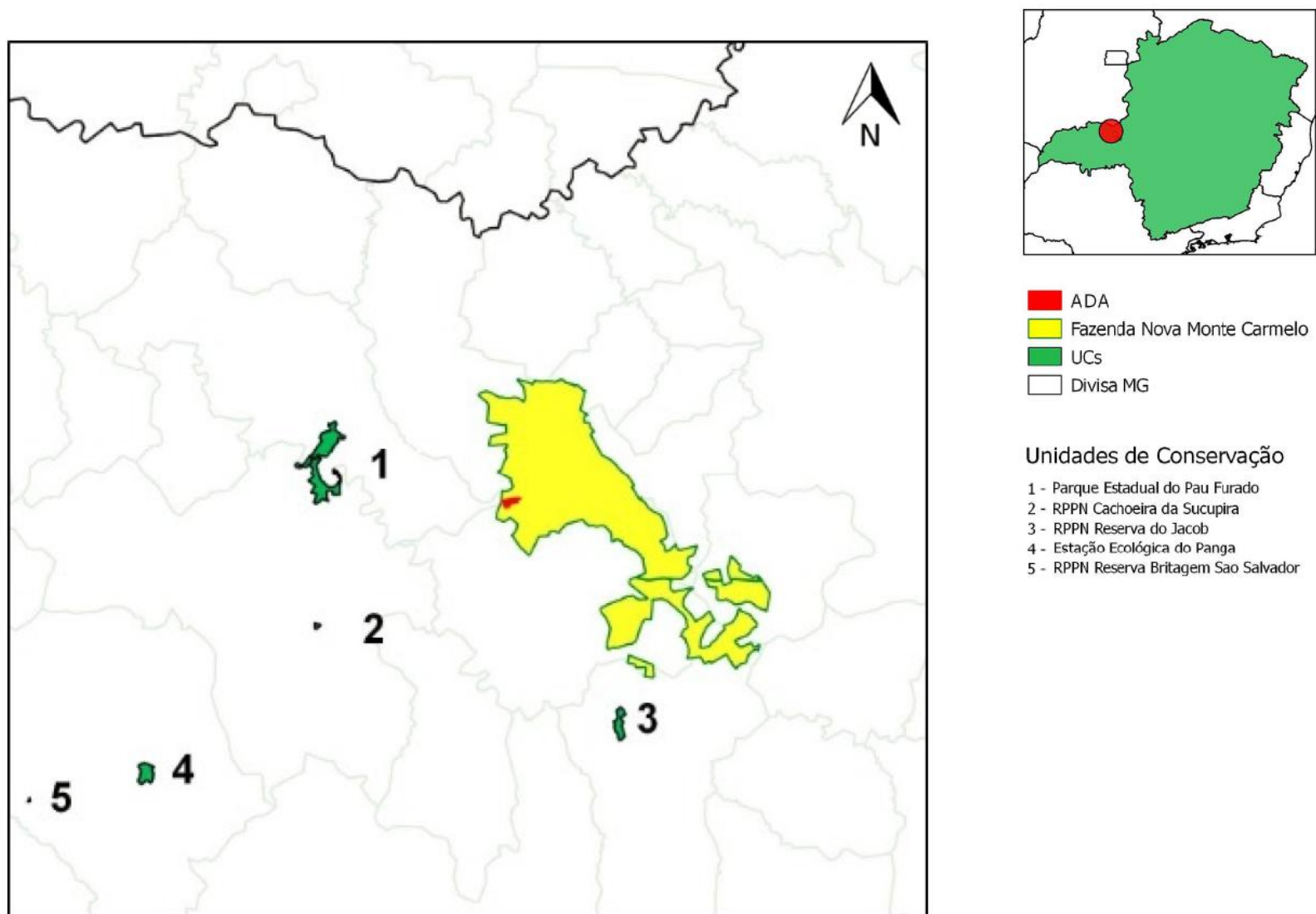


Figure 64 – Conservation Units in the project surrounding map. Source: Google earth, 2018.



The information about the UCs biota without a Management Plan practically doesn't exist. The relevant information on the 3 UCs closest to the project area is described below.

**Parque Estadual do Pau Furado:** It was the first Integral Protection Unit of the Triângulo Mineiro area, created in 2007, as environmental compensation measure resulting from the licensing process of two hydroelectric power plants called Consórcio Capim Branco Energia (CCBE), due to the destruction of hundreds of acres of Araguari river riparian forest for installation those enterprises. It is predominantly occupied by seasonal deciduous forest (*sensu* Ribeiro & Walter 2008), with some riparian vegetation types (riparian and Gallery forest), *cerradão* and *cerrado* restricted sense areas, in addition to secondary *cerradão* vegetation, deciduous and semideciduous forests that area currently in various stages of regeneration. At the Management Plan there were sampled 932 species of fauna and flora within the geographical boundaries of the park area. Among the recorded vertebrates 24 species were mammals, there were 22 species of Anurans, five species of lizards, 11 species of snakes, 162 species of birds and 43 species of fishes (IEF, 2011).

**RPPN Cachoeira da Sucupira:** created on 21<sup>st</sup> December 2007 by IEF Portaria nº 197, on rural property farm called Fazenda Sucupira, until the date of RPPN creation it had, at its Center, a large area of Eucalyptus plantation. It was drawn as a condition for the creation of RPPN, whose appeal should be used for structuring the RPPN park. In this area, until today there is the presence of the *Cerrado* species in regeneration phase, which grew after the removal of eucalyptus trees, as *Imbaúba*, *Copaiba* and *Gratambu*.

From 2010 to 2016 the RPPN was in inventorial ownership and property process, when the property, and therefore the Reserve was acquired by legal firm from José Ernesto Cadelca and others. According to Ana Paula Carvalho Monograph written in 2017, in this RPPN case, the Management Plan should have been delivered by the year 2012, five years after its creation, but not even the technical file of this conservation unit, found in the RPPN creation project elaborated by Eduardo Bevilaqua in 2007, was published neither the Management Plan. Therefore, this conservation unit is not fulfilling its legal function not being possible to extract more information from this area.

**RPPN Reserva do Jacob:** owned by CEMIG Geração e Transmissão S.A. RPPN area has its native vegetation composed by a mosaic of physiognomies, contemplating the Wooded Savanna (*Cerrado* Typical and Dense), Semideciduous Seasonal Forest and Deciduous Seasonal Forest, in addition to areas occupied by man with advanced process of natural regeneration, typical formation of *capoeira*, and areas with predominance of exotic grasses with regeneration of native species. During the reptiles and amphibians inventory at the reserve, there were recorded 12 anuran amphibians' species, 12 species of snakes, four species of lizards, two *amphisbaenas* and one *Chelonia*. For birds, there were recorded 206 species, distributed in 44 families and 16 orders. For mammals there were inventoried 38 species, grouped in 36 genera, 18 families and eight orders (Brandt, 2016).

### **Priority Areas for Biodiversity Conservation (APCB)**

To Prioritize Areas for Conservation, for Sustainable Use and for Reconcile the Benefits of Biodiversity is an instrument of public policy to support decision-making, objectively and participatory, in the planning and implementation of actions such as creating Conservation Units, licensing process, supervision process and promoting sustainable use. The rules to identify such areas and priority actions were formally established by Decree No. 5092 from 05/21/2004 within the tasks of the Environmental Ministry (MMA).

The update the Areas and the Priority Actions, depending on the availability of new data, information and tools, is a priority of the MMA, in line with the strategies recommended by the Convention on biological diversity (CDB), the Action Plan for implementing the National Biodiversity Policy (PAN-Bio) approved at the ninth special meeting (Deliberação CONABIO nº 40 de 07/02/06) and the National Protected Areas Plan (PNAP) which was established by Decree No. 5,758 from 04/13/2006.

In 2006, it was conducted the 1st update of Areas and Priority Actions process for biodiversity conservation.

The updated process of the Areas and Priority Actions for Biodiversity was held simultaneously in all of Brazilian biomes and the coastal and marine zone, and had the support of the following institutions: IBAMA, FUNBIO, Fundação Biodiversitas, GTZ, WWF, TNC, CI, IPAM, ISA, COIAB, CNS, GTA, SOS MATA ATLÂNTICA, GEF CAATINGA, APNE.

Between 2016 and 2018 it is ongoing the 2nd update process of the areas and priority actions for biodiversity conservation. The priority areas for conservation of Cerrado, Pantanal and Caatinga biomes have been updated through Portaria nº 223, from 21<sup>st</sup> June 2016. The areas of other biomes are still in the process of being updated.

The LD enterprise area is not inserted in any Priority Area for Biodiversity Conservation.

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