Nativa, Sinop, v.5, n.5, p.320-329, set./out. 2017.
Pesquisas Agrárias e Ambientais
DOI: 10.5935/2318-7670.v05n05a04
http://www.ufmt.br/nativa

ISSN: 2318-7670

Biodiversity in urban green space: a case study in the neotropics

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Recebido em março/2017; Aceito em maio/2017.

ABSTRACT: Green areas have become important for biodiversity conservation due to the increase in urban areas and to the fragmentation of natural environments. Our objective was to identify animal and plant species occurrence in a green area surrounded by industries in the county of Cuiabá MT Brazil. We sampled 142 species of plant, mammals, reptiles and birds. Four animal species had been introduced and one species comprised seasonal migration from the northern hemisphere. Species occurrence, such as *Pistia stratiotes*, *Curatella americana*, *Eupetomena macroura* and *Ortalis canicollis* indicated Cuiabá as an ecotone of the Cerrado and the Pantanal. There is, consequently, an ecological importance of the study area for harboring vast biodiversity within a 30-hectare area surrounded by industries. Cuiabá features expansion areas for housing development and commerce which trigger increase in green space and biodiversity losses. No public administration exists for the care for the study area as a biodiversity conservation space and recreation.

Keywords: conservation, ecotone, protected areas.

Biodiversidade em espaço verde urbano: estudo de caso em região neotropical

RESUMO: Áreas verdes tornam-se importantes para a conservação da biodiversidade animal e vegetal à medida que áreas urbanas crescem e o ambiente natural torna-se fragmentado. O objetivo deste estudo foi identificar a ocorrência de espécies de animais e plantas em uma área verde circundada por indústrias em Cuiabá, MT, Brasil. Nós amostramos 142 espécies de plantas, mamíferos, répteis e aves. Quatro espécies de animais eram introduzidas e uma era migrante sazonal do Hemisfério Norte. A ocorrência de espécies tais como *Pistia stratiotes*, *Curatella americana*, *Eupetomena macroura* e *Ortalis canicollis* indicou Cuiabá como um ecótono de Cerrado e Pantanal. Assim, existe importância ecológica da área de estudo por abrigar vasta biodiversidade dentro de 30 hectares circundados por indústrias. Cuiabá está expandindo áreas para moradia e comércio, o que pode aumentar a perda de espaços verdes e biodiversidade. Não existe manejo público para cuidar da área de estudo como um espaço para a conservação da biodiversidade e oportunidades recreativas.

Palavras-chave: conservação, ecótono, áreas protegidas.

1. INTRODUCTION

The conversion of the Earth's land surface for urban use is one of the most irreversible human impacts on global biosphere (SETO et al., 2011). Urbanization brought forth changes in land-cover, hydrological systems, biogeochemistry, climate and biodiversity (GRIMM et al., 2008). Worldwide urban expansion is one of the primary causes of habitat loss and species extinction (HAHS et al., 2009).

Therefore, urbanization is actually one of the most relevant threats to biodiversity worldwide (PRETTY et al., 2009) in several developing countries (SETO et al., 2000). Taking the form of housing development in the United States, it is a major threat to protected areas (RADELOFF et al., 2010).

Urban areas affect local climate through modifications in surface albedo and evapotranspiration, whilst increasing use of aerosols and anthropogenic heat sources provide elevated temperatures (ARNFIELD, 2003) and changes in precipitation patterns (SHEPHERD et al., 2002). Urban areas and complex landscapes, within which green or open areas are seen as valuable for human well-being as well as wildlife, are greatly modified (PICKETT et al., 2004). Thus, the association of biodiversity and urban ecosystems has usually concerned the impact of urbanization on biodiversity (SAVARD et al., 2000). Anyway, many cities have a network of habitat fragments or urban greenways comprising areas of semi-natural habitats, secondary succession, ruderal and pioneer environments and open areas (ANGOLD et al., 2006).

These habitats, either stable or transient, may be important features for biodiversity (MCINTYRE et al., 2001). Another benefit is the primary contact with biodiversity and natural environment for many people (JORGENSEN et al. 2002),

and may influence people's physical and mental well-being (JACKSON, 2003). They also encourage the use of outdoor spaces, increase social integration and interaction among neighbors (COLEY et al., 1997), with several opportunities for recreations (EHRENFELD, 2000). On the other hand, these habitats help in microclimate stabilization, air and water purification, wind and noise filtering (CHIESURA, 2004) and may be valuable for their possible function as corridors and stepping stones to facilitate species dispersal (KIRBY, 1995). Despite the above benefits, many urban green spaces are disappearing (YLI-PELKONEN; NIEMELA, 2005).

Although the green city is an ideal of universal appeal that transcends temporal, spatial and cultural divides (HESTMARK, 2000), conflicts with conservation aims emerge (ZHAO et al., 2006) as human populations grow extraordinarily, especially in developing countries (MEA, 2005; UNITED NATIONS, 2008). Urban green spaces deserve more attention and support for policies and practices (JIM, 2004). On the other hand, low appreciation of green spaces is reflected in recent budget cuts for their maintenance (TYRVAINEN; VAANANEN, 1998).

Urban growth changes landscapes and related biodiversity patterns at city level, the backland (rural)-urban interface and even at regional and global scales, due to the cities' ecological footprint (GRIMM et al., 2008). Since urbanization is a major global trend, the question of whether and to what extent, species of animals and plants may survive in urban settings becomes increasingly vital (KOWARIK, 2011). As many convincing arguments already exist regarding the need to prevent biodiversity losses in (semi-) natural landscapes that are affected by urban growth (HANSEN et al., 2005), current focus lies on species occurrence in an urban green space in a neotropical area. The Neotropical zone is the biogeographic region that includes South and Central America, the Mexican lowlands, the Caribbean islands, and southern Florida, and shares many plant and animal groups.

Current study identifies animal and plant species occurrence in a green area surrounded by industries in the county of Cuiabá MT Brazil.

2. MATERIAL AND METHODS

2.1. Study area

Current study area, a 33-hectare stretch belonging to the Municipality, is a Cerrado remnant in the Industrial District of the city of Cuiabá (Figure 1). The administrative regions of Cuiabá were established by Law 3262 of the 11th January 1994 (CUIABÁ, 1994). Cuiabá is a Brazilian city in an ecotone area comprising the Cerrado (Brazilian savanna) and the Pantanal (wetland), whose origin was due to mining in 1719. However, fast population growth and accelerated urbanization occurred in the 1970s (VILANOVA; MAITELLI, 2009; ROMANCINI, 2011). An ecotone is a transition area between two biomes where two communities meet and integrate, or rather, a transition area between the Pantanal and the Cerrado.

Cuiabá (15°35' S; 56°06' W), the capital of the state of Mato Grosso, at its southern tip, lies near the border of the Pantanal and has an estimated population of approximately 569,830 people with a population density of 157.66 per km^2 (IBGE, 2014). The area, totaling 3,495.4 km^2, with an urban area of 258.88 km^2, lies south of the county, at the left side of the Cuiabá River, a tributary of the Paraguay River. Its average

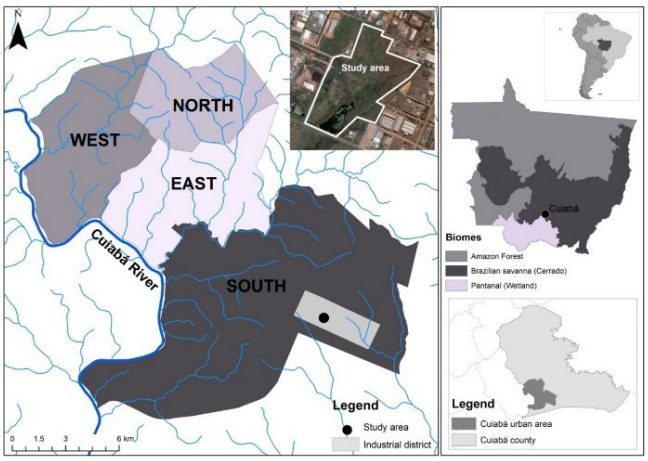

Figure 1. Location of study area in an urban green space in the county of Cuiabá, MT, Brazil.
Figura 1. Localização da área de estudo em um espaço verde urbano no município de Cuiabá, MT, Brasil.

altitude is 165 m above sea level (MATO GROSSO, 2014b). The landform elements include valleys and small hills with less than 5% slope (CASTRO JR., 1990). Vegetation comprises Cerrado remnants, dense woodland, riparian vegetation and exotic plants, represented by fruit, ornamental grasses in backyards, and city squares (GUARIM NETO, 1991).

According to Köppen's classification, the regional climate is Aw, tropical wet and dry, or savanna climate, whose seasonal regime is controlled mainly by air masses from the tropical zone, especially by the South Atlantic anticyclone factor (NIMER, 1988). The rainfall regime has well defined seasons: dry between May and September (autumn-winter) and wet between October and April (spring-summer), with an average annual rainfall ranging between 1250 mm and 1500 mm (BIUDES et al., 2015). Average annual temperature ranges between 24 and 26°C (MACHADO et al., 2015) with lowest rates during the dry season, when air transported by cold fronts from the south (locally called *friagens*) may persist for several days (BIUDES et al., 2015).

Cuiabá's economy is based on industry and commerce, with special emphasis on the growing tourism market, whereas subsistence crops and horticultural species are cultivated in the agriculture sector (MATO GROSSO, 2014a). The city has an industrial district with 183 industries currently operating, including representatives of the following sectors: rubber, food and animal products, timber processing, concrete artifacts and ceramics, chemicals and gases, metallurgical products and fertilizer production (MATO GROSSO, 2014c). One of several environmental problems in Cuiabá is related to many urban fires, especially during the dry season (MACHADO et al., 2014). They increase the concentration of gaseous and solid material suspended in the air (IAP, 2001), causing acid rain (MARQUES et al., 2006) and affecting the population's health (CARMO et al., 2010).

2.2. Data collection

Field trips occurred in June, August and October 2010. The aquatic and terrestrial plants were identified on the field by identification key, when possible (POTT & POTT, 2000) and botanical material was collected and compared to the material deposited in the Herbarium of the Federal University of Mato Grosso.

Ten transects, measuring 200 meters each, were established in the study area with sampling points at 5-m intervals. Species were sampled in transects using the point-quarter method (Goldsmith and Harrison, 1976). Briefly, each measurement point was divided into four quadrants, and within each quadrant, the distance to the nearest tree and its circumference greater than 20 cm at breast height (1.3 m above ground) were identified.

Direct evidence, such as visual or auditory observations, and indirect evidence, such as tracks, carcasses, food debris and feces, were used for the inventory of medium and large mammals. Bird species were identified by vocalizations and watching. Reptiles and amphibians were identified by intensive search in existing substrates such as leaf litter, fallen logs, rocks, tree bark, bushes, stone slabs and others.

3. RESULTS

Four aquatic plant species, distributed in 4 families were identified in a lake within the study area (Table 1). Twenty-nine species of terrestrial plants distributed in 17 families were found in the study area (Table 2). The most species-rich family was Fabaceae.

Three reptile species distributed in 3 families were identified, but no amphibian was found (Table 3). Nine species of mammals distributed in 8 families were registered (Table 4). Birds were more abundant group in the study area. Ninety-seven bird species distributed in 38 families were registered (Table 5), whilst 49 species were Passeriforms and 48 non-Passeriforms. The most species-rich family was Tyrannidae (16 species), followed by Icteridae (7 species).

4. DISCUSSION

All aquatic plants species identified may also be found in the Pantanal (POTT; POTT, 2000). A checklist reported 242 aquatic plant species distributed in 54 families, with Poaceae, Cyperaceae and Leguminosae as the most species-rich families in the Brazilian Pantanal, whilst the most abundant genera

Table 1. Aquatic plant species in an urban green space in Cuiabá, MT, Brazil.
Tabela 1. Espécies de plantas aquáticas em um espaço verde urbano em Cuiabá, MT, Brasil.

Family	Scientific name	Common name
Araceae	*Pistia stratiotes* L.	Alface-d´água, orelha-de-onça
Asteraceae	*Eclipta prostrata* L.	Erva-de-botão
Typhaceae	*Typha domingensis* Pers.	Taboa
Najadaceae	*Najas guadalupensis* (Spreng.)	Lodo

Table 2. Terrestrial plants species in an urban green space in Cuiabá, MT, Brazil.
Tabela 2. Espécies de plantas terrestres em um espaço verde urbano em Cuiabá, MT, Brasil.

Family	Scientific name	Common name
Annonaceae	*Annona dióica* St. Hil.	araticum, pinha, ata
Apocynaceae	*Himatanthus obovatus* (Müll.Arg.) Woodson	pau-de-leite-do-cerrado
Bignoneaceae	*Jacaranda cuspidifolia* Mart	caroba, jacarandá
Bignoneaceae	*Tabebuia aurea* (Manso) Benth. & Hook. f. ex S. Moore	ipê-amarelo-do-cerrado, para-tudo
Caryocaraceae	*Caryocar brasilense* Camb	Pequi
Cecropiaceae	*Cecropia sp.*	embaúba, imbaúba
Celastraceae	*Salacia crassifolia* (Mart. ex Schult.) G. Don	bacupari
Cobretaceae	*Terminalia* sp.	-
Connaraceae	*Connarus suberosus* Planchon	pau-ferro
Dilleniaceae	*Curatella americana* Linn	Lixeira
Dilleniaceae	*Davilla rugosa* Poir.	cipó-caboclo
Euphorbiaceae	*Cnidoscolus sp.* Pohl	urtiga, cansanção
Euphorbiaceae	*Ricinus communis* L.	mamona
Fabaceae	*Anadenanthera falcata* (Benth.) Speg.	angico-do-cerrado
Fabaceae	*Andira cujabensis* Benth.	angelim-de-morcego
Fabaceae	*Hymenaea stigonocarpa* Mart. ex Hayne	Jatobá
Fabaceae	*Machaerium acutifolium* Vogel	jacarandá
Fabaceae	*Bauhinia* sp.	pata de vaca
Fabaceae	*Platypodium elegans*	amendoim do mato, faveiro
Fabaceae	*Stryphnodendron adstringens* (Mart.) Coville	barbatimão
Fabaceae	*Stryphnodendron obovatum* Benth.	barbatimão
Fabaceae	*Tachigali sp.*	-
Moraceae	*Brosimum gaudichaudii* Trec	mama-cadela
Malvaceae	*Eriotheca gracilipes* (K.Schum.) A.Robyns	paineira-do-campo
Malvaceae	*Urena lobata* L.	malva-roxa
Poaceae	*Guadua paniculata* Munro	bamboo, taboca
Salicaceae	*Casearia sylvestris* Sw.	cafezeiro-do-mato
Simaroubaceae	*Simarouba versicolor* A.St.-Hil.	mata-cachorro
Vockysiaceae	*Vochysia cinnamomea* Pohl.	quina-doce, pau-doce

Table 3. Reptile species in an urban green space in Cuiabá, MT, Brazil.
Tabela 3. Espécies de répteis em um espaço verde urbano em Cuiabá, MT, Brasil.

Family	Scientific name	Common name
Iguanidae	*Iguana iguana* (Linnaeus, 1758)	sinimbú, camaleão
Tropiduridae	*Tropidurus torquatus* (Wied, 1820)	lagartixa
Teiidae	*Cnemidophorus ocellifer* (Spix, 1825)	sardão pequeno, calanguinho

Table 4. Mammal species in an urban green space in Cuiabá, MT, Brazil.
Tabela 4. Espécies de mamíferos em um espaço verde urbano em Cuiabá, MT, Brasil.

Family	Scientific name	Common name
Didelphidae	*Philander opossum* (Linnaeus, 1758)	cuica-de-quatro-olhos
Dasypodidae	*Dasypus novemcinctus* (Linnaeus, 1758)	tatu-galinha
Leporidae	*Sylvilagus brasiliensis* (Linnaeus, 1758)	Tapetí
Canidae	*Canis familiaris* (Linnaeus, 1758)	cão domestico
Cervidae	*Mazama americana* (Erxleben, 1777)	veado-mateiro
Bovidae	*Bos taurus*	boi, vaca
Caviidae	*Cavia aperea* (Erxleben, 1777)	Preá
Caviidae	*Hydrochoerus hydrochaeris* (Linnaeus, 1766)	capivara
Dasyproctidae	*Dasyprocta azara* (Lichtenstein, 1823)	Cutia

Table 5. Bird species in an urban green space in Cuiabá, MT, Brazil.
Tabela 5. Espécies de aves em um espaço verde urbano em Cuiabá, MT, Brasil.

Family	Scientific name	Common name
Anhimidae	*Chauna torquata* (Oken, 1816)	Tachã
Anatidae	*Amazonetta brasiliensis* (Gmelin, 1789)	pé-vermelho
Cracidae	*Ortalis canicollis* (Wagler, 1830)	aracuã-do-pantanal
Podicipedidae	*Tachybaptus dominicus* (Linnaeus, 1766)	mergulhão-pequeno
Ardeidae	*Butorides striata* (Linnaeus, 1758)	socozinho
Ardeidae	*Ardea cocoi* Linnaeus, 1766	garça-moura
Ardeidae	*Ardea alba* Linnaeus, 1758	garça-branca-grande
Ardeidae	*Egretta thula* (Molina, 1782)	garça-branca-pequena
Ardeidae	*Egretta caerulea* (Linnaeus, 1758)	garça-azul
Threskiornithidae	*Mesembrinibis cayennensis* (Gmelin, 1789)	coró-coró
Threskiornithidae	*Phimosus infuscatus* (Lichtenstein, 1823)	-
Threskiornithidae	*Theristicus caudatus* (Boddaert, 1783)	curicaca
Threskiornithidae	*Platalea ajaja* (Linnaeus, 1758)	colhereiro
Ciconiidae	*Mycteria americana* (Linnaeus, 1758)	cabeça-seca
Cathartidae	*Cathartes burrovianus* (Cassin, 1845)	-
Accipitridae	*Gampsonyx swainsonii* Vigors, 1825	gaviãozinho
Accipitridae	*Heterospizias meridionalis* (Latham, 1790)	gavião-caboclo
Accipitridae	*Busarellus nigricollis* (Latham, 1790)	gavião-belo
Accipitridae	*Rupornis magnirostris* (Gmelin, 1788)	gavião-carijó
Falconidae	*Caracara plancus* (Miller, 1777)	caracará
Aramidae	*Aramus guarauna* (Linnaeus, 1766)	carão
Rallidae	*Aramides cajanea* (Statius Muller, 1776)	saracura-três-potes
Rallidae	*Laterallus viridis* (Statius Muller, 1776)	sanã-castanha
Rallidae	*Porphyrio martinica* (Linnaeus, 1766)	frango-d'água-azul
Charadriidae	*Vanellus chilensis* (Molina, 1782)	quero-quero
Scolopacidae	*Tringa solitaria* (Wilson, 1813)	maçarico-solitário
Scolopacidae	Jacanidae	-
Scolopacidae	*Jacana jacana* (Linnaeus, 1766)	jaçanã
Columbidae	*Columbina talpacoti* (Temminck, 1811)	rolinha-roxa
Columbidae	*Columbina squammata* (Lesson, 1831)	fogo-apagou
Columbidae	*Columbina picui* (Temminck, 1813)	rolinha-picui
Columbidae	*Columba livia* (Gmelin, 1789)	pombo-doméstico
Columbidae	*Patagioenas picazuro* (Temminck, 1813)	pombão
Columbidae	*Leptotila verreauxi* Bonaparte, 1855	juriti-pupu
Psittacidae	*Aratinga aurea* (Gmelin, 1788)	periquito-rei
Psittacidae	*Brotogeris chiriri* (Vieillot, 1818)	-
Cuculidae	*Coccycua minuta* (Vieillot, 1817)	chincoã-pequeno
Cuculidae	*Crotophaga ani* (Linnaeus, 1758)	anu-preto
Cuculidae	*Guira guira* (Gmelin, 1788)	anu-branco
Caprimulgidae	*Podager nacunda* (Vieillot, 1817)	corucão
Caprimulgidae	*Nyctidromus albicollis* (Gmelin, 1789)	bacurau
Trochilidae	*Eupetomena macroura* (Gmelin, 1788)	beija-flor-tesoura
Trochilidae	*Thalurania furcata* (Gmelin, 1788)	-
Trochilidae	*Amazilia fimbriata* (Gmelin, 1788)	-
Alcedinidae	*Megaceryle torquata* (Linnaeus, 1766)	-
Alcedinidae	*Chloroceryle amazona* (Latham, 1790)	-
Ramphastidae	*Ramphastos toco* Statius Muller, 1776	tucanuçu
Picidae	*Veniliornis passerinus* (Linnaeus, 1766)	picapauzinho-anão
Picidae	*Piculus chrysochloros* (Vieillot, 1818)	-
Thamnophilidae	*Taraba major* (Vieillot, 1816)	choró-boi
Thamnophilidae	*Thamnophilus doliatus* (Linnaeus, 1764)	choca-barrada
Thamnophilidae	*Formicivora rufa* (Wied, 1831)	-
Furnariidae	*Furnarius rufus* (Gmelin, 1788)	joão-de-barro
Furnariidae	*Certhiaxis cinnamomeus* (Gmelin, 1788)	curutié
Furnariidae	*Phacellodomus rufifrons* (Wied, 1821)	joão-de-pau
Tyrannidae	*Todirostrum cinereum* (Linnaeus, 1766)	ferreirinho-relógio

Continues on the next page.

Continued from Table 5.

Family	Scientific name	Common name
Tyrannidae	*Elaenia flavogaster* (Thunberg, 1822)	-
Tyrannidae	*Suiriri suiriri* (Vieillot, 1818)	suiriri-cinzento
Tyrannidae	*Tolmomyias flaviventris* (Wied, 1831)	bico-chato-amarelo
Tyrannidae	*Myiophobus fasciatus* (Statius Muller, 1776)	filipe
Tyrannidae	*Pyrocephalus rubinus* (Boddaert, 1783)	príncipe
Tyrannidae	*Fluvicola albiventer* (Spix, 1825)	lavadeira-de-cara-branca
Tyrannidae	*Arundinicola leucocephala* (Linnaeus, 1764)	freirinha
Tyrannidae	*Machetornis rixosa* (Vieillot, 1819)	suiriri-cavaleiro
Tyrannidae	*Myiozetetes cayanensis* (Linnaeus, 1766)	bentevizinho-de-asa-ferrugínea
Tyrannidae	*Pitangus sulphuratus* (Linnaeus, 1766)	bem-te-vi
Tyrannidae	*Myiodynastes maculatus* (Statius Muller, 1776)	bem-te-vi-rajado
Tyrannidae	*Tyrannus melancholicus* (Vieillot, 1819)	suiriri
Tyrannidae	*Myiarchus swainsoni* Cabanis & Heine, 1859	irrê
Tyrannidae	*Myiarchus ferox* (Gmelin, 1789)	maria-cavaleira
Tyrannidae	*Myiarchus tyrannulus* (Statius Muller, 1776)	maria-cavaleira-de-rabo
Hirundinidae	*Progne tapera* (Vieillot, 1817)	andorinha-do-campo
Troglodytidae	*Troglodytes musculus* Naumann, 1823	corruíra
Troglodytidae	*Campylorhynchus turdinus* (Wied, 1831)	catatau
Troglodytidae	*Pheugopedius genibarbis* (Swainson, 1838)	garrinchão-pai-avô
Donacobiidae	*Donacobius atricapilla* (Linnaeus, 1766)	japacanim
Polioptilidae	*Polioptila dumicola* (Vieillot, 1817)	-
Turdidae	*Turdus rufiventris* (Vieillot, 1818)	sabiá-laranjeira
Turdidae	*Turdus leucomelas* (Vieillot, 1818)	sabiá-barranco
Coerebidae	*Coereba flaveola* (Linnaeus, 1758)	cambacica
Thraupidae	*Saltator coerulescens* Vieillot, 1817	sabiá-gongá
Thraupidae	*Thraupis sayaca* (Linnaeus, 1766)	sanhaçu-cinzento
Emberizidae	*Volatinia jacarina* (Linnaeus, 1766)	tiziu
Emberizidae	*Sporophila caerulescens* (Vieillot, 1823)	coleirinho
Emberizidae	*Sporophila leucoptera* (Vieillot, 1817)	chorão
Emberizidae	*Arremon flavirostris* (Swainson, 1838)	tico-tico-de-bico-amarelo
Emberizidae	*Coryphospingus cucullatus* (Statius Muller, 1776)	tico-tico-rei
Emberizidae	*Paroaria capitata* (d'Orbigny & Lafresnaye, 1837)	cavalaria
Parulidae	*Geothlypis aequinoctialis* (Gmelin, 1789)	pia-cobra
Icteridae	*Procacicus solitarius* (Vieillot, 1816)	iraúna-de-bico-branco
Icteridae	*Icterus cayanensis* (Linnaeus, 1766)	encontro
Icteridae	*Icterus croconotus* (Wagler, 1829)	joão-pinto
Icteridae	*Gnorimopsar chopi* (Vieillot, 1819)	graúna
Icteridae	*Agelasticus cyanopus* (Vieillot, 1819)	carretão
Icteridae	*Agelaioides badius* (Vieillot, 1819)	asa-de-telha
Icteridae	*Molothrus bonariensis* (Gmelin, 1789)	vira-bosta
Fringillidae	*Euphonia chlorotica* (Linnaeus, 1766)	fim-fim
Passeridae	*Passer domesticus* (Linnaeus, 1758)	pardal

were Nymphaea, Utricularia, and Echinodorus (POTT; POTT, 1997). Aquatic plants are often classified ecologically by their life-forms, such as floating (*P. stratiotes*), amphibious (*E. prostrata*), emergent (*T. domingensis*) and fixed submersed (*N. guadalupensis*), with emergent and amphibious life-forms as the most abundant (POTT; POTT, 2000). In general, the concept of aquatic plant is debatable and varies according to each author.

Several terrestrial plant species, such as *T. aurea*, *C. americana*, *C. brasilense* and *B. gaudichaudii*, are native to both the Cerrado and the Pantanal, (LORENZI, 1998; ASSUNÇÃO; FÉLFILI, 2004). *Curatella americana* often makes up the predominant landscape of Cerrado in central Brazil (SOUZA; LORENZI, 2008), with pantropical distribution (Dilleniaceae). Brazil represents the center of diversity in the Neotropics (FRAGA et al., 2013). *Platypodium elegans* and *Cecropia sp.* are naturally occurring species in the Cerrado (LORENZI, 1998) and they are used for the recovery of degraded areas (SCHORR et al., 2014). *Cecropia sp.* is a pioneer with high distribution in secondary formations, being frequent in wet soils and in open areas (LORENZI, 1998).

A list of arboreal and shrubby species, based on published surveys and species lists, was compiled by Castro et al. (1999), indicating that a considerable amount of taxonomic research has still to be done on the Cerrado flora. In fact, the flora may be much richer than generally presumed.

In animal case, the Cerrado has a high rate of species richness for reptiles and amphibians. In fact, it is comparable to the herpetofauna of the Amazon when expressed in proportion to the size of each biome (COLLI; BASTOS, 2002). However, herpetofauna is the least known of all Brazilian biomes (COSTA et al., 2007).

For many millennia, humans and reptiles have interacted, but the attitude of humans towards these animals has depended on culture, environment, and personal experience (ALVES et al., 2012). The green iguana (*I. iguana*) is one of the most commonly consumed lizards within their natural ranges in both Brazil and neighboring countries (ALVES et al., 2012). The species has been a source of protein for humans for over 7,000 years (COOKE, 1981). Many poor people from rural areas still depend on this lizard for protein (FITCH et al., 1982), featuring meat and eggs as delicacies in many areas (ALVES et al., 2012). Thus, iguana farming has become an attractive economical alternative to cattle breeding, and a significant source of food for local populations (MAGNINO et al., 2009).

Considering mammals, *Canis familiaris* and *B. taurus* are non-native species from Brazil. Direct and indirect impacts

of domestic dogs on the native fauna have become frequent (GALETTI; SAZIMA, 2006; CAMPOS et al., 2007). In addition, domestic dogs are possible disease carriers, such as leishmaniasis and rabies, whose diseases are an important threat to native species (BUTLER; DU TOIT, 2002; CURI et al., 2006).

All native bird species identified in this study are found in the Cerrado and other Brazilian biomes as specified below (MARINHO-FILHO et al., 2002). *Sylvilagus brasiliensis* is included as a vulnerable species on the red list of the state of Paraná, whilst *M. americana* is an endangered species in the red list of the states of Rio Grande do Sul and Rio de Janeiro (CHIARELLO et al., 2008). *Dasyprocta azara* is included as a vulnerable species on the IUCN red list (CATZEFLIS et al., 2008).

The domestic pigeon and house sparrow occurred in study area, but they are non-native species of Brazil. The original worldwide distribution of domestic pigeon is difficult to determine due to a long history of domestication and feral populations (GIBBS et al., 2001). Pigeons occur on all the major continents, except Antarctica (GIBBS et al., 2001). *Columba livia* may be considered a negative indicator species of environmental quality in urban space, because areas with higher levels of human interference support high populations, being dependent on resources produced by humans for its survival (AMÂNCIO et al., 2008). The house sparrow species hails from Europe and it occurs throughout Brazil (BRASIL; AMATO, 1992). *Pitangus sulphuratus* is a major potential seed disperser in the Cerrado biome (FRANCISCO; GALETTI, 2002), but it cannot be regarded as a bio-indicator of urban environmental quality because no correlation between its abundance and human intervention has been found (AMÂNCIO et al., 2008).

Several species, such as *A. brasiliensis*, *T. furcata*, *A. leucocephala* and *M. bonariensis*, show a nomadic movement in search of the most favorable areas for their survival due to seasonal availability of food caused by flood pulses (NUNES; TOMAS, 2008). Other species recorded in the study area, such as *T. dominicus*, *A. alba*, *E. caerulea*, *M. americana*, *P. picazuro*, *S. suiriri*, *M. maculatus*, *T. melancholicus*, and *S. leucoptera*, are intra-continental migrants from the southern and northern regions of South America (NUNES; TOMAS, 2008). *Tringa solitaria* recorded in the study area is an intercontinental migrant fleeing the harsh winter in the Northern Hemisphere toward the southern portion of South America (NUNES; TOMAS, 2008). These species arrive in Brazil in April when the austral winter starts, for breeding, which result in cyclical downturns in food supply (ANTAS; PALO-JÚNIOR, 2004). Migrants and nomads match 40% of birds occurring in the Pantanal (NUNES et al., 2008) and reflect the seasonality and heterogeneity in the Pantanal landscape.

On the other hand, *E. macroura*, *G. chopi* and *A. badius* are residents in the Pantanal (NUNES et al., 2008), whilst 20 other species are widespread in Brazil, such as *M. ferox* (ANTAS; PALO JÚNIOR, 2004), *C. amazona* (SIGRIST, 2009), *C. plancus* (CARVALHO; MARINI, 2007), *L. verreauxi* (FRISCH; FRISCH, 2005), *R. magnirostris* (MARINI et al. 2007), and *G. aequinoctialis* (CRBO, 2008). Fourteen species restricted to some Brazilian biomes were recorded, namely, *C. minuta* in the Cerrado and Amazon rainforest (CBRO, 2008), *P. rufifrons* in the Cerrado and Caatinga, *A. flavirostris* in the Cerrado and Pantanal (ANTAS; PALO JÚNIOR, 2004), *O. canicollis* in the Pantanal, *C. turdinus* in the Cerrado and Amazon rainforest (SIGRIST, 2009) and *B. chiriri* and *S. coerulescens* in the Cerrado (CRBO, 2008).

Several studies are extant on biodiversity in urban areas. However, it should be underscored that none of these studies surveyed plants, reptiles, mammals and birds within the same area as has been done in current study. Araújo et al. (1997) surveyed tree species in an urban forest in Araguari, Brazil. Jokimaki (1999) studied the breeding of 22 bird of species in urban parks in northern Finland. Bastin and Thomas (1999) studied plant species distribution in urban vegetation fragments in Birmingham, UK. Mörtberg (2001) investigated resident bird species in urban forest remnants in Stockholm. Franchin & Marçal-Júnior (2004) determined the avifauna richness in an urban park in Uberlândia, Brazil. Dantas & Souza (2004) forwarded a quantitative inventory of trees in Campina Grande, Brazil. Barros et al. (2006) carried out bats' inventories in three areas of urban forests in Juiz de Fora, Brazil. Reis et al. (2006) also surveyed bats in an urban park in Londrina, Brazil. Brun et al. (2007) studied the employment of trees in the maintenance of fauna biodiversity in urban areas. Lutinski et al. (2013) surveyed diversity of urban ants in ten cities in southern Brazil. Sacco et al. (2013) studied bird species that use the urban area in Pelotas, Brazil.

Cities are more than just buildings and people. Some of the world's most famous cities are known for their open spaces as they are for their culture, such as the Ibirapuera Park in São Paulo (Brazil), Phoenix Park in Dublin, Central Park in New York (USA), the Bukit Timah Nature Preserve in Singapore, and Hyde Park in London (England). These parks are attractions for dwellers and visitors. They increase the attractiveness of the urban settlement environment, offer relaxation, restoration, stress reduction, escape from the city milieu and provide sites for social interaction (BARBOSA et al., 2005; JAMES et al., 2009; SEARLE, 2011). These places should provide high-quality recreation experiences for urban residents (ARNBERGER, 2012). Thus, public urban green spaces play an important role in urban sustainability.

Humanity is increasingly urban, but continues to depend on nature for its survival since towns and cities depend on the ecosystems beyond the city limits, and benefit from internal urban ecosystems (BOLUND; HUNHAMMAR, 1999). Due to growing and increasingly urbanized populations (CLARK, 1951), the demand for more land to be released for development may be intense. Seto et al. (2011) revealed that urban land expansion rates were higher than or equal to urban population growth rates, suggesting that urban growth is becoming more expansive than compact.

Cuiabá is constantly expanding its housing development areas, with an increase in green space losses, and consequent liability in biodiversity. There is no public plan to take care of the study area in Cuiabá as a space for conserving biodiversity and opportunities for recreations.

5. CONCLUSION

Species occurrence indicated Cuiabá as an ecotone area composed of species from the Cerrado (Brazilian savanna) and the Pantanal (wetland). The ecological importance of the area for harboring biodiversity within an urban area of 30 hectares surrounded by industries is self-evident.

6. ACKNOWLEDGMENTS

We would like to thank Borrachas Drebor Ltda for its financial support. Thanks are also due to Campus Cuiabá - Bela Vista of Instituto Federal de Mato Grosso (IFMT) for its logistical support.

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