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The effects of forest-savanna-grassland gradients on bird communities of Chiquitano Dry Forests domain, in western Brazil

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ABSTRACT

Different vegetation types are distributed in mountains according to altitude, topography and soil. The composition and structure of bird communities in these areas can change in relation to the vegetation gradient, with particular communities occupying each habitat type. In this study we present the changes in composition, species richness and bird abundance over the gradient of forests, savannas and altitudinal grasslands of Maciço do Urucum, a mountainous region located in the Chiquitano Dry Forests domain in western Brazil. We recorded 165 bird species through qualitative and quantitative methods. Forested savannas, riparian forests and submontane forests presented the highest richness and abundance of birds, while arboreal savannas and altitudinal grasslands had intermediate and low values, respectively. The bird composition was similar between riparian and submontane forests, while other vegetation types present more dissimilar bird communities. Our results show differences in composition, richness and bird abundance among the vegetation types present at Maciço do Urucum, and highlight an important function of vegetation gradients for the conservation of bird communities in mountains. Additionally, this is the first study of the bird communities in the Brazilian Chiquitano Dry Forests, an important domain in the west of Brazil which has been poorly studied.

Key words: altitudinal grasslands, avian communities, Chiquitano Dry Forests, habitat diversity, habitat use, mountains.

INTRODUCTION

In landscapes formed by vegetation gradients, bird community composition can be affected by the presence and distribution of different vegetation types (Skowno and Bond 2003, Jankowski et al. 2012). This pattern is due to the fact that many bird species are exclusive to certain habitats or are abundant in specific vegetation types, while other species have wide distributions with in gradients. Therefore, in areas with vegetation gradients it is possible to distinguish different bird communities associated with each vegetation type (Tubelis and Cavalcanti 2001, Piratelli and Blake 2006, Posso et al. 2013, Godoi et al. 2016).

In mountain habitats, vegetation types are usually distributed in relation to altitude,

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topography and soil (Navarro 1992, Blake and Loiselle 2000). In these regions, the diversity and composition of bird communities could present spatial variations in relation to the presence and distribution of different vegetation types (Navarro 1992, Blake and Loiselle 2000, Melo-Júnior et al. 2001, Mallet-Rodrigues et al. 2010).

In western Brazil there are mountains which present extensive gradients of natural vegetation formed by forests, savannas and natural grasslands, such as the Serra da Bodoquena, Serra de Maracaju and Maciço do Urucum. In the Serra da Bodoquena and Serra de Maracaju inventories of bird species showed high species richness, which could be partially explained by habitat diversity in these regions (Pivatto et al. 2006, Nunes et al. 2013).

In the Maciço do Urucum there is a marked gradient of forests, savannas and altitudinal grasslands (Cáceres et al. 2011), but no basic studies on bird communities exist, with no data on bird species distributions among the different vegetation types. However, these data are essential in understanding how vegetation gradients affect the local composition and structure of bird communities and to bird conservation in Maciço do Urucum.

Furthermore, the Maciço do Urucum is located in the Chiquitano Dry Forests domain, which occurs in eastern Bolivia and in a very restricted area in western Brazil (Vasconcelos and Hoffmann 2006). Although some studies on bird communities have been conducted in the Chiquitano Forests of Bolivia (Davies 1993, Parker 1993, Remsen and Parker 1993, Flores et al. 2001, 2002, Brooks et al. 2005), there are no studies focusing on bird communities in the brazilian Chiquitano Forests.

This study is the first to describe the composition, richness and abundance of bird communities along vegetation gradients in Chiquitano Dry Forests of Brazil. Specifically, the objectives of this study were to: (1) present the species richness, abundances and composition of birds in a vegetation gradient in the Maciço do Urucum and (2) describe the dissimilarities in bird composition between different vegetation types which occur in the landscape of Maciço do Urucum.

MATERIALS AND METHODS

Study Area

The Maciço do Urucum is a mountainous region located in the Chiquitano Dry Forests domain in the extreme west of Brazil (Olson et al. 2001), near the border of Bolivia, in the county of Corumbá, Mato Grosso do Sul state (Figure 1). This region occupies an area of 1300 km^2 with mountains delimited by the Paraguai river to the north and flooded areas of Pantanal to the south and east. The climate of the region is Awa, according Koeppen´s classification, with distinct periods of rainy (October-March) and dry (April to September) seasons, with average annual rainfall of 1070 mm (Pott et al. 2000, Tomas et al. 2010).

The elevation of the mountains varies from 150 to 1130 m above sea level, and the natural vegetation gradient is formed by decidual and semidecidual seasonal forests, riparian forests, forested savannas (cerradão), arboreal savannas (cerrado stricto sensu) and altitudinal grasslands (campos de altitude) (Pott et al. 2000, Tomas et al. 2010). The plant communities are diverse and suffer biogeographic influences from different domains, like the Chiquitano Forests, Cerrado, Chaco, Atlantic Forests and Amazonian Forests (Pott et al. 2000, 2011, Salis et al. 2004). This region also contains anthropogenic landscapes, like pastures for cattle ranching and areas used for mining of iron, aluminum and limestone, which are the main economic activities in the region.

Methods

We sample bird communities in 40 stations, using eight stations from each of the following vegetation

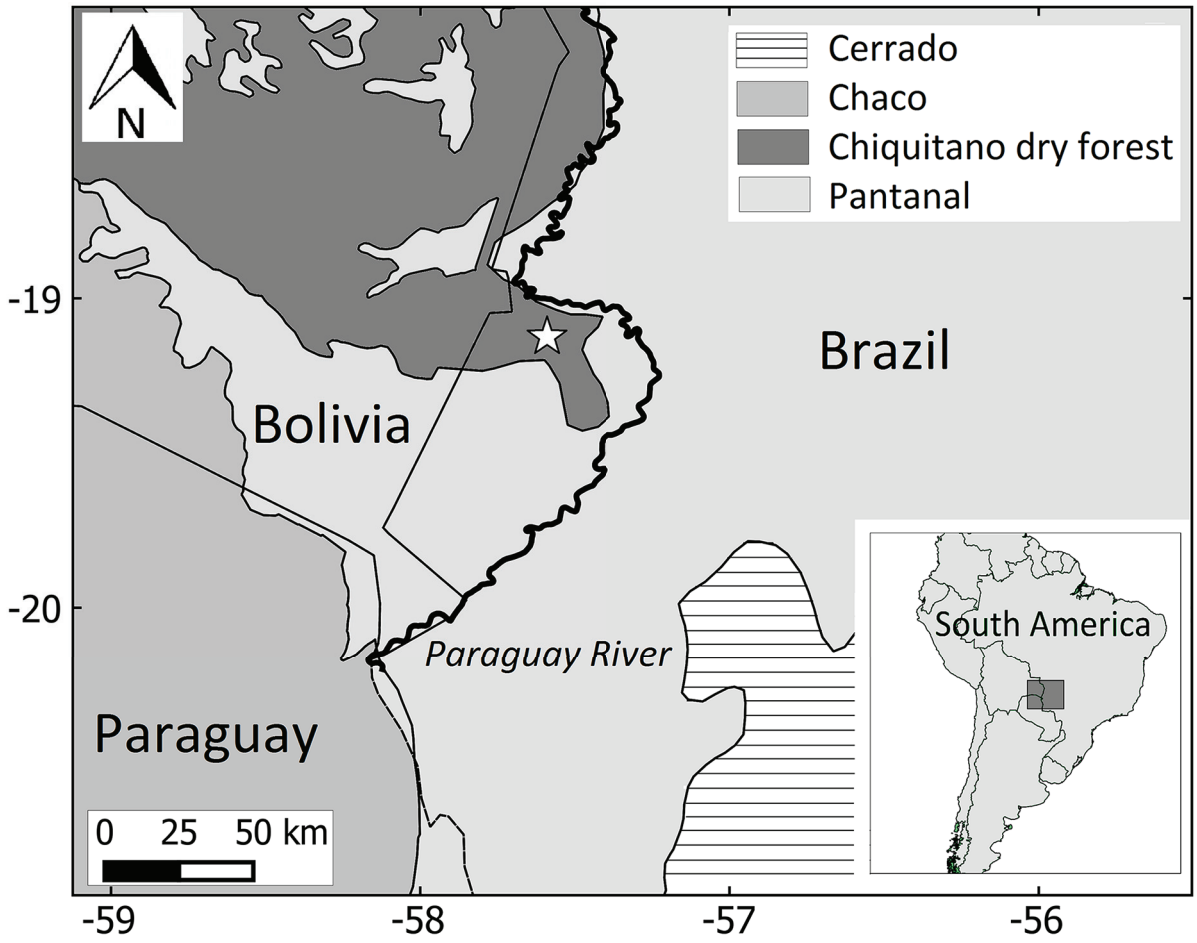

Figure 1 - The Maciço do Urucum (star) in western Brazil, and ecoregion according to Olson et al. (2001).

types: riparian forests, seasonal submontane forests, forested savannas (cerradão), arboreal savannas (cerrado stricto sensu) and altitudinal grasslands (campos de altitude) (Table I).

At each station we placed a point count with a fixed radius of 50 m and 200 m of minimal distance from any other point, except for the points located in altitudinal grasslands, where we separated points by 150 m due to the restricted available area. Each point count was sampled for 10 minutes consecutively, in which the number and species of all birds were recorded through visual or auditory observations (Anjos et al. 2010, Vielliard et al. 2010).

Samplings were always performed in the early morning, between 06:00 and 09:00 hours, when most bird species were active. At each station we sampled eight times (80 minutes of sampling effort) between July 2012 and October 2014, except for four stations in the altitudinal grasslands, which we sampled only twice (20 minutes of sampling effort), in July and October 2012 (Table I). In order to more precisely characterize the bird community composition we also recorded bird species that we observed in the intervals between each point count.

Data Analysis

For each station we recorded composition, richness and abundance (number of contacts) per species. The species abundance was expressed by Punctual Abundance Index (PAI), which is a ratio between the total number of specie´s contacts by total

TABLE I
Stations used for sampling bird communities along the vegetation gradient in Maciço do Urucum, western Brazil.

Stations	Vegetation Types	Coordinates (Elevation)
RF1	Riparian Forests	19°11'54.79"S; 57°38'11.19"W (185 m)
RF2	Riparian Forests	19°11'54.19"S; 57°38'4.30"W (192 m)
RF3	Riparian Forests	19°11'48.65"S; 57°37'58.62"W (204 m)
RF4	Riparian Forests	19°11'45.02"S; 57°37'51.87"W (215 m)
RF5	Riparian Forests	19°12'52.18"S; 57°36'38.46"W (338 m)
RF6	Riparian Forests	19°12'55.57"S; 57°36'46.20"W (315 m)
RF7	Riparian Forests	19°12'55.57"S; 57°36'54.57"W (291 m)
RF8	Riparian Forests	19°12'55.17"S; 57°37'1.43"W (273 m)
SF1	Submontane Forests	19°12'35.58"S; 57°36'31.33"W (454 m)
SF2	Submontane Forests	19°12'40.35"S; 57°36'34.23"W (422 m)
SF3	Submontane Forests	19°12'44.20"S; 57°36'35.90"W (381 m)
SF4	Submontane Forests	19°12'48.52"S; 57°36'35.20"W (358 m)
SF5	Submontane Forests	19°12'22.38"S; 57°30'24.04"W (424 m)
SF6	Submontane Forests	19°12'19.41"S; 57°30'21.83"W (472 m)
SF7	Submontane Forests	19°12'20.21"S; 57°30'18.85"W (458 m)
SF8	Submontane Forests	19°12'22.47"S; 57°30'20.67"W (446 m)
FS1	Forested Savannas (Cerradão)	19°11'43.33"S; 57°37'45.21"W (227 m)
FS2	Forested Savannas (Cerradão)	19°11'41.41"S; 57°37'38.34"W (238 m)
FS3	Forested Savannas (Cerradão)	19°11'47.37"S; 57°37'38.29"W (272 m)
FS4	Forested Savannas (Cerradão)	19°11'47.04"S; 57°37'32.50"W (317 m)
FS5	Forested Savannas (Cerradão)	19°12'11.78"S; 57°30'13.44"W (522 m)
FS6	Forested Savannas (Cerradão)	19°12'14.92"S; 57°30'7.37"W (525 m)
FS7	Forested Savannas (Cerradão)	19°12'17.18"S; 57°30'0.60"W (512 m)
FS8	Forested Savannas (Cerradão)	19°12'14.03"S; 57°29'53.48"W (510 m)
AS1	Arboreal Savannas (Cerrado)	19°12'4.68"S; 57°36'21.77"W (744 m)
AS2	Arboreal Savannas (Cerrado)	19°12'2.17"S; 57°36'17.54"W (720 m)
AS3	Arboreal Savannas (Cerrado)	19°11'58.08"S; 57°36'11.57"W (739 m)
AS4	Arboreal Savannas (Cerrado)	19°11'52.14"S; 57°36'8.03"W (765 m)
AS5	Disturbed Arboreal Savannas (Cerrado)	19°12'5.33"S; 57°30'10.41"W (564 m)
AS6	Disturbed Arboreal Savannas (Cerrado)	19°11'57.90"S; 57°30'9.12"W (541 m)
AS7	Disturbed Arboreal Savannas (Cerrado)	19°11'52.20"S; 57°30'8.98"W (587 m)
AS8	Disturbed Arboreal Savannas (Cerrado)	19°11'45.51"S; 57°30'10.65"W (595 m)
AG1	Altitudinal Grasslands	19°15'46.05"S; 57°36'40.69"W (626 m)
AG2	Altitudinal Grasslands	19°15'51.63"S; 57°36'44.74"W (692 m)
AG3	Altitudinal Grasslands	19°15'52.99"S; 57°36'51.06"W (639 m)
AG4	Altitudinal Grasslands	19°15'55.08"S; 57°36'56.35"W (662 m)
AG5	Disturbed Altitudinal Grasslands	19°12'2.77"S; 57°36'33.08"W (910 m)
AG6	Disturbed Altitudinal Grasslands	19°11'58.41"S; 57°36'17.28"W (839 m)
AG7	Disturbed Altitudinal Grasslands	19°12'1.74"S; 57°36'22.42"W (830 m)
AG8	Disturbed Altitudinal Grasslands	19°12'7.43"S; 57°36'23.83"W (745 m)

number of samples used in the study (Anjos et al. 2010, Vielliard et al. 2010). The PAI of each species was calculated for all study area and for each vegetation type separately.

To evaluate if the sampling effort applied was sufficient to sample the most bird species in the local community, we created a collector curve with the observed and estimated bird species richness

in relation to the sampling effort applied (number of stations or point counts). Bird species richness was estimated using the Jackknife 1 estimator (Magurran 2011).

The differences in avifauna abundance and richness between vegetation types were tested using Analysis of Variance (ANOVA). The community ordination in relation to composition and abundance of species was made using Non-Metric Multidimensional Scaling (NMDS) with two dimensions, using Bray-Curtis distance indices. Additionally, we used an Analysis of Similarity (ANOSIM), with the sequential Bonferroni test, to verify the levels of similarity between the bird communities among the different vegetation types.

All analyses used in this study were made in the software Past version 2.17c (Hammer et al. 2001). The taxonomic classification and nomenclature adopted followed the Brazilian Committee of Ornithological Records (CBRO 2014).

RESULTS

We observed 165 bird species, considering both quantitative and qualitative data (Table SII – Supplementary Material). In point counts the observed species richness was 110 bird species. This value corresponded to 66.6% of the diversity observed in all study area, using quantitative and qualitative data, and 78.4% of the estimated species richness (Jackknife 1 = 140.23 species) in the 40 point counts used (Figure 2).

Considering only quantitative data obtained in point counts, the 11 most abundant species in the study area corresponded to 51% of total bird abundance, while 49% of bird abundance was divided between the 99 remaining species, with 21 species being recorded just once. The most abundant species in the study area were *Basileuterus culicivorus*, *Cyanocorax cyanomelas*, *Hemithraupis guira*, *Cyanocorax chrysops*,

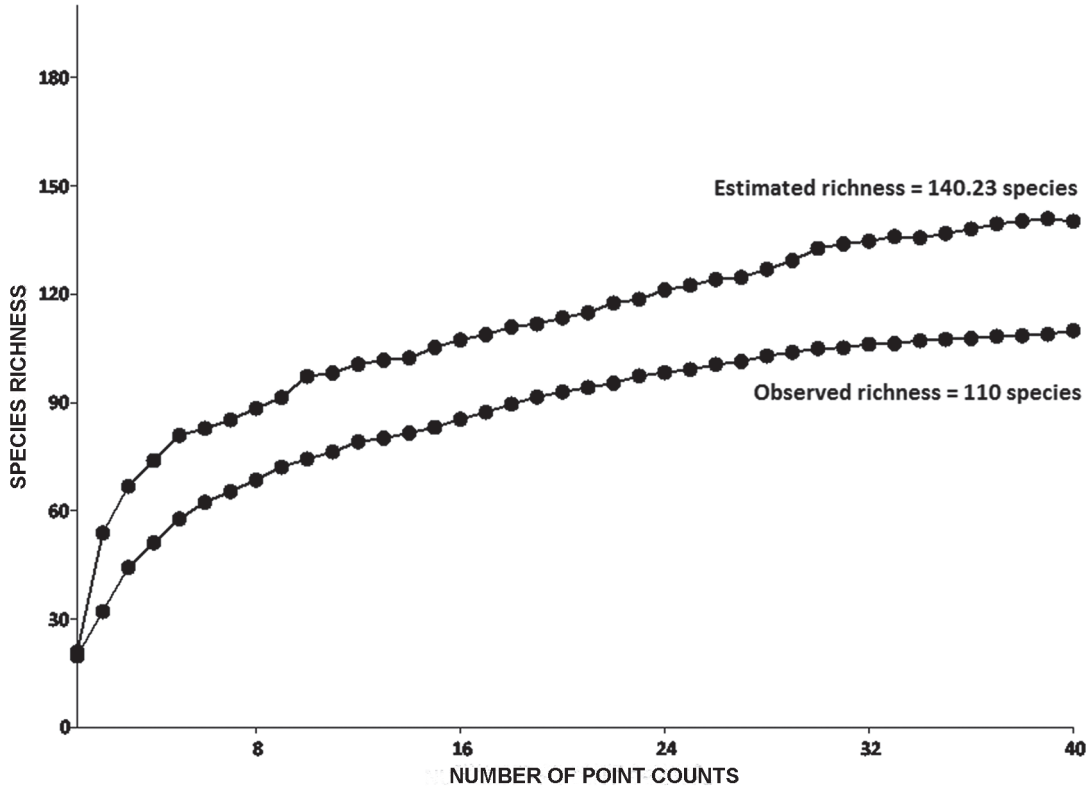

Figure 2 - Collector curve with the observed and estimated bird species richness along the vegetation gradient in Maciço do Urucum, western Brazil.

Pyrrhura molinae, *Brotogeris chiriri*, *Leptotila verreauxi*, *Turdus leucomelas*, *Myiothlypis flaveola*, *Herpsilochmus atricapillus* and *Thamnophilus sticturus* (Table SII).

Bird abundance and species richness varied among the different vegetation types (Abundance: $F_{4, 35} = 11.64$, $p \leq 0.0001$; Richness: $F_{4, 35} = 18.7$, $p \leq 0.0001$) (Figure 3). The bird abundance was higher in riparian forests, submontane forests and forested savannas, with significant statistical differences in relation to altitudinal grasslands ($p \leq 0.01$). Riparian forests, submontane forests and forested savannas also have significantly higher bird species richness in relation to altitudinal grasslands ($p \leq 0.005$), as well as between forested savannas and arboreal savannas ($p \leq 0.05$) (Figure 3).

The ordination analysis showed there was a trend in separation of the bird community at Maciço do Urucum between forest formations (riparian forests, submontane forests and forested savannas) and open areas (altitudinal grasslands) (NMDS, Stress: 0.14; $R^2 = 0.78$) (Figure 4). However, the stations of arboreal savannas did not show this trend, with half of these stations located within forest formations, while others formed a different group or were located near altitudinal grasslands stations. The similarity analysis pointed out differences in bird communities between the vegetation types (Anosim, $R = 0.53$, $p \leq 0.0001$), with significant dissimilarities between all vegetation types, except riparian forests and submontane forests, which have high similarity in their bird communities ($R = 0.15$, $p = 0.64$).

DISCUSSION

In the study area we recorded 110 species through point counts, which represents 78.4% of the estimated richness and 66.6% of richness observed by qualitative methods. These results show that the sampling effort and the point count method were suitable for sampling the majority of local bird species richness.

Most bird species recorded by point counts were considered rare in the study area. The 11 most abundant species, or 10% of the local richness, represented 51% of the bird abundance, while 49% of the bird abundance belonged to the other 99 species, or 90% of the local richness. This data corroborated the general pattern of bird communities, which are characterized by

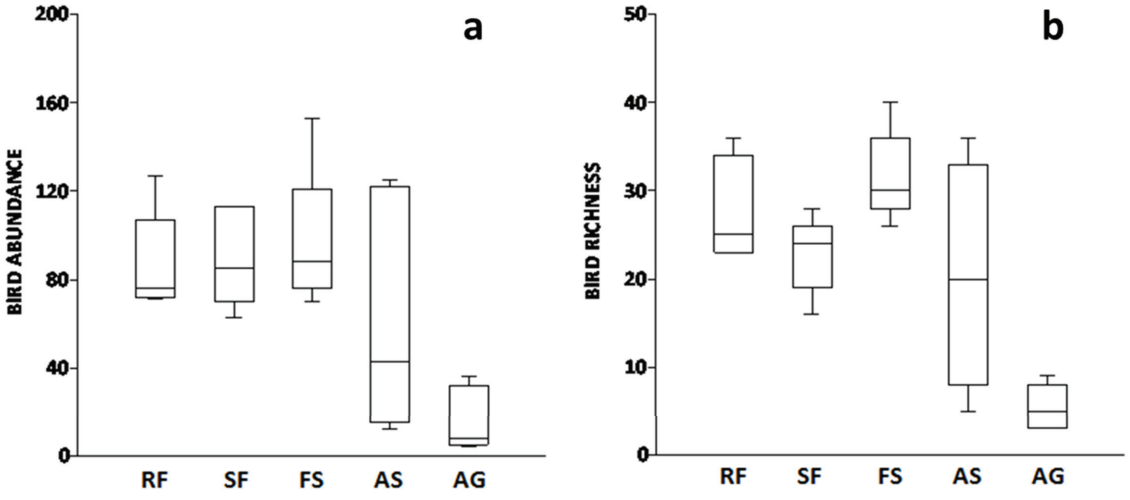

Figure 3 - Differences in bird abundance **(a)** and species richness **(b)** between vegetation types which occur in Maciço do Urucum, western Brazil. Legend: RF (Riparian Forests), SF (Submontane Forests), FS (Forested Savannas), AS (Arboreal Savannas), AG (Altitudinal Grasslands).

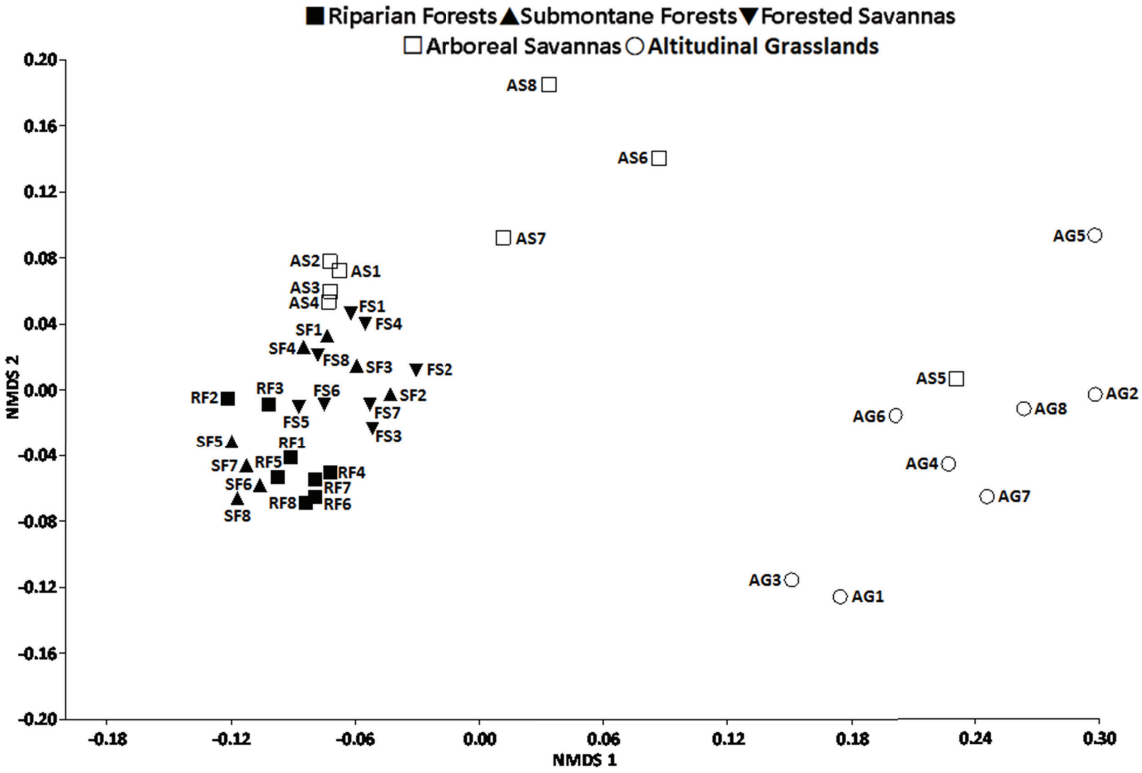

Figure 4 - Non-Metric Multidimensional Scaling (NMDS, Bray-Curtis distance) (Stress = 0.14, $R^2 = 0.78$) and Anosim ($R = 0.53$, $p \leq 0.0001$) of a bird community in different vegetation types at Maciço do Urucum, western Brazil.

the dominance of a few abundant species, while most bird species are rare (Aleixo and Vielliard 1995, Almeida et al. 1999, Pozza and Pires 2003, Donatelli et al. 2004, 2007, Lyra-Neves et al. 2004, Telles and Dias 2010).

The most abundant species in this study area present wide geographic distributions and are abundant in other regions of western Brazil, such as the Pantanal wetlands (Tubelis and Tomas 1999), Cerrado (Posso et al. 2013), ecotone between Cerrado and Seasonal Forests of High Paraná River Basin (Godoi et al. 2013) and Serra da Bodoquena (Godoi et al. 2016). However, among the locally abundant species, some species present restrict distributions in Brazil, like *Pyrrhura molinae* and *Thamnophilus sticturus*, which only occur in the extreme west of the country (Van Perlo 2009), being widely distributed in Chiquitano Forests of Bolivia (Flores et al. 2001, 2002, Brooks et al. 2005) and/or in the Bolivian and Paraguayan Chaco (Brooks 1997, Ayuso and Sánchez 2002, Zyskowski et al. 2003).

The majority of species with low abundance in this study area is common in other regions of western Brazil (Pivatto et al. 2006, Godoi et al. 2013, Nunes et al. 2013) and are typically found in open areas, which explains their scarcity in the forested Maciço do Urucum. However, among locally rare species, we observed forest birds which are rare in other regions of western Brazil, like *Platyrinchus mystaceus*, and rare raptors, as *Harpia harpyja*, *Spizaetus ornatus*, *Buteo platypterus*, *Micrastur ruficollis* and *Falco deiroleucus* (Pivatto et al. 2006, Godoi et al. 2013, Nunes et al. 2013). Some migratory species were also rare in the study area, including *Empidonomus varius*, *Turdus amaurochalinus*, *Legatus leucophaius*, *Coccyzus americanus*, *Myiarchus swainsonii* and *Contopus cinereus* (Nunes and Tomas 2008), which

are common in other regions of western Brazil (Pivatto et al. 2006, Godoi et al. 2013, Nunes et al. 2013).

The bird abundance and species richness were higher in forested savannas, riparian forests and submontane forests, when compared to arboreal savannas, and higher in all vegetation types when compared to altitudinal grasslands. These results can be explained by the hypothesis of environmental heterogeneity, which states that environments with more heterogeneous structure have higher diversity than environments with less complex structures (MacArthur and MacArthur 1961, Tews et al. 2004).

The increase in environmental heterogeneity in gradients of grasslands, savannas and forests occurs by the addition of tree and shrub density, as well as other variables related to vegetation structure, as litter abundance, canopy height and canopy cover (Tubelis and Cavalcanti 2000, Skowno and Bond 2003). This increase in environmental heterogeneity provides greater diversity of ecological niches, allowing higher diversification in resource exploitation and consequently greater species diversity (MacArthur and MacArthur 1961, Tews et al. 2004). So, the environments with more heterogeneity, especially those with more vertical stratification, like different forest types, generally have greater species diversity than environments with less vertical heterogeneity, as savannas and grasslands (Tubelis and Cavalcanti 2000, 2001, Figueira et al. 2006, Piratelli and Blake 2006, Godoi et al. 2016), although in some cases arboreal savannas (cerrado stricto sensu) have diversity as great as forests (Posso et al. 2013).

The composition of bird communities in forests and savannas were different from the composition in altitudinal grasslands. The riparian forests and submontane forests presented greater similarity in species composition, most likely due to the similarity in vegetation structure (pers. obs.) and the spatial proximity between these areas, forming a continuum of forests with high forest species diversity.

The forested savannas presented bird communities that are just as similar to riparian forests and submontane forests, as well as to arboreal savannas. So, the forested savannas of Maciço do Urucum shared bird species with local forests and arboreal savannas, which could explain their higher diversity in relation to the other vegetation types studied.

The bird communities in arboreal savannas formed two distinct groups, one consisting of more preserved areas (AS1-AS4), with greater similarity to forested savannas, riparian forests and submontane forests, and the second group consisting of disturbed areas (AS5-AS8), which presented particular bird communities or communities more similar to altitudinal grasslands. These arboreal savannas, which are close to altitudinal grasslands, were disturbed by mining activities, causing the loss and reduction of their tree and shrub layer. Consequently, the bird communities in these areas could lose species and be affected by colonization by bird species of the surrounding altitudinal grasslands, such as *Elaenia chiriquensis*, *Troglodytes musculus*, *Saltatricula atricollis* and *Emberizoides herbicola*.

In general, the results of this study showed that vegetation gradients in mountains affect the local distribution and abundance of bird species, and consequently the composition and structure of bird communities (Navarro 1992, Blake and Loiselle 2000, Melo-Júnior et al. 2001, Mallet-Rodrigues et al. 2010). In the Serra da Bodoquena, a mountainous region also located in the western Brazil, the bird communities are organized in relation to local vegetation gradients, with communities of forests, savannas and grasslands (Godoi et al. 2016). These results show the importance of habitat diversity to bird communities (Tews et al. 2004) and point out the need to maintain all gradients of forests, savannas and grasslands in mountains, as in the

Maciço do Urucum, for the long term conservation of their birds.

In relation to conservation, the riparian forests, submontane forests and forested savannas of Maciço do Urucum form an extensive vegetation gradient responsible for the preservation of high forest bird diversity, including groups of species sensitive to forest loss, fragmentation and perturbation, such as understory insectivorous birds (Sekercioglu et al. 2002, Martensen et al. 2008, Stratford and Stouffer 2013, Morante-Filho et al. 2015), forest frugivorous birds (Bregman et al. 2014, Morante-Filho et al. 2015) and forest raptors (Carvalho and Marini 2007).

The main insectivorous birds in riparian forests and submontane forests of Maciço do Urucum were *Herpsilochmus atricapillus*, *Xiphorhynchus guttatus*, *Dendrocolaptes picumnus*, *Cantorchilus guarayanus* and *Lanio penicillatus*, while in forested savannas main species were *Pyriglena leuconota*, *Thamnophilus sticturus* and *Myiothlypis flaveola*. The understory insectivorous birds are sensitive to forest loss and fragmentation because they are generally more selective in the habitat use, with small body size and restricted ability to cross open areas and move between forest fragments, making them dependent on large and well connected patches of forests in order to maintain their populations (Martensen et al. 2012).

Frugivorous birds, especially larger species, need a high diversity and abundance of fruits, and because of this they tend to be more common in landscapes with large amounts of natural habitats, with large and well connected fragments (Price et al. 1999, Morante-Filho et al. 2015). Fruit eating birds, as *Crypturellus undulatus*, *Pteroglossus castanotis, Trogon curucui*, *Turdus leucomelas*, *Tangara sayaca* and *Hemithraupis guira* were common throughout the forest and savanna gradient of Maciço do Urucum, while others such as *Crax fasciolata*, *Penelope superciliaris* and *Ramphastos toco* were less abundant. Frugivorous birds are important to plant communities since they disperse the seeds of many plants, increasing their reproductive success and helping to maintain and restore natural environments (Levey 1988, Pizo and Galetti 2010).

The forest raptors, especially large species, need large forest patches to maintain extensive territories with high prey abundance (Sick 1997, Carvalho and Marini 2007). So, these birds are generally rare and often threatened. In the gradient of riparian forests and submontane forests of our study area three species were recorded, *Harpia harpyja* and *Spizaetus ornatus,* which are near extinction on a global level (IUCN 2015), and *Spizaetus melanoleucus*. The presence of these species in the Maciço do Urucum indicates that the local forests are still capable of maintaining populations of forest raptors, demonstrating the importance of the preservation of these areas, and showing that the occurrence of these species in the western Brazil depends on the maintenance of continuous natural areas (Godoi et al. 2012).

In altitudinal grasslands of the Maciço do Urucum we observed 16 bird species, four of which were found only in these areas. Within these four species, two are considered nearly threatened for extinction on a global level, *Porphyrospiza caerulescens* and *Falco deiroleucus* (IUCN 2015). *Falco deiroleucus* certainly uses other vegetation types of the Maciço do Urucum, since raptors have extensive territories and in general occur in different types of forests and open areas (Sick 1997). On the other hand, *Porphyrospiza caerulescens* is strongly associated with natural grasslands, especially to the altitudinal grasslands (Lopes 2012), and for the maintenance of the population of this species the preservation of these areas is extremely important.

The altitudinal grasslands of Maciço do Urucum naturally occur in small patches restricted to mountain tops. Individual patches cannot maintain large populations of *Porphyrospiza caerulescens*, making it necessary to maintain of many patches of altitudinal grasslands for the conservation of this

species in the region. Unfortunately, the altitudinal grasslands of Maciço do Urucum have been intensively destroyed by mining activities of iron and aluminum, threatening local populations of *Porphyrospiza caerulescens* and other animals and plants associated with this unique environment.

Mining activities are not the only threat to bird diversity of the Maciço do Urucum. Cattle expansion and human settlements also have caused the loss and fragmentation of forests, savannas and altitudinal grasslands. Despite these threats, the Parque Natural Municipal de Piraputangas is the only protected area of the Maciço do Urucum, with an area of 1300 ha which does not contain all vegetation gradients present in the region. So, it is necessary to create a large Conservation Unit which can protect the entire vegetation gradients of forests, savannas and altitudinal grasslands present in the Maciço do Urucum. This act will certainly contribute to the conservation of birds and help maintain biodiversity in these important and poorly studied mountains located in the Chiquitano Forest domains of western Brazil.

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RESUMO

Diferentes tipos de vegetação estão distribuídos em montanhas de acordo com a altitude, topografia e solo. A composição e estrutura das comunidades de aves nestas áreas podem mudar com o gradiente de vegetação, com comunidades particulares ocupando cada tipo de habitat. Neste estudo nós apresentamos as mudanças na composição, riqueza de espécies e abundância de aves através de um gradiente de florestas, cerrados e campos de altitude no Maciço do Urucum, uma região montanhosa localizada no domínio das Florestas Secas Chiquitanas no oeste do Brasil. Nós registramos 165 espécies de aves por métodos quantitativos e qualitativos. Savanas florestadas, florestas ripárias e florestas submontanas apresentaram a maior riqueza e abundância de aves, enquanto savanas arborizadas e campos de altitude tiveram valores intermediários e baixos, respectivamente. A composição de espécies foi similar entre florestas ripárias e submontanas, enquanto os outros tipos de vegetação apresentaram comunidades de aves mais dissimilares. Nossos resultados demonstraram diferenças na composição, riqueza e abundância de aves entre os tipos de vegetação presentes no Maciço do Urucum, e apontaram a importante função dos gradientes de vegetação para a conservação das comunidades de aves em montanhas. Adicionalmente, este é o primeiro estudo sobre as comunidades de aves nas Florestas Secas Chiquitanas brasileiras, um importante domínio que ocorre no oeste do Brasil e que tem sido pouco estudado.

Palavras-chave: campos de altitude, comunidades de aves, Florestas Secas Chiquitanas, diversidade de habitats, uso do habitat, montanhas.

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SUPPLEMENTARY MATERIAL

TABLE SII - Composition, abundance (PAI) and distribution of birds along the vegetation gradient in Maciço do Urucum, western Brazil. n = number of stations. *Species without PAI did not occur in point counts, but were observed in the study area.