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Bird community of upper-montane rupestrian fields in South of Minas Gerais State, Southeastern Brazil

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ABSTRACT. Studies about the birds of rupestrian fields in the south of Minas Gerais State in Southeastern Brazil are incomplete, although this region is ornithologically well studied. This bird community has closely associated ecology with fields and the most endangered species of the Cerrado domain. The objective of this manuscript is to create a list of birds which occur in the rupestrian fields of seven municipalities in the south of Minas Gerais State, and further to analyze the birds' distribution, the endangered species (and their conservation *status*), and generate bases for future conservation actions. We evaluated seven cities in the south of Minas Gerais State between 2012 and 2018 by using binoculars and cameras. We found a high richness in relation to other open areas, with the Tyrannidae and Trochilidae families being the most representative. We highlight the endangered species in the Cerrado domain which of these species are closely linked to rupestrian fields. The composition is similar to closer areas, with exception to São Thomé das Letras city because it suffers an influence of mining areas. We suggest creating a wildlife protected area to preserve and conserve a great area of rupestrian fields and consequently the associated biota, especially the bird communities.

Keywords: conservation; list; ecology.

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Introduction

The rupestrian fields are located at altitudes of 900 meters above sea level in Brazil. The mountains present rocks from the pre-Cambrian age, directly related to quartzite, sandstone and iron ore outcrops (Eiten, 1992; Alves & Kolbek, 1994; Giulietti, Pirani, & Harley, 1997; Caiafa & Silva, 2005; Alves, Cardin, & Kropf, 2007; Vasconcellos, 2011).

This vegetation type is distributed along the Espinhaço Range, but isolated areas of this kind of landscape are located in Central Brazil, for example: Chapada dos Veadeiros and Serra dos Pirineus in Goiás State. We also found this vegetation in the west of Minas Gerais State in Serra da Canastra and in the South in the cities of São João Del Rei (Serra do Lenheiro), Tiradentes (Serra de São José), Carrancas (Serra de Carrancas), Minduri (Chapada das Perdizes), Luminárias (Serra Grande), São Tomé das Letras (Serra do Cruzeiro do Canta Galo), Itumirim (Serra de Itumirim), Ingaí (Serra do Boqueirão) and Itutinga. The last nine cities are in Serra da Mantiqueira, with similar geology and floristic compositions to the Espinhaço Range (Eiten, 1992; Alves & Kolbek, 1994; 2009; 2010; Gavilanes, Brandão, Laca-Buendia, & Araujo, 1995; Harley, 1995; Giulietti et al., 1997; Alves et al., 2007; Rapini, Ribeiro, Lambert, & Pirani, 2008; Vasconcellos, 2011).

The bird community in the south of Minas Gerais State in Southeastern Brazil has been well studied (D'Angelo Neto, Venturin, Oliveira Filho, & Costa, 1998; Ribon, 2000; Vasconcelos et al., 2002; Lopes, 2006; Vasconcelos, D'Angelo-Neto, & Nemesio, 2005; Lombardi, Vasconcelos, & D'Angelo Neto, 2007; Vasconcelos, 2008; Corrêa & Moura, 2009; Braga, Zanzini, Cerboncini, Miguel, & Moura, 2010; Moura & Soares-Junior, 2010; Corrêa & Moura, 2010; Moura, Corrêa, & Santos, 2010; Moura & Corrêa, 2011; Santos, Lombardi, D'Angelo-Neto, Miguel, & Faeti, 2011; Mazzoni & Perillo, 2011; Moura & Corrêa, 2012; Santos, 2012; Corrêa, Louzada, & Moura 2012; Lombardi et al., 2012; Rezende et al., 2013; Moura, 2014; Moura,

Camargo, & Correa, 2014; Santos, Miguel, & Lombardi, 2014; Moura, Correa, & Machado, 2015; Moura, Mariano, Machado, Cerboncini, & Fontes, 2017). Papers focusing on bird communities in rupestrian fields are incomplete, despite these communities being threatened with a high risk of extinction (Machado, Fonseca, Machado, Aguiar, & Lins, 1998; Lopes et al., 2009). In this article we present a bird list in rupestrian fields of seven cities in the south of Minas Gerais State, Southeastern Brazil, and analyze the birds' distribution, the endangered species (and its conservation *status*), and generate bases for future conservation actions.

Material and methods

The observations were conducted in rupestrian field areas (Figure 1) (Table 1), located in seven cities in the south of Minas Gerais State: Ingaí, Luminárias, São Thomé das Letras, Carrancas, Minduri, Itumirim and Tiradentes (Figure 2), during 2012 and 2018, in seasonal observations (winter and summer) to obtain occurrence data, with 10 hours (from 6 AM to 4 PM) of sampling effort of in each sampling collection point (similar to Braga et al., 2010). We used Nikon 08x40 and 10x50 binoculars, and Sony H 50, Canon EOS REBEL T1i and Canon Power Shot SX50 HS cameras to help record/sight the birds. The nomenclature follows Piacentini et al. (2015). The climate in the cities and in the studied area is Cwa according to the Köppen classification, with annual average precipitation of 1,529.7 mm concentrated in September to March, and annual average temperature of 19.4°C (Alvares, Stape, Sentelhas, Gonçalves, & Sparovek, 2013). However, the climate in the Chapada das Perdizes between the cities of Carrancas and Minduri is Cwb, common for mountain tops (Alvares et al., 2013).

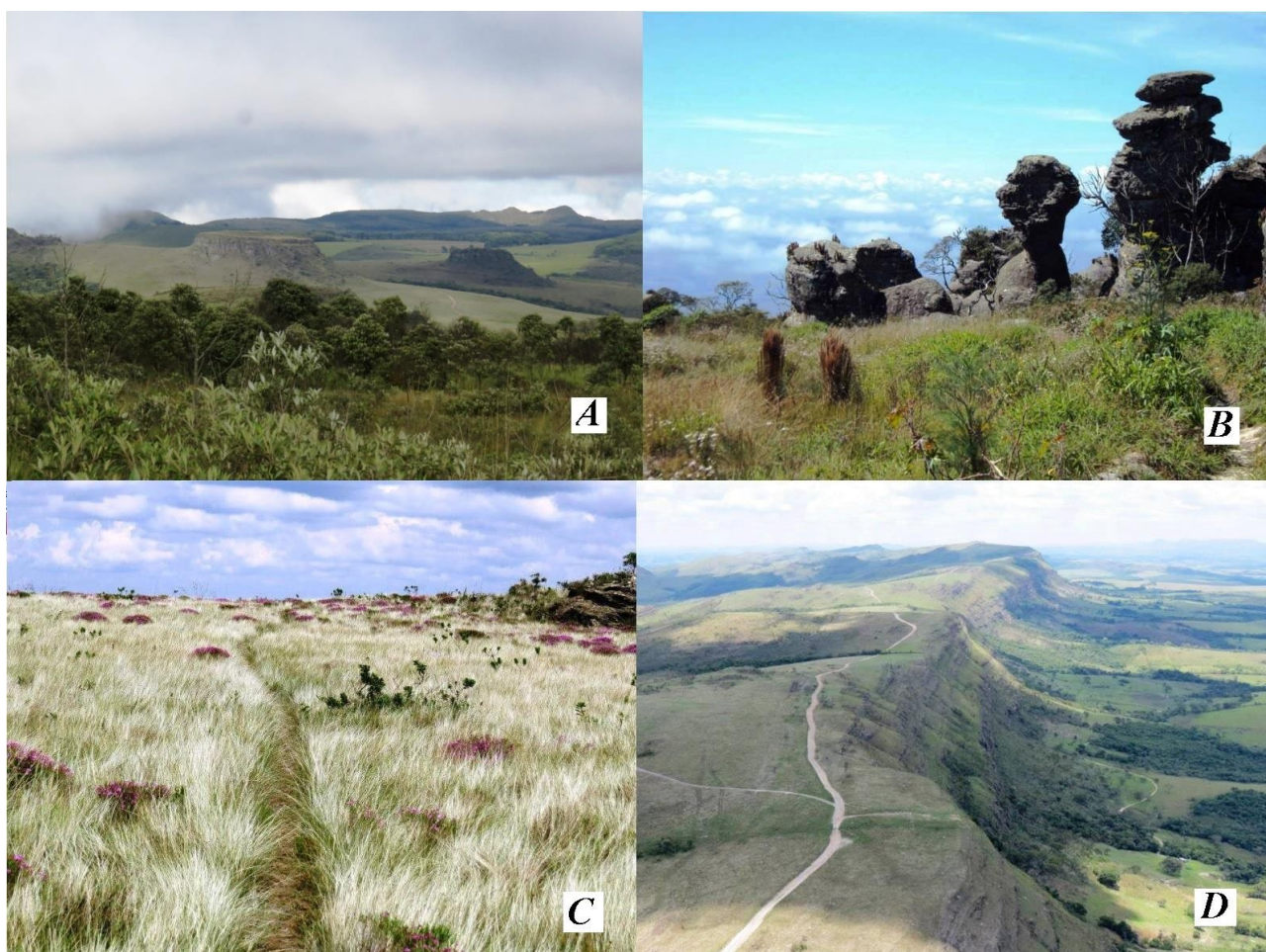
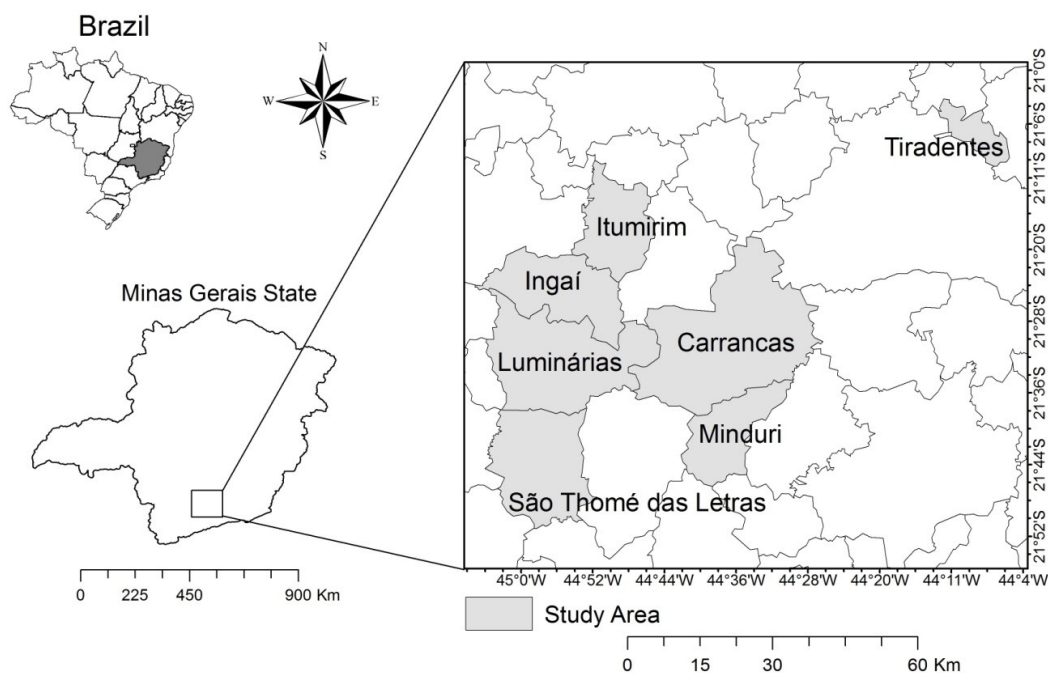


Figure 1. A = Serra das Broas, Chapada das Perdizes region, between Carrancas and Minduri cities, B = rupestrian fields in the Chapada das Perdizes region, between Carrancas and Minduri cities, C = rupestrian fields in Cruzeiro do Santa Galo, São Thomé das Letras cities, D = Serra de Carrancas, Carrancas city (Source: Moura, A. S., personal archive).

Table 1. Georeferenced points of the observation areas.

Counties	Location	Georeferencing	Altitude
São Thomé das Letras	Zé Geraldo Farm	21°43'12.39"S 44°56'53.69"W	1.091 m
São Thomé das Letras	Cruzeiro do Canta Galo Mountain	21°42'36.35"S 44°55'30.75"W	1.367 m
Ingai	Boqueirão Mountain	21°20'46.29"S 44°55'30.75"W	1.180 m
Ingai	Coroa Mountain	21°26'07.26"S 44°57'39.80"W	1.153 m
Itumirim	Itumirim Mountain	21°20'30.16"S 44°53'55.51"W	1.066 m
Itumirim	Paraíso waterfall region	21°21'02.02"S 44°53'13.80"W	987 m
Luminárias	Luminárias Mountain	21°31'56.55"S 44°48'51.93"W	1.298 m
Luminárias	Cristo Mountain	21°31'44.71"S 44°53'01.15"W	1.179 m
Carrancas	Carrancas Mountain	21°26'59.45"S 44°40'08.14"W	1.228 m
Carrancas	Broas Mountain	21°36'12.75"S 44°36'46.45"W	1.404 m
Minduri	Perdizes Plateau	21°35'34.72"S 44°34'38.63"W	1.528 m
Minduri	Galinheiro Mountain	21°36'12.42"S 44°34'35.64"W	1.553m
Tiradentes	São José Mountain	21°06'29.61"S 44°11'44.35"W	1.106 m
Tiradentes	São José Mountain	21°05'06.06"S 44°10'05.60"W	1.144 m

**Figure 2.** Study area in grey. Observed cities are Ingai, Luminárias, São Thomé das Letras, Carrancas, Minduri, Itumirim and Tiradentes, South of Minas Gerais State, Southeastern Brazil.

We made cumulative species curves with Jackknife of first order estimator to analyze the richness, abundance and sampling sufficiency. These curves were obtained with 1000 randomizations using the EstimateS program version 9.10 (Colwell et al., 2012). The similarity and the groups between the sampling collection points were performed by the Jaccard index (Valentin, 2000), using the UPGMA method to create groups of vegetation types according to species composition. These groups were made in the Primer 6 + Permanova program (Clarke & Gorey, 2006; Anderson, Gorley, & Clarke, 2008).

Results and discussion

We recorded 107 bird species (Table 2) of 29 families in a total of 280 hours of sampling effort. The more representative families in the rupestrian fields were: Thraupidae (N=26), Tyrannidae (N=15) and Trochilidae (N=11). Thraupidae was the more representative family because it presents a great species number in Brazil (n=157) (Piacentini et al., 2015). Moreover, the floristic compositions of these areas were composed of grass and herbaceous species which commonly produce fruits, and are used by the frugivorous birds as food (Sick, 1997), for example plants of the *Miconia* genus (Gavilanes et al., 1995; Baumgratz & Chiavegatto, 2006; Nunes, Landau, & Veloso, 2008).

The Tyrannidae and Trochilidae families were expected to be abundant, because previous studies conducted in the south of Minas Gerais State found similar results (Lombardi et al., 2007; Moura et al., 2015). The representativity of the Trochilidae family (nectarivorous birds popularly called hummingbirds) can also be highlighted due to the abundance of food in the rupestrian fields, as they have a variety of rupicolous flowers of the Bromeliaceae, Orchidaceae and Cactaceae families (Gavilanes et al., 1995; Oliveira-Filho & Fluminhan-Filho, 1999).

From the records of this study, 6.54% are threatened species (n=7): *Amazona vinacea* (Kuhl, 1820), *Geositta poeciloptera* (Wied, 1830), *Alectrurus tricolor* (Vieillot, 1816), *Anthus nattereri* Sclater, 1878, *Coryphaspiza melanotis* (Temminck, 1822), (International Union for Conservation of Nature and Natural Resources [IUCN], 2019), Brasil, 2014), *Culicivora caudacuta* (Vieillot, 1818), and *Polystictus superciliaris* (Wied, 1831) (IUCN, 2019). With the exception of the Vinaceous-breasted amazon (*A. vinacea*), the other recorded threatened species are birds which are closely related to fields, and these species are among the most threatened birds of the Cerrado domain (Machado et al., 1998; Lopes et al., 2009).

As a result, we emphasize the importance of preserving this vegetation type for bird communities. In addition, Oliveira-Filho & Fluminhan-Filho (1999) mention the importance of preserving rupestrian fields due to its specific flora, the high species richness with restricted ecological and geographic distribution, and the presence of floristic endemic elements in the mountains, which together evidence that this type of vegetation and its bird communities deserve high conservation priority.

Table 2. Birds species recorded in the study. Ing= Ingai, Lum= Luminárias, Stl= São Thomé das Letras, Car= Carrancas, Min= Minduri, Itu= Itumirim and Tir= Tiradentes.

Family	Species	Popular name	Ing	Lum	Stl	Car	Min	Itu	Tir
Tinamidae	<i>Crypturellus parvirostris</i> (Wagler, 1827)	Small-billed Tinamou	X	X	X	X		X	
	<i>Rhynchotus rufescens</i> (Temminck, 1815)	Red-winged Tinamou	X	X	X	X	X	X	X
	<i>Nothura maculosa</i> (Temminck, 1815)	Spotted Nothura		X		X	X	X	
Cathartidae	<i>Cathartes aura</i> (Linnaeus, 1758)	Turkey Vulture	X	X	X	X	X	X	X
	<i>Coragyps atratus</i> (Bechstein, 1793)	Black Vulture		X	X	X	X		
	<i>Sarcorampus papa</i> (Linnaeus, 1758)	King Vulture		X	X	X	X	X	
Accipitridae	<i>Ictinia plumbea</i> (Gmelin, 1788)	Plumbeous Kite		X	X		X		
	<i>Heterospizias meridionalis</i> (Latham, 1790)	Savanna Hawk	X		X		X	X	
	<i>Rupornis magnirostris</i> (Gmelin, 1788)	Roadside Hawk	X	X	X				X
	<i>Geranoaetus albicaudatus</i> (Vieillot, 1816)	White-tailed Hawk	X	X	X	X	X	X	X
	<i>Geranoaetus melanoleucus</i> (Vieillot, 1819)	Black-chested Buzzard-Eagle			X	X	X		
Charadriidae	<i>Buteo brachyurus</i> Vieillot, 1816	Short-tailed Hawk		X	X				
	<i>Vanellus chilensis</i> (Molina, 1782)	Southern Lapwing	X					X	
Columbidae	<i>Columbina talpacoti</i> (Temminck, 1810)	Ruddy Ground-Dove	X		X		X		
	<i>Patagioenas picazuro</i> (Temminck, 1813)	Picazuro Pigeon	X	X	X	X	X	X	X
	<i>Patagioenas cayennensis</i> (Bonnaterre, 1792)	Pale-vented Pigeon			X	X			
	<i>Zenaida auriculata</i> (Des Murs, 1847)	Eared Dove	X	X	X	X	X		X
Strigidae	<i>Megascops choliba</i> (Vieillot, 1817)	Tropical Screech-Owl			X				
	<i>Athene cunicularia</i> (Molina, 1782)	Burrowing Owl			X	X	X	X	
Caprimulgidae	<i>Nyctidromus albicollis</i> (Gmelin, 1789)	Common Pauraque	X		X	X	X		
Caprimulgidae	<i>Hydropsalis longirostris</i> (Bonaparte, 1825)	Band-winged Nightjar		X		X	X	X	X
Apodidae	<i>Streptoprocne zonaris</i> (Shaw, 1796)	White-collared Swift		X		X	X	X	X
Trochilidae	<i>Phaethornis pretrei</i> (Lesson & Delattre, 1839)	Planalto Hermit	X	X	X	X	X	X	X
	<i>Eupetomena macroura</i> (Gmelin, 1788)	Swallow-tailed Hummingbird	X	X	X	X	X	X	X
	<i>Colibri serrirostris</i> (Vieillot, 1816)	White-vented Violetear	X	X	X	X	X	X	X
	<i>Chlorostilbon lucidus</i> (Shaw, 1812)	Glittering-bellied Emerald	X	X	X	X	X	X	X
	<i>Thalurania glaucopis</i> (Gmelin, 1788)	Violet-capped Woodnymph			X	X	X		

Family	Species	Popular name	Ing	Lum	Stl	Car	Min	Itu	Tir
	<i>Leucochloris albicollis</i> (Vieillot, 1818)	White-throated Hummingbird				X	X		
	<i>Amazilia versicolor</i> (Vieillot, 1818)	Versicolored Emerald			X	X	X	X	
	<i>Amazilia lactea</i> (Lesson, 1832)	Sapphire-spangled Emerald	X	X	X	X	X	X	X
	<i>Heliothryx auritus</i> (Gmelin, 1788)	Black-eared Fairy			X				
	<i>Helimaster squamosus</i> (Temminck, 1823)	Stripe-breasted Starthroat		X		X	X		
	<i>Calliphlox amethystina</i> (Boddaert, 1783)	Amethyst Woodstar	X		X				
Bucconidae	<i>Nystalus chacuru</i> (Vieillot, 1816)	White-eared Puffbird	X	X	X	X	X	X	X
Ramphastidae	<i>Ramphastos toco</i> Statius Muller, 1776	Toco Toucan	X	X	X	X	X	X	X
Picidae	<i>Colaptes campestris</i> (Vieillot, 1818)	Campo Flicker	X	X	X	X	X	X	X
Cariamidae	<i>Cariama cristata</i> (Linnaeus, 1766)	Red-legged Seriema	X	X	X	X	X	X	X
Falconidae	<i>Caracara plancus</i> (Miller, 1777)	Southern Caracara	X	X	X	X	X	X	X
Falconidae	<i>Milvago chimachima</i> (Vieillot, 1816)	Yellow-headed Caracara	X	X		X	X	X	
	<i>Herpetotheres cachinnans</i> (Linnaeus, 1758)	Laughing Falcon			X				
	<i>Falco sparverius</i> Linnaeus, 1758	American Kestrel	X	X	X	X	X	X	X
	<i>Falco femoralis</i> Temminck, 1822	Aplomado Falcon	X	X		X	X		X
Psittacidae	<i>Primolius maracana</i> (Vieillot, 1816)	Blue-winged Macaw		X		X			
	<i>Psittacara leucophthalmus</i> (Statius Muller, 1776)	White-eyed Parakeet	X		X			X	
	<i>Eupsittula aurea</i> (Gmelin, 1788)	Peach-fronted Parakeet	X	X	X	X	X	X	X
	<i>Pionus maximiliani</i> (Kuhl, 1820)	Scaly-headed Parrot	X	X					
	<i>Amazona vinacea</i> (Kuhl, 1820)	Vinaceous-breasted Parrot				X	X		
Scleruridae	<i>Geositta poeciloptera</i> (Wied, 1830)	Campo Miner				X	X		X
Furnariidae	<i>Anumbius annumbi</i> (Vieillot, 1817)	Firewood-Gatherer			X	X	X		
	<i>Synallaxis spixi</i> Sclater, 1856	Spix's Spinetail	X	X	X	X		X	X
Cotingidae	<i>Phibalura flavirostris</i> Vieillot, 1816	Swallow-tailed Cotinga				X	X		
Melanopareiidae	<i>Melanopareia torquata</i> (Wied, 1831)	Collared Crescentchest	X	X	X	X	X	X	X
Tyrannidae	<i>Hirundinea ferruginea</i> (Gmelin, 1788)	Cliff Flycatcher	X	X	X	X	X	X	X
	<i>Elaenia flavogaster</i> (Thunberg, 1822)	Yellow-bellied Elaenia	X	X	X	X	X	X	X
	<i>Elaenia chiriquensis</i> Lawrence, 1865	Lesser Elaenia		X		X	X		
	<i>Elaenia obscura</i> (d'Orbigny & Lafresnaye, 1837)	Highland Elaenia	X	X	X	X	X	X	X
	<i>Culicivora caudacuta</i> (Vieillot, 1818)	Sharp-tailed Tyrant		X		X	X		
Tyrannidae	<i>Polystictus supercilialis</i> (Wied, 1831)	Gray-backed Tachuri			X				X
	<i>Myiarchus ferox</i> (Gmelin, 1789)	Short-crested Flycatcher	X	X				X	X
	<i>Tyrannus savana</i> Daudin, 1802	Fork-tailed Flycatcher	X	X	X	X	X	X	X
	<i>Colonia colonus</i> (Vieillot, 1818)	Long-tailed Tyrant	X	X	X	X	X	X	X
	<i>Alectrurus tricolor</i> (Vieillot, 1816)	Cock-tailed Tyrant				X	X		
	<i>Knipolegus lophotes</i> Boie, 1828	Crested Black-Tyrant	X	X	X	X	X	X	X
	<i>Knipolegus nigerrimus</i> (Vieillot, 1818)	Velvety Black-Tyrant	X	X		X	X		X
	<i>Xolmis cinereus</i> (Vieillot, 1816)	Gray Monjita	X	X	X	X	X	X	X
	<i>Xolmis velatus</i> (Lichtenstein, 1823)	White-rumped Monjita	X	X	X	X	X	X	X
	<i>Muscipira vetula</i> (Lichtenstein, 1823)	Shear-tailed Gray Tyrant		X		X	X	X	X
Corvidae	<i>Cyanocorax cristatellus</i> (Temminck, 1823)	Curl-crested Jay	X	X	X	X	X	X	X
Hirundinidae	<i>Tachycineta leucorrhoa</i> (Vieillot, 1817)	White-rumped Swallow	X	X		X		X	X
Troglodytidae	<i>Troglodytes musculus</i> Naumann, 1823	Southern House Wren	X	X	X	X	X	X	X
	<i>Cistothorus platensis</i> (Latham, 1790)	Sedge Wren		X		X	X		X
Motacillidae	<i>Anthus lutescens</i> Pucheran, 1855	Yellowish Pipit	X		X	X	X		X
	<i>Anthus nattereri</i> Sclater, 1878	Ochre-breasted Pipit		X	X	X	X		X
	<i>Anthus hellmayri</i> Hartert, 1909	Hellmayr's Pipit		X	X	X	X		X
Passerellidae	<i>Zonotrichia capensis</i> (Statius Muller, 1776)	Rufous-collared Sparrow	X	X	X	X	X	X	X
	<i>Ammodramus humeralis</i> (Bosc, 1792)	Grassland Sparrow	X	X	X	X	X	X	X
Icteridae	<i>Molothrus bonariensis</i> (Gmelin, 1789)	Shiny Cowbird			X				
Thraupidae	<i>Porphyrospiza caerulescens</i> (Wied, 1830)	Blue Finch	X	X	X	X	X	X	X
Thraupidae	<i>Pipraeidea melanonota</i> (Vieillot, 1819)	Fawn-breasted Tanager	X	X		X	X		
	<i>Stephanophorus diadematus</i> (Temminck, 1823)	Diademed Tanager				X	X		
	<i>Schistochlamys ruficapillus</i> (Vieillot, 1817)	Cinnamon Tanager	X	X	X	X	X	X	X
	<i>Tangara cyanoventris</i> (Vieillot, 1819)	Gilt-edged Tanager	X	X	X	X	X	X	X
	<i>Tangara desmaresti</i> (Vieillot, 1819)	Brassy-breasted Tanager				X	X		
	<i>Tangara sayaca</i> (Linnaeus, 1766)	Sayaca Tanager	X	X	X	X	X	X	X
	<i>Tangara cayana</i> (Linnaeus, 1766)	Burnished-buff Tanager	X	X	X	X	X	X	X
	<i>Nemosia pileata</i> (Boddaert, 1783)	Hooded Tanager	X			X	X	X	
	<i>Sicalis citrina</i> Pelzeln, 1870	Stripe-tailed Yellow-Finch	X	X	X	X	X	X	X
	<i>Sicalis luteola</i> (Sparrman, 1789)	Grassland Yellow-Finch	X	X	X	X	X	X	X

Family	Species	Popular name	Ing	Lum	Stl	Car	Min	Itu	Tir
Thraupidae	<i>Volatinia jacarina</i> (Linnaeus, 1766)	Blue-black Grassquit	X	X	X	X	X	X	X
	<i>Coryphospingus pileatus</i> (Wied, 1821)	Pileated Finch	X		X	X	X	X	
	<i>Tachyphonus coronatus</i> (Vieillot, 1822)	Ruby-crowned Tanager			X	X	X	X	
	<i>Tersina viridis</i> (Illiger, 1811)	Swallow Tanager	X	X	X	X	X	X	X
	<i>Dacnis cayana</i> (Linnaeus, 1766)	Blue Dacnis	X	X	X	X	X	X	X
	<i>Coereba flaveola</i> (Linnaeus, 1758)	Bananaquit	X	X	X	X	X	X	X
	<i>Sporophila lineola</i> (Linnaeus, 1758)	Lined Seedeater	X	X		X		X	
	<i>Sporophila nigricollis</i> (Vieillot, 1823)	Yellow-bellied Seedeater	X	X	X	X	X	X	X
	<i>Sporophila ardesiaca</i> (Dubois, 1894)	Dubois's Seedeater	X			X		X	
	<i>Sporophila caerulescens</i> (Vieillot, 1823)	Double-collared Seedeater	X	X	X	X	X	X	X
	<i>Coryphaspiza melanotis</i> (Temminck, 1822)	Black-masked Finch		X		X	X	X	
	<i>Embernagra platensis</i> (Gmelin, 1789)	Great Pampa-Finch	X	X	X	X	X	X	X
	<i>Emberizoides herbicola</i> (Vieillot, 1817)	Wedge-tailed Grass-Finch		X		X	X		X
	<i>Saltatricula atricollis</i> (Vieillot, 1817)	Black-throated Saltator	X	X	X	X	X	X	X
	<i>Saltator similis</i> d'Orbigny & Lafresnaye, 1837	Green-winged Saltator	X	X	X	X	X	X	X
Cardinalidae	<i>Piranga flava</i> (Vieillot, 1822)	Hepatic Tanager	X	X	X	X	X	X	X
Fringillidae	<i>Spinus magellanicus</i> (Vieillot, 1805)	Hooded Siskin	X	X	X	X	X	X	X
	<i>Euphonia chlorotica</i> (Linnaeus, 1766)	Purple-throated Euphonia	X	X	X	X	X	X	X
	<i>Euphonia cyanocephala</i> (Vieillot, 1818)	Golden-rumped Euphonia				X		X	

The species accumulation curve did not reach the asymptote, and the Jackknife of first order estimator curve presented a small slope at the curve end (Figure 3). The estimator presented a richness of 96.87% of the total diversity, with 109.43 species. This high value demonstrates that the sampling effort was satisfied. The number of records, the representativity and the threatened species show that the rupestrian fields are of extreme importance in order to preserve and conserve the bird fauna which are more specific to these fields.

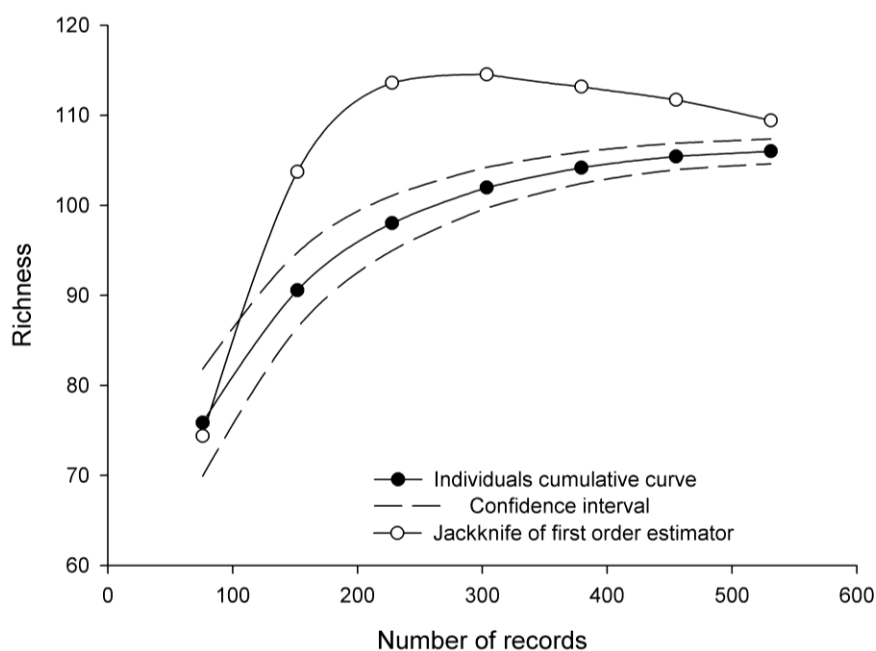


Figure 3. Cumulative species curve, confidence interval and Jackknife of first order estimator of the studied areas.

The cluster demonstrated a similarity between the bird community of rupestrian fields from the counties of Tiradentes and Luminárias; Minduri and Carrancas, Itumirim and Ingaí. The community from São Thomé das Letras city is the most different when compared among the other communities (Figure 3). The similarity is related to geographical proximity, considering that the sampling areas are continuous from a mountain range, and also the similarities are explained to their disturbance degree. In contrast, although the sampled vegetation type from São Thomé das Letras city is in good condition (Figure 1C), the landscape contains the presence of mining companies and has a great number of mining tailings (see Chiodi Filho, Artur, & Rodrigues, 2005), and therefore natural vegetation is absent in several areas, in turn presenting a human effect on the bird fauna (Figure 5).

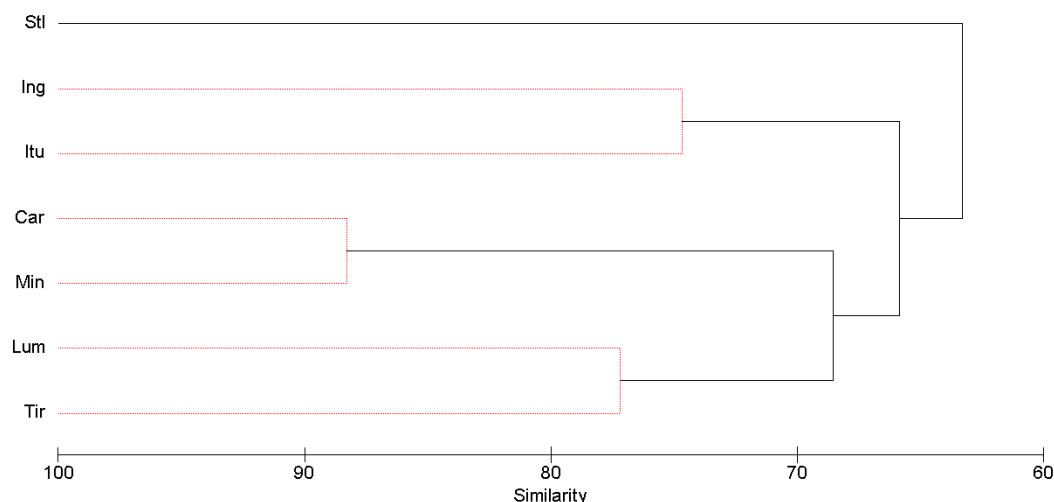


Figure 4. Bird community cluster between sampling areas. Cities: Stl= São Thomé das Letras, Ing= Ingaí, Itu= Itumirim, Car= Carrancas, Min= Minduri, Lum= Luminárias and Tir= Tiradentes.

Despite the rupestrian fields being considered components of the Cerrado domain (Oliveira-Filho & Fluminhan-Filho, 1999), we recorded five species commonly found in the Atlantic Forest (Silva, 1995; Silva & Santos, 2005): *Thalurania glaucopis* (Gmelin, 1788), *Primolius maracana* (Vieillot, 1816), *Knipolegus nigerrimus* (Vieillot, 1818), *Tachyphonus coronatus* (Vieillot, 1822) and *Sporophila ardesiaca* (Dubois, 1894). The sampling areas (Figure 2) presented high influence of Atlantic Forest due to its location near to an ecotonal region between both domains, which may have altered the bird community.



Figure 5. Photo of rupestrian fields from São Thomé das Letras city, highlighting the mining area and mining tailings, and the absence of natural vegetation (Source: Google images).

Despite expressive richness recorded for the bird communities of the rupestrian fields in the south of Minas Gerais State, the species list presented herein needs to be completed because this fauna group is dynamic. We also need to consider that Rodrigues et al. (2011) recorded 151 bird species in the rupestrian fields in Serra do Cipó National Park, in central Minas Gerais State, thus suggesting that our sampling area can present higher richness because they are identical vegetation types and present a larger area than that presented by Rodrigues et al. (2011).

Part of the sampled areas is considered a priority for biological conservation (Chapada das Perdizes, bordering the cities of Carrancas/Minduri) (Drummond, Martins, Machado, Sebaio, & Antonini, 2005), not only presenting rare, endangered and endemic species of birds, but also other species (Oliveira-Filho et al., 2004) which are present in these rupestrian fields such as mammals (Machado, Gregorin, & Mouallem, 2013;

Pecora et al., 2016; Machado et al., 2017), and plants (Oliveira-Filho et al., 2004). Lawton (1996) mentions that the knowledge about vertebrate composition in different areas and comparisons between them are important for conservationist projects. Therefore, the characteristics of the area, the large dimensions, its location, and the vegetation type make the area relevant for creating a conservation unit (wildlife protected area – Brasil, 2000) in the region. In addition, this (or these) conservation unit(s) will create an ecological corridor of rupestrian fields in association with other areas, such as the Serra de São José Environmental Protection Area (APA Serra de São José).

Conclusion

Our study found a high richness in relation to other open areas, with the Tyrannidae and Trochilidae families being the most representative. We highlight the endangered species in the Cerrado domain which of these species are closely linked to rupestrian fields. The composition is similar to closer areas, with exception to São Thomé das Letras city because it suffers an influence of mining areas. We suggest creating a wildlife protected area to preserve and conserve a great area of rupestrian fields and consequently the associated biota, especially the bird communities.

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