

# Range extensions and conservation of some threatened or little known Brazilian grassland birds

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## Summary

Populations of grassland birds are declining in Brazil due to profound alterations to grassland habitats. In this paper, we present recent records and range extensions for 12 threatened or little known Brazilian grassland species: Ocellated Crake *Micropygia schomburgkii*, Sickie-winged Nightjar *Eleothreptus anomalus*, Campo Miner *Geositta poeciloptera*, Rufous-sided Pygmy-tyrant *Euscarthmus rufomarginatus*, Sharp-tailed Grass-tyrant *Culicivora caudacuta*, Cock-tailed Tyrant *Alectrurus tricolor*, Cinereous Warbling-finch *Poospiza cinerea*, Black-masked Finch *Coryphaspiza melanotis*, Tawny-bellied Seedeater *Sporophila hypoxantha*, Marsh Seedeater *S. palustris*, Chestnut Seedeater *S. cinnamomea* and Black-bellied Seedeater *S. melanogaster*. We also comment on the biogeography and conservation of these species.

## Resumo

As populações de aves campestres brasileiras estão sofrendo tremendos impactos decorrentes das alterações sofridas pelos campos naturais. Neste estudo são apresentados registros e extensões na distribuição geográfica de 12 espécies de aves campestres brasileiras pouco conhecidas ou ameaçadas de extinção: *Micropygia schomburgkii* maxalalagá, *Eleothreptus anomalus* curiangodo-banhado, *Geositta poeciloptera* andarilho, *Euscarthmus rufomarginatus* maria-corruiá, *Culicivora caudacuta* papa-moscas-do-campo, *Alectrurus tricolor* galito, *Poospiza cinerea* capacetinho-do-oco-do-pau, *Coryphaspiza melanotis* tico-tico-de-máscara-negra, *Sporophila hypoxantha* caboclinho-de-barriga-vermelha, *S. palustris* caboclinho-de-papo-branco, *S. cinnamomea* caboclinho-de-chapéu-cinzento e *S. melanogaster* caboclinho-de-barriga-preta. Também são apresentados comentários sobre a conservação e a biogeografia dessas espécies.

## Introduction

Although populations of many grassland birds have declined sharply throughout the Western Hemisphere during the past decades (Vickery *et al.* 1999), these species have received little attention compared to tropical forest birds (Willis and Oniki 1992, Stotz *et al.* 1996). Modernisation and mechanisation of agricultural practices in central Brazil during the last two decades resulted in profound changes in grassland habitats, which threatened several habitat-restricted birds with extinction (Parker and Willis 1997, Cavalcanti 1999). According to Wege and Long (1995), 12% of the Neotropical bird species then threatened with extinction live in grasslands and savannas. Of the Neotropical species using grasslands as their primary habitat, 34% have high conservation priorities and 80% of the endemic lowland grassland birds of South

America are at risk (Stotz *et al.* 1996). In this paper we present new records and range extensions for 12 threatened or little known Brazilian grassland birds, and discuss the main threats to them.

## Study area and methods

We conducted intensive bird surveys in the state of Minas Gerais, southeastern Brazil, during the last 10 years, which resulted in a large amount of unpublished data. Here we summarize records of Near Threatened/Threatened (Collar *et al.* 1992, Machado *et al.* 2005, BirdLife International 2008) or little known grassland birds (*sensu* Vickery *et al.* 1999) observed during this period. The majority of these records were documented by digital photography or tape recordings that have been, or will be deposited in the Arquivo Sonoro Professor Elias Coelho, Universidade Federal do Rio de Janeiro, Brazil. We also report on some specimens deposited in the Brazilian ornithological collections of the Universidade Federal de Minas Gerais, Belo Horizonte (DZUFMG), Museu de Zoologia da Universidade de São Paulo, São Paulo (MZUSP) and Museu de História Natural de Taubaté, Taubaté (MHNT).

The six most important areas (Figure 1) for grassland species surveyed are described below. Vegetation community descriptions of the *Cerrado* biome follow Ribeiro and Walter (1998), and are only briefly described here: *cerrado típico* (a woodland 3–6 m tall with closed scrub and

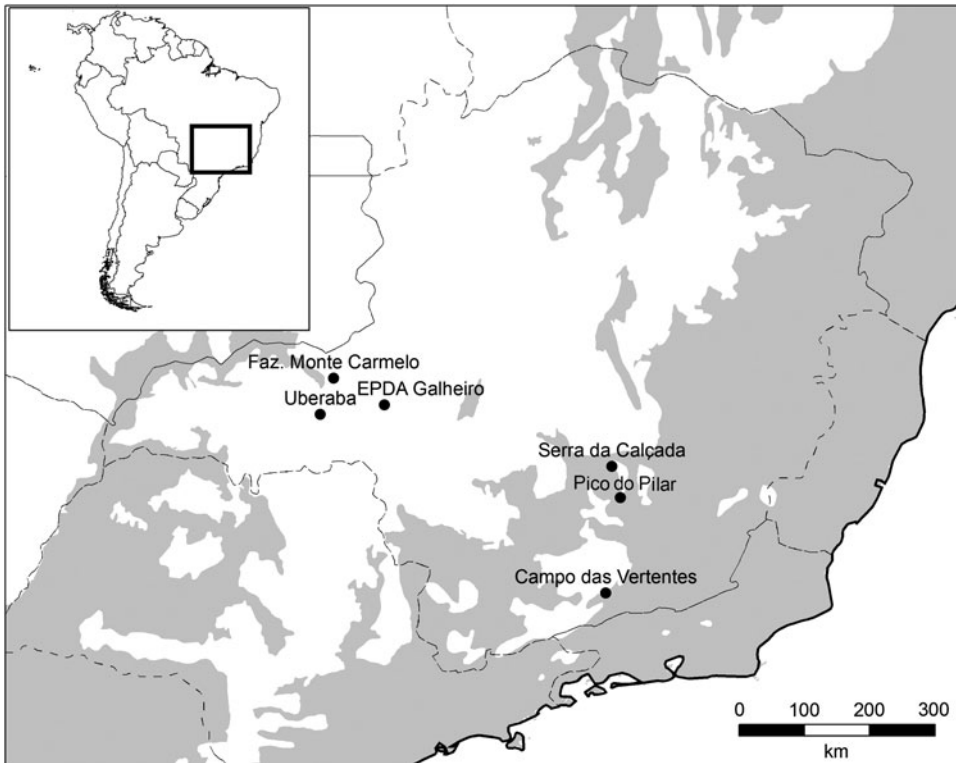


Figure 1. Grassland bird species rich areas surveyed in the state of Minas Gerais, southeastern Brazil. Gray shaded areas indicate forested regions, while white areas represent non-forested regions (according to Olson *et al.* 2001).

scattered trees), *cerrado ralo* (more open scrub with a few trees), *cerrado rupestre* (similar to the *cerrado ralo*, but growing over rocky substrates), *campo sujo* (grassland with scattered shrubs), *campo sujo com murundus* (a grassland with small groves of trees on raised earth mounds associated with termite nests, also locally known as *covoal*), *campo limpo* (grasslands without woody plants), *campos rupestres* (rocky grassland with a very peculiar shrub and herbaceous vegetation growing over quartzite outcrops; Giuliatti and Pirani 1988), *canga* (herbaceous and shrubby vegetation growing over iron ore outcrops; Vincent et al. 2002, Jacobi et al. 2007, Viana and Lombardi 2007) and *vereda* (stands of the palm *Mauritia flexuosa* growing in grass-covered swamps).

The main study areas and the localities sampled were:

*Municipality of Uberaba*: 1) *Fazenda Cocal* (19°26'S and 48°00'W; 915 m asl) and 2) *Fazenda Água Emendada* (19°17'S and 48°01'W; 950 m).

*Fazenda Monte Carmelo*: a large *Eucalyptus* and *Pinus* plantation with grassland patches in the municipalities of Estrela do Sul, Monte Carmelo, Indianópolis, Araguari and Romaria. The headwaters of the following creeks were sampled: 1) Ribeirão Buriti Alto (18°47'S and 47°46'W; 990 m); 2) Ribeirão Piçarrão (18°48'S and 47°53'W; 975 m); 3) Ribeirão Furnas (18°50'S and 47°50'W; 18°50'S and 47°52'W 970–980 m); 4) Ribeirão Mandaguari (19°02'S and 47°42'W; 990 m) and 5) Vereda Barro Preto (18°59'S and 47°40'W; 998 m).

*Estação de Pesquisa e Desenvolvimento Ambiental Galheiro (EPDA Galheiro)*: a reserve in the municipality of Perdizes (19°12'S and 47°08'W; 800–950).

*Serra da Calçada*: a hilly area (1,100–1,500 m) in the southern portion of the Espinhaço Range, in the municipalities of Nova Lima, Brumadinho and Ibirité: 1) Serra do Rola Moça State Park (20°03'S and 44°00'W); 2) surroundings of Retiro das Pedras (20°06'S and 43°59'W) and 3) Vale dos Cristais (20°00'S and 43°54'W).

*Pico do Pilar*: another hilly area in the southern Espinhaço Range, municipality of Congonhas: 1) Casa de Pedra mine (20°29'S and 43°53'W); 2) Paiol de Explosivos (20°27'S and 43°52'W) and 3) Batateiro (20°28'S and 43°56'W).

*Campo das Vertentes*: a region of extensive high altitude (1,000–1,200 m) *campos limpos* in southern Minas Gerais, municipalities of Andrelândia, Bom Jardim de Minas and Lima Duarte, among others, sampled on June 2005: 1) farm belonging to Mr. G. C. Fonseca (21°43'S and 44°00'W); 2) farm belonging to Mr. P. S. Almeida (21°43'S and 44°05'W); 3) Fazenda 48 (21°44'S and 44°03'W); 4) Souza (21°48'S and 44°05'W); 5) Fazenda Areão (21°52'S and 44°07'W). A complete list of the birds observed in this region is available elsewhere (Pacheco et al. 2008).

## Species accounts

The conservation status of each species follows Machado et al. (2005) and BirdLife International (2008) at the national and global levels, respectively. We present an updated range map for all species studied (see Supplementary Material). These maps were prepared based on unpublished field records, published records, and museum specimens (see acknowledgments).

**Ocellated Crane *Micropygia schomburgkii*** - Data Deficient (Machado et al. 2005).

This is a common species at the EPDA Galheiro, where it was recorded from January to November 2003 in *cerrado ralo*, *cerrado rupestre*, and *cerrado típico*. At Fazenda Monte Carmelo this species was recorded year round (2005–2008) inhabiting *campo sujo com murundus* and grasslands at Ribeirão Piçarrão, Ribeirão Mandaguari, Ribeirão Buriti Alto, Ribeirão Furnas and Vereda Barro Preto. Records at Fazenda Água Emendada are from February and November 2007 in *cerrado típico*. The first record of this species for Minas Gerais was presented by Pelzeln (1868–1870), who reported a specimen collected by Natterer at "Borda do Matto du Paranaíba", nowadays Borda da Mata (Paynter and Traylor 1991), near the border with the state of Goiás. Recent records for the state are from the Serra da Canastra National Park (Silveira 1998, Vasconcelos et al. 2006).

**Sickle-winged Nightjar *Eleothreptus anomalus*** - Near Threatened (Machado et al. 2005, BirdLife International 2008).

A male was observed near Ijaci (21°10'S and 44°55'W; 840 m), southern Minas Gerais, in June 2004. A possible female of this species was observed on a dirt road at Campo das Vertentes (farm belonging to Mr. G. C. Fonseca) on 26 July 2005. This road crosses extensive grasslands, and the site record was located less than 30 m from a gallery forest. If confirmed, this record would represent a connection between the historical localities of Lagoa Santa and southern Brazil (Straube 1990, Bornschein *et al.* 1996, Kirwan *et al.* 1999, Cleere 2002). An adult male was collected on 30 April 1999 at Serra da Canastra (DZUFMG 2662).

**Campo Miner *Geositta poeciloptera*** - Vulnerable (Machado *et al.* 2005), Near Threatened (BirdLife International 2008).

One individual, observed and photographed on a dirt road at Campo das Vertentes (Fazenda 48) on 26 July 2005, represents the easternmost record of this species. On 27 October 2007 one individual was recorded at Fazenda Água Emendada in *cerrado ralo*, and about eight individuals were observed and photographed in the surrounding abandoned pastures on 1 November 2007 (19°14'S and 48°05'W; 900 m). This species was previously known from only seven localities in Minas Gerais. The first record for the state is one specimen collected by Natterer in June 1823 in São Domingos (Pelzeln 1868–1870). Three other historical records are from Uberaba, Paracatu and Lagoa Santa (Reinhardt 1870, Krabbe 2007). Recent occurrences in Minas Gerais are from Serra da Canastra, Tapira, and Patrocínio (Brandt 1998, Silveira 1998, Silva e Silva 2005, Vasconcelos *et al.* 2006).

**Rufous-sided Pygmy-tyrant *Euscarthmus rufomarginatus*** - Near Threatened (Machado *et al.* 2005, BirdLife International 2008).

On 1 and 2 October 2002 at least two individuals were tape-recorded in a transition zone between a seasonally flooded *campo limpo* and a *campo sujo* at Fazenda Cocal. This is the fifth record of this species for Minas Gerais (Supplementary materials), including the record for Parque das Mangabeiras, considered doubtful by D'Angelo Neto and Queiroz (2001). We found this species to be the most common flycatcher in *campo sujo* and *cerrado ralo* during a faunal inventory (January/February 2008) at Estação Ecológica Serra Geral do Tocantins, central Brazil (10°39'S and 46°48'W). This is a large (c. 720,000 ha) conservation unit on the border of the states of Tocantins and Bahia. This species colonises recently burned areas and pairs were heard and seen every 200 m of transect on average. Four birds were collected (MZUSP 79673–76) with gonads inactive, despite the record of several young birds being fed by the parents. Stomach contents of these individuals revealed small fruits and insects in almost equal proportions. This species was also common in the adjacent Parque Estadual do Jalapão, Tocantins (Braz *et al.* 2003).

**Sharp-tailed Grass-tyrant *Culicivora caudacuta*** - Vulnerable (Machado *et al.* 2005, BirdLife International 2008).

Small groups of 2–3 individuals were recorded in *cerrado ralo* and *cerrado rupestre* in April, May, July, August and November 2003 at the EPDA Galheiro. A small group (4–5 birds) was observed at Serra do Rola Moça State Park on May and August 2005. These birds were at 1,500 m, representing a small altitudinal extension for the species, which was known to occur at a maximum of 1,400 m (Ridgely and Tudor 1994, Stotz *et al.* 1996). A small group (4–5 birds) was observed in Retiro das Pedras on August 2005. A small group was observed at Batateiro on December 2005. Two individuals were recorded at Fazenda Água Emendada in seasonally flooded *campo limpo* on 30 December 2005. This species was recorded year round (2005–2008) at Fazenda Monte Carmelo (Ribeirão Piçarrão, Ribeirão Mandaguari, Ribeirão Furnas, Ribeirão Buriti Alto and Vereda Barro Preto), where it inhabits seasonally flooded *campo limpo* and *campo sujo com murundus*. Censuses made in this area (2007/2008) revealed 88 individuals in 96 hours of observations. This species was recorded in several areas at Campo das Vertentes (farm belonging to Mr. G. C. Fonseca, Fazenda Areão, Souza, and farm belonging to Mr. P. S. Almeida), revealing that it is a locally common species. These are the easternmost records of *C. caudacuta*, extending the range c. 250 km to the east. The updated map expands the known range of this species to the north (600 km, Oren 1991) and south (450 km, Di Giacomo 2005) of its previously known range (see Supplementary materials).

Two specimens (DZUFMG 4511, male, weighing 6.4 g and DZUFMG 4512, female, 5.7 g) were found dead on 2 June 2005 in Retiro das Pedras. These birds were apparently hit when they attempted to cross the road. In the stomach of the male we found: 2 Araneae, 1 Orthoptera, 2 Hemiptera, 2 larvae of Lepidoptera, 1 adult Lepidoptera, 1 Diptera, and 1 Hymenoptera. In the stomach of the female (DZUFMG 4512, 5.7 g) we found: 1 Araneae, 1 Homoptera, 1 Diptera, and 1 Hymenoptera. The gizzards of two specimens deposited in the ornithological collection of the Reserva Ecológica do IBGE, Brasília, also contained only insects. This small sample size contradicts previous observations that this species “feeds on grass and weed seeds as well as more standard insect fare” (Traylor and Fitzpatrick 1982).

**Cock-tailed Tyrant *Alectrurus tricolor*** - Vulnerable (Machado *et al.* 2005, BirdLife International 2008).

On 2 October 2002, a pair was observed at Fazenda Cocal in a seasonally flooded *campo limpo*. One pair was observed and photographed in the Campo das Vertentes (farm belonging to Mr. G. C. Fonseca) in a seasonally flooded *campo limpo*. A small group of three females was observed nearby, but in a dry *campo limpo*. This species was recorded from August 2007 to April 2008 at Fazenda Monte Carmelo (Ribeirão Piçarrão, Ribeirão Mandaguari, Ribeirão Furnas and Ribeirão Buriti Alto), inhabiting seasonally flooded *campo sujo*, *campo sujo com murundus*, and *veredas*. On 27 August, a singing male was observed, but the long tail, characteristic of this species, was not fully grown. On 4 and 11 October, three males were observed exhibiting the typical flight display of this species (Sick 1997). On December 2007 we counted 26 individuals, on January and February seven individuals, and only five birds on April 2008.

**Cinereous Warbling-finch *Poospiza cinerea*** - Data Deficient (Machado *et al.* 2005), Vulnerable (BirdLife International 2008).

A summary of the records of this species for Minas Gerais was presented by Melo-Júnior (1998), with subsequent records obtained in central and southern Espinhaço Range (D'Angelo Neto and Queiroz 2001, Bencke *et al.* 2006, Vasconcelos 2007, Vasconcelos and D'Angelo Neto 2007). Unpublished records of this species are as follows: 1) One individual in a degraded *campo sujo* at Vale dos Cristais on 4 January 2002; 2) One individual in a degraded roadside at Pico do Pilar on 7 December 2002; 3) Two individuals on a degraded *campo cerrado* with several invasive plants at Bairro Belvedere, Belo Horizonte (19°58'S and 43°56'W; 1,130 m) on 4 June 2003 and two birds again in this same area on 11 May 2004; 4) Two individuals in degraded pastures and orchards in Fortaleza de Minas (20°53'S and 46°42'W; 900 m) on 3 October 2003, 25 November 2005, and 20 October 2006, when they were seen carrying nest material; 5) Two individuals in a poor second growth area at the EPDA Galheiro on November 2003; 6) One individual in a *campo cerrado* at Fazenda Virgulino, Santana do Riacho (19°04'S and 43°51'W; 1,150 m), on the western slope of Serra do Cipó, on 12 January 2005; 7) One individual in the *canga* of the Serra do Rola Moça State Park on 24 October 2005; 8) Three individuals on 20 November 2006 at Serra do Cabral, Joaquim Felício (17°42'S and 44°16'W; 1,140 m), in *campo rupestre* near marshy areas and degraded *campo rupestre* and 9) some pairs near the border of Serra da Canastra National Park, where it is resident and occupies pastures and other degraded areas. Although our observations indicate that this species is commonly found in degraded areas or habitats subject to regular human disturbance, our records are restricted to hilly areas in central-south Minas Gerais, and were always of single individuals or isolated pairs. We never found this species in degraded areas during our surveys in central Brazil, where it is rare. For example, this species seems to be extinct in Chapada dos Guimarães, Mato Grosso (Lopes *et al.* 2009).

There is evidence that this species is a recent colonizer of eastern Brazil, where it was observed inhabiting artificial pastures in areas previously covered by Atlantic Forest (Simon *et al.* 1999, Ribon 2002). Nevertheless, a specimen collected in the municipality of Viçosa in 1936, and deposited at the Museu Nacional, Rio de Janeiro (not numbered), indicates that this species was present in the area studied by Ribon (2002) much earlier. For comparison, Curl-crested Jay *Cyanocorax cristatellus*, a bird known to have colonised eastern Brazil (Lopes 2008), reached the

Viçosa region only in the last 15 years (G. T. Mattos pers. comm.). These data suggest that this species inhabited the region prior to forest suppression, maybe restricted to the high altitude grasslands of the nearby Serra do Brigadeiro (see Simon *et al.* 1999).

**Black-masked Finch** *Coryphasiza melanotis* - Vulnerable (Machado *et al.* 2005, BirdLife International 2008).

This species was observed three times and photographed at Campo das Vertentes in dry grasslands (farm belonging to Mr. G. C. Fonseca) and at the borders of a seasonally flooded *campo limpo* (Souza). This species was also observed and photographed at Batateiro on the following dates: 11 December 2005 (an adult with an immature), 14 July 2006 (three adults), 14 October 2006 (two adults), 26 November 2006 (an adult), and 17 December 2006 (three adults). About 40–50 individuals were observed at Fazenda Monte Carmelo (Ribeirão Piçarrão, Ribeirão Furnas and Ribeirão Buriti Alto) between October 2007–April 2008, inhabiting *campo limpo* and *campo sujo com murundus*, both seasonally flooded. Although this species has recently become very local and rare (BirdLife International 2008) our new records, along with recently published others, give a more optimistic prospect for *C. melanotis*. We found recent records of this species for 14 conservation units in Brazil, four in Argentina, two in Bolivia and one in Paraguay (see Appendix). This species seems to be extinct in Chapada dos Guimarães, Mato Grosso (Lopes *et al.* 2009).

**Tawny-bellied Seedeater** *Sporophila hypoxantha* Data Deficient (Machado *et al.* 2005).

**Marsh Seedeater** *S. palustris* Endangered (Machado *et al.* 2005, BirdLife International 2008).

**Chestnut Seedeater** *S. cinnamomea* Endangered (Machado *et al.* 2005), Vulnerable (BirdLife International 2008).

**Black-bellied Seedeater** *S. melanogaster* Vulnerable (Machado *et al.* 2005), Near Threatened (BirdLife International 2008).

These four species of *Sporophila* were observed and photographed on the headwaters of Ribeirão Mandaguari in a seasonally flooded *campo sujo* on 5 and 11 October 2007. They were foraging in native grasses, associated with a mixed species flock including Plumbeous Seedeater *S. plumbea*, Yellow-bellied Seedeater *S. nigricollis*, Double-collared Seedeater *S. caerulescens*, and Capped Seedeater *S. bouvreuil* (both *S. b. bouvreuil* and *S. b. pileata* in the same flock). When we returned to this site on 3 November 2007, only *S. melanogaster* was observed. A fully developed male of *S. melanogaster* was collected at Rio Jacaré, Morro do Ferro, Minas Gerais (20°36'S and 44°34'W; MHNT 4127) on 28 December 1997. This specimen and five other males were associated in a mixed species flock with *S. bouvreuil*, *S. caerulescens* and *S. hypoxantha*. There are few previous records of these species for Minas Gerais (see Supplementary materials), and its migratory routes are not properly known yet (Silveira 1998, Silva 1999).

## Biogeography

The records of four grassland species at Campo das Vertentes represent a remarkable range extension for these species. Although Campo das Vertentes is depicted in vegetation maps as completely isolated from the Central Brazilian *Cerrado* (see Figure 1), there seems to be a discrete connection between these grasslands. The highest areas of the southern Espinhaço Range and Serra da Mantiqueira in southeastern Minas Gerais are linked by natural grasslands along the mountain ridges. These grasslands connect the *Cerrado* to Campos das Vertentes through the municipalities of Congonhas, Lagoa Dourada, Entre Rios de Minas, Tiradentes, São João del Rey, Itumirim, São Vicente de Minas and Minduri (Azevedo 1962).

## Conservation

The southern Espinhaço Range, also known as *Quadrilátero Ferrífero*, was recognized as being of 'special biological importance' (the highest degree of biological importance) during the recent



workshop 'Priorities for Biodiversity Conservation in the State of Minas Gerais, Brazil' (Drummond *et al.* 2005). The main threats to this area are the urban expansion, iron mining, fire, and deforestation (Drummond *et al.* 2005). At Campo das Vertentes, annual fire and *Eucalyptus* plantations are the main threats. In the Triângulo Mineiro (the triangular shaped area on the westernmost part of the state, which includes the farms Cocal, Água Emendada and Monte Carmelo), the main threats are clay mining and the replacement of native grasslands with grain crops and sugarcane. All these threats are discussed in detail below.

**Fire.** Several grassland species are highly sensitive to regular fires (Cavalcanti 1988, Tubelis and Cavalcanti 2000). For example, some bird species usually found in well conserved grasslands in the southern Espinhaço Range, such as Hyacinth Visorbearer *Augastes scutatus* and *C. platensis*, are no longer found at Serra do Curral, a mountain in Belo Horizonte, suggesting local extinction (Vasconcelos 1999, 2007). In the Triângulo Mineiro, the expansion of sugarcane plantation causes concern, because farmers set their crops on fire to make harvesting easier, increasing the possibility of fires in the grasslands.

**Habitat loss.** Natural grasslands frequently give way to pastures of exotic grasses, generally unsuitable for several threatened grassland specialists (Parker and Willis 1997, Costa and Costa 2002). Silviculture is also an important, and generally unnoticed, cause of habitat loss. *Eucalyptus* and *Pinus* plantations are one of the few viable economic activities in the poor, shallow, and water deficient soils where grasslands generally occur (Rizzini 1997). The grassland patches sampled at Fazenda Monte Carmelo are small and partially isolated amidst *Pinus* plantations. *Eucalyptus* plantations are now expanding at Campo das Vertentes, where we observed the suppression of thousands of hectares of native grasslands. Silviculture is not seen by Brazilian society as a threat to ecosystem integrity, but rather, it is commonly seen as beneficial to wildlife. In a country with prodigious tropical forests, they are popularly thought to be the natural condition of a healthy environment. Grasslands are, conversely, considered as a poorly diversified habitat, and many times confounded with artificial pastures. Therefore, forestry practices are generally referred to as 'reforestation', when actually it is simply the suppression of large tracts of species-rich grasslands by extensive, little-diversified monocultures (Marsden *et al.* 2001, Willis 2004). Its conservation value is probably no better than that of an avocado or orange plantation.

A new growing threat is the expansion of 'biofuel' enterprises in the Triângulo Mineiro, which is backed by a strong lobby from the state government, facilitating the process of environmental licensing to install alcohol fuel plants. Biofuels are announced by the Brazilian Government to international organizations as 'clean energy', but what we can see is the destruction of *Cerrado* to plant sugarcane.

Iron mining is the main cause of the suppression of large tracts of a unique habitat, the *canga*, in the *Quadrilátero Ferrífero*. This area contains a unique global flora, with several endemic species (Jacobi *et al.* 2007, Viana and Lombardi 2007). In the region of Uberaba, the mining of refractory clay in seasonally flooded *campos*, especially in the headwaters of the rivers Uberabinha and Claro, results in the complete suppression or severe modification of natural grasslands.

Another important cause of habitat loss in the high altitude grasslands at the *Quadrilátero Ferrífero* is urban expansion. With growing urban criminality and the increasing appeal of living close to nature, many people are moving to luxury condominiums in the suburbs of Belo Horizonte. These condominiums are generally said to be 'ecologically correct', but they are not. There is simply no way to replace natural grasslands and forests by houses without severe disturbance.

**Roadkills.** Although the several dirt roads in the Retiro das Pedras and Serra do Rola Moça State Park are closed to the public, both areas are subject to intensive and illegal off-road vehicle traffic. During one hour on a sunny weekend, we observed three 4-WD vehicles and 10 motorcycles at Retiro das Pedras, all of them moving at high speed. A paved road also crosses the Serra do Rola Moça State Park. Roads may be a significant source of threat for grassland birds, as verified by França & Braz (2008), who found road-killed *C. caudacuta* and *C. melanotis* at Veadeiros National Park, central Brazil.

## Recommendations

- Search for grassland specialists not yet recorded in the Espinhaço Range and Campo das Vertentes, such as Dwarf Tinamou *Taoniscus nanus*, Lesser Nothura *Nothura minor*, Rufous-sided Pigmy-tyrant, and Ochre-breasted Pipit *Anthus nattereri*. In the seasonally flooded *campos* of the Triângulo Mineiro, searches must target the headwaters of the rivers Uberabinha, Claro and Tijuco.
- Create a large conservation unit at Campo das Vertentes devoted to the conservation of grassland habitats. The Ibitipoca State Park, located in the easternmost limits of Campo das Vertentes, is dominated by semi-deciduous forests, not harbouring extensive grassland areas. As a consequence, no species listed in this paper has been recorded in the area so far (Andrade 1996, Pacheco *et al.* 2008).
- Comply with environmental legislation that ensures the protection of Areas for Permanent Preservation (APPs). These areas, such as river headwaters and riparian forests, are protected by law, and cannot be used for high impact activities such as plantations, cattle raising and mining. Good examples are the seasonally flooded *campos* at the headwaters of the rivers Claro, Uberabinha and Ribeirão Mandaguari that although theoretically protected, are suffering severe anthropogenic impacts.
- Cease immediately mining of refractory clay at the headwaters of Rio Uberabinha and Rio Claro, where representative tracts of *covaais* still persist.
- Restrict sugarcane, *Eucalyptus* and *Pinus* plantations to previously cleared land, avoiding opening pristine *Cerrado* and *campos*.
- Creation of a seal of environmental certification for biofuel activities, especially for the sugarcane sector.
- Expand the Serra do Rola Moça State Park, incorporating large tracts of well conserved grasslands around Retiro das Pedras.

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