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## BIRDS OF TWO PROTECTED AREAS IN THE SOUTHERN RANGE OF THE BRAZILIAN *ARAUCARIA* FOREST

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### ABSTRACT

*Over 70% of threatened birds in the state of Rio Grande do Sul, south Brazil, inhabit forest environments. The creation and maintenance of protected areas is one of the most important measures aiming to mitigate these problems. However, the knowledge of the local biodiversity is essential so that these areas can effectively preserve the natural resources. Between 2004 and 2009 we sampled the avifauna in two conservation units in Rio Grande do Sul: Floresta Nacional de Canela (FNC) and Parque Natural Municipal da Ronda (PMR), both representative of the Mixed Humid Forest (Araucaria Forest). A total of 224 species was recorded, 116 at FNC and 201 at PMR, ten of which threatened regionally: Pseudastur polionotus, Odontophorus capueira, Patagioenas cayennensis, Amazona pretrei, A. vinacea, Triclaria malachitacea, Campephilus robustus, Grallaria varia, Procnias nudicollis and Sporophila melanogaster. Richness and species composition seem to be related to different stages of forest conservation, to size and connectivity, as well as to the diversity of environments. The better conservation of PMR compared to FNC, allied to its geographic position, results in a richer avifauna, with a larger amount of rare and endangered species, as well as species sensitive to disturbance and endemic to the Atlantic Rainforest. We suggest management actions aiming the conservation and the long-term recovery of natural environments at these sites.*

**KEY-WORDS:** Atlantic Forest; Avifauna; Conservation units; Floresta Ombrófila Mista; Rio Grande do Sul.

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## INTRODUCTION

Rio Grande do Sul is one of the states in Brazil with the best knowledge of its avian composition, with a record of 661 species (Bencke *et al.*, 2010). About 20% of these species are regionally threatened (Marques *et al.*, 2002); almost 70% ( $n = 81$ ) of which live in forest environments (Bencke *et al.*, 2003). Habitat loss and degradation are the main threats to most of these species. Among the priority actions to minimize such conservation concerns are environmental protection and habitat recovery (Fontana *et al.*, 2003).

The designation of legally protected areas is an important measure for the conservation of biodiversity (Primack, 1998; Balmford *et al.*, 2003; McDonald & Boucher, 2011), considering that human intervention can significantly affect biological communities, frequently causing habitat loss or fragmentation. Although species list in protected areas is one of the initial and most relevant procedures for the maintenance of natural resources (Wilson, 1997), many Conservation Units (CUs) in Brazil do not have biological surveys. Such is the case of Floresta Nacional de Canela and Parque Natural Municipal da Ronda, both located in São Francisco de Paula, RS. The first one is a national park created in 1946 by the former Instituto Nacional do Pinho (INP) and is historically based on regional forestry (Ferraz, 2003). The latter is a municipal park, founded 50 years later (Municipal Decree No. 1761, February 29<sup>th</sup>, 1996), that is still in need of effective actions on land regularization and restoration. There are no previous formal studies about its avifauna.

These two CUs are important remnants of the *Araucaria* forest. This typical forest of southern Brazil had already been reduced to less than 4% of its original cover by the 1990's (Leite & Klein, 1990) and it is on the verge of disappearing (Sonogo *et al.*, 2007). The forest remnants are distributed discontinuously, forming a mosaic of patches in different sizes and forms, generally sparse and disconnected, located in sites with a difficult access. Additionally, several forests in this plateau were altered and had their original floristic composition impoverished, mainly by the extraction of its main element, the Brazilian Pine *A. angustifolia*.

Despite being focus of a considerable amount of studies, there are very few published bird surveys for the *Araucaria* plateau in Rio Grande do Sul. When studying the avifauna through an altitude gradient in the Atlantic coast of the state, Bencke & Kindel (1999) sampled an area going from the sea level up to 1000 m, including the region of São Francisco

de Paula. This can be considered the most complete study on bird diversity covering an area from the slope and lowlands to the uplands along the state of Rio Grande do Sul. In addition, the biological inventories in three protected areas of the state are important references, which include the vegetation found in the slopes and lowlands. These studies include a preliminary survey conducted by Parker III & Goerck (1997) at *Parque Nacional dos Aparados da Serra* and the published management plans of *Parque Estadual do Tainhas* (SEMA, 2008a), *Reserva Biológica Estadual da Serra Geral* (SEMA, 2008b) and *Centro de Pesquisas e Conservação da Natureza Pró-Mata* (PUCRS, 2011). Moreover, Fontana *et al.* (2008) presented a synthesis of the avifauna at the *Campos de Cima da Serra* region across the states of Rio Grande do Sul and Santa Catarina, southern Brazil.

Aiming to contribute to the knowledge of avian diversity in protected areas of Rio Grande do Sul, bird surveys were carried out in two conservation units in the state: *Floresta Nacional de Canela* and *Parque Natural Municipal da Ronda*. The avifaunas were evaluated according to the local geographic and environmental characteristics, as well as to the current conservation status of the protected areas. In addition, we bring information on the poorly known, rare or endangered species in the region and propose a list of management measures.

## MATERIAL AND METHODS

### Study sites

*Floresta Nacional de Canela* (FNC; 29°19'S, 50°48'W) is located in the city of Canela, 4 km away from the urban area (Fig. 1). With an average altitude of 820 m, the CU has a total area of 517 ha, among native vegetation and *Araucaria angustifolia*, *Pinus* spp. and *Eucalyptus* spp. plantations. There are a few non-forested sites, such as cut stands in regeneration (at different stages of succession), surrounded by recreational and inhabited areas, and three artificial lakes, bordered in part by small wetlands. However, natural grasslands and wetlands of large extent are absent. The following tree species are the most representative: *A. angustifolia*, *Casearia decandra*, *Blefarocalix salicifolius*, *Zanthoxylum rhoifolium*, *Podocarpus lambertii* and *Acca sellowiana*.

*Parque Natural Municipal da Ronda* (PMR; 29°26'S, 50°32'W) is located in the city of São Francisco de Paula, less than 2 km from the urban area (Fig. 1).



**FIGURE 1:** Location of the study areas (black polygons, “C”) in Canela (Floresta Nacional de Canela) and São Francisco de Paula (Parque Natural Municipal da Ronda), Rio Grande do Sul (“B”), Brazil (“A”).

The altitude varies between 400 and 930 m, with most of the area at the higher part. The park covers 1,200 ha, with a forest matrix and only about 60 ha of open areas (wetlands and semi-natural grasslands used for cattle grazing). The largest part of the park is situated in the *Araucaria* forest region and has elements of the Semidecidual Seasonal Forest in the lowest altitudes and steep slopes, where the Brazilian Pine is absent (Teixeira *et al.*, 1986). Some representative species of the local flora are *Myrceugenia mesomischa*, *Ilex microdonta*, *I. paraguariensis*, *Piptocarpha angustifolia*, *Mimosa scabrella*, *Matayba elaeagnoides* and *Sloanea monosperma* (Cappelatti & Schmitt, 2011).

Both areas are part of the *Araucaria* plateau and are 27 km apart. According to the most recent climate classification for Rio Grande do Sul (Maluf, 2000), *São Francisco de Paula* fits in the category of Superhumid Temperate climate (“TE SU”), with an annual mean temperature of 14.4°C and the highest annual precipitation of the state (average 2,162 mm). In the region of Canela, the predominant climate type is the Perhumid Temperate (“TE PU”), with an annual mean temperature of 16°C and an average annual precipitation of 1,821 mm (IPAGRO, 1989). Rainfall is present throughout the year and winter frosts are frequent (Moreno, 1961).

### Sampling methods

Our thirty-five expeditions took place between March 2004 and May 2009, lasting from one to four days each: 21 (51 days) at FNC and 14 (32 days) at PMR (Table 1), in all seasons. There was a total of 117 hours of fieldwork at FNC and 59 h at PMR, with one or eventually two observers. The bird survey was based on qualitative samples, through visual observations (with 7 × 35 binoculars) and recognition of vocalizations (recorded when necessary with a digital recorder and a directional microphone). Copies of these recordings will be deposited at the Macaulay Library (Cornell Lab of Ornithology, Ithaca, New York). The observations were preferably made in the morning (from dawn to 10 h) and in the evening (from 16 h to sunset), sometimes at night, especially at FNC. There were some occasional captures with a continuous track of three to six mist nets (14 × 3 m, 15 and 36 mm of mesh), arranged in different environments at the CUs, especially in the forest matrix. The capture effort at FNC was of 308 h/net, during six expeditions, and once at PMR. Records obtained only in the vicinities of the study areas (< 5 km distant from the borders) during the expeditions were not included in the species list, but are discussed when relevant.

**TABLE 1:** Expedition dates for the bird survey at the Floresta Nacional de Canela (FNC) and at the Parque Natural Municipal da Ronda (PMR), Rio Grande do Sul, Brazil.

| MONTH | DATES – FNC   |               |                           |           | DATES – PMR   |                   |               |
|-------|---------------|---------------|---------------------------|-----------|---------------|-------------------|---------------|
|       | 2004          | 2005          | 2006                      | 2007      | 2007          | 2008              | 2009          |
| JAN   | —             | —             | 16, 17, 18 and 19         | —         | 05, 06 and 07 | —                 | 23, 24 and 25 |
| FEB   | —             | —             | —                         | —         | —             | —                 | 13, 14 and 15 |
| MAR   | 06, 07 and 08 | 18            | 04, 05, 06, 25, 26 and 27 | —         | 16, 17 and 18 | 04, 05, 15 and 16 | 28 and 29     |
| APR   | 21            | 16 and 17     | 21, 22, 23 and 24         | —         | —             | —                 | —             |
| MAY   | 22, 23 and 24 | —             | 07, 08, 25 and 26         | 19 and 20 | —             | 17 and 18         | —             |
| JUN   | —             | —             | —                         | —         | —             | 14                | —             |
| JUL   | 04 and 05     | 14, 15 and 16 | —                         | —         | —             | —                 | —             |
| AUG   | —             | 26            | —                         | —         | —             | —                 | —             |
| SEP   | —             | 10 and 11     | —                         | —         | 29 and 30     | 13 and 14         | —             |
| OCT   | —             | 28, 29 and 30 | 21 and 22                 | —         | —             | 13 and 14         | —             |
| NOV   | —             | —             | 06 and 07                 | —         | 10 and 11     | —                 | —             |
| DEC   | 18, 19 and 20 | 19, 20 and 21 | —                         | —         | 14, 15 and 16 | —                 | —             |

### Sources and avifaunal descriptors

The threat status of the species was consulted in Marques *et al.* (2002) at a regional scale (RS), Silveira & Straube (2008) at a national scale and IUCN (2012) at a global scale. The birds were fitted in three levels according to sensitivity to habitat disturbance (low, medium or high) following Parker III *et al.* (1996), when possible. Furthermore, the Atlantic Forest endemics are cited according to Brooks *et al.* (1999). Scientific and common nomenclatures followed CBRO (2014) and Bencke *et al.* (2010), respectively.

## RESULTS AND DISCUSSION

### Characterization of the avifaunas

We recorded 226 bird species at both CUs (Appendix), which represents 34% of the regional avifauna (Bencke *et al.*, 2010). PMR had more species ( $n = 201$ ) than FNC ( $n = 166$ ), although PMR had more exclusive species ( $n = 60$ ;  $n = 25$ ). The analysis of the collector's curve (Fig. 2) reveals an approximation to stabilization for both sites. According to Belton (1994), who sampled birds throughout the state of Rio Grande do Sul during the 1970's, 250 is probably the highest number of species any region can host, due to a variety of short-range species and to the fragmentation and discontinuity of their preferred habitats. The total number of species recorded at FNC and at PMR is similar to that from other studies in medium to large-sized South Brazilian forests, which normally find 150 to 200 species. Bird richness in the previously mentioned CUs from the northeast

Rio Grande do Sul are: *Parque Estadual do Tainhas* ( $n = 132$ ) (SEMA, 2008a), *Reserva Biológica Estadual da Serra Geral* ( $n = 172$ ) (SEMA, 2008b) and *Centro de Pesquisas e Conservação da Natureza Pró-Mata* ( $n = 215$ ) (PUCRS, 2011).

The Passeriformes Suboscines/Oscines ratio was similar between sites (*ca.* 55/45% or 1.1:0.9 in both CUs). It is known that Suboscines (Tyranni) are mostly forest birds, whereas Oscines (Passeri) prefer open environments and forest edges (Willis, 1979; Haffer, 1985; Sick, 1997). This could explain why the Suboscines species were found primarily in sites with a forest matrix. At FNC, *Pinus* and *Eucalyptus* plantations cause severe edge effects throughout the park area, which would explain the presence of a higher percentage of Oscines passerines. Forests at PMR are larger, more continuous and better preserved. Nonetheless, there are also grasslands and wetlands, which are typical habitats for several Oscines species, *e.g.*, *Ammodramus humeralis*, *Emberizooides ypiranganus*, *Sporophila melanogaster* and *Pseudoleistes guirahuro*. As a result, even though both CUs are notoriously different in several aspects such as forest conservation status and presence of open sites, these distinct characteristics bring a balance of environmental conditions that cause the similar Passeriformes Suboscines/Oscines ratio.

The *Araucaria* forest province, in which FNC and PMR are inserted, is historically related to the Brazilian Atlantic Forest province, especially in its highest altitudes at the southern and southeastern portions (Morrone, 2001; Straube & Di Giacomo, 2007). Atlantic endemisms are well represented in highland forests. Although notably conspicuous in several aspects, the region that goes northwards the south scarp's margin is sometimes considered only a

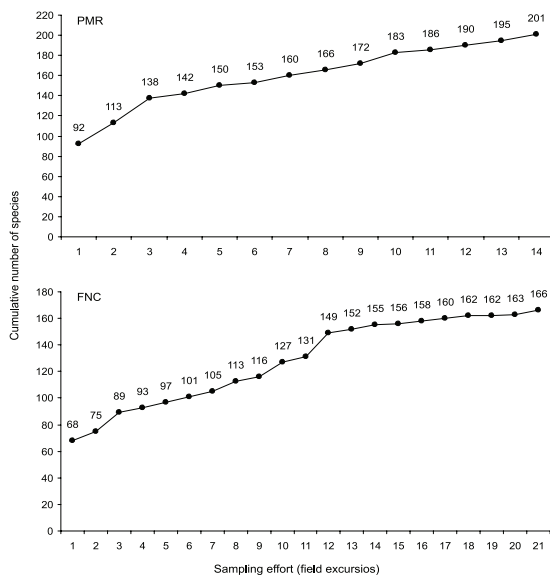
“hilly” extension of the coastal Atlantic Forest (Haffer, 1985). In this study we found that 23% of recorded species at FNC and PMR are endemic to the Atlantic Forest, with a few elements from the plateau, such as the species *Drymophila malura*, *Heliobletus contaminatus* and *Hemitriccus obsoletus*. According to Bencke *et al.* (2009), in some areas of the northeastern Rio Grande do Sul the avifauna may contain up to 41% of endemic species from that zoogeographic region. Bencke & Kindel (1999) found 26.5% of endemic birds in the extreme northeast of the state and concluded that this area is the biogeographic limit for those species. In our study, several species are considered typical from the *Araucaria* forest province, *e.g.*, *Amazona pretrei*, *A. vinacea*, *Mackenziaena leachii*, *Leptasthenura setaria*, *L. striolata*, *Phyllomyias virescens*, *Emberizoides ypiranganus*, *Poospiza cabanisi* and *Saltator maxillosus* (Straube & Di Giacomo, 2007). Nonetheless, the limits between these zones (*Araucaria* forest and lowland Atlantic Forest) do not seem to be very well defined, nor are spatially distinguished.

The lower specific richness at FNC compared to PMR may be related to a few variables. The most important ones are probably the larger area and the more pronounced altitudinal gradient at PMR. Other important characteristics of this CU possibly include the greater habitat heterogeneity, proximity to coastal forests, distinct surroundings and a better conservation status (described below). On the other hand, FNC has less diversity of typical environments, such

as grasslands and wetlands, which house several exclusive bird species. For example, *Heterospizias meridionalis* was recorded only nearby FNC, in a managed field (grassland matrix) close to *Saiquí* stream, 3.5 km away from the CU, whereas it was found at PMR, in dry grasslands. For the same reason, some species considered common in the uplands were not recorded at FNC, *e.g.*, *Ammodramus humeralis*, *Volatinia jacarina*, *Donacospiza albifrons*, *Nothura maculosa*, *Pardirallus sanguinolentus*, *Pseudoleistes guirahuro*, *Laterallus melanophaius* and *Emberizoides ypiranganus*, all of which species that inhabit grasslands, pastures and wetlands. For having some small areas of grasslands and “gravatá/eryngos” (*Eryngium pandanifolium*) wetlands, even when slightly altered, PMR hosts several species that are exclusive to these environments.

Many species that depend on well-preserved forests and could occur at FNC based strictly on their geographical distribution were not recorded during this study. Wood extraction, although selective, partially suppresses and changes vegetation, causing a negative impact on sensitive species or guilds such as large frugivores (Pizo, 2001) and understory/ground insectivores (Aleixo, 1999). Examples of species from each of these guilds are the Hooded Berryeater (*Carpornis cucullata*) and the Variegated Antpitta (*Gral-laria varia*), respectively. Although speculative, the scarcity of large areas with a preserved understory for these species – and others with similar ecological characteristics – to occur at FNC may justify their absence. In this CU, the fragments of native forest altogether account for 128 ha, interspersed with patches destined to forestry. In addition, there are 130 ha of *Araucaria* trees with an understory at several different successional stages, whereas the remaining area (*ca.* 145 ha, excluding open and human impacted areas) is characterized by *Pinus* spp. and *Eucalyptus* spp. plantations (IBAMA, 1989). The largest continuous forest with the prevalence of *Araucaria* trees has only 32 ha, with a medium to advanced degree of fragmentation. Contrarily, the forest at PMR is mostly continuous throughout the park and connects itself with surrounding forest areas. The latter also has a more homogeneous, late-secondary forest, often resembling a primary forest (*e.g.*, in slopes, where there can be found Variegated Antpittas, Hooded Berryeaters and Bare-throated Bellbirds)

Another possible driver of the bird composition and distinctiveness among these CUs is the distance to the Atlantic slope: FNC is located more to the west than PMR and other CUs such as *Floresta Nacional de São Francisco de Paula* and *Centro de Pesquisas e Conservação da Natureza Pró-Mata*. This geographical



**FIGURE 2:** Species accumulation curve for the bird survey at the Floresta Nacional de Canela (FNC) and at the Parque Natural Municipal da Ronda (PMR), Rio Grande do Sul, Brazil, between 2004 and 2009.



position, combined with the fact that its altitude does not vary as much as PMR, makes FNC lack certain Atlantic elements, such as species partly dependent on the forest, which approximate and enter the slopes. On the other hand, PMR reaches almost 400 m above sea level (at the extreme south of the park) and presents distinct vegetation types, with some elements of the seasonal forest. This characteristic seems to be one of the factors involved in the absence or low frequency of *Euphonia pectoralis*, *Dacnis cayana* (Blue Dacnis) and *Carpornis cucullata* at the FNC, all of which occur at PMR.

Bencke & Kindel (1999) mentioned some cases of an apparent altitudinal substitution of congeners or ecologically similar species. Two examples are *Picumnus temminckii* (Ochre-collared Piculet) and *P. nebulosus* (Mottled Piculet), occurring in higher altitudes and in lowlands and slopes, respectively. In this study, we recorded *P. temminckii* only along the slope at PMR, whereas *P. nebulosus* was recorded in the highlands at both sites. Further, according to these authors, it seems that the ecotones between the main forest types may play a major role in defining the altitudinal limits of the bird distribution at the southern range of the Atlantic forest. However, more studies are necessary to confirm this hypothesis.

The low richness of raptors at FNC, especially from the Accipitridae family (two species, as opposed to 10 at PMR), might be associated to the reduced and impoverished forest cover inside and surrounding the CU, as mentioned for other groups. In general, these birds require large areas for feeding and reproduction (Willis, 1979; Bildstein *et al.*, 1998). Although *Elanoides forficatus* (Swallow-tailed Kite) may cross open areas and small forest patches, it prefers to fly in groups above the forests, especially across steep slopes (Belton, 1994), where it was observed at PMR but not at FNC. *Harpagus diodon* (Rufous-thighed Kite) was recorded only at PMR in tall, steep forests. At *Centro de Pesquisas e Conservação da Natureza Pró-Mata*, which comprises an area of 4,500 ha, 22 species of Falconiformes occur, including large forest hawks such as Black Hawk-Eagle (*Spizaetus tyrannus*) (Mähler-Jr. & Fontana, 2000; Joenck, 2006). This species was recorded in 24 May 2009, in the morning, near the river *Rolantinho da Areia* (M.F.B. dos Santos, in litt.) proximate to PMR, indicating that those forests are used by this endangered species.

Strictly aquatic birds, which require water bodies to feed on, such as ducks and grebes, occur mostly at FNC. Three water reservoirs with small islands surrounded by vegetation offer the resources that attract species such as *Podylimbus podiceps* (Pied-billed

Grebe), *Amazonetta brasiliensis* (Brazilian Teal), *Dendrocygna viduata* (White-faced Whistling-Duck), *Megaceryle torquata* (Ringed Kingfisher), *Chloroceryle amazona* (Amazon Kingfisher), *C. americana* (Green Kingfisher), *Gallinula melanops* (Spot-flanked Gallinule) and even *Chauna torquata* (Southern Screamer), all absent at PMR. These artificial lakes have 0.3, 2.7 and 3.6 ha and were created in 1997, 1997 and 1968, respectively. Large groups of Common Gallinule (*Gallinula galeata*) breed nearby the largest reservoir. Some individuals of *Ciconia maguari* (Maguari Stork) and *Ardea cocoi* (Cocoi Heron) were observed above PMR flying northwards, where there is a 6 ha water reservoir and some large flooded areas.

Due to the low sampling effort, mist net captures did not contribute directly to the bird survey, since no species was recorded exclusively through this method. Nonetheless, at FNC this type of sampling was an important tool in the identification of cryptic species (*e.g.*, young *Turdus*, *Elaenia* spp.) and to better characterize the occurrence and seasonality patterns of some species. Two capture events are noteworthy: 15 individuals of *T. subalaris* (Easter Slaty Thrush) in only three mist nets during three days in December 2005 and six *Haplospiza unicolor* (Uniform Finch) in two days, in January and February 2006 (dozens of birds were heard at the same point), although only when the bamboo *Merostachys aff. skvortzovii* was fruiting. This species fruits every 31–33 years, and the most recent event was observed in Rio Grande do Sul in 2005 and 2006 (Sendulsky, 1995; Schmidt & Longhi-Wagner, 2009). At PMR, Uniform Finches were recorded only in January 2007, when two individuals were unexpectedly seen flying among shrubby grasslands, possibly searching for fruiting bamboos (see Vasconcelos *et al.*, 2005). Belton (1994) called attention to the ringing of eight individuals in Gramado, a neighboring city of Canela, more than thirty years ago (10 December 1975) and considered this an expressive number comparing to the usual capture frequency during his ringing sessions.

The recording of *Penelope obscura* (Dusky-legged Guan) at FNC must be interpreted with caution, since some captive specimens were released by the former Centro de Triagem de Animais Silvestres (CETAS, a rescue center for wild animals) of the Brazilian Institute for the Environment (IBAMA), located at this CU. Nevertheless, both individuals observed at the forest edge in 15 December 2005 had a behavior similar to that of guans in natural habitats. The same to *Ramphastos dicolorus* (Red-breasted Toucan) and *Cyanoloxia brissonii* (Glaucous-blue Grosbeak),

both with constant release records from the CETAS. However, in the case of these species, the birds were displaying a rather friendly behavior during some of the observations.

There were other bird releases at the FNC that almost certainly resulted in death. That was probably the fate for the species that do not use the habitats at FNC or have their distribution far from that region (e.g., *Paroaria coronata*, *Sporophila nigricollis* and *S. angolensis*). The practice of releasing birds from captivity, which is usual in some Brazilian CUs, is not recommended, except in specific study cases. The Brazilian Ornithological Society (SBO) does not support this activity (more information on Efe *et al.*, 2006).

### Species sensitivity to habitat disturbance and endemism

We were able to fit 220 species into some level of sensitivity to disturbance, according to Parker III *et al.* (1996): 162 at FNC and 196 at PMR (Appendix). Among these, 117 (53%), 88 (40%) and 15 (7%) were classified in the categories of low, medium and high sensitivity, respectively. At FNC, these numbers were 88 (54%), 67 (42%) and seven (4%). Thus, FNC appears to have fewer ecological requirements to maintain highly sensitive species than PMR (7 vs. 4%). For example, sensitive forest species such as Spot-winged Wood-Quail (*Odontophorus capueira*), Mantled Hawk (*Pseudastur polionotus*) and Variegated Antpitta (*Grallaria varia*) were recorded exclusively at PMR.

Fifty-one species (23%) are endemic to the Atlantic Forest (*sensu* Brooks *et al.* 1999), 50 at PMR and 37 at FNC (Appendix).

### Noteworthy records

*Turdus leucomelas* was seen and photographed foraging in a recreational area at FNC in May 24, 2004. This species has been expanding its distribution in Rio Grande do Sul since the 1990's (Bencke & Grillo, 1995) and today it occupies several regions in the state (Accordi & Barcelos, 2006; Bencke *et al.*, 2007, Franz & Bencke, *in prep.*). This is its first record for the highlands of Rio Grande do Sul.

The Striped Owl (*Asio clamator*) was observed at FNC on December 20, 2005. This was an unexpected record, considering the distribution of this species is mostly along the coast and east of the central lowlands, only in the base of the scarp (Belton, 1994).

Ten species recorded in the CUs are under some threat of extinction at a local level (RS, *sensu* Bencke *et al.*, 2003). Three of them (*Amazona pretrei*, *A. vinacea* and *Procnias nudicollis*) are also cited in the official Brazilian List of Threatened Fauna Species (BR, *sensu* Silveira & Straube, 2008) or mentioned in the global IUCN Red List (2012, GL). In addition, ten species are also considered near threatened (NT) worldwide (IUCN, 2012) (Appendix). The codes in parenthesis are also labeled on the Appendix.

*Pseudastur polionotus* (EN-RS, NT-GL) – In September 14, 2008 an individual, possibly male due to its size (the first author has experienced observations of this species in several occasions elsewhere), was observed from a long distance during 20 s. It flew from the ground up to a tall tree, in a trail near the west border of the PMR, nearby the *Oito Cachoeiras* private park.

*Odontophorus capueira* (VU-RS) – On March 16, 2007, in a forest dense with *Araucaria angustifolia* at PMR, by nightfall, it was possible to hear at least four distinct individuals of the Spot-winged Wood Quails vocalizing. This species is seen throughout the plateau scarp, although only in large forest remnants (Bencke *et al.*, 2003).

*Amazona pretrei* (VU-RS, VU-BR, VU-GL) – Scarce records at both FNC and PMR. Typically flying in pairs or groups of up to 10 individuals. In March 07, 2004, a juvenile and an adult were seen feeding on *Podocarpus lambertii* in an open area at FNC. In May 23, 2004, a pair flew by FNC. Although Varty *et al.* (1994) have highlighted FNC as a potentially important site for this species, nesting and roosting sites of Red-spectacled Parrots were not observed in the present study. Thus, it is possible that the species only uses FNC as a “stepping stone” or as an occasional feeding site. At PMR, in the evening of September 29, 2007, 10 individuals were seen crossing the grassland towards the *Eucalyptus* forest located north outside the park, where they passed the night. Today *A. pretrei* is found throughout most of the *Araucaria* plateau (Bencke *et al.*, 2003).

*Amazona vinacea* (EN-RS, VU-BR, EN-GL) – Apparently more abundant than *A. pretrei* in both CUs, occurring in larger groups. Nonetheless, few records were obtained, and most of them were from flocks flying by. During the *Araucaria* seed production season (autumn-winter), Psittacidae was the most often heard group during daytime, forming large feeding

groups (*Amazona* spp., *Pionus maximiliani* [Scaly-headed Parrot] and *Pyrrhura frontalis* [Maroon-bellied Parakeet]). On January 18, 2006, an individual of *A. vinacea* was heard and later seen at the canopy of an *Araucaria*, in an open site nearby the buildings at FNC. At PMR, on January 06, 2007, three of them were observed flying over the *Araucaria* forest and on 15 March 2008 the vocalization of four individuals was recorded. In the *Araucaria* plateau this species is found at the top of the northeast slope as well as throughout the *Campos de Cima da Serra* physiognomy (Bencke *et al.*, 2003).

*Triclaria malachitacea* (VU-RS, NT-GL) – Recorded only at PMR, where it seems to be abundant in well-preserved forests. On September 13, 2008, a female was observed resting on a *Mimosa scabrella* tree, which later vocalized its characteristic whistles while entering the forest. On September 14, 2008, a couple was seen feeding on *Myrceugenia mesomischa* fruits during ca. 8 min. A recording was obtained on 28 March 2009. This species occurs mostly throughout the slopes, from 100 to 1000 m above sea level, and breeds in primary forests (Bencke *et al.*, 2003). The forests at PMR apparently have conditions suitable to the maintenance of these populations, which in several occasions were recorded throughout the day.

*Campephilus robustus* (EN-RS) – Robust Woodpecker is usually associated with large forest remnants or areas with a significant forest cover (Belton, 1994; Bencke *et al.*, 2003). It is mainly distributed across the northern and northeastern plateau, with records in the northwestern and medium plateau and in southern regions (Bencke *et al.*, 2003, Agne *et al.*, 2007). On November 07, 2006, a female was observed foraging the area '1' (18 ha), on top of *Araucaria angustifolia* and other dead trees, at FNC. On May 17, 2008 two strong thumps, characteristic of this species, were heard in the interior of the Dense Humid Forest at PMR. Furthermore, there are records of this species at the following protected areas in the state: *Turvo*, *Espigão Alto* and *Rondinha* state parks, *Centro de Pesquisas e Conservação da Natureza Pró-Mata*, as well as at the national forests of São Francisco de Paula (Bencke *et al.*, 2003) and Passo Fundo (Agne, 2005).

*Grallaria varia* (VU-RS) – On May 28, 2009, during nightfall, Variegated Antpittas began vocalizing in the hills of the Mixed Humid Forest, at PMR. From the same observation point, four vocalizing individuals were identified. In the state, this species is found throughout the plateau (Bencke *et al.*, 2003).

*Procnias nudicollis* (EN-RS, VU-GL) – At FNC only one record was obtained, at site '7H' (15 ha), on November 06, 2006. At PMR, this species is abundant during the spring and summer, when numerous individuals were heard. According to Bencke *et al.* (2003), this species is today confined to the top of *Serra Geral*, where the largest continuum forests are found in the state.

*Sporophila melanogaster* (VU-RS, VU-BR, NT-GL) – A pair of Black-bellied Seedeaters was seen on January 24, 2009 at PMR. The male was displaying a territorial behavior (aggressively replying the playback) and had its vocalization recorded. The female was photographed. Although they seemed paired – moving together and not abandoning that half-hectare area – no direct indication of nesting was seen during this and the following day. The environment in which they were found was a humid grassland area with patches of turf and a dense cover of Asteraceae species, *Eryngium* spp. and *Eupatorium grandiflorum*. The small and altered surrounding fields of São Francisco de Paula constitute the southern edge of *Campos de Cima da Serra* (upland grasslands). Therefore this might be considered the southernmost record for this species.

### Conservation and management

The history of land use at FNC, including the selective logging (in plantations), especially before the establishment of the protected area, allied to the proximity to the suburbs are considered the two major drivers of diversity loss during the past 60 years (Ferraz, 2003). Illegal activities such as logging, hunting and fishing (IBAMA, 1989) may, direct or indirectly, be serious threats to the local fauna and flora. Hunting, for instance, possibly caused the local extinction of the Solitary Tinamou (*Tinamus solitarius*), recorded in Canela by Belton (1994). The fragmentation itself, aggravated by habitat change, must have contributed to the decline or extinction of species sensitive to disturbance, such as large frugivores, ground insectivores and raptors (the latter affected by hunting or indirectly by prey scarcity). These are the bird groups that are the most disturbed by habitat change (Renjifo, 1999) and that were recorded almost exclusively at PMR, due to its better conservation situation.

*Araucaria* trees, found at FNC, seem to be a much more viable culture for maintaining the environmental mosaic which the local avifauna requires, compared to *Eucalyptus* and *Pinus*. For example, sites '1' (18 ha) and '7H' (15 ha), planted with *A. angus-*



*tifolia* on 1948 and 1957, represent relevant areas for birds and other organisms. At these sites, we recorded *Campephilus robustus* and *Procnias nudicollis*, and other sensitive and endangered animals, such as native canids, felids, cervids and rodents.

The local habit of burning grasslands annually to renew the pastures has significantly altered the natural habitat at PMR, where the grass is short and impoverished. This activity is a possible driver of the local extinction of grassland birds that require dense and extended areas such as the species *Gallinago undulata* (humid grasslands and wetlands), *Rhynchotus rufescens* and *Anthus nattereri* (dry grasslands). However, other related species such as *G. paraguayana*, *Nothura maculosa* and *Anthus helmayri*, with a wider ecological plasticity, were common at the site.

A few measures are suggested aiming to bring benefits to the bird assembly and biota as well: (a) the use of *Araucaria angustifolia* as a primary species in future plantations, reducing the use of exotic species at FNC; (b) a more moderate use of the forest resources such as *Araucaria* seeds ("pinhões"), restricting its extraction; (c) surveillance reinforcement as a means of eliminate illegal hunting; (d) keeping the large dead trees at the site of the fall, in order to maintain an adequate number of nesting cavities for parrots and other birds; (e) removal and control of domestic animals such as cats and dogs; (f) extinction of grassland burning (illegal activity in the state of Rio Grande do Sul); and (g) end of the release of captive animals at the CUs. Moreover, land regularization at PMR and its surroundings is an urgent step for the elaboration of its management plan.

Further, it should be emphasized the importance of preserving the forests in northeast Rio Grande do Sul. This is one of the few regions in the state where it is possible to establish connectivity among patches and where the largest forests are found (together with the north and northwest). The areas in the plateau where the matrix is the forest have numerous endangered, rare and endemic species, granting them the priority for conservation efforts, as well as the adjacent grasslands and wetlands. These areas are home of the threatened parrots *Amazona pretrei* and *A. vinacea*. The city of São Francisco de Paula is situated in a transition between the forests from the south to the grasslands of the northeast plateau (*Campos de Cima da Serra*). Toward the southeast the landscape is characterized by the forested hills and slopes and, toward the west, by the plateau. Thus these protected areas are located in a key-region for the conservation of the rich forest environments in the plateau and its transitions, because it connects the forests from the slopes

and lowlands to those of the plateau, at its extremities. However this region has been suffering an accelerated process of habitat loss and fragmentation, mainly in open areas (natural grasslands), marked by the advance of agriculture and forestry. With a goal to preserve the high biological diversity that still remains in this region, the creation and maintenance of conservation units are imperative actions. Equally relevant is the effectiveness of these protected areas that will be reached through adequate management actions.

## RESUMO

*Mais de 70% das aves ameaçadas de extinção no Rio Grande do Sul habitam ambientes florestais. A criação e manutenção de áreas protegidas é uma das principais medidas apontadas para mitigar esses problemas. Contudo, para que estas áreas possam ser efetivas na conservação dos recursos naturais, o conhecimento sobre a diversidade biológicas nelas contida se faz necessário. Entre 2004 e 2009, foi realizado o levantamento de aves em duas áreas protegidas no Rio Grande do Sul: a Floresta Nacional de Canela (FNC) e o Parque Natural Municipal da Ronda (PMR), áreas representativas da Floresta Ombrófila Mista (florestas com araucárias). Um total de 224 espécies foi registrado, sendo 166 na FNC e 201 no PMR. Dez espécies ameaçadas de extinção no RS foram registradas: Pseudastur polionotus, Odontophorus capueira, Patagonas cayennensis, Amazona pretrei, A. vinacea, Tricharia malachitacea, Campephilus robustus, Grallaria varia, Procnias nudicollis e Sporophila melanogaster. A riqueza e composição de espécies parecem estar relacionadas aos diferentes graus de conservação das florestas, às suas dimensões e conectividade, bem como à disponibilidade de variados tipos de ambientes. As melhores condições ambientais do PMR, quando comparadas às da FNC, aliadas a sua posição geográfica, resultam em uma avifauna mais rica e composta em maior número por espécies ameaçadas, raras, endêmicas da Mata Atlântica e de alta sensibilidade à perturbação nos habitats. Medidas de manejo são sugeridas visando à conservação e recuperação das condições naturais das áreas a longo prazo.*

**PALAVRAS-CHAVE:** Mata Atlântica; Avifauna; Unidades de conservação; Floresta Ombrófila Mista; Rio Grande do Sul.

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## REFERENCES

- ACCORDI, I.A. & BARCELOS, A. 2006. Composição da avifauna em oito áreas úmidas da Bacia Hidrográfica do Lago Guaíba, Rio Grande do Sul. *Revista Brasileira de Ornitologia*, 14(2): 101-115.
- AGNE, C.E. 2005. Novos registros de aves ameaçadas de extinção no estado do Rio Grande do Sul. *Atualidades Ornitológicas*, 126: 8.
- AGNE, C.E.; RUPP, A.E. & ACCORDI, I.A. 2007. Presença do picapau-rei (*Campyphilus robustus*) no Planalto Médio do Rio Grande do Sul. In: Congresso Brasileiro de Ornitologia, 15º. *Livro de Resumos*. Porto Alegre, EDIPUCRS. p. 217-218.
- ALEIXO, A. 1999. Effects of selective logging on a bird community in the Brazilian Atlantic forest. *The Condor*, 101: 537-548.
- BALMFORD, A.; GASTON, K.J.; BLYTH, S.; JAMES, A. & KAPOV, V. 2003. Global variation in terrestrial conservation costs, conservation benefits and unmet conservation needs. *Proceedings of the National Academy of Science of the United States of America*, 100: 1046-1050.
- BELTON, W. 1994. *Aves do Rio Grande do Sul: distribuição e biologia*. São Leopoldo, Editora Unisinos.
- BENCKE, G.A. & GRILLO, H. 1995. Range expansion of the pale-breasted thrush *Turdus leucomelas* (Aves, Turdidae) in Rio Grande do Sul, Brazil. *Iheringia. Série Zoologia*, 79: 175-176.
- BENCKE, G.A. & KINDEL, A. 1999. Bird counts along an altitudinal gradient of Atlantic forest in northeastern Rio Grande do Sul, Brazil. *Ararajuba*, 7: 91-107.
- BENCKE, G.A.; BURGER, M.I.; DOTTO, J.C.P.; GUADAGNIN, D.L.; LEITE, T.O. & MENEGHETTI, J.O. 2007. Aves. In: Becker, F.G.; Ramos, R.A. & Moura, L.A. (Orgs.). *Biodiversidade. Regiões da Lagoa do Casamento e dos Butiazais de Tapes, planície costeira do Rio Grande do Sul*. Brasília, Ministério do Meio Ambiente. p. 316-355.
- BENCKE, G.A.; DIAS, R.A.; BUGONI, L.; AGNE, C.E.; FONTANA, C.S.; MAURÍCIO, G.N. & MACHADO, D.B. 2010. Revisão e atualização da lista das aves do Rio Grande do Sul. *Iheringia, Série Zoologia*, 100(4): 519-556.
- BENCKE, G.A.; FONTANA, C.S.; DIAS, R.A.; MAURÍCIO, G.N. & MÄHLER JR., J.K.F. 2003. Aves. In: Fontana, C.S.; Bencke, G.A. & Reis, R.E. (Orgs.). *Livro vermelho da fauna ameaçada de extinção no Rio Grande do Sul*. Porto Alegre, EDIPUCRS. p. 189-479.
- BENCKE, G.A.; JARDIM, M.; BORGES-MARTINS, M. & ZANK, C. 2009. Composição e padrões de distribuição da fauna de tetrápodes recentes do Rio Grande do Sul, Brasil. In: Ribeiro, A.M.; Bauermann, S.G. & Schere, C.S. (Orgs.). *Quaternário do Rio Grande do Sul: integrando conhecimentos*. Porto Alegre, Sociedade Brasileira de Paleontologia. p. 123-142.
- BILDSTEIN, K.L.; SCHELSEY, W. & ZALLES, J. 1998. Conservation status of tropical raptors. *Journal of Raptors Research*, 32: 3-18.
- BROOKS, T.; TOBIAS, J. & BALMFORD, A. 1999. Deforestation and bird extinctions in the Atlantic forest. *Animal Conservation*, 2: 211-222.
- CAPPELLATI, A. & SCHMITT, J.L. 2011. Flora arbórea de área de Floresta Ombrófila Mista em São Francisco de Paula, RS, Brasil. *Pesquisas, Botânica*, 62: 253-261.
- CBRO – COMITÊ BRASILEIRO DE REGISTROS ORNITOLÓGICOS. 2014. *Listas das Aves do Brasil*. 11. ed. 01/01/2014. Available at: www.cbro.org.br. Access in: 05/02/2014.
- EFE, M.A.; MARTINS-FERREIRA, C.; OLMOV, F.; MOHR, L.V. & SILVEIRA, L.F. 2006. Diretrizes da Sociedade Brasileira de Ornitologia para a destinação de aves silvestres provenientes do tráfico e cativeiro. *Revista Brasileira de Ornitologia*, 14(1): 67-72.
- FERRAZ, E.A.R. 2003. Floresta Nacional IBAMA Canela. In: Oliveira, P. & Barroso, V.L.M. (Orgs.). *Raízes de Canela*. Porto Alegre, Edições Est. p. 423-432.
- FONTANA, C.S.; BENCKE, G.A. & REIS, R.E. 2003. *Livro vermelho da fauna ameaçada de extinção no Rio Grande do Sul*. Porto Alegre, EDIPUCRS.
- FONTANA, C.S.; ROVEDDER, C.E.; REPPENING, M. & GONÇALVES, M.L. 2008. Estado atual do conhecimento e conservação da avifauna dos Campos de Cima da Serra do sul do Brasil, Rio Grande do Sul e Santa Catarina. *Revista Brasileira de Ornitologia*, 16(4): 281-307.
- FRANZ, I. & BENCKE, G.A. [IN PREP.]. SPATIOTEMPORAL DYNAMICS OF THE RANGE EXPANSION AND CURRENT DISTRIBUTION OF THE PALE-BREADED THRUSH (*TURDUS LEUCOMELAS*) IN THE STATE OF RIO GRANDE DO SUL, SOUTHERN BRAZIL.
- HAFFER, J. 1985. Avian zoogeography of the Neotropical lowlands. *Ornithological Monographs*, 36: 113-146.
- IBAMA – INSTITUTO BRASILEIRO DO MEIO AMBIENTE E DOS RECURSOS NATURAIS RENOVÁVEIS. 1989. *Plano de manejo para a Floresta Nacional de Canela*, RS. Santa Maria, RS, FATEC/UFMS. 388p.
- IPAGRO – INSTITUTO DE PESQUISAS AGRONÔMICAS. 1989. *Atlas agroclimático do Estado do Rio Grande do Sul*. Porto Alegre, IPAGRO.
- IUCN – INTERNATIONAL UNION FOR CONSERVATION OF NATURE. 2012. *Red list of threatened species*. Version 2012.2. Available at: www.iucnredlist.org. Access in: 07/10/2012.
- JOENCK, C.M. 2006. Observações de *Spizaetus tyrannus* (Acciptridae) no Centro de Pesquisa e Conservação da Natureza Pró-Mata (CPCN Pró-Mata) no nordeste do Rio Grande do Sul, Brasil. *Revista Brasileira de Ornitologia*, 14(4): 427-428.
- LEITE, P.F. & KLEIN, R.M. 1990. Vegetação. In: IBGE. *Geografia do Brasil: Região Sul*. Rio de Janeiro, Instituto Brasileiro de Geografia e Estatística. v. 2. p. 113-150.
- MÄHLER JR., J.K.F. & FONTANA, C.S. 2000. Os Falconiformes no Centro de Pesquisas e Conservação da Natureza Pró-Mata: riqueza, status e considerações para a conservação das espécies no nordeste do Rio Grande do Sul. *Divulgações do Museu de Ciências e Tecnologia Ubea PUCRS*, 5: 129-141.
- MALUF, J.R.T. 2000. Nova classificação climática do estado do Rio Grande do Sul. *Revista Brasileira de Agrometeorologia*, 8(1): 141-150.
- MARQUES, A.A.B.; FONTANA, C.S.; VÉLEZ, E.; BENCKE, G.A.; SCHNEIDER, M. & REIS, R.E. 2002. *Lista das espécies da fauna*

- ameaçadas de extinção no Rio Grande do Sul*. Decreto nº 41.672, de 11 de Junho de 2002. Porto Alegre, FZB/MCT-PUCRS/PANGEA.
- MCDONALD, R.I. & BOUCHER, T.M. 2011. Global development and the future of the protected area strategy. *Biological Conservation*, 144(1): 383-392.
- MORENO, J.A. 1961. *Clima do Rio Grande do Sul*. Porto Alegre, Secretaria da Agricultura.
- MORRONE, J.J. 2001. Biogeografía de América Latina y el Caribe. Zaragoza, Sociedade Entomologica Aragonesa.
- PARKER III, T.A. & GOERCK, J.M. 1997. The importance of national parks and biological reserves to bird conservation in the Atlantic forest region of Brazil. *Ornithological Monographs*, 48: 527-541.
- PARKER III, T.A.; STOTZ, D.F. & FITZPATRICK, J.W. 1996. Ecological and distributional databases. In: Stotz, D.F.; Fitzpatrick, J.W.; Parker III, T.A. & Moskovits, D.K. *Neotropical birds: ecology and conservation*. Chicago, The University of Chicago Press. p. 113-436.
- PIZO, M.A. 2001. A conservação das aves frugívoras. In: Albuquerque, J.L.B.; Cândido-Jr., J.F.; Straube, F.C. & Roos, A.L. (Eds.). *Ornitologia e conservação: da ciência às estratégias*. Tubarão, Editora Unisul. p. 49-59.
- PRIMACK, R.B. 1998. *Essentials of conservation biology*. Sunderland, Sinauer Associates.
- PUCRS – PONTIFÍCIA UNIVERSIDADE CATÓLICA DO RIO GRANDE DO SUL. 2011. *Plano de manejo do Centro de Pesquisas e Conservação da Natureza Pró-Mata*. Porto Alegre, PUCRS.
- RENJIFO, L.M. 1999. Composition changes in a subandean avifauna after long-term forest fragmentation. *Conservation Biology*, 13(5): 1124-1139.
- SCHMIDT, R. & LONGHI-WAGNER, H.M. 2009. A tribo Bambusae (Poaceae, Bambusoideae) no Rio Grande do Sul, Brasil. *Revista Brasileira de Biociências*, 7(1): 71-128.
- SEMA – SECRETARIA DO MEIO AMBIENTE. 2008a. *Plano de manejo do Parque Estadual do Tainhas*. Porto Alegre, Secretaria Estadual do Meio Ambiente.
- SEMA – SECRETARIA DO MEIO AMBIENTE. 2008b. *Plano de manejo Reserva Biológica Estadual da Serra Geral*. Porto Alegre, Secretaria Estadual do Meio Ambiente.
- SENDULSKY, T. 1995. *Merostachys multiramea* (Poaceae: Bambusoideae: Bambuseae) and similar species from Brazil. *Novon*, 5: 76-96.
- SICK, H. 1997. *Ornitologia brasileira, uma introdução*. Rio de Janeiro, Ed. Nova Fronteira.
- SILVEIRA, L.F. & STRAUBE, F.C. 2008. Aves. In: Machado, A.B.M., Drummond, G.M. & Paglia, A.P. (Eds.). *Livro vermelho da fauna brasileira ameaçada de extinção*. Brasília, MMA. v. 2, p. 378-678.
- SONEGO, R.C.; BACKES, A. & SOUZA, A.F. 2007. Descrição da estrutura de uma Floresta Ombrófila Mista, RS, Brasil, utilizando estimadores não-paramétricos de riqueza e rarefação de amostras. *Acta Botanica Brasilica*, 21(4): 943-955.
- STRAUBE, F.C. & DI GIACOMO, A. 2007. A avifauna das regiões subtropical e temperada do Neotrópico: desafios biogeográficos. *Ciência & Ambiente*, 35: 137-166.
- TEIXEIRA, M.B.; COURA-NETO, A.B.; PASTORE, U. & RANGEL-FILHO, A.L.R. 1986. Vegetação. In: IBGE. *Levantamento de recursos naturais*. Rio de Janeiro, IBGE. v. 33, p. 541-620.
- VARTY, N.; BENCKE, G.A.; BERNARDINI, L.M.; CUNHA, A.S.; DIAS, E.V.; FONTANA, C.S.; GUADAGNIN, A.; KINDEL, E.; RAYMUNDO, M.M.; RICHTER, A.; ROSA, O. & TOSTES, C.S. 1994. Conservação do papagaio-charão *Amazona pretrei* no sul do Brasil: um plano de ação preliminar. *Divulgações do Museu de Ciências e Tecnologia Ubeca PUCRS*, 1: 1-70.
- VASCONCELOS, M.F.; VASCONCELOS, A.P.; VIANA, P.L.; PALÚ, L. & SILVA, J.F. 2005. Observações sobre aves granívoras (Columbidae e Emberizidae) associadas à frutificação de taquaras (Poaceae, Bambusoideae) na porção meridional da Cadeia do Espinhaço, Minas Gerais, Brasil. *Lundiana*, 6(1): 75-77.
- WILLIS, E.O. 1979. The composition of avian communities in remanent woodlots in southern Brazil. *Papéis Avulsos de Zoologia*, 33(1): 1-25.
- WILSON, E.O. 1997. A situação atual da diversidade biológica. In: Wilson, E.O. (Ed.). *Biodiversidade*. Ed. Nova Fronteira, Rio de Janeiro, 3-24.

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## APPENDIX

List of birds recorded at the Floresta Nacional de Canela (FNC) and at the Parque Natural Municipal da Ronda (PMR), Rio Grande do Sul, Brazil, between 2004 and 2009. Sensitivity to disturbance (SD): H = high, M = medium, L = low. Conservation status and endemism: RS = threatened in Rio Grande do Sul, BR = threatened in Brazil, GL = globally threatened. EN = “endangered”, VU = “vulnerable”, NT = “near threatened”. AFE = endemic to the Atlantic Forest. References in the text.

| SPECIES                        | FNC | PMR | SD | STATUS OF CONSERVATION AND ENDEMISM |    |    |     |
|--------------------------------|-----|-----|----|-------------------------------------|----|----|-----|
|                                |     |     |    | RS                                  | BR | GL | AFE |
| <b>TINAMIFORMES</b>            |     |     |    |                                     |    |    |     |
| <b>Tinamidae</b>               |     |     |    |                                     |    |    |     |
| <i>Crypturellus obsoletus</i>  | X   | X   | L  |                                     |    |    |     |
| <i>Crypturellus tataupa</i>    |     | X   | L  |                                     |    |    |     |
| <i>Nothura maculosa</i>        |     | X   | L  |                                     |    |    |     |
| <b>ANSERIFORMES</b>            |     |     |    |                                     |    |    |     |
| <b>Anhimidae</b>               |     |     |    |                                     |    |    |     |
| <i>Chauna torquata</i>         | X   |     | L  |                                     |    |    |     |
| <b>Anatidae</b>                |     |     |    |                                     |    |    |     |
| <i>Dendrocygna viduata</i>     | X   |     | L  |                                     |    |    |     |
| <i>Amazonetta brasiliensis</i> | X   |     | L  |                                     |    |    |     |
| <i>Anas flavirostris</i>       | X   | X   | M  |                                     |    |    |     |
| <i>Anas georgica</i>           | X   |     | L  |                                     |    |    |     |
| <b>GALLIFORMES</b>             |     |     |    |                                     |    |    |     |
| <b>Cracidae</b>                |     |     |    |                                     |    |    |     |
| <i>Ortalis guttata</i>         |     | X   | L  |                                     |    |    |     |
| <i>Penelope obscura</i>        | X   |     | M  |                                     |    |    |     |
| <b>Odontophoridae</b>          |     |     |    |                                     |    |    |     |
| <i>Odontophorus capueira</i>   |     | X   | H  | VU                                  |    |    | X   |
| <b>PODICIPEDIFORMES</b>        |     |     |    |                                     |    |    |     |
| <b>Podicipedidae</b>           |     |     |    |                                     |    |    |     |
| <i>Podilymbus podiceps</i>     | X   |     | M  |                                     |    |    |     |
| <b>CICONIIFORMES</b>           |     |     |    |                                     |    |    |     |
| <b>Ciconiidae</b>              |     |     |    |                                     |    |    |     |
| <i>Ciconia maguari</i>         |     | X   |    |                                     |    |    |     |
| <b>PELECANIFORMES</b>          |     |     |    |                                     |    |    |     |
| <b>Ardeidae</b>                |     |     |    |                                     |    |    |     |
| <i>Nycticorax nycticorax</i>   | X   |     | L  |                                     |    |    |     |
| <i>Butorides striata</i>       | X   | X   | L  |                                     |    |    |     |
| <i>Bulbulcus ibis</i>          | X   | X   | L  |                                     |    |    |     |
| <i>Ardea cocoi</i>             |     | X   | L  |                                     |    |    |     |
| <i>Ardea alba</i>              | X   | X   | L  |                                     |    |    |     |
| <i>Syrigma sibilatrix</i>      | X   | X   | M  |                                     |    |    |     |
| <i>Egretta thula</i>           | X   |     | L  |                                     |    |    |     |
| <b>Threskiornithidae</b>       |     |     |    |                                     |    |    |     |
| <i>Theristicus caudatus</i>    | X   | X   |    |                                     |    |    |     |
| <b>CATHARTIFORMES</b>          |     |     |    |                                     |    |    |     |
| <b>Cathartidae</b>             |     |     |    |                                     |    |    |     |
| <i>Cathartes aura</i>          | X   | X   | L  |                                     |    |    |     |
| <i>Coragyps atratus</i>        | X   | X   | L  |                                     |    |    |     |
| <b>ACCIPITRIFORMES</b>         |     |     |    |                                     |    |    |     |
| <b>Accipitridae</b>            |     |     |    |                                     |    |    |     |
| <i>Elanoides forficatus</i>    |     | X   | M  |                                     |    |    |     |
| <i>Elanus leucurus</i>         |     | X   | L  |                                     |    |    |     |
| <i>Harpagus diodon</i>         |     | X   | M  |                                     |    |    |     |

| SPECIES                           | FNC | PMR | SD | STATUS OF CONSERVATION AND ENDEMISM |    |    |     |
|-----------------------------------|-----|-----|----|-------------------------------------|----|----|-----|
|                                   |     |     |    | RS                                  | BR | GL | AFE |
| <i>Ictinia plumbea</i>            |     | X   | M  |                                     |    |    |     |
| <i>Accipiter striatus</i>         |     | X   | L  |                                     |    |    |     |
| <i>Pseudastur polionotus</i>      |     | X   | H  | EN                                  |    | NT | X   |
| <i>Heterospizias meridionalis</i> |     | X   | L  |                                     |    |    |     |
| <i>Rupornis magnirostris</i>      | X   | X   | L  |                                     |    |    |     |
| <i>Geranoaetus albicaudatus</i>   |     | X   | L  |                                     |    |    |     |
| <i>Buteo brachyurus</i>           | X   | X   | M  |                                     |    |    |     |
| <b>GRUIFORMES</b>                 |     |     |    |                                     |    |    |     |
| <b>Rallidae</b>                   |     |     |    |                                     |    |    |     |
| <i>Aramides cajaneus</i>          | X   |     | H  |                                     |    |    |     |
| <i>Aramides saracura</i>          | X   | X   | M  |                                     |    |    | X   |
| <i>Laterallus melanophaius</i>    |     | X   | L  |                                     |    |    |     |
| <i>Pardirallus sanguinolentus</i> |     | X   | M  |                                     |    |    |     |
| <i>Gallinula galeata</i>          | X   | X   | L  |                                     |    |    |     |
| <i>Gallinula melanops</i>         | X   |     | M  |                                     |    |    |     |
| <b>CHARADRIIFORMES</b>            |     |     |    |                                     |    |    |     |
| <b>Charadriidae</b>               |     |     |    |                                     |    |    |     |
| <i>Vanellus chilensis</i>         | X   | X   |    |                                     |    |    |     |
| <b>Scolopacidae</b>               |     |     |    |                                     |    |    |     |
| <i>Gallinago paraguaiiae</i>      |     | X   |    |                                     |    |    |     |
| <b>Jacanidae</b>                  |     |     |    |                                     |    |    |     |
| <i>Jacana jacana</i>              | X   | X   | L  |                                     |    |    |     |
| <b>COLUMBIFORMES</b>              |     |     |    |                                     |    |    |     |
| <b>Columbidae</b>                 |     |     |    |                                     |    |    |     |
| <i>Columbina talpacoti</i>        |     | X   | L  |                                     |    |    |     |
| <i>Columbina picui</i>            | X   | X   | L  |                                     |    |    |     |
| <i>Patagioenas picazuro</i>       | X   | X   | M  |                                     |    |    |     |
| <i>Patagioenas cayennensis</i>    | X   | X   | M  | VU                                  |    |    |     |
| <i>Zenaida auriculata</i>         | X   |     | L  |                                     |    |    |     |
| <i>Leptotila verreauxi</i>        | X   | X   | L  |                                     |    |    |     |
| <i>Leptotila rufaxilla</i>        | X   | X   | M  |                                     |    |    |     |
| <i>Geotrygon montana</i>          |     | X   | M  |                                     |    |    |     |
| <b>CUCULIFORMES</b>               |     |     |    |                                     |    |    |     |
| <b>Cuculidae</b>                  |     |     |    |                                     |    |    |     |
| <i>Piaya cayana</i>               | X   | X   | L  |                                     |    |    |     |
| <i>Crotophaga ani</i>             | X   | X   | L  |                                     |    |    |     |
| <i>Guira guira</i>                | X   | X   | L  |                                     |    |    |     |
| <i>Tapera naevia</i>              |     | X   | L  |                                     |    |    |     |
| <b>STRIGIFORMES</b>               |     |     |    |                                     |    |    |     |
| <b>Tytonidae</b>                  |     |     |    |                                     |    |    |     |
| <i>Tyto furcata</i>               | X   | X   | L  |                                     |    |    |     |
| <b>Strigidae</b>                  |     |     |    |                                     |    |    |     |
| <i>Megascops choliba</i>          | X   |     | L  |                                     |    |    |     |
| <i>Megascops sanctaecatarinae</i> | X   | X   |    |                                     |    |    |     |
| <i>Strix hylophila</i>            | X   | X   | H  |                                     |    | NT | X   |
| <i>Asio clamator</i>              | X   |     | L  |                                     |    |    |     |
| <b>CAPRIMULGIFORMES</b>           |     |     |    |                                     |    |    |     |
| <b>Caprimulgidae</b>              |     |     |    |                                     |    |    |     |
| <i>Lurocalis semitorquatus</i>    | X   | X   | M  |                                     |    |    |     |
| <i>Hydropsalis torquata</i>       | X   |     | L  |                                     |    |    |     |
| <b>APODIFORMES</b>                |     |     |    |                                     |    |    |     |
| <b>Apodidae</b>                   |     |     |    |                                     |    |    |     |
| <i>Cypseloides fumigatus</i>      |     | X   | M  |                                     |    |    |     |



| SPECIES                          | FNC | PMR | SD | STATUS OF CONSERVATION AND ENDEMISM |    |    |     |
|----------------------------------|-----|-----|----|-------------------------------------|----|----|-----|
|                                  |     |     |    | RS                                  | BR | GL | AFE |
| <i>Streptoprocne zonaris</i>     |     | X   | L  |                                     |    |    |     |
| <i>Chaetura meridionalis</i>     | X   | X   | L  |                                     |    |    |     |
| <b>Trochilidae</b>               |     |     |    |                                     |    |    |     |
| <i>Stephanoxis lalandi</i>       | X   | X   | M  |                                     |    |    | X   |
| <i>Chlorostilbon lucidus</i>     | X   | X   | L  |                                     |    |    |     |
| <i>Thalurania glaucopis</i>      |     | X   | M  |                                     |    |    | X   |
| <i>Leucochloris albicollis</i>   | X   | X   | L  |                                     |    |    | X   |
| <b>TROGONIFORMES</b>             |     |     |    |                                     |    |    |     |
| <b>Trogonidae</b>                |     |     |    |                                     |    |    |     |
| <i>Trogon surrucuna</i>          | X   | X   | M  |                                     |    |    | X   |
| <b>CORACIIFORMES</b>             |     |     |    |                                     |    |    |     |
| <b>Alcedinidae</b>               |     |     |    |                                     |    |    |     |
| <i>Megaceryle torquata</i>       | X   |     | L  |                                     |    |    |     |
| <i>Chloroceryle amazona</i>      | X   |     | L  |                                     |    |    |     |
| <i>Chloroceryle americana</i>    | X   |     | L  |                                     |    |    |     |
| <b>PICIFORMES</b>                |     |     |    |                                     |    |    |     |
| <b>Ramphastidae</b>              |     |     |    |                                     |    |    |     |
| <i>Ramphastos dicolorus</i>      | X   | X   | M  |                                     |    |    | X   |
| <b>Picidae</b>                   |     |     |    |                                     |    |    |     |
| <i>Picumnus temminckii</i>       |     | X   | M  |                                     |    |    | X   |
| <i>Picumnus nebulosus</i>        | X   | X   | M  |                                     |    | NT |     |
| <i>Veniliornis spilogaster</i>   | X   | X   | M  |                                     |    |    | X   |
| <i>Piculus aurulentus</i>        | X   | X   | M  |                                     |    | NT | X   |
| <i>Colaptes melanochloros</i>    | X   | X   | L  |                                     |    |    |     |
| <i>Colaptes campestris</i>       | X   | X   | L  |                                     |    |    |     |
| <i>Celeus flavescens</i>         | X   | X   | M  |                                     |    |    |     |
| <i>Campephilus robustus</i>      | X   | X   | M  | EN                                  |    |    | X   |
| <b>FALCONIFORMES</b>             |     |     |    |                                     |    |    |     |
| <b>Falconidae</b>                |     |     |    |                                     |    |    |     |
| <i>Caracara plancus</i>          | X   | X   | L  |                                     |    |    |     |
| <i>Milvago chimachima</i>        | X   | X   | L  |                                     |    |    |     |
| <i>Milvago chimango</i>          | X   | X   | L  |                                     |    |    |     |
| <i>Micrastur ruficollis</i>      | X   | X   | M  |                                     |    |    |     |
| <i>Falco sparverius</i>          |     | X   | L  |                                     |    |    |     |
| <b>PSITTACIFORMES</b>            |     |     |    |                                     |    |    |     |
| <b>Psittacidae</b>               |     |     |    |                                     |    |    |     |
| <i>Pyrrhura frontalis</i>        | X   | X   | M  |                                     |    |    | X   |
| <i>Myiopsitta monachus</i>       |     | X   | L  |                                     |    |    |     |
| <i>Pionopsitta pileata</i>       | X   | X   | M  |                                     |    |    | X   |
| <i>Pionus maximiliani</i>        | X   | X   | M  |                                     |    |    |     |
| <i>Amazona pretrei</i>           | X   | X   | M  | VU                                  | VU | VU | X   |
| <i>Amazona vinacea</i>           | X   | X   | M  | EN                                  | VU | EN | X   |
| <i>Triclarina malachitacea</i>   |     | X   | M  | VU                                  |    | NT | X   |
| <b>PASSERIFORMES</b>             |     |     |    |                                     |    |    |     |
| <b>Thamnophilidae</b>            |     |     |    |                                     |    |    |     |
| <i>Batara cinerea</i>            |     | X   | M  |                                     |    |    |     |
| <i>Mackenziaena leachii</i>      | X   | X   | M  |                                     |    |    | X   |
| <i>Thamnophilus ruficapillus</i> | X   | X   | L  |                                     |    |    |     |
| <i>Thamnophilus caerulescens</i> | X   | X   | L  |                                     |    |    |     |
| <i>Dysithamnus mentalis</i>      | X   | X   | M  |                                     |    |    |     |
| <i>Drymophila malura</i>         | X   | X   | M  |                                     |    |    | X   |
| <b>Conopophagidae</b>            |     |     |    |                                     |    |    |     |
| <i>Conopophaga lineata</i>       | X   | X   | M  |                                     |    |    | X   |

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|------------------------------------|-----|-----|----|-------------------------------------|----|----|-----|
|                                    |     |     |    | RS                                  | BR | GL | AFE |
| <b>Grallariidae</b>                |     |     |    |                                     |    |    |     |
| <i>Grallaria varia</i>             |     | X   | H  | VU                                  |    |    |     |
| <i>Hylopezus nattereri</i>         | X   | X   | H  |                                     |    |    | X   |
| <b>Rhinocryptidae</b>              |     |     |    |                                     |    |    |     |
| <i>Scytalopus speluncae</i>        | X   | X   | M  |                                     |    |    | X   |
| <b>Formicariidae</b>               |     |     |    |                                     |    |    |     |
| <i>Chamaeza campanisona</i>        |     | X   | H  |                                     |    |    |     |
| <i>Chamaeza ruficauda</i>          |     | X   | H  |                                     |    |    | X   |
| <b>Scleruridae</b>                 |     |     |    |                                     |    |    |     |
| <i>Sclerurus scansor</i>           | X   | X   | H  |                                     |    |    | X   |
| <b>Dendrocolaptidae</b>            |     |     |    |                                     |    |    |     |
| <i>Sittasomus griseicapillus</i>   | X   | X   | M  |                                     |    |    |     |
| <i>Xiphocolaptes albicollis</i>    | X   | X   | M  |                                     |    |    |     |
| <i>Dendrocolaptes platyrostris</i> | X   | X   | M  |                                     |    |    |     |
| <i>Xiphorhynchus fuscus</i>        | X   | X   | H  |                                     |    |    | X   |
| <i>Lepidocolaptes falcinellus</i>  | X   | X   | H  |                                     |    |    | X   |
| <b>Furnariidae</b>                 |     |     |    |                                     |    |    |     |
| <i>Furnarius rufus</i>             | X   | X   | L  |                                     |    |    |     |
| <i>Leptasthenura striolata</i>     | X   | X   | L  |                                     |    |    | X   |
| <i>Leptasthenura setaria</i>       | X   | X   | L  |                                     |    | NT | X   |
| <i>Synallaxis ruficapilla</i>      | X   | X   | M  |                                     |    |    | X   |
| <i>Synallaxis cinerascens</i>      | X   | X   | M  |                                     |    |    |     |
| <i>Synallaxis spixi</i>            | X   | X   | L  |                                     |    |    |     |
| <i>Cranioleuca obsoleta</i>        | X   | X   | M  |                                     |    |    | X   |
| <i>Anumbius annumbi</i>            |     | X   | M  |                                     |    |    |     |
| <i>Syndactyla rufosuperciliata</i> | X   | X   | M  |                                     |    |    |     |
| <i>Philydor rufum</i>              | X   | X   | M  |                                     |    |    |     |
| <i>Lochmias nematura</i>           | X   | X   | M  |                                     |    |    |     |
| <i>Heliobletus contaminatus</i>    | X   | X   | H  |                                     |    |    | X   |
| <b>Pipridae</b>                    |     |     |    |                                     |    |    |     |
| <i>Chiroxiphia caudata</i>         | X   | X   | L  |                                     |    |    | X   |
| <b>Tityridae</b>                   |     |     |    |                                     |    |    |     |
| <i>Schiffornis virescens</i>       | X   | X   | M  |                                     |    |    | X   |
| <i>Tityra cayana</i>               | X   | X   | M  |                                     |    |    |     |
| <i>Pachyramphus castaneus</i>      |     | X   | M  |                                     |    |    |     |
| <i>Pachyramphus polychopterus</i>  | X   | X   | L  |                                     |    |    |     |
| <i>Pachyramphus validus</i>        | X   | X   | M  |                                     |    |    |     |
| <b>Cotingidae</b>                  |     |     |    |                                     |    |    |     |
| <i>Carpornis cucullata</i>         |     | X   | H  |                                     |    | NT | X   |
| <i>Procnias nudicollis</i>         | X   | X   | M  | EN                                  |    | VU | X   |
| <b>Platyrinchidae</b>              |     |     |    |                                     |    |    |     |
| <i>Platyrinchus mystaceus</i>      | X   | X   | M  |                                     |    |    |     |
| <b>Rhynchocyclidae</b>             |     |     |    |                                     |    |    |     |
| <i>Mionectes rufiventris</i>       |     | X   | M  |                                     |    |    | X   |
| <i>Hemitriccus obsoletus</i>       |     | X   | M  |                                     |    |    | X   |
| <i>Poecilotriccus plumbeiceps</i>  | X   | X   | M  |                                     |    |    |     |
| <i>Phylloscartes ventralis</i>     | X   | X   | M  |                                     |    |    |     |
| <i>Tolmomyias sulphurescens</i>    | X   | X   | M  |                                     |    |    |     |
| <b>Tyrannidae</b>                  |     |     |    |                                     |    |    |     |
| <i>Tyranniscus burmeisteri</i>     | X   | X   | M  |                                     |    |    |     |
| <i>Phyllomyias virescens</i>       | X   | X   | M  |                                     |    |    | X   |
| <i>Phyllomyias fasciatus</i>       | X   | X   | M  |                                     |    |    |     |
| <i>Elaenia parvirostris</i>        | X   | X   | L  |                                     |    |    |     |

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|----------------------------------|-----|-----|----|-------------------------------------|----|----|-----|
|                                  |     |     |    | RS                                  | BR | GL | AFE |
| <i>Elaenia mesoleuca</i>         | X   | X   | L  |                                     |    |    |     |
| <i>Elaenia obscura</i>           | X   |     | M  |                                     |    |    |     |
| <i>Camptostoma obsoletum</i>     | X   | X   | L  |                                     |    |    |     |
| <i>Serpophaga nigricans</i>      |     | X   | L  |                                     |    |    |     |
| <i>Serpophaga subcristata</i>    | X   | X   | L  |                                     |    |    |     |
| <i>Lathrotriccus euleri</i>      | X   | X   | M  |                                     |    |    |     |
| <i>Pyrocephalus rubinus</i>      |     | X   | L  |                                     |    |    |     |
| <i>Satrapa icterophrys</i>       | X   | X   | L  |                                     |    |    |     |
| <i>Xolmis cinereus</i>           |     | X   | L  |                                     |    |    |     |
| <i>Xolmis irupero</i>            | X   | X   | L  |                                     |    |    |     |
| <i>Muscipira vetula</i>          | X   |     | M  |                                     |    |    | X   |
| <i>Arundinicola leucocephala</i> | X   |     | M  |                                     |    |    |     |
| <i>Machetornis rixosa</i>        | X   | X   | L  |                                     |    |    |     |
| <i>Legatus leucophaeus</i>       | X   |     | L  |                                     |    |    |     |
| <i>Pitangus sulphuratus</i>      | X   | X   | L  |                                     |    |    |     |
| <i>Myiodynastes maculatus</i>    | X   | X   | L  |                                     |    |    |     |
| <i>Megarynchus pitangua</i>      | X   | X   | L  |                                     |    |    |     |
| <i>Empidonomus varius</i>        | X   | X   | L  |                                     |    |    |     |
| <i>Tyrannus melancholicus</i>    | X   | X   | L  |                                     |    |    |     |
| <i>Tyrannus savana</i>           | X   | X   | L  |                                     |    |    |     |
| <i>Myiarchus swainsoni</i>       | X   | X   | L  |                                     |    |    |     |
| <i>Attila phoenicurus</i>        |     | X   | H  |                                     |    |    |     |
| <b>Vireonidae</b>                |     |     |    |                                     |    |    |     |
| <i>Cyclarhis gujanensis</i>      | X   | X   | L  |                                     |    |    |     |
| <i>Vireo olivaceus</i>           | X   | X   | L  |                                     |    |    |     |
| <i>Hylophilus poicilotis</i>     |     | X   | M  |                                     |    |    | X   |
| <b>Corvidae</b>                  |     |     |    |                                     |    |    |     |
| <i>Cyanocorax caeruleus</i>      | X   | X   | M  |                                     |    | NT | X   |
| <i>Cyanocorax chrysops</i>       |     | X   | L  |                                     |    |    |     |
| <b>Hirundinidae</b>              |     |     |    |                                     |    |    |     |
| <i>Pygochelidon cyanoleuca</i>   | X   | X   | L  |                                     |    |    |     |
| <i>Stelgidopteryx ruficollis</i> | X   |     | L  |                                     |    |    |     |
| <i>Progne tapera</i>             | X   | X   | L  |                                     |    |    |     |
| <i>Progne chalybea</i>           | X   | X   | L  |                                     |    |    |     |
| <i>Tachycineta leucorrhoa</i>    | X   | X   | L  |                                     |    |    |     |
| <b>Troglodytidae</b>             |     |     |    |                                     |    |    |     |
| <i>Troglodytes musculus</i>      | X   | X   | L  |                                     |    |    |     |
| <b>Turdidae</b>                  |     |     |    |                                     |    |    |     |
| <i>Turdus flavipes</i>           |     | X   | M  |                                     |    |    |     |
| <i>Turdus rufiventris</i>        | X   | X   | L  |                                     |    |    |     |
| <i>Turdus leucomelas</i>         | X   |     | L  |                                     |    |    |     |
| <i>Turdus amaurochalinus</i>     | X   | X   | L  |                                     |    |    |     |
| <i>Turdus subalaris</i>          | X   | X   | L  |                                     |    |    | X   |
| <i>Turdus albicollis</i>         | X   | X   | M  |                                     |    |    |     |
| <b>Mimidae</b>                   |     |     |    |                                     |    |    |     |
| <i>Mimus saturninus</i>          |     | X   | L  |                                     |    |    |     |
| <b>Motacillidae</b>              |     |     |    |                                     |    |    |     |
| <i>Anthus helmayri</i>           |     | X   | L  |                                     |    |    |     |
| <b>Passerellidae</b>             |     |     |    |                                     |    |    |     |
| <i>Zonotrichia capensis</i>      | X   | X   | L  |                                     |    |    |     |
| <i>Ammodramus humeralis</i>      |     | X   | L  |                                     |    |    |     |
| <b>Parulidae</b>                 |     |     |    |                                     |    |    |     |
| <i>Setophaga pitiauyumi</i>      | X   | X   | M  |                                     |    |    |     |

| SPECIES                          | FNC | PMR | SD | STATUS OF CONSERVATION AND ENDEMISM |    |    |     |
|----------------------------------|-----|-----|----|-------------------------------------|----|----|-----|
|                                  |     |     |    | RS                                  | BR | GL | AFF |
| <i>Geothlypis aequinoctialis</i> | X   | X   | L  |                                     |    |    |     |
| <i>Basileuterus culicivorus</i>  | X   | X   | M  |                                     |    |    |     |
| <i>Myiothlypis leucoblephara</i> | X   | X   | M  |                                     |    |    | X   |
| <b>Icteridae</b>                 |     |     |    |                                     |    |    |     |
| <i>Cacicus chrysopterus</i>      | X   | X   | M  |                                     |    |    |     |
| <i>Icterus pyrrhopterus</i>      |     | X   | M  |                                     |    |    |     |
| <i>Gnorimopsar chopi</i>         |     | X   | L  |                                     |    |    |     |
| <i>Pseudoleistes guirahuro</i>   |     | X   | L  |                                     |    |    |     |
| <i>Agelaioides badius</i>        | X   | X   | L  |                                     |    |    |     |
| <i>Molothrus bonariensis</i>     |     | X   | L  |                                     |    |    |     |
| <b>Thraupidae</b>                |     |     |    |                                     |    |    |     |
| <i>Coereba flaveola</i>          | X   | X   | L  |                                     |    |    |     |
| <i>Saltator similis</i>          | X   | X   | L  |                                     |    |    |     |
| <i>Saltator maxillosum</i>       | X   | X   | M  |                                     |    |    | X   |
| <i>Pyrrhocomia ruficeps</i>      | X   | X   | M  |                                     |    |    | X   |
| <i>Tachyphonus coronatus</i>     | X   | X   | L  |                                     |    |    | X   |
| <i>Tangara sayaca</i>            | X   | X   | L  |                                     |    |    |     |
| <i>Tangara preciosa</i>          | X   | X   | L  |                                     |    |    |     |
| <i>Stephanophorus diadematus</i> | X   | X   | L  |                                     |    |    |     |
| <i>Pipraeidea bonariensis</i>    | X   | X   | L  |                                     |    |    |     |
| <i>Pipraeidea melanonota</i>     | X   | X   | M  |                                     |    |    |     |
| <i>Tersina viridis</i>           |     | X   | L  |                                     |    |    |     |
| <i>Dacnis cayana</i>             |     | X   | L  |                                     |    |    |     |
| <i>Hemithraupis guira</i>        |     | X   | L  |                                     |    |    |     |
| <i>Haplospiza unicolor</i>       | X   | X   | M  |                                     |    |    | X   |
| <i>Donacospiza albifrons</i>     |     | X   | L  |                                     |    |    |     |
| <i>Poospiza cabanisi</i>         | X   | X   | M  |                                     |    |    |     |
| <i>Sicalis flaveola</i>          | X   | X   | L  |                                     |    |    |     |
| <i>Sicalis luteola</i>           | X   | X   | L  |                                     |    |    |     |
| <i>Emberizoides ypiranganus</i>  |     | X   | M  |                                     |    |    |     |
| <i>Embernagra platensis</i>      | X   | X   | L  |                                     |    |    |     |
| <i>Volatinia jacarina</i>        |     | X   | L  |                                     |    |    |     |
| <i>Sporophila caerulea</i>       | X   | X   | L  |                                     |    |    |     |
| <i>Sporophila melanogaster</i>   |     | X   | M  | VU                                  | VU | NT | X   |
| <b>Cardinalidae</b>              |     |     |    |                                     |    |    |     |
| <i>Habia rubica</i>              |     | X   | H  |                                     |    |    |     |
| <i>Cyanoloxia brissonii</i>      | X   |     | M  |                                     |    |    |     |
| <i>Cyanoloxia glaucocerulea</i>  | X   | X   | L  |                                     |    |    |     |
| <b>Fringillidae</b>              |     |     |    |                                     |    |    |     |
| <i>Sporagra magellanica</i>      | X   | X   | L  |                                     |    |    |     |
| <i>Euphonia chlorotica</i>       | X   | X   | L  |                                     |    |    |     |
| <i>Euphonia chalybea</i>         |     | X   | M  |                                     |    | NT | X   |
| <i>Euphonia pectoralis</i>       |     | X   | M  |                                     |    |    | X   |
| <i>Chlorophonia cyanea</i>       | X   | X   | M  |                                     |    |    |     |
| <b>Estrildidae</b>               |     |     |    |                                     |    |    |     |
| <i>Estrilda astrild</i>          | X   |     |    |                                     |    |    |     |