AVIAN DISTRIBUTION PATTERNS AND CONSERVATION IN AMAZONIA

by

Mariana Moncassim Vale

University Program in Ecology
Nicholas School of the Environment and Earth Science
Duke University

Date:_______________________
Approved:

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Stuart L. Pimm, Supervisor

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Maria Alice S. Alves, Co-supervisor

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Patrick N. Halpin

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Norman L. Christensen

Dissertation submitted in partial fulfillment of
the requirements for the degree of
Doctor of Philosophy in the University Program in Ecology
in the Graduate School
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ABSTRACT

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Abstract

In this dissertation, I address the distribution and conservation of the Amazonian avifauna at several different scales. In Chapter 1, I looked at how the spatial bias in ornithological collections affects our understanding of the patterns of diversity in Amazonia. I showed that Amazonia is massively under-collected, that biological collection sites cluster around points of access, and that the richness at collection localities is higher than would be expected at random. This greater richness in collected areas was associated with a higher proportion of species with small geographical ranges as compared to uncollected areas. These small range species are relevant for conservation, as they are especially prone to extinction. I concluded that the richness of the uncollected areas of Amazonia is seriously underestimated, and that current knowledge gaps preclude accurate selection of areas for conservation in Amazonia.

With this in mind, I modeled the impacts of continued deforestation on the Amazonian endemic avifauna. To overcome knowledge gaps, I complemented bird range maps with a "bird-ecoregions." I identified several taxa and bird-ecoregions likely to face great threat in the near future, most of them associated with riverine habitats. To evaluate these predictions, I conducted a detailed study on two riverine species: the Rio Branco Antbird (*Cercomacra carbonaria*) and the Hoary-throated Spinetail (*Synallaxis kollari*). Both are threatened and endemic to the gallery forests of Roraima, Brazil. I predicted that both would lose critical habitat in the near future. I concluded that neither is categorized correctly in by The World Conservation Union and recommend the down-listing of the Rio-Branco-Antbird and the up-listing of the Hoary-throated Spinetail. I also explored the importance of indigenous reserves for the conservation of both species and emphasized the need for greater involvement of conservation biologists in the social issues related to their study organisms.

Keywords: Amazonia, Birds, Biodiversity, Conservation, Indigenous People

To my father, Jorge Raimundo Rodrigues Vale, who was born and raised in Amazonia, and first introduced me to the wonders of that magical place. Shall his soul rest in peace under Saint George's shield.

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I wrote the chapters of this dissertation in publication format, and I would like to thank my co-authors for their extensive help. Stuart Pimm is a co-author in every chapter of this dissertation. Clinton Jenkins is a co-author in Chapter 1. Mario Cohn-Half from the *Instituto Nacional de Pesquisas Amazônicas* (INPA) and Scott Bergen from World Conservation Society are co-authors on Chapter 2. Maria Alice S. Alves and James Bruce Bell are co-author on Chapter 3.

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Introduction

This study is broadly focused on questions relating to the distribution and conservation of the Amazonian avifauna. The sequence of chapters was not planned, but came about as a natural consequence of the work. Chapter 1, on the effect of collection bias on the understanding of biodiversity patterns in Amazonia, sets the stage for the rest of the dissertation. It contextualizes Amazonia's place within the Neotropical rainforests through comparison with the Atlantic forest, an area that is equally renowned for its bird diversity and endemism, but that, as opposed to Amazonia, has lost most of its original forest cover. This chapter demonstrates how little is known about biodiversity in Amazonia. The collection density in the Atlantic forest is five times greater than in Amazonia, where collection gaps larger than 1 million Km^2 are common. I show that ornithological collections tend to cluster around cities, rivers, and roads. The bias in the location of ornithological collections has a strong effect on bird richness patterns, with the richness at collection localities being significantly higher than expected at random. This greater richness in collected areas is associated with a higher proportion of species with small geographical ranges as compared to uncollected areas, suggesting that there are small-ranged species awaiting discovery in the latter. These species are very relevant for conservation, as they are especially prone to extinction. Furthermore, Endemic Bird Areas (*sensu* BirdLife International) – which are set as priorities for biodiversity conservation – have collection densities tens of times higher than Amazonia as whole, which also inflates their relative species richness. I conclude that the richness of uncollected areas of Amazonia is seriously underestimated and that current knowledge gaps preclude accurate selection of areas for conservation in Amazonia.

Chapter 2 examines the impacts of continued infrastructure development and deforestation in the Amazonian endemic avifauna. The region is losing forest at an astonishing rate of ~20,000 km^2 per year, before scientists have even had the opportunity to catalogue its biodiversity. Although we know little about biodiversity patterns in Amazonia, we cannot afford to pause to construct full understanding before identifying areas and taxa that need immediate attention. I used two approaches to overcome the uncertainties in species distribution (and consequently in regional richness): (1) through a collaboration with researchers at the Brazilian National Institute for Amazonian Research (INPA), I corrected available distribution maps with the most up-to-date information, often fresh from the field and, (2) I used a modified version of the Ecoregions (*sensu* World Wildlife Fund) as a surrogate for areas of bird endemism, determining the threat to the area as a whole and predicting the conservation status of species that are likely present but have not yet been described. The study identified 16 taxa that will likely be threatened due to range contraction associated with deforestation, according to the criteria of the The World Conservation Organization. It also identified several "bird-ecoregions" whose endemic taxa will also likely be threatened. An important finding was the identification of riverine habitats (*várzea*, *igapó*, gallery forests and river islands) as potential areas for future extinctions. There is a pervasive notion among ornithologists that species specialized in Amazonian riverine habitats are pre-adapted to human disturbance, because they are adapted to an environment that is naturally disturbed by seasonal flooding. Chapter 2 is under review for publication (Vale *et al.* in review).

In Chapter 3 I verified some of the predictions made in Chapter 2. I did a detailed study on two riverine species predicted to the threatened: the Rio Branco Antbird (*Cercomacra carbonaria*) and the Hoary-throated Spinetail (*Synallaxis kollari*). The two species are threatened and endemic to the gallery forests of Roraima in northern Brazilian Amazon. There is hardly any published information about them, despite the fact that both are already *Vulnerable* under The World Conservation Organization. This illustrates the aforementioned lack of basic information on biodiversity in Amazonia. My study showed that the current assigned conservation status for both species is incorrect. I recommend that *C. carbonaria* be down-listed to *Near Threatened* and *S. kollari* up-listed to *Endangered*. The discrepancy between my evaluation and The World Conservation Organization's is associated with a lack of basic information about the species' natural history. I found that *S. kollari* has less available habitat than previously thought, while *C. carbonaria* is much more widespread. Another important component of the puzzle is the distribution of protected areas and indigenous reserves within the species' ranges. *Cercomacra carbonaria* has 8% of its habitat within protected areas and 15% in indigenous reserves. *Synallaxis kollari* has no habitat within protected areas but almost 60% within indigenous reserves. The pertinent literature completely overlooked the fact that both species have any habitat within indigenous reserves. Chapter 3 has generated two publications (Vale *et al.* 2005; Vale *et al.* 2007).

This brings us to Chapter 4, where I evaluate the role of indigenous communities on biodiversity conservation in Amazonia, using Roraima as a case study. Indigenous reserves cover more than 50% of Roraima, making it the state with the toughest conflicts between indigenous and non-indigenous populations in all of Brazil. In this chapter, I give a personal testimony of my direct experience with indigenous peoples and organizations. I emphasize the difficulties involved in carrying fieldwork in the tropics and how biologists can no longer abstain from getting involved in the broader issues surrounding their study organisms. Getting involved may take time away from research, but it also can do more for conservation than scientific research in isolation ever could.

1. Missing Bird Species in Amazonia

I evaluated how spatial collecting bias affects patterns of bird richness, endemism, and conservation in Amazonia. I then compared these results with similar analyses for the relatively well-collected Atlantic forest. As data inputs, I used the assembled collection localities from the Ornithological Gazetteers of the Neotropics and a dataset of species distribution maps from NatureServe. I asked, (1) Are the distances from collection localities to the nearest access points shorter than expected at random, (2) Is bird richness greater in collection localities than expected at random, (3) Is there a difference in the distribution of range sizes of the species in collected and uncollected areas, and (4) Do Bird Endemic Areas (*sensu* BirdLife International) have more collection localities than expected at random.

Collection density in the Atlantic forest was five times greater than in Amazonia (2 and 10 collections per 10,000 km^2, respectively). In both, collection localities were significantly closer to access points (cities, rivers, roads, and other collecting localities) than expected at random. The bias in the location of ornithological collections has a strong effect on bird richness patterns, with the richness at collection localities being significantly higher than expected at random. This greater richness in collected areas was associated with a higher proportion of species with small geographical ranges as compared to uncollected areas. This suggests that there are small-ranged species awaiting discovery in uncollected areas. Finally, Endemic Bird Areas in Amazonia had significantly more collection localities than expected at random, leading to an increase in apparent bird richness in these areas.

These biases in collections have serious implications for selecting priority areas for biodiversity conservation. We generally select among areas to find those that maximize a conservation goal (e.g. species richness), while minimizing the total cost (e.g., area). It is impossible to maximize species richness, though, unless you know where the species are. This study indicates that the richness of uncollected areas of Amazonia is seriously underestimated. More significantly, it is the small-ranged species, which tend to be at higher risk of extinction, that are likely the most underestimated. This spatial bias should not be ignored, for it could lead to the poorly collected areas being left out of prioritizing plans. For instance, some Endemic Bird Areas have an unusually high number of collections, casting doubt on their value as a conservation priority in Amazonia.

1.1 Introduction

Museum collections are the ultimate depositories of biological information, with specimens dating back to the great explorers of the 19th century (Winker 1996). For the most part, these are the sources of information used to identify species and define their geographic ranges. Biological collection tends to happen in places that are more accessible, leaving vast areas with few or no collections (Nelson *et al.* 1990). In order to fill in these gaps, biologists interpolate information from surrounding collection localities, based on expert knowledge. This procedure, illustrated in Figure 1, can account for known species but leaves any taxa endemic to uncollected areas out of the picture. With the recent explosion of Geographic Information Systems, biologists have gained the ability to interpolate and stack massive amounts of information associated with collection data (e.g. Rahbek & Graves 2001). This creates new and exciting possibilities but also propagates information gap errors. The well-collected areas tend to have more species precisely because they have been inventoried them, often making the list of top conservation priorities for their alleged high biodiversity (e.g. Reddy & Dávalos 2003). This is especially worrisome in the tropics, which combine high biodiversity with low biological collection and rapid habitat loss (Prance *et al.* 2000).

Studies in tropical forests in South and Central America, Africa and Asia have demonstrated that a strong bias of collection location inflates species richness around these locations (Nelson et al. 1990; Kress et al. 1998; Peterson *et al.* 1998; Parnell *et al.* 2003; Reddy & Dávalos 2003; Tobler *et al.* 2007; Schulman et al. 2007). The pressing question is whether this bias is hiding relevant species or not. If uncollected areas have mostly widespread species, then inventorying these areas will not provide any insights on biodiversity patterns or area selection for conservation. If, on the other hand, uncollected areas are hiding small-ranged, endemic species, than we might be missing important pieces of the puzzle.

I examine how collecting bias affects bird richness patterns in the Amazon rainforest (hereafter called Amazonia) and the Atlantic forest. Both are renowned for high richness and endemism, but whereas Amazonia retains more than 80% of its original forest cover, the Atlantic forest retains less than 8% (Myers *et al.* 2000; Fearnside 2005). Consequently, Amazonia is a priority because it is still relatively untouched, while the Atlantic forest is a Biodiversity Hotspot, where biodiversity is a priority because it is on the brink of disappearance (Myers 1988, 1990; Myers *et al.* 2000).

Amazonia and the Atlantic forest make an interesting experiment for evaluating the effects of collecting bias on spatial patterns of species richness and endemism. Both are undercollected (Prance *et al.* 2000), but the Atlantic forest has five times more collection localities per unit area than in Amazonia (Fig. 2). Biodiversity patterns in the Atlantic forest should be better known and less affected by collecting bias. Amazonia, on the other hand, should have large collection gaps where actual richness and endemism are essentially unknown.

I evaluate the type and extent of collecting bias in these two forests, how it affects richness, endemism, and priority areas, and how it differs between the two regions. There are several studies on collection bias in Amazonia (Nelson *et al.* 1990; Kress *et al.* 1998; Schulman *et al.* 2007; Tobler *et al.* 2007) but no published studies on the Atlantic forest. I used birds as a case study for several reasons. Birds are highly collected taxon with well-established endemic and conservation priority areas (Haffer 1974; Cracraft 1985; Stattersfield *et al.* 1998; Silva *et al.* 2004). Furthermore, no study has used birds to access collecting bias in either Amazonia or the Atlantic forest.

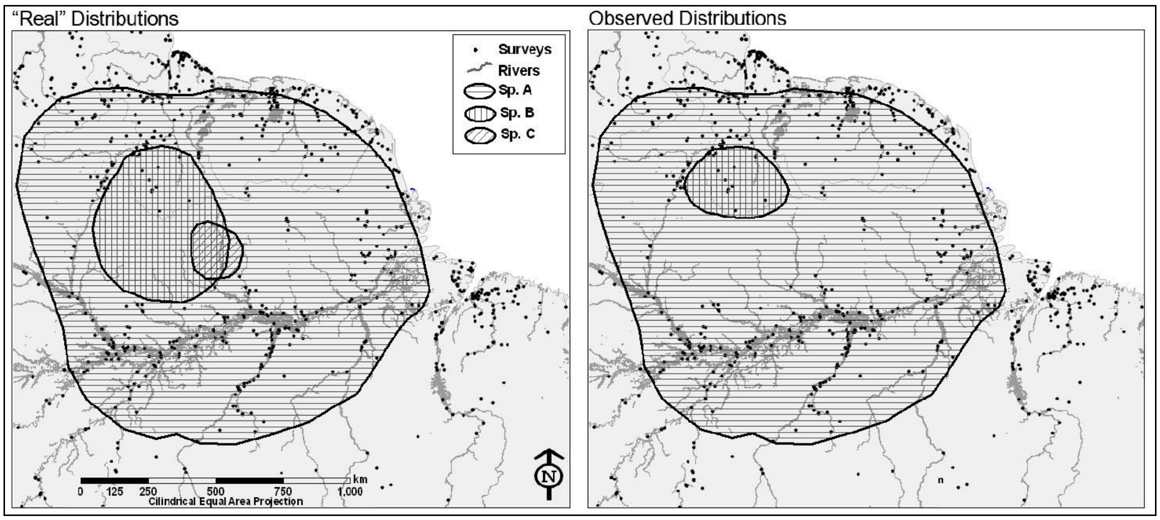

Figure 1 "Real" and observed distribution of three hypothetical species.

Typically, the range maps in bird guides (the ultimate source of the digital maps used here) are abstractions created by experts from localities where the species has been recorded (Brown *et al.* 1996). The expert draws the distribution to include all the localities of occurrence, either in a continuous or discontinuous area, according to her or his knowledge of the species' habitat requirements. Here I illustrate the procedure showing the "real" (unknown) and observed range (abstracted from collection localities) for three hypothetical species. Species A has a large range well covered by ornithological collections; species B has a medium sized range well covered in its northern portion only; and species C has a small range with no biological collection. With the current collection scenario, the observed range of species A is congruent with its "real" range, while the observed range of species B is incomplete, and the observed range of C is non-existent. Consequently, there is an artificial decrease in richness where there is no ornithological collection.

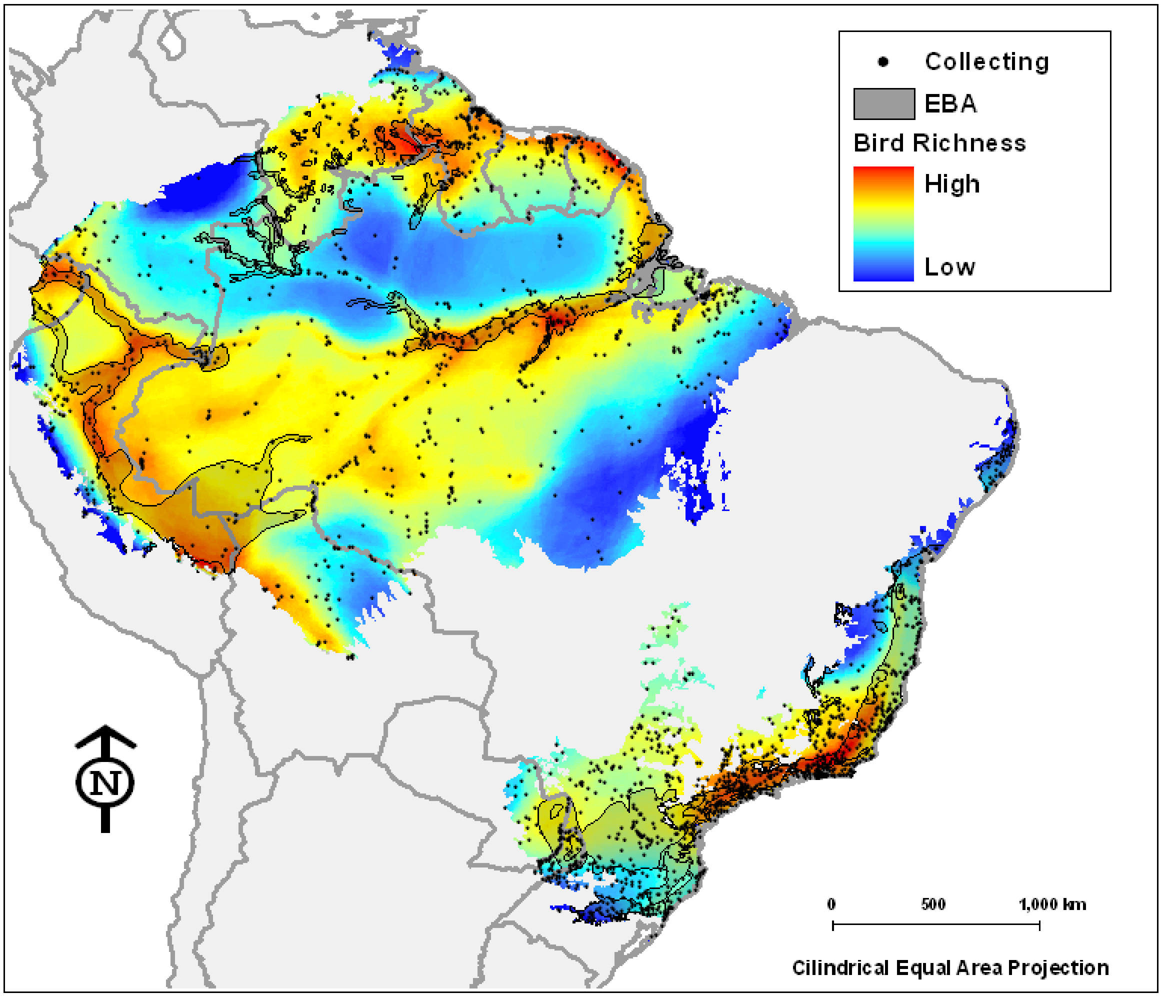

Figure 2 Total bird richness, collection localities, and Endemic Bird Areas in Amazonia and Atlantic forest.

In Amazonia (north) high = 558 species and low = 114 species; in the Atlantic forest (southeast) high = 551 species and low = 175 species. Richness is in 25-km^2 grid cell.

1.2 Methods

1.2.1 Datasets

1.2.1.1 Species Range Map Data

I used the Digital Distribution Maps of The Birds of the Western Hemisphere (Ridgely *et al.* 2003). These maps show ranges for all bird species occurring in the Americas. I entered these distribution maps in a Geographic Information System (GIS), using ArcGIS 9.1 software (ESRI, 2006) for data processing and analysis. I converted the original shapefile range maps into a merged personal geodatabase so that species lists could be generated for any given location. This procedure avoids the widely used grid cell approach (eg. Kress *et al.* 1998; Tobler *et al.* 2007). Grid resolution strongly affects the result of studies using grid cell analysis (Rahbek & Graves 2001; Schulman *et al.* 2007). One drawback, however, is that range maps generate large commission errors because they assume homogeneous species distribution throughout the landscape (Rondinini *et al.* 2006).

I restricted the analysis to the breeding range of native terrestrial species, excluding species with distribution information restricted to single locations. In the Americas, there are 3,868 species that satisfy these conditions, with a median range size of 477,951 km^2. I divided the analysis among three category of species: (1) all species (total richness), (2) small-ranged species, and (3) endemic species. I defined as "small-ranged" any species with a range smaller than the median range size for the Americas. I defined as "Amazonia endemic" any species restricted to the North Amazon and/or South Amazon zoogeographic regions, and as "Atlantic forest endemic" any species restricted to the Atlantic Forest zoogeographic region according to Parker *et al.* (1996). Nine species in Amazonia (*Myrmotherula klagesi, Pithys castanea, Thripophaga cherriei, Hemitriccus inornatus, Poecilotriccus senex, Caprimulgus maculosus, Clytoctantes atrogularis, Lepidothrix vilasboasi, Hemitriccus minimus, Zimmerius gracilipes*) and five species in the Atlantic forest (*Hemitriccus mirandae*, *Merulaxis stresemanni*, *Myrmotherula fluminensis*, *Philydor novaesi*, *Tijuca condita*) had distributions restricted to single locations. In Amazonia, I included 1,768 species, of which 577 were small-ranged and 366 endemic. In the Atlantic forest, I included 1,005 species, of which 123 were small-ranged and 179 endemic (Appendix A).

1.2.1.2 Ornithological Collection Data

I used the collection localities of the Ornithological Gazetteers of the Neotropics (Paynter 1982, 1988, 1989, 1992, 1993, 1994, 1995, 1997; Stephens & Traylor 1983, 1985; Paynter & Traylor 1991; Vanzolini 1992). These gazetteers provide geographic coordinates for ornithological collection localities, compiled from the literature and museum collections. They do not provide a list of species recorded at the locality. I independently generated a list of species that potentially occur in the locality using the species' range map data. The gazetteers also do not provide a measure of sampling effort. In one hand, they overestimate effort by including localities where no inventory actually occurred, such as mere camping sites for example (Silva 1995). On the other hand, they underestimate effort by having only one record for a locality where many collections might have occurred. The data was typed and transferred from paper format into a digital database. I cleared the dataset from illdefined localities such as entire rivers or lakes, states, or large parks. In total, I gathered 13,574 well-defined collecting localities, of which 1,328 were in Amazonia and 1,244 were in the Atlantic forest.

Following the recommendation of Schulman *et al.* (2007), I converted the collection data into a network of Thiessen polygons. In the Thiessen network, each polygon contain only one anchor point (collection locality) and within each polygon every point is closer to its own anchor point than to anchor points of all other regions (Lo & Yeung 2002). In the resulting map, the larger the polygon, the greater the area represented by a single collection locality. By constructing a Thiessen network, the distribution of ornithological collection localities was readily comparable with that of botanical collection localities from Schulman *et al.* (2007).

1.2.1.3 Environmental Data

I also used three datasets to gather environmental data: (1) I used the Global Ecoregions (Olson *et al.* 2001) to determine the boundaries of Amazonia and the Atlantic forest, (2) I used the Endemic Bird Areas of the World (Stattersfield *et al.* 1998) to map the Endemic Bird Areas within these forests, and (3) I used the Digital Chart of the World (NIMA 2000) to identify rivers, roads, and settlements (cities and towns).

1.2.2 Analysis

I generated an equivalent number of random localities as collection localities for each forest to test whether the spatial distribution of collecting localities was significantly different from what would be expected if collection sites were randomly distributed. I generated 1,328 random localities within Amazonia and 1,244 within the Atlantic forest using the Hawths Sampling Tool in ArcGIS 9.2 software (ESRI, 2006).

1.2.2.1 Determination of Collection Bias

In order to assess whether there is a bias in the location of ornithological collection localities I looked at possible predictors of collection presence using a Generalized Linear Model (GLM), with a Logit link function and a binomial distribution. In the model, collection locality data represents collection presence and random locality data represents collection absence. I transformed the data into World Equidistant Cylindrical Projection and estimated four covariates: (1) distance to the nearest settlement, (2) distance to the nearest road, (3) distance to the nearest river, and (4) distance to the next nearest collection locality. The analysis determined whether collection localities are closer to access points than expected at random.

1.2.2.2 Effect of Collection Bias on Species Richness

I compared the richness between the actual collection localities and the randomly generated localities using the Wilcoxon rank-sum test. I made the comparison for the three categories of species: all species, small-range species, and endemic species. This analysis determined whether species richness is higher in collection localities than expected at random.

1.2.2.3 Characterization of the Missing Species in Amazonia

For Amazonia, where there are vast undercollected areas, I compared the distribution of species range sizes within a highly collected area and a poorly collected area using the Two-Sample Kolmogorov-Smirnov Test. I arbitrarily selected the areas, picking one area that combines high collection and high richness, and another that combines low collection and low richness (Fig. 4). I used the random localities to generate a species list for each area. Highly collected areas tend to be along rivers (Fig. 2), and riverine species tend to have relatively small range sizes. I, therefore, excluded riverine species from the sample in order to avoid biasing the highly sampled area towards small-ranged species. I compiled a list of 34 riverine species (Appendix A, Fig. 3) with information from specialized literature (Ridgely & Tudor 1989, 1994; Parker *et al.* 1996; Restall 2006). That list excludes four species with distribution restricted to single locations (*Hemitriccus inornatus*, *Myrmotherula klagesi*, *Pithys castanea*, *Thripophaga cherriei*). In the highly collected area, there were 32 riverine and 1,072 non-riverine species, while in the poorly collected area there were seven riverine and 804 non-riverine species.

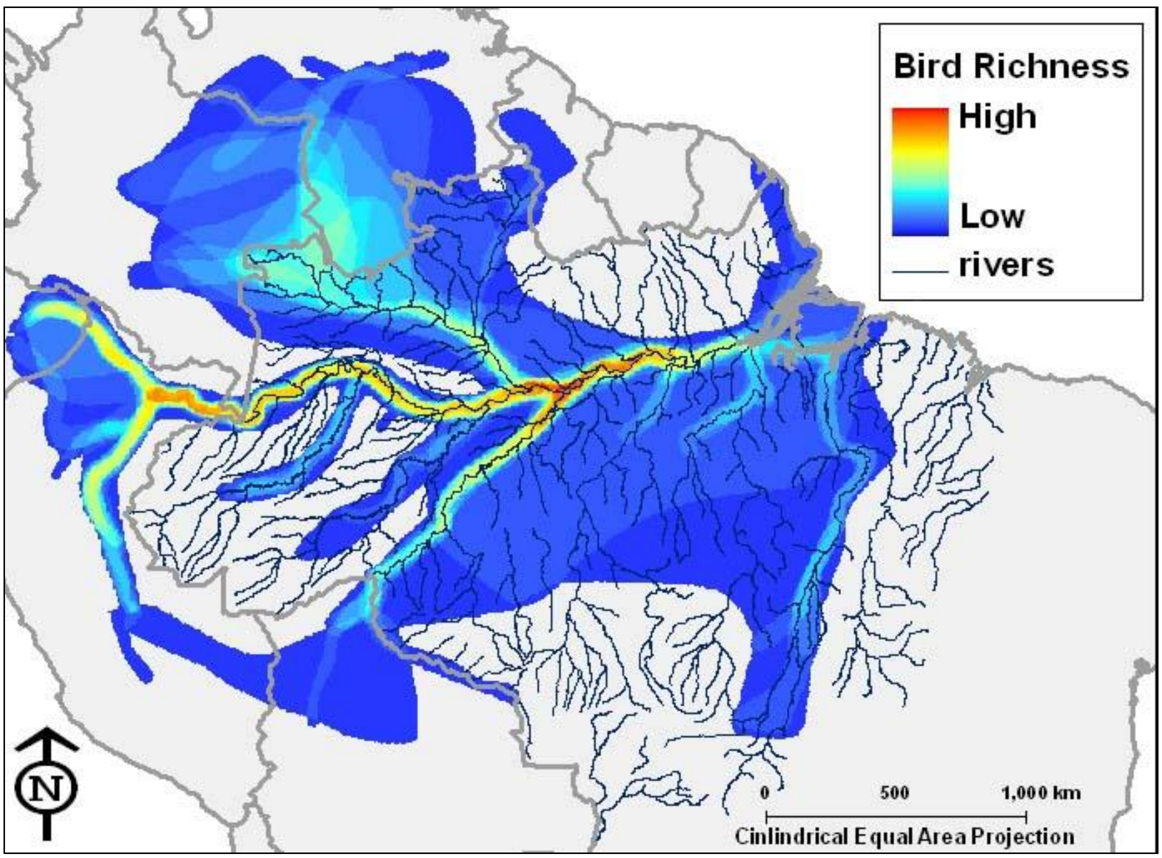

Figure 3 Richness of riverine species in Amazonia.

Richness in 25-km^2 grid cell; High = 19 riverine species, Low = 1 riverine species.

1.2.2.4 Effect of Collecting Bias on Endemic Bird Areas

Amazonia and the Atlantic forest had a density of two and ten collection localities per 10,000 km^2, respectively. I transformed the data into World Cylindrical Equal Area Projection and calculated the number of collection points expected within Endemic Bird Areas (EBAs), if they had the same collection density as the forest as a whole. I used a chi-square test to compare observed and expected collection density within EBAs. I also estimated the richness each EBA would have if it had the expected number of collection localities. For EBAs with a lower than expected number of collections, I added random localities and re-calculated species richness estimates. For EBAs with a higher number of collections, I re-calculated species richness using the abundance-based Cole Rarefaction diversity estimator with 100 randomizations, using EstimateS 8.0 software (Colwell 2006). I used chi-square test to compare observed and expected number of collections and richness within EBAs.

1.3 Results

1.3.1 Predictors of Collection Presence

The GLM showed a significant relationship between the presence of collection localities and all the covariates analyzed in Amazonia, and all covariates but distance to rivers in the Atlantic forest (Table 1). The relationships are all negative, meaning that the closer a site is to the feature, the greater the likelihood of the site having an ornithological collection.

Although for both Amazonia and the Atlantic forest the trend is significant, the magnitude is greater in Amazonia (Table 2).

Table 1 Generalized Linear Model for predictors of bird collection localities presence in Amazonia and the Atlantic forest.

	Amazonia			Atlantic forest		
Distance to nearest:	**Max. Likelihood Estimate**	**S.E.**	***p***	**Max. Likelihood Estimate**	**S.E.**	***p***
(intersect)	0.9261	0.0165	< .00001	0.9922	0.1078	< .0001
Settlement	-0.0072	0.0005	< .0001	-0.0213	0.0058	< .001
Road	-0.0006	0.0001	< .0001	-0.0915	0.0140	< .0001
River	-0.0073	0.0007	< .0001	-0.0046	0.0024	.0545
Collection locality	-0.0084	0.0005	< .0001	-0.0378	0.0052	< .0001

Table 2 Mean (± S.D) bird species richness and distance to nearest access point in Amazonia and the Atlantic forest.

Collection = collection localities, *Random* = randomly generated localities, *Diff.* = difference between means for collection and random localities.

	Amazonia			**Atlantic forest**		
	Collection	**Random**	**Diff.**	**Collection**	**Random**	**Diff.**
			Richness (number of species)			
All species	464.5 (± 1.47)	434.0 (± 1.55)	30.6	405.2 (± 1.73)	386.8 (± 1.51)	18.4
Small-ranged	10.0 (± 0.41)	4.8 (± 0.26)	5.14	24.1 (± 0.33)	15.5 (± 0.42)	8.6
Endemic	113.3 (± 0.89)	108.0 (± 0.98)	5.33	75.8 (± 0.98)	62.6 (± 0.89)	13.1
			Distance to Nearest (km)			
Settlement	10.4 (± 0.39)	26.2 (± 0.57)	15.8	8.9 (± 0.21)	10.6 (± 0.21)	1.7
Road	60.1 (± 2.15)	94.2 (± 2.17)	34.1	2.4 (± 0.33)	3.5 (± 0.33)	1.6
River	7.7 (± 0.30)	15.2 (± 0.33)	7.5	19.2 (± 0.51)	20.4 (± 0.47)	1.2
Collection locality	14.7 (± 0.43)	25.2 (± 0.36)	10.4	10.2 (± 0.25)	12.6 (± 0.21)	2.4

1.3.2 Species Richness

The simple observation of the spatial distribution of collection localities and bird richness (Fig. 2) suggests two trends: (1) the Atlantic forest has much more collection localities than Amazonia, and (2) a high number of collection localities tends to coincide with high species richness. I confirmed these suggestions statistically. Species richness at collection localities was significantly different from random for all three species categories in both biomes (Table 3). In every case, species richness at collection localities was higher (Table 2). The percentage difference in total richness was similar between Amazonia and the Atlantic forest (7% and 5%, respectively), but higher in the Atlantic forest for richness of small-ranged (7% and 55%, respectively), and endemic species (5% and 21%, respectively).

The network of Thiessen polygons (Fig. 4) shows the extent to which there is clustering and unevenness in the distribution of ornithological collections throughout the landscape. The Thiessen polygons clearly depict undercollected areas. The larger the polygon, the more area a single collection locality represents. The Atlantic forest is clearly more collected than in Amazonia, since it has no single Thiessen polygon the size of the largest polygons in Amazonia.

Table 3 Wilcoxon rank-sum test results for the comparison between bird species richness in collection and random localities.

	Amazonia		Atlantic forest	
Species	**Z**	***p***	**Z**	***p***
All	14.81	< 0.001	7.44	< 0.001
Small-ranged	20.09	< 0.001	11.39	< 0.001
Endemics	4.15	< 0.001	-20.64	< 0.001

1.3.3 Missing Species in Amazonia

There was a significant difference in the distribution of species' range sizes in highly and poorly collected areas (Two-sample Kolmogorov Smirnov test: $p < 0.0001$). Species with ranges $\leq$ 3 million km^2 are consistently more abundant in the highly collected area while species with ranges $\geq$ 5 million km^2 are consistently more abundant in the poorly collected area (Fig. 5). This trend indicates that in poorly collected areas, relatively low species richness is associated with the concealment of species with ranges $\leq$ 3 million km^2.

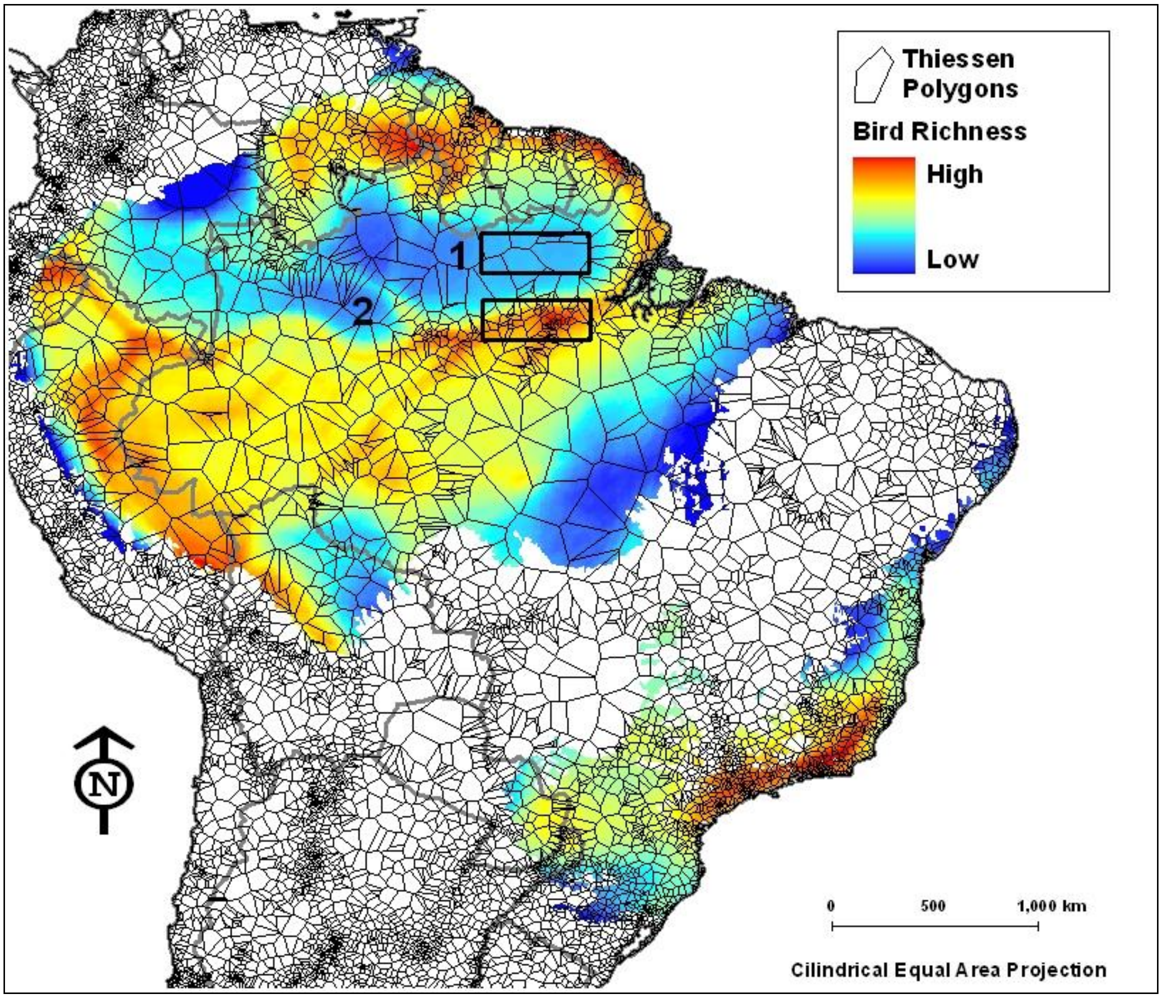

Figure 4 Thiessen network of bird collection localities in Amazonia.

Bird richness is as in Figure 2. The larger the polygon area, the greater the extent of land covered by a single collection locality. In Amazonia: black boxes show the two areas used to compare the distribution of species' range sizes in highly (bottom) and poorly (top) sampled areas; the numbers represent the two main areas that need further collecting: *1* = rio Negro/rio Jari interfluves, *2* = rio Negro/rio Solimões interfluve.

1.3.4 Endemic Bird Areas

A cursory observation of the spatial distribution of collection localities and Endemic Bird Areas suggests that EBAs coincide with collected areas, and that EBAs cover a large proportion of the Atlantic forest (Fig. 2). The collection density of EBAs was higher than in the forest as a whole for all EBAs with the exception of two (Fig. 6). In Amazonia, 11% of the area and 29% of the collection localities are within EBAs while in the Atlantic forest, 45% of the area and 44% of the collection localities are within EBAs. These observations were confirmed statistically, as the number of collections within EBAs was significantly different from expected both for Amazonia (X^2 = 1,194.3, d.f. = 5, $p < 0.0001$) and the Atlantic forest (X^2 = 221.9, d.f. = 3, $p < 0.0001$). For Amazonia, the observed species richness in EBAs was significantly higher than the expected for total richness and richness of small-ranged species (Table 4), while in the Atlantic forest the total observed richness in EBAs was not significantly different from expected.

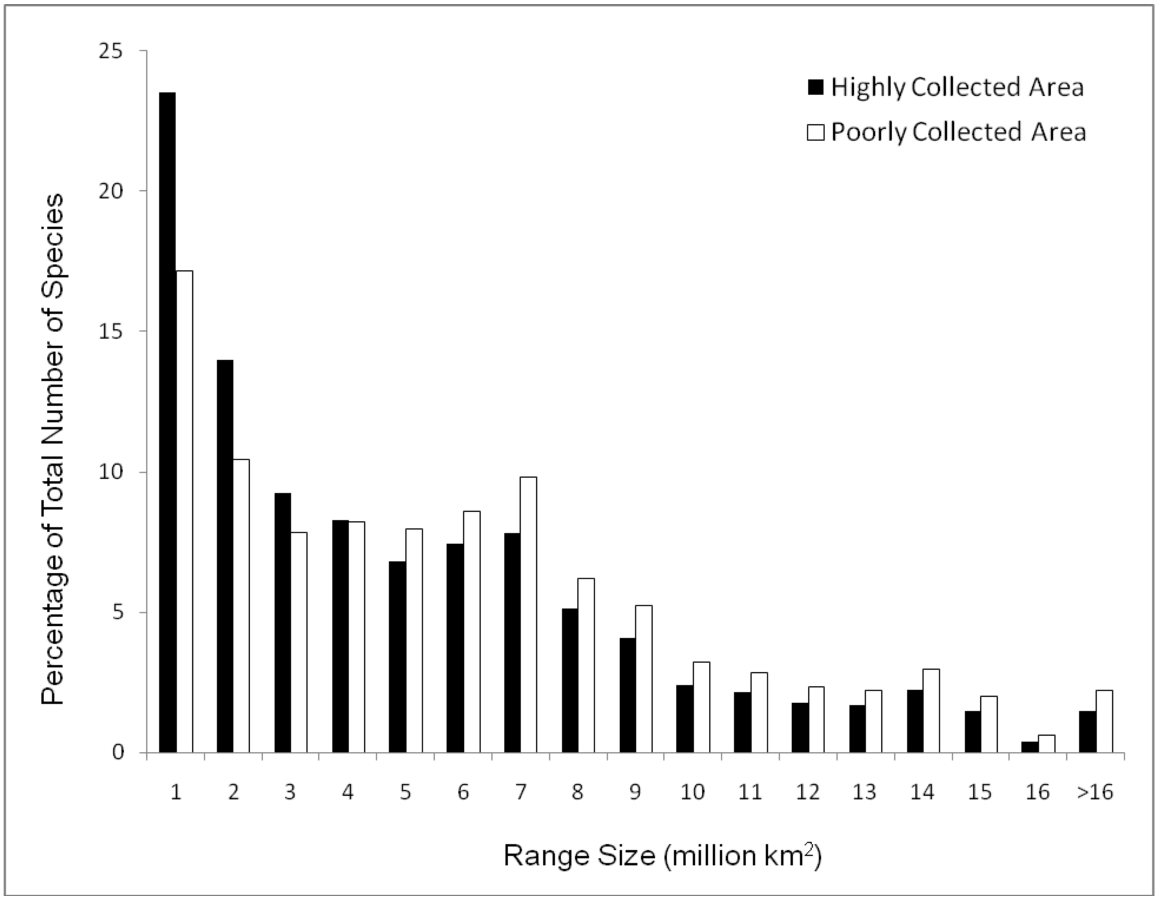

Figure 5 Distribution of non-riverine bird species per range-size in Amazonia.

Comparison of species' range size in highly and a poorly collected areas in Amazonia (see Fig. 4 for areas location). The sample excludes riverine species. The highly collected area had 1,072 species and the poorly collected 804 non-riverine species. There is a significant difference in the distribution of species' range sizes (Two-sample Kolmogorov Smirnov test: $p < 0.0001$). Species with ranges $\leq$ 3 million km^2 are more abundant in the highly collected area while species with ranges $\geq$ 5 million km^2 are more abundant in the poorly collected area.

Table 4 Chi-square test for Endemic Bird Areas bird richness in Amazonia and the Atlantic forest.

This table shows the comparison of observed and expected species richness in Bird Endemic Areas, where the expected is the richness if EBA had the same density of collection density as the forest as a whole.

	Amazonia			Atlantic forest		
Species	X^2	**D.f.**	p	X^2	**D.f.**	p
All	22.83	5	< .001	2.31	3	0.5106
Small-ranged	21.32	5	< .001	0.96	3	0.9568
Endemics	5.61	5	0.2346	0.49	3	0.9200

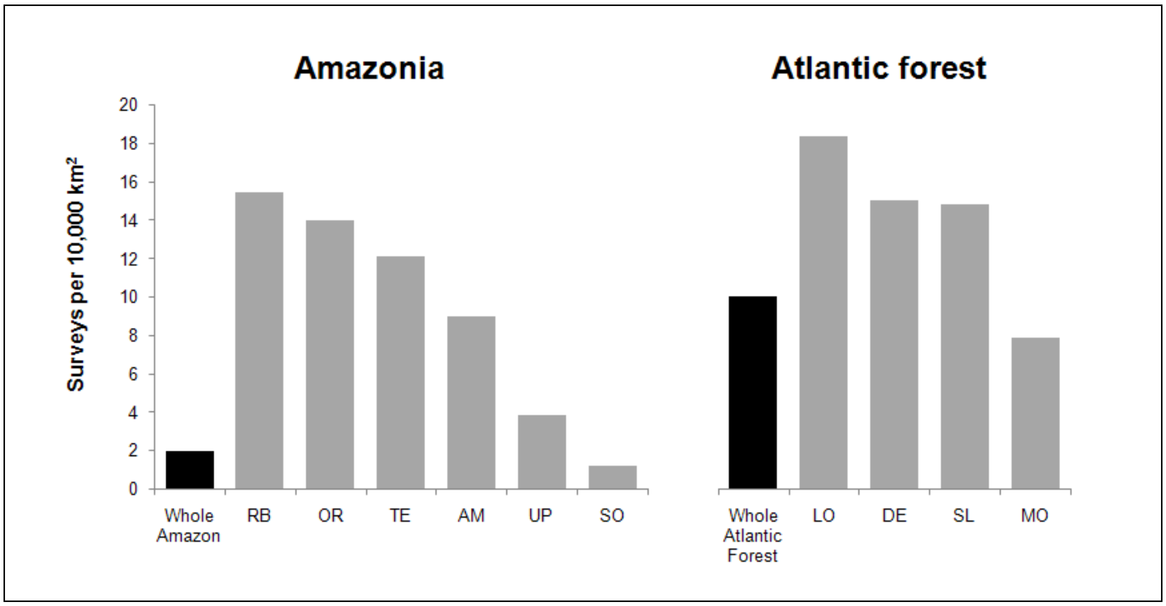

Figure 6 Density of collection localities within Endemic Bird Areas for Amazonia and the Atlantic forest.

Comparison between forest as a whole (black) and Endemic Bird Areas (gray). Endemic Bird Areas: *RB* = Rio Branco gallery forest, *OR* = Orinoco-Negro white-sand forest, *TE* = Tepuis, *AM* = Amazon Flooded Forest, *UP* = Upper Amazon-Napo lowlands, *SO* = Southeast Peruvian lowlands, *LO* = Atlantic forest lowland, *DE* = Deciduous forest of Bahia, *SL* = Atlantic slopes of Alagoas and Pernambuco, *MO* = Atlantic forest mountains.

1.4 Discussion

1.4.1 Bias in Biological Collections and Species Richness

There is a striking similarity between the Thiessen network for ornithological collections and polygons for plant collections (Schulman *et al.* 2007), indicating that spatial distribution and bias in biological collection is similar across taxa. I found a clear and strong bias in ornithological collection locations for both Amazonia and the Atlantic forest, despite the fact that birds are one of the most inventoried vertebrate taxa. Collections were generally close to readily accessible areas such as settlements, roads and rivers, a pattern that is characteristic of biological collections elsewhere (Peterson *et al.* 1998; Parnell *et al.* 2003; Reddy & Dávalos 2003; Tobler *et al.* 2007). Furthermore, the presence of an ornithological collection increases the likelihood of occurrence of another, showing that there is clustering in collections, further decreasing collection representation. The similarity in spatial collection patterns between birds and plants does not come, therefore, as a surprise – biological collections tend to happen near accessible areas, and there is a limited number of such areas. Therefore, the effect of collecting bias on bird diversity patterns shown here should apply to other taxa in Amazonia and the Atlantic forest.

A strong sampling bias in Amazonia is not surprising given that it still has large tracts of inaccessible (and therefore uncollected) forests. The significant bias in the Atlantic forest, however, is eye opening, as it is a region were birds were highly collected, as far as tropical forests goes.

The bias in collection locations generated areas with little or no ornithological inventory and areas with many inventories where avian richness was higher than expected at random. This pattern holds for other taxa in Amazonia. Nelson *et al.* (1990) showed that areas of high endemism of Chrysobalanaceae plants coincide with areas of high botanical collections. Kress *et al.* (1998), shows that areas of high richness of 421 species of plants, arthropods, amphibians, fish, and primates also coincide with highly collected areas. Finally, Tobler *et al.* (2007) shows a similar pattern for Moraceae and Myristicaceae plants in the Peruvian Amazon.

There are two possible, and causally reversed, explanatory mechanisms for the relationship between collection intensity and species richness. In the first, which I call "richness comes first," areas with high species richness have high inventory because ornithologists have greater interest in visiting them. In the second, called "ornithologists come first," areas with high inventories have high species richness because ornithologists have actually visited them. Strictly, the only way to determine which explanation is more accurate is to visit poorly inventoried areas and verify whether they have higher richness than previously thought. Here I argue that in Amazonia, the relationship between collection and species richness is likely caused by the "ornithologists come first" mechanism, while in the Atlantic forest, it is likely caused by a "richness comes first" mechanism. In Amazonia, with its vast gaps in biological collection, it is hard to believe that ornithologists have enough knowledge to bias ornithological collection towards biologically rich areas, avoiding the biologically poor ones. Furthermore, even low richness areas in Amazonia (as defined by range maps), have at least 114 species per 25-km^2 cell, a richness that can hardly be discounted (Fig. 2). In the Atlantic forest, however, biological collection is much greater, and it is plausible that ornithologists already identified real areas of endemism and have been targeting them for ornithological collection. This could explain why in the Atlantic forest, the presence of a collection locality increases the overall richness by 6% but increases the richness of small-range and endemic species by 55% and 21%, respectively.

In this study, I showed that the species missing in poorly collected areas are the ones with the smaller range sizes. A logical outcome is that these areas will prove more diverse when ornithologists make additional collecting. Indeed, new ornithological collections in unexplored sites in Amazonia routinely expand species' ranges and occasionally discover new species (Vale *et al.* in review). Even in the Atlantic forest, where biological collection is much greater, surveys in unexplored sites are still finding new species and expanding the geographic ranges of old ones (Gonzaga & Pacheco 1990; Prance *et al.* 2000; Alves *et al.* in press). If we are still finding new species in the 8% of forest remaining in the Atlantic forest, the region most likely has already lost a great number of unknown species.

1.4.2 Conservation Implications

The successful conservation of biodiversity depends in part upon an accurate assessment of the diversity to be preserved (Winker 1996). The spatial collecting bias seen in Amazonia and the Atlantic forest seriously affects our understanding of the distribution of richness within these regions. The selection of priority areas for biodiversity conservation is necessarily a comparative exercise. It requires uniform sampling of the entire region, so that the selected areas maximize richness and minimize size and number of areas (Williams *et al.* 2002). It is impossible to maximize richness, however, if we effectively do not know where species are.

The greater the number of collections in an area, the higher the likelihood of detecting rare and small-ranged species, which are more prone to extinction and therefore of high conservation value (Manne *et al.* 1999, 2001; Pimm *et al.* 1995). The density of ornithological collections in Endemic Bird Areas (EBAs) was clearly higher than expected for eight out of the ten EBAs examined. The high species richness within EBAs is real but it is unclear whether it is greater than in less collected areas. In Amazonia, greater ornithological collection inside EBAs increased their overall richness and the richness of small-ranged species. Happily, it did not increase the richness of endemic species, which are the target group for this category of priority areas. The EBAs, however, work within the universe of currently known endemic species. Because of the higher number of collections within EBAs, one cannot discard the possibility that other, less collected areas are equally rich in not yet described endemics. Even in the well-collected Atlantic forest, where (maybe as a consequence) EBAs cover almost the entire biome, poorly collected areas might be hiding species. A recent expedition to the single poorly collected EBA in the Atlantic forest – the Atlantic forest Mountains – found new records of *Tijuca condita,* an extremely rare and endangered endemic species (Alves *et al.* in press). As discussed earlier, uncollected areas of Amazonia are likely to be hiding small-range and endemic species. Therefore, the Amazonian EBAs are likely an incomplete set of priority areas. They are a step forward in comparison with the Workshop 90's Amazon priorities (Anonymous 1991), however, which did not coincide with the areas with the highest endemism and diversity for any taxon (Kress *et al.* 1998).

One serious problem of ignoring spatial collecting bias when selecting priority areas is that once these areas are singled out, others that might be equally or more important begin to be ignored (Bates & Demos 2001). Using endemic avian richness, for example, Fjeldså & Rahbek (1998) point to the "myth" of Amazonian diversity, suggesting that Andean regions should have a higher global conservation priority. The present study clearly shows, however, that there are far more ornithological collections in the Andes than in the lowland Amazonia (Fig. 4).

1.4.3 Recommendations

The destruction of tropical habitats continues at an alarming rate. This is happening even before we have completed the inventory of what exists (Prance *et al.* 2000). To make matters worse, ornithological collecting worldwide has been declining since the 1960's (Winker 1996). In order to fully understand and protect biodiversity in the Neotropics, it is essential to increase collecting, targeting undercollected areas. A density of two collecting localities per 10,000 km^2 in Amazonia is simply not enough, even if there were no collection clustering. Furthermore, many of the collection localities might not even represent minimum inventory (Silva 1995).

Almost two decades have passed since Nelson *et al.* (1990) first highlighted the strong influence of spatial collecting bias on observed richness and endemism in Amazonia.

With the current low collection and high bias, it is virtually impossible to determine which areas are in fact biologically richer. This is a serious obstacle for biogeographic understanding and conservation prioritization within Amazonia. I recommend inventorying areas where low collection density coincides with low species richness. The large region delimited by the Amazon River to the south, the rio Negro to the southwest, and rio Jari to the east (area 1 in Fig. 4), has about 470,000 km^2, and is relatively untouched, with the exception of the areas around the city of Manaus and the BR-174 highway. The smaller area delimited by the rio Negro to the north and the rio Solimões to the south (area 2 in Fig. 4), is about 260,000 km^2 and also relatively untouched.

I join others who advocate for more biological collections in poorly inventoried areas in Amazonia (Nelson *et al.* 1990; Kress *et al.* 1998; Prance *et al.* 2000; Schulman *et al.* 2007). In the meantime, any analysis that directly or indirectly involves collecting data must explicitly correct for spatial bias. There is an increasing body of literature with methods directed to correct collecting bias (Duckworth 1997; Ponder *et al.* 2001; Funk & Richardson 2002; William *et al.* 2002; Schulman *et al.* 2007). There is no reason, therefore, for this problem to continue clouding our understanding of spatial biodiversity patterns worldwide.

2. Threatened Species in the Brazilian Amazon: which will be next, and where will they be

Lack of infrastructure has protected vast areas of the Amazon basin. This passive protection is now ending as Brazil pushes for infrastructure development in the region. Studies predict that this new infrastructure will sharply increase the rate and extent of deforestation in the Brazilian Amazon. There are no predictions, however, of which species it will affect. Here, I combine deforestation models, ecoregions, and range maps to identify birds likely to be at risk by 2020 due to infrastructure development. I identified at least 16 species that will qualify as threatened based on The World Conservation Union criteria, or that will lose more than half of their forested habitat. I also identified several sub-species and isolated populations that will also qualify as threatened. Most identified taxa are not currently listed as threatened. The majority is associated with riverine habitats, which, for the most part, have been ignored in bird conservation in Amazonia. They will be increasingly relevant as Brazil implements new waterways and hydroelectric dams in the region.

2.1 Introduction

Amazonia is unmatched in its extent and biodiversity. It is also losing forest rapidly. Moreover, Brazil – with 60% of Amazonia – is implementing a wide array of infrastructure projects in the region. Several studies forecast a measurable increase in the already high rates of deforestation and increased CO_2 emissions if these projects are fully implemented (Laurance *et al.* 2001a; Nepstad *et al.* 2001; Andersen *et al.* 2002; Soares-Filho *et al.* 2004, 2006). Few studies, however, look at the possible consequences of Amazonian infrastructure development to the area's exceptional biodiversity, and no study predicts which species might be at risk. Here, I fill this gap for birds, one of the best-known vertebrate taxa. To do this, we must document two things: (1) where the species are found – and in particular, where the species most vulnerable to extinction are found, and (2) where infrastructure developments are planned. The places where the two coincide are where species will be at risk.

2.1.1 Where the Species Are

Although this paper is about how development in the Brazilian Amazon will threaten bird species, my results should apply in some general ways to other taxa. According to the maps of Ridgely *et al.* (2003), Amazonia holds 1,778 native birds, 627 mammals, and 527 amphibians, or one sixth of the world's totals on average. The Brazilian Amazon alone holds 1,169 birds, or ~12% of the world's birds.

Not all parts of Amazonia are equally rich in species (Haffer 1969; Rahbek & Graves 2001). The areas with the highest bird richness are Western Amazonia, the Guyana Shields and south of the Amazon River (Fig. 7A) — areas largely outside Brazil. This also applies to the richness of small-ranged species. These are especially relevant for conservation, since they are most likely to be threatened with extinction (Manne *et al.* 1999, 2001; Pimm *et al.* 1995). In Amazonia, such species are mostly outside Brazil, on the slopes of the Andes and the Guyana Shields (Fig. 7B). So, are there small-ranged birds within the Brazilian Amazon? Yes — they are an idiosyncratic and often overlooked group of 39 known species, many restricted to riverine habitats (Fig. 7B, Table 5).

Conservation priorities sensibly focus on hotspots, where high human impact collides with a concentration of small-ranged species (Myers *et al.* 2000). The Brazilian Amazon would seem to not have these areas. This is because many view Amazonia as whole, as if it were a single system (Bates & Demos 2001). This is not the case, however. The habitats along the major rivers, for example, are a well-established endemic bird area (EBA 067 in Stattersfield *et al.* 1998). Riverine habitats have also been highly impacted by human activities over the last several centuries (Barros & Uhl 1995). To make matters worse, Laurance *et al.* (2001a) predicted that future infrastructure development would massively affect these areas (Fig. 7C).

2.1.2 Where the Development Projects Are

Since 1988, the Brazilian Amazon has lost 330,000 km^2 of forest — an area about the size of Germany (INPE 2007). The region has strategic importance for energy production, with considerable natural gas and hydroelectric power resources. It is subject to mining, logging, cattle ranching, and most recently, soy plantations. For the last decade, Brazil has implemented a series of nationwide development programs: *Brasil em Ação* (1996-1999), *Avança Brasil* (2000-2003), *Plano Plurianual de Investimentos* (2004-2007), and now *Plano de Aceleração do Crescimento* (2007 onwards; Allegretti 2006; Fearnside 2006; Smeraldi 2006). Planned infrastructure for the region is colossal, including thousands of kilometers of paved roads, transmission lines, railways, industrial waterways, gas pipelines, and hydroelectric dams (Laurance 2001a; Fearnside 2002). If implemented, these projects will translate into large forest losses.

Deforestation rates have averaged 21,500 km^2 per year since 2000 (INPE 2007). Nepstad *et al.* (2001) estimated an *additional* deforestation of 4,000–13,500 km^2 per year due to highway development alone. Using all planned projects, Laurance *et al.* (2001a,b) estimated an *additional* deforestation of 2,690–5,060 km^2 per year, which translates into a total deforestation of 28–42% of the Brazilian Amazon by 2020. The models predict deforestation to be concentrated along roads, rivers and the surroundings of other infrastructure projects, with protected areas seeing less severe impacts, while historically fire prone areas could see more severe impacts. The conservative model used for this analysis projects that roughly 28% of the Brazilian Amazon would be heavily to moderately impacted by these developments projects (Laurance *et al.* 2001a). This is slightly less than other

Brazilian Amazon projections of 33 – 34% for the year 2020 (Nepstad *et al.* 2001; INPE 2002, respectively). This model bases its projections on deforestation rates associated with road building throughout the entire Brazilian Amazon, quantified by Landsat TM image analysis.

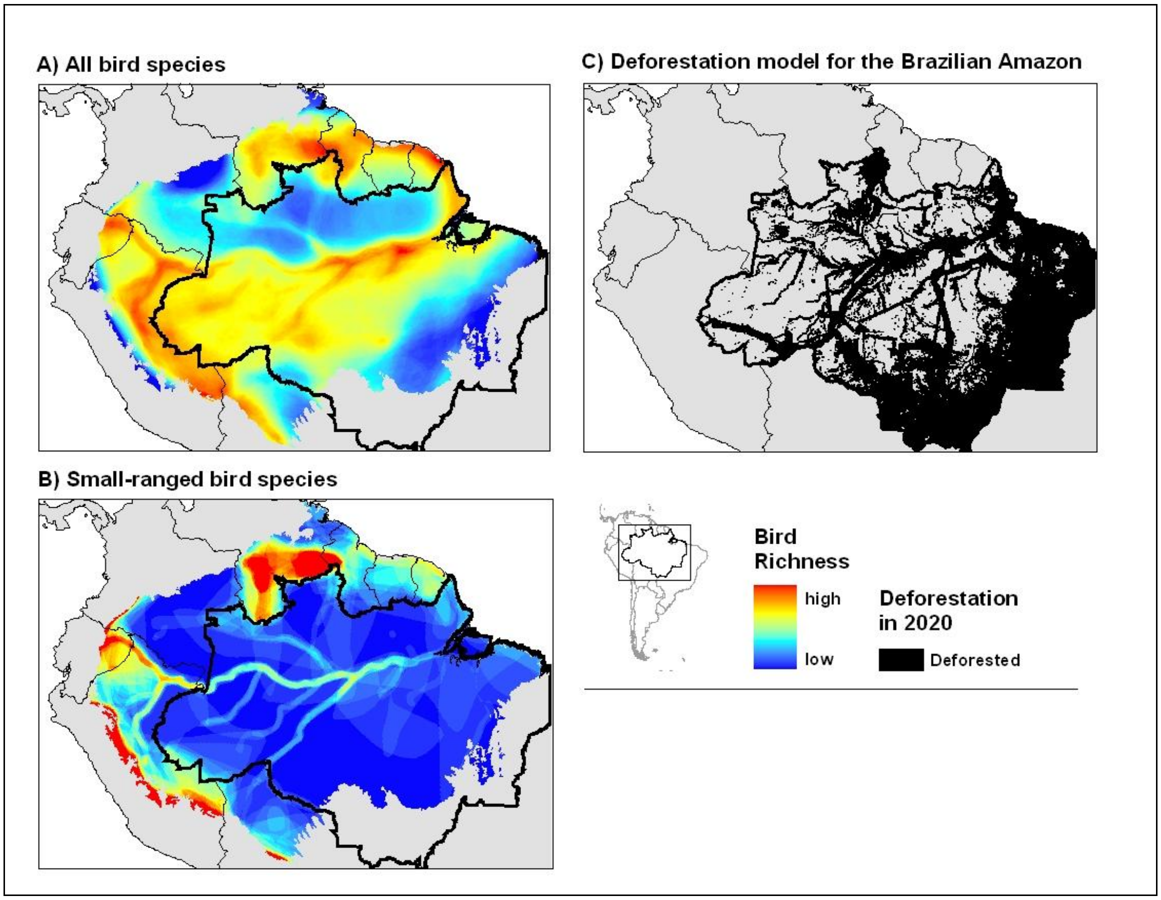

Figure 7 Bird richness and deforestation in Amazonia.

A) all species occurring in Amazonia (high = 588 species), B) species with ranges smaller ≤ 500,000 km^2 occurring in Amazonia (high = 157 species), C) areas predicted to be highly impacted by 2020 in the Brazilian Amazon according to Laurance *et al.* (2001a). Thin outline defines country limits and thick outline the Brazilian (Legal) Amazon. The Legal Amazon is not completely contained within Amazonia because it is a geo-political definition of the Brazilian Amazon, including non-forest areas.

2.2 Methods

2.2.1 Deforestation Model

I used the deforestation model of Laurance *et al.* (2001a). It is a spatially explicit model that estimates additional deforestation in the Brazilian Amazon by 2020, if infrastructure projects associated with *Avança Brasil* are fully implemented. Based on deforestation patterns of previous projects, the model predicts the spatial distribution of four categories of disturbance: (1) "Heavy-impact areas" have primary-forest cover absent or heavily reduced and fragmented, (2) "Moderate-impact areas" have mostly intact primary-forest cover (>85%), but have some unpaved roads and localized forest clearings, (3) "Light-impact areas" have nearly intact primary-forest (>95%), but some localized forest clearings, and (4) "pristine areas" will retain fully intact primary-forest cover; that is, free from impacts by non-indigenous people.

The model has two distinct sets of assumptions that create "optimistic" and "non-optimistic" scenarios. The *optimistic* and *non-optimistic* scenarios predict an additional deforestation rate of 2,690 and 5,060 km^2 per year, respectively. Here I used only the *optimistic* scenario. This scenario has conservative assumptions, based on documented deforestation rates associated with reviews of infrastructure development within the Brazilian Amazon. Under the *optimistic* scenario, degraded zones near roads and infrastructure projects are more localized and protected areas are less likely to be degraded (see Laurance *et al.* 2001b for details).

2.2.2 Species Analysis

I restricted the analysis to the 39 bird species that: (1) are endemic to Amazonia, (2) have at least 45% of their distribution within the Brazilian Amazon, and (3) have a total range of ≤ 500,000 km^2 (Table 5). These are the species that deforestation in the Brazilian Amazon is likely to harm the most. I defined Amazonian endemics as all birds that occur exclusively in the Southern and/or Northern Amazon zoogeographic region according to Parker *et al.* (1996). I used the Digital Distribution Maps of The Birds of the Western Hemisphere (Ridgely *et al.* 2003). The range 500,000 km^2 cut-off size corresponds to the median breeding range size for birds in the Americas, according to the maps of Ridgely *et al.* (2003). Eighteen of the 39 distribution maps were updated based on the pertinent literature, museum records, personal observations, and information from *bonafide* ornithologists (Appendix B). The new maps were on average 70,500 km^2 larger than the original ones.

I predicted the area of species' distribution that will remain *pristine* or have *light*, *moderate*, or *heavy* impact by 2020, by overlaying the deforestation model on the distribution maps. The analysis was restricted to the portion of the range that is within the geographic limits of the deforestation model, i.e. the Brazilian Amazon.

I considered *heavy-impact* areas as "habitat loss" and *pristine-*, *light-*, and *moderate-impact* areas as "remaining habitat" because these categories encompass at least 85% of intact primary-forest cover. I calculated the "future extent of occurrence" by 2020 as the predicted remaining habitat within the Brazilian Amazon and all the species' range area outside of it. I considered the entire area outside the Brazilian Amazon as constituting "remaining habitat" because of the lack of a comparable model that estimates future deforestation outside Brazil.

In doing so, I underestimated the degree of habitat loss for species that have a great portion of their distribution outside the Brazilian Amazon.

2.2.3 Bird-Ecoregion Analysis

Knowledge of bird diversity and endemism within Amazonia is still rudimentary (Silva *et al.* 2005). The forest is enormous and poorly inventoried. Consequently, scientists are still describing new species and updating range maps. The many taxa awaiting taxonomic revision increase errors in diversity calculations. Such revisions could potentially upgrade many subspecies to species, but it was not possible to account for subspecies in my analysis because no maps exist of their distributions. My approach was to look at areas of endemism. Habitat loss within these areas will jeopardize all birds that are endemic to them, even ones that are not yet described or are currently recognized only as subspecies.

The major Amazonian interfluves (areas between the largest rivers) generally define areas of bird endemism within Amazonia (Haffer 1974; Cracraft 1985). The ecoregions established by Olson *et al.* (2001) depict these interfluves well because the authors used distribution patterns of birds, among other taxa, to define ecoregion boundaries. Although interfluves approximate patterns of endemism of *terra firme* (upland forest) species, they are less robust predictors for species endemic to more localized habitats such as *várzea* and *igapó* (seasonally flooded lowland forest in white water and black water rivers, respectively). Ecoregions, however, represent well both interfluves and the more localized habitats.

I used the Digital Ecoregion Database (Olson *et al.* 2001), restricting the analysis to the ecoregions within the geographic limits of the deforestation model, i.e. the Brazilian Amazon. I excluded ecoregions that are not strictly within the Amazonian biome: Coastal Restingas, Mangroves, Babaçú Forests, Pantanal, Cerrado, Beni Savannas, Chiquitania Dry Forest, and Tepuis. I modified some ecoregions to better reflect known patterns of bird endemism and assemblages, calling the final product "bird-ecoregions". The main changes consisted of the subdivision of some of the original ecoregions into distinct bird-ecoregions. This was especially important in the *várzea* (Cohn-Haft *et al.* 2007a) and in the Madeira river basin (Cohn-Haft *et al.* 2007b), where new, smaller regions of endemism are becoming recognized. Figure 8 shows the bird-ecoregions, and Appendix C explains the differences between the original ecoregions and the bird-ecoregions.

I predicted the areas of the bird-ecoregions that will remain *pristine* or have *light*, *moderate*, or *heavy* impact by 2020, by overlaying the deforestation model on the bird-ecoregion maps. I used the same criteria as in the species level analysis to determine "lost habitat", "remaining habitat", and "future extent of occurrence".

2.2.4 Prediction of Future Threat

The World Conservation Union (IUCN) has a series of criteria to determine species conservation status (IUCN 2001). I used the geographic ranges in the form of the "extent of occurrence" (criterion B1) to determine threat. In order to qualify for threat under this criterion, the extent of occurrence has to: (1) have an estimated area smaller than a threshold size, and (2) fulfill at least two of the following requirements: (a) be severely fragmented, (b) be in continuing decline, and (c) have extreme fluctuation. I identified the species and bird-ecoregions that will reach the threshold size for extent of occurrence by 2020, assuming that the reduction in the extent of occurrence is enough indication of its continuing decline and fragmentation. The threshold sizes in extent of occurrence for the different threat categories are: ≤ 100 km^2 or restricted to a single locality for *Critically Endangered*; ≤ 5,000 km^2 for *Endangered*, and ≤ 20,000 km^2 for *Vulnerable* (IUCN 2001). There is no guideline for the *Near Threatened* category, and I considered a ≤ 30,000 km^2 for *Near Threatened*.

2.3 Results

2.3.1 Threatened Species

Table 5 shows the results for all species. I predicted that by 2020 eight species will be threatened: two *Critically Endangered* (*Clytoctantes atrogularis* and *Lepidothrix vilasboasi*), one *Endangered* (*Picumnus varzeae*), two *Vulnerable* (*Rhegmatorhina berlepschi* and *Synallaxis kollari*), and three *Near Threatened* (*Cercomacra carbonaria*, *Cranioleuca muelleri*, *Amazona diadema*). Half of these species occur in riverine environments (*várzea, igapó*, gallery forest), and the other half in *terra firme*. The next session gives a detailed diagnosis of their future status.

Another eight species, although not yet threatened in 2020, will have lost at least 50% of their habitat within Brazil: *Psarocolius bifasciatus, Lepidothrix iris, Myrmotherula klagesi, Myrmoborus lugubris, Furnarius minor, Xiphorhynchus kienerii*, *Myrmochanes hemileucus,* and *Elaenia pelzelni*. Six of these species occur in *várzea* and two in *terra firme*.

Table 5 Predicted reduction extent of occurrence of species and bird-ecoregions.

[a] According to the maps of Ridgely *et al.* (2003) and Olson *et al.* (2001), for species and bird-ecoregions, respectively. (*Riv*) = riverine species. Asterisks (*) indicate species maps that were updated (see details in Appendix B).
[b] Percentage of occurrence that is within the Brazilian Amazon.
[c] Predicted remaining habitat within the Brazilian Amazon by 2020, plus entire species or bird-ecoregion range outside the Brazilian Amazon.
[d] Percentage of species or bird-ecoregion range within the Brazilian Amazon predicted to be lost by 2020.

Species	Present extent of occurrence (km^2)[a]	Brazil range (%)[b]	Future extent of occurrence (km^2)[c]	Brazil habitat loss (%)
Tinamidae				
Crypturellus casiquiare	50,443	51	48,030	9
Cracidae				
Penelope pileata	393,339	100	218,493	45
Psittacidae				
Amazona diadema	56,293	100	29,435	48
Picidae				
Picumnus pumilis (Riv)	217,350	53	196,196	18
Picumnus varzeae (Riv)	26,363	100	4,895	81
Picumnus castelnau	79,654*	50	63,485	41
Furnariidae				
Furnarius minor (Riv)	366,754*	65	235,593	55
Synallaxis kollari (Riv)	28,043*	83	6,455	93
Cranioleuca muelleri (Riv)	86,035*	99	24,076	73
Dendrocolaptidae				
Xiphorhynchus kienerii (Riv)	223,284	92	133,891	53
Thamnophilidae				
Thamnophilus cryptoleucus (Riv)	221,699*	46	174,619	46
Clytoctantes atrogularis	Point data	100	Point data	100
Myrmotherula klagesi	146,347*	100	60,653	59
Myrmotherula ambigua (Riv)	145,542	72	129,494	15
Myrmotherula assimilis (Riv)	420,678	83	265,219	45
Cercomacra carbonaria (Riv)	49,999*	92	21,815	62
Cercomacra manu	300,804*	49	240,399	41
Myrmoborus lugubris (Riv)	267,557	72	156,361	57
Myrmochanes hemileucus (Riv)	272,939	49	203,547	52
Myrmeciza disjuncta	206,581*	56	195,434	10
Myrmeciza pelzelni	51,861	45	50,582	6

Table 5 Continued.

Myrmeciza goeldi	360,140	50	309,446	28
Rhegmatorhina cristata (Riv)	276,511	76	251,387	12
Rhegmatorhina berlepschi	26,131	100	20,140	23
Rhegmatorhina gymnops	157,738	100	98,598	38
Skutchia borbae	151,247	100	116,503	23
Formicariidae				
Grallaria eludens	422,275*	75	389,580	10
Pipridae				
Lepidothrix iris	495,379	100	182,624	63
Lepidothrix vilasboasi	Point data	100	Point data	50
Tyraniidae				
Elaenia pelzelni (Riv)	318,401	83	187,749	50
Stigmatura napensis	343,865*	65	235,572	48
Lophotriccus eulophotes	344,820	73	281,556	25
Hemitriccus inornatus	122,682*	100	96,430	21
Poecilotriccus senex	84,872*	100	65,421	23
Troglodytidae				
Thryothorus griseus	94,807	100	92,133	3
Thraupidae				
Conirostrum margaritae (Riv)	216,624*	89	126,354	47
Emberizidae				
Dolospingus fringilloides (Riv)	332,860	46	307,810	16
Icteridae				
Ocyalus latirostris	566,573*	47	532,848	13
Psarocolius bifasciatus	149,212	100	46,495	69
Bird-Ecoregion				
Caqueta Moist Forests	200,638	6	200,347	2
Gurupa Várzea	10,084	100	3,243	68
Guyanan Moist Forests	511,949	34	488,060	14
Guyanan Savannas	103,074	76	45,898	73
Iquitos Várzea	121,446	26	110,344	35
Japurá/Solimões-Negro Moist Forests	274,394	87	243,079	13
Juruá/Purus Moist Forests	248,699	100	232,032	7
Madeira/Tapajós Moist Forest (Machado/Madeira)	172,852*	100	96,661	4
Madeira/Tapajós Moist Forest (Teles Pires/Juruena)	66,238*	100	29,052	56
Madeira/Tapajós Moist Forests (Aripuanã-Roosevelt/ Machado-Jiparaná)	121,954*	100	93,909	23
Madeira/Tapajós Moist Forests (Aripuanã-Roosevelt/ Tapajós)	285,123*	100	220,564	23
Marajó Várzea Forests	82,509	100	39,329	51

Table 5 Continued.

Mato Grosso Tropical Dry Forests	414,687	100	200,634	52
Monte Alegre Várzea (East)	18,921*	100	5,308	72
Monte Alegre Várzea (rio Branco)	1,023*	100	278	73
Monte Alegre Várzea (South)	20,294*	100	9,861	51
Monte Alegre Várzea (West)	66,953*	100	9,453	64
Negro/Branco Moist Forests	313,848	16	306,254	15
Purus Várzea	181,412	81	144,115	26
Purus/Madeira Moist Forests (South)	71,198*	100	50,515	29
Purus/Madeira Moist Forests (North)	106,357*	100	48,114	55
Rio Negro Campinarana	82,222	99	56,882	31
Solimões/Japurá Moist Forests	78,406	22	176,478	5
Southwestern Amazonian Moist Forests	848,149	41	798,464	14
Tapajós/Xingú Moist Forests	335,711	100	251,144	25
Tocantins-Araguaia/Maranhão Moist Forests	198,214	100	51,931	74
Uatumã-Trombetas Moist Forests (East)	212,490*	100	166,311	22
Uatumã-Trombetas Moist Forests (West)	250,270*	100	190,567	24
Xingu/Tocantins-Araguaia Moist Forest	271,308	100	161,401	41

2.3.1.1 Predicted Conservation Status for Bird Species

Clytoctantes atrogularis **(Thamnophilidae)**

IUCN status: *Critically Endangered* (CR B1ab(i,ii,iii,v); C2a(ii); D)

Predicted status: *Critically Endangered*

The Rondônia Bushbird is endemic to Brazil. It is known from two localities: Cachoeira Nazaré and rio Sucurundi (Whitney 2005). I predict that the forest in both localities will be totally cleared by 2020. The first is along BR-364, a road known for uncontrolled immigration and deforestation and where paving will further the process (Alves *et al.* 1999; Roberts *et al.* 2002; Allegretti 2006). The second is near the BR-230 road in a region quite populated, where further development seems unavoidable, if not socially desirable (Carvalho *et al.* 2001). Between these two localities lies a newly created mosaic of conservation areas in the state of Amazonas (SDS 2007). These could prove to be crucial in the conservation of the species, although it has not yet been found there. The species is currently not included on the Brazilian list of threatened fauna (Brasil 2003; Machado *et al.* 2005).

Lepidothrix vilasboasi **(Pipridae)**

IUCN status: *Vulnerable* (VU C2a(ii))

Predicted status: *Critically Endangered*

The Golden-crowned Manakin is endemic to Brazil. It is known from two localities in Pará state: Novo Progresso and rio Cururu (Olmos & Pacheco 2003). I predict that the forests around the first will be totally cleared by 2020. This locality is along BR-163, a road where paving will open vast tracks of intact forest to uncontrolled immigration (Carvalho *et al.*

2001; Nepstad *et al.* 2002; Soares-Filho *et al.* 2004; Smeraldi 2006). Fortunately, its other known locality is within a military reserve considered one of the best-preserved forests in southern Pará (Olmos & Pacheco 2003). The species is currently not included on the Brazilian list of threatened fauna (Brasil 2003; Machado *et al.* 2005).

Picumnus varzeae **(Picidae)**

IUCN status: *Least Concern*

Predicted status: *Endangered*

The Varzea Piculet is endemic to Brazil, occurring on *várzea* along the rio Amazonas (Winkler & Christie 2002). This piculet is currently not threatened but I predict that it will lose 81% of its habitat by 2020, bringing it to less than 5,000 km^2. A number of infrastructure projects are proposed along *várzea* in Brazil (Fearnside 2002).

Synallaxis kollari **(Furnariidae)**

IUCN status: *Vulnerable* (VU B1ab(iii,v); D1)

Predicted status: *Vulnerable*

The Hoary-throated Spinetail has most of its distribution inside Brazil. It occurs in gallery forests of extreme northern Amazonia (Remsen 2003). These forests are under great pressure by rice plantations (Zimmer *et al.* 1997; Vale *et al.* 2007). I estimate that it will lose 92% of its habitat within Brazil, bringing its extent to 6,455 km^2, which qualifies for *Vulnerable* status and is quite close to *Endangered* status. Vale *et al.* (2007) suggests that it should already be listed as *Endangered*. The species is currently not included on the Brazilian list of threatened fauna (Brasil 2003; Machado *et al.* 2005).

Rhegmatorhina berlepschi (Thamnophilidae)

IUCN status: *Least Concern*

Predicted status: *Vulnerable*

The Harlequin Antbird is endemic to Brazil, occurring in *terra firme* in a very restricted area within the Tapajós/Madeira interfluve (Zimmer & Isler 2003). The area is under relatively low human pressure, and I predict that the species will lose 23% of its habitat; however, its distribution is sufficiently small to bring its remaining extent to a critical size. I predict that it will have an area of 20,140 km^2, which I consider close enough to the 20,000 km^2 threshold for the *Vulnerable* status. Its conservation status should not change as long as the pace of forest loss within its range remains slow.

Cercomacra carbonaria (Thamnophilidae)

IUCN status: *Vulnerable* (VU C2a(ii))

Predicted status: *Near Threatened*

The Rio Branco Antbird has most of its distribution inside Brazil. It occurs in gallery forests of extreme northern Amazonia (Zimmer & Isler 2003). I predict that the species will lose 62% of its habitat, and will have 21,815 km^2 of remaining habitat. Based on the future extent of occurrence, therefore, this species qualifies for a lower conservation status than it presently has. This is because the species has a distribution much larger than IUCN currently recognizes (Vale *et al.* 2007). The species is currently not included on the Brazilian list of threatened fauna (Brasil 2003; Machado *et al.* 2005).

***Cranioleuca muelleri* (Furnariidae)**

IUCN status: *Least Concern*

Predicted status: *Near Threatened*

The Scaled Spinetail is endemic to Brazil, occurring in *várzea* on the lower rio Amazonas (Remsen 2003). I predict that it will lose 73% of its habitat. It occurs along a main boat traffic corridor, between the cities of Manaus and the mouth of the rio Amazonas.

***Amazona diadema* (Psittacidae)**

IUCN status: not evaluated

Predicted status: *Near Threatened*

The Diamaded Amazon is endemic to Brazil, occurring in *terra firme* within the Negro/Solimões and Negro/Amazonas interfluves. Parker *et al.* (1996) treat it as a full species while Collar (1997) as an incipient species within *Amazona autumnalis*. I predict that this parrot will lose 48% of its habitat. The rio Negro/Solimões portion of its range will remain relatively intact. The upper rio Amazonas portion, however, will be highly impacted by the growth of the city of Manaus. Nonetheless, the parrot's large range means that it could survive the extirpation of part of it. To complicate matters, the species makes migratory movements, disappearing entirely from part of its known range for several months every year (Cohn-Haft *et al.* 1997; Naka 2004), and thus may suffer greater pressure at particular times of year in the parts of its distribution yet unidentified.

2.3.2 Threatened Bird-Ecoregions

In addition to the species already mentioned, I predicted that by 2020 any bird taxa endemic to six bird-ecoregions will be threatened (Table 5, Fig. 8). Taxa endemic to two of those ecoregions will be *Endangered* (Monte Alegre Várzea in rio Branco and Gurupa Várzea); taxa endemic to three will be *Vulnerable* (Monte Alegre Várzea in its southern, eastern and western portions); and taxa endemic to one will be *Near Threatened* (Madeira/Tapajós Moist Forest within the Teles Pires/Juruena interfluve). Five of these bird-ecoregions are in *várzea*, and one in *terra firme*. The next session gives a detailed diagnosis of the future status of these bird-ecoregions and a list of their known endemic taxa.

I also predicted that taxa endemic to five bird-ecoregions will lose least 50% of their habitat within Brazil: Tocantins-Araguaia/Maranhão Moist Forests, Guyanan Savannas, Purus/Madeira Moist Forests in its northern portion, Mato Grosso Tropical Dry Forests, and Marajó Várzea. All of these bird-ecoregions, with exception of Guyana Savannas, are endemic to Brazil.

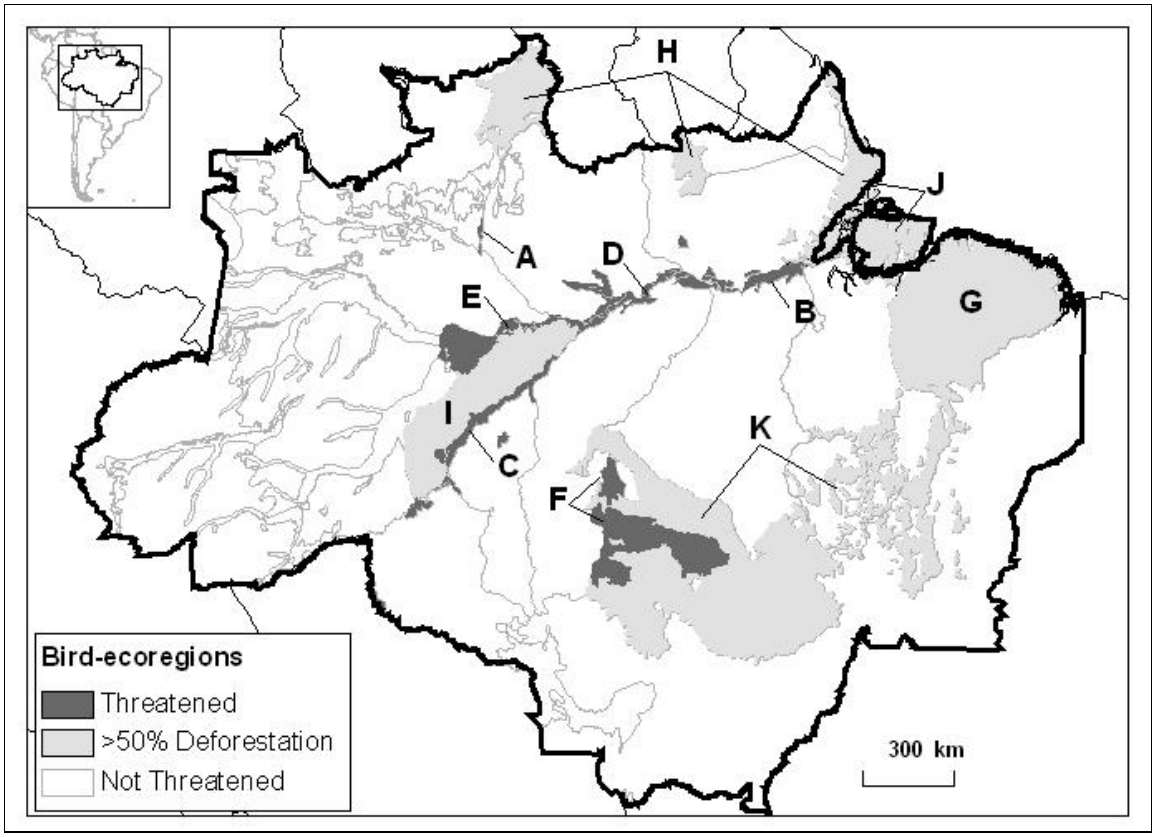

Figure 8 Prediction of Bird-Ecoregions future status.

A = Monte Alegre Várzea in rio Branco, **B** = Gurupa Várzea, **C** = Monte Alegre Várzea (South), **D** = Monte Alegre Várzea (East), **E** = Monte Alegre Várzea (West), **F** = Madeira/Tapajós Moist Forest within Teles Pires/Juruena interfluve, **G** = Tocantins-Araguaia/Maranhão Moist Forests, **H** = Guyanan Savannas, **I** = Purus/Madeira Moist Forests (North), **J** = Marajó Várzea Forests, **K** = Mato Grosso Tropical Dry Forests.

2.3.2.1 Predicted Conservation Status for Bird-ecoregions

Monte Alegre Várzea in rio Branco

Predicted status: *Endangered*

Endemic taxa: see bellow

The rio Branco portion of the Monte Alegre Várzea is well preserved but I predict it to lose significant habitat. This bird-ecoregion has no described endemics but houses isolated populations of species typical of the *várzea* on the rio Solimões and rio Amazonas, including: *Cercomacra nigrescens*, *Synallaxis guianensis*, *Synallaxis propinqua*, *Stigmatura napensis*, and *Stigmatura napensis* (Naka *et al.* 2007).

Gurupa Várzea

Predicted status: *Endangered*

Endemic taxa: *Picumnus cirratus macconnelli*

This ecoregion is under great human pressure. *Picumnus cirratus macconnelli* has an isolated distribution, distant and disjoint from that of others treated as conspecific. It probably deserves full species status and replaces *P. varzeae* geographically along the easternmost extent of *várzea* in the lower rio Amazonas, where it is subject to the same pressures as that species (Cohn-Haft *et al.* 2007*a*).

Monte Alegre Várzea (South, East and West)

Predicted status: *Vulnerable*

Endemic taxa: *Cranioleuca muelleri*, *Thripopha fusciceps obidensis*, *Picumnus varzeae*, *Myrmoborus lugubris femininus*

These *várzeas* have a long history of cattle and buffalo ranching. It is unknown whether the numerous grassland clusters within it are natural or human-made. To date, no bird species are known to have been extirpated from these areas, despite the high degree of disturbance. It is therefore unclear whether this community is especially adapted to disturbance, or if it is a matter of time until extirpations catch-up with deforestation.

Madeira/Tapajós Moist Forest within Teles Pires/Juruena interfluve

Predicted status: *Near Threatened*

Endemic taxa: ?

Although no endemic taxa have been identified from this region, the prevalence of endemism in mini-interfluves within the greater Madeira-Tapajós region (Cohn-Haft *et al.* 2007*b*) makes it imperative to treat all these sub-regions as probable areas of endemism as long as their rate of deforestation continues to be much faster than that at which they are inventoried biologically.

Tocantins-Araguaia/Maranhão Moist Forests, Guyanan Savannas, Purus/Madeira (North) Moist Forests, Mato Grosso Tropical Dry Forests, and Marajó Várzea

Predicted status: not threatened, >50% deforestation

Endemic taxa: see below

All, with exception of Guyana Savannas, are endemic to Brazil. A predicted loss of more than 50% of the original area is cause for serious concern. The Purus/Madeira (North) Moist Forest is an area where a number of new taxa are being described in the genera *Herpsilochmus*, *Hemitriccus* and *Cyanocorax* (Cohn-Haft *et al.* 2007*b*). The Tocantins-Araguaia/Maranhão Moist Forest is within the "arc of deforestation", the most deforested area in whole Amazonia. Although I did not identify this bird-ecoregion as threatened in by 2020, many taxa within it are already feeling the effects of deforestation. It houses several taxa on the Brazilian list of threatened fauna: *Pyrrhura lepida lepida*, *Pteroglossus bitorquatus bitorquatus*, *Crax fasciolata pinima*, *Psophia viridis obscura*, *Dendrocincla merula badia*, and *Phlegopsis nigromaculata paraensis* (Brasil 2003; Machado *et al.* 2005).

2.4 Discussion

2.4.1 Which Species Will Be Next and Where Will They Be

Using species-area relationships and Laurance's *et al.* (2001a) deforestation model, Grelle (2005) predicts that by 2020, 5% to 18% of all mammals endemic to the Brazilian Amazon may become extinct. The study identifies the magnitude of species loss but does not identify which species will be threatened. Using a different deforestation model, Soares-Filho *et al.* (2006) predict that by 2050, 25% of the mammals in their sample will be "imperiled" (≥ 40% habitat loss). This includes all mammals with at least one fifth of their range within Amazonia. Only small-ranged species with most (if not all) of their range within Amazonia, however, should be significantly harmed by habitat loss of this magnitude (Pimm & Askins 1995).

I identified many bird taxa that will likely be affected by infrastructure development in Amazonia. Most of them occur in riverine habitats (*várzea, igapó*, gallery forests, and river islands). The identification of five bird-ecoregions in *várzea* is especially worrisome. *Várzeas* are seasonally flooded forests in nutrient rich "white water" (muddy, sediment-rich) rivers in Amazonia (Prance 1979). They cover about 14% of the basin, and comprise its largest area of good-quality soils (Roosevelt 1999; Olson *et al.* 2001). These forests house 15% of the terrestrial avifauna endemic to Amazonia but there are few studies of the *várzea* avifauna (Remsen & Parker 1983; Cohn-Haft *et al.* 2007a). Rivers have provided Amazonians their main transportation routes, since the arrival of humans 12,000 years ago (Roosevelt 1999). Over the last several centuries, most of the logging in the Brazilian Amazon has occurred in *várzea,* where timber is abundant, extraction and transport costs are low, and access to markets is good (Barros & Ulh 1995). Agriculture and cattle or water buffalo ranching are also increasingly prevalent on these fertile floodplains (Junk & Piedade 2004).

There is an expectation that species associated with riverine habitats may be more adaptable to disturbance (Stotz *et al.* 1996). That is because they occur in an environment that is naturally disturbed by seasonal flooding and stochastic changes in river course. It is important to be cautious, however, as there is clear endemism in smaller subregions of the Amazonian *várzea* (Cohn-Haft *et al.* 2007a). The planned implementation of 1,057 km of industrial waterways, and 20.4 MW hydroelectric dams (Fearnside 2002) represents disturbance of unprecedented magnitude.

2.4.2 Brazilian Bird Conservation

Approximately 12% of all bird species in the world occur within the Brazilian Amazon. Although most are not endemic to Brazil, many have a large portion of their range within it. Not surprisingly, the major threat to Brazilian birds is habitat loss and fragmentation. Of the 124 Brazilian species in the IUCN Red List (IUCN 2006), 90% face habitat loss or degradation as one of the major threats (Marini & Garcia 2006). Brazil has its own Red List of threatened species that grants them some legal protection (Brasil 2003; Machado *et al.* 2005). Although it uses the same threat categories as the IUCN, the two lists often differ because of species' assigned status. Of the 160 birds on the Brazilian list, 38% have the same status and 52% have a more critical status than that of the IUCN.

I identified eight species that are likely to join the IUCN's Red List. Although some are already listed by the IUCN under a different status, none is on the Brazilian list of threatened fauna (Brasil 2003; Machado *et al.* 2005). Six of these species are endemic to Brazil and the other two have most of their range within it. Their fate in the country, therefore, is equivalent to their fate globally. I also identified eight species that, although not predicted to become threatened, will lose more than 50% of their habitat within the Brazilian Amazon. Finally, I identified numerous taxa (sub-species and isolated populations) that will either qualify for threat or lose more than 50% of their habitat within Brazil. These might not be globally threatened but are relevant on the context of Brazilian biodiversity conservation.

I might have overestimated threat by underestimating species' extent of occurrence. Knowledge of Amazonian species' distribution is far from complete; expeditions to unexplored sites routinely expand species' ranges. During the course of this present study, for example, I eliminated several species from the analysis, as new information made their ranges larger than the 500,000 km^2 cut-off size. Although I corrected distribution maps to reflect the most up to date information available, including unpublished data (from *bonafide* ornithologists), some species might still have their ranges redefined in the future. If species' ranges are larger, the estimated amount of habitat left will necessarily increase. In every other aspect, however, my predictions are conservative. I used IUCN threshold size for extent of occurrence, which is conservative in itself (Harris & Pimm 2007). Furthermore, I likely overestimated future extent of occurrence (therefore underestimating threat due to habitat loss) for several reasons. First: I used an optimistic deforestation model to predict habitat loss that uses historical deforestation patterns. Changes in technology, however, could accelerate forest loss (Laurance *et al.* 2001a,b). Second: the estimates of remaining habitat only included the *heavy impact* class of the deforestation model, neglecting the 15% deforestation in the *moderate impact* class. Third: the actual extent of occurrence of species may be smaller than that described by the maps of Ridgely *et al.* (2003), which depict the entire region where species might occur, disregarding habitat patchiness within it. For example, Ridgely *et al.* (2003)'s distribution map for S*ynallaxis kollari* has 28,000 km^2, while a mapping of its available habitat estimates 206 km^2 (Vale *et al.* 2007). Species with significantly smaller ranges than shown in Ridgely *et al.* (2003) could reach the threshold for threat for the remaining extent of occurrence. Fourth: I considered all ranges outside of the Brazilian Amazon to be areas of intact habitat. I did so because there is no comparable deforestation model for the non-Brazilian Amazon. Nonetheless, deforestation rates in Ecuador, Colombia and Venezuela can be as significant as in Brazil (FAO 2005). If I had considered species habitat loss in these countries, the predicted 2020 extent of occurrence would have been smaller, and threat level greater.

The most important and surprising results found here are that birds of the Amazonian *várzea* appear to be under considerable impending threat, despite being adapted to habitats that suffer a certain degree of natural disturbance. Also relevant is the fact that the high levels of endemism in "mini-interfluves" in the rio Madeira basin, only recently recognized and mostly not reflected in existing taxonomy (Cohn-Haft *et al.* 2007b), coincide with areas that are beginning to feel the impact of human population expansion and development. It is not surprising that small-ranged taxa are the most susceptible to extinction, however, the existence and location of many small-ranged taxa in the vast Amazonia lowlands is only beginning to be recognized. As taxonomic work begins to detect the true avian diversity in the region, it is likely that more and more taxa will be recognized as already or imminently threatened

3. Abundance, Distribution and Conservation of *Cercomacra carbonaria* and *Synallaxis kollari*, in Roraima, Brazil

The Rio Branco Antbird (*Cercomacra carbonaria*) and the Hoary-throated Spinetail (*Synallaxis kollari*) are passerine birds endemic to the gallery forests of Roraima state in northernmost Brazil and adjacent Guyana. The Red List of The World Conservation Union has both as *Vulnerable* but they have been removed from Brazil's list of threatened species because of data deficiency. They are poorly known, reflecting both Roraima's distance from Brazil's main population centers and the inaccessibility of their habitat. In 2004 and 2005, I conducted bird surveys along the major rivers that provided previous sightings, and expanded records from only a handful to several dozen. I found *C. carbonaria* at 29% of the points surveyed, and estimated its local population density at ~80 individuals/km^2 and total population size to exceed 15,000 individuals. The species has 723 km^2 of available habitat, 8% of which is inside protected areas. I found *S. kollari* at 44% of the points surveyed, and estimated its local population density as ~60 individuals/km^2, with an estimated total population size exceeding 5,000 individuals. It has 206 km^2 of available habitat, none of which is inside protected areas. I recommend that *C. carbonaria* be down-listed on the *Near Threatened* category, and that *S. kollari* be up-listed to *Endangered*. Both species live in areas vulnerable to habitat loss. I also recommend that both species re-enter the Brazilian List of Threatened Fauna and highlight the importance of indigenous reserves to their conservation.

3.1 Introduction

Roraima State is located in extreme northern Brazil, bordering Venezuela to the north and west, Guyana to the north and east, and Amazonas state to the south. Roraima has a more heterogeneous vegetation than would be expected from its location in the Amazon Basin, including evergreen tropical forests, semi-deciduous forests, swamps, white sand forests (*campina* and *campinarana*), and savannas (*Lavrado*) (Furley & Mougeot 1994). Nearly all water bodies in the savannas are fringed by gallery forests, which do not flood during the high-water season (unlike *várzea* forest) and are characterized by shrubby vegetation with a dense understory dominated by vines (Fig. 9, 10). Stattersfield *et al.* (1998) identified the Rio Branco gallery forest of Roraima as an Endemic Bird Area (EBA 063) based on the presence of two endemic passerines specialized to this linear riverine habitat: the Rio Branco Antbird (*Cercomacra carbonaria*) and the Hoary-throated Spinetail *(Synallaxis kollari*) (Fig. 11). Wege & Long (1995) recognize four "Key Areas for Threatened Birds" within the Rio Branco gallery forest EBA: Boa Vista and Rio Mucajaí, based on the presence of *C. carbonaria*, and Conceição do Mau and Rio Surumu, based on the presence of *S. kollari*. Although, these key areas are in the northern, more populated, portion of the state, they are not formally protected within protected areas.

Photo: Mariana Vale

Figure 9 Savanna in Roraima, Brazil.

In northern Roraima state there is the largest enclave of Amazonian savanna, the *Lavrado*.

Figure 10 Gallery forests in Roraima, Brazil.

The Rio Branco Antbird and the Hoary-throated Spinetail are endemic to the narrow strip of gallery forest along the rivers in the *Lavrado*.

According to the map of Monteiro and Sawyer (2001), which combines demographic and socio-economic indices, Boa Vista, rio Surumu and rio Mucajaí are in the counties with the highest anthropogenic pressures in Roraima State. Conceição do Mau, a small town within the Raposa Serra do Sol Indigenous Reserve, is subject to lower levels of such pressures.

Zimmer *et al.* (1997) identified uncontrolled fires and conversion to rice plantation as the main threats facing the gallery forests of Roraima. Since their assessment, however, the establishment of new rice production along riverbanks has increased dramatically (Cordeiro 2005) and these are now the single major threat to these forests.

Cercomacra carbonaria occurs in the gallery forests along the entire rio Branco and its major tributaries, while *S. kollari* is restricted to the tributaries (Remsen 2003; Zimmer & Isler 2003; Naka *et al.* 2006). Parker *et al.* (1996) considered *C. carbonaria* to be "fairly common" and *S. kollari* "probably rare" and ranked both species as a medium level priority for research and conservation. The World Conservation Union (IUCN) lists both species as *Vulnerable* based on their estimated small ranges, continuing habitat loss, and population decline (IUCN 2004; BirdLife International 2006a,b). Information about these species is still very limited, as evidenced by the quality of the data available to assess their conservation status (BirdLife International 2006a,b). The only pertinent literature published since the Collar *et al.* (1992) assessment is a study on *C. carbonaria* vocalization and behavior (Zimmer *et al.* 1997) and a few additional sightings (Forrester 1992; Stotz 1997; Grosset & Minns 2002; Santos 2003). Because of clear deficiency in data, both were removed from the Brazilian List of Threatened Fauna (Brasil 2003; Machado *et al.* 2005).

Following the recommendations of Collar *et al.* (1992), I investigated both *C. carbonaria* and *S. kollari* to revise and offer new information on species' geographic range limits, investigate abundance at the local and regional levels, and estimate available habitat and global population size.

Figure 11 Rio Branco Antbird (*Cercomacra carbonaria*) and Hoary-throated Spinetail (*Synallaxis kollari*).

The two endemic and threatened birds of Roraima, Brazil. LEFT: Rio Branco Antbird, RIGHT: Hoary-throated Spinetail.

3.2 Methods

3.2.1 Bird Surveys

3.2.1.1 Regional Abundance

Following explorations in July 2003, I conducted fieldwork from 10 July to 24 August 2004. These months represent the height of the Roraima rainy and high water level season (Barbosa 1997), which coincide with the breeding season of both *C. carbonaria* and *S. kollari* (Zimmer *et al.* 1997; Vale *et al.* 2005). Here I use the terms "right bank" and "left bank" according to the traditional Amazonian system, based on the hand each bank faces when descending the watercourse (Whittaker & Oren 1999).

I determined the presence or absence of *C. carbonaria* and *S. kollari* along the major rivers where they occur with field assistance of a very experienced boatman, Claudiomiro Parente (CP). I surveyed 157 km on the right bank of the mid and lower rio Uraricoera, 114 km on the right bank of the mid and lower rio Tacutu, and 70 km on the left bank of the mid and lower rio Surumu (Fig. 12A). On 13 July 2005, I surveyed an additional point on rio Uraricoera, 3 km away from the uppermost point surveyed in 2004, where CP reported hearing both species in August 2003.

I used a boat to survey the strip of gallery forest along these rivers, stopping every 3 km to perform playback. At each point, I broadcasted a 3:47 minute pre-set sequence of vocalization intercalated with silence for each species using a Sony TCM-5000 EV tape recorder. *Cercomacra carbonaria*'s sequence was always broadcasted before *S. kollari*'s. I created the sequence in the computer using a commercial recording of *C. carbonaria*'s song (Isler & Whitney 2002) and a recording of *S. kollari*'s song made by Jeremy Minns (Grosset & Minns 2002). Each point was visited only once. No work was done under rainy or windy conditions.

I used playback to improve my chances of detecting the birds. Playback is especially recommended for secretive species and dense habitats (Johnson *et al.* 1981), which is the case for both species studied. The preferred habitat of *C. carbonaria* and *S. kollari* is nearly impenetrable (Zimmer *et al.* 1997), and although both species are secretive, I found in our 2003 explorations that they respond well to playback.

I divided the number of points where a species was present by the total points surveyed to estimate the probability of finding the species in a given site within its geographic range. It is important to note that although presence data are definite, absence data are not. If a given species responded to playback, I were sure it was present at that point but if it did not respond it could either have been absent or present but unresponsive. Therefore, our estimate of the probability of finding a species in a given site is likely underestimated.

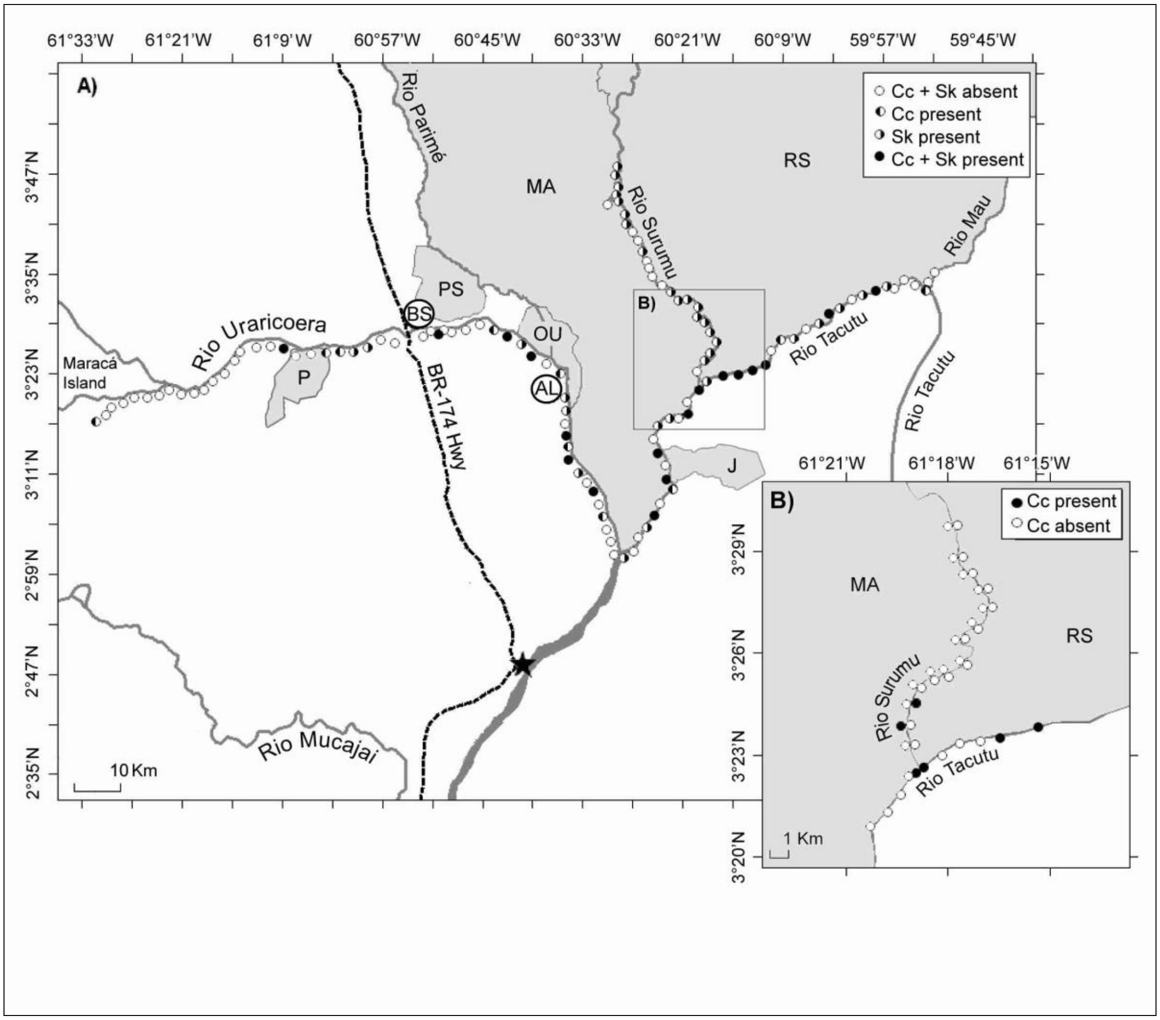

Figure 12 Regional bird abundance survey in northern Roraima, Brazil.

A) rio Uraricoera, rio Tacutu and rio Surumu survey (3 km sampling regime). B) rio Surumu survey (1 km sampling regime). *Cc* = *Cercomacra carbonaria*, *Sk* = *Synallaxis kollari*, *AL* = Alagadiço, *BS* = Bridge site, *J* = Jaboti Indigenous Reserve, *OU* = Ouro Indigenous Reserve, *P* = Pium Indigenous Reserve, *PS* = Ponta da Serra Indigenous Reserve, *RS* = Raposa Serra do Sol Indigenous Reserve, *MA* = São Marcos Indigenous Reserve.

3.2.1.2 Local Abundance

I used playback counts to estimate local abundance (Bibby *et al.* 2000). The fieldwork on local abundance ran from 10 July to 5 August 2004. The surveys took place in two sites on the rio Uraricoera: "Alagadiço" and "Bridge site" (Fig. 12A). Both sites had a strip of dense gallery forest dominated by shrubs and vines, with an average canopy height of 4 m, and a sharp edge with savanna originally converted to rice plantation and cattle pasture and subsequently abandoned. I chose these sites based on the confirmed presence of both species in July 2003 exploratory surveys. Alagadiço (03º22'N/60º35'W) is located on the right bank of the rio Uraricoera, inside Fazenda Truarú, a farm 67 km north of Boa Vista. The patch of forest surveyed at Alagadiço was 4 km long, had an area of 39.6 ha, and a width ranging from 3 m to 300 m. This site was relatively undisturbed by human visitation, having at the time of the study only one household within the 330 km^2 of Fazenda Truarú. The Bridge site (03º27'N/60º54'W) is 86 km north of Boa Vista, on the left margin of the rio Uraricoera near the BR-174 highway bridge that spans the river. The patch of gallery forest surveyed at the Bridge site was 3.5 km long, had an area of 37.5 ha, and a width ranging from 11 m to 220 m.

At both sites, I flagged points at 200 m intervals, as suggested in Hutto *et al.* (1986) and Gutzwiller (1991), along a pre-existing trail parallel to the inland margin of the gallery forest. I surveyed the maximum number of points I could fit into each patch of gallery forest: 20 points (4 km) in Alagadiço and 17 points (3.5 km) in the Bridge site. Each site was visited three times. During each visit, two surveys were carried-out by two observers (Bruce Bell and myself) starting at the same time from opposite ends of the line, such that each point was surveyed twice in each visit. The three visits and two surveys per visit yielded six surveys per site.

The surveys started at 08h00 and took 3 to 5 hours to complete. I standardized the time spent at each point by the length of the playback (3:47 minutes). In contrast, the time spent between points varied considerably between sites and observers due to heterogeneity in terrain condition and observers' travel speed. In the field, the observer broadcasted the same pre-set vocalizations used at the regional survey at each survey point, recording all individuals heard or seen within 100 m from the observer during the playback.

3.2.1.3 Geographic Range Limits

I determined the species geographic range limits from: (1) the literature, (2) fieldwork carried out in 2004 during the regional abundance bird survey (mentioned above), and (3) from fieldwork carried out in 2005 in key areas, using the same 3 km and playback sampling regime as in the regional abundance survey.

Between 05 and 14 September 2005, I surveyed 23 km upriver on the rio Mau starting at the uppermost record in this river for *C. carbonaria* and *S. kollari* (O'Shea *et al.* 2007), 55 km upriver on the rio Mucajaí starting from *C. carbonaria*, also beginning at the uppermost record for this river (Santos 2003), and 46 km upriver on the rio Parimé starting at its mouth with the rio Uraricoera.

3.2.2 Analysis

3.2.2.1 Local Population Density

I used the local abundance data to estimate population density at Alagadiço and the Bridge site. The total number of individuals at a site (N) was defined as the sum of the maximum number of individuals recorded at each point surveyed for that site. While Zimmer *et al.* (1997) recorded *C. carbonaria* female response to playback, in our study only males responded. This may be a consequence of female occupation with nesting duties during the breeding season. There is no sexual dimorphism in *S. kollari* and I do not know of differential response to playback vocalization (Grosset & Minns 2002). In Manú National Park, Peru, both male and female of the genera *Synallaxis* respond to playback (J. Terbough, pers. comm.). I considered that both male and female *S. kollari* responded to playback, using the total number of individuals recorded as the estimate of the number *S. kollari* individuals at each site. I therefore used the total number of individuals recorded for *S. kollari* estimates and twice the total number recorded for *C. carbonaria* estimates.

Both species often came close to the observer without vocalizing in response to broadcasting. This usually enabled first detection just a few meters from the observer. Therefore, the distance between the observer and the bird was omitted from population density estimates, as it would artificially inflate the estimate. At each point, I only recorded birds that were within a 100 m radius, considering birds beyond this distance as belonging to adjacent points.

I calculated male population density (D) per site as the total number of individuals

(N) divided by the area surveyed, that area being within a 100 m radius of the survey point.

I used regression and one-way ANOVA to test if the number of missed individuals at a given point was influenced by: (1) the time of day at which the point was surveyed, and (2) if it was the first or second time this point had been surveyed that day. I estimated the number of individuals missed per point in each survey by subtracting the number of individuals recorded at each point in that survey from the maximum number of individuals recorded for that point in all surveys. The regression of the number of individuals missed against the time of day revealed no relationship for any of the species in either site ($r^2_{max} < 0.01$, $p_{min} > 0.05$), possibly because point counts supplemented by playback equalize detection rates at different times of day (Sliwa & Sherry 1992). At both sites and for both species, a single-factor ANOVA showed no difference in number of missed individuals in points surveyed for the first versus second time that point was surveyed (ANOVA $p_{min} > 0.05$), which indicates that the simultaneous surveys did not influence the results.

3.2.2.2 Available Habitat and Global Population Size

Zimmer *et al.* (1997) consider *C. carbonaria* habitat to be confined to 0.5 km from the riverbanks where the species occur. Because *S. kollari* is believed to share the same habitat as *C. carbonaria*, I used the Zimmer *et al.* (1997) assessment of habitat for both species. I determined the potential available habitat as the entire area within 0.5 km from water, either along riverbanks or islands, within the known geographic range of the species. I used three mosaics of Landsat TM images (Mr-Sid N-20-00, N-21-00, S-20-00) and geographic information system (GIS) buffering techniques. These mosaics are from year 2000, cover an area of 555 km x 768 km, and have a resolution of 14.25 m.

From the total potential habitat, I visually identified and removed areas that did not correspond to gallery forest, which is the preferred habitat of *C. carbonaria* and *S. kollari*. I divided the non-gallery forest areas (hereafter called "non-habitat") into natural landscapes (savanna, sand banks, and water bodies) and human-modified landscapes (urban areas, roads, and farms). I calculated available habitat as the total potential habitat area less the non-habitat areas. Although the visual identification of habitat and non-habitat areas is straightforward, the distinction between natural and human-modified non-habitat areas can be subjective and the results should be interpreted with caution.

I calculated the area of available habitat within protected areas and indigenous reserves using the GIS database of the SIGLAB at the *Instituto Nacional de Pesquisas da Amazônia* (INPA) and the online interactive maps of *Instituto Socioambiental*.

I multiplied the available habitat by the mean population density (between Alagadiço and the Bridge site) to estimate species' maximum global population size. This is the *maximum* global population because it considers that the entire available habitat is occupied by the species. I calculated a minimum global population size by multiplying the available habitat by the probability of finding the species in a given site. This is a *minimum* population size because the probability of finding the species in a given site is likely underestimated. The species' global population size should lie somewhere between the estimated maximum and minimum population size.

3.3 Results

3.3.1 Regional Abundance

Synallaxis kollari was present at 44% of the 121 points surveyed during the 2004 fieldwork, being most common along the rio Surumu (67% of 27 points surveyed), followed by the rio Tacutu (54% of 41 points) and the rio Uraricoera (36% of 36 points surveyed up to the species' range limit on this river). *Cercomacra carbonaria* was present in 24% of the 121 points surveyed, being more abundant on the rio Tacutu (37% of 41 points surveyed), followed by rio Uraricoera (12% of 53 points) and absent from the rio Surumu (Fig. 12A). To confirm the absence of *C. carbonaria* from the rio Surumu, I revisited this river 21 days later, stopping every 1 km on both margins through 16 km. In the second, more thorough, survey of the rio Surumu I found *C. carbonaria* at three points, the one farthest upriver being only 2.8 km away from the mouth of the rio Surumu (03°24'N/60°19'W) (Fig. 12B).

4.3.2 Local Abundance

Table 6 shows the number of individuals recorded and the estimated population density for Alagadiço and the Bridge site. *Synallaxis kollari* had a mean density estimate of ~60 individuals/km^2 and *C. carbonaria* of ~75 individuals/km^2. The Bridge site had the highest male population density for both species (Table 6).

Both *C. carbonaria* and *S. kollari* were responsive to playback. *Synallaxis kollari* was especially bold, sometimes positioning itself less than one meter away from the observer.

Sightings (as opposed to hearings) represented 29% of *C. carbonaria* records and 46% of *S. kollari* records. I commonly recorded solitary individuals of both species (70% of *C. carbonaria* and 55% of *P. kollari* records) and paired individuals (27% of *C. carbonaria* and 39% of *P. kollari* records). The maximum group size was three individuals for *C. carbonaria* and five for *S. kollari*.

Table 6 Local Abundance of *Cercomacra carbonaria* and *Synallaxis kollari*.

Alagadiço = 20 survey points, *Bridge* = 17 survey points. *N* = Number of individuals recorded. *D* = Population density expressed as individuals/km^2. * Twice the number of male individuals.

	C. carbonaria		***S. kollari***	
Site	N	D	N	D
Alagadiço	42*	67	35	56
Bridge site	44*	82	34	64
Mean	43	76	34.5	60

3.3.3 Geographic Range Limits

Table 7 presents the distribution of both species from the literature and data herein. In the 2004 survey, I recorded both *C. carbonaria* and *S. kollari* up to 111 km on the rio Uraricoera (03º28'N/61º09'W). The surveys detected neither species at the remaining 16 points surveyed upriver (~ 46 km). This is the most upstream record of *S. kollari* on the rio Uraricoera to date. On 13 July 2005, I confirmed the presence of two *C. carbonaria* males at a point 3 km farther upstream than the farthest point surveyed in 2004 (03º18'N/ 61º31'W), as reported by CP. The record was on the right bank of the rio Uraricoera, approximately 24 km upriver from the easternmost tip of Maracá Island, in an area highly disturbed by cattle ranching. This is the farthest upstream record to date for *C. carbonaria* on the rio Uraricoera.

On 5 September 2005, I failed to record *C. carbonaria* or *S. kollari* individuals upriver from their previous uppermost record in rio Mau (Good Hope - Guyana, 3º53'N/ 59º35'W, O'Shea *et al.* 2007). Likewise, on 14 September 2005 MMV recorded no individuals upriver from the uppermost records of *C. carbonaria* in rio Mucajaí (Fazenda Paraense - Brazil, 2º41'N/61º16'W, Santos 2003). Therefore, I have confirmed the known uppermost records for the species in the rio Mucajaí and rio Mau.

On 7 September 2005, I recorded *C. carbonaria* individuals up to 4 km (03º25'N/60º36'W) and *S. kollari* up to 35 km (03º34'N/60º44'W) from the mouth of the rio Parimé. These are the first records for both species on the rio Parimé and represent their known geographic limits on this river.

I do not consider *C. carbonaria* to occur in rio Parimé and rio Surumu, nor *S. kollari* to occur in rio Branco. My study shows that *C. carbonaria* occurrence in rio Parimé and rio Surumu is restricted to the area a few kilometers from the respective mouths of these rivers and, thus, should be considered within the influence of rio Uraricoera and rio Tacutu, respectively. Similarly, the only *S. kollari* record in the rio Branco is on Forte São Joaquim (J. Natterer 1836, Vienna Museum of Natural History), at about 1 km from rio Branco's source (the confluence of rio Uraricoera and rio Tacutu), and should be considered under the influence of rio Tacutu.

3.3.4 Available Habitat and Global Population Size

Table 7 shows the amount of available habitat for *C. carbonaria* and *S. kollari* along the rivers at which they occur. *Cercomacra carbonaria* has 723 km^2 of available habitat (gallery forest), with only 25 km^2 of this within islands. The available habitat represents 72% of the species' potential habitat (all habitat within 0.5 km from the river margin). The non-habitat is mostly covered by natural landscapes (savanna, sand beaches, and water bodies), but 37% is covered by human-modified landscapes (urban areas, roads and farms). Eight percent of the available habitat of *C. carbonaria* is within protected areas and 15% within indigenous reserves. The combination of *C. carbonaria* available habitat (723 km^2) and its population density (75 individuals/km^2) translates into a maximum estimate exceeding 50,000 individuals. If I factor-in the species' regional abundance (found in 29% of points surveyed) I have a global population size of about 15,000 individuals.

Synallaxis kollari has 206 km^2 of available habitat (gallery forest), with only 14 km^2 of this within islands. This habitat represents only 36% of the total potential habitat within the species' range. As with *C. carbonaria*, the non-habitat is mostly covered by natural landscapes, with 32% covered by human-modified landscapes. There is no *S. kollari* habitat within protected areas but 57% is within indigenous reserves. The combination of available habitat (206 km^2) and population density (60 individuals/km^2) translates into a maximum estimate exceeding 12,000 individuals. If I factor in the species' regional abundance (found in 44% of points surveyed) I estimate a population size of about 5,000 individuals.

Table 7 Geographic range limits, available habitat, and area within reserves for *Cercomacra carbonaria* and *Synallaxis kollari*.

Geographic Range = specie's upper and lower range limits along rivers; *Length*: extent of range along rivers; *Habitat*: area of available habitat along rivers within riverbanks and (islands). Sources of geographic range limit data: (1) 10 km upriver from mouth of Rio Branco, Brazil (Naka *et al.* in press), (2) Good Hope, Guyana (O'Shea *et al.* in press), (3) Fazenda Paraense, Brazil (Santos 2003), (4) near Conceição do Mau, Brazil (Forrester 1992), (5) data herein, (6) near Contão, Brazil (Grosset and Minns 2002), (7) near Surumu town, Brazil (Grosset and Minns 2002). Reserves: CSP = Caracaraí State Park, NSP = Niquiá State Park, VNP = Viruá National Park (see Fig. 12 for indigenous reserves). * The source of the rio Branco is the confluence between the rio Uraricoera and the rio Tacutu.

River	Geographic Range	Length (km)	Habitat (km^2)	Area w/in reserve (%)
	Cercomacra carbonaria			
Branco	source* down to $01^0 16'S/61^0 50'W$ (1)	562	467 (11)	18 % (VNP, CSP, NSP)
Mau	mouth up to $03^0 42'N/59^0 40'W$ (2)	80	25	54% (RS)
Mucajaí	mouth up to $02^0 41'N/61^0 16'W$ (3)	95	68	0%
Tacutu	mouth up to $03^0 34'N/59^0 53'W$ (4)	120	36 (1)	57% (RS, MA, J)
Uraricoera	mouth up to $03^0 18'N/61^0 31'W$ (5)	169	102 (13)	65% (MA, OU, P)
	Synallaxis kollari			
Cotingo	mouth up to $04^0 10'N/60^0 32'W$ (6)	46	8	100% (RS)
Mau	mouth up to $03^0 42'N/59^0 40'W$ (2)	80	25	54% (RS)
Parimé	mouth up to $03^0 34'N/60^0 44'W$ (5)	46	10	70% (MA, PS, OU)
Surumu	mouth up to $04^0 12'N/60^0 48'W$ (7)	183	42	100% (RS, MA)
Tacutu	mouth up to $03^0 34'N/59^0 53'W$ (4)	120	36 (1)	57% (RS, Ma, J)
Uraricoera	mouth up to $03^0 28'N/61^0 09'W$ (5)	116	71 (13)	88% (MA, OU, P)

3.4 Discussion

3.4.1 Local Abundance

Few studies of population density in riverine habitats have been attempted in Amazonia. The methods I used have obvious and well-known flaws, some of which likely cancel each other. Logistical issues limit what I could do, of course. Circular plots suffer the obvious limitation that an x% error in estimating the maximum distance at which one regularly detects the bird, yields an ~x^2% error in density. I took care to judge whether birds were within or without a 100 m radius. With circular plot methods, there is always the possibility of the systematic error of some fraction of the birds present not calling or, in this case, responding to play-back. This might be especially true for birds at the farthest distances from the observer. To reduce that error, I surveyed each site several times and took the maximum estimate. Clearly, if birds were not detected until I had surveyed each point several times, I might not detect all the birds present and so *underestimate* the correct density. In fact, for both species, for survey points that eventually held birds, I detected birds at roughly 60% on the first visit, and only 5% needed five visits to find the birds. Sixth visits detected no extra birds.

I found that the birds responded strongly to the tape and sometimes came close to it. That poses the concern that the tape might attract individuals from territories outside the 100 m survey radius — then I would *overestimate* the correct density. My experience was that I readily heard birds up to 100 m away in their habitat and the play-back did not obviously bring them in to it from large distances away. Were it to be the case, it would take several surveys at each point before birds moved in and I recorded the maximum number of birds at each point. In fact, I recorded the maximum numbers at each point at 45% of the survey points (for both species) on the first visit, needing no more than five visits for *S. kollari* and six visits only a one point for *C. carbonaria.*

Another check on the estimates is to compare them to other studies. Taken at face value, a density of 76 and 60 individuals per km^2 (roughly 38 and 30 pairs) for *C. carbonaria* and *S. kollari*, respectively, is comparable to abundance of birds in similar guilds and environments. In western Amazonia, for example, Robinson and Terborgh (1997) found that early forests along the river have significantly more "common" species than do mature forests inland. That these habitats were rich in arthropods explained an average density of 30 pairs (= 60 birds) per km^2 for understory insectivorous species, which is strikingly similar to mine, all things considered.

Katter (1995) estimated the population density of *Formicarius rufifrons*, a threatened bird endemic to western Amazonia. The species is similar to *C. carbonaria* and *S. kollari* in having a very small geographic range and a preferred habitat restricted to the thin strip of forest along a few rivers. There are numerous methodological differences between his study and mine, but the salient difference is the rarity of *F. rufifrons* when compared to either *C. carbonaria* or *S. kollari.* Kratter found only five territories during 180 days of fieldwork — a measure of how time-consuming was his method. He estimated population density as about one territory per kilometer of river length surveyed or about three territories per km^2.

In examining relative abundances, Parker *et al.* (1996) consider *C. carbonaria* to be "fairly common" and *S. kollari* as "probably rare" (and *F. rufifrons* to be "rare"). However, using their definition of "common" as those species that "occur throughout their ranges in moderate to large numbers and are found easily during brief periods of fieldwork", our results suggest that both species of the present study are locally "common".

3.4.2 Conservation

The greatest human threats to Roraima occur in the northern portion of the state, where the capital, Boa Vista, and most agricultural and ranching activities are located. Based on demographic and socio-economic indices, all rivers in this region, with the exception of rio Mau, are considered to be under pressure (Monteiro & Sawyer 2001). These include the upper rio Branco (north of Caracaraí), rio Uraricoera, rio Tacutu, rio Surumu, and rio Cotingo. Rio Mau and the lower rio Branco (south of Caracaraí) suffer lower pressure. Because *S. kollari* is restricted to northern Roraima, its entire available habitat is under pressure. *Cercomacra carbonaria* occupies large tracts of available habitat in the southern portion of its range that are under low pressure.

Birdlife (2006a) lists *C. carbonaria* as *Vulnerable* based on small geographical range and estimated population declines. The species is supposed to have a declining population of between 4,200 and 4,700 individuals, all within a single subpopulation (Birdlife International 2006a), based on species distribution data up to Grosset & Minns (2002). Since its initial designation, however, the known distribution of *C. carbonaria* has more than doubled through new records by Santos (2003) on the rio Mucajaí, Naka *et al.* (2006) on the rio Branco, O'Shea *et al.* (2007) on the rio Mau and rio Tacutu, and the present study on the rio Uraricoera and the rio Parimé. Of special relevance is the record by Naka *et al.* (2006) that extended the known distribution ~300 km southward, including large tracts of forests south of Caracaraí (previously known as the species' southernmost limit) that, as mentioned above, are under considerably less threat than those in the north (Monteiro & Sawyer 2001). *Cercomacra carbonaria* may, therefore, have greater ecological plasticity than previously thought, occurring in gallery forests to the north and short *várzea* forests to the south (Naka *et al.* 2006).

The increase of the known range of *C. carbonaria* should lower the species' inferred level of threat, as it likely possesses better population trends than previously thought, though the human threat is still present. The species should still remain on the Red List, where I suggest it be down-listed to *Near Threatened*, as it fulfills the relevant area of occupancy criterion (it is restricted to a single river and its tributaries) and has only limited habitat protection within protected areas. Furthermore, our estimate of available habitat of 723 km^2 fulfills one only of two required criteria for *Vulnerable* species, namely that it occupy an area of occupancy smaller than 2,000 km^2 under continual decline (IUCN 2001). My estimated area is about three times larger than estimated by Birdlife International (2006a). It is important to note that only about 3% of *C. carbonaria* available habitat is within islands, lessening their importance for the species conservation, previously suggested by Zimmer *et al.* (1997).

In 2005, *Synallaxis kollari* was listed as *Endangered*, as it was known to have a small range with records from only five localities (BirdLife International 2004). In the 2006 assessment, the species was down-listed to *Vulnerable* because of additional recent sightings (BirdLife International 2006b). I consider the down-listing to be premature: although *S.*

kollari is more regionally abundant than previously thought, it still has a very small range and strict ecological requirements. My estimate of 206 km^2 of available habitat fulfills the criterion of an area of occupancy smaller than 500 km^2 (IUCN 2001), which, together with a declining and fragmented habitat, makes *S. kollari* eligible for *Endangered* status. This small range is sufficient to raise considerable concerns about the species' survival. None of the *S. kollari* range is within a protected area, and all of it is within the region of highest anthropogenic pressure in Roraima. The gallery forests within the species' range are rapidly being converted into rice plantations. In 1997 Zimmer mention "some conversion to agriculture, especially rice cultivation" as a possible threat to *C. carbonaria* and *S. kollari* (Zimmer *et al.* 1997). In 1999, however, mechanized irrigated rice boomed in Roraima, and by 2002, the production was already three-fold what these authors had witnessed (Cordeiro 2005). The rice plantations are concentrated on the margins of rio Branco's main tributaries and rely heavily on fertilizers, pesticides, and herbicides (Cordeiro 2005). Local authorities have generally failed to investigate reports by local indigenous populations of occasional bird and fish die-offs near these plantations (CIR 2001; 2003). The margins of the rio Tacutu, rio Surumu, and rio Mau have been completely converted to rice plantations. In 2005, I recorded 16 irrigation pipes for rice along 110 km of the rio Tacutu (between its mouth and Conceição do Mau).

Cercomacra carbonaria and *S. kollari* were removed from Brazilian List of Threatened Fauna based on data deficiency (Brasil 2003; Machado *et al.* 2005). The present study provides enough new information for both species to be reconsidered under the Brazilian list.

3.4.3 The Importance of Indigenous Reserves

The role of indigenous reserves in the conservation of *C. carbonaria* and *S. kollari* has been overlooked. Previous authors systematically failed to acknowledge that most of the species records have been in indigenous reserves. Records from the rio Uraricoera and Vila Surumu (Grosset & Minns 2002) are in the São Marcos Indigenous Reserve; while the records from Conceição do Mau (Zimmer *et al.* 1997; Forrester 1992), Flexal, Limão (T. D. Carter 1927, American Museum of Natural History), and Contão (Grosset and Minns 2002) are in the Raposa Serra do Sol Indigenous Reserve.

Most gallery forests in the northern, more disturbed, area of Roraima are within indigenous reserves. Although these are not part of the Brazilian network of protected areas, indigenous people have had a much better record of maintaining the ecosystems around them than other populations in Amazonia (Fearnside 2003; Nepstad *et al.* 2006). Rice cultivation is the main threat to *C. Carbonaria* and *S. kollari* habitat. In Roraima, most rice production is carried out illegally by non-indigenous people within indigenous land (Rohter 2004). Producers have already been evicted from the São Marcos Indigenous Reserve and were required to evict from Raposa Serra do Sol, one year following its ratification on 13 April 2005. This, however, has not yet happened. In the context of the conservation of *C. carbonaria*, and especially of *S. kollari*, the ratification of Raposa Serra do Sol Indigenous Reserve provides added protection.

4. Indigenous Peoples as Conservation Actors in Amazonia: the case of Roraima, Brazil

I had a GPS, a map, and a mission – to get to the right patch of forest by the right river, without getting into trouble with either the local farmers or the indigenous communities. With luck, I would find that obscure object of my desire – the two birds I had been studying for so long but had not yet seen in the wild – birds that, actually, few scientists had seen.

The path that brought me to this far corner of the Amazon was a long one. As a doctoral student at Duke University, I had modeled how infrastructure development was destroying species' habitat throughout the Amazon and had predicted which birds were most likely join the Red List of Threatened Species in the near future. Two unlucky finalists caught my attention: the Rio Branco Antbird (*Cercomacra carbonaria*) and the Hoary-throated Spinetail (*Synallaxis kollari*). I predicted that these birds were about to lose more than half of their habitat. Both were already *Vulnerable* to extinction under the Red List of Threatened Species. They were quite particular, occurring only in some sites on the narrow strip of forest along some rivers in the northern Amazon (Remsen 2003; Zimmer & Isler 2003). They belong to the Thamnophilidae and Furnariidae bird families, whose species usually feed on insects and other invertebrates (Remsen 2003; Zimmer & Isler 2003). This was pretty much all the information available. Because specialists had insufficient data to assess their conservation status, neither species was on the Brazilian List of Threatened Fauna (Machado *et al.* 2005). If these birds were indeed about to lose so much habitat, we needed to know where and how many they were, and what was destroying their environment. I had to go to the field.

These species are restricted to Roraima state, in the northern Brazilian Amazon. Don't feel bad if you have never heard of the place. For most Brazilians, Roraima is just another remote state that only makes the news when fires destroy the forest or indigenous people occupy government buildings. Remote places, however, are full of surprises. Roraima has an astonishing landscape, with tropical forests, natural savannas, and the tablelands that made the setting for Sir Arthur Conan Doyle's novel "The Lost World."

I had a handful of records of bird occurrence, some dating back to the 1831 expedition of Austrian naturalist Johann Natterer. My number one task, of course, was to plot these records on a map. To my surprise, virtually every point fell on indigenous land. I re-checked places descriptions and geographic coordinates and there was no doubt; for some reason, scientists failed to acknowledge that their sightings were on indigenous reserves. This is, however, a very important piece of information: Roraima is indisputably the state with the toughest indigenous conflicts in all of Brazil (Ricardo 2000)! That did not discourage me a bit, however. Much on the contrary, I was ready to go and unveil every relevant detail that would allow an accurate assessment of the conservation status of these special birds. I knew I had long journey ahead – I had to elaborate a research plan, get contacts on the ground, raise the money… But the number one task was to convince my Ph.D. advisor, Professor Stuart Pimm, at Duke University that this was a sensible project. He thought it would be a waste of time and resources – I would spend years going to the field only to get one publication out of my efforts. Well, that is what it takes to discover the conservation status of a threatened species. Some other colleagues also thought it was a crazy idea – what if I did not find the damn birds?! Regardless, I knew I could do it, and I just needed to get my advisor on my side. After exhausting all rational arguments, I resorted to my advisor's weakness: "The Lost World." He had read the book as a teenager and was a big fan of it. Thanks, Conan Doyle!

4.1 The Journey

After a year of preparation, one flight to Rio de Janeiro, and another to Manaus (in the central Amazon), I finally got on a bus to Roraima. I boarded the bus at midnight, and by dawn, I saw for the first time the breathtaking Amazonian savannas. It was July, during the wet season. The grassland was bright green, and punctuated by flooded ponds and buriti palm stands. Soon afterward, I crossed the bridge over the Rio Branco, a large river that cuts through Roraima from North to South. I knew that somewhere along this river were the Rio Branco Antbird and maybe, the Hoary-throated Spinetail. They occur in the narrow strip of forest, called gallery forest that grows along the rivers that cut through the Roraima savannas. At noon, I finally reached the state's capital, Boa Vista. I had arranged to stay at the Roraima branch of INPA – the National Institute for Amazonian Research – one of Brazil's most prestigious research institutions.

The next day I left for the field, with the GPS, the map, and the mission! More than 50% of Roraima is located inside indigenous reserves. While still in the US, I had tried many times to get in contact with CIR – the Indigenous Council of Roraima – but to no avail. CIR is an indigenous organization that represents thousands of indigenous people in Roraima. I decided to start my survey in the few accessible areas outside indigenous reserves until I could get the proper authorization. I had a recording of the antbird's call from the Cornell Lab of Ornithology, and of the spinetail's call from Jeremy Minns, one of the best birdwatchers in Brazil. I started, naturally, where Natterer had collected specimens of both species, in the surroundings of Boa Vista. Things had certainly changed since the 1800's; the rivers were now quite polluted and the vegetation degraded. Not a single bird answered my calls… so I moved to my next spot, the bridge over the Rio Branco that I had crossed on my way into Roraima. The degraded patch of forest along the bridge did not look very promising. As soon as I played the recording, however, I got a call from the Rio Branco Antbird! The call got closer and closer and I finally saw the little thing, just as I knew it from museum specimens. It was black with white spots on the wing and tail and was quite angry with a supposed intruder calling inside his territory! From that moment, I knew my project was possible. After that, I recorded the antbird at two more locations and eventually found the spinetail in a more remote site.

4.2 The Conflict

This first exploratory survey gave me enough material to design a detailed research plan. I still had not met with CIR, though. After almost one month of trying, I finally got an appointment through Vicenzo Lauriola, the indigenous affairs representative at INPA. CIR's headquarters in Boa Vista had a very lively atmosphere, with colorful hammocks hanging outside, people talking in small circles, and kids running everywhere. The friendly atmosphere, however, vanished as soon as I entered the conference room. I found myself in an interrogative setting, with seven tuxauas (chiefs) in chairs lined up against the wall and my chair in the center of the room. Jacir de Souza, the head of CIR at the time said: "You called this meeting, so what do you want"? I gave a lengthy explanation of my study and my need to access some sites inside indigenous reserves. First Mr. Souza asked if these birds had any commercial value. "Well, they really don't," I answered him. Then he asked what the communities would gain from granting access to these areas. Stuttering, I explaining that as a Ph.D. student, my only capital was knowledge, and I offered to teach any biology-related topic of interest. The tuxauas were not very impressed, and Mr. Souza finally said that the community was "sick and tired" of seeing biologists come and go without ever explaining "what the hell" was their research. On top of that, he added, nobody in the community had the background to evaluate the veracity of these biologists' claims. Apparently, a few years prior, an alleged parrot specialist had talked the community into showing him nestling sites. The man turned out to be a wildlife smuggler, who stole a large number of baby parrots outside the reserves. Clearly, the tuxauas did not know me, had no reason to believe my good intentions, and, to top it all off, I had nothing of interest to offer them. As the meeting was ending, I mumbled a couple of words about the widespread conversion of the birds' habitat into irrigated rice plantations. All of a sudden, the attitude changed. "Did say rice plantations?"

Most rice farmers in Roraima are non-indigenous squatters on indigenous lands. These farmers are extremely powerful, often holding governmental offices. One of CIR's greatest struggles surrounds the ratification of Raposa Serra do Sol Indigenous Reserve. The 17,000-km^2 area is home to about 18,000 indigenous people from five ethnic groups: Macuxi, Wapichana, Ingarikó, Taurepang, and Patamona (Ricardo 2000). Unfortunately, it also has a particularly high number of illegal rice plantations. Indigenous peoples in the area have been struggling for the recognition of the reserve for over 20 years. In 1998, the federal government took the first step towards the creation of the reserve, recognizing indigenous right to the land and delimiting the area of the reserve-to-be (Ricardo 2000). Since then, however, rice farmers have used their political power to intimidate indigenous communities and obstruct the ratification of the reserve. The assault on indigenous villages by hooded men, the burning of community centers, and the destruction of crops is commonplace (Rohter 2004). When I started my fieldwork in 2003, the conflict was at its height. The body of a Macuxi man was found at a farm in Raposa Serra do Sol. The state police issued a certificate for death by undetermined natural causes. Indignant, the family requested a re-evaluation by the federal police in Brazil's capital. The new certificate revealed a death caused by gunshot (CIMI 2004). No wonder CIR had no time to spare on my request for a research license. Once the tuxauas realized, however, that they shared with these birds not only their land, but also their number one enemy – rice farmers – their interest in my research started to grow. A younger tuxaua explained how the organization had denounced bird and fish die-offs associated with pesticide use in rice farms (CIR 2003). The local authorities, however, never investigated these episodes. The meeting ended on a happier, but still unresolved note, although Vicenzo, my sole advocate, seemed quite optimistic.

4.3 Collaboration

The next day Vicenzo said that the Surumu School for Indigenous Training, at Raposa Serra do Sol, was interested in collaborating. The school is a traditional center of indigenous resistance in Roraima and Sumuru happened to be one of the sites I needed to visit. I had a meeting with the student tuxauas and we decided to have a one-day bird identification workshop at the school. A week later, I drove up the road between Boa Vista and Venezuela to Surumu. The school is one of those inspiring places that made me regain perspective and optimism. It has a two-year program where young indigenous leaders, elected by their communities, get training in sustainable agriculture and herding practices. I was immediately taken by the school's peaceful but cheerful environment. It sits on a large lot on the banks of the Surumu River. The school has great infrastructure, with classrooms, a dining hall, a library, a clinic, and dorms, with their striking profusion of multi-colored hammocks.

At 5 a.m., we were already in the field setting up nets. The students did not seem bothered at all by the early assignment. We soon started to capture birds, and I showed the students how to gently take out birds of the nets for identification. As a guide to the birds of Roraima does not exist, I brought with me a homemade field guide that I had put together from data found in more broadly defined guides. Students were giddy with excitement! To my surprise, they were unfamiliar with most of the birds, even the common ones. We ended-up spending the whole day with the activity, sharing their newly born enthusiasm for birds. At the end, the students expressed interest in having copies of my homemade field guide. They wanted to take the guides back home in order to make birds lists for their own communities. The guide I had was unsuitable. It was a very idiosyncratic list of species with only scientific names. Furthermore, I could run into serious copyright issues by distributing plates gathered from other publications. Back in the U.S., I got reproduction permission, put together the complete guide with common names, and sent it back to CIR and the Surumu

School. Several years later, I found out that Roraima's environmental agency was using the guide.

That was the first of a series of educational collaborations we had during the three years that I spent doing research in the region. As part of the Raposa Serra do Sol struggle, CIR was developing an ethno-mapping program with the help of The Nature Conservancy. The idea was to map all the sites traditionally used by the community within the reserve-to-be. CIR and I wrote a grant together, and obtained GPS units for the program. Then Bruce Bell, my field assistant from Duke University, gave a GPS workshop to teach the community how to use the units. Additionally, he helped Vicenzo to establish a small Geographic Information System facility at INPA to help with the ethno-mapping program.

4.4 Indigenous People as Conservation Actors

During these three years, I performed most of my research by boat, surveying gallery forests along almost 500 km of rivers in indigenous and non-indigenous lands. We went from a handful of records to several dozen, and now have a very good idea of the conservation status of these species. The Rio Branco Antbird is doing a bit better than I had predicted, while the Hoary-throated-Spinetail is doing significantly worse. The antbird is doing well simply because it turned out to have a larger geographical range than we previously thought. The spinetail, however, turned out to have a much more restricted range. It has about 200 km^2 of remaining habitat, or only one-fourth the size of New York City! To complicate things, it only occurs in the northern, more degraded area of Roraima. None of the spinetail's habitat is inside protected areas but almost 60% is inside indigenous reserves. That means that the species' existence is tied to the existence of these reserves. As I had predicted, the number one threat to both species is the conversion of their habitat into rice plantations. These plantations are located right at the river's edge, in order to pump the water for irrigation. During my survey, I saw countless irrigation pumps and rice fields that were once gallery forest. The plantations are illegal on two counts. First, they are located inside indigenous reserves. Second, they are right at the river's margins, which infringes on Brazilian regulations for watershed protection.

By fighting to expel rice farmers from their lands, the indigenous peoples of Roraima are fighting to preserve the remaining habitat of the Hoary-throated Spinetail – without getting any credit for it. This is often the case in the Amazon. While protected areas need large sums of money to keep their forests standing, indigenous reserves protect forests for free. Although there are some instances of indigenous people depleting their land (such as the Kayapó people's participation in mahogany logging), indigenous people have a much better record of maintaining their ecosystems than other Amazonian populations (Fearnside 2003). For indigenous communities, nature preservation is often more than a matter of culture; it is a matter of self-preservation. Therefore, indigenous people actively monitor their land and expel farmers, miners, and loggers. Their hundreds of watchful eyes are missing in protected areas.

In April 2005, the Brazilian government ratified the Raposa Serra do Sol Indigenous Reserve (JB 2005). Outraged, rice farmers threatened to retaliate with violence. Indeed, they launched an "incendiary campaign" as soon as the celebration festivities started. To my great grief, they burned down the Surumu School where we had done the bird identification workshop (CIMI 2005). Then they set a bridge on fire, cutting off access to three thousand revelers (AE 2005). The revelers soon fixed the bridge and the festivities went on for another entire month. CIR also did a campaign to raise funds for the school's reconstruction (which we contributed to), and Surumu is now stronger than ever. The battle, however, is not over yet. The Brazilian federal government has already spent US$ 6.5 million in compensation and most of the non-indigenous population has left the reserve (EQ 2007). Rice farmers, however, are still there. In September 2007, the UN Committee on the Elimination of Racial Discrimination sent a letter of concern to the Brazilian government (Chade 2007). The committee inquired about the presence of these rice farmers and the continuation of their production activities almost three years after the ratification of the reserve. It also expressed concern over the chronic impunity in cases of violence against indigenous people. In the same month, CIR and eight other indigenous organizations of Roraima signed an agreement with the federal government with a commitment to a rapid and non-violent eviction of the rice farmers of Raposa Serra do Sol (EQ 2007).

4.5 Conservation in the Real World

As I approach the end of my Ph.D. I am looking back at my journey. As Stuart predicted, I spent years going to the field, only to get one publication out of my efforts. That publication finally gave specialists sufficient data to add the Rio Branco Antbird and the Hoary-throated Spinetail to the Brazilian List of Threatened Fauna. I hope they soon will. Recognizing species threat, however, is only the first step towards saving it from extinction. The next and decisive step is to eradicate the causes of threat. This is where biologists often get lost. We care deeply for the organisms we study but don't want to get involved with the complicated issues that will ultimately determine their fate. After all, getting involved takes time away from our research and requires skills that we often don't have. Unfortunately, however, we don't have a choice anymore. During Natterer's times, naturalists would sail around the tropics unveiling the marvels of the natural world. Each new site would entail novel species and theories on how all this biodiversity came about. Nowadays, we can hardly find our study organism. We often resort to Google Earth to find a little patch of forest where we can conduct the research. Then we get to the field and are confronted with all kinds of extraneous issues – the plane can't land because of smog from forest fires; the government has canceled research permits in a bio-piracy scare; landless peasants have blocked the road demanding agrarian reform; drug traffickers have blown-up all bridges to restrict access to coca plantations… Today, doing biological research in the field without getting involved has become a luxury. We can't keep coming and going without ever explaining "what the hell" we are researching. We can't publish our results and hope that people will divert their attention from all these issues and suddenly care for two little birds with no commercial value. Getting involved might take time away from research, but it might also do more for the survival of our study organism than the actual research ever would.

That first day at CIR, I asked the tuxauas to give me the chance to take the first step and demonstrate that the Rio Branco Antbird and the Hoary-throated Spinetail are threatened. At the time, neither party knew that the tuxauas and the communities they represent were already taking the next step; they were eradicating the causes of that threat. At the end of my journey, I came to realize that my most concrete contribution has been to acknowledge the vital role that these communities are playing in the conservation of two threatened and endemic birds of Roraima.

Appendices

Appendix A: List of Bird Species with Range Sizes

List of native terrestrial bird species occurring in the Amazon (AMZ) and/or the Atlantic forests (ATL). 1 = species occurring but neither small-ranged nor endemic, 2 = small-ranged species, 3 = endemic species. RIV = Amazonian riverine species. The information was compiled from Ridgely *et al.* (2003) distribution maps and is sorted alphabetically by Family name.

Scientific Name	Family	AMZ	ATL	Range (km²)
Accipiter bicolor	Accipitridae	1	1	14,385,114
Accipiter collaris	Accipitridae	2	0	21,627
Accipiter poliogaster	Accipitridae	1	1	7,340,651
Accipiter striatus	Accipitridae	1	1	16,375,609
Accipiter superciliosus	Accipitridae	1	1	8,560,171
Asturina nitida	Accipitridae	1	1	11,260,175
Busarellus nigricollis	Accipitridae	1	1	8,550,893
Buteo albicaudatus	Accipitridae	1	1	9,467,463
Buteo albonotatus	Accipitridae	1	1	5,793,810
Buteo brachyurus	Accipitridae	1	1	14,372,505
Buteo leucorrhous	Accipitridae	1	1	1,189,735
Buteo magnirostris	Accipitridae	1	1	15,042,837
Buteo polyosoma	Accipitridae	1	0	3,164,580
Buteogallus aequinoctialis	Accipitridae	2	2	161,029
Buteogallus anthracinus	Accipitridae	1	0	1,381,640
Buteogallus meridionalis	Accipitridae	1	1	10,449,900
Buteogallus urubitinga	Accipitridae	1	1	13,125,071
Chondrohierax uncinatus	Accipitridae	1	1	9,787,521
Circus buffoni	Accipitridae	1	1	6,089,975
Circus cinereus	Accipitridae	1	1	3,642,880
Elanoides forficatus	Accipitridae	1	1	11,972,793
Elanus leucurus	Accipitridae	1	1	9,396,870
Gampsonyx swainsonii	Accipitridae	1	1	10,220,960
Geranoaetus melanoleucus	Accipitridae	1	1	6,808,003
Geranospiza caerulescens	Accipitridae	1	1	14,541,072
Harpagus bidentatus	Accipitridae	1	1	8,956,177
Harpagus diodon	Accipitridae	1	1	3,725,132
Harpia harpyja	Accipitridae	1	1	6,973,625
Harpyhaliaetus coronatus	Accipitridae	1	1	3,773,861
Harpyhaliaetus solitarius	Accipitridae	2	0	450,768
Ictinia plumbea	Accipitridae	1	1	13,070,262
Leptodon cayanensis	Accipitridae	1	1	12,071,718
Leucopternis albicollis	Accipitridae	1	1	7,615,868
Leucopternis kuhli	Accipitridae	3	0	2,375,302
Leucopternis lacernulatus	Accipitridae	0	2,3	277,181
Leucopternis melanops	Accipitridae	3	0	2,570,819
Leucopternis polionotus	Accipitridae	0	3	639,902
Leucopternis princeps	Accipitridae	2	0	113,390
Leucopternis schistaceus	Accipitridae	1	0	3,833,153
Morphnus guianensis	Accipitridae	1	1	4,775,907
Oroaetus isidori	Accipitridae	2	0	182,260
Parabuteo unicinctus	Accipitridae	1	1	5,974,316
Rostrhamus hamatus	Accipitridae	1	0	2,223,551

Rostrhamus sociabilis	Accipitridae	1	1	11,475,397
Spizaetus ornatus	Accipitridae	1	1	9,433,671
Spizaetus tyrannus	Accipitridae	1	1	8,302,883
Spizastur melanoleucus	Accipitridae	1	1	8,073,973
Ceryle torquatus	Alcedinidae	1	1	16,638,648
Chloroceryle aenea	Alcedinidae	1	1	9,332,216
Chloroceryle amazona	Alcedinidae	1	1	14,157,081
Chloroceryle americana	Alcedinidae	1	1	16,945,303
Chloroceryle inda	Alcedinidae	1	1	8,573,821
Amazonetta brasiliensis	Anatidae	1	1	8,743,695
Anas bahamensis	Anatidae	1	1	2,992,034
Anas cyanoptera	Anatidae	1	0	6,912,495
Anas discors	Anatidae	1	1	8,509,249
Anas flavirostris	Anatidae	1	1	3,857,614
Anas georgica	Anatidae	1	1	4,190,941
Anas platalea	Anatidae	1	1	2,949,192
Anas puna	Anatidae	1	0	586,051
Anas sibilatrix	Anatidae	0	1	2,182,210
Anas versicolor	Anatidae	0	1	3,094,241
Aythya affinis	Anatidae	1	0	5,126,983
Cairina moschata	Anatidae	1	1	13,898,345
Callonetta leucophrys	Anatidae	1	1	1,310,243
Chloephaga melanoptera	Anatidae	1	0	1,077,757
Coscoroba coscoroba	Anatidae	0	1	2,500,348
Cygnus melancoryphus	Anatidae	0	1	2,130,927
Dendrocygna autumnalis	Anatidae	1	1	9,298,269
Dendrocygna bicolor	Anatidae	1	1	4,295,097
Dendrocygna viduata	Anatidae	1	1	8,110,508
Heteronetta atricapilla	Anatidae	0	1	1,954,260
Lophonetta specularioides	Anatidae	1	0	1,843,867
Merganetta armata	Anatidae	1	0	1,090,319
Mergus octosetaceus	Anatidae	0	1	776,156
Neochen jubata	Anatidae	1	0	4,364,056
Netta erythrophthalma	Anatidae	1	1	2,399,666
Netta peposaca	Anatidae	0	1	2,792,327
Nomonyx dominicus	Anatidae	1	1	8,398,583
Oxyura ferruginea	Anatidae	1	0	1,278,453
Sarkidiornis melanotos	Anatidae	1	1	5,433,523
Anhima cornuta	Anhimidae	1	1	9,918,335
Chauna torquata	Anhimidae	1	1	3,503,614
Anhinga anhinga	Anhingidae	1	1	14,693,813
Aeronautes andecolus	Apodidae	1	0	891,296
Aeronautes montivagus	Apodidae	1	0	704,271
Chaetura brachyura	Apodidae	1	0	7,462,328
Chaetura chapmani	Apodidae	1	0	2,713,523
Chaetura cinereiventris	Apodidae	1	1	6,092,563
Chaetura egregia	Apodidae	3	0	1,756,674
Chaetura meridionalis	Apodidae	1	1	5,066,426
Chaetura spinicaudus	Apodidae	1	1	3,142,422
Chaetura viridipennis	Apodidae	1	0	1,991,145
Cypseloides cryptus	Apodidae	2	0	288,691
Cypseloides fumigatus	Apodidae	0	1	792,940
Cypseloides lemosi	Apodidae	2	0	26,045
Cypseloides senex	Apodidae	1	1	2,015,321
Panyptila cayennensis	Apodidae	1	1	8,540,680
Streptoprocne biscutata	Apodidae	0	1	1,247,808
Streptoprocne phelpsi	Apodidae	2	0	249,496
Streptoprocne rutila	Apodidae	1	0	1,386,667
Streptoprocne zonaris	Apodidae	1	1	8,314,629
Tachornis squamata	Apodidae	1	1	9,480,963
Aramus guarauna	Aramidae	1	1	12,272,377
Agamia agami	Ardeidae	1	0	7,839,991
Ardea alba	Ardeidae	1	1	18,551,137
Ardea cocoi	Ardeidae	1	1	14,798,855
Botaurus pinnatus	Ardeidae	1	1	2,182,774
Bubulcus ibis	Ardeidae	1	1	17,910,476
Butorides striata	Ardeidae	1	1	14,584,577

Butorides virescens	Ardeidae	1	0	7,925,336
Cochlearius cochlearius	Ardeidae	1	1	11,641,773
Egretta caerulea	Ardeidae	1	1	5,632,062
Egretta thula	Ardeidae	1	1	17,603,992
Egretta tricolor	Ardeidae	1	0	1,310,249
Ixobrychus exilis	Ardeidae	1	1	6,223,415
Ixobrychus involucris	Ardeidae	1	1	2,400,048
Nyctanassa violacea	Ardeidae	1	1	4,196,329
Nycticorax nycticorax	Ardeidae	1	1	19,867,899
Pilherodius pileatus	Ardeidae	1	1	10,270,879
Syrigma sibilatrix	Ardeidae	1	1	4,235,351
Tigrisoma fasciatum	Ardeidae	1	1	1,359,752
Tigrisoma lineatum	Ardeidae	1	1	13,077,482
Zebrilus undulatus	Ardeidae	1	0	5,811,823
Bucco capensis	Bucconidae	3	1	5,282,603
Bucco macrodactylus	Bucconidae	3	0	3,329,755
Bucco tamatia	Bucconidae	3	1	4,349,372
Chelidoptera tenebrosa	Bucconidae	1	1	9,064,225
Hapaloptila castanea	Bucconidae	2	0	19,385
Hypnelus ruficollis	Bucconidae	1	0	832,172
Malacoptila fulvogularis	Bucconidae	2	0	95,217
Malacoptila fusca	Bucconidae	3	0	1,912,033
Malacoptila rufa	Bucconidae	3	0	2,585,040
Malacoptila semicincta	Bucconidae	3	0	649,539
Malacoptila striata	Bucconidae	0	3	759,205
Micromonacha lanceolata	Bucconidae	1	0	1,646,311
Monasa atra	Bucconidae	3	0	1,731,256
Monasa flavirostris	Bucconidae	3	0	785,434
Monasa morphoeus	Bucconidae	1	1	4,915,067
Monasa nigrifrons	Bucconidae	1	1	5,929,662
Nonnula amaurocephala	Bucconidae	2,3	0	25,182
Nonnula brunnea	Bucconidae	2,3	0	251,219
Nonnula rubecula	Bucconidae	1	1	3,844,966
Nonnula ruficapilla	Bucconidae	3	0	2,841,156
Nonnula sclateri	Bucconidae	3	0	642,844
Notharchus hyperrhynchus	Bucconidae	1	0	5,241,282
Notharchus macrorhynchos	Bucconidae	1	0	871,882
Notharchus ordii	Bucconidae	2,3	0	281,101
Notharchus swainsoni	Bucconidae	0	1	927,755
Notharchus tectus	Bucconidae	1	1	5,331,354
Nystalus chacuru	Bucconidae	1	1	4,161,149
Nystalus maculatus	Bucconidae	1	1	3,577,863
Nystalus striolatus	Bucconidae	3	0	2,385,107
Burhinus bistriatus	Burhinidae	1	0	842,468
Capito auratus	Capitonidae	1	0	3,131,022
Capito aurovirens	Capitonidae	3	0	1,112,319
Capito brunneipectus	Capitonidae	2	0	105,841
Capito dayi	Capitonidae	3	0	1,182,894
Capito niger	Capitonidae	3	0	1,094,508
Eubucco bourcierii	Capitonidae	2	0	233,214
Eubucco richardsoni	Capitonidae	3	0	1,909,303
Eubucco tucinkae	Capitonidae	2,3	0	177,647
Eubucco versicolor	Capitonidae	2	0	171,671
Caprimulgus cayennensis	Caprimulgidae	1	0	1,522,591
Caprimulgus hirundinaceus	Caprimulgidae	0	1	554,246
Caprimulgus longirostris	Caprimulgidae	1	1	4,585,121
Caprimulgus maculicaudus	Caprimulgidae	1	1	3,304,891
Caprimulgus nigrescens	Caprimulgidae	1	0	4,123,603
Caprimulgus parvulus	Caprimulgidae	1	1	7,062,180
Caprimulgus rufus	Caprimulgidae	1	1	5,391,344
Caprimulgus sericocaudatus	Caprimulgidae	1	1	1,075,625
Caprimulgus whitelyi	Caprimulgidae	2	0	37,233
Chordeiles acutipennis	Caprimulgidae	1	1	2,107,616
Chordeiles pusillus	Caprimulgidae	1	1	3,874,347
Chordeiles rupestris	Caprimulgidae	1	0	1,639,512
Eleothreptus anomalus	Caprimulgidae	0	1	910,233
Hydropsalis climacocerca	Caprimulgidae	3	0	5,855,956

Hydropsalis torquata	Caprimulgidae	1	1	7,852,108
Lurocalis rufiventris	Caprimulgidae	2	0	222,350
Lurocalis semitorquatus	Caprimulgidae	1	1	8,387,625
Macropsalis forcipata	Caprimulgidae	0	3	517,255
Nyctidromus albicollis	Caprimulgidae	1	1	13,748,497
Nyctiphrynus ocellatus	Caprimulgidae	1	1	3,388,287
Nyctiprogne leucopyga	Caprimulgidae	1	0	4,417,285
Podager nacunda	Caprimulgidae	1	1	12,270,729
Uropsalis lyra	Caprimulgidae	2	0	231,629
Uropsalis segmentata	Caprimulgidae	2	0	221,936
Caryothraustes canadensis	Cardinalidae	1	1	2,746,144
Cyanocompsa brissonii	Cardinalidae	1	1	5,851,868
Cyanocompsa cyanoides	Cardinalidae	1	1	7,475,782
Cyanoloxia glaucocaerulea	Cardinalidae	0	1	683,558
Gubernatrix cristata	Cardinalidae	0	1	1,073,233
Parkerthraustes humeralis	Cardinalidae	3	0	1,813,726
Paroaria baeri	Cardinalidae	2	0	76,860
Paroaria capitata	Cardinalidae	0	1	1,231,286
Paroaria coronata	Cardinalidae	1	1	2,348,666
Paroaria dominicana	Cardinalidae	1	1	1,212,743
Paroaria gularis	Cardinalidae	1	1	4,878,788
Periporphyrus erythromelas	Cardinalidae	3	1	872,769
Pheucticus aureoventris	Cardinalidae	1	0	810,152
Pheucticus chrysogaster	Cardinalidae	2	0	348,951
Saltator atricollis	Cardinalidae	1	1	2,746,676
Saltator aurantiirostris	Cardinalidae	1	0	2,474,151
Saltator coerulescens	Cardinalidae	1	1	10,132,538
Saltator fuliginosus	Cardinalidae	0	3	760,141
Saltator grossus	Cardinalidae	1	1	6,242,998
Saltator maxillosus	Cardinalidae	0	2,3	436,871
Saltator maximus	Cardinalidae	1	1	9,544,528
Saltator orenocensis	Cardinalidae	2	0	408,358
Saltator similis	Cardinalidae	1	1	3,043,354
Saltator striatipectus	Cardinalidae	1	0	859,387
Cariama cristata	Cariamidae	1	1	5,848,980
Cathartes aura	Cathartidae	1	1	28,198,625
Cathartes burrovianus	Cathartidae	1	1	7,820,962
Cathartes melambrotus	Cathartidae	3	0	6,652,380
Coragyps atratus	Cathartidae	1	1	20,938,619
Sarcoramphus papa	Cathartidae	1	1	13,760,766
Charadrius alticola	Charadriidae	1	0	605,183
Charadrius collaris	Charadriidae	1	1	14,988,384
Charadrius wilsonia	Charadriidae	1	1	849,427
Hoploxypterus cayanus	Charadriidae	1	1	11,467,423
Oreopholus ruficollis	Charadriidae	0	1	2,310,330
Vanellus chilensis	Charadriidae	1	1	12,717,188
Vanellus resplendens	Charadriidae	1	0	734,769
Ciconia maguari	Ciconiidae	1	1	5,197,127
Jabiru mycteria	Ciconiidae	1	1	6,907,875
Mycteria americana	Ciconiidae	1	1	13,936,528
Cinclus leucocephalus	Cinclidae	1	0	619,975
Coereba flaveola	Coerebidae	1	1	10,806,786
Claravis godefrida	Columbidae	0	3	662,864
Claravis pretiosa	Columbidae	1	1	12,977,680
Columbina cyanopis	Columbidae	0	2	293,339
Columbina minuta	Columbidae	1	1	7,034,947
Columbina passerina	Columbidae	1	1	6,761,998
Columbina picui	Columbidae	1	1	5,555,970
Columbina squammata	Columbidae	1	1	4,813,334
Columbina talpacoti	Columbidae	1	1	14,617,016
Geotrygon frenata	Columbidae	2	0	442,925
Geotrygon linearis	Columbidae	2	0	162,084
Geotrygon montana	Columbidae	1	1	10,342,190
Geotrygon saphirina	Columbidae	2	0	263,978
Geotrygon violacea	Columbidae	1	1	1,478,806
Leptotila megalura	Columbidae	2	0	147,307
Leptotila rufaxilla	Columbidae	1	1	11,668,034

Leptotila verreauxi	Columbidae	1	1	13,409,575
Metriopelia ceciliae	Columbidae	1	0	490,069
Metriopelia melanoptera	Columbidae	1	0	1,473,860
Patagioenas cayennensis	Columbidae	1	1	13,517,163
Patagioenas fasciata	Columbidae	1	0	3,308,047
Patagioenas maculosa	Columbidae	1	0	2,369,536
Patagioenas picazuro	Columbidae	1	1	5,828,401
Patagioenas plumbea	Columbidae	1	1	6,564,853
Patagioenas speciosa	Columbidae	1	1	9,715,621
Patagioenas subvinacea	Columbidae	1	1	6,896,402
Uropelia campestris	Columbidae	1	1	1,782,362
Zenaida auriculata	Columbidae	1	1	11,531,108
Conopophaga ardesiaca	Conopophagidae	2	0	100,325
Conopophaga aurita	Conopophagidae	3	1	3,258,762
Conopophaga castaneiceps	Conopophagidae	2	0	160,632
Conopophaga lineata	Conopophagidae	0	3	1,879,941
Conopophaga melanogaster	Conopophagidae	3	0	911,155
Conopophaga melanops	Conopophagidae	0	2,3	242,671
Conopophaga peruviana	Conopophagidae	3	0	1,098,599
Conopophaga roberti	Conopophagidae	1	0	686,636
Cyanocorax caeruleus	Corvidae	0	3	518,879
Cyanocorax cayanus	Corvidae	3	0	1,160,987
Cyanocorax chrysops	Corvidae	1	1	2,831,198
Cyanocorax cristatellus	Corvidae	1	1	2,902,753
Cyanocorax cyanomelas	Corvidae	1	1	1,594,230
Cyanocorax cyanopogon	Corvidae	1	1	3,068,149
Cyanocorax heilprini (RIV)	Corvidae	2,3	0	140,726
Cyanocorax violaceus	Corvidae	3	0	3,381,162
Cyanocorax yncas	Corvidae	1	0	1,092,574
Cyanolyca armillata	Corvidae	2	0	96,608
Cyanolyca viridicyanus	Corvidae	2	0	133,353
Ampelioides tschudii	Cotingidae	2	0	200,540
Ampelion rubrocristatus	Cotingidae	2	0	413,410
Calyptura cristata	Cotingidae	0	2,3	13,615
Carpornis cucullata	Cotingidae	0	2,3	251,728
Carpornis melanocephala	Cotingidae	0	2,3	188,208
Cephalopterus ornatus	Cotingidae	1	0	5,505,890
Conioptilon mcilhennyi	Cotingidae	2,3	0	146,135
Cotinga cayana	Cotingidae	3	1	6,352,974
Cotinga cotinga	Cotingidae	3	0	1,870,234
Cotinga maculata	Cotingidae	0	2,3	83,208
Cotinga maynana	Cotingidae	3	0	2,547,209
Doliornis sclateri	Cotingidae	2	0	13,034
Gymnoderus foetidus	Cotingidae	3	0	5,252,110
Haematoderus militaris	Cotingidae	3	0	1,020,317
Lipaugus lanioides	Cotingidae	0	2,3	203,277
Lipaugus streptophorus	Cotingidae	2	0	47,371
Lipaugus vociferans	Cotingidae	1	1	7,063,018
Perissocephalus tricolor	Cotingidae	3	0	1,655,157
Phoenicircus carnifex	Cotingidae	3	1	1,387,058
Phoenicircus nigricollis	Cotingidae	3	0	1,720,908
Pipreola arcuata	Cotingidae	2	0	258,680
Pipreola chlorolepidota	Cotingidae	2	0	83,530
Pipreola frontalis	Cotingidae	2	0	93,424
Pipreola intermedia	Cotingidae	2	0	75,631
Pipreola lubomirskii	Cotingidae	2	0	28,329
Pipreola pulchra	Cotingidae	2	0	37,024
Pipreola riefferii	Cotingidae	2	0	256,139
Pipreola whitelyi	Cotingidae	2	0	24,789
Porphyrolaema porphyrolaema	Cotingidae	3	0	2,187,287
Procnias albus	Cotingidae	1	0	505,075
Procnias averano	Cotingidae	1	1	966,788
Procnias nudicollis	Cotingidae	0	3	1,455,488
Pyroderus scutatus	Cotingidae	1	1	2,116,649
Querula purpurata	Cotingidae	1	0	5,636,288
Rupicola peruvianus	Cotingidae	2	0	257,299
Rupicola rupicola	Cotingidae	1	0	1,710,896

Snowornis cryptolophus	Cotingidae	2	0	92,422
Snowornis subalaris	Cotingidae	2	0	22,402
Tijuca atra	Cotingidae	0	2,3	31,553
Xipholena atropurpurea	Cotingidae	0	2,3	105,758
Xipholena lamellipennis	Cotingidae	3	0	1,007,781
Xipholena punicea	Cotingidae	3	0	3,623,887
Aburria aburri	Cracidae	2	0	139,296
Chamaepetes goudotii	Cracidae	2	0	279,407
Crax alector	Cracidae	3	0	2,099,421
Crax blumenbachii	Cracidae	0	2,3	219,381
Crax daubentoni	Cracidae	2	0	364,710
Crax fasciolata	Cracidae	1	1	3,699,470
Crax globulosa	Cracidae	3	0	1,505,313
Mitu mitu	Cracidae	0	2,3	9,147
Mitu salvini	Cracidae	1	0	490,121
Mitu tomentosum	Cracidae	3	0	1,247,565
Mitu tuberosum	Cracidae	3	0	3,901,993
Nothocrax urumutum	Cracidae	3	0	1,026,906
Ortalis canicollis	Cracidae	0	1	1,171,727
Ortalis guttata	Cracidae	1	1	3,881,499
Ortalis motmot	Cracidae	3	0	2,134,681
Ortalis ruficauda	Cracidae	2	0	474,249
Ortalis superciliaris	Cracidae	2	0	346,515
Pauxi unicornis	Cracidae	2	0	7,203
Penelope argyrotis	Cracidae	2	0	88,747
Penelope jacquacu	Cracidae	3	0	5,007,152
Penelope jacucaca	Cracidae	0	1	617,589
Penelope marail	Cracidae	3	0	1,217,959
Penelope montagnii	Cracidae	2	0	368,407
Penelope obscura	Cracidae	1	1	1,012,796
Penelope ochrogaster	Cracidae	1	1	620,173
Penelope pileata	Cracidae	2,3	0	389,524
Penelope purpurascens	Cracidae	1	0	1,219,470
Penelope superciliaris	Cracidae	1	1	5,614,374
Pipile jacutinga	Cracidae	0	3	815,420
Pipile pipile	Cracidae	1	1	6,483,620
Coccyzus cinereus	Cuculidae	0	1	2,258,812
Coccyzus euleri	Cuculidae	1	1	9,036,276
Coccyzus melacoryphus	Cuculidae	1	1	14,059,402
Coccyzus minor	Cuculidae	1	0	897,276
Coccyzus pumilus	Cuculidae	1	0	647,662
Crotophaga ani	Cuculidae	1	1	14,116,572
Crotophaga major	Cuculidae	1	1	12,114,426
Crotophaga sulcirostris	Cuculidae	1	0	2,665,529
Dromococcyx pavoninus	Cuculidae	1	1	3,082,050
Dromococcyx phasianellus	Cuculidae	1	1	8,845,014
Guira guira	Cuculidae	1	1	7,687,629
Neomorphus geoffroyi	Cuculidae	1	1	611,754
Neomorphus pucheranii	Cuculidae	3	0	1,098,657
Neomorphus rufipennis	Cuculidae	3	0	594,190
Neomorphus squamiger	Cuculidae	3	0	2,232,823
Piaya cayana	Cuculidae	1	1	14,262,506
Piaya melanogaster	Cuculidae	3	0	4,840,299
Piaya minuta	Cuculidae	1	1	8,753,978
Tapera naevia	Cuculidae	1	1	12,345,244
Campylorhamphus falcularius	Dendrocolaptidae	0	3	876,885
Campylorhamphus procurvoides	Dendrocolaptidae	3	0	3,450,148
Campylorhamphus pucherani	Dendrocolaptidae	2	0	23,728
Campylorhamphus pusillus	Dendrocolaptidae	2	0	177,593
Campylorhamphus trochilirostris	Dendrocolaptidae	1	1	7,392,723
Deconychura longicauda	Dendrocolaptidae	1	1	5,123,874
Deconychura stictolaema	Dendrocolaptidae	3	0	2,839,148
Dendrexetastes rufigula	Dendrocolaptidae	3	1	3,200,673
Dendrocincla fuliginosa	Dendrocolaptidae	1	1	8,458,324
Dendrocincla merula	Dendrocolaptidae	3	1	5,358,239
Dendrocincla turdina	Dendrocolaptidae	0	3	1,216,336
Dendrocincla tyrannina	Dendrocolaptidae	2	0	201,215

Dendrocolaptes certhia	Dendrocolaptidae	1	1	6,659,253
Dendrocolaptes hoffmannsi	Dendrocolaptidae	3	0	862,880
Dendrocolaptes picumnus	Dendrocolaptidae	1	1	5,736,769
Dendrocolaptes platyrostris	Dendrocolaptidae	1	1	3,762,028
Glyphorynchus spirurus	Dendrocolaptidae	1	1	7,196,428
Hylexetastes brigidai	Dendrocolaptidae	2	0	326,294
Hylexetastes perrotii	Dendrocolaptidae	3	0	1,087,284
Hylexetastes stresemanni	Dendrocolaptidae	3	0	1,120,018
Hylexetastes uniformis	Dendrocolaptidae	1	0	1,068,089
Lepidocolaptes albolineatus	Dendrocolaptidae	3	1	6,259,158
Lepidocolaptes angustirostris	Dendrocolaptidae	1	1	6,576,322
Lepidocolaptes falcinellus	Dendrocolaptidae	0	2	435,584
Lepidocolaptes lacrymiger	Dendrocolaptidae	2	0	360,595
Lepidocolaptes souleyetii	Dendrocolaptidae	1	0	1,349,597
Lepidocolaptes squamatus	Dendrocolaptidae	0	3	745,611
Nasica longirostris	Dendrocolaptidae	3	1	5,357,328
Sittasomus griseicapillus	Dendrocolaptidae	1	1	11,995,777
Xiphocolaptes albicollis	Dendrocolaptidae	0	1	2,097,458
Xiphocolaptes major	Dendrocolaptidae	1	1	1,461,588
Xiphocolaptes promeropirhynchus	Dendrocolaptidae	1	0	4,644,606
Xiphorhynchus elegans	Dendrocolaptidae	3	0	2,951,359
Xiphorhynchus eytoni	Dendrocolaptidae	3	0	1,708,340
Xiphorhynchus fuscus	Dendrocolaptidae	0	3	2,238,738
Xiphorhynchus guttatus	Dendrocolaptidae	1	1	6,521,168
Xiphorhynchus kienerii (RIV)	Dendrocolaptidae	2,3	0	219,303
Xiphorhynchus obsoletus	Dendrocolaptidae	3	1	6,661,704
Xiphorhynchus ocellatus	Dendrocolaptidae	1	0	2,806,421
Xiphorhynchus pardalotus	Dendrocolaptidae	1	0	1,710,307
Xiphorhynchus picus	Dendrocolaptidae	1	1	9,830,615
Xiphorhynchus spixii	Dendrocolaptidae	1	0	637,147
Xiphorhynchus susurrans	Dendrocolaptidae	1	0	611,424
Xiphorhynchus triangularis	Dendrocolaptidae	2	0	286,417
Amaurospiza moesta	Emberizidae	0	3	605,323
Ammodramus aurifrons	Emberizidae	1	0	3,867,505
Ammodramus humeralis	Emberizidae	1	1	8,728,990
Arremon aurantiirostris	Emberizidae	1	0	693,938
Arremon flavirostris	Emberizidae	1	1	2,104,691
Arremon franciscanus	Emberizidae	0	2	56,081
Arremon semitorquatus	Emberizidae	0	2,3	144,480
Arremon taciturnus	Emberizidae	1	1	6,904,105
Arremonops conirostris	Emberizidae	1	0	1,131,741
Atlapetes canigenis	Emberizidae	2	0	5,553
Atlapetes latinuchus	Emberizidae	2	0	177,600
Atlapetes melanolaemus	Emberizidae	2	0	16,046
Atlapetes melanopsis	Emberizidae	2	0	2,511
Atlapetes personatus	Emberizidae	2	0	100,635
Atlapetes schistaceus	Emberizidae	2	0	160,904
Atlapetes tricolor	Emberizidae	2	0	73,018
Buarremon brunneinucha	Emberizidae	1	0	615,911
Buarremon torquatus	Emberizidae	2	0	458,970
Catamenia analis	Emberizidae	1	0	1,027,757
Catamenia homochroa	Emberizidae	2	0	283,917
Catamenia inornata	Emberizidae	1	0	801,495
Charitospiza eucosma	Emberizidae	1	1	2,067,680
Coryphaspiza melanotis	Emberizidae	1	1	1,355,972
Coryphospingus cucullatus	Emberizidae	1	1	4,042,904
Coryphospingus pileatus	Emberizidae	1	1	2,757,824
Diglossa albilatera	Emberizidae	2	0	240,087
Diglossa brunneiventris	Emberizidae	2	0	317,815
Diglossa caerulescens	Emberizidae	2	0	266,469
Diglossa carbonaria	Emberizidae	2	0	70,103
Diglossa cyanea	Emberizidae	2	0	381,287
Diglossa duidae	Emberizidae	2	0	104,472
Diglossa glauca	Emberizidae	2	0	114,794
Diglossa major	Emberizidae	2	0	31,560
Diglossa mystacalis	Emberizidae	2	0	121,306
Diglossa sittoides	Emberizidae	1	0	593,607

Diuca speculifera	Emberizidae	2	0	208,447
Dolospingus fringilloides (RIV)	Emberizidae	2,3	0	322,809
Donacospiza albifrons	Emberizidae	1	1	1,671,370
Emberizoides herbicola	Emberizidae	1	1	5,051,581
Emberizoides ypiranganus	Emberizidae	0	1	531,781
Embernagra longicauda	Emberizidae	0	2	145,001
Embernagra platensis	Emberizidae	1	1	2,736,220
Haplospiza rustica	Emberizidae	2	0	477,951
Haplospiza unicolor	Emberizidae	0	3	977,457
Lophospingus griseocristatus	Emberizidae	2	0	84,840
Lysurus castaneiceps	Emberizidae	2	0	68,801
Oryzoborus angolensis	Emberizidae	1	1	12,133,178
Oryzoborus atrirostris	Emberizidae	2	0	201,075
Oryzoborus crassirostris	Emberizidae	1	1	2,533,692
Oryzoborus maximiliani	Emberizidae	1	1	1,528,740
Phrygilus alaudinus	Emberizidae	1	0	679,821
Phrygilus fruticeti	Emberizidae	1	0	1,791,164
Phrygilus plebejus	Emberizidae	1	0	950,553
Phrygilus punensis	Emberizidae	2	0	309,668
Phrygilus unicolor	Emberizidae	1	0	1,357,929
Poospiza caesar	Emberizidae	2	0	32,345
Poospiza cinerea	Emberizidae	0	1	763,788
Poospiza erythrophrys	Emberizidae	2	0	80,120
Poospiza lateralis	Emberizidae	0	1	660,220
Poospiza melanoleuca	Emberizidae	1	1	1,482,680
Poospiza nigrorufa	Emberizidae	0	1	1,477,906
Poospiza thoracica	Emberizidae	0	2,3	77,560
Poospiza torquata	Emberizidae	1	0	955,745
Porphyrospiza caerulescens	Emberizidae	1	1	1,531,600
Sicalis citrina	Emberizidae	1	1	1,436,195
Sicalis columbiana	Emberizidae	1	1	1,494,456
Sicalis flaveola	Emberizidae	1	1	6,542,016
Sicalis luteola	Emberizidae	1	1	2,711,951
Sicalis olivascens	Emberizidae	1	0	955,818
Sicalis uropygialis	Emberizidae	1	0	705,518
Sporophila albogularis	Emberizidae	0	1	910,942
Sporophila americana	Emberizidae	1	0	638,258
Sporophila bouvreuil	Emberizidae	1	1	3,930,602
Sporophila bouvronides	Emberizidae	1	0	638,487
Sporophila caerulescens	Emberizidae	1	1	7,990,281
Sporophila castaneiventris	Emberizidae	3	0	3,489,663
Sporophila collaris	Emberizidae	1	1	3,264,779
Sporophila falcirostris	Emberizidae	0	2,3	395,929
Sporophila frontalis	Emberizidae	0	2,3	438,602
Sporophila hypochroma	Emberizidae	0	2	196,681
Sporophila hypoxantha	Emberizidae	1	1	2,492,516
Sporophila intermedia	Emberizidae	1	0	1,371,523
Sporophila leucoptera	Emberizidae	1	1	3,777,197
Sporophila lineola	Emberizidae	1	1	2,572,112
Sporophila luctuosa	Emberizidae	1	0	524,724
Sporophila melanogaster	Emberizidae	0	2,3	113,073
Sporophila minuta	Emberizidae	1	1	2,242,981
Sporophila murallae	Emberizidae	1	0	957,962
Sporophila nigricollis	Emberizidae	1	1	7,194,550
Sporophila nigrorufa	Emberizidae	2	0	267,151
Sporophila palustris	Emberizidae	0	1	530,724
Sporophila plumbea	Emberizidae	1	1	4,739,510
Sporophila ruficollis	Emberizidae	0	1	1,365,909
Sporophila schistacea	Emberizidae	1	0	1,535,672
Sporophila simplex	Emberizidae	2	0	95,338
Volatinia jacarina	Emberizidae	1	1	15,247,787
Zonotrichia capensis	Emberizidae	1	1	11,340,287
Eurypyga helias	Eurypygidae	1	1	8,422,459
Caracara cheriway	Falconidae	1	1	4,279,012
Caracara plancus	Falconidae	1	1	8,891,920
Daptrius ater	Falconidae	3	0	6,701,794
Falco deiroleucus	Falconidae	1	1	3,251,089

Falco femoralis	Falconidae	1	1	12,686,483
Falco peregrinus	Falconidae	1	0	8,870,154
Falco rufigularis	Falconidae	1	1	13,377,470
Falco sparverius	Falconidae	1	1	24,153,607
Herpetotheres cachinnans	Falconidae	1	1	12,964,711
Ibycter americanus	Falconidae	1	1	8,442,065
Micrastur buckleyi	Falconidae	3	0	619,557
Micrastur gilvicollis	Falconidae	3	0	4,251,501
Micrastur mintoni	Falconidae	1	0	1,839,654
Micrastur mirandollei	Falconidae	1	1	5,297,748
Micrastur ruficollis	Falconidae	1	1	12,393,166
Micrastur semitorquatus	Falconidae	1	1	13,182,445
Milvago chimachima	Falconidae	1	1	11,196,550
Milvago chimango	Falconidae	0	1	3,230,534
Phalcoboenus megalopterus	Falconidae	1	0	1,011,372
Chamaeza campanisona	Formicariidae	1	1	1,779,694
Chamaeza meruloides	Formicariidae	0	2,3	99,280
Chamaeza mollissima	Formicariidae	2	0	80,042
Chamaeza nobilis	Formicariidae	3	0	2,594,361
Chamaeza ruficauda	Formicariidae	0	2,3	371,500
Formicarius analis	Formicariidae	1	0	6,008,808
Formicarius colma	Formicariidae	1	1	6,982,064
Formicarius rufifrons	Formicariidae	2,3	0	24,491
Formicarius rufipectus	Formicariidae	2	0	165,662
Grallaria albigula	Formicariidae	2	0	45,648
Grallaria andicolus	Formicariidae	2	0	141,081
Grallaria blakei	Formicariidae	2	0	17,079
Grallaria dignissima (RIV)	Formicariidae	2,3	0	180,193
Grallaria eludens	Formicariidae	2,3	0	107,751
Grallaria erythroleuca	Formicariidae	2	0	12,747
Grallaria guatimalensis	Formicariidae	1	0	1,067,741
Grallaria haplonota	Formicariidae	2	0	40,725
Grallaria przewalskii	Formicariidae	2	0	17,277
Grallaria ruficapilla	Formicariidae	2	0	239,639
Grallaria rufula	Formicariidae	2	0	234,775
Grallaria squamigera	Formicariidae	2	0	269,430
Grallaria varia	Formicariidae	1	1	3,148,149
Grallaricula ferrugineipectus	Formicariidae	2	0	136,009
Grallaricula flavirostris	Formicariidae	2	0	198,083
Grallaricula nana	Formicariidae	2	0	110,065
Hylopezus auricularis	Formicariidae	2	0	1,048
Hylopezus berlepschi	Formicariidae	3	0	1,422,635
Hylopezus fulviventris	Formicariidae	2,3	0	156,624
Hylopezus macularius	Formicariidae	3	1	3,005,087
Hylopezus nattereri	Formicariidae	0	3	494,026
Hylopezus ochroleucus	Formicariidae	0	1	545,880
Myrmothera campanisona	Formicariidae	3	1	4,560,279
Myrmothera simplex	Formicariidae	2	0	108,986
Carduelis atrata	Fringillidae	1	0	839,938
Carduelis cucullata	Fringillidae	2	0	110,008
Carduelis magellanica	Fringillidae	1	1	6,077,456
Carduelis olivacea	Fringillidae	2	0	173,124
Carduelis psaltria	Fringillidae	1	0	3,940,618
Carduelis xanthogastra	Fringillidae	2	0	152,927
Carduelis yarrellii	Fringillidae	0	3	632,594
Chlorophonia cyanea	Fringillidae	1	1	2,010,478
Chlorophonia pyrrhophrys	Fringillidae	2	0	124,125
Euphonia cayennensis	Fringillidae	3	1	1,272,516
Euphonia chalybea	Fringillidae	0	3	745,403
Euphonia chlorotica	Fringillidae	1	1	9,183,291
Euphonia chrysopasta	Fringillidae	3	1	5,478,545
Euphonia cyanocephala	Fringillidae	1	1	2,558,819
Euphonia finschi	Fringillidae	2,3	0	327,329
Euphonia laniirostris	Fringillidae	1	0	4,074,278
Euphonia mesochrysa	Fringillidae	2	0	193,535
Euphonia minuta	Fringillidae	1	0	4,773,004
Euphonia pectoralis	Fringillidae	1	3	1,359,085

Euphonia plumbea	Fringillidae	3	0	810,254
Euphonia rufiventris	Fringillidae	3	0	4,288,301
Euphonia trinitatis	Fringillidae	1	0	576,171
Euphonia violacea	Fringillidae	1	1	4,921,923
Euphonia xanthogaster	Fringillidae	1	1	3,715,671
Acrobatornis fonsecai	Furnariidae	0	2	3,104
Anabacerthia amaurotis	Furnariidae	0	3	499,233
Anabacerthia striaticollis	Furnariidae	2	0	335,290
Anabazenops dorsalis	Furnariidae	3	0	663,013
Anabazenops fuscus	Furnariidae	0	2,3	372,725
Ancistrops strigilatus	Furnariidae	3	0	2,507,929
Anumbius annumbi	Furnariidae	0	1	2,928,529
Asthenes flammulata	Furnariidae	2	0	122,938
Asthenes humilis	Furnariidae	2	0	145,899
Asthenes modesta	Furnariidae	1	0	2,015,651
Asthenes ottonis	Furnariidae	2	0	48,173
Asthenes urubambensis	Furnariidae	2	0	64,788
Asthenes virgata	Furnariidae	2	0	35,154
Asthenes wyatti	Furnariidae	2	0	175,996
Automolus infuscatus	Furnariidae	3	1	4,330,795
Automolus leucophthalmus	Furnariidae	0	3	1,858,383
Automolus melanopezus	Furnariidae	3	0	670,429
Automolus ochrolaemus	Furnariidae	1	1	6,428,677
Automolus paraensis	Furnariidae	1	0	1,651,975
Automolus roraimae	Furnariidae	2	0	110,045
Automolus rubiginosus	Furnariidae	1	1	2,142,394
Automolus rufipileatus	Furnariidae	1	1	4,007,295
Berlepschia rikeri	Furnariidae	3	1	5,179,158
Certhiaxis cinnamomeus	Furnariidae	1	1	8,364,900
Certhiaxis mustelinus (RIV)	Furnariidae	3	0	693,850
Cichlocolaptes leucophrus	Furnariidae	0	2,3	296,525
Cinclodes atacamensis	Furnariidae	1	0	870,981
Cinclodes fuscus	Furnariidae	1	0	2,284,242
Cinclodes pabsti	Furnariidae	0	2,3	22,099
Clibanornis dendrocolaptoides	Furnariidae	0	2,3	452,977
Cranioleuca albicapilla	Furnariidae	2	0	18,629
Cranioleuca baroni	Furnariidae	2	0	104,848
Cranioleuca curtata	Furnariidae	2	0	173,834
Cranioleuca demissa	Furnariidae	2	0	91,870
Cranioleuca gutturata	Furnariidae	3	0	4,168,226
Cranioleuca marcapatae	Furnariidae	2	0	5,518
Cranioleuca muelleri (RIV)	Furnariidae	2,3	0	73,898
Cranioleuca obsoleta	Furnariidae	0	3	654,065
Cranioleuca pallida	Furnariidae	0	3	694,101
Cranioleuca pyrrhophia	Furnariidae	1	0	2,026,349
Cranioleuca semicinerea	Furnariidae	0	1	987,585
Cranioleuca subcristata	Furnariidae	2	0	182,937
Cranioleuca sulphurifera	Furnariidae	0	1	711,094
Cranioleuca vulpecula	Furnariidae	2	0	340,471
Cranioleuca vulpina	Furnariidae	1	1	5,717,953
Furnarius figulus	Furnariidae	1	1	1,933,987
Furnarius leucopus	Furnariidae	1	1	4,965,278
Furnarius minor (RIV)	Furnariidae	2,3	0	319,129
Furnarius rufus	Furnariidae	1	1	6,181,624
Furnarius torridus (RIV)	Furnariidae	2,3	0	87,571
Geositta cunicularia	Furnariidae	1	1	2,874,302
Geositta poeciloptera	Furnariidae	1	1	1,347,042
Geositta rufipennis	Furnariidae	1	0	758,499
Geositta saxicolina	Furnariidae	2	0	44,750
Geositta tenuirostris	Furnariidae	1	0	622,308
Gyalophylax hellmayri	Furnariidae	0	1	506,615
Heliobletus contaminatus	Furnariidae	0	3	786,450
Hellmayrea gularis	Furnariidae	2	0	162,109
Hylocryptus rectirostris	Furnariidae	0	1	1,014,117
Hyloctistes subulatus	Furnariidae	1	0	3,476,224
Leptasthenura andicola	Furnariidae	2	0	295,318
Leptasthenura setaria	Furnariidae	0	2,3	394,941

Leptasthenura striolata	Furnariidae	0	2,3	208,961
Leptasthenura yanacensis	Furnariidae	2	0	74,214
Limnoctites rectirostris	Furnariidae	0	2	179,710
Limnornis curvirostris	Furnariidae	0	2	217,473
Lochmias nematura	Furnariidae	1	1	2,649,560
Margarornis squamiger	Furnariidae	2	0	469,656
Metopothrix aurantiaca	Furnariidae	3	0	1,452,788
Oreophylax moreirae	Furnariidae	0	2,3	39,557
Phacellodomus erythrophthalmus	Furnariidae	0	2,3	311,108
Phacellodomus ruber	Furnariidae	1	1	2,766,415
Phacellodomus rufifrons	Furnariidae	1	1	2,963,735
Phacellodomus striaticollis	Furnariidae	0	1	651,246
Philydor atricapillus	Furnariidae	0	3	1,129,934
Philydor dimidiatum	Furnariidae	1	1	1,419,959
Philydor erythrocercum	Furnariidae	3	1	5,418,110
Philydor erythropterum	Furnariidae	3	0	3,018,613
Philydor lichtensteini	Furnariidae	0	3	1,589,199
Philydor pyrrhodes	Furnariidae	3	1	4,931,176
Philydor ruficaudatum	Furnariidae	3	1	4,131,476
Philydor rufum	Furnariidae	1	1	2,187,500
Phleocryptes melanops	Furnariidae	1	1	3,129,189
Premnoplex brunnescens	Furnariidae	2	0	406,166
Premnornis guttuligera	Furnariidae	2	0	341,406
Pseudocolaptes boissonneautii	Furnariidae	2	0	399,684
Pseudoseisura cristata	Furnariidae	0	1	910,989
Pseudoseisura unirufa	Furnariidae	2	0	434,879
Roraimia adusta	Furnariidae	2	0	79,605
Schizoeaca fuliginosa	Furnariidae	2	0	60,570
Schizoeaca helleri	Furnariidae	2	0	14,651
Schizoeaca palpebralis	Furnariidae	2	0	4,030
Schoeniophylax phryganophilus	Furnariidae	1	1	2,188,287
Sclerurus albigularis	Furnariidae	2	0	369,747
Sclerurus caudacutus	Furnariidae	1	1	5,473,268
Sclerurus mexicanus	Furnariidae	1	1	6,317,809
Sclerurus rufigularis	Furnariidae	3	1	4,898,050
Sclerurus scansor	Furnariidae	0	3	2,753,138
Simoxenops striatus	Furnariidae	2	0	19,367
Simoxenops ucayalae	Furnariidae	2,3	0	257,308
Synallaxis albescens	Furnariidae	1	1	9,891,845
Synallaxis albigularis	Furnariidae	3	0	1,133,010
Synallaxis azarae	Furnariidae	2	0	477,737
Synallaxis cabanisi	Furnariidae	2,3	0	157,023
Synallaxis cherriei	Furnariidae	3	0	519,835
Synallaxis cinerascens	Furnariidae	0	1	1,224,120
Synallaxis cinnamomea	Furnariidae	2	0	85,367
Synallaxis frontalis	Furnariidae	1	1	5,745,513
Synallaxis gujanensis	Furnariidae	3	1	4,461,746
Synallaxis hypospodia	Furnariidae	1	1	3,300,657
Synallaxis infuscata	Furnariidae	0	2,3	16,634
Synallaxis kollari (RIV)	Furnariidae	2,3	0	26,208
Synallaxis macconnelli	Furnariidae	2	0	311,543
Synallaxis maranonica	Furnariidae	2	0	14,002
Synallaxis moesta	Furnariidae	2,3	0	205,792
Synallaxis propinqua (RIV)	Furnariidae	3	0	531,721
Synallaxis ruficapilla	Furnariidae	0	3	1,175,024
Synallaxis rutilans	Furnariidae	3	1	5,856,421
Synallaxis scutata	Furnariidae	1	1	3,736,066
Synallaxis spixi	Furnariidae	0	1	1,343,842
Synallaxis unirufa	Furnariidae	2	0	210,436
Syndactyla rufosuperciliata	Furnariidae	1	1	1,726,972
Syndactyla subalaris	Furnariidae	2	0	250,588
Thripadectes holostictus	Furnariidae	2	0	214,784
Thripadectes melanorhynchus	Furnariidae	2	0	120,964
Thripadectes scrutator	Furnariidae	2	0	114,991
Thripadectes virgaticeps	Furnariidae	2	0	35,779
Thripophaga berlepschi	Furnariidae	2	0	12,426
Thripophaga fusciceps (RIV)	Furnariidae	2,3	0	455,993

Thripophaga macroura	Furnariidae	0	2,3	173,175
Upucerthia dumetaria	Furnariidae	1	0	1,996,592
Upucerthia jelskii	Furnariidae	1	0	522,244
Xenops milleri	Furnariidae	3	0	3,557,154
Xenops minutus	Furnariidae	1	1	9,720,964
Xenops rutilans	Furnariidae	1	1	6,929,155
Xenops tenuirostris	Furnariidae	3	0	3,582,828
Brachygalba albogularis	Galbulidae	3	0	660,230
Brachygalba lugubris	Galbulidae	1	1	4,798,736
Galbalcyrhynchus leucotis	Galbulidae	3	0	478,041
Galbalcyrhynchus purusianus	Galbulidae	3	0	821,115
Galbula albirostris	Galbulidae	3	1	2,944,080
Galbula chalcothorax	Galbulidae	3	0	816,470
Galbula cyanescens	Galbulidae	3	0	1,188,844
Galbula cyanicollis	Galbulidae	3	0	2,704,986
Galbula dea	Galbulidae	3	1	5,923,798
Galbula galbula	Galbulidae	3	0	1,927,624
Galbula leucogastra	Galbulidae	3	0	3,120,831
Galbula ruficauda	Galbulidae	1	1	7,606,632
Galbula tombacea	Galbulidae	3	0	969,400
Jacamaralcyon tridactyla	Galbulidae	0	3	553,547
Jacamerops aureus	Galbulidae	1	1	5,672,918
Haematopus palliatus	Haematopodidae	0	1	862,532
Heliornis fulica	Heliornithidae	1	1	8,811,880
Alopochelidon fucata	Hirundinidae	1	1	4,295,649
Atticora fasciata	Hirundinidae	3	1	6,512,224
Atticora melanoleuca	Hirundinidae	1	1	2,062,260
Neochelidon tibialis	Hirundinidae	1	1	4,176,003
Notiochelidon flavipes	Hirundinidae	2	0	127,868
Notiochelidon murina	Hirundinidae	2	0	425,743
Progne chalybea	Hirundinidae	1	1	15,122,897
Progne tapera	Hirundinidae	1	1	8,235,543
Pygochelidon cyanoleuca	Hirundinidae	1	1	10,389,142
Stelgidopteryx ruficollis	Hirundinidae	1	1	13,831,445
Tachycineta albiventer	Hirundinidae	1	1	11,742,545
Tachycineta leucorrhoa	Hirundinidae	1	1	5,024,218
Agelaioides badius	Icteridae	1	1	4,291,631
Amblycercus holosericeus	Icteridae	1	0	1,152,550
Amblyramphus holosericeus	Icteridae	1	1	1,268,239
Cacicus cela	Icteridae	1	1	8,859,477
Cacicus chrysonotus	Icteridae	2	0	53,373
Cacicus chrysopterus	Icteridae	1	1	1,744,064
Cacicus haemorrhous	Icteridae	1	1	8,041,888
Cacicus koepckeae	Icteridae	2	0	35,656
Cacicus leucoramphus	Icteridae	2	0	162,782
Cacicus sclateri	Icteridae	2,3	0	293,824
Cacicus solitarius	Icteridae	1	1	8,791,524
Cacicus uropygialis	Icteridae	2	0	405,497
Chrysomus cyanopus	Icteridae	1	1	2,666,564
Chrysomus icterocephalus	Icteridae	1	1	1,582,828
Chrysomus ruficapillus	Icteridae	1	1	5,568,726
Chrysomus thilius	Icteridae	0	1	2,331,057
Clypicterus oseryi	Icteridae	3	0	614,904
Curaeus forbesi	Icteridae	0	2,3	37,564
Gnorimopsar chopi	Icteridae	1	1	5,930,633
Gymnomystax mexicanus	Icteridae	1	1	1,536,282
Hypopyrrhus pyrohypogaster	Icteridae	2	0	27,745
Icterus auricapillus	Icteridae	2	0	405,690
Icterus cayanensis	Icteridae	1	1	10,358,787
Icterus chrysater	Icteridae	1	0	777,237
Icterus chrysocephalus	Icteridae	1	0	2,501,391
Icterus croconotus	Icteridae	1	0	3,330,575
Icterus icterus	Icteridae	2	0	432,623
Icterus jamacaii	Icteridae	1	1	2,033,160
Icterus nigrogularis	Icteridae	1	1	1,367,041
Lampropsar tanagrinus	Icteridae	3	0	2,415,513
Macroagelaius imthurni	Icteridae	2	0	58,909

Molothrus bonariensis	Icteridae	1	1	13,410,873
Molothrus oryzivorus	Icteridae	1	1	10,750,560
Molothrus rufoaxillaris	Icteridae	0	1	3,183,972
Ocyalus latirostris	Icteridae	2,3	0	418,791
Oreopsar bolivianus	Icteridae	2	0	77,392
Psarocolius angustifrons	Icteridae	1	0	2,231,194
Psarocolius atrovirens	Icteridae	2	0	97,092
Psarocolius bifasciatus	Icteridae	3	0	4,573,310
Psarocolius decumanus	Icteridae	1	1	10,581,705
Psarocolius viridis	Icteridae	3	1	4,930,412
Pseudoleistes guirahuro	Icteridae	0	1	2,177,843
Pseudoleistes virescens	Icteridae	0	1	890,486
Quiscalus lugubris	Icteridae	1	0	701,531
Sturnella magna	Icteridae	1	1	7,284,868
Sturnella militaris	Icteridae	1	1	3,368,988
Sturnella superciliaris	Icteridae	1	1	4,919,509
Xanthopsar flavus	Icteridae	0	1	526,613
Donacobius atricapilla	Incertae Sedis (near Cinclidae)	1	1	8,625,417
Granatellus pelzelni	Incertae sedis (near Parulidae)	3	1	4,145,283
Iodopleura fusca	Incertae Sedis (near Pipridae)	2,3	0	444,582
Iodopleura isabellae	Incertae Sedis (near Pipridae)	3	0	4,493,633
Iodopleura pipra	Incertae Sedis (near Pipridae)	0	2,3	110,232
Laniisoma elegans	Incertae Sedis (near Pipridae)	1	1	528,973
Laniocera hypopyrra	Incertae Sedis (near Pipridae)	1	1	6,640,200
Phibalura flavirostris	Incertae Sedis (near Pipridae)	0	1	1,084,518
Schiffornis major	Incertae Sedis (near Pipridae)	3	0	2,591,204
Schiffornis turdina	Incertae Sedis (near Pipridae)	1	1	7,963,609
Schiffornis virescens	Incertae Sedis (near Pipridae)	0	3	1,662,597
Tityra cayana	Incertae Sedis (near Pipridae)	1	1	11,903,938
Tityra inquisitor	Incertae Sedis (near Pipridae)	1	1	11,190,769
Tityra semifasciata	Incertae Sedis (near Pipridae)	1	1	5,866,147
Xenopsaris albinucha	Incertae Sedis (near Pipridae)	1	1	3,214,663
Chlorospingus canigularis	Incertae Sedis (near Thraupidae)	2	0	164,580
Chlorospingus flavigularis	Incertae Sedis (near Thraupidae)	2	0	195,958
Chlorospingus ophthalmicus	Incertae Sedis (near Thraupidae)	1	0	582,194
Chlorospingus parvirostris	Incertae Sedis (near Thraupidae)	2	0	87,150
Chlorothraupis carmioli	Incertae Sedis (near Thraupidae)	2	0	214,741
Habia rubica	Incertae Sedis (near Thraupidae)	1	1	5,690,375
Mitrospingus oleagineus	Incertae Sedis (near Thraupidae)	2	0	38,822
Tiaris bicolor	Incertae Sedis (near Thraupidae)	2	0	262,753
Tiaris fuliginosus	Incertae Sedis (near Thraupidae)	1	1	824,900
Tiaris obscurus	Incertae Sedis (near Thraupidae)	1	0	1,514,927
Tiaris olivaceus	Incertae Sedis (near Thraupidae)	1	0	934,559
Jacana jacana	Jacanidae	1	1	13,881,403
Mimus gilvus	Mimidae	1	1	2,159,463
Mimus saturninus	Mimidae	1	1	7,198,443
Mimus triurus	Mimidae	0	1	899,062
Baryphthengus martii	Momotidae	1	0	2,809,481
Baryphthengus ruficapillus	Momotidae	0	3	1,565,716
Electron platyrhynchum	Momotidae	1	0	2,864,008
Momotus momota	Momotidae	1	1	9,751,462
Anthus bogotensis	Motacillidae	2	0	335,998
Anthus chacoensis	Motacillidae	0	1	620,395
Anthus correndera	Motacillidae	1	1	3,089,221
Anthus furcatus	Motacillidae	1	1	1,987,619
Anthus hellmayri	Motacillidae	1	1	1,150,629
Anthus lutescens	Motacillidae	1	1	7,219,832
Anthus nattereri	Motacillidae	0	1	481,312
Nyctibius aethereus	Nyctibiidae	1	1	4,956,479
Nyctibius bracteatus	Nyctibiidae	2,3	0	105,109
Nyctibius grandis	Nyctibiidae	1	1	8,477,803
Nyctibius griseus	Nyctibiidae	1	1	13,692,742
Nyctibius leucopterus	Nyctibiidae	2	0	440,858
Colinus cristatus	Odontophoridae	1	0	2,010,693
Odontophorus balliviani	Odontophoridae	2	0	46,447
Odontophorus capueira	Odontophoridae	0	3	1,313,376
Odontophorus gujanensis	Odontophoridae	1	1	6,337,788

Odontophorus speciosus	Odontophoridae	2	0	166,495
Odontophorus stellatus	Odontophoridae	3	0	1,723,892
Opisthocomus hoazin	Opisthocomidae	1	0	6,513,940
Oxyruncus cristatus	Oxyruncidae	1	1	1,832,898
Basileuterus bivittatus	Parulidae	2	0	220,708
Basileuterus chrysogaster	Parulidae	2	0	55,935
Basileuterus coronatus	Parulidae	2	0	417,584
Basileuterus culicivorus	Parulidae	1	1	5,600,209
Basileuterus flaveolus	Parulidae	1	1	4,000,097
Basileuterus fulvicauda	Parulidae	1	0	2,473,019
Basileuterus hypoleucus	Parulidae	0	1	1,214,826
Basileuterus leucoblepharus	Parulidae	0	3	1,372,127
Basileuterus leucophrys	Parulidae	0	1	808,561
Basileuterus luteoviridis	Parulidae	2	0	241,837
Basileuterus rivularis	Parulidae	1	1	3,992,915
Basileuterus signatus	Parulidae	2	0	148,815
Basileuterus tristriatus	Parulidae	2	0	467,464
Dendroica petechia	Parulidae	1	0	15,250,105
Geothlypis aequinoctialis	Parulidae	1	1	7,877,200
Myioborus albifacies	Parulidae	2	0	17,029
Myioborus castaneocapillus	Parulidae	2	0	95,602
Myioborus melanocephalus	Parulidae	2	0	185,711
Myioborus miniatus	Parulidae	1	0	1,237,572
Parula pitiayumi	Parulidae	1	1	8,362,817
Phoenicopterus chilensis	Phoenicopteridae	1	1	2,937,515
Phoenicopterus ruber	Phoenicopteridae	2	0	418,690
Campephilus haematogaster	Picidae	2	0	273,246
Campephilus leucopogon	Picidae	1	1	1,077,585
Campephilus melanoleucos	Picidae	1	1	11,098,978
Campephilus pollens	Picidae	2	0	195,676
Campephilus robustus	Picidae	0	3	1,885,820
Campephilus rubricollis	Picidae	3	0	6,911,191
Celeus elegans	Picidae	1	0	6,509,915
Celeus flavescens	Picidae	1	1	3,696,800
Celeus flavus	Picidae	1	1	6,126,685
Celeus grammicus	Picidae	3	0	3,990,164
Celeus lugubris	Picidae	1	1	841,503
Celeus spectabilis	Picidae	3	0	528,328
Celeus torquatus	Picidae	1	1	5,892,454
Celeus undatus	Picidae	1	0	1,588,737
Colaptes campestris	Picidae	1	1	5,836,241
Colaptes melanochloros	Picidae	1	1	7,046,340
Colaptes punctigula	Picidae	1	0	3,373,443
Colaptes rupicola	Picidae	1	0	900,922
Dryocopus galeatus	Picidae	0	3	562,257
Dryocopus lineatus	Picidae	1	1	13,583,481
Melanerpes cactorum	Picidae	1	0	923,794
Melanerpes candidus	Picidae	1	1	4,811,608
Melanerpes cruentatus	Picidae	1	1	7,237,038
Melanerpes flavifrons	Picidae	0	3	1,557,798
Melanerpes rubricapillus	Picidae	1	0	860,582
Picoides lignarius	Picidae	1	0	597,481
Picoides mixtus	Picidae	1	1	3,656,544
Piculus aurulentus	Picidae	0	3	843,170
Piculus chrysochloros	Picidae	1	1	8,592,387
Piculus flavigula	Picidae	1	1	6,464,125
Piculus leucolaemus	Picidae	1	0	885,352
Piculus rivolii	Picidae	2	0	429,786
Piculus rubiginosus	Picidae	1	0	1,823,939
Picumnus albosquamatus	Picidae	1	1	2,008,151
Picumnus aurifrons	Picidae	3	0	2,988,957
Picumnus castelnau	Picidae	2,3	0	36,250
Picumnus cirratus	Picidae	1	1	1,398,400
Picumnus dorbignyanus	Picidae	2	0	80,808
Picumnus exilis	Picidae	1	1	1,289,762
Picumnus fulvescens	Picidae	0	2	59,007
Picumnus fuscus	Picidae	2	0	40,792

Picumnus lafresnayi	Picidae	3	0	749,483
Picumnus minutissimus	Picidae	2,3	0	69,557
Picumnus nebulosus	Picidae	0	1	517,983
Picumnus pumilus (RIV)	Picidae	2,3	0	210,423
Picumnus pygmaeus	Picidae	0	1	837,474
Picumnus rufiventris	Picidae	3	0	1,173,237
Picumnus spilogaster	Picidae	2	0	232,286
Picumnus squamulatus	Picidae	2	0	437,390
Picumnus steindachneri	Picidae	2	0	5,511
Picumnus subtilis	Picidae	2,3	0	16,179
Picumnus temminckii	Picidae	0	3	846,767
Picumnus varzeae (RIV)	Picidae	2,3	0	26,374
Veniliornis affinis	Picidae	1	1	5,369,673
Veniliornis callonotus	Picidae	2	0	135,989
Veniliornis cassini	Picidae	3	0	1,226,063
Veniliornis dignus	Picidae	2	0	89,813
Veniliornis frontalis	Picidae	2	0	102,728
Veniliornis fumigatus	Picidae	1	0	1,109,550
Veniliornis kirkii	Picidae	1	0	686,417
Veniliornis maculifrons	Picidae	0	2,3	253,876
Veniliornis nigriceps	Picidae	2	0	181,347
Veniliornis passerinus	Picidae	1	1	11,102,927
Veniliornis sanguineus	Picidae	2,3	0	36,225
Veniliornis spilogaster	Picidae	0	3	1,540,090
Antilophia galeata	Pipridae	1	1	1,960,330
Chiroxiphia boliviana	Pipridae	2	0	78,967
Chiroxiphia caudata	Pipridae	0	3	1,459,528
Chiroxiphia lanceolata	Pipridae	2	0	413,515
Chiroxiphia pareola	Pipridae	1	1	5,015,449
Chloropipo flavicapilla	Pipridae	2	0	11,900
Chloropipo holochlora	Pipridae	1	0	478,440
Chloropipo unicolor	Pipridae	2	0	57,211
Chloropipo uniformis	Pipridae	2	0	37,514
Corapipo gutturalis	Pipridae	3	0	1,107,382
Dixiphia pipra	Pipridae	1	1	4,953,752
Heterocercus aurantiivertex (RIV)	Pipridae	2,3	0	187,016
Heterocercus flavivertex (RIV)	Pipridae	3	0	827,955
Heterocercus linteatus	Pipridae	3	0	2,128,458
Ilicura militaris	Pipridae	0	3	777,386
Lepidothrix coeruleocapilla	Pipridae	2	0	35,313
Lepidothrix coronata	Pipridae	1	0	3,221,125
Lepidothrix iris	Pipridae	3	0	487,325
Lepidothrix isidorei	Pipridae	2	0	87,635
Lepidothrix nattereri	Pipridae	3	0	865,184
Lepidothrix serena	Pipridae	3	0	583,706
Lepidothrix suavissima	Pipridae	2	0	310,207
Machaeropterus pyrocephalus	Pipridae	3	1	2,187,033
Machaeropterus regulus	Pipridae	1	1	1,763,200
Manacus manacus	Pipridae	1	1	7,306,408
Masius chrysopterus	Pipridae	2	0	134,240
Neopelma aurifrons	Pipridae	0	2,3	224,166
Neopelma chrysocephalum	Pipridae	3	0	692,653
Neopelma chrysolophum	Pipridae	0	2,3	159,672
Neopelma pallescens	Pipridae	1	1	2,039,690
Neopelma sulphureiventer	Pipridae	3	0	1,158,795
Pipra aureola	Pipridae	1	1	671,375
Pipra chloromeros	Pipridae	2	0	472,753
Pipra cornuta	Pipridae	2	0	345,167
Pipra erythrocephala	Pipridae	1	0	3,456,019
Pipra fasciicauda	Pipridae	1	1	4,779,136
Pipra filicauda	Pipridae	1	0	2,613,845
Pipra rubrocapilla	Pipridae	1	1	3,391,810
Tyranneutes stolzmanni	Pipridae	3	0	5,292,413
Tyranneutes virescens	Pipridae	3	0	1,189,031
Xenopipo atronitens	Pipridae	3	0	1,950,709
Podiceps major	Podicipedidae	0	1	2,920,035
Podilymbus podiceps	Podicipedidae	1	1	21,078,061

Rollandia rolland	Podicipedidae	1	1	4,836,359
Tachybaptus dominicus	Podicipedidae	1	1	9,159,412
Amazona aestiva	Psittacidae	1	1	4,217,509
Amazona amazonica	Psittacidae	1	1	7,419,351
Amazona autumnalis	Psittacidae	1	0	853,865
Amazona brasiliensis	Psittacidae	0	2,3	14,428
Amazona dufresniana	Psittacidae	2	0	365,991
Amazona farinosa	Psittacidae	1	1	7,159,601
Amazona festiva	Psittacidae	1	1	857,325
Amazona kawalli	Psittacidae	1	0	716,717
Amazona mercenaria	Psittacidae	2	0	432,637
Amazona ochrocephala	Psittacidae	1	0	6,626,087
Amazona pretrei	Psittacidae	0	2,3	329,661
Amazona rhodocorytha	Psittacidae	0	2,3	144,472
Amazona vinacea	Psittacidae	0	3	718,283
Amazona xanthops	Psittacidae	1	1	1,448,235
Anodorhynchus glaucus	Psittacidae	0	2	75,092
Anodorhynchus hyacinthinus	Psittacidae	1	1	2,116,953
Ara ararauna	Psittacidae	1	1	7,782,290
Ara chloropterus	Psittacidae	1	1	8,071,437
Ara glaucogularis	Psittacidae	2	0	26,669
Ara macao	Psittacidae	1	0	7,030,975
Ara militaris	Psittacidae	1	0	924,371
Ara severus	Psittacidae	1	0	5,769,852
Aratinga acuticaudata	Psittacidae	1	1	2,332,010
Aratinga aurea	Psittacidae	1	1	5,676,117
Aratinga auricapillus	Psittacidae	0	1	1,229,474
Aratinga cactorum	Psittacidae	0	1	1,195,221
Aratinga jandaya	Psittacidae	1	1	1,514,385
Aratinga leucophthalma	Psittacidae	1	1	8,505,101
Aratinga mitrata	Psittacidae	2	0	251,263
Aratinga pertinax	Psittacidae	1	0	1,656,659
Aratinga pintoi	Psittacidae	2	0	8,562
Aratinga solstitialis	Psittacidae	2	0	65,280
Aratinga wagleri	Psittacidae	2	0	329,465
Aratinga weddellii	Psittacidae	3	0	2,260,162
Bolborhynchus orbygnesius	Psittacidae	2	0	179,423
Brotogeris chiriri	Psittacidae	1	1	3,434,816
Brotogeris chrysoptera	Psittacidae	1	1	3,112,044
Brotogeris cyanoptera	Psittacidae	3	0	2,567,440
Brotogeris sanctithomae	Psittacidae	3	1	1,707,029
Brotogeris tirica	Psittacidae	0	2,3	293,930
Brotogeris versicolurus	Psittacidae	3	1	635,604
Cyanopsitta spixii	Psittacidae	2	0	289,476
Deroptyus accipitrinus	Psittacidae	3	1	4,238,177
Diopsittaca nobilis	Psittacidae	1	1	4,282,292
Forpus passerinus	Psittacidae	1	1	1,060,752
Forpus sclateri	Psittacidae	3	1	2,855,322
Forpus xanthopterygius	Psittacidae	1	1	5,340,148
Graydidascalus brachyurus	Psittacidae	3	1	642,118
Guarouba guarouba	Psittacidae	3	0	666,247
Hapalopsittaca melanotis	Psittacidae	2	0	38,307
Leptosittaca branickii	Psittacidae	2	0	71,479
Myiopsitta monachus	Psittacidae	1	1	2,820,306
Nannopsittaca dachilleae	Psittacidae	2,3	0	156,675
Nannopsittaca panychlora	Psittacidae	2	0	41,773
Orthopsittaca manilata	Psittacidae	1	1	7,147,984
Pionites leucogaster	Psittacidae	3	0	3,563,956
Pionites melanocephalus	Psittacidae	3	0	2,920,133
Pionopsitta aurantiocephala	Psittacidae	2	0	351,766
Pionopsitta barrabandi	Psittacidae	3	0	3,467,557
Pionopsitta caica	Psittacidae	3	0	1,290,459
Pionopsitta pileata	Psittacidae	0	3	728,893
Pionopsitta vulturina	Psittacidae	3	0	533,561
Pionus chalcopterus	Psittacidae	2	0	177,067
Pionus fuscus	Psittacidae	3	1	1,865,071
Pionus maximiliani	Psittacidae	1	1	4,524,966

Pionus menstruus	Psittacidae	1	1	8,264,759
Pionus sordidus	Psittacidae	2	0	178,993
Pionus tumultuosus	Psittacidae	2	0	262,367
Propyrrhura auricollis	Psittacidae	1	0	838,451
Propyrrhura couloni	Psittacidae	2,3	0	371,310
Propyrrhura maracana	Psittacidae	1	1	3,505,096
Psilopsiagon aurifrons	Psittacidae	1	0	819,598
Psilopsiagon aymara	Psittacidae	2	0	383,001
Pyrrhura cruentata	Psittacidae	0	2,3	182,445
Pyrrhura egregia	Psittacidae	2	0	49,354
Pyrrhura frontalis	Psittacidae	0	3	1,613,395
Pyrrhura lepida	Psittacidae	3	0	548,390
Pyrrhura leucotis	Psittacidae	2	2	372,343
Pyrrhura melanura	Psittacidae	1	0	1,535,229
Pyrrhura molinae	Psittacidae	1	0	675,225
Pyrrhura perlata	Psittacidae	3	0	1,128,815
Pyrrhura picta	Psittacidae	3	0	3,974,244
Pyrrhura rupicola	Psittacidae	3	0	545,595
Touit batavicus	Psittacidae	2	0	329,607
Touit huetii	Psittacidae	1	0	1,804,844
Touit melanonotus	Psittacidae	0	2,3	141,480
Touit purpuratus	Psittacidae	3	1	3,820,962
Touit stictopterus	Psittacidae	2	0	19,018
Touit surdus	Psittacidae	0	2,3	205,998
Triclaria malachitacea	Psittacidae	0	2,3	371,183
Psophia crepitans	Psophiidae	1	0	2,780,195
Psophia leucoptera	Psophiidae	3	0	1,537,020
Psophia viridis	Psophiidae	3	0	1,386,881
Amaurolimnas concolor	Rallidae	1	1	1,595,530
Anurolimnas castaneiceps	Rallidae	3	0	582,656
Anurolimnas fasciatus	Rallidae	3	0	1,297,066
Anurolimnas viridis	Rallidae	1	1	6,136,529
Aramides axillaris	Rallidae	2	0	336,566
Aramides cajanea	Rallidae	1	1	13,579,616
Aramides calopterus	Rallidae	3	0	646,317
Aramides mangle	Rallidae	1	1	774,434
Aramides saracura	Rallidae	0	3	928,702
Aramides ypecaha	Rallidae	1	1	1,086,476
Coturnicops notatus	Rallidae	0	1	1,540,931
Fulica ardesiaca	Rallidae	1	0	560,339
Fulica armillata	Rallidae	0	1	2,623,435
Fulica gigantea	Rallidae	2	0	439,486
Fulica leucoptera	Rallidae	1	1	3,041,616
Fulica rufifrons	Rallidae	0	1	1,255,586
Gallinula chloropus	Rallidae	1	1	13,570,659
Gallinula melanops	Rallidae	0	1	2,604,907
Laterallus exilis	Rallidae	1	1	5,159,312
Laterallus leucopyrrhus	Rallidae	0	1	882,133
Laterallus melanophaius	Rallidae	1	1	9,763,183
Micropygia schomburgkii	Rallidae	1	1	2,871,320
Neocrex erythrops	Rallidae	1	1	1,425,029
Pardirallus maculatus	Rallidae	1	1	2,167,061
Pardirallus nigricans	Rallidae	1	1	3,249,617
Pardirallus sanguinolentus	Rallidae	1	1	4,580,004
Porphyrio flavirostris	Rallidae	1	1	5,269,981
Porphyrio martinica	Rallidae	1	1	13,383,208
Porzana albicollis	Rallidae	1	1	6,152,092
Porzana flaviventer	Rallidae	1	1	2,070,549
Rallus longirostris	Rallidae	1	1	579,614
Andigena hypoglauca	Ramphastidae	2	0	122,383
Aulacorhynchus coeruleicinctis	Ramphastidae	2	0	103,153
Aulacorhynchus derbianus	Ramphastidae	2	0	391,969
Aulacorhynchus haematopygus	Ramphastidae	2	0	179,239
Aulacorhynchus prasinus	Ramphastidae	1	0	995,551
Aulacorhynchus sulcatus	Ramphastidae	2	0	53,440
Pteroglossus aracari	Ramphastidae	1	1	3,320,103
Pteroglossus azara	Ramphastidae	3	0	3,125,190

Pteroglossus bailloni	Ramphastidae	0	3	653,733
Pteroglossus beauharnaesii	Ramphastidae	3	0	1,823,270
Pteroglossus bitorquatus	Ramphastidae	3	0	2,069,800
Pteroglossus castanotis	Ramphastidae	1	1	5,071,416
Pteroglossus inscriptus	Ramphastidae	1	1	4,855,832
Pteroglossus pluricinctus	Ramphastidae	1	0	1,262,866
Pteroglossus viridis	Ramphastidae	3	0	1,558,657
Ramphastos ambiguus	Ramphastidae	2	0	164,550
Ramphastos dicolorus	Ramphastidae	0	3	1,394,169
Ramphastos toco	Ramphastidae	1	1	4,259,458
Ramphastos tucanus	Ramphastidae	1	0	7,335,814
Ramphastos vitellinus	Ramphastidae	1	1	7,920,760
Selenidera culik	Ramphastidae	3	0	1,055,217
Selenidera gouldii	Ramphastidae	3	0	1,919,665
Selenidera maculirostris	Ramphastidae	0	3	930,800
Selenidera nattereri	Ramphastidae	3	0	879,231
Selenidera reinwardtii	Ramphastidae	3	0	1,766,306
Himantopus mexicanus	Recurvirostridae	1	1	9,529,791
Rhea americana	Rheidae	1	1	6,540,246
Liosceles thoracicus	Rhinocryptidae	3	0	2,273,676
Melanopareia maximiliani	Rhinocryptidae	1	0	752,336
Melanopareia torquata	Rhinocryptidae	1	1	2,770,923
Merulaxis ater	Rhinocryptidae	0	2,3	163,732
Myornis senilis	Rhinocryptidae	2	0	118,970
Psilorhamphus guttatus	Rhinocryptidae	0	2,3	273,365
Scytalopus acutirostris	Rhinocryptidae	2	0	11,846
Scytalopus altirostris	Rhinocryptidae	2	0	12,806
Scytalopus atratus	Rhinocryptidae	2	0	187,462
Scytalopus bolivianus	Rhinocryptidae	2	0	64,273
Scytalopus femoralis	Rhinocryptidae	2	0	42,486
Scytalopus indigoticus	Rhinocryptidae	0	3	498,378
Scytalopus iraiensis	Rhinocryptidae	0	2	2,897
Scytalopus latrans	Rhinocryptidae	2	0	217,041
Scytalopus macropus	Rhinocryptidae	2	0	39,810
Scytalopus micropterus	Rhinocryptidae	2	0	45,400
Scytalopus parvirostris	Rhinocryptidae	2	0	116,082
Scytalopus schulenbergi	Rhinocryptidae	2	0	37,055
Scytalopus simonsi	Rhinocryptidae	2	0	29,913
Scytalopus speluncae	Rhinocryptidae	0	3	537,824
Nycticryphes semicollaris	Rostratulidae	0	1	2,534,233
Gallinago andina	Scolopacidae	1	0	777,480
Gallinago jamesoni	Scolopacidae	2	0	258,522
Gallinago paraguaiae	Scolopacidae	1	1	15,346,296
Gallinago undulata	Scolopacidae	1	1	2,569,589
Steatornis caripensis	Steatornithidae	1	0	1,022,853
Aegolius harrisii	Strigidae	0	1	836,509
Asio flammeus	Strigidae	1	1	18,787,741
Asio stygius	Strigidae	1	1	3,161,823
Athene cunicularia	Strigidae	1	1	14,203,497
Bubo virginianus	Strigidae	1	1	26,217,801
Glaucidium bolivianum	Strigidae	2	0	69,767
Glaucidium brasilianum	Strigidae	1	1	12,593,776
Glaucidium hardyi	Strigidae	1	0	3,369,992
Glaucidium jardinii	Strigidae	2	0	205,489
Glaucidium minutissimum	Strigidae	0	1	575,147
Glaucidium parkeri	Strigidae	2	0	22,076
Lophostrix cristata	Strigidae	1	0	4,942,166
Megascops albogularis	Strigidae	2	0	244,885
Megascops atricapilla	Strigidae	0	3	777,864
Megascops choliba	Strigidae	1	1	13,065,051
Megascops guatemalae	Strigidae	1	0	1,139,321
Megascops ingens	Strigidae	2	0	170,331
Megascops sanctaecatarinae	Strigidae	0	2	418,337
Megascops watsonii	Strigidae	3	0	6,312,243
Pseudoscops clamator	Strigidae	1	1	7,162,176
Pulsatrix koeniswaldiana	Strigidae	0	3	501,547
Pulsatrix melanota	Strigidae	2	0	156,842

Pulsatrix perspicillata	Strigidae	1	1	12,679,339
Strix albitarsis	Strigidae	2	0	325,427
Strix huhula	Strigidae	1	1	7,366,626
Strix hylophila	Strigidae	0	3	711,601
Strix virgata	Strigidae	1	1	10,135,310
Microbates cinereiventris	Sylviidae	1	0	551,564
Microbates collaris	Sylviidae	3	0	2,079,076
Polioptila dumicola	Sylviidae	1	1	3,677,287
Polioptila guianensis	Sylviidae	3	0	1,413,230
Polioptila lactea	Sylviidae	0	2,3	441,093
Polioptila plumbea	Sylviidae	1	1	6,791,024
Ramphocaenus melanurus	Sylviidae	1	1	9,159,254
Batara cinerea	Thamnophilidae	1	1	600,007
Biatas nigropectus	Thamnophilidae	0	2,3	270,761
Cercomacra brasiliana	Thamnophilidae	0	2,3	89,229
Cercomacra carbonaria (RIV)	Thamnophilidae	2,3	0	36,374
Cercomacra cinerascens	Thamnophilidae	3	1	6,700,478
Cercomacra ferdinandi (RIV)	Thamnophilidae	2,3	0	58,313
Cercomacra laeta	Thamnophilidae	2	2	393,669
Cercomacra manu	Thamnophilidae	2,3	0	142,189
Cercomacra melanaria	Thamnophilidae	2	0	445,503
Cercomacra nigrescens	Thamnophilidae	1	0	3,915,426
Cercomacra nigricans	Thamnophilidae	1	0	546,875
Cercomacra serva	Thamnophilidae	3	0	1,105,370
Cercomacra tyrannina	Thamnophilidae	1	1	3,170,787
Cymbilaimus lineatus	Thamnophilidae	1	1	6,643,381
Cymbilaimus sanctaemariae	Thamnophilidae	3	0	494,497
Dichrozona cincta	Thamnophilidae	3	0	3,112,061
Drymophila caudata	Thamnophilidae	2	0	256,095
Drymophila devillei	Thamnophilidae	3	0	2,088,484
Drymophila ferruginea	Thamnophilidae	0	3	506,186
Drymophila genei	Thamnophilidae	0	2,3	43,258
Drymophila malura	Thamnophilidae	0	3	769,773
Drymophila ochropyga	Thamnophilidae	0	2,3	182,300
Drymophila rubricollis	Thamnophilidae	0	2,3	329,394
Drymophila squamata	Thamnophilidae	0	2,3	298,187
Dysithamnus leucostictus	Thamnophilidae	2	0	31,008
Dysithamnus mentalis	Thamnophilidae	1	1	4,414,117
Dysithamnus plumbeus	Thamnophilidae	0	2,3	148,623
Dysithamnus stictothorax	Thamnophilidae	0	2,3	415,228
Dysithamnus xanthopterus	Thamnophilidae	0	2,3	60,342
Formicivora erythronotos	Thamnophilidae	0	2,3	13,059
Formicivora grisea	Thamnophilidae	1	1	5,987,872
Formicivora iheringi	Thamnophilidae	0	2	128,656
Formicivora littoralis	Thamnophilidae	0	2,3	5,489
Formicivora melanogaster	Thamnophilidae	1	1	2,649,612
Formicivora rufa	Thamnophilidae	1	1	3,081,416
Formicivora serrana	Thamnophilidae	0	2,3	193,915
Frederickena unduligera	Thamnophilidae	3	0	1,735,634
Frederickena viridis	Thamnophilidae	3	0	1,266,888
Gymnopithys leucaspis	Thamnophilidae	1	0	1,531,337
Gymnopithys lunulatus	Thamnophilidae	2	0	297,054
Gymnopithys rufigula	Thamnophilidae	3	1	1,727,720
Gymnopithys salvini	Thamnophilidae	3	0	1,355,063
Herpsilochmus atricapillus	Thamnophilidae	1	1	3,731,813
Herpsilochmus axillaris	Thamnophilidae	2	0	109,348
Herpsilochmus dorsimaculatus (RIV)	Thamnophilidae	3	0	907,472
Herpsilochmus dugandi	Thamnophilidae	2,3	0	231,971
Herpsilochmus gentryi	Thamnophilidae	2	0	57,441
Herpsilochmus longirostris	Thamnophilidae	1	1	1,991,215
Herpsilochmus motacilloides	Thamnophilidae	2	0	15,465
Herpsilochmus pectoralis	Thamnophilidae	2	2	125,639
Herpsilochmus pileatus	Thamnophilidae	0	2	17,121
Herpsilochmus roraimae	Thamnophilidae	2	0	283,888
Herpsilochmus rufimarginatus	Thamnophilidae	1	1	3,089,739
Herpsilochmus sellowi	Thamnophilidae	1	1	995,778
Herpsilochmus stictocephalus	Thamnophilidae	3	0	527,239

Herpsilochmus sticturus	Thamnophilidae	3	0	490,693
Hylophylax naevius	Thamnophilidae	3	1	5,848,162
Hylophylax poecilinotus	Thamnophilidae	1	1	6,426,321
Hylophylax punctulatus	Thamnophilidae	3	0	2,774,887
Hypocnemis cantator	Thamnophilidae	3	1	6,471,995
Hypocnemis hypoxantha	Thamnophilidae	3	0	1,245,968
Hypocnemoides maculicauda	Thamnophilidae	3	0	3,323,685
Hypocnemoides melanopogon	Thamnophilidae	3	1	3,491,559
Hypoedaleus guttatus	Thamnophilidae	0	3	1,214,130
Mackenziaena leachii	Thamnophilidae	0	3	796,751
Mackenziaena severa	Thamnophilidae	0	3	955,425
Megastictus margaritatus	Thamnophilidae	3	0	1,936,908
Microrhopias quixensis	Thamnophilidae	1	1	4,104,148
Myrmeciza atrothorax	Thamnophilidae	3	1	6,800,286
Myrmeciza castanea	Thamnophilidae	2	0	80,270
Myrmeciza disjuncta	Thamnophilidae	2,3	0	36,087
Myrmeciza ferruginea	Thamnophilidae	3	1	1,081,526
Myrmeciza fortis	Thamnophilidae	3	0	1,945,517
Myrmeciza goeldii	Thamnophilidae	2,3	0	342,065
Myrmeciza hemimelaena	Thamnophilidae	1	0	2,633,897
Myrmeciza hyperythra	Thamnophilidae	3	0	1,642,093
Myrmeciza longipes	Thamnophilidae	1	1	1,403,333
Myrmeciza loricata	Thamnophilidae	0	2,3	177,959
Myrmeciza melanoceps	Thamnophilidae	3	0	1,321,146
Myrmeciza pelzelni	Thamnophilidae	2,3	0	50,543
Myrmeciza ruficauda	Thamnophilidae	0	2,3	98,885
Myrmeciza squamosa	Thamnophilidae	0	2,3	241,754
Myrmoborus leucophrys	Thamnophilidae	1	1	5,126,727
Myrmoborus lugubris (RIV)	Thamnophilidae	2,3	0	259,378
Myrmoborus melanurus (RIV)	Thamnophilidae	2,3	0	32,272
Myrmoborus myotherinus	Thamnophilidae	3	0	4,777,538
Myrmochanes hemileucus (RIV)	Thamnophilidae	2,3	0	261,130
Myrmorchilus strigilatus	Thamnophilidae	1	1	1,728,776
Myrmornis torquata	Thamnophilidae	1	1	3,108,449
Myrmotherula ambigua (RIV)	Thamnophilidae	2,3	0	141,614
Myrmotherula assimilis (RIV)	Thamnophilidae	2,3	0	412,218
Myrmotherula axillaris	Thamnophilidae	1	1	7,975,281
Myrmotherula behni	Thamnophilidae	2	0	277,868
Myrmotherula brachyura	Thamnophilidae	3	1	6,190,744
Myrmotherula cherriei	Thamnophilidae	3	0	584,884
Myrmotherula erythrura	Thamnophilidae	3	0	1,668,001
Myrmotherula fjeldsaai	Thamnophilidae	2	0	102,544
Myrmotherula grisea	Thamnophilidae	2	0	29,995
Myrmotherula gularis	Thamnophilidae	0	3	500,924
Myrmotherula guttata	Thamnophilidae	3	1	1,694,795
Myrmotherula gutturalis	Thamnophilidae	3	1	1,094,083
Myrmotherula haematonota	Thamnophilidae	3	0	2,624,223
Myrmotherula hauxwelli	Thamnophilidae	3	0	4,248,229
Myrmotherula ignota	Thamnophilidae	1	0	1,428,313
Myrmotherula iheringi	Thamnophilidae	3	0	1,006,313
Myrmotherula leucophthalma	Thamnophilidae	3	0	1,995,466
Myrmotherula longicauda	Thamnophilidae	2	0	100,450
Myrmotherula longipennis	Thamnophilidae	3	1	5,116,699
Myrmotherula menetriesii	Thamnophilidae	3	1	6,331,469
Myrmotherula minor	Thamnophilidae	0	2,3	96,411
Myrmotherula multostriata	Thamnophilidae	1	0	4,533,371
Myrmotherula ornata	Thamnophilidae	3	0	2,079,895
Myrmotherula schisticolor	Thamnophilidae	1	0	490,902
Myrmotherula sclateri	Thamnophilidae	3	0	1,918,939
Myrmotherula spodionota	Thamnophilidae	2	0	69,601
Myrmotherula sunensis	Thamnophilidae	2,3	0	113,002
Myrmotherula surinamensis	Thamnophilidae	1	0	1,194,636
Myrmotherula unicolor	Thamnophilidae	0	2,3	81,796
Myrmotherula urosticta	Thamnophilidae	0	2,3	97,013
Neoctantes niger	Thamnophilidae	3	0	1,222,260
Percnostola arenarum	Thamnophilidae	2	0	13,590
Percnostola lophotes	Thamnophilidae	2,3	0	172,742

Percnostola rufifrons	Thamnophilidae	3	0	1,102,111
Phlegopsis erythroptera	Thamnophilidae	3	0	1,942,209
Phlegopsis nigromaculata	Thamnophilidae	3	1	3,847,731
Pithys albifrons	Thamnophilidae	3	1	3,102,664
Pygiptila stellaris	Thamnophilidae	3	0	4,692,679
Pyriglena atra	Thamnophilidae	0	2,3	4,425
Pyriglena leuconota	Thamnophilidae	1	1	1,593,820
Pyriglena leucoptera	Thamnophilidae	0	3	1,228,647
Rhegmatorhina berlepschi	Thamnophilidae	2,3	0	26,141
Rhegmatorhina cristata (RIV)	Thamnophilidae	2,3	0	267,421
Rhegmatorhina gymnops	Thamnophilidae	2,3	0	157,596
Rhegmatorhina hoffmannsi	Thamnophilidae	3	0	646,226
Rhegmatorhina melanosticta	Thamnophilidae	3	0	1,909,621
Rhopornis ardesiacus	Thamnophilidae	0	2	27,542
Sakesphorus canadensis	Thamnophilidae	1	0	1,931,419
Sakesphorus cristatus	Thamnophilidae	0	1	647,891
Sakesphorus luctuosus (RIV)	Thamnophilidae	3	0	1,618,388
Sakesphorus melanothorax	Thamnophilidae	2,3	0	258,220
Schistocichla caurensis	Thamnophilidae	2	0	240,243
Schistocichla leucostigma	Thamnophilidae	1	1	5,204,671
Schistocichla schistacea	Thamnophilidae	3	0	529,447
Sclateria naevia	Thamnophilidae	1	1	5,330,154
Skutchia borbae	Thamnophilidae	2,3	0	151,255
Taraba major	Thamnophilidae	1	1	12,778,823
Terenura callinota	Thamnophilidae	2	0	62,502
Terenura humeralis	Thamnophilidae	3	0	1,271,897
Terenura maculata	Thamnophilidae	0	3	783,993
Terenura sharpei	Thamnophilidae	2	0	22,164
Terenura sicki	Thamnophilidae	0	2,3	6,135
Terenura spodioptila	Thamnophilidae	3	1	2,162,267
Thamnistes anabatinus	Thamnophilidae	1	0	564,366
Thamnomanes ardesiacus	Thamnophilidae	3	1	3,380,603
Thamnomanes caesius	Thamnophilidae	1	1	6,049,448
Thamnomanes saturninus	Thamnophilidae	3	0	1,364,556
Thamnomanes schistogynus	Thamnophilidae	3	0	1,177,231
Thamnophilus aethiops	Thamnophilidae	1	1	4,696,845
Thamnophilus amazonicus	Thamnophilidae	3	1	6,192,171
Thamnophilus ambiguus	Thamnophilidae	0	2	209,897
Thamnophilus aroyae	Thamnophilidae	2	0	41,031
Thamnophilus caerulescens	Thamnophilidae	1	1	3,969,482
Thamnophilus cryptoleucus (RIV)	Thamnophilidae	2,3	0	203,476
Thamnophilus doliatus	Thamnophilidae	1	1	10,665,521
Thamnophilus insignis	Thamnophilidae	2	0	52,493
Thamnophilus murinus	Thamnophilidae	3	0	4,198,335
Thamnophilus nigrocinereus (RIV)	Thamnophilidae	3	1	1,973,257
Thamnophilus palliatus	Thamnophilidae	1	1	2,542,412
Thamnophilus pelzelni	Thamnophilidae	1	1	2,622,756
Thamnophilus praecox (RIV)	Thamnophilidae	2,3	0	8,868
Thamnophilus punctatus	Thamnophilidae	1	0	1,569,764
Thamnophilus ruficapillus	Thamnophilidae	1	1	1,504,860
Thamnophilus schistaceus	Thamnophilidae	3	0	3,991,504
Thamnophilus stictocephalus	Thamnophilidae	1	0	939,774
Thamnophilus sticturus	Thamnophilidae	2	0	304,690
Thamnophilus tenuepunctatus	Thamnophilidae	2	0	107,696
Thamnophilus torquatus	Thamnophilidae	1	1	3,732,494
Thamnophilus unicolor	Thamnophilidae	2	0	118,964
Thinocorus orbignyianus	Thinocoridae	1	0	1,466,543
Anisognathus igniventris	Thraupidae	2	0	284,182
Anisognathus lacrymosus	Thraupidae	2	0	151,798
Anisognathus somptuosus	Thraupidae	2	0	273,302
Buthraupis montana	Thraupidae	2	0	290,952
Calochaetes coccineus	Thraupidae	2	0	99,150
Catamblyrhynchus diadema	Thraupidae	2	0	331,318
Chlorophanes spiza	Thraupidae	1	1	7,921,081
Chlorornis riefferii	Thraupidae	2	0	290,761
Cissopis leverianus	Thraupidae	1	1	5,226,039
Cnemoscopus rubrirostris	Thraupidae	2	0	109,408

Compsothraupis loricata	Thraupidae	1	1	1,492,369
Conirostrum albifrons	Thraupidae	2	0	298,072
Conirostrum bicolor	Thraupidae	1	1	558,562
Conirostrum ferrugineiventre	Thraupidae	2	0	86,808
Conirostrum margaritae (RIV)	Thraupidae	2,3	0	67,765
Conirostrum sitticolor	Thraupidae	2	0	300,019
Conirostrum speciosum	Thraupidae	1	1	7,216,202
Creurgops dentatus	Thraupidae	2	0	46,130
Creurgops verticalis	Thraupidae	2	0	93,901
Cyanerpes caeruleus	Thraupidae	1	0	6,673,613
Cyanerpes cyaneus	Thraupidae	1	1	8,186,073
Cyanerpes nitidus	Thraupidae	3	0	2,672,970
Cyanicterus cyanicterus	Thraupidae	2,3	0	395,563
Cypsnagra hirundinacea	Thraupidae	1	1	3,191,352
Dacnis albiventris	Thraupidae	3	0	1,029,700
Dacnis cayana	Thraupidae	1	1	12,058,726
Dacnis flaviventer	Thraupidae	3	0	4,099,958
Dacnis lineata	Thraupidae	1	1	5,605,809
Dacnis nigripes	Thraupidae	0	2,3	150,090
Delothraupis castaneoventris	Thraupidae	2	0	81,863
Dubusia taeniata	Thraupidae	2	0	281,388
Eucometis penicillata	Thraupidae	1	1	5,551,303
Hemispingus auricularis	Thraupidae	2	0	61,917
Hemispingus frontalis	Thraupidae	2	0	200,811
Hemispingus melanotis	Thraupidae	2	0	184,757
Hemispingus parodii	Thraupidae	2	0	2,600
Hemispingus superciliaris	Thraupidae	2	0	271,658
Hemispingus trifasciatus	Thraupidae	2	0	64,702
Hemispingus xanthophthalmus	Thraupidae	2	0	80,606
Hemithraupis flavicollis	Thraupidae	1	1	5,612,324
Hemithraupis guira	Thraupidae	1	1	9,379,958
Hemithraupis ruficapilla	Thraupidae	0	3	648,723
Iridophanes pulcherrimus	Thraupidae	2	0	115,344
Iridosornis analis	Thraupidae	2	0	96,997
Iridosornis jelskii	Thraupidae	2	0	47,740
Iridosornis reinhardti	Thraupidae	2	0	62,343
Lamprospiza melanoleuca	Thraupidae	3	1	3,388,737
Lanio fulvus	Thraupidae	3	0	2,285,765
Lanio versicolor	Thraupidae	3	0	2,829,851
Nemosia pileata	Thraupidae	1	1	8,701,317
Nemosia rourei	Thraupidae	0	2,3	16,526
Neothraupis fasciata	Thraupidae	1	1	2,239,245
Orchesticus abeillei	Thraupidae	0	2,3	145,358
Orthogonys chloricterus	Thraupidae	0	2,3	121,502
Pipraeidea melanonota	Thraupidae	1	1	2,111,515
Piranga flava	Thraupidae	1	1	7,741,807
Piranga leucoptera	Thraupidae	1	0	565,958
Piranga rubriceps	Thraupidae	2	0	80,393
Pyrrhocoma ruficeps	Thraupidae	0	3	611,582
Ramphocelus bresilius	Thraupidae	0	2,3	377,675
Ramphocelus carbo	Thraupidae	1	1	10,472,004
Ramphocelus melanogaster	Thraupidae	2	0	41,140
Ramphocelus nigrogularis	Thraupidae	3	0	2,102,049
Schistochlamys melanopis	Thraupidae	1	1	6,178,979
Schistochlamys ruficapillus	Thraupidae	1	1	1,860,994
Sericossypha albocristata	Thraupidae	2	0	79,315
Stephanophorus diadematus	Thraupidae	0	1	1,089,020
Tachyphonus coronatus	Thraupidae	0	3	1,359,308
Tachyphonus cristatus	Thraupidae	1	1	6,216,883
Tachyphonus luctuosus	Thraupidae	1	1	7,131,746
Tachyphonus phoenicius	Thraupidae	3	1	2,106,202
Tachyphonus rufiventer	Thraupidae	3	0	737,314
Tachyphonus rufus	Thraupidae	1	1	5,369,294
Tachyphonus surinamus	Thraupidae	3	1	4,731,897
Tangara argyrofenges	Thraupidae	2	0	35,712
Tangara arthus	Thraupidae	2	0	437,714
Tangara callophrys	Thraupidae	3	0	1,481,371

Tangara cayana	Thraupidae	1	1	5,675,416
Tangara chilensis	Thraupidae	3	0	4,475,500
Tangara chrysotis	Thraupidae	2	0	99,786
Tangara cyanicollis	Thraupidae	1	0	1,243,921
Tangara cyanocephala	Thraupidae	0	2,3	444,863
Tangara cyanoptera	Thraupidae	2	0	277,098
Tangara cyanotis	Thraupidae	2	0	88,888
Tangara cyanoventris	Thraupidae	0	2,3	475,555
Tangara desmaresti	Thraupidae	0	2,3	220,070
Tangara fastuosa	Thraupidae	0	2,3	36,001
Tangara guttata	Thraupidae	2	0	365,499
Tangara gyrola	Thraupidae	1	0	3,988,518
Tangara heinei	Thraupidae	2	0	131,406
Tangara mexicana	Thraupidae	1	1	7,172,986
Tangara nigrocincta	Thraupidae	3	0	3,416,823
Tangara nigroviridis	Thraupidae	2	0	348,805
Tangara parzudakii	Thraupidae	2	0	163,484
Tangara peruviana	Thraupidae	0	2,3	36,153
Tangara preciosa	Thraupidae	0	1	1,104,884
Tangara punctata	Thraupidae	1	1	2,552,958
Tangara ruficervix	Thraupidae	2	0	249,587
Tangara schrankii	Thraupidae	3	0	2,751,195
Tangara seledon	Thraupidae	0	3	672,718
Tangara varia	Thraupidae	3	0	1,223,427
Tangara vassorii	Thraupidae	2	0	313,064
Tangara velia	Thraupidae	1	1	5,136,011
Tangara viridicollis	Thraupidae	2	0	102,229
Tangara xanthocephala	Thraupidae	2	0	357,030
Tangara xanthogastra	Thraupidae	1	0	2,786,921
Tersina viridis	Thraupidae	1	1	8,757,417
Thlypopsis fulviceps	Thraupidae	2	0	40,006
Thlypopsis ornata	Thraupidae	2	0	181,101
Thlypopsis pectoralis	Thraupidae	2	0	12,520
Thlypopsis ruficeps	Thraupidae	2	0	213,744
Thlypopsis sordida	Thraupidae	1	1	6,836,055
Thraupis bonariensis	Thraupidae	1	1	2,581,363
Thraupis cyanocephala	Thraupidae	2	0	428,218
Thraupis cyanoptera	Thraupidae	0	2,3	224,105
Thraupis episcopus	Thraupidae	1	1	7,892,486
Thraupis ornata	Thraupidae	0	2,3	392,916
Thraupis palmarum	Thraupidae	1	1	12,180,145
Thraupis sayaca	Thraupidae	1	1	6,566,284
Trichothraupis melanops	Thraupidae	1	1	2,473,265
Wetmorethraupis sterrhopteron	Thraupidae	2	0	9,158
Xenodacnis parina	Thraupidae	2	0	109,736
Cercibis oxycerca	Threskiornithidae	2	0	395,865
Eudocimus ruber	Threskiornithidae	1	1	816,474
Mesembrinibis cayennensis	Threskiornithidae	1	1	10,573,889
Phimosus infuscatus	Threskiornithidae	1	1	6,585,894
Platalea ajaja	Threskiornithidae	1	1	7,946,962
Plegadis chihi	Threskiornithidae	0	1	5,296,809
Theristicus caerulescens	Threskiornithidae	1	1	1,749,881
Theristicus caudatus	Threskiornithidae	1	1	5,146,144
Theristicus melanopis	Threskiornithidae	1	0	1,965,781
Crypturellus atrocapillus	Tinamidae	2,3	0	120,675
Crypturellus bartletti	Tinamidae	3	0	1,611,432
Crypturellus brevirostris	Tinamidae	3	0	636,407
Crypturellus casiquiare	Tinamidae	2,3	0	48,634
Crypturellus cinereus	Tinamidae	3	0	5,924,633
Crypturellus duidae	Tinamidae	2,3	0	58,336
Crypturellus erythropus	Tinamidae	1	0	1,827,501
Crypturellus noctivagus	Tinamidae	0	3	1,469,564
Crypturellus obsoletus	Tinamidae	1	1	1,731,600
Crypturellus parvirostris	Tinamidae	1	1	6,659,518
Crypturellus ptaritepui	Tinamidae	2	0	1,031
Crypturellus soui	Tinamidae	1	1	9,520,929
Crypturellus strigulosus	Tinamidae	1	1	2,589,971

Crypturellus tataupa	Tinamidae	1	1	4,856,097
Crypturellus undulatus	Tinamidae	1	1	8,596,776
Crypturellus variegatus	Tinamidae	1	1	5,436,753
Nothocercus bonapartei	Tinamidae	2	0	137,923
Nothocercus nigrocapillus	Tinamidae	2	0	35,019
Nothoprocta ornata	Tinamidae	1	0	741,553
Nothura boraquira	Tinamidae	1	1	1,348,268
Nothura maculosa	Tinamidae	0	1	3,879,952
Nothura minor	Tinamidae	0	1	928,032
Rhynchotus maculicollis	Tinamidae	2	0	113,174
Rhynchotus rufescens	Tinamidae	1	1	5,674,255
Taoniscus nanus	Tinamidae	0	1	504,539
Tinamotis pentlandii	Tinamidae	1	0	589,020
Tinamus guttatus	Tinamidae	3	0	3,970,786
Tinamus major	Tinamidae	1	0	6,587,450
Tinamus solitarius	Tinamidae	0	3	990,356
Tinamus tao	Tinamidae	1	0	3,554,757
Adelomyia melanogenys	Trochilidae	1	0	619,862
Aglaeactis castelnaudii	Trochilidae	2	0	72,579
Aglaeactis cupripennis	Trochilidae	2	0	276,591
Aglaiocercus kingi	Trochilidae	2	0	338,188
Amazilia brevirostris	Trochilidae	1	0	584,295
Amazilia cupreicauda	Trochilidae	2	0	234,310
Amazilia fimbriata	Trochilidae	1	1	9,475,294
Amazilia franciae	Trochilidae	2	0	247,255
Amazilia lactea	Trochilidae	1	1	1,449,362
Amazilia leucogaster	Trochilidae	2	2	259,431
Amazilia tobaci	Trochilidae	2	0	467,693
Amazilia versicolor	Trochilidae	1	1	5,113,572
Amazilia viridigaster	Trochilidae	2	0	42,935
Anthracothorax nigricollis	Trochilidae	1	1	9,821,789
Anthracothorax viridigula	Trochilidae	3	0	591,469
Aphantochroa cirrochloris	Trochilidae	0	3	1,117,981
Augastes lumachella	Trochilidae	0	2	40,543
Augastes scutatus	Trochilidae	0	2	124,030
Avocettula recurvirostris	Trochilidae	3	0	695,476
Boissonneaua flavescens	Trochilidae	2	0	128,711
Boissonneaua matthewsii	Trochilidae	2	0	127,435
Calliphlox amethystina	Trochilidae	1	1	7,988,121
Campylopterus duidae	Trochilidae	2	0	102,776
Campylopterus falcatus	Trochilidae	2	0	86,845
Campylopterus hyperythrus	Trochilidae	2	0	40,876
Campylopterus largipennis	Trochilidae	1	1	6,522,429
Campylopterus villaviscensio	Trochilidae	2	0	22,860
Chaetocercus bombus	Trochilidae	2	0	145,611
Chaetocercus heliodor	Trochilidae	2	0	108,753
Chaetocercus jourdanii	Trochilidae	2	0	46,451
Chaetocercus mulsant	Trochilidae	2	0	263,640
Chalcostigma olivaceum	Trochilidae	2	0	92,082
Chalcostigma ruficeps	Trochilidae	2	0	123,505
Chalcostigma stanleyi	Trochilidae	2	0	116,888
Chlorestes notata	Trochilidae	1	1	4,700,527
Chlorostilbon alice	Trochilidae	2	0	81,268
Chlorostilbon aureoventris	Trochilidae	1	1	5,788,270
Chlorostilbon mellisugus	Trochilidae	1	0	5,801,339
Chlorostilbon olivaresi	Trochilidae	2	0	6,529
Chrysolampis mosquitus	Trochilidae	1	1	5,296,429
Chrysuronia oenone	Trochilidae	1	0	1,336,392
Clytolaema rubricauda	Trochilidae	0	2,3	352,773
Coeligena coeligena	Trochilidae	2	0	387,621
Coeligena iris	Trochilidae	2	0	75,156
Coeligena torquata	Trochilidae	2	0	308,863
Coeligena violifer	Trochilidae	2	0	136,209
Colibri coruscans	Trochilidae	1	0	920,393
Colibri delphinae	Trochilidae	1	0	1,200,041
Colibri serrirostris	Trochilidae	1	1	2,370,665
Colibri thalassinus	Trochilidae	1	0	792,321

Discosura langsdorffi	Trochilidae	1	1	1,980,004
Discosura longicaudus	Trochilidae	1	1	1,879,853
Discosura popelairii	Trochilidae	2	0	138,778
Doryfera johannae	Trochilidae	2	0	459,629
Doryfera ludovicae	Trochilidae	2	0	387,150
Ensifera ensifera	Trochilidae	2	0	346,092
Eriocnemis alinae	Trochilidae	2	0	68,343
Eriocnemis luciani	Trochilidae	2	0	84,184
Eupetomena macroura	Trochilidae	1	1	4,360,586
Eutoxeres aquila	Trochilidae	2	0	250,253
Eutoxeres condamini	Trochilidae	2	0	370,060
Florisuga fusca	Trochilidae	0	3	675,237
Florisuga mellivora	Trochilidae	1	0	8,105,461
Glaucis dohrnii	Trochilidae	0	2,3	74,514
Glaucis hirsutus	Trochilidae	1	1	7,820,115
Haplophaedia aureliae	Trochilidae	2	0	190,669
Heliactin bilophus	Trochilidae	1	1	2,505,369
Heliangelus amethysticollis	Trochilidae	2	0	201,740
Heliangelus exortis	Trochilidae	2	0	64,066
Heliodoxa aurescens	Trochilidae	3	0	3,600,178
Heliodoxa branickii	Trochilidae	2	0	52,918
Heliodoxa gularis	Trochilidae	2	0	15,681
Heliodoxa leadbeateri	Trochilidae	2	0	347,823
Heliodoxa rubinoides	Trochilidae	2	0	203,571
Heliodoxa schreibersii	Trochilidae	1	0	746,386
Heliodoxa xanthogonys	Trochilidae	2	0	118,267
Heliomaster furcifer	Trochilidae	1	1	2,298,107
Heliomaster longirostris	Trochilidae	1	1	8,290,186
Heliomaster squamosus	Trochilidae	0	1	1,519,237
Heliothryx auritus	Trochilidae	1	1	6,893,421
Hylocharis chrysura	Trochilidae	1	1	3,128,402
Hylocharis cyanus	Trochilidae	1	1	7,006,381
Hylocharis sapphirina	Trochilidae	1	1	4,204,065
Hylonympha macrocerca	Trochilidae	2	0	2,472
Klais guimeti	Trochilidae	2	0	471,395
Lafresnaya lafresnayi	Trochilidae	2	0	312,916
Lesbia nuna	Trochilidae	2	0	231,985
Leucippus chionogaster	Trochilidae	1	0	488,769
Leucippus chlorocercus (RIV)	Trochilidae	2,3	0	173,797
Leucippus taczanowskii	Trochilidae	2	0	86,686
Leucippus viridicauda	Trochilidae	2	0	28,879
Leucochloris albicollis	Trochilidae	0	3	1,340,687
Lophornis chalybeus	Trochilidae	1	1	2,993,007
Lophornis delattrei	Trochilidae	2	0	186,088
Lophornis gouldii	Trochilidae	1	0	1,191,086
Lophornis magnificus	Trochilidae	1	1	1,674,605
Lophornis ornatus	Trochilidae	1	0	828,804
Lophornis pavoninus	Trochilidae	2	0	206,406
Lophornis stictolophus	Trochilidae	2	0	44,743
Metallura eupogon	Trochilidae	2	0	25,485
Metallura theresiae	Trochilidae	2	0	18,246
Metallura tyrianthina	Trochilidae	2	0	422,578
Microstilbon burmeisteri	Trochilidae	2	0	109,880
Myrtis fanny	Trochilidae	2	0	256,480
Ocreatus underwoodii	Trochilidae	2	0	385,602
Oreotrochilus estella	Trochilidae	1	0	659,604
Oreotrochilus melanogaster	Trochilidae	2	0	55,337
Patagona gigas	Trochilidae	1	0	1,221,102
Phaethornis atrimentalis	Trochilidae	1	0	829,115
Phaethornis augusti	Trochilidae	1	0	557,854
Phaethornis bourcieri	Trochilidae	1	0	2,686,503
Phaethornis eurynome	Trochilidae	0	3	934,277
Phaethornis griseogularis	Trochilidae	2	0	159,113
Phaethornis guy	Trochilidae	2	0	339,278
Phaethornis hispidus	Trochilidae	3	0	4,008,377
Phaethornis idaliae	Trochilidae	0	2,3	154,971
Phaethornis koepckeae	Trochilidae	2	0	4,272

Phaethornis longuemareus	Trochilidae	2	0	279,905
Phaethornis malaris	Trochilidae	1	1	3,375,311
Phaethornis nattereri	Trochilidae	1	0	1,411,587
Phaethornis philippii	Trochilidae	3	0	1,596,475
Phaethornis pretrei	Trochilidae	1	1	3,080,805
Phaethornis ruber	Trochilidae	1	1	7,403,439
Phaethornis rupurumii	Trochilidae	1	0	559,452
Phaethornis squalidus	Trochilidae	0	2	262,388
Phaethornis stuarti	Trochilidae	2	0	203,433
Phaethornis subochraceus	Trochilidae	2	0	305,789
Phaethornis superciliosus	Trochilidae	1	0	2,717,052
Phaethornis syrmatophorus	Trochilidae	2	0	159,646
Phlogophilus harterti	Trochilidae	2	0	37,922
Phlogophilus hemileucurus	Trochilidae	2	0	25,433
Polytmus guainumbi	Trochilidae	1	1	4,835,837
Polytmus milleri	Trochilidae	2	0	67,020
Polytmus theresiae	Trochilidae	1	0	1,908,665
Pterophanes cyanopterus	Trochilidae	2	0	232,556
Ramphodon naevius	Trochilidae	0	2,3	220,329
Schistes geoffroyi	Trochilidae	2	0	186,136
Stephanoxis lalandi	Trochilidae	0	3	911,032
Taphrospilus hypostictus	Trochilidae	2	0	112,581
Thalurania furcata	Trochilidae	1	1	10,557,281
Thalurania glaucopis	Trochilidae	0	3	1,415,901
Thalurania watertonii	Trochilidae	0	2	32,561
Threnetes leucurus	Trochilidae	3	0	5,166,669
Threnetes niger	Trochilidae	2,3	0	196,084
Topaza pella	Trochilidae	3	1	1,629,283
Topaza pyra	Trochilidae	3	0	787,342
Urochroa bougueri	Trochilidae	2	0	49,762
Urosticte ruficrissa	Trochilidae	2	0	31,247
Campylorhynchus griseus	Troglodytidae	1	0	904,351
Campylorhynchus nuchalis	Troglodytidae	1	0	506,638
Campylorhynchus turdinus	Troglodytidae	1	1	4,443,360
Cinnycerthia fulva	Troglodytidae	2	0	69,563
Cinnycerthia olivascens	Troglodytidae	2	0	89,335
Cinnycerthia peruana	Troglodytidae	2	0	48,650
Cistothorus platensis	Troglodytidae	1	1	6,592,804
Cyphorhinus arada	Troglodytidae	3	0	4,457,647
Cyphorhinus thoracicus	Troglodytidae	2	0	140,812
Henicorhina leucophrys	Troglodytidae	1	0	712,730
Henicorhina leucosticta	Troglodytidae	1	0	2,521,837
Microcerculus bambla	Troglodytidae	3	0	1,636,643
Microcerculus marginatus	Troglodytidae	1	0	4,780,653
Microcerculus ustulatus	Troglodytidae	2	0	325,777
Odontorchilus branickii	Troglodytidae	2	0	131,632
Odontorchilus cinereus	Troglodytidae	3	0	1,047,805
Thryothorus coraya	Troglodytidae	1	1	3,793,684
Thryothorus eisenmanni	Troglodytidae	2	0	4,180
Thryothorus genibarbis	Troglodytidae	1	1	5,958,615
Thryothorus griseus	Troglodytidae	2,3	0	90,773
Thryothorus guarayanus	Troglodytidae	1	0	574,136
Thryothorus leucotis	Troglodytidae	1	1	8,528,161
Thryothorus longirostris	Troglodytidae	0	1	1,386,903
Thryothorus rufalbus	Troglodytidae	1	0	779,632
Thryothorus rutilus	Troglodytidae	2	0	206,159
Troglodytes aedon	Troglodytidae	1	1	25,141,831
Troglodytes rufulus	Troglodytidae	2	0	58,638
Troglodytes solstitialis	Troglodytidae	1	0	553,659
Pharomachrus antisianus	Trogonidae	2	0	427,107
Pharomachrus auriceps	Trogonidae	1	0	494,349
Pharomachrus fulgidus	Trogonidae	2	0	21,864
Pharomachrus pavoninus	Trogonidae	3	0	3,760,675
Trogon collaris	Trogonidae	1	1	5,392,179
Trogon curucui	Trogonidae	1	1	7,396,207
Trogon melanurus	Trogonidae	1	1	6,812,167
Trogon personatus	Trogonidae	1	0	745,887

Trogon rufus	Trogonidae	1	1	6,589,763
Trogon surrucura	Trogonidae	1	3	1,550,720
Trogon violaceus	Trogonidae	1	1	6,901,004
Trogon viridis	Trogonidae	1	1	8,149,935
Catharus aurantiirostris	Turdidae	1	0	645,137
Catharus dryas	Turdidae	2	0	465,896
Catharus fuscater	Turdidae	2	0	260,289
Cichlopsis leucogenys	Turdidae	2	2	193,066
Entomodestes leucotis	Turdidae	2	0	110,225
Myadestes ralloides	Turdidae	2	0	457,727
Platycichla flavipes	Turdidae	1	1	898,170
Platycichla leucops	Turdidae	2	0	413,725
Turdus albicollis	Turdidae	1	1	7,733,989
Turdus amaurochalinus	Turdidae	1	1	3,769,251
Turdus fulviventris	Turdidae	2	0	71,578
Turdus fumigatus	Turdidae	1	1	4,070,787
Turdus fuscater	Turdidae	2	0	411,251
Turdus haplochrous	Turdidae	2	0	191,947
Turdus hauxwelli	Turdidae	3	0	2,612,318
Turdus ignobilis	Turdidae	1	0	3,471,559
Turdus lawrencii	Turdidae	3	0	3,081,631
Turdus leucomelas	Turdidae	1	1	7,245,055
Turdus nigriceps	Turdidae	2	0	329,646
Turdus nudigenis	Turdidae	1	1	1,520,480
Turdus olivater	Turdidae	2	0	227,987
Turdus rufiventris	Turdidae	1	1	5,028,676
Turdus serranus	Turdidae	2	0	408,837
Turdus subalaris	Turdidae	0	1	535,409
Agriornis andicola	Tyrannidae	1	0	751,003
Agriornis montanus	Tyrannidae	1	0	2,169,292
Alectrurus risora	Tyrannidae	0	1	793,652
Alectrurus tricolor	Tyrannidae	1	1	1,867,470
Anairetes agraphia	Tyrannidae	2	0	44,426
Anairetes flavirostris	Tyrannidae	1	0	1,523,174
Anairetes parulus	Tyrannidae	1	0	2,638,448
Arundinicola leucocephala	Tyrannidae	1	1	9,087,741
Attila bolivianus	Tyrannidae	3	0	2,789,950
Attila cinnamomeus	Tyrannidae	3	1	5,274,572
Attila citriniventris	Tyrannidae	3	0	1,246,784
Attila phoenicurus	Tyrannidae	0	1	552,447
Attila rufus	Tyrannidae	0	2,3	342,557
Attila spadiceus	Tyrannidae	1	1	7,244,073
Camptostoma obsoletum	Tyrannidae	1	1	14,428,569
Capsiempis flaveola	Tyrannidae	1	1	5,511,307
Casiornis fuscus	Tyrannidae	1	1	2,106,626
Casiornis rufus	Tyrannidae	1	1	2,802,837
Cnemarchus erythropygius	Tyrannidae	2	0	127,380
Cnemotriccus fuscatus	Tyrannidae	1	1	12,243,269
Cnipodectes subbrunneus	Tyrannidae	1	0	1,950,422
Colonia colonus	Tyrannidae	1	1	6,371,550
Conopias albovittatus	Tyrannidae	1	0	3,411,402
Conopias cinchoneti	Tyrannidae	2	0	162,548
Conopias trivirgatus	Tyrannidae	1	1	1,614,986
Contopus albogularis	Tyrannidae	2,3	0	114,557
Contopus cinereus	Tyrannidae	1	1	5,646,112
Contopus fumigatus	Tyrannidae	1	0	1,020,956
Contopus nigrescens	Tyrannidae	2	0	55,584
Corythopis delalandi	Tyrannidae	1	1	2,463,949
Corythopis torquatus	Tyrannidae	3	1	6,636,123
Culicivora caudacuta	Tyrannidae	1	1	1,737,913
Elaenia albiceps	Tyrannidae	1	0	2,242,260
Elaenia chiriquensis	Tyrannidae	1	1	7,145,422
Elaenia cristata	Tyrannidae	1	1	5,127,714
Elaenia dayi	Tyrannidae	2	0	26,628
Elaenia flavogaster	Tyrannidae	1	1	10,277,875
Elaenia frantzii	Tyrannidae	2	0	259,469
Elaenia gigas	Tyrannidae	2,3	0	474,633

Elaenia mesoleuca	Tyrannidae	0	1	2,005,471
Elaenia obscura	Tyrannidae	1	1	1,792,390
Elaenia pallatangae	Tyrannidae	2	0	473,359
Elaenia parvirostris	Tyrannidae	1	1	2,741,970
Elaenia pelzelni (RIV)	Tyrannidae	2,3	0	311,538
Elaenia ruficeps	Tyrannidae	3	0	693,640
Elaenia spectabilis	Tyrannidae	1	1	2,885,017
Elaenia strepera	Tyrannidae	2	0	231,136
Empidonomus varius	Tyrannidae	1	1	10,262,694
Euscarthmus meloryphus	Tyrannidae	1	1	5,965,380
Euscarthmus rufomarginatus	Tyrannidae	1	1	1,594,783
Fluvicola albiventer	Tyrannidae	1	1	5,617,767
Fluvicola nengeta	Tyrannidae	1	1	1,947,027
Fluvicola pica	Tyrannidae	1	0	1,658,369
Griseotyrannus aurantioatrocristatus	Tyrannidae	1	1	5,420,777
Gubernetes yetapa	Tyrannidae	1	1	1,843,894
Hemitriccus cinnamomeipectus	Tyrannidae	2	0	8,958
Hemitriccus diops	Tyrannidae	0	3	737,293
Hemitriccus flammulatus	Tyrannidae	3	0	806,782
Hemitriccus furcatus	Tyrannidae	0	2,3	28,130
Hemitriccus granadensis	Tyrannidae	2	0	204,186
Hemitriccus griseipectus	Tyrannidae	1	1	2,653,610
Hemitriccus iohannis	Tyrannidae	3	0	1,022,293
Hemitriccus josephinae	Tyrannidae	3	0	666,070
Hemitriccus kaempferi	Tyrannidae	0	2,3	7,039
Hemitriccus margaritaceiventer	Tyrannidae	1	1	5,590,359
Hemitriccus minor	Tyrannidae	3	0	2,416,885
Hemitriccus nidipendulus	Tyrannidae	0	3	542,182
Hemitriccus obsoletus	Tyrannidae	0	2,3	262,912
Hemitriccus orbitatus	Tyrannidae	0	3	663,621
Hemitriccus rufigularis	Tyrannidae	2	0	60,933
Hemitriccus striaticollis	Tyrannidae	1	1	3,646,725
Hemitriccus zosterops	Tyrannidae	1	0	2,016,453
Hirundinea ferruginea	Tyrannidae	1	1	6,290,006
Hymenops perspicillatus	Tyrannidae	0	1	2,683,332
Inezia caudata	Tyrannidae	1	0	597,300
Inezia inornata	Tyrannidae	1	1	1,166,668
Inezia subflava	Tyrannidae	1	0	972,376
Knipolegus aterrimus	Tyrannidae	1	1	1,597,009
Knipolegus cyanirostris	Tyrannidae	0	1	1,579,040
Knipolegus lophotes	Tyrannidae	1	1	1,319,784
Knipolegus nigerrimus	Tyrannidae	0	2,3	399,565
Knipolegus orenocensis (RIV)	Tyrannidae	3	0	511,122
Knipolegus poecilocercus (RIV)	Tyrannidae	3	0	1,166,994
Knipolegus poecilurus	Tyrannidae	2	0	467,680
Knipolegus signatus	Tyrannidae	2	0	132,007
Lathrotriccus euleri	Tyrannidae	1	1	10,220,656
Legatus leucophaius	Tyrannidae	1	1	11,371,317
Leptopogon amaurocephalus	Tyrannidae	1	1	8,059,948
Leptopogon rufipectus	Tyrannidae	2	0	91,197
Leptopogon superciliaris	Tyrannidae	1	0	615,506
Leptopogon taczanowskii	Tyrannidae	2	0	52,506
Lessonia oreas	Tyrannidae	1	0	832,008
Lophotriccus eulophotes	Tyrannidae	2,3	0	328,684
Lophotriccus galeatus	Tyrannidae	1	1	2,441,848
Lophotriccus pilaris	Tyrannidae	1	0	814,013
Lophotriccus pileatus	Tyrannidae	2	0	470,940
Lophotriccus vitiosus	Tyrannidae	3	0	2,198,914
Machetornis rixosa	Tyrannidae	1	1	6,651,859
Mecocerculus calopterus	Tyrannidae	2	0	58,751
Mecocerculus hellmayri	Tyrannidae	2	0	70,007
Mecocerculus leucophrys	Tyrannidae	1	0	880,144
Mecocerculus minor	Tyrannidae	2	0	62,124
Mecocerculus poecilocercus	Tyrannidae	2	0	162,082
Mecocerculus stictopterus	Tyrannidae	2	0	265,920
Megarynchus pitangua	Tyrannidae	1	1	13,242,973
Mionectes macconnelli	Tyrannidae	1	1	2,930,260

Mionectes oleagineus	Tyrannidae	1	1	8,926,634
Mionectes olivaceus	Tyrannidae	1	0	744,817
Mionectes rufiventris	Tyrannidae	0	3	1,057,699
Mionectes striaticollis	Tyrannidae	2	0	318,011
Mitrephanes olivaceus	Tyrannidae	2	0	91,047
Muscigralla brevicauda	Tyrannidae	2	0	167,064
Muscipipra vetula	Tyrannidae	0	3	828,356
Muscisaxicola fluviatilis	Tyrannidae	3	0	1,235,816
Muscisaxicola griseus	Tyrannidae	2	0	312,768
Muscisaxicola juninensis	Tyrannidae	1	0	513,972
Muscisaxicola maculirostris	Tyrannidae	1	0	1,996,704
Muscisaxicola rufivertex	Tyrannidae	1	0	1,036,170
Myiarchus cephalotes	Tyrannidae	2	0	292,584
Myiarchus ferox	Tyrannidae	1	1	11,854,104
Myiarchus swainsoni	Tyrannidae	1	1	11,078,531
Myiarchus tuberculifer	Tyrannidae	1	1	10,571,088
Myiarchus tyrannulus	Tyrannidae	1	1	10,368,368
Myiarchus venezuelensis	Tyrannidae	2	0	258,532
Myiobius atricaudus	Tyrannidae	1	1	4,896,999
Myiobius barbatus	Tyrannidae	1	1	6,212,014
Myiobius villosus	Tyrannidae	2	0	270,828
Myiodynastes chrysocephalus	Tyrannidae	1	0	479,825
Myiodynastes maculatus	Tyrannidae	1	1	14,403,580
Myiopagis caniceps	Tyrannidae	1	1	7,058,598
Myiopagis flavivertex	Tyrannidae	3	1	1,303,975
Myiopagis gaimardii	Tyrannidae	1	1	8,652,879
Myiopagis viridicata	Tyrannidae	1	1	7,284,413
Myiophobus cryptoxanthus	Tyrannidae	2	0	70,460
Myiophobus fasciatus	Tyrannidae	1	1	10,232,440
Myiophobus flavicans	Tyrannidae	2	0	272,293
Myiophobus inornatus	Tyrannidae	2	0	55,970
Myiophobus ochraceiventris	Tyrannidae	2	0	92,917
Myiophobus phoenicomitra	Tyrannidae	2	0	44,067
Myiophobus pulcher	Tyrannidae	2	0	76,667
Myiophobus roraimae	Tyrannidae	2	0	247,068
Myiornis albiventris	Tyrannidae	2	0	56,663
Myiornis auricularis	Tyrannidae	0	3	1,267,218
Myiornis ecaudatus	Tyrannidae	1	1	6,413,786
Myiotheretes fumigatus	Tyrannidae	2	0	203,526
Myiotheretes fuscorufus	Tyrannidae	2	0	72,175
Myiotheretes striaticollis	Tyrannidae	1	0	692,826
Myiotriccus ornatus	Tyrannidae	2	0	185,809
Myiozetetes cayanensis	Tyrannidae	1	1	7,536,041
Myiozetetes granadensis	Tyrannidae	1	0	3,321,908
Myiozetetes luteiventris	Tyrannidae	3	0	3,958,722
Myiozetetes similis	Tyrannidae	1	1	10,241,653
Neopipo cinnamomea	Tyrannidae	3	0	3,330,573
Ochthoeca cinnamomeiventris	Tyrannidae	2	0	311,053
Ochthoeca frontalis	Tyrannidae	2	0	228,625
Ochthoeca fumicolor	Tyrannidae	2	0	258,017
Ochthoeca jelskii	Tyrannidae	2	0	73,733
Ochthoeca oenanthoides	Tyrannidae	1	0	624,156
Ochthoeca pulchella	Tyrannidae	2	0	116,866
Ochthoeca rufipectoralis	Tyrannidae	2	0	333,684
Ochthornis littoralis	Tyrannidae	1	0	4,561,675
Onychorhynchus coronatus	Tyrannidae	1	1	6,921,616
Ornithion inerme	Tyrannidae	1	1	6,701,217
Pachyramphus albogriseus	Tyrannidae	2	0	341,650
Pachyramphus castaneus	Tyrannidae	1	1	5,788,265
Pachyramphus marginatus	Tyrannidae	1	1	6,344,835
Pachyramphus minor	Tyrannidae	3	0	6,895,146
Pachyramphus polychopterus	Tyrannidae	1	1	13,913,681
Pachyramphus rufus	Tyrannidae	1	0	3,903,332
Pachyramphus surinamus	Tyrannidae	3	0	647,271
Pachyramphus validus	Tyrannidae	1	1	6,063,201
Pachyramphus versicolor	Tyrannidae	2	0	302,160
Pachyramphus viridis	Tyrannidae	1	1	5,140,542

Phaeomyias murina	Tyrannidae	1	1	10,941,388
Phelpsia inornata	Tyrannidae	2	0	278,017
Phyllomyias burmeisteri	Tyrannidae	1	1	813,448
Phyllomyias cinereiceps	Tyrannidae	2	0	144,466
Phyllomyias fasciatus	Tyrannidae	1	1	3,601,379
Phyllomyias griseiceps	Tyrannidae	1	0	615,944
Phyllomyias griseocapilla	Tyrannidae	0	2,3	182,456
Phyllomyias nigrocapillus	Tyrannidae	2	0	254,815
Phyllomyias plumbeiceps	Tyrannidae	2	0	71,929
Phyllomyias reiseri	Tyrannidae	1	1	650,249
Phyllomyias sclateri	Tyrannidae	2	0	86,748
Phyllomyias uropygialis	Tyrannidae	2	0	232,105
Phyllomyias virescens	Tyrannidae	0	3	1,029,237
Phyllomyias zeledoni	Tyrannidae	2	0	40,096
Phylloscartes ceciliae	Tyrannidae	0	2,3	1,654
Phylloscartes difficilis	Tyrannidae	0	2,3	153,946
Phylloscartes gualaquizae	Tyrannidae	2	0	13,145
Phylloscartes kronei	Tyrannidae	0	2,3	7,307
Phylloscartes nigrifrons	Tyrannidae	2	0	172,912
Phylloscartes oustaleti	Tyrannidae	0	2,3	74,773
Phylloscartes parkeri	Tyrannidae	2	0	38,712
Phylloscartes paulistus	Tyrannidae	0	2,3	472,808
Phylloscartes sylviolus	Tyrannidae	0	2,3	435,025
Phylloscartes ventralis	Tyrannidae	1	1	1,633,417
Phylloscartes virescens	Tyrannidae	2,3	0	428,288
Piprites chloris	Tyrannidae	1	1	6,993,990
Piprites pileata	Tyrannidae	0	2,3	336,081
Pitangus lictor	Tyrannidae	1	1	9,186,023
Pitangus sulphuratus	Tyrannidae	1	1	16,166,582
Platyrinchus coronatus	Tyrannidae	1	1	5,182,865
Platyrinchus flavigularis	Tyrannidae	2	0	57,522
Platyrinchus leucoryphus	Tyrannidae	0	2,3	420,836
Platyrinchus mystaceus	Tyrannidae	1	1	5,770,997
Platyrinchus platyrhynchos	Tyrannidae	3	1	5,529,328
Platyrinchus saturatus	Tyrannidae	3	1	2,221,985
Poecilotriccus albifacies	Tyrannidae	2,3	0	33,854
Poecilotriccus calopterus	Tyrannidae	2,3	0	208,586
Poecilotriccus capitalis	Tyrannidae	1	0	499,554
Poecilotriccus fumifrons	Tyrannidae	1	1	2,054,038
Poecilotriccus latirostris	Tyrannidae	1	1	4,660,953
Poecilotriccus luluae	Tyrannidae	2	0	2,616
Poecilotriccus plumbeiceps	Tyrannidae	1	1	1,466,756
Poecilotriccus pulchellus	Tyrannidae	2,3	0	17,456
Poecilotriccus russatus	Tyrannidae	2	0	28,838
Poecilotriccus sylvia	Tyrannidae	1	0	1,909,885
Pogonotriccus chapmani	Tyrannidae	2	0	174,070
Pogonotriccus eximius	Tyrannidae	0	3	1,008,816
Pogonotriccus ophthalmicus	Tyrannidae	2	0	178,234
Pogonotriccus orbitalis	Tyrannidae	2	0	121,511
Pogonotriccus poecilotis	Tyrannidae	2	0	212,727
Polioxolmis rufipennis	Tyrannidae	2	0	393,817
Polystictus pectoralis	Tyrannidae	1	1	3,234,592
Polystictus superciliaris	Tyrannidae	0	2	104,277
Pseudocolopteryx acutipennis	Tyrannidae	1	0	506,129
Pseudocolopteryx flaviventris	Tyrannidae	0	1	1,747,646
Pseudocolopteryx sclateri	Tyrannidae	0	1	622,572
Pseudotriccus pelzelni	Tyrannidae	2	0	115,829
Pseudotriccus ruficeps	Tyrannidae	2	0	192,651
Pseudotriccus simplex	Tyrannidae	2	0	46,064
Pyrocephalus rubinus	Tyrannidae	1	1	7,061,406
Pyrrhomyias cinnamomeus	Tyrannidae	1	0	538,169
Ramphotrigon fuscicauda	Tyrannidae	2,3	0	413,035
Ramphotrigon megacephalum	Tyrannidae	1	1	2,267,282
Ramphotrigon ruficauda	Tyrannidae	3	1	6,735,643
Rhynchocyclus fulvipectus	Tyrannidae	2	0	196,882
Rhynchocyclus olivaceus	Tyrannidae	1	1	5,689,115
Rhytipterna immunda	Tyrannidae	3	0	733,385

Rhytipterna simplex	Tyrannidae	1	1	7,376,420
Satrapa icterophrys	Tyrannidae	1	1	6,572,001
Sayornis nigricans	Tyrannidae	1	0	2,967,365
Serpophaga cinerea	Tyrannidae	1	0	537,372
Serpophaga hypoleuca (RIV)	Tyrannidae	3	0	554,150
Serpophaga nigricans	Tyrannidae	0	1	3,554,162
Serpophaga subcristata	Tyrannidae	1	1	5,110,169
Sirystes sibilator	Tyrannidae	1	1	6,958,021
Stigmatura budytoides	Tyrannidae	1	0	1,478,448
Stigmatura napensis	Tyrannidae	1	1	617,029
Sublegatus arenarum	Tyrannidae	1	0	940,744
Sublegatus modestus	Tyrannidae	1	1	6,470,233
Sublegatus obscurior	Tyrannidae	1	1	4,486,943
Suiriri islerorum	Tyrannidae	1	1	903,235
Suiriri suiriri	Tyrannidae	1	1	5,840,135
Tachuris rubrigastra	Tyrannidae	0	1	2,203,135
Taeniotriccus andrei	Tyrannidae	3	0	808,306
Terenotriccus erythrurus	Tyrannidae	1	1	7,494,507
Todirostrum chrysocrotaphum	Tyrannidae	3	1	4,205,258
Todirostrum cinereum	Tyrannidae	1	1	8,070,747
Todirostrum maculatum	Tyrannidae	3	1	4,363,304
Todirostrum pictum	Tyrannidae	3	1	1,704,245
Todirostrum poliocephalum	Tyrannidae	0	2,3	465,112
Tolmomyias assimilis	Tyrannidae	1	1	6,079,413
Tolmomyias flaviventris	Tyrannidae	1	1	6,719,404
Tolmomyias poliocephalus	Tyrannidae	1	1	6,112,787
Tolmomyias sulphurescens	Tyrannidae	1	1	12,451,644
Tolmomyias traylori	Tyrannidae	2,3	0	270,025
Tolmomyias viridiceps	Tyrannidae	1	0	2,250,863
Tyrannopsis sulphurea	Tyrannidae	1	1	6,496,054
Tyrannulus elatus	Tyrannidae	1	1	6,406,080
Tyrannus albogularis	Tyrannidae	1	1	4,234,391
Tyrannus dominicensis	Tyrannidae	1	0	575,520
Tyrannus melancholicus	Tyrannidae	1	1	16,506,107
Tyrannus savana	Tyrannidae	1	1	6,327,817
Xolmis cinereus	Tyrannidae	1	1	6,894,909
Xolmis dominicanus	Tyrannidae	0	1	765,100
Xolmis irupero	Tyrannidae	1	1	3,434,456
Xolmis velatus	Tyrannidae	1	1	3,163,784
Zimmerius bolivianus	Tyrannidae	2	0	68,448
Zimmerius chrysops	Tyrannidae	1	0	479,150
Zimmerius cinereicapilla	Tyrannidae	2	0	31,615
Zimmerius gracilipes	Tyrannidae	3	1	6,008,545
Zimmerius viridiflavus	Tyrannidae	2	0	28,971
Tyto alba	Tytonidae	1	1	26,302,537
Cyclarhis gujanensis	Vireonidae	1	1	13,485,529
Cyclarhis nigrirostris	Vireonidae	2	0	83,593
Hylophilus amaurocephalus	Vireonidae	0	1	1,499,536
Hylophilus aurantiifrons	Vireonidae	1	0	611,629
Hylophilus brunneiceps	Vireonidae	3	0	528,903
Hylophilus flavipes	Vireonidae	1	0	835,533
Hylophilus hypoxanthus	Vireonidae	3	0	3,940,040
Hylophilus muscicapinus	Vireonidae	3	1	2,386,675
Hylophilus ochraceiceps	Vireonidae	1	1	6,040,091
Hylophilus olivaceus	Vireonidae	2	0	86,203
Hylophilus pectoralis	Vireonidae	3	1	2,217,994
Hylophilus poicilotis	Vireonidae	0	3	702,373
Hylophilus sclateri	Vireonidae	2	0	290,280
Hylophilus semibrunneus	Vireonidae	2	0	23,737
Hylophilus semicinereus	Vireonidae	3	1	3,181,822
Hylophilus thoracicus	Vireonidae	1	1	2,712,858
Vireo leucophrys	Vireonidae	1	0	575,088
Vireo olivaceus	Vireonidae	1	1	11,732,055
Vireolanius leucotis	Vireonidae	1	1	4,316,527

Appendix B: Updates to Bird Range Maps

I updated the maps of Ridgely *et al.* (2003) based on museum records, the literature, personal observations, and information from *bonafide* ornithologists, especially Mario Cohn-Haft (Ph.D.), curator of the ornithological collection of the *Instituto de Pesquisas da Amazônia* (INPA). I updated the *Cercomacra manu* range based on the map of Krabbe & Schulenberg (2003). The range of *Cercomacra carbonaria* extends south to 01º16'S/61º50'W, and *Myrmeciza disjuncta* occurs east to the campinas of the middle rio Branco (Naka *et al.* 2006). *Synallaxis kollari* occurs on the rio Uraricoera up to 03º28'N/61º09'W (Vale *et al.* 2007). *Clytoctantes atrogularis* was recently recorded on the upper rio Sucunduri, Amazonas (Whitney 2005), and there is no strong evidence for its presence in Alta Floresta, Pará (Lanyon *et al.* 1990). Based on recent ornithological expeditions throughout the Brazilian Amazon (Mario Cohn-Haft, unpublished data), we now know that: (a) *Conirostrum margaritae* occurs along the rio Amazonas and rio Madeira, (b) *Conirostrum margaritae*, *Furnarius minor*, and *Stigmatura napensis* occur on the lower and middle rio Madeira, (c) the range of *Cranioleuca muelleri* extends along the rio Solimões for some 100 km west of Manaus, and along the lower rio Madeira, (d) *Hemitriccus inornatus* occurs throughout the left bank of the rio Negro, (e) *Myrmotherula klagesi* occurs in *várzea* along the rio Solimões-Amazonas from the rio Purus to the rio Tapajós, as well as on the lower rio Branco and rio Madeira, (f) *Picumnus castelnau* occurs along the rio Solimões until its confluence with the rio Japurá, (g) *Ocyalus latirostris* occurs along the upper and mid rio Solimões, (h) the range of *Grallaria eludens* is continuous until Benjamin Constant, Amazonas State (approx. 04º22 S/70º02 W), (i) *Thamnophilus cryptoleucus* occurs on the rio Amazonas until its confluence with the rio Madeira, (j) *Poecilotriccus senex* occurs along black- and clear-water tributaries of the right bank of the entire rio Madeira within Brazil. I updated the digital distribution map of these species accordingly.

Appendix C: Updates to Ecoregion Maps

I updated the maps of Olson *et al.* (2003) mostly based on the literature (Cohn-Haft *et al.* 2007a, Cohn-Haft *et al.* 2007b) and information from *bonafide* ornithologist, especially Mario Cohn-Haft (Ph.D.), curator of the ornithological collection of the *Instituto de Pesquisas da Amazônia* (INPA). I split the Purus/Madeira Moist Forest into portions north and south of the rio Mucuim. I divide the Madeira/Tapajós Moist Forest into four sub-categories: Aripuanã-Roosevelt/Tapajós, Aripuanã-Roosevelt/Machado-Jiparaná, Machado/Madeira, and Teles Pires/Juruena in the headwaters of the Tapajós. Madeira/Tapajós Moist Forest east of rio Teles Pires was incorporated into the Xingú/Tapajós, and that west of rio Madeira into the Purus/Madeira Moist Forest ecoregion. I divided the Uatumã/Trombetas Moist Forest into a western portion Negro/Trombetas interfluve and an eastern section (east of rio Trombetas). The portion of the Uatumã/Trombetas Moist Forest west of rio Branco was incorporated into the Negro/Branco Moist Forest ecoregion. I divided the Monte Alegre Várzea ecoregion in four sections: west, east and south of the confluence with rio Negro and rio Solimões, as well as the rio Branco Várzea ecoregion.

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Biography

Mariana Moncassim Vale is Brazilian, born on June 14th, 1975 in Algiers, Algeria. She is the daughter of the French teacher Elise Moncassin and the Brazilian architect Jorge R. Rodrigues Vale. She was raised in Rio de Janeiro, Brazil, and has always had a strong interest in nature and scientific research.

In 1997, Mariana received a three-year fellowship from the Brazilian National Council for Technological and Scientific Development (CNPq), graduating in 1999 with a Bachelor's Degree in Biology from the Federal University of Rio de Janeiro (UFRJ), Brazil. In 2000, she received a two-year International Student Fellowship from the Center for Environmental Research and Conservation, graduating in 2002 with a Master's of Art in Conservation Biology from Columbia University, USA. During her doctoral studies at Duke University, she received three years of support from Professor's Pimm endowment chair, two years from a teaching fellowship from the Nicholas School of the Environment, and support for her final semester from the Thorensen Foundation and the award of the Proctor Prize to Professor Pimm.

At the time of her defense, Mariana has published two chapters of her Ph.D. Dissertation entitled "An incomplete nest of *Poecilurus kollari* in Roraima, Brazil" and "Abundance, Distribution, and Conservation of *Cercomacra carbonaria* and *Synallaxis kollari*."