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ARTICLE

A review of the ornithological knowledge of the northern Serra do Mar mountains in the state of São Paulo, southeastern Brazil

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ABSTRACT: The northern portion of the Serra do Mar mountains in the state of São Paulo, near the border with the state of Rio de Janeiro, including a portion of the Rio Paraíba Valley, ranges between 450 and 1900 m a.s.l. in altitude and is composed of sub-montane and montane Atlantic Forest. It is unique in that the ornithological knowledge of the region can be traced back to the 19th century. Here we present a compilation of historical and recent data, including intensive field work undertaken between 1989 and 2015 in nine natural areas as well as the Bananal Ecological Station (BES), the only protected area in the region. A total of 371 bird species were recorded in the Bananal region and can be separated into two main bird communities, those of the higher Serra de Bananal and those of the lowlands of the Paraíba Valley. These are typical of the avifauna of the mountainous regions of the Serra do Mar and the Paraíba Valley, respectively. Of the above species, 23 lacked any recent records with a single possible extinction, 257 were recorded in the BES, 111 are endemic to the Atlantic Forest and 15 are listed as threatened. Despite its small size compared to other protected areas in the Serra do Mar, the BES and its surrounding areas have well preserved regional characteristics and are highlighted as an important area for bird conservation in the northern portion of the Serra do Mar in São Paulo.

KEY-WORDS: Atlantic Forest, Bananal, Bocaina, Paraíba Valley, threatened species.

INTRODUCTION

The Serra da Bocaina is located along the border between the states of São Paulo and Rio de Janeiro and is part of the Serra do Mar, a complex of mountain ranges that extend from the state of Santa Catarina to Rio de Janeiro. It has a pronounced altitudinal gradient ranging from sea level to over 2000 m a.s.l. (Almeida & Carneiro 1998). This provides a range of environmental conditions that influence the composition of the region's avifauna, which surpasses 400 species and has been considered as one of the richest in the Atlantic Forest (Mallet-Rodrigues *et al*. 2015). As well as harbouring a large number of threatened and restricted range species, the Serra da Bocaina also shelters about 60% of the species endemic to the Atlantic Forest, the highest of any Brazilian IBA - Important Bird Area (Bencke *et al*. 2006).

The Austrian naturalist Johan Natterer explored the southern portion of the Serra da Bocaina, in the state of São Paulo. In 1818 he collected along the Tropeiros Road, a route that once connected the cities of Rio de Janeiro and São Paulo. Peter Lund (October 1833), E. Garbe (August 1909), and H. Lüderwaldt (May 1924) later undertook shorter expeditions (Pinto 1950, Paynter-Jr. & Traylor-Jr. 1991, Willis & Oniki 2003). The first attempts to describe the avifauna of this region were made by A. Schneider, who collected at the locality known as the Sertão das Cobras in August and September 1940 and February 1942 (Pacheco & Bauer 1995). Another attempt was made by an expedition led by the Zoology Department of the Secretary of Agriculture of the state of São Paulo (currently the Museu de Zoologia da Universidade de São Paulo, MZUSP) which in August 1941 collected specimens in the region of the Serra de Bananal and the "alto Rio Paca region/Fazenda Califórnia" (Pinto 1941, 1944, 1945). Additional material was collected in 1952, 1961, 1965 and 1977, and several ornithologists sporadically visited the Serra da Bocaina region, including

Werner Bokermann (November 1964), E. Willis (8 visits between January 1985 and November 1996) and Dante Buzzetti and Jeremy Minns, who made expeditions to Bananal Biological Station in 1995, 1996, 2003, 2004 and 2005, the data being partially published by Minns *et al*. (2010). Specimens collected were deposited in the Natural History Museum of Los Angeles, MZUSP, and the Field Museum of Natural History (Sick & Teixeira 1979, Willis & Oniki 1985, Paynter-Jr. & Traylor-Jr. 1991, Fonseca & Pacheco 2000, Willis & Oniki 2003).

As a result, ornithological knowledge of the Serra da Bocaina has accumulated over two centuries and it is certainly one of the few regions of the entire Atlantic Forest domain to have been continuously studied. This provides a unique opportunity for comparisons to be made over a long time span. Here, we present a compilation of the existing ornithological knowledge of the area, based on historical data as well as the results of intensive recent sampling expeditions to the region. Changes in the bird community and biogeographical relationships have also been investigated by comparison of past and recent records.

METHODS

Study areas

Bananal Ecological Station (BES): (Portuguese: Estação Ecológica de Bananal): this conservation unit conserves 884 ha and is located in the municipality of Bananal, in the northern portion of the Serra do Mar/Bocaina, São Paulo state, on the border with Rio de Janeiro (Fig. 1). It has an altitudinal gradient ranging between 1200 and 1900 m a.s.l. with montane forest as the predominant vegetation type (Fig. 2). However, cloud forest, Araucaria Forest, bamboo (*Chusquea* spp. and *Merostachys* sp.), natural grassland and degraded areas in different stages of succession are also present near the station. We sampled the avifauna at five main areas: Pedra Vermelha/Córrego do Barbosa Trail, Ouro-Mirante Trail, Invernada Road, Encosta and Cachoeira Sete Quedas Trail, all close to the headquarters (22°47'53''S; 44°21'35''W, 1200 m a.s.l.) and its access roads (Fig. 1). They all have similar vegetation characteristics and consist mostly of secondary forest in an advanced state of regeneration with relatively well defined vertical stratification and an herbaceous stratum composed of seedlings, terrestrial bromeliads, and small ferns with a thick layer of litterfall. The understory reaches a height of between 5 and 10 m and is characterized by the presence of *Dicksonia* ferns, *Geonoma* palms, various vines and the saplings of many typical species, especially the Juçara Palm *Euterpe edulis*. The largest trees reach up to 20 m tall but a dense and continuous canopy has not yet formed along most of the sampling trails and is present only in certain areas, especially in the valley bottom.

Another nine localities were also sampled: four on the slopes of the Paraíba Valley, at 450 m a.s.l. (B1, B2, B3 and B4), one intermediate area in the Serra de Bananal, at

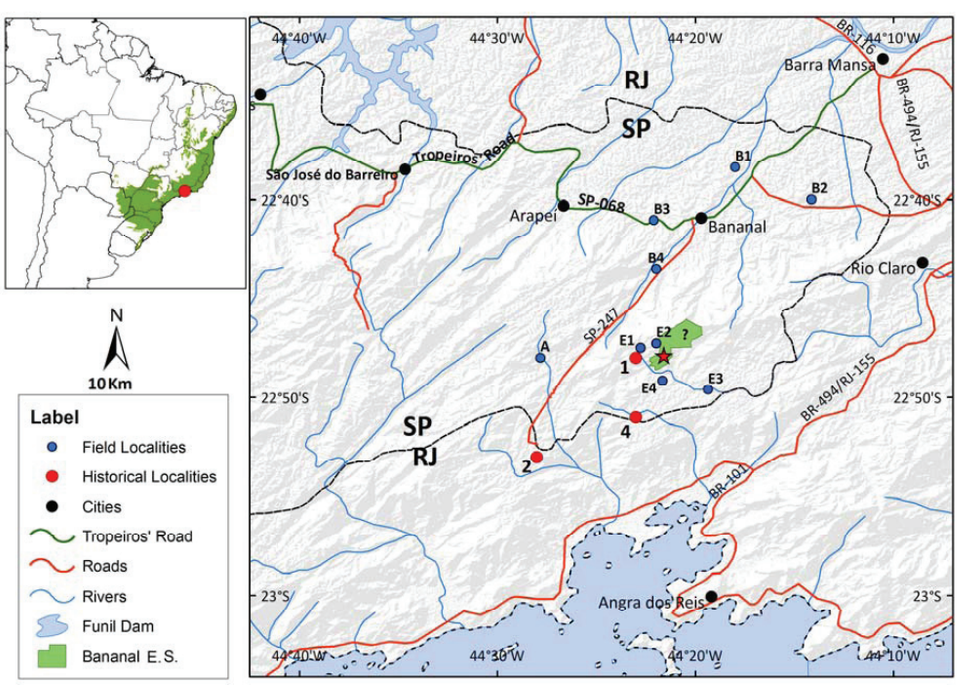

Figure 1. Location map of the Bananal Ecological Station-BES. The numbers correspond to the following localities: 1. Sertão das Cobras, 2. Serra de Bananal (Rio Paca/Fazenda Califórnia), 3. vicinity of the BES, and some additional data contained in Paynter-Jr. & Traylor-Jr. (1991) (no exact locality and no indication on the map) and 4. Fazenda da Posse. The star indicates the location of the study areas within the BES.

Figure 2. View of a part of the Serra de Bananal. Photo author: F. Schunck.

1100 m a.s.l. (A) and another four near the BES, between 900 and 1400 m a.s.l. (E1, E2, E3 and E4) (Fig. 1). All had phytophysionomies similar to those found in the BES, besides areas with pristine vegetation, open or at other transitional stages of succession, according to the descriptions below.

Sertão da Bocaina (A) (22º48'00"S; 44º27'49"W, 1100 m a.s.l.): located 8 km SW of the BES, near the Trutário Aqua, it possesses a large artificial lake and a couple of areas of pasture and shrubby secondary vegetation. Regenerating mountain forest covers the surrounding slopes.

Forest fragment near Fazenda Três Barras (B1) (22º38'21"S; 44º17'59"W, 450 m a.s.l.): located in the Paraíba Valley lowlands, it contains thick seasonal semideciduous forest within a pastureland matrix with influence from the Bananal River, which forms its eastern border.

Forest fragment near Fazenda Boa Vista (B2) (22º39'59"S; 44º14'08"W, 450 m a.s.l.): located in the Paraíba Valley lowlands, it contains thick seasonal semideciduous forest within a pastureland matrix, much of which were coffee plantations until some decades ago.

Fazenda Coqueiros fragment (B3) (22º41'01"S; 44º22'06"W, 450 m a.s.l.): located in the Paraíba Valley lowlands, it consists of seasonal semideciduous forest on what was previously a farm.

Estrada do Sertão (B4) (22º43'31"S; 44º21'58"W, 450 m a.s.l.): located in the Paraíba Valley lowlands, it consists predominantly of shrubby thicket vegetation in a pastureland matrix. Observations were made from the road.

Fazenda Encontro (E1) (22º47'30"S; 44º22'46"W, 1200 m a.s.l.): located about 5 km from the northeastern portion of the BES, with which it is contiguous, the vegetation is similar to that found in the BES. It is adjoins Fazenda Albion, which belongs to the same family.

Trilha do Pico Vermelho (E2) (22º47'17"S; 44º21'58"W, 1400 m a.s.l.): located nearly 6 km from the eastern portion of the BES, the vegetation is mostly similar to that found at the BES.

Fazenda Conceição Rio do Braço (E3) (22º49'36"S; 44º19'21"W, 900 m a.s.l.): located about 5 km from the southeastern portion of the BES, the property contains a clearing of 1 km by 300 m surrounded by primary mountain forest or forest in an advanced state of regeneration.

Brejo Grande da Madeireira (E4) (22º49'09"S; 44º21'39"W, 1000 m a.s.l.): a marshy area 1.5 km long, running along the southern edge of the BES, consisting of predominantly shrubby vegetation on waterlogged soils with an abundance of sedges.

Bird sampling

Bananal Ecological Station (BES): field work at the BES was undertaken over seven field trips between 2003 and 2015, with a total of 46 days of sampling (270 h; Table 1). The first, second and fourth field trips were undertaken by the MZUSP team, the third by the Instituto Florestal de São Paulo and the fifth, sixth and sevenths by J.F.P., R.L.G. and other collaborators (Table 1).

Birds were sampled by active searches, mist netting, and collection with shotguns for deposition in the bird collection at MZUSP. Ten mist nets (12 × 2 m, 30 mm mesh) were opened along transects in areas 1, 4 and 5 in the morning (between 5:00 h and 6:00 h) and closed in the evening (between 17:30 h and 18:00 h) for 20

Table 1. Data from field trips at Bananal Ecological Station (BES) and in the Bananal region, Brazil.

Locality	Field trip	Hours field	Researchers	Field period
BES	1	90:00 h	L.F. Silveira, M. Sboarim & F. Belmonte	between 01–20 December 2003
BES	2	120 h	F. Schunck	between 13–25 April 2004
BES	3	30 h	A.Z. Antunes	between 13–16 September 2011
BES	4	20 h	L.F. Silveira, L.M. Lima & C.O.A. Gussoni	between 12–19 December 2011
BES	5	4:00 h	J.F. Pacheco, R.L. Gagliardi & L. Florit	20 February 2012
BES	6	3:00 h	J.F. Pacheco, R.L. Gagliardi & C. Bauer	07 September 2012
BES	7	5:00 h	J.F. Pacheco & L. Florit	01 January 2015
A	8a	3:00 h	J.F. Pacheco & L. Florit	31 December 2012
A	9a	1:30 h	J.F. Pacheco, R.L. Gagliardi & L. Florit	30 March 2013
A	10a	2:00 h	J.F. Pacheco & F. Traiano	16 November 2013
A	11a	4:00 h	J.F. Pacheco & L. Florit	02 March 2014
B1	1a	1:30 h	J.F. Pacheco & P.S.M. Fonseca	24 September 1989
B1	2a	1:00 h	J.F. Pacheco & P.S.M. Fonseca	16 December 1990
B1	3a	0:30 h	J.F. Pacheco, P.S.M. Fonseca & C. Bauer	03 January 1993
B1	4a	12:00 h	J.F. Pacheco & R.L. Gagliardi	between 18–22 February 2012
B1	6a	12:00 h	J.F. Pacheco & R.L. Gagliardi	between 12–14 October 2012
B1	13a	15:30 h	J.F. Pacheco & L. Florit	between 02–05 April 2015
B2	6a	2:00 h	J.F. Pacheco & R.L. Gagliardi	14 October 2012
B2	11a	2:30 h	J.F. Pacheco & L. Florit	03 March 2014
B2	13a	4:30 h	J.F. Pacheco & L. Florit	03 and 04 April 2015
B3	6a	6:00 h	J.F. Pacheco & R.L. Gagliardi	13–14 October 2012
B3	13a	3:30 h	J.F. Pacheco & L. Florit	03–04 April 2015
B4	1a	0:30 h	J.F. Pacheco & P.S.M. Fonseca	24 September 1989
B4	3a	0:30 h	J.F. Pacheco, P.S.M. Fonseca & C. Bauer	03 January 1993
B4	4a	4:00 h	J F. Pacheco, R.L. Gagliardi & L. Florit	18–19 and 22 February 2012
B4	5a	2:00 h	J.F. Pacheco, R.L. Gagliardi & C. Bauer	07–09 September 2012
B4	7a	5:00 h	J.F. Pacheco, R.L. Gagliardi & A.H. Oliveira	02–04 November 2012
B4	8a	2:30 h	J.F. Pacheco & L. Florit	28–30 December 2012; 01 January 2013
B4	9a	3:00 h	J.F. Pacheco & L. Florit	28–31 March 2013
B4	10a	3:00 h	J.F. Pacheco & L. Florit	15–17 November 2013
B4	11a	3:00 h	J.F. Pacheco & L. Florit	01, 03 and 05 March 2014
B4	12a	4:00 h	J.F. Pacheco & L. Florit	between 31 December 2014–04 January 2015
E1	1a	10:00 h	J.F. Pacheco, B.M. Whitney & P.S.M. Fonseca	23–24 September 1989
E1	2a	8:00 h	J.F. Pacheco & P.S.M. Fonseca	between 15–16 December 1990
E1	3a	16:00 h	J.F. Pacheco, P.S.M. Fonseca & C. Bauer	between 31 December 1992–02 January 1993
E1	4a	12:00 h	J F. Pacheco, R.L. Gagliardi & L. Florit	between 18–22 February 2012
E1	5a	10:00 h	J.F. Pacheco, R.L. Gagliardi & C. Bauer	between 07–09 September 2012
E1	7a	10:00 h	J.F. Pacheco, R.L. Gagliardi & A.H. Oliveira	03–04 November 2012
E1	8a	10:00 h	J.F. Pacheco & L. Florit	between 28 December 2012–01 January 2013

Locality	Field trip	Hours field	Researchers	Field period
E1	9a	17:30 h	J.F. Pacheco, R.L. Gagliardi, P.S.M Fonseca, L. Trindade & L. Florit	between 28–31 March 2013
E1	10a	20:00 h	J.F. Pacheco, R.L. Gagliardi & L. Florit	between 15–17 November 2013
E1	11a	24:00 h	J.F. Pacheco & L. Florit	between 01–05 March 2014
E1	12a	34:30 h	J.F. Pacheco, R.L. Gagliardi & L. Florit	between 31 December 2014–04 January 2015
E2	4a	10:00 h	J.F. Pacheco, R.L. Gagliardi & L. Florit	19–21 February 2012
E3	4a	4:00 h	J.F. Pacheco, R.L. Gagliardi & L. Florit	21 February 2012
E3	5a	7:00 h	J.F. Pacheco & R.L. Gagliardi	08 September 2012
E3	7a	6:20 h	J.F. Pacheco, R.L. Gagliardi & A.H. Oliveira	04 November 2012
E3	8a	6:00 h	J.F. Pacheco & L. Florit	30 December 2012
E3	9a	5:00 h	J.F. Pacheco, R.L. Gagliardi & L. Trindade	30 March 2013
E4	5a	2:00 h	J.F. Pacheco, R.L. Gagliardi & C. Bauer	08 September 2012
E4	7a	2:00 h	J.F. Pacheco, R.L. Gagliardi & A.H. Oliveira	03 November 2012
E4	12a	4:30 h	J.F. Pacheco & L. Florit	31 December 2013
E4	9a	1:30 h	J.F. Pacheco, R.L. Gagliardi, P.S.M. Fonseca, L. Trindade & L. Florit	29 March 2013
E4	11a	1:30 h	J.F. Pacheco & L. Florit	03 March 2014

consecutive days, with a total sampling effort of 2360 net h. On field trips 1, 2 and 4 we sampled for 960, 1200 and 200 net h, respectively (Table 1). Species recorded within a 5 km perimeter of the BES during the third field trip are indicated as being from the "Surroundings" in Appendix I.

Localities A, B and E: field work in the areas outside the BES was undertaken in twelve field trips between 1989 and 2015, mainly by J.F.P., R.L.G. and other collaborators. This totalled 321.5 h of field work; 233 h at sites A and E and 88 h at site B (Table 1). Records were made by direct searches undertaken at different times of the day, such that a single locality was sometimes revisited multiple times on the same day, since they are close together.

Birds were observed with the aid of 10 × 40 and 8.5 × 40 binoculars. Vocalizations were recorded with Sony TCM 5000-EV and PMD222 Marantz recorders and Sennheiser ME 66 and Mineroff shotgun microphones. Recordings are deposited in the *Arquivo Sonoro da Seção de Aves do MZUSP* and the online database WikiAves (www.wikiaves.com.br). Some species were documented by photographs, which are presently only available in the personal collections of the authors, but may be accessed upon request. The nomenclature and systematics follow Piacentini *et al*. (2015).

Historical data: ornithological data from the Bananal region was obtained by extensively searching through museum catalogues, scientific articles, books, CD-ROMs, personal data not published and open access websites with photographic and vocalisation records of Brazilian birds, such as WikiAves (WA) and xeno-canto (XC) (www.xeno-canto.org). The keywords used were Bananal and Serra da Bocaina and the searches were completed in January 2017. Reliable and documented records by the ex-manager of the BES were also considered.

Localities where ornithological studies were undertaken in the past included: (1) Sertão das Cobras; (2) Serra de Bananal (Rio Paca/Fazenda Califórnia); (3) proximity to BES, and some additional data contained in Paynter-Jr. & Traylor-Jr. (1991); (4) Fazenda da Posse (for one specimen collected by J.L. Lima) and (5) Bananal region, published by Minns *et al*. (2010) (Fig. 1). We also considered the data cited for the Bananal region but without exact location in the compilation made by Willis & Oniki (2003) (denoted by an X in Appendix I).

Data analyses

Since the Bananal region possesses considerable altitudinal variation, ranging from 450 to 1900 m a.s.l., a cluster analysis was carried out to detect possible differences in the bird community composition in this portion of the northern Serra do Mar in São Paulo. PAST v. 2.16 was used to calculate the Euclidian distance between sites based on species presence/ absence data.

To detect possible local extinctions in the Bananal avifauna, the data available in the bibliography was compared with that obtained in field trips since 1989.

RESULTS AND DISCUSSION

We present records of 371 bird species in the Bananal region, belonging to 24 orders and 67 families. Of these, 348 were recorded in the field, 112 were endemic to the Atlantic Forest (Bencke *et al*. 2006), one is considered threatened in Brazil (MMA 2014), and 16 threatened in the state of São Paulo (São Paulo 2008, 2014). The total corresponds to approximately 48% of the avifauna of the state of São Paulo (793 species; Silveira & Uezo 2011), which is highly noteworthy when compared to other reserves that have been studied in the state (Table 2 & Appendix I).

In spite of the difference in the sampling effort between the higher parts of the Serra do Bananal and the Paraíba Valley (Table 1), the cluster analysis showed two avifauna communities across the altitudinal gradient. The first (204 species) occurs in the Paraíba Valley, at around 450 m a.s.l. (B) and the second (314 species) in the higher regions of the Serra da Bananal, between 900 and 1400 m a.s.l. (A, E and BES) (Figs. 1 & 3, Appendix I). We found various species typical of higher parts of the Serra do Mar in the Serra da Bananal, such as *Chamaeza ruficauda* and *Lipaugus ater*, whilst important elements of the avifauna from lower areas, such as *Veniliornis maculifrons* and *Cantorchilus longirostris*, were still present on the slopes of the Paraíba Valley. Even with this apparently well-defined trend, there were exceptions, such as the occurrence of *Piculus flavigula* at Sertão das Cobras and *Manacus manacus* along the upper Rio Paca (nearly 1000 m a.s.l.) (Pinto 1944). Both are usually associated with lowland areas (Sick 1997). *Manacus manacus* has also been found between 800–1000 m a.s.l. near Macaé de Cima, Nova Friburgo, Rio de Janeiro state, where it was considered uncommon (Pacheco *et al.* 2014). Other recent records also show that *V. maculifrons* is present within the immediate surroundings of the BES, in the higher regions of the Serra de Bananal (Pinto 2012, Guerra 2014). Both *P. flavigula* and *M. manacus*, along with *Coccyzus melacoryphus*, were the only species with historical records that were not recorded during our field work in the higher regions of the Serra de Bananal.

The bird community of the higher regions of the Serra do Bananal is very similar to recently published data for the higher parts (between 1000 and 1600 m a.s.l.) of the Serra da Bocaina (Mallet-Rodrigues *et al*. 2015). However, nine species recorded in the Serra de Bocaina were not found in the Serra do Bananal, namely *Glaucidium brasilianum*, *Triclaria malachitacea*, *Dysithamnus stictothorax*, *Laniisoma elegans*, *Phylloscartes oustaleti*, *Myiothlypis rivularis* and *Sporophila falcirostris*.

We recorded a total of 257 bird species for the study sites in the Bananal Ecological Station (BES) between 2003 and 2015 (two more unpublished records made in 1995 by D. Buzzetti bring the total to 259 species), an important conservation area that until now had not been systematically inventoried. This is a very high level of species richness for a single relatively small nature reserve of only 884 ha (Table 2 & Appendix I). When compared to the region as a whole, 12 species were found to be restricted to this reserve whilst 38 were found in the surrounding areas (E) but still had not been recorded within the boundaries of the reserve. These were, in general, species of open or very specific habitats that do not exist or are rare within the reserve (Fig. 1, Appendix I).

The species accumulation curve for the BES shows that our estimate of species richness is reaching a stable asymptote, with few new additions being made in the final expeditions but this is, in part, due to the fact that sampling was concentrated within the region around the reserve's headquarters. Further sampling in unsurveyed areas, especially with different habitats, would undoubtedly

Table 2. Bird species richness in protected areas located in the Serra do Mar, São Paulo state.

Conservation Unit	Number of species	Area (ha)	Source
Intervales State Park	354	41,700	Aleixo & Galetti 1997 and Vielliard & Silva 2001
Carlos Botelho State Park	370	37,644	Antunes *et al*. 2013
Turístico do Alto Ribeira State Park	319	35,772	Antunes & Eston 2010
Serra do Mar State Park, Curucutu Nucleus	373	36,134	Schunck *et al.* in prep.
Juréia-Itatins Ecological Station	352	79,240	Develey *et al.* in prep.
Boracéia Biological Station (including Casa Grande and part of Padre Dória Nucleus of Serra do Mar State Park)	323	96	Cavarzere *et al*. 2010
Bananal Ecological Station-BES	259	884	This study
Serra do Mar State Park, Picinguaba Nucleus	254	47,000	Goerck 1997
Paranapiacaba Biological Reserve	183	336	Silveira 2009

increase the curve (Fig. 4). The avifauna of the BES is typical of the mountain regions of the Serra do Mar/Bocaina, with species that occur above 700 m in altitude, such as *Hydropsalis forcipata*, *Stephanoxis lalandi*, *Hylopezus nattereri*, *Hemitriccus obsoletus* and *Stephanophorus diadematus* as well as those that occur above 1000 m a.s.l., including *Drymophila genei* and *Microspingus lateralis*. The presence of game birds, particularly *Tinamus solitarius* and *Penelope obscura*, and species dependent on forests in a good state of conservation and/or that are threatened, such as *Selenidera maculirostris*, *Carpornis cucullata* and *Onychorhynchus swainsoni*, attests to the low degree of disturbance at the BES.

Examples of unsampled habitats in the reserve are the montane or high altitude grasslands found in the highest portions of the reserve to which there is little or no access. These areas may contain bird species typical of this habitat, such as *Polystictus superciliaris* and *Anthus hellmayri*. Indeed, the former was collected in 1961 by J.L. Lima at Rio Mambucaba (1350 m a.s.l.), Fazenda da Posse (Fig. 1) and there are historical records of the latter for the Bananal region (Willis & Oniki 2003). Both species have recently been photographed in the municipality of São José do Barreiro (Martins 2008, Torrubia 2014), relatively close to the Serra do Bananal, besides the fact that they are frequently recorded around Campos do Jordão and Cunha, always in natural open habitats (Willis & Oniki 2003). *Penelope superciliaris* was also recorded by Mallet-Rodrigues *et al.* (2015) in the higher parts of the Serra da Bocaina.

Attention is drawn to a large and varied group of species that were not found in the BES during this study, including various migrants and/or common species, others that are more reclusive and still others that are difficult to identify in the field. Nevertheless, all have historical or recent records in the Bananal and surrounding municipalities. These are *Glaucidium minutissimum*, *Cypseloides fumigatus*, *Chlorostilbon lucidus*, *Drymophila ferruginea*, *Psilorhamphus guttatus*, *M. manacus*, *Tityra cayana*, *Elaenia parvirostris*, *Cnemotriccus fuscatus*, *Contopus cinereus*, *Pyrrhocoma ruficeps*, *Poospiza thoracica* and *Euphonia violacea*. The only species recorded before 2004 in the BES that were not registered in the field by this study were *Lepidocolaptes squamatus* and *Lipaugus lanioides*. The occurrence of these species requires dedicated investigation, as they are linked to specific habitats with punctuated distribution but they are very likely to be recorded in future studies.

Deforestation in the region surrounding the BES now provides new habitats for species of open environments. For example, *Cyanocorax cristatellus* has invaded the region through the Paraíba Valley, arriving in the Serra do Bananal in the 1990s (Alvarenga 1990, Willis & Oniki 2003). Other examples include *Bubulcus ibis*, *Phacellodomus rufifrons* and *Coryphospingus pileatus*. All have significantly expanded their ranges southwards into São Paulo state (Willis & Oniki 1993, Sick 1997, Cestari & Pacheco 2010).

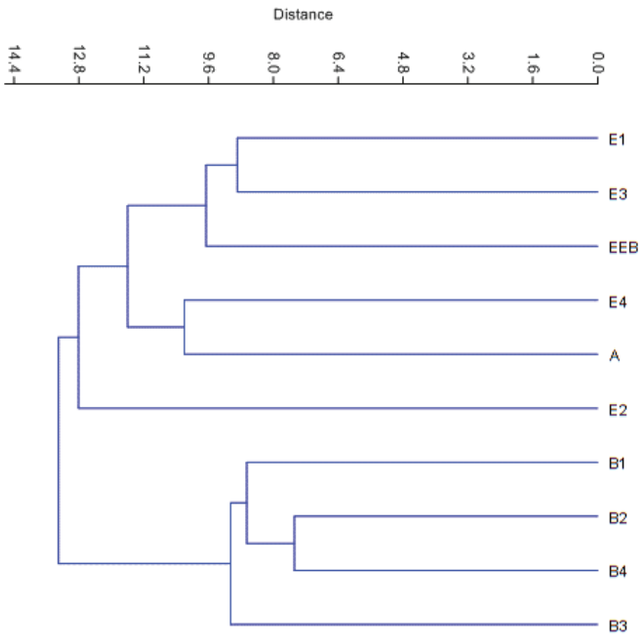

Figure 3. Cluster pattern for ten studied points at Bananal region. The localities indicated by the letter B are located in the Paraíba Valley, at lower altitudes. The localities indicated by the letters A and E are located in the Serra de Bananal, at higher altitudes.

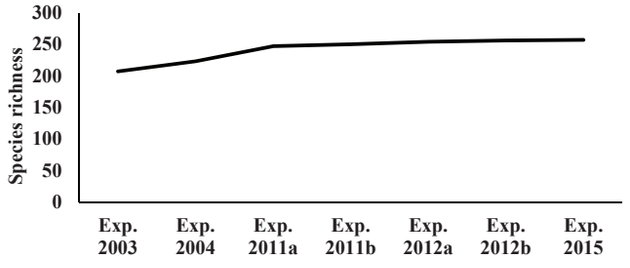

Figure 4. Accumulation curve for the species recorded at the Bananal Ecological Station between 2003 and 2015.

When data regarding the birds of the Serra do Bananal were compared before and after 1989 there were 23 species for which no recent records had been made in the region. Most of these were migratory species, waterbirds or species that rarely occur on the Brazilian Plateau in São Paulo (Appendix I) and may thus still be recorded in future studies. *Jacamaralcyon tridactyla*, in particular, deserves attention, since this species has not been recorded since the 1940s (Collar *et al.* 1992), which strongly indicates that it has possibly become extinct at both the local and the state level, having not been recently recorded at other historical sites (Silveira 2009a) (Appendix I & Fig. 1).

Noteworthy records

Tinamus solitarius: considered "Vulnerable" in the list of threatened animals in the state of São Paulo (São Paulo 2008, 2014), this species was recorded on all field trips to the BES so it can be considered common in the reserve and surrounding areas. In the higher regions of the Serra da Bocaina it was recorded below 800 m a.s.l. (Mallet-Rodrigues *et al*. 2015).

Sarcoramphus papa: considered "Vulnerable" in the list of threatened animals in the state of São Paulo (São Paulo 2008, 2014), this species was photographed flying over the headquarters of the BES by the former manager in 2011. It is regarded as uncommon in the east of the state, with only a few documented records for the Serra do Mar and had not previously been observed in the Bananal region (Willis & Oniki 2003).

Pseudastur polionotus: an Atlantic Forest endemic, considered "Vulnerable" in the list of threatened animals in the state of São Paulo (São Paulo 2008, 2014), it was first photographed in the BES in 2011 by the reserve manager and more recently by other observers (WA1343324). Records of this hawk in the northern parts of the Serra do Mar and Mantiqueira have only begun to occur in the last 10 years (Willis & Oniki 2003). In the Serra da Bocaina it was recorded below 800 m a.s.l. (Mallet-Rodrigues *et al*. 2015).

Spizaetus tyrannus: considered "Vulnerable" in the list of threatened animals in the state of São Paulo (São Paulo 2008, 2014). Recorded on all field trips to the BES, it can be considered common in the reserve and surrounding areas as well as the entire area of the Serra do Mar and Bocaina lying in São Paulo (Mallet-Rodrigues *et al*. 2015).

Claravis pretiosa: a widely distributed species in Brazil and the state of São Paulo, where it is more frequently recorded in the summer months (Sick 1997, Willis & Oniki 2003). Previously unknown in the Bananal region, the first and only record was made in February 2012 on the Trilha do Pico Vermelho (E2), in the high parts of the mountain range. Our record is during the expected time of year and may thus indicate seasonal movements, which requires further investigation.

Primolius maracana: considered threatened in the state of São Paulo (São Paulo 2008, 2014), it was recorded in the surroundings of BES in 2009 (WA193668) when a group of six individuals was seen during the third field trip (2011). Historical records also exist for this species from the beginning of the 19th century (São José dos Campos; Pelzeln 1871). In Rio de Janeiro state, in the municipalities of Resende, Volta Redonda, Barra do Piraí and Barra Mansa it is considered common (Pacheco *et al*. 1994, Nunes 2003). Thus, it may be expanding its range into the Serra do Mar due to the substitution of humid forest with more open and semi-deciduous vegetation types, which are preferred by this species. In 2009, André De Luca (pers. comm.) recorded this species in Caraguatatuba, which corroborates the hypothesis of geographic expansion due to modifications in vegetation. This scenario has also been confirmed in parts of Rio de Janeiro and Minas Gerais states (Pacheco *et al*. 1994).

Touit melanonotus: an Atlantic Forest endemic, considered "Vulnerable" in the list of threatened animals of the state of São Paulo (São Paulo 2008, 2014) and Endangered by the IUCN (2017). It was recorded on the first field trip to the BES (2003), where several individuals flew, vocalising, over the forest surrounding the headquarters. Voice recordings were also obtained at Fazenda Encontro on the 04 March 2014 (of a group in flight) and from an area close to the BES in 2014, whilst a historic record exists for the Bananal region cited by Paynter-Jr. & Traylor-Jr. (1991). It was recorded only at low elevations in the Serra da Bocaina by Mallet-Rodrigues *et al*. (2015).

Myrmoderus squamosus and *M. loricatus*: these are species endemic to the Atlantic Forest with parapatric distributions. The shortest distance between documented records of the two taxa is precisely in the Bananal region—approximately 12 km, between the BES and Lídice in the state of Rio de Janeiro (Amaral *et al*. 2013). For the BES, there is a documented record (museum skin) for *M. squamosus* and a recording of an alarm call attributed to *M. loricatus* in Minns *et al*. (2010). The latter should be disregarded, since these calls of the two species are very similar and cannot be used for identification, and the species of the female giving the call was not certain (J. Minns, pers. comm.). In September 1989, an individual of *M. loricatus* was heard singing at Fazenda Encontro (E1), about 5 km from the northeastern portion of the BES, but was never relocated on subsequent surveys. Therefore, based on the available records, we hypothesize that in the Serra da Bocaina *M. squamosus* is present along the moderately low coastal slopes, whilst *M. loricatus* uses the slopes along the edge of the Paraíba Valley, where an exemplar was collected in Cruzeiro (SP) and examined by Hellmayr (1924). What is most intriguing to us, however, is the reason for the lack of recent records of this species in the region. This justifies the need for new studies focusing on the biogeographical importance of the Bananal region.

Lepidocolaptes falcinellus: according to Silva & Straube (1996), this woodcreeper occurs from Rio Grande do Sul state northward to the left margin of the Paraíba do Sul River, in northeastern São Paulo, where it is substituted by *L. squamatus*. Inclusion of *L. falcinellus* on the BES list is based on a vocalization heard in 2003 and a visual record from 2011, when an individual was observed in a mixed flock. The presence of *L. squamatus* in the Bananal region and in the BES, however, is certain (MZUSP 27133 and

27134; Silva & Straube 1996, Fonseca & Pacheco 2000, D. Buzzetti, pers. comm.). A documented record of *L. falcinellus* was recently made southwest of the BES in the Cunha region located between 50 and 70 km to the east and northeast of the Paraíba do Sul River (R. Bessa, L. Lima & M.A. Rego, pers. comm.). According to Silva & Straube (1996), this river is the geographical barrier for the north/south separation of these species in the Atlantic Forest. These records of *L. falcinellus* to the northeast and east of the Paraíba do Sul therefore prove that it is not a geographical barrier to these woodcreepers and suggests that they may be sympatric in this region. This was also found to be the case in the Serra da Mantiqueira in Minas Gerais, where interbreeding was detected between the two species (Vasconcelos & D'Angelo-Neto 2009). However, further studies are necessary to better define the distributions of both species as well as the areas in which they may occur in sympatry.

Leptasthenura setaria: the occurrence of this Tit-Spinetail is associated with the presence of araucaria pines (*Araucaria angustifolia*) which, in the state of São Paulo, extend throughout the Serra do Mar and Mantiqueira (Sick 1997, Willis & Oniki 2003, Antunes *et al*. 2007). It is common in the Bananal region, and its current presence within the BES and surroundings areas is restricted to araucarias probably planted in the 1960s (Natália Ivanauskas, pers. comm.).

Onychorhynchus swainsoni: endemic to the Atlantic Forest, this species is considered "Vulnerable" in the list of threatened animals in the state of São Paulo (São Paulo 2008, 2014) and globally (IUCN 2017). It was only recorded on the first field trip to the BES, where a single male was mist netted on the Pedra Vermelha Trail, which runs along a forested stream, their preferred habitat. A historical record was made in 1941 during an expedition by the Departamento de Zoologia to the Serra de Bananal (Rio Paca/Fazenda Califórnia) and a photo taken in 2009 (WA95542), documenting the presence of this interesting but still little known species in the region (Pinto 1944, 1945). It was recorded only in the lower portion of the Serra da Bocaina by Mallet-Rodrigues *et al*. (2015).

Procnias nudicollis: endemic to the Atlantic Forest, this species is considered "Vulnerable" in the list of threatened animals in the state of São Paulo (São Paulo 2008, 2014) and globally by the IUCN (2017). It was recorded on five separate trips to the BES (1, 3, 4, 6 and 7), coinciding with the hottest period of the year, when the species vocalises more frequently in the higher regions of the Serra do Mar. The only trips when bellbirds were not recorded were during February and April, which may represent a period of absence from the mountainous regions or a period when they are less vocal and thus less detectable. Sick (1997) confirmed that this species undergoes altitudinal movements, wintering in the coastal lowlands and restingas but this question requires further study.

Pyroderus scutatus: endemic to the Atlantic Forest, this species is considered "Vulnerable" in the list of threatened animals in the state of São Paulo (São Paulo 2008, 2014). It was recorded on all field trips to the BES so can be considered common in the reserve, where it is historically well known (Willis & Oniki 2003). Various other records exist from around the BES (including photographs and sound recordings). Despite the fact that this species is undergoing a population decline across the interior of the state, because of habitat loss (Develey & De Luca 2009), it is very common in the Serra do Mar, where it frequently occurs in rural areas and even city parks, such as in São Paulo (São Paulo 2010).

Lipaugus lanioides: endemic to the Atlantic Forest, this species is considered "Vulnerable" in the list of threatened animals in the state of São Paulo (São Paulo 2008, 2014). It is rare in the northern portion of the Serra do Mar in São Paulo state, occasionally occurring in the lowlands around Ubatuba (Willis & Oniki 2003, Simpson *et al*. 2012). In the Serra da Bocaina it was recorded between 0 and 500 m a.s.l. (Mallet-Rodrigues *et al*. 2015), whilst only a single record exists for the BES and the entire Serra de Bananal region, being voice recording made by D. Buzzetti in March 1995. This is also the highest record ever made in the Serra do Mar in São Paulo state, where it is only known to occur up to 900 m a.s.l., according to Willis & Oniki (2003).

Piprites pileata: endemic to the Atlantic Forest, this species is considered "Vulnerable" in the list of threatened animals in the state of São Paulo (São Paulo 2008, 2014) and globally by the IUCN (2017). It was recorded on the third field trip to the BES. Another seven records were obtained (including photographs and sound recordings) for the surrounding areas. It is typical of the Serra da Mantiqueira but also occurs in this portion of the Serra do Mar with both historical and recent records in the Bananal region (Willis & Oniki 2003). It was not recorded in the higher parts of the Serra da Bocaina by Mallet-Rodrigues *et al*. (2015).

Elaenia chilensis: a southern migratory species (Sick 1983, Marini & Cavalcanti 1990, Willis & Oniki 2003) that usually passes through the states of São Paulo, Rio de Janeiro and Minas Gerais between February and April (Pacheco & Gonzaga 1994, Willis & Oniki 2003, Montanhini 2010). Its presence in the BES was detected during April 2004, along with individuals of *Elaenia mesoleuca* (MZUSP 78357, 78358 and 78360). This provides the first record of this species in the northern portion of Serra do Mar/Bocaina and the only one above 1000 m a.s.l. in the state, providing new information about its migratory route in Serra do Mar. It was not recorded in the higher parts of the Serra da Bocaina by

Mallet-Rodrigues *et al*. (2015).

Sporophila angolensis: considered "Vulnerable" in the list of threatened animals in the state of São Paulo (São Paulo 2008, 2014), this species was recorded on the fourth field trip to the BES, when a male was captured by mist net in a partially open area with low vegetation near the reserve headquarters. Another four records were subsequently made around the BES and lower lying areas. These records are important as they show that, even though this is one of the most sought after species in the illegal songbird trade, because of its loud and complex song, it has a stable population in the Bananal region, as is proven by both historical and recent records. This species was only recorded in the lower portions of the Serra da Bocaina by Mallet-Rodrigues *et al*. (2015).

Cyanoloxia brissonii: listed as "Vulnerable" in the list of threatened animals in the state of São Paulo (São Paulo 2008, 2014), this species was recorded on the third field trip to the BES, when an adult male was observed and recorded in a partially open area along the forest edge. Another five records exist for the areas surrounding the BES and the lower lying regions. Willis & Oniki (2003) also recorded the presence of this species in the Bananal region, which shows that although it is also sought after for the illegal songbird trade, it is still present in this region of the Serra do Mar. It was also only recorded in the lower portions of the Serra da Bocaina by Mallet-Rodrigues *et al*. (2015).

Data collected in the field and from bibliographic sources show that the bird diversity of the Bananal region is very high and divided into two main communities: one from the higher regions of the Serra de Bananal and the other from the lowlands of the Paraíba do Sul River Valley. However, only 259 out of the 371 recorded species presently receive any kind of legal protection, by means of the BES, which is the only reserve in the region. Thus, the creation of new protected areas is essential in both the highlands of the Serra de Bananal as well as of the forest fragments in the Paraíba do Sul River Valley, where most the original forest cover has already been lost. The present study recorded 26 new species for the Bananal region and the absence of 23 previously recorded species, including *J. tridactyla*, possibly extinct in the state of São Paulo, given the lack of recent records from the current study site and elsewhere in the state. Nevertheless, many of these and other species will likely be recorded in future field work. The region is also biogeographically important for certain species whose distribution limits coincide precisely with the Bananal, such as *M. squamosus*/*M. loricatus* and *L. falcinellus*/*L. squamatus*. However, their occurrence, contact and possible overlap require further investigation. Further studies in the region are therefore important to improve the current knowledge and determine with more precision the occurrence of various species, especially in relation to altitude, an issue typical of birds of the Serra do Mar.

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APPENDIX I

Species of birds in the Bananal region. END - Species (taxa) endemic to the Atlantic Forest (according to Bencke *et al.* 2006); * Threatened species at the national level (according to MMA 2014); # Threatened species at the state level (according to São Paulo 2008, 2014) and + Introduced species; **Evidence:** V (visual record); A (auditory record); R (sound recording); P (photograph); P* (photograph deposited in WikiAves): C (collected specimen) and L (record by local people). **Habitat:** MF (Montane Forest), NF (Natural Grassland), AA (Open Anthropic Areas), FL (Flooded Areas). Species recorded within a 5 km perimeter of the BES are highlighted in the table with the letter S (surroundings) and groups of birds indicated by the letter G (Groups). The numbers indicated in column number 3 of BES field trips refer to the number of individuals recorded in the field and X corresponds to photographic records made by the manager of the reserve. The column "Historical and Current Data" refers to the compilation by Willis & Oniki (2003) for the entire Bananal region without exact location (denoted by X). Highlighted are the data from Sertão das Cobras (1) and Serra de Bananal (Rio Paca/Fazenda Califórnia) (2), the vicinity of the BES, and some additional data contained in Paynter-Jr. & Traylor-Jr. (1991) (3) (no exact locality), Fazenda da Posse (4) (for one specimen collected by J.L. Lima), (5) for records for the Bananal region published by Minns *et al.* (2010) and (6) for the relevant and documented records obtained by D. Buzzetti in March 1995 in the BES and not published by Minns *et al.* (2010). This column also contains modern records contained in online digital databases (WikiAves and xeno-canto) for the Bananal municipality (R+: recordings and P+: photographs). Species cited in the "Historical and Current Data" column do not have information in the columns Evidence and Habitat as this information was not available in the original sources. For numbers separated by a "-", all intermediate values are valid. Data from field trips are found in Table 1.

Taxa	Evidence	Habitat	Bananal Ecological Station (Field trip)							Bananal region (historical and current data)	Bananal region (Field trip)							
			1	2	3	4	5	6	7		A	B1	B2	B3	B4	E1	E2	E3	E4
Tinamiformes																			
Tinamidae (4)																			
Tinamus solitarius[end #]	R,P,C	MF	X	X	10	X	X	X		P+,R+						7,10,11		5,7-9	5,7
Crypturellus obsoletus	R,P	MF	X	X	8	X	X	X		1,2,P+,R+	8,10			6		1-5,7-12	4	4,5,7-9	5,7-9,11
Crypturellus parvirostris	A	MF	X	X						X		13	13						
Crypturellus tataupa	A	MF	X							X		2,6,13	13						
Anseriformes																			
Anatidae (3)																			
Dendrocygna bicolor										X									
Dendrocygna viduata										X									
Amazonetta brasiliensis	P	AA,FL								X,P+	8	2			7				
Galliformes																			
Cracidae (1)																			
Penelope obscura	R,C	MF	X	X	12	X	X			X,5,P+	10	6,13		6		4,5,7,8,10-12	4	5,7-9	5,9
Odontophoridae (1)																			
Odontophorus capueira[end]	R,P,C	MF	X	X	6			X	X	P+,R+						1,4,5,7-10,12		4,5	5,7,9

Taxa	Evidence	Habitat	Bananal Ecological Station (Field trip)							Bananal region (historical and current data)	Bananal region (Field trip)							
			1	2	3	4	5	6	7		A	B1	B2	B3	B4	E1	E2	E3	E4
Podicipediformes																			
Podicipedidae (2)																			
Tachybaptus dominicus	V	AA,FL								X,P+,R+	8,9								
Podilymbus podiceps	P	AA,FL								X,P+,R+	8,9,10								
Suliformes																			
Phalacrocoracidae (1)																			
Nannopterum brasilianus	P									P+	8,9,10	6							
Anhingidae (1)																			
Anhinga anhinga										X,P+									
Pelecaniformes																			
Ardeidae (6)																			
Nycticorax nycticorax	P	AA,FL								P+	9,10								
Butorides striata	V	AA,FL								P+	8								
Bubulcus ibis	V	AA			S					P+		6,13		6	4,5				
Ardea alba	P	AA,FL								P+	8,9,10	13			7			8	
Syrigma sibilatrix	P	AA			2					P+		6,13			4,7,12	12		4,7,8	9
Pilherodius pileatus										X,P+		13							
Cathartiformes																			
Cathartidae (4)																			
Cathartes aura	V	AA	X		1	X				X,P+	11	6,13	6,13	13	5,8,9,12	4,5,8-12			9
Cathartes burrovianus	V	AA								P+		13	13		4,8,11,12				
Coragyps atratus	V	AA	X	X	6	X		X		X,P+	8,9,11	1-3,6,13	13	6,1	4,5,9-12	1,3-5,7-12		5,7,9	
Sarcoramphus papa[#]	P	AA			X														
Accipitriformes																			
Accipitridae (18)																			
Leptodon cayanensis	V	MF,AA	X							X								8	
Chondrohierax uncinatus																3			
Elanoides forficatus	L	MF,AA																	
Elanus leucurus										X									

Taxa	Evidence	Habitat	Bananal Ecological Station (Field trip)							Bananal region (historical and current data)	Bananal region (Field trip)								
			1	2	3	4	5	6	7		A	B1	B2	B3	B4	E1	E2	E3	E4
Harpagus diodon	P,C	MF	X							P+						1,9,10,12			
Accipiter superciliosus	V	MF	X													9		9	9
Accipiter striatus	V	MF								1,2,P+						1,4,5		5	
Ictinia plumbea										X						7			
Geranospiza caerulescens	V	MF								3						1		5,8	
Heterospizias meridionalis	P	AA								X,P+		6			7	1-3,8,10-12		5,7,8	8,11
Rupornis magnirostris	P	MF,AA	X	X	3	X	X			X,P+	10	6,13	13		4,7,8,10	1-5,7,8,10-12	4	5,7,8	5,7,8,11
Parabuteo leucorrhous	V	MF														9			
Geranoaetus albicaudatus	V,A	AA	X							X,P+				6					
Pseudastur polionotus[end #]	P	AA			X					5,P+						9			
Buteo brachyurus	V	AA	X							X				6					
Buteo albonotatus	V	AA								P+		6							
Spizaetus tyrannus[#]	V	MF	X	X	1	X				X,P+						1-4,8	4	7,8,9	
Spizaetus melanoleucus[#]	V	MF					X			P+									
Gruiformes																			
Rallidae (6)																			
Aramides saracura[end]	P	FL	X	X	5	X	X		X	X,P+	8	13		6		1,3-5,7-12		4,8,9	7,8,9
Laterallus melanophaius	V	FL								R+									5,11
Laterallus leucopyrrhus	V	FL								R+									5
Mustelirallus albicollis	L	FL								X		13							
Pardirallus nigricans	V	FL								X,P+		1				10		4	
Gallinula galeata	P	FL								X,P+,R+	8,9,10	2							
Charadriiformes																			
Charadriidae (1)																			
Vanellus chilensis	V,A	AA,FL	X	X	2	X	X	X	X	X,P+	8,9,10	6,13	6,13	6	4,7,9,10	5,9-12		4,5,7-9	9,11
Recurvirostridae (1)																			
Himantopus melanurus										X									
Jacanidae (1)																			
Jacana jacana										X									

Taxa	Evidence	Habitat	Bananal Ecological Station (Field trip)							Bananal region (historical and current data)	Bananal region (Field trip)							
			1	2	3	4	5	6	7		A	B1	B2	B3	B4	E1	E2	E3	E4
Columbiformes																			
Columbidae (9)																			
Columbina talpacoti	P	AA	X	X						2,P+	8	2,3,6,13	6,11,13	6	1,3-5,7-9,11,12			5,7,8	
Claravis pretiosa																	4		
Columba livia	V	AA								X,P+	8	6,13			4,5,7-12				
Patagioenas picazuro	V	MF,AA	X	X	2					X,P+	9,10	6,13	6,13	6,1	4,7-10,12	12		5,7-9	
Patagioenas cayennensis	V,A	MF	X							X		6		6					9
Patagioenas plumbea	R	MF	X		3	X	X	X	X	2,P+,R+	8,10					1-3,5,7,8,10-12		5,7,8	5,7,8
Leptotila verreauxi	A	MF	X	X						X,R+	8,11	2,6,13	13	6	8	7,10,12		7,8	8
Leptotila rufaxilla	R,P	MF	X	X	2					X,P+									
Geotrygon montana	P,C	MF	X	X	1					1						4,5,8-10,12	4	8	
Cuculiformes																			
Cuculidae (5)																			
Piaya cayana	V,A	MF	X	X	1	X	X	X		1,P+		2,6,13	11,1	6	7	1-5,7-12	4	8,9	9
Coccyzus melacoryphus										P+									
Crotophaga ani	V,A	AA	X	X	S					1,P+		2,3,6,13	6,13	6,1	1,4,7-9,11,12			8	
Guira guira	V,A	AA	X	X						X,P+	8	2,6,11	6,11	6	4,7				
Tapera naevia	A	MF	X							X		1,6	6		12	1			
Strigiformes																			
Tytonidae (1)																			
Tyto furcata	V	AA	X																
Strigidae (6)																			
Megascops choliba	R,C	MF	X	X	2	X										3,4,8,11,12		4	
Pulsatrix koeniswaldiana[end]	A	MF	X		1					6,R+						1,7,12		4,5	
Strix hylophila[end]	R,C	MF	X	X	1	X				P+,R+						8,11,12		4	5
Glaucidium minutissimum[end]	A	MF								5								5	
Athene cunicularia	V	AA	X							X					1				
Asio stygius	A	MF														10			

Taxa	Evidence	Habitat	Bananal Ecological Station (Field trip)							Bananal region (historical and current data)	Bananal region (Field trip)							
			1	2	3	4	5	6	7		A	B1	B2	B3	B4	E1	E2	E3	E4
Nyctibiiformes																			
Nyctibiidae (1)																			
Nyctibius griseus	C	MF	X			X				P+,R+		6				3,7,12	4		
Caprimulgiformes																			
Caprimulgidae (5)																			
Lurocalis semitorquatus	C	MF	X		1	X				X,R+		6				3,4,7,8,10,12	4	4,7	
Nyctidromus albicollis	V,A	AA,NF	X		1					X		6		6		9,11,12	4	8	
Hydropsalis longirostris	V	AA,NF														1			
Hydropsalis torquata	V	AA,NF	X															5	9
Hydropsalis forcipata[end]	V	AA,NF	X													4,11			
Apodiformes																			
Apodidae (5)																			
Cypseloides fumigatus	V	MF,AA								X	9					1,2,8,12			
Streptoprocne zonaris	V,A	MF,AA	X		G	X		X	X	X,P+		6,13	6	6	4,7,11	1-5,9-12		4,5,8	
Streptoprocne biscutata	V	MF,AA														1			
Chaetura cinereiventris	V,A	MF,AA	X		G	X		X								2,3,7,8,10,11		4,5,8	
Chaetura meridionalis	C	MF,AA	X		S	X		X		X	9,10	3,6,13	6,13	6,1	4,7-10			4	8
Trochilidae (16)																			
Ramphodon naevius[end]	V	MF																9	
Phaethornis pretrei	V	AA								X,P+		1,3,6,13	6,11	6,1	3,4,7-10,12				
Phaethornis eurynome[end]	P,C	MF	X	X	4	X	X			2,5,P+,R+	11					1-5,7-12	4	5,7-9	
Eupetomena macroura	V	AA								X,P+		6,13	11,1	6,1	7,10				
Aphantochroa cirrochloris[end]	V													6					
Florisuga fusca[end]	V	MF,AA	X			X	X		X	P+	8	6,13		6,1		3,8,9,11,12	4	4,7-9	8,9,11
Colibri serrirostris	V	MF,AA	X							X,P+		3,6,13	6,13	6	4,5,7,8,10-12				
Anthracothorax nigricollis	V	MF,AA	X									6,13							
Stephanoxis lalandi [end]	R,P,C	MF	X	X	3	X	X			1,2,5,P+,R+	9					1-5,7-12	4	8	8

Taxa	Evidence	Habitat	Bananal Ecological Station (Field trip)							Bananal region (historical and current data)	Bananal region (Field trip)							
			1	2	3	4	5	6	7		A	B1	B2	B3	B4	E1	E2	E3	E4
Chlorostilbon lucidus	V	AA								X		1,6,13	6,11,13	6	4,12	1-3,11			8,11
Thalurania glaucopis[end]	P,C	MF	X	X	6	X	X		X	2,P+		13	13	6,1		1,4,5,7-12	4	5,7-9	9
Leucochloria albicollis[end]	C	MF	X		4	X	X			2,P+	8,10					1-5,7-12	4	4,7,9	5,7-9,11
Amazilia versicolor	V	ME,AA			1					2		13					4		
Amazilia lactea	V	AA								X,P+		1,13	11,1	6,1					
Heliodoxa rubricauda[end]	R,P,C	MF	X	X	6	X	X	X		2,5,P+						1-5,7-12	4	4,5,7,9	9,11
Calliphlox amethystina	V	ME,AA			1					2,P+				6	7	1,3,11,12			7
Trogoniformes																			
Trogonidae (3)																			
Trogon viridis										X,5									
Trogon surrucura[end]	R,P,C	MF	X	X	10	X		X		1,5,6,P+,R+	10	6		6		1-3,5,7-12	4	5,7-9	8
Trogon rufus	R,C	MF	X	X	4	X	X			1,2,5,6,P+						1,5,8,12		5,7,8	8
Coraciiformes																			
Alcedinidae (3)																			
Megaceryle torquata	V	AA,FL								X,P+	8	13			7,9,12	8,10			
Chloroceryle amazona	V	AA,FL													7			7	
Chloroceryle americana	P	AA,FL								P+		13				3			
Momotidae (1)																			
Baryphtengus ruficapillus[end]	R	MF			2	X												5	
Galbuliformes																			
Galbulidae (1)																			
Jacamaralcyon tridactyla[end #]										X									
Bucconidae (2)																			
Nystalus chacuru	A	ME,AA			S					X,P+		6	11		4,9,12				
Malacoptila striata[end]	V	MF		X															
Piciformes																			
Ramphastidae (4)																			

Taxa	Evidence	Habitat	Bananal Ecological Station (Field trip)							Bananal region (historical and current data)	Bananal region (Field trip)							
			1	2	3	4	5	6	7		A	B1	B2	B3	B4	E1	E2	E3	E4
Ramphastos toco	V	AA								X,P+		13			5,7				
Ramphastos dicolorus[end]	V,A	MF	X	X	3	X	X	X	X	1,P+						1-5,7-12	4	7,8,9	5
Selenidera maculirostris[end]	R	MF			1														
Pteroglossus bailloni[end #]	V	MF								X						1			
Picidae (11)																			
Picumnus cirratus	V,A	MF			1					1,2,P+		6,13	6,13	6	3,4,7	8,10-12		5,7,9	5,8
Melanerpes candidus	V	AA			S					X,P+		6	13	6					
Veniliornis maculifrons[end]	V									X,P+		6,13	13	6					
Veniliornis spilogaster[end]	R	MF	X		3		X			1,2,5,P+						1-3,5,8,9,11,12		7,9	8
Piculus flavigula										1									
Piculus aurulentus[end]	P,C	MF	X	X	1	X				2,6,P+						1-3,5,7-9,11,12	4	4,5	
Colaptes melanochloros	V,A	MF	X							X,P+	8	6	6	6	7,8,10	1,3,10			
Colaptes campestris	V,A	AA,NF	X	X	S					X,P+	9,10	2,6,13	6,13	6	1,4,5,7,11,12	1-3,7,8,10		4,5,7-9	5,8,9
Celeus flavescens	A	MF	X																
Dryocopus lineatus	A	MF	X		1					2,P+		13		6	7			4,5,8,9	11
Campephilus robustus[end]	A	MF	X							2,5,6,P+,R+		13				5,7,8,11,12		7	
Cariamiformes																			
Cariamidae (1)																			
Cariama cristata	P	AA			X					X				6					
Falconiformes																			
Falconidae (8)																			
Caracara plancus	P	AA	X	X	1	X		X	X	X,P+	9	1,6,13	6,13	6	5,11	1,2,4,5,7,8,10-12		4,5,8,9	9,11
Milvago chimachima	P	AA	X	X	2	X				X,P+	8,10,11	2,6,13	6,13	6	4,5,7,10-12	1,3,4,7-12		5,7-9	5,8
Herpetotheres cachinnans	A	MF,AA	X							X,P+		6			5				
Micrastur ruficollis	R,P,C	MF	X		4	X				X,6,P+	9,10					1,3,4,8,11,12	4	4,5,8	5,7,9
Micrastur semitorquatus	P	MF			X					P+,R+						7		8	
Falco sparverius	V	AA								X,P+		6,13			7,9				

Taxa	Evidence	Habitat	Bananal Ecological Station (Field trip)							Bananal region (historical and current data)	Bananal region (Field trip)							
			1	2	3	4	5	6	7		A	B1	B2	B3	B4	E1	E2	E3	E4
Falco rufigularis	V	AA														4			
Falco femoralis	V	AA	X							X,P+		6				3			
Psittaciformes																			
Psittacidae (9)																			
Primolius maracana[#]	V	AA			S					X,P+		13	6,13	6	7				
Psittacara leucophthalmus	V,A	AA	X	X	14				X	X,P+	8	2,6,13	6,11,13	6	1,3-5,7-12	12			
Pyrrhura frontalis[end]	P,C	MF	X	X	6	X	X	X		2,P+	8,10,11					1-5,7-12	4	4,7-9	7,8,9
Forpus xanthopterygius	A	MF	X		4					X,P+		1,6,13	11,1	6,1	4,5,7-12				
Brotogeris tirica[end]	R	MF	X	X	4	X		X		2,5		13				1-5,7-12	4	5,7-9	8
Touit melanonotus[end * #]	V,A	MF	X							3,R+						1,11			
Pionopsitta pileata[end]	R,V,A	MF	X		4					1,R+						1-5,7-12	4	4,5,9	8
Pionus maximiliani	R,P	MF	X	X	6	X	X		X	X,P+		1,6,13	13	6	4,7,8	1-5,7-12	4	4,8,9	8,9
Amazona vinacea[end]	A															5		7	
Passeriformes																			
Thamnophilidae (19)																			
Terenura maculata[end]	A	MF		X														4,5,7,8,9	
Rhopias gularis[end]	R,C	MF	X	X	6	X	X	X		1	9					4,5,7-12	4	5,7-9	8,9
Dysithamnus mentalis	R,P,C	MF	X	X	4	X	X			2		6,13		6		2,4,7,12		4,5,7-9	
Dysithamnus xanthopterus[end]	R,P,C	MF	X	X	4		X	X		1,2,5,6,P+R+						1,2,4,5,8-12	4	7,8,9	
Herpsilochmus rufimarginatus	A													6					
Thamnophilus ruficapillus	P	MF			S				X	X,P+		13			3			4	5,7,9,11
Thamnophilus caerulescens	R,P,C	MF	X	X	4	X	X		X	1,2,P+	9,10	6,13	11	6		1-5,7-12	4,11	4,5,7-9	5,7-9
Hypoedaleus guttatus[end]	A																	5,7	
Batara cinerea	A,R	MF	X		4		X			1,6						1-5,8-12			
Mackenziaena leachii[end]	R	MF	X		5					1,2,6,P+						1-5,7,8,10-12	4	4,5,8	5,7-9,11
Mackenziaena severa[end]	A	MF	X				X			X			11			3		9	

Taxa	Evidence	Habitat	Bananal Ecological Station (Field trip)							Bananal region (historical and current data)	Bananal region (Field trip)								
			1	2	3	4	5	6	7		A	B1	B2	B3	B4	E1	E2	E3	E4
Myrmoderus cf. loricatus[end]	R	MF								5						1			
Myrmoderus squamosus[end]	C	MF	X																
Pyriglena leucoptera[end]	P,C	MF	X	X	6	X	X	X		1	10			6		1,3-5,7-12	4	4,5,7-9	5,7-9,11
Drymophila ferruginea[end]	V,A	MF								X,P+		2,6,13							
Drymophila rubricollis[end]	C	MF			2	X	X		X	X,5,6,P+,R+						5,7,8,10-12	4	4,5,7-9	8
Drymophila genei[end]	R,P	MF			2		X	X		1,2,5,6,P+,R+						1-5,7-12	4		
Drymophila ochropyga[end]	A	MF		X						X,R+						10,12		5	
Drymophila malura[end]	A	MF			1					X,P+,R+						10		5	
Conopophagidae (1)																			
Conopophaga lineata[end]	R,P,C	MF	X	X	8	X	X	X		1,2,5,6,P+	9			6	8,1	1-5,7-12	4	4,5,7,9	5,8,9,11
Grallariidae (2)																			
Grallaria varia	R,C	MF	X		4	X		X		1,6,R+						1,3-5,7,8,10,12			
Hylopezus natterer[end]	R,C	MF	X		3			X		1,6						1-5,7-12	4	8	5,7,8
Rhinocryptidae (4)																			
Merulaxis ater[end]	R	MF		X	2			X		1,2,R+						1,4,7,8,10,12	4	7	8
Eleoscytalopus indigoticus[end]	R	MF		X						1								5,7	
Scytalopus speluncae[end]	R	MF	X		1					X,5,6,P+						1-3,5,12		5	
Psilorhamphus guttatus[end]	A	MF					X			X,R+						12			
Formicariidae (2)																			
Chamaeza meruloides[end]	R	MF			3											1			
Chamaeza ruficauda[end]	R,C	MF	X	X	5	X	X	X		1,6,P+						1-5,7-12	4	4,5,7-9	7,8
Scleruridae (1)																			
Sclerurus scansor[end]	R,C	MF	X	X	3	X				1,2,P+,R+				6		1,3,9-12	4	4,5,7-9	
Dendrocolaptidae (9)																			
Dendrocincla turdina[end]	A	MF	X			X													
Sittasomus griseicapillus	R,P,C	MF	X	X	10	X	X	X	X	1,2,P+,R+	10	1		6		1-5,7-12	4	4,5,7-9	5,8,11

Taxa	Evidence	Habitat	Bananal Ecological Station (Field trip)							Bananal region (historical and current data)	Bananal region (Field trip)							
			1	2	3	4	5	6	7		A	B1	B2	B3	B4	E1	E2	E3	E4
Xiphorhynchus fuscus[end]	R,P,C	MF	X	X	2	X	X	X		1,2,P+		6		6		2,4,5,7-12	4	4,5,7-9	8
Campylorhamphus falcularius[end]	P,C	MF	X	X						1,2,P+,R+		6,13		6		12		8	
Lepidocolaptes angustirostris	P	AA			X					X,P+		6,13							
Lepidocolaptes squamatus[end]	V	MF								2,6,P+,R+		2,6,13				1,2,4,7,8,10-12	4	4,5,7	
Lepidocolaptes falcinellus[end]	V,A	MF	X		2														
Dendrocolaptes platyrostris	R	MF	X		1	X	X			1,2,P+,R+				6		1,3-5,7,9-12	4	4,7,8	
Xiphocolaptes albicollis	R,C	MF	X	X	4	X	X	X		1,2,6						1,3-5,8-12	4	4,5,8	7,9
Xenopidae (2)																			
Xenops minutus	A	MF		X															
Xenops rutilans	V	MF	X		1		X	X		1,P+		6,13			4	2,7-12	4	7,8,9	
Furnariidae (22)																			
Furnarius figulus	V	AA								X,P+	8,9	6,13		6,1	7,12				
Furnarius rufus	V,A	AA	X	X	S	X	X			X,P+	8,9,11	2,3,6,13	6,11,13	6	1,3,4,7-9,11,12				5
Lochmias nematura	P	MF	X		2			X	X	1,P+	9,11	4			7,8,10	1-3,5,7-12	4	4,5,8,9	8,11
Automolus leucophthalmus[end]	A	MF	X							X		6							
Anabazenops fuscus[end]	C	MF	X		3	X				X		6		6		3,7,9			
Anabacerthia amaurotis[end]	C	MF	X				X			1,2,5,P+,R+						7,12	4	9	
Anabacerthia lichtensteini[end]	V	MF					X									2,5		9	
Philydor atricapillus[end]	V	MF		X															
Philydor rufum	P,C	MF	X	X	8	X	X	X	X	1,P+		6,13		6		1-5,7-12	4	5,7-9	7,8,11
Heliobletus contaminatus[end]	P,C	MF	X		12	X		X		1,2,5,P+,R+						2,4,5,7,9-12	4	7,9	8
Syndactyla rufosuperciliata	R,P,C	MF	X	X	10	X	X	X	X	1,2,P+,R+						1-5,7-12	4	4,5,7-9	5,7,8,11
Cichlocolaptes leucophrus[end]	R,C	MF	X	X	3		X			1,2,5,6,P+,R+						1-5,7-12	4	4,7,9	
Leptasthenura setaria[end]	R,C	MF	X		2	X	X			X,P+,R+						4,5,7-12			9
Phacellodomus rufifrons	V	AA			S					P+		6,13	6,11,13	6,1	4,5,7-12	12			
Phacellodomus erythrophthalmus[end]	V,A	MF			S					X,P+,R+		1,2,6,13	11,1	6	5,7,12	1,9,12		4	5,8

Taxa	Evidence	Habitat	Bananal Ecological Station (Field trip)							Bananal region (historical and current data)	Bananal region (Field trip)							
			1	2	3	4	5	6	7		A	B1	B2	B3	B4	E1	E2	E3	E4
Anumbius annumbi	V	AA			S					X,P+,R+		6,13	11		3-5,7-10,12				
Certhiaxis cinnamomeus	V,A	FL								X,P+	8	2,3,6,13	11,1	6	4,7,8				
Synallaxis ruficapilla[end]	R,P,C	MF	X	X	6		X	X	X	1,2,P+		13	13	6		1-5,7-12	4	4,5,7-9	
Synallaxis cinerascens	A,C	MF			2	X	X			X						10		7	
Synallaxis albescens												6	13		4,7,9				
Synallaxis spixi	P	MF	X	X	2	X	X			1,2,P+,R+	8,9,10	1,3,6,13		6	1,3-5,7-10,12	1-5,7-12	4	4,5,7,8	5,7-9,11
Cranioleuca pallida[end]	R	MF	X		4	X	X	X		1,2,5,P+,R+	10,11	6,13	13			1-5,7-12	4	4,5,7-9	7,8,9
Pipridae (4)																			
Neopelma chrysolophum[end]	R,P,C	MF	X	X	3	X				X,6,P+,R+	8					1,7,10,12		7,8,9	5,7
Manacus manacus	A									2		1							
Ilicura militaris[end]	R,P,C	MF	X	X	3	X	X			1,P+						3-5,7,9-12	4	4,5,8,9	9
Chiroxiphia caudata[end]	R,P,C	MF	X	X	18	X	X	X	X	1,2,P+	8,9,10,11	2,13	11,1	6		1-5,7-12	4	4,5,7-9	5,8,9,11
Oxyruncidae (1)																			
Oxyruncus cristatus	R,C	MF	X		2	X	X			2,P+						1,8,11,12	4		
Onychorhynchidae (2)																			
Onychorhynchus swainsoni[end #]	P,C	MF		X						2,P+									
Myiobius atricaudus	P,C	MF	X	X	1	X				2,P+						8,10-12		9	
Tityridae (6)																			
Schiffornis virescens[end]	R,P,C	MF	X	X	8		X			1,P+						1,2,4,5,7,9-12	4	4,5,7-9	7,11
Tityra cayana	V	MF																7	
Pachyramphus viridis	R,C	MF	X		6	X				2,P+					4	1-5,7,8,10,12		8	
Pachyramphus castaneus	A	MF	X		3	X	X	X		X,5,P+		6				1-5,7-12	4	5,7-9	
Pachyramphus polychopterus	R,C	MF	X			X	X			X,P+,R+		1,6,13	13	6	4	1-4,7-12	4	4,7-9	4,8
Pachyramphus validus	R,C	MF	X		1	X	X		X	X,P+		6				3,4,7-12	4	9	4,8
Cotingidae (6)																			
Carpornis cucullata[end]	R,P,C	MF	X	X	16	X	X	X	X	1,2,5,6,P+,R+						1-5,7-9,11,12	4	4,5,7-9	5,7,8
Phibalura flavirostris	P	MF						X		1,P+						4,5,8,11,12		4	8

Taxa	Evidence	Habitat	Bananal Ecological Station (Field trip)							Bananal region (historical and current data)	Bananal region (Field trip)							
			1	2	3	4	5	6	7		A	B1	B2	B3	B4	E1	E2	E3	E4
Pyroderus scutatus[end #]	P	MF	X	X	10	X				X,P+,R+	8,10					4,5,7-12	4	5,7-9	8
Lipaugus ater[end]	R,P	MF	X	X	8	X	X	X		1,2,6,P+						1-5,7-12	4		8
Lipaugus lanioides[end #]										6									
Procnias nudicollis[end #]	R,P,C	MF	X		14	X		X	X	X,P+,R+	8,10					1-5,7,8,10,12		4,5,7,8	5,7,8
Pipritidae (2)																			
Piprites chloris	R	MF		X															
Piprites pileata[end #]	R	MF			2					X,6,P+,R+						4,8,9,11,12	4	9	
Platyrinchidae (1)																			
Platyrinchus mystaceus	R,P,C	MF	X	X	5	X		X		1,2,5,P+		6				1,4,5,7-9,11,12	4	4,5,7-9	
Rhynchocyclidae (13)																			
Mionectes rufiventris	P,C	MF	X	X	2	X		X		1,2,P+				6		3,5,7-9,11,12		5,7-9	8
Leptopogon amaurocephalus	P	MF	X	X	4	X	X			1,P+			11	6		5,7,8,10		5,7,8	8
Corythopis delalandi	A	MF												6					
Phylloscartes ventralis	R,P,C	MF	X	X	16	X	X	X		1,2,P+						1-5,7-12	4	4,5,7-9	5,8,9
Phylloscartes difficilis[end]	A	MF		X						1,2,P+,R+						1,2,4,5,7-12	4		
Tolmomyias sulphurescens	R,C	MF	X	X	8	X	X	X		X,P+	8	1,6,13	11,1	6	4,7,9,12	1-5,7-12	4	4,5,7-9	
Todirostrum poliocephalum[end]	A	MF			2		X	X	X	X,P+	9	6	11		3,7,10,12	1,4,5,7-12	4	4,5,7	7,9
Todirostrum cinereum	V	MF		X						X,P+	8	6,13	6,11,13	6	7,8,9,10				
Poecilotriccus plumbeiceps	R,P	MF	X	X	6		X	X	X	1,2,P+	10					1-4,7-12	4	4,5,7,8	5,7-9
Myiornis auricularis[end]	A,P	MF	X		3		X			2,P+				6		1-5,9,11,12	4	4,5	
Hemitriccus diops[end]	V,A	MF		X										6					
Hemitriccus obsoletus[end]	R,P,C	MF	X	X	3	X	X	X		2,6,P+,R+						1-5,7,10-12	4	4,5,7-9	7,8
Hemitriccus nidipendulus[end]	A	AA		X						X,P+		6		6	10				
Tyrannidae (45)																			
Hirundinea ferruginea	V	AA			1		X			1,P+		13	11,1		3,12	1,4,5,10,12			
Tyranniscus burmeisteri	A	MF	X				X	X		2,P+,R+						1,2,4,5,7-12	4	5,7-9	8
Camptostoma obsoletum	P,C	MF,AA	X	X	4	X	X			X,P+,R+	10	1,6,13		6		1,5,7,9-12		5,7,8	8,9,11

Taxa	Evidence	Habitat	Bananal Ecological Station (Field trip)							Bananal region (historical and current data)	Bananal region (Field trip)							
			1	2	3	4	5	6	7		A	B1	B2	B3	B4	E1	E2	E3	E4
Elaenia flavogaster	A	ME,AA	X	X	S					X,P+		6,13	6,13	6,1	1,4,7,10	2,5			
Elaenia chilensis	P,C	MF		X															
Elaenia parvirostris										X									
Elaenia mesoleuca	P,C	MF	X			X	X		X	1,P+,R+	8					2-4,7-10,12	4	4,8	8
Elaenia obscura	P,C	MF	X			X				P+,R+						2,5,7-12			5,7-9
Myiopagis caniceps	A	MF	X							X									
Capsiempis flaveola	V									X,P+		13							
Phyllomyias virescens[end]	V	MF			2	X				P+,R+						1,5,7-12		5,7,8	
Phyllomyias fasciatus	R,C	MF	X		4	X	X			X,P+,R+	10	13				1-5,7-12	4	4,5,7-9	7-9,11
Phyllomyias griseocapilla[end]	R	MF	X		1	X	X	X								2-5,7-12	4	4,5,8	8
Polystictus superciliaris										4,P+									
Serpophaga nigricans	P	ME,FL								2,P+	8,9	13			7				
Serpophaga subcristata	P	MF	X	X	2		X		X	2,P+	10	13	13		7	1,3,5,7,9-12		5	5,8,9
Attila phoenicurus	P,C	MF	X			X	X		X	X,6,P+,R+	8					2-5,7,8,10-12	4	5,7,8	8,11
Attila rufus[end]	R,P,C	MF	X	X	12	X	X		X	1,2,P+	10	1,6				1-5,7-12		5,7-9	5,7-9
Legatus leucophaius	A	MF				X				X									
Myiarchus swainsoni	R,P,C	MF	X		1	X	X		X	X,P+,R+	10	1,6		6		2-5,7-12	4	4,7	7,8
Myiarchus ferox	C	ME,AA				X				1	8	1,6,13	11,1	6,1	8	7			
Sirystes sibilator	A	MF	X							X									
Pitangus sulphuratus	R	MF	X	X	4	X	X	X	X	2,P+	8,9,10,11	2,6,13	6,11,13	6	3,4,7-12	1-5,7-12	4	4,5,7-9	5,8,9,11
Machetornis rixosa	P	AA	X		S			X		X,P+	9	2,6,13	6,11,13	6	3-5,7-10,12	1-3,8,10-12		5,7,8	
Myiodynastes maculatus	A	MF	X		2	X	X		X	1,P+	10,11	1,2,6	6	6	7,11,12	2-4,7,8,10-12		7,8	7,8,11
Megarynchus pitangua	P	ME,AA	X	X	2		X	X		X		2,6,13		6	4,7,8,10	2,3,5,8-12	4	4,8	7-9,11
Myiozetetes similis	V,A	ME,AA	X	X	2	X			X	X,P+	8,9	6,13	11,1	13	4,5,7-12	1,4,7-12	4	4	9,11
Tyrannus melancholicus	V,A,C	ME,AA	X		2	X	X		X	X,P+	8,9,10,11	2,6,13	6,11,13	6	1,3-5,7-10,12	1-4,7-12	4	4,7-9	7-9,11
Tyrannus savana	P	AA,NF	X		S	X				X,P+	8,10	2,3,6	6	6	5,7,10,11				
Empidonomus varius	V	MF	X			X			X	X,P+,R+	8	1,6,13	13	6	3,7,8,12	3,8,10-12			7,8,11
Colonia colonus	V	MF	X							1,2,P+		6,13	13	6		1			

Taxa	Evidence	Habitat	Bananal Ecological Station (Field trip)							Bananal region (historical and current data)	Bananal region (Field trip)							
			1	2	3	4	5	6	7		A	B1	B2	B3	B4	E1	E2	E3	E4
Myiophobus fasciatus	C	MF	X		1	X	X		X	X,P+,R+	8,11	6,13	11,1	6	7	1,3,5,7-12		4,5,7,9	5,7-9,11
Fluvicola nengeta	P	AA	X							X,P+	8,9,10	6,13	6,13	6,1	5,7,8,12	2,10,11		5,8,9	
Arundinicola leucocephala	V	AA	X							X		1,2,3							
Gubernetes yetapa	V	AA,FL								X		2		6					
Cnemotriccus fuscatus	V,A	MF								X,P+,R+				6					
Lathrotriccus euleri	R	MF	X		3					1,R+		6	13	6,1		1,2,5,7,9-12		7,8,9	8
Contopus cinereus	P	MF						X		1,2,P+						5,7-11		7	
Knipolegus cyanirostris	P	MF	X		1			X		1,2,P+						1-5,7-12		7	9
Knipolegus lophotes	P	AA			S					X,P+		2,3		6	1,3-5,7,10,12				
Knipolegus nigerrimus[end]	P	AA,AL	X							1,P+						3			9
Satrapa icterophrys	V	AA,AL	X							1	8	6						7	
Xolmis cinereus	V	AA												6					8
Xolmis velatus	V	AA								X,P+		2	13		3,12	1			
Muscipipra vetula[end]	C	MF	X		1					1,2,P+						1,7-10		7,8,9	5
Vireonidae (3)																			
Cyclarhis gujanensis	R	MF,AA	X	X	10	X	X	X	X	1,2,5,P+	9,10	1,2,6,13	6,11,13	6,1	1,7,	1-5,7-12	4	4,5,7-9	5,7-9,11
Hylophilus poicilotis[end]	R,C	MF	X	X	8	X	X			2,P+						1-5,7-12	4	4,5,7-9	8
Vireo chivi	R,C	MF,AA	X	X	4	X	X		X	X,P+	8,10	1,6		6	3,7,10,12	1-4,7-12	4	4,7,8	8
Corvidae (1)																			
Cyanocorax cristatellus	V	AA			S					X,P+	9,10	6,13	13		5,7,9				
Hirundinidae (6)																			
Pygochelidon cyanoleuca	R,P,C	AA	X	X	12	X	X	X	X	2,P+	8,10	1,3,6,13	6,11,13	6,1	3-5,7-12	1-5,7-12	4	4,5,7,8	8,9
Alopochelidon fucata										X									
Stelgidopteryx ruficollis	V	AA	X		S	X				1,P+		2,6,13	6,13	6,1	1,3-5,7-10,12	2,5,7,		5,7	
Progne tapera	V	AA								X	10	6	6		5				8
Progne chalybea	V	AA	X	X	S					P+		2,3,6	6,11	6	7,8,10,12				
Tachycineta leucorrhoa	V	AA								X		6	6	6					

Taxa	Evidence	Habitat	Bananal Ecological Station (Field trip)							Bananal region (historical and current data)	Bananal region (Field trip)							
			1	2	3	4	5	6	7		A	B1	B2	B3	B4	E1	E2	E3	E4
Troglodytidae (2)																			
Troglodytes musculus	P	ME,AA	X	X	2	X		X	X	2,P+	8,9,10	6,13	6,11,13	6,1	1,4,5,7-12	1-3,5,7-12		5,7,8	5,7,8
Cantorchilus longirostris	A	MF								X,P+		1,2,6,13	13	6					
Donacobiidae (1)																			
Donacobius atricapilla										X									
Turdidae (6)																			
Turdus flavipes	R,P,C	MF	X	X	4	X	X		X	1,2,P+,R+	8,10					1-5,7-12	4	4,5,7-9	7,8,11
Turdus leucomelas	C	ME,AA	X	X		X				X,P+		1,6,13	6,11,13	6	4,7,10,12	1,4,5,7,11		9	
Turdus rufiventris	R,P,C	ME,AA	X	X	8	X	X	X	X	2,P+,R+	8,9,10,11	2,6,13	6,11,13	13	3-5,7,10,12	1-5,7-12		4,5,7-9	5,7-9,11
Turdus amaurochalinus	R,P	ME,AA	X	X	3	X		X		X,P+	8	1,6,13	13	6	3	1,5,7-12		5,7	5,7,11
Turdus subalaris										P+									
Turdus albicollis	R,P,C	MF	X	X	4	X	X	X	X	X,P+		1,6,	13	6		1-3,5,7-12	4	4,5,7,8	8
Mimidae (1)																			
Mimus saturninus	V	AA,NF	X		S					1,2, P+	10,11	2,6,13	13	6,1	1,3-5,7-9,11,12			7	
Motacillidae (1)																			
Anthus hellmayri										X									
Passerellidae (3)																			
Zonotrichia capensis	P,C	AA,NF	X	X	14	X		X	X	1,2,P+	8,9,10,11	2,3,6,13	13	6	1,3,5,7-9,12	1-3,5,7-12		5,7-9	5,7-9,11
Ammodramus humeralis	V	AA								X		3,6	11	6	3,7,12				
Arremon semitorquatus[end]	A	MF		X								1,6,13			10				
Parulidae (4)																			
Setophaga pitiayumi	V,A	MF	X	X						X,P+		6,13	6		10	5			
Geothlypis aequinoctialis	V,A	AA,FL	X	X	S				X	1,2,P+,R+	9,10,11	2,6,13	11,1	6	1,7,	1-3,10		4,7	5,8,9,11
Basileuterus culicivorus	R,P,C	MF	X	X	22	X	X	X		1,2,P+	8,9,10,11	6,13	11,1	6	7,8	1-5,7-12	4	4,5,7-9	7-9,11
Myiothlypis leucoblephara[end]	R,P,C	MF	X	X	14	X	X	X		1,2,P+	8,9,10,11					1-5,7-12	4	4,5,7-9	5,7-9,11
Icteridae (7)																			
Psarocolius decumanus	R	AA	X		3	X	X		X		8,9	6,13				5,7,9-12		7	7

Taxa	Evidence	Habitat	Bananal Ecological Station (Field trip)							Bananal region (historical and current data)	Bananal region (Field trip)							
			1	2	3	4	5	6	7		A	B1	B2	B3	B4	E1	E2	E3	E4
Cacicus chrysopterus	R,P,C	MF	X	X	10	X	X	X		1,2,5,P+	9					1-5,7-12	4	4,5,7,9	5,8,9,11
Gnorimopsar chopi	V	AA			S					X,P+		6,13	6	6	4,5,7,9,11,12	2			
Chrysomus ruficapillus	V	AA,FL	X							P+		2,6,13	6,13	6,1	4,7,12				
Molothrus rufoaxillaris										X									
Molothrus oryzivorus	P	AA			X					X									
Molothrus bonariensis	P	AA,NF	X		S	X				2,P+	8	2,6	6	6	3,7,8,10,12	1,3,5,7,8,10,12		5,8	
Mitrospingidae (1)																			
Orthogonys chloricterus[end]	R,P	MF			8					1,2	9					2,9-11			
Thraupidae (42)																			
Orchesticus abeillei[end]	R	MF		X						2,5,R+						5,7-12	4		
Pipraeidea melanonota	P,C	ME,AA	X	X	3	X		X		1,2,P+,R+						2,5,7-12		5,7-9	5
Stephanophorus diadematus	P	MF	X				X	X		1,2,P+,R+	8					1-5,7-12	4	4,5,7-9	8,9,11
Cissopis leverianus	V	MF	X			X				X,R+						12		4	5
Schistochlamys ruficapillus	V	NE,AA								X,P+		2,6,13	13		3,7	3,9,12		7	5,8
Paroaria dominicana *	V	AA								P+									8
Tangara cyanoventris[end]	V	MF								X,P+		1,13	13						
Tangara desmaresti[end]	R	MF	X	X	20	X	X	X		1,2,P+	9,10					1-5,7-12	4	4,7-9	8
Tangara sayaca	R,C	ME,AA	X	X	10	X	X	X	X	X,P+	8,10	1,2,6,13	6,11,13	6,1	3-5,7-12	1-5,7-12		4,5,7,9	5,7,8
Tangara cyanoptera[end]	R,C	MF	X	X	6	X				1,2,6,P+,R+						1,2,5,7-12	4	4,7-9	8
Tangara palmarum	V,A	ME,AA	X	X	2	X				1,P+		6,13	6		4,5,7,8,12	12		5	
Tangara ornata[end]	P	MF	X		4	X	X	X	X	1,2,5,P+	10					1-5,7-12	4	4,7,8	5,8
Tangara cayana	P	MF	X	X	2					X,P+	10	6,13	11	6,1	7,8,10	2,3,5,7-12		5,7	5
Nemosia pileata	V	ME,AA										6,13							
Conirostrum speciosum	V	MF								X		6,13	13	6					
Sicalis citrina										X									
Sicalis flaveola	P	AA			2	X	X	X	X	1,2,P+	8,11	2,6,13	6,13	6,1	3,4,7-12	4,5,8-12		5,7-9	8
Haplospiza unicolor[end]	P,C	MF	X	X	1	X	X			1,6,P+						2-4,7-12		4,8,9	11
Hemithraupis ruficapilla[end]	V	MF	X		1														

Taxa	Evidence	Habitat	Bananal Ecological Station (Field trip)							Bananal region (historical and current data)	Bananal region (Field trip)							
			1	2	3	4	5	6	7		A	B1	B2	B3	B4	E1	E2	E3	E4
Volatinia jacarina	V	AA,NF	X							X,P+	8	2,3,6,13	6,13	6,1	3,4,7-12	2			
Trichothraupis melanops	R,P,C	MF	X	X	6	X	X	X	X	1,2,P+		6	13	6		1,2,4,5,7-9,11,12	4	4,5,7-9	5,7
Coryphospingus pileatus	V	AA								7		2,6			4				
Tachyphonus coronatus[end]	P,C	MF	X	X		X	X			1,2, P+,R+	8,9,10	6,13		6	3,7,8,10,12	1,3-5,7,12	4	4,5,7,8	7,8,11
Ramphocelus bresilius[end]	V	AA								X,P+		1,6,13	11	6	7,8,10,12				
Tersina viridis	V	MF					X		X	X,P+	8	1,6,13			4,5,7,8,12	8,11,12			
Dacnis cayana	V	MF,AA	X	X		X	X			X		6,13	11,1		8	2,7,9,11,12			5
Coereba flaveola	V,A	MF,AA	X	X	1	X				2,P+		2,6,13	6,11,13	6,1	3-5,7-10,12	7,8,9,10,11,12			
Tiaris fuliginosus	A									5		13							
Sporophila lineola	V	AA,NF	X							P+	11	13	11		4,8,9,11,12				
Sporophila frontalis[end]	A	MF														2			
Sporophila nigricollis	V	AA,NF	X			X				X									
Sporophila caerulescens	C	AA,NF	X			X	X		X	1,2,P+	8,11	2,3,6,13	13	13	3,4,7-9,11,12	2-4,8-12		4,7,8	7,8,11
Sporophila leucoptera	V,A	AA								X,P+		2,13	13	13	4,12				
Sporophila angolensis[#]	C	AA,NF				X				1,2,P+		6,13			4	10			
Emberizoides herbicola	V	AA,NF								X,P+,R+		6	13		3,4,7				
Saltator similis	P	MF	X	X	8	X	X		X	1,2,P+	8,10	1,2,6		6		3-5,7-12	4	4,5,7,9	5,7,8
Saltator maxillosus[end]	R	MF								1,P+,R+						1-5,7,12	4		
Saltator fuliginosus[end]	R	MF	X		2					2		2,13				1-4,10,12			
Poospiza thoracica[end]	V	MF								1,P+						1,2			
Microspingus lateralis	R,P,C	MF	X	X	6					1,2,6,P+,R+	8					1-5,7-12		5	5,8,11
Thlypopsis sordida	V	MF								2,P+		6,13		6	3,5,7,9,12				
Pyrrhocoma ruficeps[end]	V	MF								X								5,7,8	
Cardinalidae (3)																			
Piranga flava	V	MF								P+									
Habia rubica	V,A	MF	X			X				X				6				8	

Taxa	Evidence	Habitat	Bananal Ecological Station (Field trip)							Bananal region (historical and current data)	Bananal region (Field trip)							
			1	2	3	4	5	6	7		A	B1	B2	B3	B4	E1	E2	E3	E4
Cyanoloxia brissonii[#]	R	MF,AA			1		X			X		2			7,9,10				9
Fringillidae (5)																			
Spinus magellanicus	V	AA,NF	X			X				1,2,P+,R+		6		5	8,12	1-4,7,9-12		5	11
Euphonia chlorotica	A	MF	X							X,P+		2,6,13	13	13		4			
Euphonia violacea										X,R+									
Euphonia cyanocephala	V	MF								X									
Euphonia pectoralis[end]	A	MF	X		5	X	X			1,P+,R+						1,37,9-12		5,7,9	9
Estrildidae (1)																			
Estrilda astrild	V	AA								X		6			9,11				
Passeridae (1)																			
Passer domesticus	V	AA								X,P+		6	6	6	4,5,7-12				