

Birds of Estação Ecológica de Carijós, southern Brazil

Bianca Pinto Vieira ^{1*}, Dayse Dias ², Vítor de Queiroz Piacentini ³, Edineia Caldas Correia ⁴, Patricia Pereira Serafini ⁵

- 1 Post-graduate in Zoology, University of Glasgow, Glasgow, United Kingdom.
 - 2 Pós-graduação em Biologia Animal, Universidade Federal do Espírito Santo, Vitória, Espírito Santo, Brazil.
 - 3 Seção de Aves, Museu de Zoologia da Universidade de São Paulo. Rua Nazaré, 481, CEP: 04263-000, São Paulo, SP, Brazil.
 - 4 Ministério do Meio Ambiente, Instituto Chico Mendes de Conservação da Biodiversidade, Estação Ecológica de Carijós. Rodovia Maurício Sirotski Sobrinho, SC 402 - km02, CEP 88053-700, Florianópolis, SC, Brazil.
 - 5 Ministério do Meio Ambiente, Instituto Chico Mendes de Conservação da Biodiversidade, Centro Nacional de Pesquisa e Conservação de Aves Silvestres. Rodovia Maurício Sirotski Sobrinho, SC 402 - km02, CEP 88053-700, Florianópolis, SC, Brazil.
- * Corresponding author. E-mail: biancabiofsc@gmail.com

ABSTRACT: *Estação Ecológica de Carijós*, southern Brazil, was created to protect biodiversity found in mangrove areas, *restingas*, and swamps of Santa Catarina Island. This paper presents an updated bird list of this protected area based on different surveying methods between 2009 and 2012. Thirty new species were recorded to *Estação Ecológica de Carijós*. Among 227 species known to occur in the area, 6 are threatened and 5 are highly dependent on mangrove areas or *restingas*. Study area has great importance, once it holds 64% of all bird species recorded in Santa Catarina Island, and 32% of those found in the state of Santa Catarina. High richness that was observed can be due to complex mosaic of natural habitats. Results show this protected area should be expanded to include not only nearby areas of *restinga*, but also the marine portion of Ratoles Bay.

DOI: 10.15560/10.5.1110

INTRODUCTION

Importance of coastal environments to regional biodiversity has been neglected despite these areas often exhibiting high levels of habitat heterogeneity and harboring habitat specialists (Rocha *et al.* 2007). In Brazil, these habitats began to be more valued for conservation purposes when endemic species, such as *Stymphalornis acutirostris* Bornschein, Reinert & Teixeira, 1995 and *Formicivora littoralis* Gonzaga & Pacheco, 1990 became globally threatened due to habitat loss (IUCN 2013). Fauna along Santa Catarina's coastline in southern Brazil remains understudied. Yet, it can potentially hold a significant and diverse bird assemblage due to its vast plains of unique vegetation. Region shelters the largest areas of *restinga* habitat in Brazil (Falkenberg 1999). *Restinga* is a coastal moist broadleaf forest formed on sandy, acidic, and nutrient-poor soils and characterized by medium sized trees and shrubs (Falkenberg 1999). Region also represents the southernmost mangroves along the Atlantic coast in South America (Chapman 1977; Spalding *et al.* 1997). Following a Brazilian trend, Santa Catarina coastal zone is under severe threat due to new settlements, invasions of exotic species, selective removal of species of economic importance, predatory fishing, and mining (MMA 2003; Rocha *et al.* 2007).

Estação Ecológica de Carijós is a protected area created to conserve the diversity found in mangrove areas, *restingas*, and swamps of Santa Catarina Island. Avifauna of this area has been sampled by Efe *et al.* (2007). However, many researchers have surveyed this area in recent years and gathered new unpublished data. Thus, this paper presents an updated bird list of *Estação Ecológica de Carijós* with new records to this protected area, including an update of birds conservation status.

MATERIALS AND METHODS

Study area

Estação Ecológica de Carijós (ESEC Carijós) was created in July 1987 with 759.33 hectares divided in two areas (27°27'54" S, 48°30'37" W; 27°32'50" S, 48°30'21" W). Station's largest area has 90% of whole unit and is in the locality of Ratoles whereas second area is in the locality of Saco Grande (Figure 1). Eight places (*Fazenda Brinkas*, Station's headquarters, *Restinga do Olandi*, *Antiga Estrada da Daniela*, *Coroa do Bicudo*, *Manguezal do Saco Grande*, *Restinga de Ratoles*, and *Pontal de Jurerê*) were surveyed (Figure 1). Seven places were in largest area and one in the smaller one (Figure 1). Avifauna was sampled in different habitats, including *restinga*, mangrove areas, beaches, and mudflats. Excepting *Coroa do Bicudo*, all sampled sites were close to roads, agricultural fields or residences.

Data collection

Species records were gathered through four methods: literature review, *ad libitum* searches, point counts, and mist-net captures. Potential records from nearby sites up to 4 km obtained from literature were included depending on the species and its habitat use, if compatible with habitats present in ESEC Carijós. For an instance, Piacentini *et al.* (2005) recorded some pelagic species in the North Bay area of Santa Catarina Island, but these species were not included in our list once they are pelagic and not expected to occur in habitats found in ESEC Carijós, such as mangrove areas, *restingas*, mudflats, or swamps. On the other hand, Ghizoni-Jr. *et al.* (2013) recorded some terrestrial and aquatic birds in the localities of Vargem Pequena and Ratoles that can likely use ESEC Carijós as well.

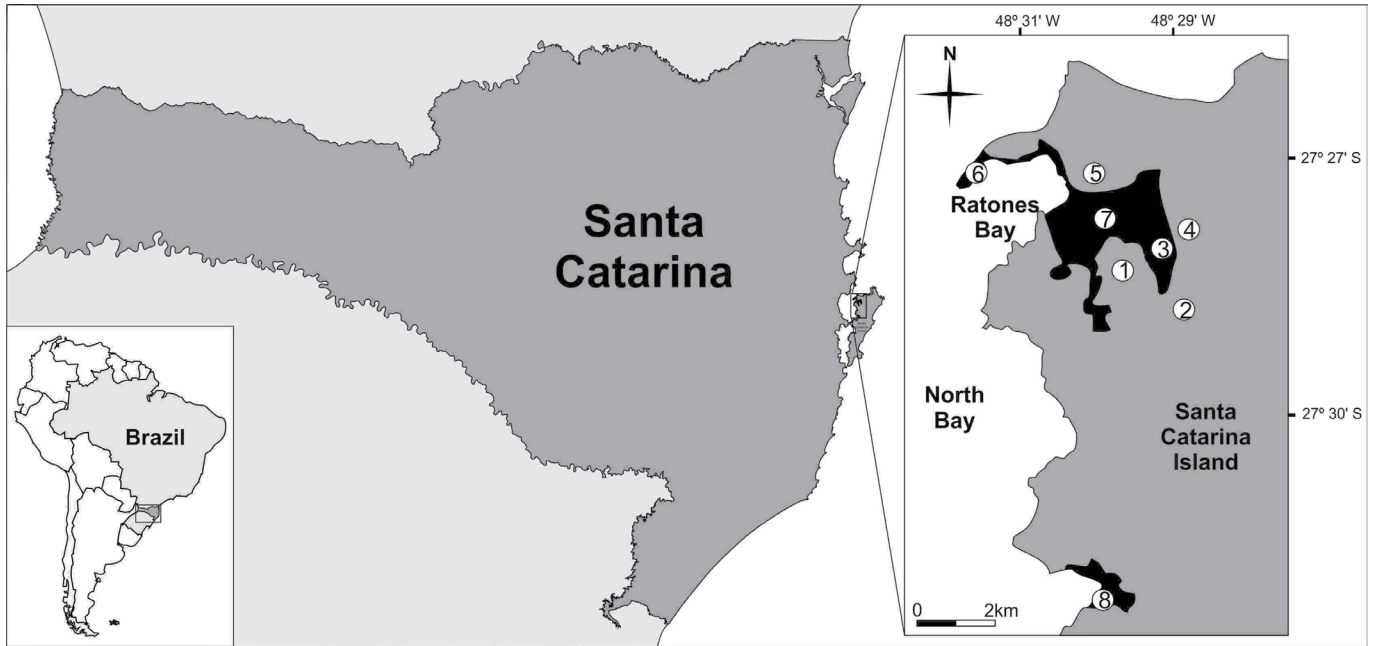


FIGURE 1. Study sites in Estação Ecológica de Carijós (black), Santa Catarina Island in southern Brazil. Legend: 1, Fazenda Brinkas (27°28'27" S, 48°30'09" W); 2, Restinga de Ratores (27°29'10" S, 48°29'82" W); 3, Station's headquarters (27°28'22" S, 48°29'32" W); 4, Restinga do Olandi (27°28'10" S, 48°29'12" W); 5, Antiga Estrada da Daniela (27°27'23" S, 48°30'55" W); 6, Pontal de Jurerê (27°27'14" S, 48°32'24" W); 7, Coroa do Bicudo (27°28'02" S, 48°29'53" W); 8, Manguezal do Saco Grande (27°33'09" S, 48°30'39" W). Author: BPV.

Our sampling places (Figure 1) were *ad libitum* searched between September 2005 and September 2012 with around 100 fieldtrips. In addition, three point counts with a 300-m radius were performed during 1 h each at Pontal de Jurerê. Survey was carried out monthly from sunrise to sunset between August 2011 and October 2012. Mist-netting was used to sample avian assemblages at Fazenda Brinkas, the Station's headquarters, Antiga Estrada da Daniela, Restinga do Olandi, and Restinga de Ratores. Individuals were banded (permits SISBIO number 23678-1 and CEMAVE/IBAMA number 3272) in monthly samplings between November 2010 and March 2012. Mist-nets were opened before sunset for three consecutive days at each site, totaling 38,880 h·m² efforts (Straube and Bianconi 2002).

Birds were identified with the help of field guides and manuals, such as van Perlo (2009), Rosário (1996), and Sick (1997). Some photographs and voice recordings taken from the area were deposited in Wikiaves website (www.wikiaves.com) or Xeno-Canto website (www.xeno-canto.org). Scientific and common names, and systematic classification follow the Brazilian Committee of Ornithological Records (CBRO 2014), except for the treatment of their expanded *Lanio*; we instead follow Remsen *et al.* (2013) for those species. Conservation status of species was accessed at the state (CONSEMA 2011), national (MMA 2003), and global level (IUCN 2013).

RESULTS AND DISCUSSION

Species richness

A total of 227 species from 68 families were recorded at ESEC Carijós and its vicinity between 1980 and 2012 (Table 1). This period includes records from the literature. Presence of 196 species were previously reported by: Rosário (1996), Naka and Rodrigues (2000), Naka *et al.* (2000), Azevedo *et al.*, (2003), Piacentini *et al.* (2005), Ghizoni-Jr. and Kunz (2006), Efe *et al.* (2007), Amorim and

Piacentini (2006), Piacentini *et al.* (2009), and Ghizoni-Jr. *et al.* (2013). Thirty-five species were included in the list, exclusively from data found in the literature (Table 1) highlighting the importance of a careful literature review as a complementary method in avian surveys.

Thirty species were added to the list from our own fieldwork (Table 1). We mist-netted and banded 185 individuals belonging to 33 species (Table 1). *Coryphospingus cucullatus* (Müller, 1776) was the only new species recorded exclusively by this method (Figure 2). We further recorded 115 species using point counts, with the highest number of species detected in aquatic habitats. *Ad libitum* searches detected 176 species. During point counts and *ad libitum* searches we recorded 168 species by visual contact and 104 by vocal signals (Table 1). Use of complementary surveying methods allowed improving site's check-list (Bibby *et al.* 2000). Previous surveys at this area resulted in 148 spp. (Efe *et al.* 2007).

Other bird studies along Brazilian coastline focused on inventorying the avifauna in *restingas*, mangrove



FIGURE 2. Adult male of *Coryphospingus cucullatus* (Statius Muller, 1776) banded (F24918) in the Station's headquarters of Estação Ecológica de Carijós, Santa Catarina Island. Photo by BPV.

areas, beaches, swamps, and mudflats. Almeida and Barbieri (2008) found 46 species in mangrove areas in northeastern Brazil, while Mestre *et al.* (2007) listed 81 species in Paraná. Almeida *et al.* (2013) and Mota *et al.* (2012) listed respectively 136 and 96 bird species to *restinga* habitat in northeastern Brazil, and their species richness is similar to other protected (146 spp.; Simon *et al.* 2007) and not protected (87 spp.; Dario 2009) *restingas* in Espírito Santo. Southern Brazil has few studies on coastal bird assemblages, but Piacentini and Campbell-Thompson (2006) listed 117 species in different habitats (mostly affected by human presence) at the *Lagoa de Ibiraquera* basin, in Imbituba.

Good part of the regional biodiversity can be found in ESEC Carijós. Sixty-four percent of bird species historically recorded in the Santa Catarina Island (*ca.* 355; Ghizoni-Jr. *et al.* 2013) have been found in our study area. In addition, bird assemblage represents about 32% of the species known to occur in the Santa Catarina state (*ca.* 700; VQP *unp. data*). Despite many new species added to ESEC Carijós, sampling effort was spatially unequal, with *Manguezal do Saco Grande* still in need of more intensive and longer-term surveys. There is a need also of studies focusing on nocturnal species, as well as swamp specialists (*e.g.*, Rallidae and some Passeriformes).

Natural habitat heterogeneity could explain the high richness encountered (see Fahrig 2003). Aquatic avian diversity in ESEC Carijós is maintained by the mosaic of wetland habitats that has many animal species essential to aquatic birds, such as fish, crustaceans, and benthic invertebrates (Cintrón and Schaeffer-Novelli 1992; Alves 2001). Additionally, ESEC Carijós represents a resting ground for migratory shorebirds (according to parameters defined by Myers *et al.* 1987). Monthly censuses from 2011 allowed the detection of several migratory species, such as *Pluvialis dominica* (Statius Muller, 1776), *P. squatarola* (Linnaeus, 1758), *Numenius phaeopus* (Linnaeus, 1758), *Arenaria interpres* (Linnaeus, 1758), *Calidris alba* (Pallas, 1764), *C. pusilla*, *Sternula supercilialis* (Vieillot, 1819), *Sterna trudeaui* Audubon, 1838, *Circus buffoni* (Gmelin, 1788), *Mimus triurus* (Vieillot, 1818), and *Pyrocephalus rubinus* (Boddaert, 1783). Species historically regarded as rare (see Rosário 1996) are actually commoner than previously thought, such as *Aphantochroa cirrochloris* (Vieillot, 1818), *Certhiaxis cinnamomeus* (Gmelin, 1788), *Agelasticus thilius* (Molina, 1782), and *Icterus pyrrhopterus* (Vieillot, 1819). Finally, some of the new records (Table 1) to this protected area have recently expanded their range in Brazil, such as *Plegadis chihi* (Vieillot, 1817), *Phimosus infuscatus* (Lichtenstein, 1823), *Coryphospingus cucullatus*, and *Eupetomena macroura* (Gmelin, 1788) (Piacentini *et al.* 2009; Straube *et al.* 2006; Ghizoni-Jr. *et al.* 2013).

Unconfirmed and questioned species

Three species have been reported to ESEC Carijós but were not validated in our review. Additionally, one species could not be identified to species level:

Flamingo (Phoenicopteridae): at an unspecified date, L.O.F. Rocha (pers. comm.) saw flamingos near the Station's headquarters, but the birds could not be identified. Ghizoni-Jr. and Piacentini (2010) suggested that *Phoenicoparrus andinus* (Philippi, 1854) might use the

Pontal de Jurerê. But in fact, *Coroa do Bicudo* is a very likely place to be visited by flamingos given its habitat.

Buteo nitidus (Latham, 1790): Though cited in Efe *et al.* (2007) to ESEC Carijós and in Naka *et al.* (2000) to Santa Catarina Island, this hawk has no confident records in southern Brazil. Closest known population of this species is in northern São Paulo state, around 700 km of Santa Catarina (Sick 1997; Ferguson-Less and Christie 2001). We therefore believe that this record should be left as hypothetical until physical evidence becomes available. Given the presence of some gray-backed and/or light-plumaged individuals of *Rupornis magnirostris* (Gmelin, 1788) in Santa Catarina (*e.g.*, records WA412005 – Niehues 2011; WA431470 – Florencio 2011; and WA880322 – Andrade 2013), confusion with the latter species is likely (VQP pers. obs.).

Sporophila frontalis (Verreaux, 1869): cited by Efe *et al.* (2007) to ESEC Carijós based on a pair of buff *Sporophila* seedeaters with facial markings seen in a *restinga* area by a roadside (M.A.G. Azevedo *in litt.*). The habitat where the record was made differs strikingly from the bamboo patches within forested areas where *S. frontalis* is found (see Areta *et al.* 2013). Indeed, there seems to be no suitable habitat to this species at ESEC Carijós, so we have chosen to exclude it from the list until physical evidence for its presence in the area becomes eventually available.

Noteworthy records

Anas bahamensis Linnaeus, 1758: Species has few records in Santa Catarina Island. On 23 November 2011, an individual was observed in a water channel near *Antiga Estrada da Daniela*. On 27 January 2012, three individuals were seen resting on the coastal plain of *Coroa do Bicudo* (see Ghizoni-Jr. *et al.* 2013), together with *ca.* 650 *Tringa flavipes* (Gmelin, 1789), 18 *Calidris fuscicollis* (Vieillot, 1819), 21 *Charadrius semipalmatus* Bonaparte, 1825, 5 *Phalacrocorax brasilianus* (Gmelin, 1789), and 3 *Platalea ajaja* Linnaeus, 1758. On 23 September 2012, an adult was seen in a temporary lagoon in the *Pontal de Jurerê*.

Spheniscus magellanicus (Forster, 1781): one adult and two juveniles were observed swimming and foraging in the Ratones Bay on 17 June 2012 (Figure 3C). Carcasses have been sporadically observed along the beach of the *Pontal de Jurerê*. The species appears in the reserve during the period of winter migration (Rosário 1996; Sick 1997), when it is commonly seen near beach areas.

Elanus leucurus (Vieillot, 1818): One individual was observed flying above Ratones River on 27 January 2012. Naka and Rodrigues (2000) noted that this species is common in the continent, but rare in the Santa Catarina Island, so it is worth mentioning recent records by BPV and DD in *Via Expressa Sul* on 20 November 2009 and in Beira-Mar Norte Avenue on 25 September 2012.

Pluvialis dominica: This migratory species, which was only recently found in Santa Catarina Island (Rosario 2004), was observed at the *Pontal de Jurerê* on 3 January 2011 (Figure 4A). The bird foraged along the beach and close to two *Tringa melanoleuca* (Gmelin, 1789). This species occasionally appears in the region between October and January (BPV *pers. obs.*).

Pluvialis squatarola: First species record in ESEC Carijós was at the *Pontal de Jurerê* on 13 November 2010.



FIGURE 3. Some species photographed during our surveys that are regionally threatened and new to *Estação Ecológica de Carijós* in southern Brazil: A) *Rallus longirostris* Boddaert, 1783, vulnerable at the state level, at *Pontal do Jurerê* on 6 January 2012; B) *Thalasseus maximus* (Boddaert, 1783), vulnerable at the state and national levels, appearing in front of *Thalasseus acutiflavus* (Cabot, 1847) at *Pontal do Jurerê* on 13 November 2011; C) *Spheniscus magellanicus* (Forster, 1781) swimming in the Ratones Bay on 17 June 2012; D) *Calidris pusilla* (Linnaeus, 1766) (left) with two *Calidris alba* (Pallas, 1764) (right) foraging at the *Pontal de Jurerê* on 29 August 2012. Photos by DD (A, B) and BPV (C, D).

On 3 January 2011, another one rested in the intertidal zone together with *Calidris alba*. In that same year, four individuals were found foraging with *Numenius phaeopus* (Linnaeus, 1758) on 18 November (Figure 4B).

Arenaria interpres: One individual (Figure 4C) in adult-intermediate plumage was observed foraging with one *C. canutus* (Linnaeus, 1758), four *C. fuscicollis*, and six *Charadrius semipalmatus* at the *Pontal de Jurerê*, on 14 November 2012. Five days later, Ghizoni-Jr. et al. (2013) recorded two individuals at the same place. The first documented record for Santa Catarina Island was in 2005 (Ghizoni-Jr. et al. 2013).

Numenius phaeopus: One individual recorded at the *Pontal de Jurerê* on 18 November 2011 (Figure 4D) foraging on polychaetes and *Uca* spp. close to four *Pluvialis squatarola*. This is the first record of the species on Santa Catarina Island (see Ghizoni et al. 2013).

Calidris alba: Rosário (2004) obtained the first record for the Santa Catarina Island. It was initially observed in ESEC Carijós on 10 October 2010 (Figure 3D), using beaches and mudflats between September and January (BPV pers. obs.). In 2012, a few individuals were seen sporadically in April, May, and August (BPV pers. obs.).

Calidris pusilla (Linnaeus, 1766): We recorded the species at *Pontal de Jurerê* on 29 August 2012 (Figure 3D), representing the first record to Santa Catarina Island (see Ghizoni-Jr. et al. 2013). The species was seen again foraging again at *Pontal de Jurerê* with two *Calidris alba* and few *C. fuscicollis* on 9 and 23 September 2012.

Sternula superciliaris: On 14 November 2012, three adults in breeding plumage were observed resting at the *Pontal de Jurerê* together with 23 *Thalasseus acutiflavus* (Cabot, 1847) and seven *T. maximus* (Boddaert, 1783). Rosário (1996) mentioned the species for the northern portion of Santa Catarina Island.

Aphantochroa cirrochloris: On 9 November 2011, one individual was foraging in a feeder at a residence near the mangrove swamp of *Pontal de Jurerê*. Piacentini et al. (2006) made the first record for the Santa Catarina Island.

Certhiaxis cinnamomeus: This bird is common in *restingas*, swamps, and mangrove areas around the island (Figure 4E). It was recorded in swamps at *Restinga do Olandi* and along the *Antiga Estrada da Daniela*, as well as in the mangroves of *Pontal de Jurerê* and of the Station's headquarters since 2011. Rosário (2004) first recorded the species in January 2003.

Mimus triurus: Two individuals were observed foraging in shrub-dominated *restinga* at *Antiga Estrada da Daniela* on 9 September 2012 (Figure 4F). This migratory species was first documented in the Santa Catarina Island by Ghizoni-Jr. et al. (2013).

Coryphospingus cucullatus: One adult individual was mist-netted, banded (CEMAVE F24918), and released on 12 November 2010 at the Station's headquarters (Figure 2; see Ghizoni-Jr. et al. 2013). It is a recent colonizer in eastern Santa Catarina state, likely through releases and escape as pet birds (VQP pers. obs.). Soares (2004) recorded one individual in the locality of Ribeirão da Ilha,



FIGURE 4. New species to Estação Ecológica de Carijós, southern Brazil, photographed during our surveys: A) *Pluvialis dominica* (Statius Muller, 1776) at Pontal de Jurerê on 27 November 2011; B) *Pluvialis squatarola* (Linnaeus, 1758) at Pontal de Jurerê on 18 November 2011; C) *Arenaria interpres* (Linnaeus, 1758) foraging at Pontal de Jurerê on 14 November 2012; D) *Numenius phaeopus* (Linnaeus, 1758) at Pontal de Jurerê on 18 November 2011; E) *Certhiaxis cinnamomeus* (Gmelin, 1788) at Station's headquarters on 2 January 2011; F) *Mimus triurus* (Vieillot, 1818) at Antiga Estrada da Daniela on 9 September 2012. Photos by BPV (A, B, C, D, and F) and DD (E).

southern Santa Catarina Island.

Donacospiza albifrons (Vieillot, 1817): Migratory species with its first record for the Santa Catarina Island by Naka and Rodrigues (2000) at *Manguezal of Pirajubaé*. VQP observed this species in a swamp at *Antiga Estrada da Daniela* on 24 September 2005 and on 17 October 2006. Voice recordings are deposited on Xeno-Canto (XC115058 and XC115059).

Threatened species

Six threatened species were documented. *Spizaetus tyrannus* (Wied, 1820), *Rallus longirostris* Boddaert, 1783 (Figure 3A), *Ramphocelus bresilius* (Linnaeus, 1766), and *Conirostrum bicolor* (Vieillot, 1809) are vulnerable at the state level. *Tangara peruviana* (Desmarest, 1806) is endangered at the state level and vulnerable at the global level. *Thalasseus maximus* (Figure 3B) is vulnerable at the

state and national levels.

Threatened species have general reduced population sizes or populations in decline due to habitat loss and resource scarcity (CONSEMA 2011; IUCN 2013). Despite not being a nesting site for birds as *S. tyrannus* and *T. maximus*, the study area plays an important role as foraging grounds. According to Ghizoni-Jr. et al. (2013), there have been at least five pairs of *S. tyrannus* observed using areas in the Santa Catarina Island. At the ESEC Carijós, they are often observed searching for food in tree-dominated *restingas* (Azevedo et al. 2003; Ghizoni-Jr. et al. 2013).

Thalasseus maximus is present throughout the year, with greater numbers between July and November (BPV pers. obs.), corresponding to breeding period in Uruguay coastline (Lenzi et al. 2010). ESEC Carijós is close enough of Uruguay considering birds' flight capacity. They could fly from one place to another in a few days, once they can

move up to 40 km per day to search for food (Del-Hoyo 1996). It is possible that species uses ESEC Carijós region to forage and rest during its breeding season (BPV pers. obs.).

Among forest birds, *Ramphocelus bresilius* is a species under pressure from illegal capture and trade (IUCN 2013). In 2012, for example, a man was observed with cages and traps at the *Antiga Estrada da Daniela*. This is the same place where *Sporophila caerulescens* (Vieillot, 1823) occurs.

Egretta caerulea (Linnaeus, 1758), *Nyctanassa violacea* (Linnaeus, 1758), *R. longirostris*, and *Conirostrum bicolor* are especial due to their strong dependence on mangrove areas. *Tangara peruviana* also represents an endemic species threatened due to the destruction of the *restingas* (CONSEMA 2011). *Rallus longirostris*, as well as *C. bicolor* and *T. peruviana* are at regional risk due to the isolation of subpopulations in fragmented and/or polluted habitats (CONSEMA 2011; IUCN 2013).

Population fluctuations, even if they are not significant, have also been globally observed for *Spheniscus magellanicus* and *Puffinus griseus* (Gmelin, 1789) likely due to the fishing industry and marine pollution (IUCN 2013). North Bay region, including Ratoles Bay, could be a valuable foraging and resting area for these species, due to the low fishing pressure in the area, although it has been suffering from irregular dumping of waste into the sea (Severino et al. 2006; Vieira et al. 2011, 2012). Therefore, we recommend to intensify the water quality monitoring in ESEC Carijós and to establish its relationship with avian health.

Efe et al. (2007) have recommended special attention to human pressures such as settlements in the *restinga* habitat at ESEC Carijós and surrounding areas. Expansion of ESEC Carijós throughout buffer zone, in order to include marine area in Ratoles Bay and the *restingas* of Olandi, Brinkas, and Ratoles, could restrict human activities and reduce pressure upon this protected area. Our results reinforce the strategic importance of this protected area in the conservation of Atlantic Forest biodiversity.

ACKNOWLEDGMENT: Instituto Chico Mendes de Biodiversidade (ICMBio) for permits and Centro Nacional de Pesquisa e Conservação de Aves Silvestres for permits, bands, and equipment. Everyone that helped mist-netting, especially Isaac Simão Neto and Vilmar Spricigo. Catherine L. Bechtoldt translated the first version of this paper from Portuguese. Bianca P. Vieira thanks the Conselho Nacional de Desenvolvimento Científico e Tecnológico for a scientific initiation fellowship. Dayse Dias thanks the ICMBio for a trainee fellowship. Acronyms used: BPV – Bianca Pinto Vieira, DD – Dayse Dias, and VPQ – Vítor de Queiroz Piacentini.

LITERATURE CITED

- Almeida, B.J.M. and E. Barbieri. 2008. Biodiversidade das aves do manguezal da 13 de julho em Aracaju, Sergipe. *O Mundo da Saúde* 32(3): 317–328 (http://www.saocamillo-sp.br/pdf/mundo_saude/63/317-328pdf.pdf).
- Almeida, B.J.M., B.D.A. Almeida, A.G. Souza, J.M. Ruiz-Esparza and S.F. Ferrari. 2013. Avifauna dos remanescentes das *restingas* ao longo da zona de expansão urbana de Aracaju, Sergipe. *Scientia Plena* 8(12): 1–11 (<http://www.scientiaplena.org.br/sp/article/viewFile/1113/629>).
- Alves, J.R.P. 2001. *Manguezais: Educar para Proteger*. Rio de Janeiro: FEMAR/SEMADS. 96 pp.
- Amorim, J.F. and V.Q. Piacentini. 2006. Novos registros de aves raras em Santa Catarina, Sul do Brasil, incluindo os primeiros registros documentados de algumas espécies para o Estado. *Revista Brasileira de Ornitologia* 14(2): 145–149 (<http://www.ararajuba.org.br/sbo/ararajuba/artigos/Volume142/ara142not1.pdf>).
- Andrade, P.S. 2013. WA880322, *Rupornis magnirostris* (Gmelin, 1788). *Wiki Aves—A Enciclopédia das Aves do Brasil*. Electronic database accessible at <http://www.wikiaves.com/880322>. Captured on 13 April 2014.
- Areta, J.I., A. Bodrati, G. Thom, A.E. Rupp, M. Velazquez, I. Holzmann, E. Carrano and C.E. Zimmermann. 2013. Natural History, Distribution, and Conservation of Two Nomadic *Sporophila* Seedeaters Specializing on Bamboo in the Atlantic Forest. *The Condor* 115(2): 237–252 (doi: 10.1525/cond.2013.120064).
- Azevedo, M.A.G., D.A. Machado and J.L.B. Albuquerque. 2003. Aves de rapina na Ilha de Santa Catarina, SC: composição, frequência de ocorrência, uso de hábitat e conservação. *Ararajuba* 11(1): 75–81 (<http://www.ararajuba.org.br/sbo/ararajuba/artigos/Volume111/ara111art7.pdf>).
- Bibby, C.L., N.D. Burgess, D.A. Hill, S. Mustoe. 2000. *Bird census techniques*. 2nd ed., London: Academic Press. 302 pp.
- CBRO [Comitê Brasileiro de Registros Ornitológicos]. 2014. *Lista das aves do Brasil*. Electronic database accessible at <http://www.cbro.org.br>. Captured on 13 April 2014.
- Chapman, V.J. 1977. Introduction; pp. 1–29, in: V.J. Chapman (ed.). *Ecosystems of the World 1: Wet Coastal Ecosystems*. Amsterdam/Oxford/New York: Elsevier.
- Cintrón, G. and Schaeffer-Novelli, Y. 1992. Ecology and management of New World mangroves; pp. 233–258, in: U. Seeliger (ed.). *Coastal Plant Communities of Latin America*. New Jersey: Academic Press.
- CONSEMA 2011. Resolução nº 02/2011—Reconhece a Lista Oficial de Espécies da Fauna Ameaçadas de Extinção no Estado de Santa Catarina e dá outras Providências. Florianópolis: CONSEMA/SDS. 18 pp.
- Dario, F.R. 2009. Composição da avifauna de restinga no Estado do Espírito Santo, Brasil. *Revista Biociências* 15(2): 95–105 (<http://periodicos.unitau.br/ojs-2.2/index.php/biociencias/article/view/1003>).
- Del-Hoyo, J., A. Elliott, A. and J. Sargatal. 1996. *Handbook of the Birds of the World: Hoatzin to Auks*. Barcelona: Lynx Edicions.
- Efe, M.A., M.A.G. Azevedo and A. Filippini. 2007. Avifauna da Estação Ecológica de Carijós, Florianópolis—SC. *Ornithologia* 2(1): 1–13 (<http://cemave.net/ornithologia/index.php/ornithologia/article/view/22>).
- Fahrig, L. 2003. Effects of habitat fragmentation on biodiversity. *Annual Review of Ecology, Evolution, and Systematics* 34: 487–515 (doi: 10.1146/annurev.ecolsys.34.011802.132419).
- Falkenberg, D.B. 1999. Aspectos da flora e da vegetação secundária da restinga de Santa Catarina, sul do Brasil. *Insula* 28: 1–30 (<https://periodicos.ufsc.br/index.php/insula/article/view/21771>).
- Ferguson-Lees, J. and D.A. Christie. 2001. *Raptors of the World*. New York: Houghton Mifflin Company. 992 pp.
- Florencio, V.E. 2011. WA431470, *Rupornis magnirostris* (Gmelin, 1788). *Wiki Aves—A Enciclopédia das Aves do Brasil*. Electronic database accessible at <http://www.wikiaves.com/431470>. Captured on 13 April 2014.
- Ghizoni-Jr., I.R. and T.S. Kunz. 2006. Registro da curicaca *Theristicus caudatus* (Threskiornithidae) e do carão *Aramus guarauna* (Aramidae) na Ilha de Santa Catarina, Sul do Brasil. *Atualidades Ornitológicas* 134: 12–13 (http://www.ao.com.br/download/AO171_50.pdf).
- Ghizoni-Jr., I.R. and V.Q. Piacentini. 2010. The Andean Flamingo *Phoenicoparrus andinus* (Philippi, 1854) in southern Brazil: Is it a vagrant? *Revista Brasileira de Ornitologia* 18(3): 263–266 (<http://www4.museu-goeldi.br/revistabronito/revista/index.php/BJO/article/view/4024>).
- Ghizoni-Jr., I.R., F.B. Farias, B.P. Vieira, G. Willrich, E.S. Silva, E.N. Mendonça, J.L.B. Albuquerque, D.A. Gass, M.H. Ternes, C.E. Nascimento, A.L. Roos, C.C.M. Couto, M. Serrão, P.P. Serafini, D. Dias, F.M. Fantacini, S. Santi, M.C.R. Souza, M.S. Silva, A. Barcellos, C. Albuquerque, and C.R.R. Espínola. 2013. Checklist da avifauna da Ilha de Santa Catarina, sul do Brasil. *Atualidades Ornitológicas* 171: 50–75 (http://www.ao.com.br/download/AO171_50.pdf).
- IUCN 2013. *The IUCN Red List of Threatened Species*. Electronic database accessible at <http://www.iucnredlist.org>. Captured on 13 April 2014.
- Lenzi, J., S. Jiménez, D. Caballero-Sadi, M. Alfaro and P. Laporta. 2010. Some aspects of the breeding biology of Royal (*Thalasseus maximus*) and Cayenne terns (*T. sandvicensis eurygnathus*) on Isla Verde, Uruguay. *Ornithologia Neotropical* 21: 361–370 ([http://www.researchgate.net/publication/233778408_Some_aspects_of_the_breeding_biology_of_Royal_\(Thalasseus_maximus\)_and_Cayenne_terns_\(T_sandvicensis_eurygnathus\)_on_Isla_Verde_Uruguay/file/d912f50b65912eeaa8.pdf](http://www.researchgate.net/publication/233778408_Some_aspects_of_the_breeding_biology_of_Royal_(Thalasseus_maximus)_and_Cayenne_terns_(T_sandvicensis_eurygnathus)_on_Isla_Verde_Uruguay/file/d912f50b65912eeaa8.pdf)).
- MMA [Ministério do Meio Ambiente]. 2003. *Livro Vermelho da Fauna Brasileira Ameaçada de Extinção*. Brasília: Ministério do Meio Ambiente; Belo Horizonte: Fundação Biodiversitas. 1420 pp.
- Mestre, L.A.M., R. Krul and V.D.S. Moraes. 2007. Mangrove bird community of Paranaguá Bay-Paraná, Brazil. *Brazilian Archives*

- of *Biology and Technology* 50(1): 75–83 (doi: 10.1590/S1516-89132007000100009).
- Mota, J.V.L., A.A.F. Carvalho and M.S. Tinoco. 2012. Composição da avifauna e sua relação com áreas manejadas na restinga da Reserva Imbassá, Litoral Norte da Bahia, Brasil. *Ornithologia* 5(1): 6–18 (<http://cemave.net/ornithologia/index.php/ornithologia/article/view/70>).
- Myers, J.P., R.I.G. Morrison, P.Z. Antas, B.A. Harrington, T.E. Lovejoy, M. Salaberry, S.E. Senner and A. Tarak. 1987. Conservation strategy for migratory species. *American Scientist* 75(1): 18–26 (<http://connection.ebscohost.com/c/articles/11232332/conservation-strategy-migratory-species>).
- Naka, L.N. and M. Rodrigues. 2000. *As aves da Ilha de Santa Catarina*. Florianópolis, Editora da UFSC. 294 pp.
- Naka, L.N., J.M. Barnett, G.M. Kirwan, J.A. Tobias and M.A.G. Azevedo. 2000. New and noteworthy bird records from Santa Catarina State, Brasil. *Bulletin of the British Ornithologist's Club* 120(4): 237–250 (<http://biostor.org/reference/111873>).
- Niehues, J. 2011. *WA412005*, Rupornis magnirostris (Gmelin, 1788). *Wiki Aves—A Enciclopédia das Aves do Brasil*. Electronic database accessible at <http://www.wikiaves.com/412005>. Captured on 13 April 2014.
- Perlo, B.V. 2009. *A Field Guide to the Birds of Brazil*. New York: Oxford University Press. 465 pp.
- Piacentini, V.Q. and E.R. Campbell-Thompson. 2006. Lista comentada da avifauna da microbacia hidrográfica da Lagoa de Ibraquera, Imbituba, SC. *Biotemas* 19(2): 55–65 (<https://periodicos.ufsc.br/index.php/biotemas/article/view/21216>).
- Piacentini, V.Q., I.R. Ghizoni-Jr, M.A.G. Azevedo, E. Carrano, C.A. Borchardt-Jr, J.F. Amorim, C. Alberto and A.V. Grose. 2009. Ocorrência, expansão e distribuição do maçarico-de-cara-pelada *Phimosus infuscatus* (Lichtenstein, 1823) (Ciconiiformes: Threskiornithidae) no Estado de Santa Catarina, sul do Brasil. *Revista Brasileira de Ornitologia* 17(2): 107–112 (<http://www4.museu-goeldi.br/revistabrornito/revista/index.php/BJO/article/download/3605/pdf/789>).
- Piacentini, V.Q., L.L. Wedekin and F.G. Daura-Jorge. 2005. Petrels, skuas and other migrant seabirds in a coastal bay in Santa Catarina State, southern Brazil. *Cotinga* 24: 55–59 (<http://www.neotropicalbirdclub.org/pages/jmenu.asp?IssueID=24>).
- Remsen, J.V., Jr., C.D. Cadena, A. Jaramillo, M. Nores, J.F. Pacheco, J. Pérez-Emán, M.B. Robbins, F.G. Stiles, D.F. Stotz, and K. J. Zimmer. 2013. *A Classification of the Bird Species of South America*. American Ornithologists' Union. Available at <http://www.museum.lsu.edu/~Remsen/SACCBaseline.html>. Captured on 20 December 2013.
- Rocha C.F.D., H.G. Bergallo, M. Van Sluys and M.A.S. Alves. 2007. The remnants of restinga habitats in the Brazilian Atlantic Forest of Rio de Janeiro state, Brazil: habitat loss and risk of disappearance. *Brazilian Journal of Biology* 67(2): 263–273 (doi: 10.1590/S1519-69842007000200011).
- Rosário, L. A. 1996. *As aves em Santa Catarina: Distribuição geográfica e meio ambiente*. Florianópolis: FATMA. 326 pp.
- Rosário, L. A. 2004. *Um outro olhar da Via Expressa Sul*. Florianópolis: Edição da autora. 114 pp.
- Severino, S.S., F.W. Schwegler and R. Silva. 2006. Os impactos da atividade turística, estudo na Praia da Daniela. *Caderno Virtual de Turismo* 6(2): 51–58 ([http://www.ivt.coppe.ufrj.br/caderno/index.php?journal=caderno&page=article&op=view&path\[\]=121](http://www.ivt.coppe.ufrj.br/caderno/index.php?journal=caderno&page=article&op=view&path[]=121)).
- Sick, H. 1997. *Ornitologia Brasileira*. Rio de Janeiro: Nova Fronteira. 912 pp.
- Simon, J.E., S.R. Lima and T. Cardinali. 2007. Comunidade de aves no Parque Estadual da Fonte Grande, Vitória, Espírito Santo, Brasil. *Revista Brasileira de Zoologia* 24(1): 121–132. (doi: 10.1590/S0101-81752007000100015)
- Soares, A.G. 2004. A avifauna de uma área do bairro Ribeirão da Ilha, Florianópolis, Santa Catarina: Levantamento e implicações para a educação ambiental. *Biotemas* 17(2): 107–124. (<https://periodicos.ufsc.br/index.php/biotemas/article/view/23251>)
- Spalding, M. 1997. The global distribution and status of mangrove ecosystems. *International News Letter of Coastal Management-Intercoast Network*, special edition(1): 20–21.
- Straube, F.C. and G.V. Bianconi 2002. Sobre a grandeza e a unidade utilizada para estimar esforço de captura com utilização de redes-de-neblina. *Chiroptera Neotropical* 8: 150–152.
- Straube, F.C., A. Urben-Filho and V.Q. Piacentini. 2006. O beija-flor-tesoura e sua ampliação de distribuição *Eupetomena macroura* (Gmelin, 1788) pelo sul do Brasil. *Atualidades Ornitológicas* (on-line) 132: 1–4 (<http://www.ao.com.br/download/tesoura.pdf>).
- Vieira, B.P., D. Dias and N. Hanazaki. 2011. Homogeneidade de encalhe de resíduos sólidos em um manguezal da Ilha de Santa Catarina, Brasil. *Journal of Integrated Coastal Zone Management* 11(1): 21–30. (http://www.aprh.pt/rgci/pdf/rgci-188_Vieira.pdf)
- Vieira, B.P., D. Dias, E. M. Nakamura, T. I. Arai and N. Hanazaki. 2012. Is there temporal variation on solid waste stranding in mangroves? A case study in Ratoles mangrove, Florianópolis, Brazil. *Biotemas* 26(1): 79–86. (doi: 10.5007/2175-7925.2013v26n1p79)

RECEIVED: January 2014

ACCEPTED: August 2014

PUBLISHED ONLINE: October 2014

EDITORIAL RESPONSIBILITY: Marcelo F. de Vasconcelos

TABLE 1. Avifauna of Estação Ecológica de Carijós, Santa Catarina Island, southern Brazil. Legend: Conservation Status: VU – vulnerable; EN – endangered; DD – deficient data; NT – near threatened; LC – least concern; SC – state-level (CONSEMA 2011); BR – national-level (MMA 2003); IU – global-level (IUCN 2013). **Records:** The habitat where the species was recorded is indicated by each period of time, being Re – restinga; Ma – mangrove area; B – beach; Mu – mudflat; W – water (includes species foraging from riverside or flying through it to forage); Sw – swamp. **Literature:** records found in R – Rosário (1996); NK – Naka and Rodrigues (2000); N – Naka et al. (2000); A – Azevedo et al. (2003); P5 – Piacentini et al. (2005); GK – Ghizoni, Jr. and Kunz (2006); E – Efe et al. (2007); AP – Amorim and Piacentini (2006); P9 – Piacentini et al. (2009); Ghi – Ghizoni-Jr. et al. (2013); LR – Lenir A.B. Rosário pers. comm.; and * – new records from our fieldwork. **Fieldwork:** class of record if V – visual; A – audio; C – capture with CEMAVE band code in parentheses; (W followed by a number code) – deposited in Wikiaves website; (X followed by a number code) – deposited Xeno-Canto website.

TAXA	CONSERVATION STATUS	RECORDS					
		1980–1996	1997–2001	2002–2007	2008–2012	LITERATURE	FIELDWORK
Tinamidae (1)							
<i>Crypturellus obsoletus</i> (Temminck, 1815)	LC		Re	Re	Re	NR, E	A
Anatidae (5)							
<i>Dendrocygna viduata</i> (Linnaeus, 1766)	LC				W	*	V (W - WA523879)
<i>Coscoroba coscoroba</i> (Molina, 1782)	DD-SC			W		Ghi	
<i>Amazonetta brasiliensis</i> (Gmelin, 1789)	LC	W	W	W	W	R, NR, E	V
<i>Anas bahamensis</i> Linnaeus, 1758	LC				W	Ghi	V
<i>Anas versicolor</i> Vieillot, 1816	LC				W	*	V
Cracidae (1)							
<i>Ortalis guttata</i> (Spix, 1825)	LC	Re	Re	Re	Re	R, NR, E	V, A
Podicipedidae (1)							
<i>Podiceps major</i> (Boddaert, 1783)	LC				W	Ghi	V
Spheniscidae (1)							
<i>Spheniscus magellanicus</i> (Forster, 1781)	NT-IU				W, Be	*	V (Figure 3C)
Procellariidae (1)							
<i>Puffinus griseus</i> (Gmelin, 1789)	NT-IU	B			W	R	V
Ciconiidae (1)							
<i>Mycteria americana</i> Linnaeus, 1758	LC			W		Ghi	

TABLE 1. Continued.

TAXA	CONSERVATION STATUS	RECORDS					
		1980–1996	1997–2001	2002–2007	2008–2012	LITERATURE	FIELDWORK
Fregatidae (1)							
<i>Fregata magnificens</i> Mathews, 1914	LC	W	W	W	W	R, NR, E	V
Sulidae (1)							
<i>Sula leucogaster</i> (Boddaert, 1783)	LC	W	W	W	W	R, NR, E	V
Phalacrocoracidae (1)							
<i>Phalacrocorax brasilianus</i> (Gmelin, 1789)	LC	W	W	W	W	R, NR, E	V
Anhingidae (1)							
<i>Anhinga anhinga</i> (Linnaeus, 1766)	LC			W		Ghi	
Ardeidae (9)							
<i>Nycticorax nycticorax</i> (Linnaeus, 1758)	LC		W, Mu, B	W, Mu, B	W, Mu, B	NR, E	V, A
<i>Nyctanassa violacea</i> (Linnaeus, 1758)	LC		W, Mu, Ma	W, Mu, Ma	W, Mu, Ma	NR, E	V
<i>Butorides striata</i> (Linnaeus, 1758)	LC		W, Mu, Ma	W, Mu, Ma	W, Mu, Ma	NR, E	V
<i>Bubulcus ibis</i> (Linnaeus, 1758)	LC	Re	Re	Re	Re	R, NR, E	V
<i>Ardea cocoi</i> Linnaeus, 1766	LC		W, Mu, Ma	W, Mu, Ma	W, Mu, Ma	NR, E	V, A
<i>Ardea alba</i> Linnaeus, 1758	LC	W, Mu, Ma	W, Mu, Ma	W, Mu, Ma	W, Mu, Ma	R, NR, E	V, A
<i>Syrigma sibilatrix</i> (Temminck, 1824)	LC	W, Mu, Ma	W, Mu, Ma	W, Mu, Ma	W, Mu, Ma	R, NR, E	V (W - WA458279)
<i>Egretta thula</i> (Molina, 1782)	LC	W, Mu, Ma, B	W, Mu, Ma, B	W, Mu, Ma, B	W, Mu, Ma, B	R, NR, E	V, A
<i>Egretta caerulea</i> (Linnaeus, 1758)	LC		W, Mu, Ma	W, Mu, Ma	W, Mu, Ma	NR, E	V, A
Threskiornithidae (4)							
<i>Plegadis chihi</i> (Vieillot, 1817)	LC				Re, Mu	Ghi	V
<i>Phimosus infuscatus</i> (Lichtenstein, 1823)	LC			Re, Mu	Re, Mu	P9, Ghi	V (W - WA430155)
<i>Theristicus caudatus</i> (Boddaert, 1783)	LC				Re	GK	V
<i>Platalea ajaja</i> Linnaeus, 1758	LC		Re, Ma, Mu	Re, Ma, Mu	Re, Ma, Mu	NR, E	V (W - WA544632)
Phoenicopteridae (1)							
Species 1	LC				W, Mu	Ghi	
Cathartidae (3)							
<i>Cathartes aura</i> (Linnaeus, 1758)	LC	Re, B	Re, B	Re, B	Re, B	R, NR, E	V
<i>Cathartes burrovianus</i> Cassin, 1845	LC			Re		Ghi	
<i>Coragyps atratus</i> (Bechstein, 1793)	LC	Re, B	Re, B	Re, B	Re, B	R, NR, E	V
Pandionidae (1)							
<i>Pandion haliaetus</i> (Linnaeus, 1758)	LC			W	W	E	V
Accipitridae (12)							
<i>Leptodon cayanensis</i> (Latham, 1790)	LC				Re	Ghi	
<i>Elanoides forficatus</i> (Linnaeus, 1758)	LC	Re	Re	Re	Re	R, NR, A, E	V
<i>Elanus leucurus</i> (Vieillot, 1818)	LC				Re	*	V
<i>Harpagus diodon</i> (Temminck, 1823)	LC			Re		E	
<i>Circus buffoni</i> (Gmelin, 1788)	LC				Re	Ghi	V (W - WA758553)
<i>Accipiter striatus</i> Vieillot, 1808	LC			Re	Re	E	V
<i>Ictinia plumbea</i> (Gmelin, 1788)	LC	Re	Re			LR, A	
<i>Rostrhamus sociabilis</i> (Vieillot, 1817)	LC		Re	Re	Re	NR, A, Ghi	V
<i>Urubitinga urubitinga</i> (Gmelin, 1788)	LC			Re		E	
<i>Rupornis magnirostris</i> (Gmelin, 1788)	LC	Re, Ma	Re, Ma	Re, Ma	Re, Ma	R, NR, E	V (W - WA458274), A
<i>Buteo brachyurus</i> Vieillot, 1816	LC		Re	Re	Re	A, E	V
<i>Spizaetus tyrannus</i> (Wied, 1820)	VU-SC			Re		E	
Aramidae (1)							
<i>Aramus guarauna</i> (Linnaeus, 1766)	LC				W, Ma	*	V
Rallidae (7)							
<i>Rallus longirostris</i> Boddaert, 1783	VU-SC	Ma, Mu			Ma, Mu	R	V (Figure 3A), A (W - WA430207)
<i>Aramides cajanea</i> (Statius Muller, 1776)	LC	Ma, Mu	Ma, Mu	Ma, Mu		R, NR, E	V (W - WA512529)
<i>Aramides saracura</i> (Spix, 1825)	LC	Re		Re	Re	R, E	V, A
<i>Laterallus melanophaius</i> (Vieillot, 1819)	LC		Sw	Sw		NR, E	
<i>Porzana albicollis</i> (Vieillot, 1819)	LC			Sw		E	
<i>Pardirallus nigricans</i> (Vieillot, 1819)	LC		Ma, Sw	Ma, Sw	Ma, Sw	R, E	A
<i>Gallinula galeata</i> (Lichtenstein, 1818)	LC	Sw			Sw	R	V, A
Charadriidae (5)							
<i>Vanellus chilensis</i> (Molina, 1782)	LC	Re, B, Mu	Re, B, Mu	Re, B, Mu	Re, B, Mu	R, NR, E	V (W - WA470264), A
<i>Pluvialis dominica</i> (Statius Muller, 1776)	LC				Mu, Ma, B	Ghi	V (Figure 4A)
<i>Pluvialis squatarola</i> (Linnaeus, 1758)	LC				Mu, Ma, B	Ghi	V (Figure 4B)
<i>Charadrius semipalmatus</i> Bonaparte, 1825	LC		Mu, Ma, B	Mu, Ma, B	Mu, Ma, B	NR, E	V (W - WA425613), A
<i>Charadrius collaris</i> Vieillot, 1818	LC	Mu, Ma, B	Mu, Ma, B	Mu, Ma, B	Mu, Ma, B	R, NR, E	V

TABLE 1. Continued.

TAXA	CONSERVATION STATUS	RECORDS					
		1980–1996	1997–2001	2002–2007	2008–2012	LITERATURE	FIELDWORK
Haematopodidae (1)							
<i>Haematopus palliatus</i> Temminck, 1820	LC		Mu, Ma, B		Mu, Ma, B	N	V (W - WA544629), A
Recurvirostridae (1)							
<i>Himantopus melanurus</i> Vieillot, 1817	LC			Mu, Ma, B	Mu, Ma, B	E	V (W - WA605530)
Scolopacidae (11)							
<i>Gallinago paraguayae</i> (Vieillot, 1816)	LC	Re, Sw	Re, Sw	Re, Sw		R, NR, E	
<i>Numenius hudsonicus</i> Latham, 1790	LC				Mu, Ma, B	Ghi	V (Figure 4D)
<i>Actitis macularius</i> (Linnaeus, 1766)	LC	Mu, Ma, B		Mu, Ma, B	Mu, Ma, B	R, E	V (W - WA468227), A
<i>Tringa solitaria</i> Wilson, 1813	LC	Mu, Ma, B			Mu, Ma, B	R	V, A
<i>Tringa melanoleuca</i> (Gmelin, 1789)	LC		Mu, Ma, B	Mu, Ma, B	Mu, Ma, B	NR, E	V (WA523883), A
<i>Tringa flavipes</i> (Gmelin, 1789)	LC		Mu, Ma, B	Mu, Ma, B	Mu, Ma, B	NR, E	V (WA523883), A
<i>Arenaria interpres</i> (Linnaeus, 1758)	LC				Mu, Ma, B	Ghi	V (Figure 4C)
<i>Calidris canutus</i> (Linnaeus, 1758)	LC			Mu, Ma, B	Mu, Ma, B	E	V (W - WA475069)
<i>Calidris alba</i> (Pallas, 1764)	LC				Mu, Ma, B	*	V (Figure 3D), A
<i>Calidris pusilla</i> (Linnaeus, 1766)	NT-IU				Mu, Ma, B	Ghi	V (Figure 3D)
<i>Calidris fuscicollis</i> (Vieillot, 1819)	LC		Mu, Ma, B	Mu, Ma, B	Mu, Ma, B	NR, E	V (W - WA470273), A
Jacanidae (1)							
<i>Jacana jacana</i> (Linnaeus, 1766)	LC	W, Sw				R	
Stercorariidae (1)							
<i>Stercorarius parasiticus</i> (Linnaeus, 1758)	LC		W	W	W	P5	V
Laridae (2)							
<i>Chroicocephalus maculipennis</i> (Lichtenstein, 1823)	LC	W			W, B	R, NR	V
<i>Larus dominicanus</i> Lichtenstein, 1823	LC	W, B, Mu	W, B, Mu	W, B, Mu	W, B, Mu	R, NR, E	V (W - WA544628), A
Sternidae (5)							
<i>Sternula supercilii</i> (Vieillot, 1819)	LC				W, B, Mu	*	V
<i>Sterna hirundinacea</i> Lesson, 1831	LC	W, B, Mu		W, B, Mu	W, B, Mu	R, E	V
<i>Sterna trudeaui</i> Audubon, 1838	LC				W, B, Mu	*	V
<i>Thalasseus acuflavidus</i> (Cabot, 1847)	LC	W, B, Mu		W, B, Mu	W, B, Mu	R, E	V (Figure 3B)
<i>Thalasseus maximus</i> (Boddaert, 1783)	VU-SC/BR			W, B, Mu	W, B, Mu	E	V (Figure 3B)
Rynchopidae (1)							
<i>Rynchops niger</i> Linnaeus, 1758	LC			W, B, Mu	W, B, Mu	E	V, A
Columbidae (9)							
<i>Columbina talpacoti</i> (Temminck, 1811)	LC	Re, Ma	Re, Ma	Re, Ma	Re, Ma	R, NR, E	V, A, C (H80421, 25; H85511, 12, 25; J54750)
<i>Columbina picui</i> (Temminck, 1813)	LC	Re		Re	Re	R, E	V
<i>Columba livia</i> Gmelin, 1789	LC			Re	Re	E	V
<i>Patagioenas picazuro</i> (Temminck, 1813)	LC			Re	Re	E	V
<i>Patagioenas cayennensis</i> (Bonnaterre, 1792)	LC		Re	Re	Re	NR, E	V
<i>Zenaida auriculata</i> (Des Murs, 1847)	LC				Re	*	V
<i>Leptotila verreauxi</i> Bonaparte, 1855	LC		Re	Re	Re	NR, E	A, C (L121451)
<i>Leptotila rufaxilla</i> (Richard & Bernard, 1792)	LC	Re	Re	Re	Re	R, NR, E	A
<i>Geotrygon montana</i> (Linnaeus, 1758)	LC			Re		E	
Cuculidae (5)							
<i>Piaya cayana</i> (Linnaeus, 1766)	LC	Re, Ma	Re, Ma	Re, Ma	Re, Ma	R, NR, E	V, A, C (N33089; P05011)
<i>Coccyzus melacoryphus</i> Vieillot, 1817	LC		Re			N	
<i>Crotophaga ani</i> Linnaeus, 1758	LC	Re	Re	Re	Re	R, NR, E	V, A
<i>Guira guira</i> (Gmelin, 1788)	LC	Re	Re	Re	Re	R, NR, E	V, A
<i>Tapera naevia</i> (Linnaeus, 1766)	LC		Re	Re	Re	NR, E	A
Tytonidae (1)							
<i>Tyto alba</i> (Scopoli, 1769)	LC	Re				R	
Strigidae (5)							
<i>Megascops choliba</i> (Vieillot, 1817)	LC			Re		E	
<i>Megascops sanctaecatarinae</i> (Salvin, 1897)	LC				Re	*	A
<i>Athene cunicularia</i> (Molina, 1782)	LC	Re		Re	Re	R, E	V
<i>Asio clamator</i> (Vieillot, 1808)	LC			Re		E	
<i>Asio stygius</i> (Wagler, 1832)	LC			Re		E	
Nyctibiidae (1)							
<i>Nyctibius griseus</i> (Gmelin, 1789)	LC				Re, Ma	*	A
Caprimulgidae (2)							
<i>Hydropsalis albicollis</i> (Gmelin, 1789)	LC				Re	*	V
<i>Hydropsalis torquata</i> (Gmelin, 1789)	LC		Re	Re	Re	NR, E	V (W - WA458871), A

TABLE 1. Continued.

TAXA	CONSERVATION STATUS	RECORDS					
		1980-1996	1997-2001	2002-2007	2008-2012	LITERATURE	FIELDWORK
Apodidae (4)							
<i>Streptoprocne zonaris</i> (Shaw, 1796)	LC	Re	Re	Re	Re	R, NR, E	V
<i>Streptoprocne biscutata</i> (Slater, 1866)	LC	Re				R	
<i>Chaetura cinereiventris</i> Slater, 1862	LC		Re	Re	Re	NR, E	V
<i>Chaetura meridionalis</i> Hellmayr, 1907	LC	Re		Re	Re	R, E	V
Trochilidae (8)							
<i>Eupetomena macroura</i> (Gmelin, 1788)	LC				Re	Ghi	V
<i>Aphantochroa cirrochloris</i> (Vieillot, 1818)	LC				Ma	*	V
<i>Florisuga fusca</i> (Vieillot, 1817)	LC	Re		Re	Re	R, E	V
<i>Chlorostilbon lucidus</i> (Shaw, 1812)	LC			Re	Re	E	V
<i>Thalurania glaucopsis</i> (Gmelin, 1788)	LC	Re	Re	Re	Re	R, NR, E	V, C (A61173, 74)
<i>Leucochloris albicollis</i> (Vieillot, 1818)	LC	Re			Re	R	V
<i>Amazilia versicolor</i> (Vieillot, 1818)	LC	Re	Re			R, NR	
<i>Amazilia fimbriata</i> (Gmelin, 1788)	LC	Re, Ma	Re, Ma	Re, Ma	Re, Ma	R, NR, E	V, C (A13981-90; A61172, 75-81, 83)
Alcedinidae (3)							
<i>Megaceryle torquata</i> (Linnaeus, 1766)	LC	W	W	W	W	R, NR, E	V, A
<i>Chloroceryle amazona</i> (Latham, 1790)	LC		W	W	W	N, E	V
<i>Chloroceryle americana</i> (Gmelin, 1788)	LC	W	W	W	W	R, NR, E	V
Ramphastidae (2)							
<i>Ramphastos vitellinus</i> Lichtenstein, 1823	LC				Re	*	V, A
<i>Ramphastos dicolorus</i> Linnaeus, 1766	LC				Re	*	V (W - WA434421)
Picidae (5)							
<i>Picumnus temminckii</i> Lafresnaye, 1845	LC		Re	Re	Re	NR, E	V, A, C (D113509; E101598, 623, 628; G89639)
<i>Veniliornis spilogaster</i> (Wagler, 1827)	LC			Re	Re	E	A
<i>Colaptes campestris</i> (Vieillot, 1818)	LC	Re	Re	Re	Re	R, NR, E	V, A
<i>Celeus flavescens</i> (Gmelin, 1788)	LC	Re	Re	Re	Re	R, NR, E	A, C (M24121)
<i>Dryocopus lineatus</i> (Linnaeus, 1766)	LC			Re		E	
Falconidae (6)							
<i>Caracara plancus</i> (Miller, 1777)	LC		Re, B	Re, B	Re, B	NR, E	V
<i>Milvago chimachima</i> (Vieillot, 1816)	LC	Re, Ma, B	Re, Ma, B	Re, Ma, B	Re, Ma, B	R, NR, E	V (W - WA422007)
<i>Milvago chimango</i> (Vieillot, 1816)	LC	Re, Ma, B	Re, Ma, B	Re, Ma, B	Re, Ma, B	R, NR, E	V (W - WA508259)
<i>Falco sparverius</i> Linnaeus, 1758	LC				Re	*	V
<i>Falco femoralis</i> Temminck, 1822	LC				Re	*	V
<i>Falco peregrinus</i> Tunstall, 1771	LC	Re				R	
Psittacidae (3)							
<i>Pyrrhura frontalis</i> (Vieillot, 1817)	LC				Re	*	V
<i>Forpus xanthopterygius</i> (Spix, 1824)	LC				Re	*	V
<i>Amazona aestiva</i> (Linnaeus, 1758)	LC		Re	Re	Re	NR, E	V, A
Thamnophilidae (3)							
<i>Dysithamnus mentalis</i> (Temminck, 1823)	LC		Re	Re	Re	NR, E	V, A
<i>Thamnophilus caerulescens</i> Vieillot, 1816	LC	Re		Re	Re	R, E	A
<i>Myrmoderus squamosus</i> (Pelzeln, 1868)	LC	Re	Re	Re	Re	R, NR, E	A, C (E101599, 600, 631)
Conopophagidae (1)							
<i>Conopophaga melanops</i> (Vieillot, 1818)	LC	Re				R	
Rhinocryptidae (1)							
<i>Eleoscytalopus indigoticus</i> (Wied, 1831)	NT-IU			Sw	Sw	E	A
Formicariidae (1)							
<i>Formicarius colma</i> Boddaert, 1783	LC	Re	Re	Re	Re	R, NR, E	A, C (G89606)
Dendrocolaptidae (1)							
<i>Sittasomus griseicapillus</i> (Vieillot, 1818)	LC	Re		Re	Re	R	V (W - WA480635)
Furnariidae (5)							
<i>Furnarius rufus</i> (Gmelin, 1788)	LC	Re, Ma	Re, Ma	Re, Ma	Re, Ma	R, NR, E	V, A
<i>Anabacerthia lichtensteini</i> (Cabanis & Heine, 1859)	LC	Re				R	
<i>Philydor atricapillus</i> (Wied, 1821)	LC			Re	Re	E	V, A, C (E101606)
<i>Certhiaxis cinnamomeus</i> (Gmelin, 1788)	LC				Re, Ma	*	V (Figure 4E)
<i>Synallaxis spixi</i> Slater, 1856	LC	Re, Sw	Re, Sw	Re, Sw	Re, Sw	R, NR, E	A, C (E101587, 614, 621, 639; F24938)

TABLE 1. Continued.

TAXA	CONSERVATION STATUS	RECORDS					
		1980-1996	1997-2001	2002-2007	2008-2012	LITERATURE	FIELDWORK
Pipridae (2)							
<i>Manacus manacus</i> (Linnaeus, 1766)	LC		Re	Re	Re	NR, E	V, A (W - WA533586), C (E101636)
<i>Chiroxiphia caudate</i> (Shaw & Nodder, 1793)	LC			Re	Re	E	V, A
Tityridae (1)							
<i>Schiffornis virescens</i> (Lafresnaye, 1838)	LC			Re	Re	E	A
Platyrrhynchidae (1)							
<i>Platyrrhynchus mystaceus</i> Vieillot, 1818	LC			Re	Re	E	A, C (C72234)
Rhynchocyclidae (3)							
<i>Mionectes rufiventris</i> Cabanis, 1846	LC			Re	Re	E	V, A, C (C72235)
<i>Leptopogon amaurocephalus</i> Tschudi, 1846	LC			Re	Re	E	V, C (D103001)
<i>Tolmomyias sulphureus</i> (Spix, 1825)	LC			Re	Re	E	V
Tyrannidae (23)							
<i>Euscarthmus meloryphus</i> Wied, 1831	LC			Re	Re	E, Ghi	
<i>Camptostoma obsoletum</i> (Temminck, 1824)	LC	Re	Re	Re	Re	R, NR, E	V, A, C (C72232; D113513, 14)
<i>Elaenia flavogaster</i> (Thunberg, 1822)	LC	Re, Ma	Re, Ma	Re, Ma	Re, Ma	R, NR, E	V, A, C (E101577, 579, 659; F24921)
<i>Elaenia parvirostris</i> Pelzeln, 1868	LC			Re	Re	*	A, C (F24925; E101592, 608)
<i>Elaenia obscura</i> (d'Orbigny & Lafresnaye, 1837)	LC		Re	Re	Re	NR, E	V (W - WA458280), A, C (F24916, 17, 22, 23; E101585, 86)
<i>Serpophaga nigricans</i> (Vieillot, 1817)	LC		Re			NR	
<i>Serpophaga subcristata</i> (Vieillot, 1817)	LC		Re	Re	Re	NR, E	V (W - WA425615), A
<i>Attila rufus</i> (Vieillot, 1819)	LC		Re	Re	Re	NR, E	A, C (F24924; G89635)
<i>Legatus leucophaeus</i> (Vieillot, 1818)	LC	Re			Re	R	V
<i>Myiarchus swainsoni</i> Cabanis & Heine, 1859	LC	Re		Re	Re	R, E	V, A
<i>Myiarchus ferox</i> (Gmelin, 1789)	LC			Ma		E	
<i>Pitangus sulphuratus</i> (Linnaeus, 1766)	LC	Re, Ma, W, B	Re, Ma, W, B	Re, Ma, W, B	Re, Ma, W, B	R, NR, E	V, A, C (H85110 G89628 G89641)
<i>Machetornis rixosa</i> (Vieillot, 1819)	LC	Re			Re	R	V, A
<i>Myiodynastes maculatus</i> (Statius Muller, 1776)	LC	Re		Re	Re	R, E	V (W - WA556274), A (W - WA556232)
<i>Myiozetetes similis</i> (Spix, 1825)	LC	Re		Re	Re	R, E	V, A
<i>Tyrannus melancholicus</i> Vieillot, 1819	LC	Re	Re	Re	Re	R, NR, E	V, A, C (G89627)
<i>Tyrannus savanna</i> Vieillot, 1808	LC	Re		Re	Re	R, E	V, A
<i>Empidonomus varius</i> (Vieillot, 1818)	LC	Re			Re	R	V, A
<i>Myiophobus fasciatus</i> (Statius Muller, 1776)	LC		Re	Re	Re	NR, E	V, A, C (E101573, 595, 632, 633; D113515)
<i>Pyrocephalus rubinus</i> (Boddaert, 1783)	LC				Re	*	V, A
<i>Cnemotriccus fuscatus</i> (Wied, 1831)	LC		Re	Re	Re	NR, E	A
<i>Lathrotriccus euleri</i> (Cabanis, 1868)	LC			Re	Re	E	A
<i>Satrapa icterophrys</i> (Vieillot, 1818)	LC	Re			Re	R	V
Vireonidae (2)							
<i>Cyclarhis gujanensis</i> (Gmelin, 1789)	LC	Re		Re	Re	R, E	V, A
<i>Vireo olivaceus</i> (Linnaeus, 1766)	LC	Re			Re	R	A
Corvidae (1)							
<i>Cyanocorax caeruleus</i> (Vieillot, 1818)	NT-IU	Re	Re	Re	Re	R, NR, E	V (W - WA414648), A
Hirundinidae (6)							
<i>Pygochelidon cyanoleuca</i> (Vieillot, 1817)	LC	Re	Re	Re	Re	R, NR, E	V, A
<i>Stelgidopteryx ruficollis</i> (Vieillot, 1817)	LC		Re	Re	Re	NR, E	V
<i>Progne tapera</i> (Vieillot, 1817)	LC	Re			Re	R	V
<i>Progne chalybea</i> (Gmelin, 1789)	LC	Re	Re	Re	Re	R, NR, E	V
<i>Tachycineta leucorrhoa</i> (Vieillot, 1817)	LC	Re	Re	Re	Re	R, NR, E	V, A
<i>Riparia riparia</i> (Linnaeus, 1758)	LC			Re		E	
Troglodytidae (1)							
<i>Troglodytes musculus</i> Naumann, 1823	LC	Re, Ma	Re, Ma	Re, Ma	Re, Ma	R, NR, E	V, A, C (E101574, 578, 619, 620, 629)

TABLE 1. Continued.

TAXA	CONSERVATION STATUS	RECORDS					
		1980–1996	1997–2001	2002–2007	2008–2012	LITERATURE	FIELDWORK
Turdidae (5)							
<i>Turdus flavipes</i> Vieillot, 1818	LC	Re		Re		R, E	V, A
<i>Turdus rufiventris</i> Vieillot, 1818	LC	Re	Re	Re	Re	R, NR, E	V, A
<i>Turdus leucomelas</i> Vieillot, 1818	LC				Re	*	V
<i>Turdus amaurochalinus</i> Cabanis, 1850	LC	Re, Ma	Re, Ma	Re, Ma	Re, Ma	R, NR, E	V, A, C (F24915; G89607, 08, 20, 29, 31, 32, 34, 42, 43; H80416-19; H85508, 09)
<i>Turdus albicollis</i> Vieillot, 1818	LC	Re		Re	Re	R, E	V, A
Mimidae (2)							
<i>Mimus saturninus</i> (Lichtenstein, 1823)	LC				Re, B	*	V, A
<i>Mimus triurus</i> (Vieillot, 1818)	LC				Re	*	V (Figure 4F)
Motacillidae (1)							
<i>Anthus lutescens</i> Pucheran, 1855	LC			Re, B	Re, B	E	V, A
Passerellidae (2)							
<i>Zonotrichia capensis</i> (Statius Muller, 1776)	LC	Re, Ma	Re, Ma	Re, Ma	Re, Ma	R, NR, E	V, A, C (E101576, 609, 622, 625; F24926, 27)
<i>Ammodramus humeralis</i> (Bosc, 1792)	LC			Sw		E	
Parulidae (3)							
<i>Setophaga pitaiayumi</i> (Vieillot, 1817)	LC	Re, Ma	Re, Ma	Re, Ma	Re, Ma	R, NR, E	V, A
<i>Geothlypis aequinoctialis</i> (Gmelin, 1789)	LC	Re, Ma, Sw	Re, Ma, Sw	Re, Ma, Sw	Re, Ma, Sw	R, NR, E	V (W - WA458281), A, C (C72233; D113502, 03, 05, 07, 08, 11; E101567, 568, 570-572, 581-583, 588-591, 593, 594, 607, 610-613, 615-618, 626, 627, 630, 634, 637, 638, 656, 657, 658)
<i>Basileuterus culicivorus</i> (Deppe, 1830)	LC	Re, Ma	Re, Ma	Re, Ma	Re, Ma	R, NR, E	V (W - WA461497), A, C (E101584, 96, 97)
Icteridae (7)							
<i>Icterus pyrrhopterus</i> (Vieillot, 1819)	LC				Ma	Ghi	V
<i>Amblyramphus holosericeus</i> (Scopoli, 1786)	LC		Sw	Sw		NR, E	
<i>Agelasticus thilius</i> (Molina, 1782)	LC			Ma	Ma	E	V, A
<i>Chrysomus ruficapillus</i> (Vieillot, 1819)	LC				Re, Sw	*	V
<i>Pseudoleistes virescens</i> (Vieillot, 1819)	LC	Sw	Sw			R, NR	
<i>Molothrus bonariensis</i> (Gmelin, 1789)	LC	Re	Re		Re	R, NR	V, A
<i>Sturnella superciliaris</i> (Bonaparte, 1850)	LC	Re	Re	Re	Re	R, NR, E	V, A
Thraupidae (16)							
<i>Coereba flaveola</i> (Linnaeus, 1758)	LC	Re, Ma	Re, Ma	Re, Ma	Re, Ma	R, NR, E	V, A, C (E101569, 580, 624; D113501, 04, 06, 12)
<i>Tachyphonus coronatus</i> (Vieillot, 1822)	LC	Re, Ma	Re, Ma	Re, Ma	Re, Ma	R, NR, E	V, A, C (E101575; G89626, 30, 40; F24919, 20, 29, 30, 34)
<i>Ramphocelus bresilius</i> (Linnaeus, 1766)	VU-SC			Re		Ghi	
<i>Coryphospingus cucullatus</i> (Müller, 1776)	LC				Re	Ghi	C (Figure 2) (F24918)
<i>Trichothraupis melanops</i> (Vieillot, 1818)	LC				Re	*	V
<i>Tangara sayaca</i> (Linnaeus, 1766)	LC	Re	Re	Re	Re	R, NR, E	V, A, C (F24931, 32)
<i>Tangara cyanoptera</i> (Vieillot, 1817)	NT-IU				Re		V, A
<i>Tangara palmarum</i> (Wied, 1823)	LC	Re			Re	R	V, A
<i>Tangara peruviana</i> (Desmarest, 1806)	EN-SC, VU-IU	Re	Re	Re	Re	R, NR, N, E	V, A
<i>Pipraeidea melanonota</i> (Vieillot, 1819)	LC				Re	*	V
<i>Dacnis cayana</i> (Linnaeus, 1766)	LC	Re	Re	Re	Re	R, NR, E	V, A
<i>Conirostrum bicolor</i> (Vieillot, 1809)	VU-SC, NT-IU			Ma	Ma	AP	V, A (W - WA739753)
<i>Donacospiza albifrons</i> (Vieillot, 1817)	LC			Sw		*	A (XC115058, 059)
<i>Sicalis flaveola</i> (Linnaeus, 1766)	LC	Re	Re	Re	Re	R, NR, E	V, A
<i>Volatinia jacarina</i> (Linnaeus, 1766)	LC		Re	Re		NR, E	
<i>Sporophila caerulea</i> (Vieillot, 1823)	LC	Re			Re	R	V, A

TABLE 1. Continued.

TAXA	CONSERVATION STATUS	RECORDS					
		1980-1996	1997-2001	2002-2007	2008-2012	LITERATURE	FIELDWORK
Cardinalidae (1)							
<i>Habia rubica</i> (Vieillot, 1817)	LC			Re	Re	E	V, A, C (F24933; G89618, 22-25, 30, 33; H80422, 24)
Fringillidae (1)							
<i>Euphonia violacea</i> (Linnaeus, 1758)	LC	Re		Re		R, E	
Estrildidae (1)							
<i>Estrilda astrild</i> (Linnaeus, 1758)	LC	Re	Re	Re	Re	R, NR, E	V (W - WA419195), A
Passeridae (1)							
<i>Passer domesticus</i> (Linnaeus, 1758)	LC	Re	Re	Re	Re	R, NR, E	V (W - WA512521), A