

## BIRD DIVERSITY AND CONSERVATION IN THE LOWER DELTA OF THE PARANÁ RIVER, ARGENTINA

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**ABSTRACT.**-The Delta of the Paraná River, one of the most important wetlands in South America, harbors subtropical and temperate bird species. Although this region is key for biodiversity conservation, aspects such as species composition and conservation status, and their relationship with vegetation types are poorly known. Here we described bird richness and composition of this area, with emphasis on the relationship between vegetation type and the presence of key bird species. We compiled systematic studies conducted during the 2007-2020 period and performed new surveys to elaborate a checklist of bird species and assess completeness. We reviewed a total of 12 studies distributed along five landscape units and nine vegetation types. We recorded 245 species, though the species accumulation curve indicates that the number of species could be even higher for the area. Most species were recorded in freshwater marshes, watercourses and grasslands in Entre Ríos. We identified 14 (5.7%) threatened species (e.g., *Spartonoica maluroides*, *Limnoctites rectirostris* and *Sporophila palustris*), most of them registered in grasslands and freshwater marshes. To our best knowledge, the list of species is the most comprehensive one for the area, showing that 23.7% of all bird species known for Argentina. Our results suggest the importance of freshwater marshes, watercourses and grasslands as key vegetation types for birds.

**KEYWORDS:** *birds, wetlands, compilation, systematic studies, freshwater marshes, grassland, biodiversity.*

**RESUMEN.**-DIVERSIDAD DE AVES Y CONSERVACION DEL BAJO DELTA DEL RÍO PARANÁ, ARGENTINA. El delta del río Paraná, uno de los humedales más importantes de América del Sur, alberga especies de aves subtropicales y templadas. Si bien esta región es clave para la conservación de la biodiversidad, aspectos como la composición de especies presentes, el estado de conservación y su relación con los tipos de vegetación son poco conocidos. En este trabajo describimos la composición de aves del Bajo Delta del Río Paraná, relacionando la ubicación en el paisaje y el tipo de vegetación con la presencia de especies clave. Para elaborar una lista de especies de aves en el Bajo Delta y evaluar su integridad recopilamos estudios sistemáticos realizados durante 2007-2020 y realizamos nuevos muestreos. Revisamos un total de 12 estudios distribuidos a lo largo de cinco Unidades de paisaje y nueve tipos de vegetación. Registramos 245 especies, aunque la curva de acumulación de especies indica que el número de especies podría ser aún mayor para el área. El mayor número de especies se registraron en pajonales y juncales, cursos de agua y pastizales en Entre Ríos. Identificamos 14 (5.7%) especies en riesgo de extinción (por ejemplo, *Spartonoica maluroides*, *Limnoctites rectirostris* y *Sporophila palustris*), la mayoría de ellas registradas en pastizales y pajonales. La lista de especies que se presenta aquí es, a nuestro entender, la más completa para el área, mostrando que el 23.7% de todas las especies de aves conocidas para Argentina habitan en el Bajo Delta. Nuestros resultados sugieren la importancia de los pajonales y juncales, cursos de agua y pastizales como tipos de vegetación clave para las aves.

**PALABRAS CLAVE:** *aves, humedales, compilación, estudios sistemáticos, pastizales, pastizales húmedos, biodiversidad*

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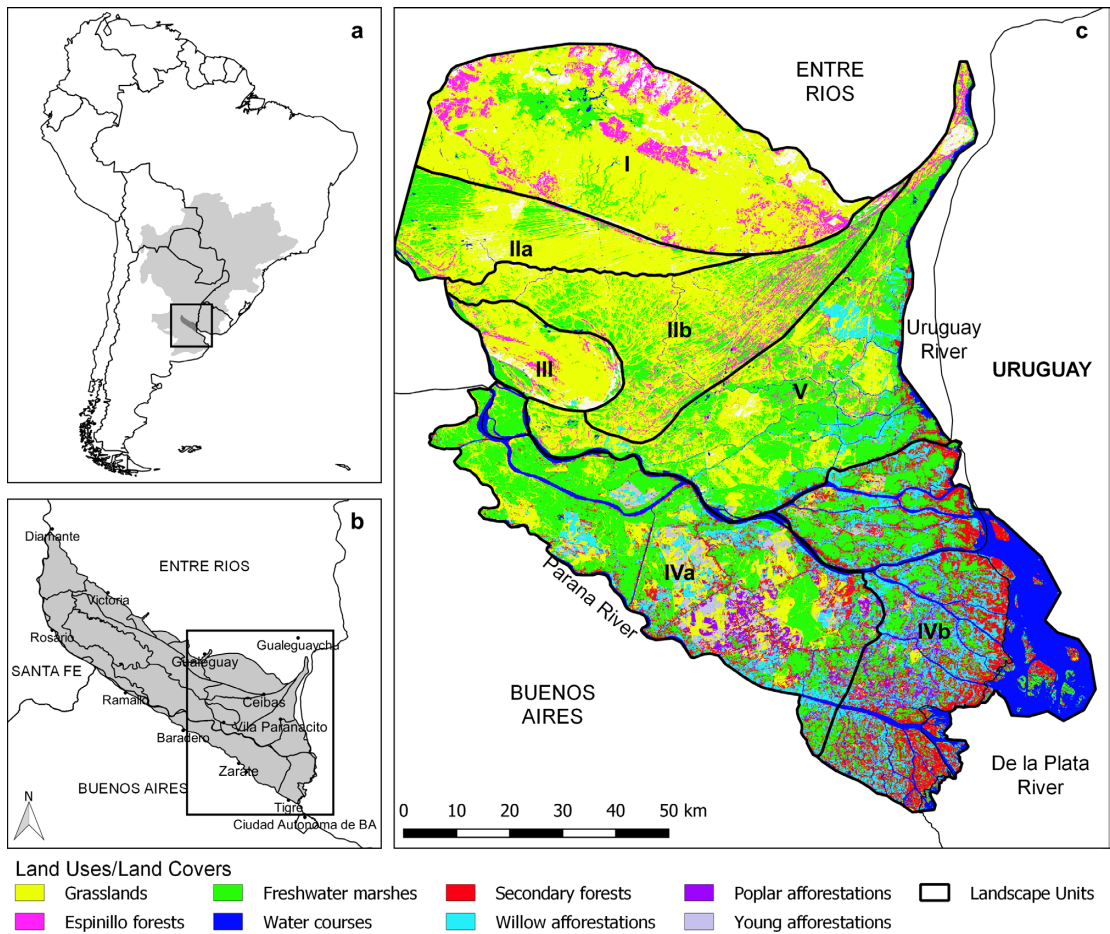
Wetlands such as the Delta of the Paraná River (hereafter Delta, Fig. 1) are very rich ecosystems that provide multiple services (Mitsch and Gossilink 2007,

Cannicci and Contini 2009). These ecosystems are among the most vulnerable to the impact of human activity, being characterized by a higher transfor-

mation rate than both terrestrial and aquatic realms (Millennium Ecosystem Assessment 2005, Zedler and Kercher 2005). For instance, about 54% of vertebrate populations that depend on wetlands are decreasing (Dudgeon et al. 2006). In particular, wetland birds are threatened by habitat loss and fragmentation (Whited et al. 2000, Riffell et al. 2001, Yuan et al. 2014, Sica et al. 2020), drainage and other types of hydrological alterations (Deluca et al. 2004, Maclean et al. 2011), and climate change (Chesser 1998). Thus, many wetland species are facing high extinction risks, with the increase of pressure outweighing conservation efforts (CBD 2014). The Delta is a region heavily modified by agriculture (e.g. in the Pampa's Grasslands and Chaco Forest) and urbanization. The Delta is key for biodiversity conservation in the region, and aspects such as bird species diversity and conservation status and their relationship with vegetation types are poorly known; therefore, collecting baseline data on species

assemblages is critically needed to design management and/or conservation actions.

The Paraná River Delta is among the most important wetland macrosystems of the South American southern cone (Bonetto et al. 1986). Its hydrological regime is dominated by floods from the Paraná River, as well as from the Gualeguay and Uruguay rivers. The flood pulses favor an important diversity of environments (Neiff, 1981). Sediment form banks and islands, swamps, estuaries and/or lagoons, and active and inactive lateral and internal channels (Ringuelet 1963, Neiff 1981). This variety of habitats enhance biodiversity (Malvárez 1999) and provide a wealth of ecological services (Baigún et al. 2008). The insular delta landscape before colonization consisted mostly of marshlands with gallery forests along borders of water courses. The remnants of these forests are highly diverse and include both tropical and temperate



**Figure 1.** Location of the Delta of Paraná River and the different landscape units, a) location of the Delta of Paraná River (rectangle) and of the Del Plata basin (gray area) in South America, b) location of the Lower Delta of Paraná River (rectangle), and c) land uses/land covers and landscape units in the Lower Delta.

species (e.g. Lauraceae) (Kalesnik et al. 2008, Kandus et al. 2016).

The Parana River Delta is a focus of high bird diversity within the Pampas grasslands, which has been mostly transformed into croplands and urbanized areas (Baldi et al. 2008). For instance, there are more bird species in the delta (c. 260 species; Bó and Quintana 2011) than in the surrounding landscape outside the floodplain (<200 species; Di Giacomo and Contreras 2002). The high bird diversity of the delta is likely related to its biogeographical complexity. Indeed, the delta is at the southernmost extreme of the corridor of tropical biodiversity elements contributed by the Paraná-Paraguay rivers system (Oakley et al. 2005, Nores et al. 2005), and is an area of endemism for some taxa (Apodaca et al. 2019). Some typical tropical taxa have their southernmost distribution limit in this region, such as the Dusky-legged Guan (*Penelope obscura*) and the Mottle-cheeked Tyrannulet (*Phylloscartes ventralis*) (Haene and Pereira 2003). In addition, the region likely acts as a biogeographical bridge between the margins of both the Paraná and Uruguay rivers (Kopuchian et al. 2020, Rocha et al. 2020). Finally, the Delta provides habitat for numerous bird species, many of them globally endangered or vulnerable (BirdLife International 2018), such as the Dot-winged Crake (*Porzana spiloptera*), the Black-and-white Monjita (*Xolmis dominicanus*) and the Yellow Cardinal (*Gubernatrix cristata*). Despite the high bird richness of the Delta and the extensive transformations that the area has undergone, regional studies on the ecology, distribution and conservation of its birds are scarce (e.g. Capllonch et al. 2008, Ronchi-Virgolini et al. 2010, De Stefano et al. 2012, Sica et al. 2018, Magnano et al. 2019, Frutos et al. 2020), and a comprehensive understanding of how bird richness relates to the different productive and natural landscape units of the delta is lacking.

The lower delta is the portion at the final stretch of the Paraná River Delta where the Paraná River divides into two main distributary channels (Fig. 1). The most important landscape transformations in this portion began in the 1970's with Salicaceae plantations (*Populus* spp. and *Salix* spp.) inside polders (Borodowski and Suárez 2004, Gaute et al. 2007). Recently, land use patterns have shifted towards more intensive and permanent grazing and silvopastoral systems (Galassini 2005, Quintana et al. 2014). These activities were accompanied by intensified management based on water control structures such as polders, ditches, pumping systems and levees (Baigún et al. 2008). As a

result, between 1999 and 2013, 35% of the freshwater marshes in the area were converted into pastures and forest plantations (Sica et al. 2018). These landscape conversions may have had consequences on wildlife distribution and diversity (Quintana et al. 2002, Fracassi 2012, Sica et al. 2018). However, there is a lack of baseline information needed to evaluate these changes in the mid-and long term. Thus, a comprehensive study on the diversity and ecological requirements of bird assemblages of the delta, especially the most transformed lower portion, is urgently needed.

Here, we described the composition and conservation status of birds of the lower delta of the Paraná River, with emphasis on the relationship between vegetation type and avian species composition. To meet our objective, we reviewed published field studies and conducted new surveys to elaborate a comprehensive checklist of bird species and evaluate conservation status and their association with vegetation types.

## METHODS

### Study Area and vegetation types

The Paraná River Delta covers the final 300 km of the Paraná Basin, from Diamante City, Entre Ríos (32°4'S, 60°39'W), to the surroundings of Buenos Aires City (34°19'S, 58°28'W; Fig. 1). The climate in the region is humid temperate, with a mean annual temperature of 16.3°C and a total annual rainfall of about 1000 mm (Servicio Meteorológico Nacional 1992). The study area encompasses the lower delta (Fig. 1) that covers approximately 4500 km<sup>2</sup> of mainland (southern Entre Ríos Province) and 3000 km<sup>2</sup> of islands (northern Buenos Aires Province).

It is divided into five landscape units differing in their hydrological regime, geomorphological setting, and land cover patterns (Malvárez 1999, Kandus et al. 2006; Fig. 1). Four of these landscape units (I, II, III and V) occur in the mainland part of the Lower Delta. Units I and III are characterized by native grasslands dominated by *Panicum miloides* and *Panicum racemosum*, and referred to as Entre Ríos Grasslands (ERG) vegetation type. Xerophytic forest patches are frequent in these units, including native trees such as *Vachellia caven* and *Prosopis nigra*. These areas are referred to as Espinillo Forest (EF) vegetation type. Unit II (with subunits a and b) and V are dominated by Freshwater Marshes (FM) covered by bulrushes (*Schoenoplectus californicus*) together with floating

or deeply rooted aquatic vegetation (e.g., *Hydrocleys nymphoides*, *Luziola peruviana*), whereas the mid-slopes are covered by grasslands (*Cynodon dactylon*) and upper elevation areas are characterized by EF. The insular area of the lower delta is characterized by Unit IV (with subunits a and b sensu; Kandus et al. 2006). The topographically lower portions of these natural islands are permanently flooded and covered with FM dominated by *Scirpus giganteus*. Most of the original riparian forests (characterized by abundant native trees, such as *Nectandra angustifolia*, *Myrsine parvula* and *Erythrina crista-galli*) located on the perimetral levees (Burkart 1957) have been transformed into *Salix* spp. and *Populus* spp. plantations (Borodowski and Suárez 2004). Some of these plantations were abandoned and here are referred to as Secondary Forest (SF) vegetation type; these areas are dominated by the original riparian forest species and invasive exotic plant species (e.g. *Iris pseudacorus*, *Lonicera japonica*, *Ligustrum lucidum*, *Ligustrum sinense* and *Rubus* spp.; Kalesnik and Malvárez 2004). Mid-slopes towards the center of the islands are marshlands converted to grasslands dominated by patches of both tall and short graminoid species mixed with patches of bare soil and exotic grasses, here referred to as Buenos Aires grasslands (BSASG) vegetation type. Unit IV is highly transformed to implanted forests of Salicaceae that includes: Adult Willow Plantation (*Salix* spp.; AW) vegetation type, characterized by a high tree density with an understory of two to three shrub layers; Adult Poplar Plantation (*Populus* spp.; AP) vegetation type, characterized by a lower tree density and fewer (one to two) layers than AW, and the understory dominated by herbs and exotic shrubs and trees (Fracassi 2012); and young plantations (*Salix* spp. and *Populus* sp. together), here referred to as Young Salicaceae Plantation vegetation type (between three and five years; YS), characterized by Salicaceae seedlings and herbaceous species. Along the study area several rivers, artificial channels, and streams can be found with open non vegetated water. We consider these as Water Courses (WC).

### Data collection

We compiled studies describing bird richness of the Lower Delta and spanning a 13-year period from 2007 to 2020 (Table 1). We excluded surveys carried out before 2007 because they did not represent the current state of bird communities in the Delta since most environments surveyed at that time were subsequently transformed. In addition, we only included studies that applied a standard survey methodology

(i.e., transects, point counts or mist netting) and that sampled the study area for at least three full days.

We also conducted bird surveys using mist nets, transect counts with binoculars (walking and/or from a vehicle), photographic and song records. On each occasion, we used 4, 8 and 12 m mist nets that were open at dawn and dusk. We studied two locations: Ceibas and Forestal Nucleus (most forested area in the insular Lower Delta). In Ceibas (Islas del Ibicuy and Gualaguaychú, Entre Ríos Province, 33°29'S, 58°41'W), we surveyed landscape units I, IIb, III and V during October and November 2019, totaling 11 days of observations (c. 140 h/net, 16 transects of 400 m and approximately 146 km of road transects). We established four sites: I) Transect from Ceibas to Estancia Ríos de las Aves (road to Ñancay, Gualaguaychú); II) Estancia San Ricardo, Ceibas; III) Transect from Ceibas to Puerto Ibicuy, through provincial route 45; IV) Transect from Ceibas to public road end. In Forestal Nucleus, (Campana and San Fernando, Buenos Aires Province, 34°3'S, 58°43'W) we performed surveys during September 2019 and January 2020 along landscape unit IVa with a total effort of six days of observation (c.70 h/net) and approximately 90 km of transects. We sampled 2 sites: I) CABBY S.A. Forestry property, Campana; and II) Nueva Esperanza, San Fernando. Altogether, the compilation of studies and the field surveys carried out for this study covered the different landscape units of the study area (Table 1, Fig. 1).

### Data analysis

According to the location of each survey, we assigned each species to the landscape units and vegetation type where it was recorded. We also assigned a threat status at the national (MAyDS and AA 2017) and international levels (BirdLife International 2021) with the aim of analyzing bird composition and threat status at each landscape unit and vegetation type. We scored a species as rare when it appeared in a single survey. In addition, we considered a species as exclusive if it occupied a single vegetation type. Finally, to assess the completeness of this compilation, we applied a species accumulation curve (Foster et al. 2010) using the specaccum function of the Vegan R package (R Studio Team 2020).

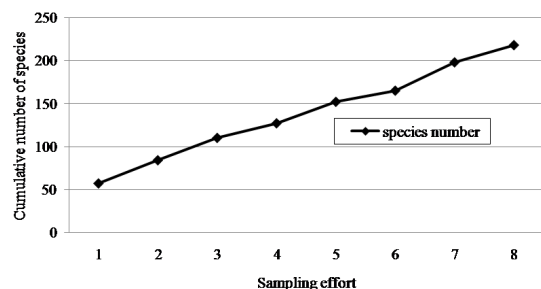


## RESULTS

The compilation of 12 published studies, and the two field surveys conducted (Table 1) yielded a total of 245 species belonging to 48 families occurring in the lower delta (Tables 1, 2 and Appendix). The species accumulation curve showed a plateau of the number of accumulated species, suggesting that the number of species detected in this work would represent the expected species of the study area (Fig. 2). Nevertheless, for our final list of species (Appendix), we included 8 species which were occasionally found by the authors of this article in the study area but were not mentioned in the published studies nor were they detected in the field surveys conducted in this work: Osprey (*Pandion haliaetus*), Bicolored Hawk (*Accipiter bicolor*), White-banded Mockingbird (*Mimus triurus*), Large Elaenia (*Elaenia spectabilis*), Black-backed Water Tyrant (*Fluvicola albiventer*), Grass Wren (*Cistothorus platensis*), Yellow Cardinal (*Gubernatrix cristata*) and Fawn-breasted Tanager (*Pipraeidea melanonota*). Four exotic species were recorded: Graylag Goose (*Anser anser*), Feral Pigeon (*Columba livia*), House Sparrow (*Passer domesticus*) and European Starling (*Sturnus vulgaris*).

At the landscape unit level, we detected 133 species for unit I, 73 for unit IIa, 171 for unit IIb, 93 for unit III, 196 for unit IVa, 86 for IVb and 193 for unit V. The landscape unit with the highest count of species with high risk of extinction was IVa with 10 species, followed by V with 6, I with 5, II with 4, IVb with 2, and III with 0 (Table 3).

The vegetation types with the highest count of species were ERG and FM, followed by WC, SF, EF and BSASG (Table 2). Forest plantations presented the lowest number of species, with AP plantations having the lowest number. Exclusive species (i.e., those



**Figure 2.** Species accumulation curve for the Lower Delta of the Paraná River. Each sampling unit represents a published report (1-12) or a bird survey carried out for this study (13-14). See Table 1 for details. The mean and 95% confidence intervals (dashed lines) are shown based on 1000 random trials.

recorded in only one vegetation type) amounted to 58 (23.6%), with most of them being associated with WC and SF. Moreover, 41 species (16.7%) were rare in the study area, with WC and SF harboring the highest number of these species. None of the forest plantations presented exclusive or rare species.

We identified 14 (5.7 % of the total) threatened species in the lower delta (Table 2 and 3, Fig. 3). Three of those species were threatened both at global and national levels, whereas the remaining 11 species are at risk of extinction at the national level. Species at high risk of extinction were not evenly distributed among vegetation types, with most of them occurring in FM and ERG (Table 3). Regarding the three globally endangered species (BirdLife International 2021), Bay-capped Wren-Spintail (*Spartonoica maluroides*) was recorded in FM and ERG, Hudson's Canastero (*Asthenes hudsoni*) was only found in ERG, and Marsh Seedeater (*Sporophila palustris*) was recorded in FM and BSASG. Some near threatened species were widely distributed in several landscape units and vegetation types, such as Dusky-legged Guan (*Penelope obscura*), Curve-billed Reedhaunter (*Limnornis curvirostris*) and Scarlet-headed Blackbird (*Amblyramphus holosericeus*).

## DISCUSSION

We studied the assemblages of birds in the Lower Paraná River Delta, and described the association of these birds with vegetation types. We found 253 bird species, which accounted for 24.4% of the bird species richness of Argentina (MAyDS and AA 2017). According to these results, the study area harbors 57.7% of the bird species of Buenos Aires Province (343 species) (Darrieu et al. 2013) and 79% of the bird species of Entre Ríos Province (317 species) (Dardanelli et al. 2018). These results indicate that the lower delta can be a key area maintaining high bird diversity in the region. However, we mostly focused our study during the breeding season, which could have resulted in missing wintering species (e.g. Bar-winged Cinclodes *Cinclodes fuscus*). To our knowledge, we present one of the most complete checklists of the lower delta of the Paraná River.

The high landscape heterogeneity of the lower delta allows the coexistence of species with different ecological traits and habitat requirements. In this study, exclusive species of a single habitat type represented 23.5% of the total. Most of these habitat-restricted species were associated with natural habitats

like WC and SF, followed by ERG, FM and EF. Landscapes with forest plantations were the poorest in terms of exclusive species. Some examples of exclusive species are Great Grebe (*Podiceps major*), Fulvous Whistling Duck (*Dendrocygna bicolor*) and Amazon Kingfisher (*Chloroceryle amazona*) (aquatic obligate); Spotted Tinamou (*Nothura maculosa*) and Hudson's Canastero (grasslands specialists); and Ultramarine Grosbeak (*Cyanoloxia brissonii*) (forests specialists). In addition, some rare species were found only in native vegetation types, representing 16.7% of the species. These species are mostly grassland and wetland specialists (e.g., Anhinga *Anhinga anhinga*, Red-and-white Crake *Laterallus leucopyrrhus*). A greater or balanced number of studies by vegetation and unit type, would be necessary to adjust these values and analyze the importance and contribution of each habitat.

We recorded the Wedge-tailed Grass Finch (*Emberizoides herbicola*) for the first time in Buenos Aires Province, in a grassland from a forest company. This indicates that biodiversity in the area is still not completely known, even being a region close to the most important urban center of Argentina. Our results show the importance of baseline data collec-

tion to understand species distribution, even in largely monitored areas.

The lower delta provides habitat for 14 species at high risk of extinction (Table 3), with most of them being registered in the natural habitats of ERG, FM, SF and BSASG. In our survey, we did not find Saffron-cowled Blackbird (*Xanthopsar flavus*), a vulnerable species (BirdLife International 2021), that was last detected in the study area in the 1990s (Sica et al. 2018). In Argentina, due to fragmentation and degradation of wet grasslands caused by agricultural use (Fraga et al. 1998), its populations are now restricted to southern Entre Rios, northern Corrientes and southern Misiones. The mainland area of the lower delta represents the southern limit of this species range (BirdLife International 2021), which appears to have contracted even further.

If the current land use tendency in the area continues (i.e., expansion of afforestation, intensified silvopastoral and pastoral systems), and no biodiversity conservation strategies are implemented at local and landscape levels (such as the biodiversity protocol of conservation strategies in Salicaceae



**Figure 3.** Documented records of species at high risk of extinction in the Lower Delta of the Parana River: a) Long-winged Harrier (*Circus buffoni*) (Campana, November 11th, 2020), b) Straight-billed Reedhaunter (*Limnoides rectirostris*) (Campana, Buenos Aires, October 10th, 2019), c) Curve-billed Reedhaunter (*Limnoides curvirostris*) (Campana, Buenos Aires, October 10th, 2019), d) Scarlet-headed Blackbird (*Amblyramphus holosericeus*) (Campana, November 11th, 2020). Photo: Cabanne GS.

plantations of the Lower Delta of the Parana River; Fracassi et al. 2013), the consequences for bird populations in the area could be dramatic. According to Bó et al. (2002), more than 60% of the species in the delta are primarily associated with wetland habitats, such as freshwater marshes, watercourses and riparian forests. Our results support this evidence, since we found that most of the species were recorded in natural wetlands. Only around 30% of the recorded species used the forest plantations as alternative habitats, and none of these species were exclusive, rare or under any category of threat. For instance, only 50 species were recorded in an adult poplar plantation, meaning that this habitat type may not be fulfilling the habitat requirements for most of the species that inhabit the Lower Delta.

For Straight-billed Reedhaunter (*Limnoctites recirostris*) (Fig. 3B), which is vulnerable (AM) in Argentina (MAYDS and AA 2017), the delta encompassed the entire range of the species in Argentina. Thus, this is a key region for its conservation. We found it in degraded grasslands in Entre Ríos and Buenos Aires, as well as in FM. We suggest re-evaluating the conservation status of the species in the country because it is highly likely that its conservation situation is worse than suggested by the literature (MAYDS and AA 2017). During the two surveys conducted in the breeding season of 2019 in Ceibas, we detected a total of three isolated individuals that were in two distant locations. These birds neither vocalized spontaneously nor responded to playback consistently. They might have been individuals without an established territory. Importantly, we did not find the species in Ibicuy and provincial route 45 (Entre Ríos), a region with records during the 2006-2010 period (e.g., eBird: S55185305 and S12301645). During our surveys in Entre Ríos, we noticed that the quality of the specific habitat of Straight-billed Reedhaunter (i.e., grasslands with *Eryngium pandanifolium*, *E. eburneum* and *E. horridum*) was very degraded, which might explain our failure to find active territories in Entre Ríos Province. We only found a pair that actively defended stable territories in the insular part of the Lower Delta (Campaña and San Fernando, Buenos Aires, landscape unit IVa). However, whether this population comprises a viable population is unknown, and there is no infor-

mation about its survival after September 2020 fires (FIRMS 2020).

The Yellow Cardinal, whose distribution limit is in the study area, was not recorded in any of the systematic surveys in this work, although it was observed by the authors. Citizen science (e.g., eBird, Ecoregistros) would be a good complementary alternative to systematic surveys to increase detection or records of uncommon species (Callaghan et al. 2018). However, survey effort is not declared by birdwatchers, and it is necessary to identify minimal standards of quality to use these data (Hochachka et al. 2012). Without such information, it is difficult to assess the demographic status of species. Using systematic survey data may guarantee the same prospecting effort; however, for rare species it requires specific survey methods (e.g., playback or live capture; Lor and Malecki 2002).

We found that the Lower Delta of the Paraná River is a refuge for high bird diversity in the Pampas and Espinal regions, two biomes that are heavily impacted by human activity. The Delta also harbors populations of species with high risk of extinction, such as Straight-billed Reedhaunter and Marsh Seedeater. Therefore, urgent actions are needed to ensure the management and conservation of these wetlands.

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**Table 1.** Bird surveys in the Lower Delta of the Paraná River included in the present study.

Studyperiod	Landscape unit	Method	Sample size (point counts, transects or h/net)	Reference
2007-2008	IV	Fixed-Radius Point Count, 10 min	205 points	<i>Fracassi, 2012</i> <sup>*1</sup>
2008-2009	IV	Fixed-Radius Point Count, 10 min (Ralph et al., 1995)	30 points	<i>Magnano, 2011</i> <sup>*2</sup>
2011-2014	I, IIa, IIb, V	Fixed radius point on routes and roads, 15min	222 points	<i>Sica, 2016</i> <sup>a*3</sup>
2012	IV	Unlimited radius plots, 10min	150 points	<i>Bellocq et al., 2013a</i>
2012	IV	Unlimited radius plots, 10 min (Blondel et al., 1970)	80 points	<i>Bellocq et al., 2013c</i>
2012-2013	IVb, IVa	Strip transects by boat 50m wide (Christensen, 1985)	38 transects	<i>Vaccaro, 2014</i> <sup>4</sup>
2013	IV	Unlimited radius plots, 10min	150 points	<i>Bellocq et al., 2013b</i>
2013-2014	IVa	Fixed-Radius Point Count, 15 min	107 points	<i>Sica, 2016b</i> <sup>*5</sup>
2013-2015	IV	Fixed-Radius Point Count, 10 min (Ralph et al., 1995)	57 points	<i>Fracassi et al., 2016</i> <sup>*6</sup>
2014	V	Strip transects by foot and vehicle	no data	<i>Aparicio et al., 2014</i>
2017	IV	Lineal Transects (Ralph et al., 1996)	no data	<i>Grilli et al., 2017</i>
2017	IVb	Fixed-Radius Point Count, 10 min	12 points	<i>Fracassi and Dieta, 2017</i>
2019	I, IIb, III,V	Survey using mist nets, transects and <i>add libitum</i> observations.	16 transects, c.140 hs/ net 146 km road transects	<i>This study</i> <sup>*7</sup>
2019-2020	IVa	Survey using mist nets, transects and <i>add libitum</i> observations	c.70 hs/net, 90 km of road transects.	<i>This study</i> <sup>*8</sup>

\* Survey used for Figure 3. Surveys are identified with this number (1-8) in Figure 3.

**Table 2.** Number of species at high risk of extinction (HRE, at the international and national levels), rare and exclusive species in each vegetation type in the Lower Delta of the Paraná River, Argentina. Vegetation type: Secondary forests (SF), Espinillo Forests (EF), Freshwater marshes (FM), Entre Rios Grasslands (ERG), Buenos Aires Grasslands (BSASG), Water Courses (WC), Adult poplar plantations (AP), Young Salicaceae plantations (YS), Adult Willow plantations (AW)

	Natural forests		Marshes/grasslands			Forest Plantations				Total
	SF	EF	FM	ERG	BAG	WC	AP	YS	AW	
<b>HRE (international)</b>	0	0	2	2	1	0	0	0	0	3
<b>HRE (national)</b>	5	2	7	7	4	2	0	3	2	14
<b>Exclusive</b>	16	5	7	9	3	20	1	0	0	58
<b>Rare species</b>	11	6	4	8	2	13	0	0	0	41
<b>Total</b>	127	113	147	155	90	142	50	89	80	245



**Table 3.** Threat status and rarity status (R= rare) of species at high risk of extinction along with the landscape unit (I, II, III, IVa, and IVb) and vegetation type where they occur. Threat status at global level: Endangered (EN), Near threatened (NT), and Least Concern (LC). Threat status at national scale: Endangered (EN), Vulnerable (AM), Near Threatened (VU), and Least Concern (NA). Vegetation types: Secondary forests (SF), Espinillo Forests (EF), Freshwater marshes (FM), Entre Rios Grasslands (ERG), Buenos Aires Grasslands (BSASG), Water Courses (WC), Adult poplar plantation (AP), Young Salicaceae plantations (YS), and Adult Willow plantations (AW).

Species		Global category	National category	Rarity	Landscaper unit	Vegetation type
Greater Rhea	<i>Rhea americana</i>	NT	VU	R	I	ERG, EF
Crane hawk	<i>Geranospiza caerulescens</i>	LC	NA	R	IVa	SF
Long-winged Harrier	<i>Circus buffoni</i>	LC	VU		I, IIb, IVa, IVb, V	ERG, YS, FM
Dusky-legged Guan	<i>Penelope obscura</i>	LC	VU		IVa, IVb, V	SF, YS, AW, FM
Olog's Gull	<i>Larus atlanticus</i>	NT	VU		IVa, IVb	WC
Curve-billed Reedhaunter	<i>Limnornis curvirostris</i>	LC	VU		I, IIb, IVa, V	SF, ERG, YS, AW, EF, WC, FM
Straight-billed Reedhaunter	<i>Limnortites rectirostris</i>	NT	AM		IIb, IVa, V	FM, BSASG, ERG
Red-capped Wren-Spinetail	<i>Spartonoica maluroides</i>	EN	VU		I, V	ERG, FM
Hudson's Canastero	<i>Asthenes hudsoni</i>	EN	AM	R	IIa	ERG
Bearded Tachuri	<i>Polystictus pectoralis</i>	NT	VU		IVa	FM
Glaucous-blue Grosbeak	<i>Cyanoloxia glaucocaerulea</i>	NT	VU	R	IVa	BSASG, SF
Marsh Seedeater	<i>Sporophila palustris</i>	EN	EN		IVa	FM, BSASG
Dark-throated Seedeater	<i>Sporophila ruficollis</i>	NT	VU	R	IVa	BSASG
Scarlet-headed Blackbird	<i>Amblyramphus holosericeus</i>	LC	VU		I, IIb, IVa, V	SF, ERG, EF, WC, FM, BSASG

2014 2153, CONICET PUE 22920160100098, PIP 2015 0637, INTA PE 1128053 an PE 1128052, PICTOCIN I 0022, PIP 0092 (CONICET), PNFOR 1104073, BANOR 710122, PICT Bicentenario 2227 (ANPCyT), BIOSILVA 16 (Project GEF T.F. 090118), Neotropical Grassland Conservation, Idea Wild and Bergstrom Awards (Ass. of Field Ornithologists).

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**Appendix.** List of species registered for the Lower Delta of Parana River. Including threat (MAyDS and AA, 2015, IUCN, 2017) and rarity status (rare, R) and the landscape unit and vegetation type where they were recorded. Threat status according to IUCN red list: not evaluated (n/e), Data Deficient (DD), Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered (EN), Critically Endangered (CR), Extinct In The Wild (EW), Extinct (EX). Threat status according to Argentine categorization and corresponding IUCN category (in bold): Not Threatened (NA-**LC**), Near Threatened (VU-**NT**), Vulnerable (AM-**VU**), Endangered (EN-**EN**), Critically Endangered (EC-**CR**). Rare species were recorded in a single study or landscape unit.

Species		Threatstatus			Distribution	
		International	National	Rarity	Landscapeunit	Vegetationtype
<b>Rheidae</b>						
Greater Rhea	<i>Rhea americana</i>	NT	VU	R	I	ERG, EF
<b>Tinamidae</b>						
Tataupa Tinamou	<i>Crypturellus tataupa</i>	LC	NA	R	V	SF
Spotted Nothura	<i>Nothura maculosa</i>	LC	NA		I, I Ib, IVa	ERG, BSASG
White-tufted Grebe	<i>Rollandia rolland</i>	LC	NA	R	I Ib, III, V	FM
Great Grebe	<i>Podiceps major</i>	LC	NA		IVa, IVb	WC
Pied-billed Grebe	<i>Podilymbus podiceps</i>	LC	NA		I Ib, V	ERG, WC, FM
<b>Anhingidae</b>						
Anhinga	<i>Anhinga anhinga</i>	LC	NA	R	I Ib, V	SF, WC
<b>Phalacrocoracidae</b>						
Neotropical Cormorant	<i>Phalacrocorax brasilianus</i>	LC	NA		I, I Ia, I Ib, IVa, IVb, V	SF, ERG, EF, WC, FM
<b>Ardeidae</b>						
Striated Heron	<i>Butorides striata</i>	LC	NA		I, I Ib, IVa, IVb, V	ERG, EF, WC, FM
Snowy Egret	<i>Egretta thula</i>	LC	NA		I, I Ia, I Ib, IVa, IVb, V	ERG, EF, FM
Cattle Egret	<i>Bubulcus ibis</i>	LC	NA		I, I Ia, I Ib, IVa, IVb, V	ERG, FM
Great Egret	<i>Ardea alba</i>	LC	NA		I, I Ib, III, IVa, IVb, V	ERG, AW, EF, FM
Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	LC	NA		I Ib, III, V	ERG, EF, FM, WC
Cocoi Heron	<i>Ardea cocoi</i>	LC	NA		I, I Ia, I Ib, III, IVa, IVb, V	ERG, EF, WC, FM
Rufescent Tiger-Heron	<i>Tigrisoma lineatum</i>	LC	NA		I Ib, IVa, V	SF, ERG, YS, AW, FM
Whistling Heron	<i>Syrigma sibilatrix</i>	LC	NA		I, I Ib, IVa, V	WC, AP, FM, BSASG
Maguari Stork	<i>Ciconia maguari</i>	LC	NA		I, I Ia, I Ib, III, IVa, IVb, V	ERG, WC, FM
American Wood Stork	<i>Mycteria americana</i>	LC	NA		I, I Ib, IVa, V	ERG, FM, WC
<b>Threskiornithidae</b>						
Whispering Ibis	<i>Phimosus infuscatus</i>	LC	NA		I, I Ia, I Ib, III, IVa, IVb, V	ERG, EF, WC, FM, BSASG
White-faced Ibis	<i>Plegadis chihi</i>	LC	NA		I, I Ia, I Ib, III, IVa, IVb, V	ERG, WC, FM, BSASG



Roseate Spoonbill	<i>Platalea ajaja</i>	LC	NA		I,IIb, V	ERG, WC, FM
<b>Anhimidae</b>						
Southern Screamer	<i>Chauna torquata</i>	LC	NA		I, IIa, IIb, III, IVa, V	ERG, AW, WC, FM, BSASG
<b>Anatidae</b>						
Speckled Teal	<i>Anas flavirostris</i>	LC	NA		IIb, IVa, IVb, V	WC
White-cheeked Pintail	<i>Anas bahamensis</i>	LC	NA	R	V	WC
Yellow-billed Pintail	<i>Anas georgica</i>	LC	NA		I, IIb, IVa, IVb, V	ERG, FM
Red Shoveler	<i>Anas platalea</i>	LC	NA		IVa, IVb	WC
Silver Teal	<i>Spatula versicolor</i>	LC	NA		I, IIa, IIb, V	ERG, FM
Brazilian Teal	<i>Amazonetta brasiliensis</i>	LC	NA		I, IIa, IIb, III, IVa, IVb, V	ERG, YS, AW, EF, WC, FM, BSASG
Ringed Teal	<i>Callonetta leucophrys</i>	LC	NA		I, IIa, IIb, V	ERG, EF, WC, FM
Masked duck	<i>Nomonyx dominicus</i>	LC	NA	R	IIb, V	WC
Rosy-billed Pochard	<i>Netta peposaca</i>	LC	NA		I, IIa, IIb, IVa, IVb, V	ERG, WC, FM
Fulvous Whistling-Duck	<i>Dendrocygna bicolor</i>	LC	NA		I, IIb,IVa, IVb, V	WC, ERG
White-faced Whistling-Duck	<i>Dendrocygna viduata</i>	LC	NA		I, IIa, IIb, IVa, V	ERG, EF, WC, FM
Black-bellied Whistling-Duck	<i>Dendrocygna autumnalis</i>	LC	NA	R	I, V	ERG, WC
Black necked Swan	<i>Cygnus melancoryphus</i>	LC	NA	R	IIb,V	WC
Coscoroba Swan	<i>Coscoroba coscoroba</i>	LC	NA	R	IIb, V	WC
<b>Cathartidae</b>						
Black Vulture	<i>Coragyps atratus</i>	LC	NA		IIb,IVa, IVb, V	SF
<b>Accipritidae</b>						
Great Black Hawk	<i>Buteogallus urubitinga</i>	LC	NA	R	IVa, IVb	SF
Bay-winged Hawk	<i>Parabuteo unicinctus</i>	LC	NA		IVa, IVb, V	SF, AW, WC
Snail Kite	<i>Rostrhamus sociabilis</i>	LC	NA		I, IIa, IIb, III, IVa,IVb, V	SF, ERG, YS, AW, EF, WC, FM, BSASG
Crane hawk	<i>Geranospiza caerulescens</i>	LC	NA	R	IVa	SF
Long-winged Harrier	<i>Circus buffoni</i>	LC	VU		I, IIb,IVa, IVb, V	ERG, YS, FM
Cinereous Harrier	<i>Circus cinereus</i>	LC	NA	R	IVa	*
White-tailed Kite	<i>Elanus leucurus</i>	LC	NA		IVa, IVb, V	SF, YS, BSASG
Roadside Hawk	<i>Rupornis magnirostris</i>	LC	NA		I, IIb, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG

Savanna Hawk	<i>Buteogallus meridionalis</i>	LC	NA		I, I Ib, IIa, IVa, V	SF, ERG, YS, AW, BSASG
Black-collared Hawk	<i>Busarellus nigricollis</i>	LC	NA		IVa, V	SF, AW, WC
Sharp-shinned Hawk	<i>Accipiter striatus</i>	LC	NA		I Ib, IVa, V	ERG, SF
<b>Falconidae</b>						
Southern Crested-Caracara	<i>Caracara plancus</i>	LC	NA		I, IIa, I Ib, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, FM, BSASG
Chimango Caracara	<i>Milvago chimango</i>	LC	NA		I, IIa, I Ib, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
Peregrine Falcon	<i>Falco peregrinus</i>	LC	NA		IVa, IVb	BSASG
Aplomado Falcon	<i>Falco femoralis</i>	LC	NA		IVa	FM
American Kestrel	<i>Falco sparverius</i>	LC	NA		IVa, IVb, V	SF, BSASG
<b>Cracidae</b>						
Dusky-legged Guan	<i>Penelope obscura</i>	LC	VU		IVa, IVb, V	SF, YS, AW, FM
<b>Aramidae</b>						
Limpkin	<i>Aramus guarauna</i>	LC	NA		I, IIa, I Ib, III, IVa, IVb, V	SF, ERG, EF, WC, AP, FM
<b>Rallidae</b>						
Giant Wood-Rail	<i>Aramides ypecaha</i>	LC	NA		I, IIa, I Ib, IVa, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
Grey-necked Wood-Rail	<i>Aramides cajaneus</i>	LC	NA		IVa, IVb, V	SF
Plumbeous Rail	<i>Pardirallus sanguinolentus</i>	LC	NA		I Ib, IVa, V	ERG, WC, FM
Spotted Rail	<i>Pardirallus maculatus</i>	LC	NA	R	I Ib, V	WC
Red-and-white Crake	<i>Laterallus leucopyrrhus</i>	LC	NA	R	IVa	BSASG
Rufous-sided Crake	<i>Laterallus melanophaius</i>	LC	NA		I Ib, IVa, V	ERG, FM, WC
White-winged Coot	<i>Fulica leucoptera</i>	LC	NA	R	I Ib	WC, FM
Red-fronted Coot	<i>Fulica rufifrons</i>	LC	NA		I, I Ib, V	ERG, FM
Red-gartered Coot	<i>Fulica armillata</i>	LC	NA	R	I Ib, IVa	WC
Common Moorhen	<i>Gallinula galeata</i>	LC	NA		IIa, I Ib, III, IVa, V	ERG, EF, WC, FM
Spot-flanked Gallinule	<i>Porphyriops melanops</i>	LC	NA		I Ib, IVa, V	ERG, WC, FM
<b>Jacanidae</b>						
Wattled Jacana	<i>Jacana jacana</i>	LC	NA		I, IIa, I Ib, III, IVa, V	SF, ERG, AW, EF, WC, FM, BSASG
South American Painted-snipe	<i>Nycticryphes semicollaris</i>	LC	NA	R	I, I Ib, V	FM
<b>Recurvirostridae</b>						
Black-necked Stilt	<i>Himantopus mexicanus</i>	LC	NA		I, I Ib, III, IVa, V	ERG, WC, FM

**Charadriidae**

Southern Lapwing	<i>Vanellus chilensis</i>	LC	NA		I, IIa, IIb, III, IVa, IVb, V	ERG, YS, AW, EF, WC, FM, BSASG
Collared Plover	<i>Charadrius collaris</i>	LC	NA		I, IIa, IIb	ERG
Semipalmated Plover	<i>Charadrius semipalmatus</i>	LC	NA	R	IIb	ERG

**Scolopacidae**

Lesser Yellowlegs	<i>Tringa flavipes</i>	LC	NA		I, IIa, IIb, IVa, V	ERG, EF, WC, FM
Spotted Sandpiper	<i>Actitis macularius</i>	LC	NA	R	V	ERG
Pectoral Sandpiper	<i>Calidris melanotos</i>	LC	NA		I, IIa, IIb, IVa, V	ERG, WC
White-rumped Sandpiper	<i>Calidris fuscicollis</i>	LC	NA		I, IIb, V	ERG, WC
Common Snipe	<i>Gallinago paraguaiiae</i>	LC	NA		I, IIa, IIb, III, IVa, V	ERG, YS, AW, EF, WC, AP, FM, BSASG

**Laridae**

Olog's Gull	<i>Larus atlanticus</i>	NT	VU		IVa, IVb	WC
Brown-hooded Gull	<i>Chroicocephalus maculipennis</i>	LC	NA		I, IIb, III, IVa, IVb, V	WC
Gray-hooded Gull	<i>Chroicocephalus cirrocephalus</i>	LC	NA		IVa, IVb	WC
Kelp Gull	<i>Larus dominicanus</i>	LC	NA		IVa, IVb, V	WC

**Sternidae**

Snowy -crowned Tern	<i>Sterna trudeaui</i>	LC	NA		IVa, IVb	WC
Large-billed Tern	<i>Phaetusa simplex</i>	LC	NA	R	V	WC

**Rynchopidae**

Black Skimmer	<i>Rynchops niger</i>	LC	NA		IVa, IVb	WC
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**Columbidae**

Spot-winged Pigeon	<i>Patagioenas maculosa</i>	LC	NA		IIb, III, IVa, IVb, V	SF, YS, FM
Picazuro Pigeon	<i>Patagioenas picazuro</i>	LC	NA		I, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
Ruddy Ground-Dove	<i>Columbina talpacoti</i>	LC	NA	R	IVa	SF
Picui Ground-Dove	<i>Columbina picui</i>	LC	NA		I, IIa, IIb, III, IVa, V	SF, ERG, YS, AW, EF, WC, FM, BSASG
Eared Dove	<i>Zenaida auriculata</i>	LC	NA		I, IIa, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, WC, AP, FM
White-tipped Dove	<i>Leptotila verreauxi</i>	LC	NA		I, IIa, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM

**Psittacidae**

Monk Parakeet	<i>Myiopsitta monachus</i>	LC	NA		I, IIa, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
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**Cuculidae**

Dark-billed Cuckoo	<i>Coccyzus melacoryphus</i>	LC	NA		I, IIb, III, IVa, IVb	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG, YS
Ash-colored Cuckoo	<i>Coccyua cinerea</i>	LC	NA		I, IIb, IVa, V	SF, YS, AW, EF, WC, FM, BSASG
Smooth-billed Ani	<i>Crotophaga ani</i>	LC	NA	R	IVa	FM
Guira Cuckoo	<i>Guira guira</i>	LC	NA		I, IIa, IIb, III, IVa, V	SF, ERG, YS, AW, EF, WC, FM, BSASG
Striped Cuckoo	<i>Tapera naevia</i>	LC	NA		I, IIb, III, IVa, V	SF, ERG, EF, AP, FM, YS
Squirrel Cuckoo	<i>Piaya cayana</i>	LC	NA		IVa	SF

**Tytonidae**

Barn Owl	<i>Tyto alba</i>	LC	NA		IVa	AP
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**Strigidae**

Burrowing Owl	<i>Athene cunicularia</i>	LC	NA		I, IIa, IIb, III, IVa	ERG, YS, EF, WC, FM, BSASG
Striped Owl	<i>Pseudoscops clamator</i>	LC	NA		IVa	SF
Tropical Screech-Owl	<i>Megascops choliba</i>	LC	NA		IIb, IVa, V	AP, SF, EF
Ferruginous Pygmy-Owl	<i>Glaucidium brasilianum</i>	LC	NA	R	IIb, V	SF
Great Horned Owl	<i>Bubo virginianus</i>	LC	NA	R	IIb, V	SF, EF

**Caprimulgidae**

Little Nightjar	<i>Setopagis parvula</i>	LC	NA		IIb, IVa, V	ERG, BSASG
Band-winged Nightjar	<i>Systellura longirostris</i>	LC	NA	R	V	ERG
Scissor-tailed Nightjar	<i>Hydropsalis torquata</i>	LC	NA		IIb, IVa, V	SF, ERG, AW, WC, BSASG
Nacunda Nighthawk	<i>Chordeiles nacunda</i>	LC	NA		I, IIa, IIb, III, V	ERG

**Trochilidae**

Gilded Hummingbird	<i>Hylocharis chrysura</i>	LC	NA		I, IVa, V	SF, ERG, EF, FM, BSASG
Glittering-bellied Emerald	<i>Chlorostilbon aureoventris</i>	LC	NA		I, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
White-throated Hummingbird	<i>Leucochloris albicollis</i>	LC	NA		IVa, V	SF, YS, WC

**Alcedinidae**

Green Kingfisher	<i>Chloroceryle americana</i>	LC	NA		IIa, IIb, IVa, V	SF, YS, WC, FM
Ringed Kingfisher	<i>Megaceryle torquata</i>	LC	NA		IIb, III, IVa, IVb, V	SF, ERG, WC, FM
Amazon Kingfisher	<i>Chloroceryle amazona</i>	LC	NA		IVa, V	WC

**Picidae**

White-barred Piculet	<i>Picumnus cirratus</i>	LC	NA	R	Iva	SF
Checkered Woodpecker	<i>Dryobates mixtus</i>	LC	NA		I, IIb, III, IVa, V	SF, ERG, YS, AW, EF, WC, AP, FM
White Woodpecker	<i>Melanerpes candidus</i>	LC	NA		IVa, IVb, V	SF, ERG, YS, EF, FM
Field Flicker	<i>Colaptes campestris</i>	LC	NA		I, IIb, III, IVa, V	SF, ERG, YS, FM, BSASG
White-fronted Woodpecker	<i>Melanerpes cactorum</i>	LC	NA		I, IIb, V	ERG, EF, FM
Green-barred Woodpecker	<i>Colaptes melanochloros</i>	LC	NA		I, IIa, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG

**Dendrocolaptidae**

Narrow-billed Woodcreeper	<i>Lepidocolaptes angustirostris</i>	LC	NA		I, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
Scimitar-billed Woodcreeper	<i>Drymornis bridgesii</i>	LC	NA		I,IIb, V	ERG, EF, SF

**Furnariidae**

Rufous Hornero	<i>Furnarius rufus</i>	LC	NA		I, IIa, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
Curve-billed Reedhaunter	<i>Limnornis curvirostris</i>	LC	VU		I, IIb, IVa, V	SF, ERG, YS, AW, EF, WC, FM
Straight-billed Reedhaunter	<i>Limnoctites rectirostris</i>	NT	AM		IIb, IVa, V	FM, BSASG, ERG
Sulphur-bearded Spinetail	<i>Limnoctites sulphuriferus</i>	LC	NA		IIb, IVa, V	EF, WC, FM, BSASG
Bay-capped Wren-Spinetail	<i>Spartonoica maluroides</i>	EN	VU		I, V	ERG, FM
Hudson's Canastero	<i>Asthenes hudsoni</i>	EN	AM	R	IIa	ERG
Stripe-crowned Spinetail	<i>Cranioleuca pyrrhophia</i>	LC	NA		I, IIb, IVa, V	ERG, YS, EF, WC
Yellow-chinned Spinetail	<i>Certhiaxis cinnamomeus</i>	LC	NA		IIa, IIb, IVa, V	SF, ERG, AW, FM, BSASG
Short-billed Canastero	<i>Asthenes baeri</i>	LC	NA		I, IIb, III, V	ERG, EF, FM
Wren-like Rushbird	<i>Phleocryptes melanops</i>	LC	NA		I, IIa, IIb, III, IVa, V	SF, ERG, YS, WC, FM
Firewood-gatherer	<i>Anumbius annumbi</i>	LC	NA		I, IIb,III, IVa, V	ERG, EF, YS, BSASG, SF
Lark-like Brushrunner	<i>Coryphistera alaudina</i>	LC	NA	R	I	EF
Pale-breasted Spinetail	<i>Synallaxis albescens</i>	LC	NA		I, IIa, IIb, III, IVa	SF, ERG, EF, FM



Sooty-fronted Spinetail	<i>Synallaxis frontalis</i>	LC	NA		I, I Ib, III, IVa, V	EF, FM
Chicli Spinetail	<i>Synallaxis spixi</i>	LC	NA		I, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
Chotoy Spinetail	<i>Schoeniophylax phryganophilus</i>	LC	NA		I, IIa, IIb, III, IVa, V	ERG, EF, FM, BSASG
Tufted Tit-Spinetail	<i>Leptasthenura platensis</i>	LC	NA		I, IIb, III, V	ERG, EF, WC
Buff-browed Foliage-gleaner	<i>Syndactyla rufosuperciliata</i>	LC	NA		IVb, V	SF
Little Thornbird	<i>Phacellodomus sibilatrix</i>	LC	NA		I, IIa, IIb, III, IVa, V	SF, ERG, WC, FM, EF
Greater Thornbird	<i>Phacellodomus ruber</i>	LC	NA		IVa	SF, BSASG
Freckle-breasted Thornbird	<i>Phacellodomus striaticollis</i>	LC	NA		I, IIa, IIb, III, IVa, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
Brown Cacholote	<i>Pseudoseisura lophotes</i>	LC	NA		I, IIb, V	ERG, EF
<b>Thamnophilidae</b>						
Variable Antshrike	<i>Thamnophilus caeruleus</i>	LC	NA		IIb, IVa, V	SF, ERG, AW, EF, WC, FM
Rufous-capped Antshrike	<i>Thamnophilus ruficapillus</i>	LC	NA		IIb, IVa, V	SF, YS, AW, WC, FM
<b>Cotingidae</b>						
White-tipped Plantcutter	<i>Phytotoma rutila</i>	LC	NA	R	I	EF
White-winged Becard	<i>Pachyrhamphus polychopterus</i>	LC	NA		IIb, IVa, IVb, V	SF, YS, AW, WC, AP
White-naped Xenopsaris	<i>Xenopsaris albinucha</i>	LC	NA		I, IIb, IVa, V	ERG, EF, FM, YS, SF
<b>Tyrannidae</b>						
Mottle-cheeked Tyrannulet	<i>Phylloscartes ventralis</i>	LC	NA		IVa	SF, BSASG
Sepia-capped Flycatcher	<i>Leptopogon amaurocephalus</i>	LC	NA	R	IVa	WC
Bran-colored Flycatcher	<i>Myiophobus fasciatus</i>	LC	NA		I, IIb, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, FM, BSASG
Pearly-vented Tody-Tyrant	<i>Hemitriccus margaritaceiventer</i>	LC	NA		IVa	SF, YS
Euler's Flycatcher	<i>Lathrotriccus euleri</i>	LC	NA	R	V	SF
White-crested Tyrannulet	<i>Serpophaga subcristata</i>	LC	NA		I, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, FM, BSASG
Sooty Tyrannulet	<i>Serpophaga nigricans</i>	LC	NA		I, IIa, IIb, III, IVa, V	SF, ERG, AW, EF, WC, FM, BSASG
Straneck's Tyrannulet	<i>Serpophaga griseicapilla</i>	LC	NA	R	IIb	EF

Southern Beardless-Tyrannulet	<i>Camptostoma obsoletum</i>	LC	NA		Iib, IVa, V	SF
Small-billed Elaenia	<i>Elaenia parvirostris</i>	LC	NA		I, Iib, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, FM
White-crested Elaenia	<i>Elaenia albiceps</i>	LC	NA		IVa, V	SF
Yellow-browed Tyrant	<i>Satrapa icterophrys</i>	LC	NA		Iia, Iib, III, IVa, V	ERG, EF, FM, SF, AW
Chaco Suiriri	<i>Suiriri suiriri</i>	LC	NA		I, Iib, III, IVa, V	SF, ERG, AW, EF, WC, AP, FM
Southern Scrub-Flycatcher	<i>Sublegatus modestus</i>	LC	NA		IVa, V	WC, EF
Tropical Kingbird	<i>Tyrannus melancholicus</i>	LC	NA		I, Iia, Iib, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG, YS
Warbling Doradito	<i>Pseudocolopteryx flaviventris</i>	LC	NA		I, Iib, IVa, V	YS, WC, FM, BSASG
Crested Doradito	<i>Pseudocolopteryx sclateri</i>	LC	NA		IVa	FM
Bearded Tachuri	<i>Polystictus pectoralis</i>	NT	VU		IVa	FM
Many-colored Rush-Tyrant	<i>Tachuris rubrigastra</i>	LC	NA		Iib, IVa, V	FM
Vermilion Flycatcher	<i>Pyrocephalus rubinus</i>	LC	NA		I, Iia, Iib, III, IVa, V	SF, ERG, AW, EF, WC, FM, YS, BSASG
Great Kiskadee	<i>Pitangus sulphuratus</i>	LC	NA		I, Iia, Iib, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
Streaked Flycatcher	<i>Myiodynastes maculatus</i>	LC	NA		I, Iib, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
Spectacled Tyrant	<i>Hymenops perspicillatus</i>	LC	NA		I, Iia, Iib, III, IVa, V	ERG, YS, AW, EF, WC, FM, BSASG
Black-backed Water-Tyrant	<i>Fluvicola albiventer</i>	LC	NA		I, Iib, V	ERG, WC, FM, SF
White-winged Black-Tyrant	<i>Knipolegus aterrimus</i>	LC	NA		IVa	SF, WC
Blue-billed Black-Tyrant	<i>Knipolegus cyanirostris</i>	LC	NA		IVa	SF, YS, AW, BSASG
Fork-tailed Flycatcher	<i>Tyrannus savana</i>	LC	NA		I, Iia, Iib, III, IVa, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
Crowned Slaty Flycatcher	<i>Griseotyrannus aurantioatrocristatus</i>	LC	NA	R	Iib	EF
Swainson's Flycatcher	<i>Myiarchus swainsoni</i>	LC	NA		Iib, IVa, V	AW, SF

Tawny-crowned Pygmy-Tyrant	<i>Euscarthmus meloryphus</i>	LC	NA	R	V	ERG
White Monjita	<i>Xolmis irupero</i>	LC	NA		I, IIa, IIb, III, IVa, V	SF, ERG, EF, WC, FM, BSASG
Black-crowned Monjita	<i>Xolmis coronatus</i>	LC	NA		I, IVa	ERG, EF, FM
Cattle Tyrant	<i>Machetornis rixosa</i>	LC	NA		I, IIa, IIb, III, IVa, V	ERG, YS, EF, WC, AP, FM, BSASG
<b>Hirundinidae</b>						
Barn Swallow	<i>Hirundo rustica</i>	LC	NA		IIb, V	ERG, FM, WC
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	LC	NA	R	IIb	ERG
Blue-and-white Swallow	<i>Pygochelidon cyanoleuca</i>	LC	NA		IIb, IVa, IVb, V	WC, FM, BSASG
White-rumped Swallow	<i>Tachycineta leucorrhoa</i>	LC	NA		I, IIb, III, IVa, V	SF, ERG, YS, AW, FM, BSASG
Grey-breasted Martin	<i>Progne chalybea</i>	LC	NA		I, IIa, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, FM, BSASG
Brown-chested Martin	<i>Progne tapera</i>	LC	NA		I, IIa, IIb, III, IVa, V	SF, ERG, YS, AW, EF, WC, FM, BSASG
<b>Troglodytidae</b>						
House Wren	<i>Troglodytes aedon</i>	LC	NA		I, IIa, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
<b>Vireonidae</b>						
Red-eyed Vireo	<i>Vireo olivaceus</i>	LC	NA		IVa, IVb	SF, YS, AW, WC, AP, FM, BSASG
Rufous-browed Peppershrike	<i>Cyclarhis gujanensis</i>	LC	NA		I, IIb, IVa, IVb, V	SF, YS, AW, EF, AP, FM
<b>Poliophtilidae</b>						
Masked Gnatcatcher	<i>Poliophtila dumicola</i>	LC	NA		I, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, FM
<b>Mimidae</b>						
Chalk-browed Mockingbird	<i>Mimus saturninus</i>	LC	NA		I, IIa, IIb, III, IVa, V	SF, ERG, YS, AW, EF, WC, FM, BSASG
<b>Turdidae</b>						
Creamy-bellied Thrush	<i>Turdus amaurochalinus</i>	LC	NA		I, IIa, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG

Rufous-bellied Thrush	<i>Turdus rufiventris</i>	LC	NA		I, IIa, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
<b>Motacillidae</b>						
Yellowish Pipit	<i>Anthus lutescens</i>	LC	NA		I, IIa, IIb, III, IVa, V	ERG, EF, FM, BSASG
Correndera Pipit	<i>Anthus correndera</i>	LC	NA		I, IIa, III, IVa, IVb, V	ERG, WC, BSASG
<b>Parulidae</b>						
Masked Yellowthroat	<i>Geothlypis aequinoctialis</i>	LC	NA		I, IIa, IIb, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
Golden-crowned Warbler	<i>Basileuterus culicivorus</i>	LC	NA		IVa, IVb, V	SF, AW, AP
White-rimmed Warbler	<i>Myiothlypis leucoblephara</i>	LC	NA		IVa, IVb, V	SF, YS, AW, WC, AP
Tropical Parula	<i>Setophaga pitiayumi</i>	LC	NA		IVa, V	SF, AW
<b>Cardinalidae</b>						
Ultramarine Grosbeak	<i>Cyanocopsa brissonii</i>	LC	NA		IVa, V	SF
Indigo grosbeak	<i>Cyanoloxia glaucocaerulea</i>	NT	VU	R	IVa	BSASG, SF
<b>Thraupidae</b>						
Sayaca Tanager	<i>Thraupis sayaca</i>	LC	NA		I, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
Diademed Tanager	<i>Stephanophorus diadematus</i>	LC	NA		IVa, IVb	SF, FM
Blue-and-yellow Tanager	<i>Pipraeidea bonariensis</i>	LC	NA		I, IIb, III, V, IVa	ERG, EF, WC, FM, YS, SF
Hepatic-Tanager	<i>Piranga flava</i>	LC	NA		IVa, IVb, V	SF, AP
White-lined Tanager	<i>Tachyphonus rufus</i>	LC	NA	R	IVb	*
Blue-black Grassquit	<i>Volatinia jacarina</i>	LC	NA		IVa, V	ERG, YS, WC, BSASG
Greyish Saltator	<i>Saltator coerulescens</i>	LC	NA		I, IIb, III, IVa, IVb, V	SF, ERG, AW, EF, WC, FM, BSASG
Golden-billed Saltator	<i>Saltator aurantiirostris</i>	LC	NA		I, IIb, III, V	SF, ERG, AW, EF, FM
Green-winged Saltator	<i>Saltator similis</i>	LC	NA	R	V	SF
Saffron Finch	<i>Sicalis flaveola</i>	LC	NA		I, IIa, IIb, III, IVa, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
Grassland Yellow-Finch	<i>Sicalis luteola</i>	LC	NA		I, IIa, IIb, III, IVa, V	SF, ERG, YS, EF, WC, FM, BSASG
Red-crested Cardinal	<i>Paroaria coronata</i>	LC	NA		I, IIa, IIb, III, IVa, IVb, V	SF, ERG, YS, EF, FM

Yellow-billed Cardinal	<i>Paroaria capitata</i>	LC	NA		I Ib, III, IVa, V	ERG, EF, WC
Double-collared Seedeater	<i>Sporophila caeruleascens</i>	LC	NA		I, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
Rusty-collared Seedeater	<i>Sporophila collaris</i>	LC	NA		IIb, IVa, V	ERG, FM, EF
Marsh Seedeater	<i>Sporophila palustris</i>	En	EN		IVa	FM, BSASG
Dark-throated Seedeater	<i>Sporophila ruficollis</i>	NT	VU	R	IVa	BSASG
Long-tailed Reed-Finch	<i>Donacospiza albifrons</i>	LC	NA		I, IIb, IVa, V	ERG, YS, WC, AP, FM, BSASG
Black-capped Warbling Finch	<i>Microspingus melanoleucus</i>	LC	NA		I, IIb, III, IVa, V	SF, ERG, AW, EF, FM
Red-rumped Warbling finch	<i>Poospiza lateralis</i>	LC	NA		IVa, V	SF, ERG, YS, AP, FM
Black-and-rufous Warbling-Finch	<i>Poospiza nigrorufa</i>	LC	NA		I, IIa, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
Black-capped Warbling Finch	<i>Microspingus melanoleucus</i>	LC	NA	R	V	EF
Great Pampa-Finch	<i>Embernagra platensis</i>	LC	NA		I, IIb, III, IVa, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
Wedge-tailed Grass-Finch	<i>Emberizoides herbicola</i>	LC	NA	R	IVa	WC
<b>Passerillidae</b>						
Grassland Sparrow	<i>Ammodramus humeralis</i>	LC	NA		I, IIa, IIb, III, IVa	ERG, FM, BSASG
Rufous-collared Sparrow	<i>Zonotrichia capensis</i>	LC	NA		I, IIa, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
<b>Fringillidae</b>						
Hooded Siskin	<i>Spinus magellanicus</i>	LC	NA		I, IIa, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
<b>Icteridae</b>						
Epaulet Oriole	<i>Icterus pyrrhopterus</i>	LC	NA		I, IIb, IVa, V	SF, ERG, YS, AW, EF, WC, AP, FM
Solitary Black Cacique	<i>Cacicus solitarius</i>	LC	NA		IIb, IVa, IVb, V	SF, ERG, YS, AW, WC, AP
Grayish Baywinged	<i>Agelaioides badius</i>	LC	NA		I, IIb, III, IVa, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
Scarlet-headed Blackbird	<i>Amblyramphus holosericeus</i>	LC	VU		I, IIb, IVa, V	SF, ERG, EF, WC, FM, BSASG



Chopi Blackbird	<i>Gnorimopsar chopi</i>	LC	NA	R	IVa	WC
Screaming Cowbird	<i>Molothrus rufoaxillaris</i>	LC	NA		I, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, FM
Shiny Cowbird	<i>Molothrus bonariensis</i>	LC	NA		I, IIa, IIb, III, IVa, IVb, V	SF, ERG, YS, AW, EF, WC, AP, FM, BSASG
Yellow-winged Blackbird	<i>Agelasticus thilius</i>	LC	NA		I, IIa, IIb, IVa, V	ERG, YS, EF, WC, FM, BSASG
Chestnut-capped Blackbird	<i>Chrysomus ruficapillus</i>	LC	NA		I, IIa, IIb, III, IVa, IVb, V	ERG, EF, WC, FM, BSASG
Unicolored Blackbird	<i>Agelasticus cyanopus</i>	LC	NA		IVa, IVb, V	EERG, WC, FM
Brown-and-yellow Marshbird	<i>Pseudoleistes virescens</i>	LC	NA		I, IIa, IIb, III, IVa, IVb, V	ERG, YS, EF, WC, FM, BSASG
White-browed Blackbird	<i>Leistes supercilialis</i>	LC	NA		I, IIa, IIb, III, IVa, V	ERG, YS, EF, FM, BSASG
<b>Alien species</b>						
Greylag Goose	<i>Anser anser</i>	n/e	IN		IIb, III	ERG
Feral Pigeon	<i>Columba livia</i>	n/e	IN		I, IIb, III, IVa, V	ERG, SF
House Sparrow	<i>Passer domesticus</i>	n/e	IN		I, IIb, III, V, IVa	ERG, EF, FM, YS
European Starling	<i>Sturnus vulgaris</i>	n/e	IN		IIb, V, IVa	ERG, WC

\*: vegetation type not determined