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RESEARCH

# The avifauna of the Rio Cautário State extractive reserve, Rondônia, Brazil

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**Abstract**
The biogeographical province known as the Rondônia Center of Endemism is one of the most threatened regions in the Brazilian Amazon. Here we present a comprehensive assessment of a bird community within this region — that of the Rio Cautário State Extractive Reserve, addressing a major knowledge gap about this Center of Endemism. The reserve lies in the southwestern part of the state wherewe have carrying out bird inventories since 2020 using a combination of direct active searches coupled with passive acoustic monitoring and camera trapping techniques. During our field inventory, we recorded 516 bird species distributed in 73 families. Our avifaunal survey of the reserve represents the most extensive inventory for any site in this region of Amazonia and includes endemic taxa from the Rondônia Center, as well as species threatened with global extinction (nine globally threatened species). This diverse assemblage also includes species vulnerable to hunting and forest-dependent species sensitive to forest loss and fragmentation. These findings underscore the value of using mixed methods in documenting super species-rich avian assemblages.

**Keywords** Amazonia · Birds · Conservation · Passive acoustic monitoring · Rondônia center of endemism

## Introduction

Tropical forests harbor the greatest expression of biodiversity on the planet, the result of complex eco-evolutionary processes playing out over deep time (Barlow et al. 2018). However, tropical forests are facing increasing threats arising from intense anthropogenic pressures, principally forest loss driven by arable and pastoral agricultural expansion, along with logging, mining, road construction, and other infrastructure developments (Tyukavina et al. 2017; Stabile et al. 2022; Cruz et al. 2021; Silveira et al. 2022). In addition, climate change acts in synergy with these other threats and may already be driving population declines, both directly and indirectly, in rainforest birds in otherwise undisturbed landscapes (Wolfe et al. 2025).

The Amazon, covering an area of 6.7 Mkm$^2$, is the largest tropical rainforest in the world (Uhl et al. 1997; Laurance et al. 2001). It is subdivided by numerous rivers that serve as important geographic barriers for many species, creating a complex mosaic of interfluvial regions known as "centers of endemism" (Cracraft 1985; Silva et al. 2005). Currently, eleven major centers of endemism are recognized (Anjos et al. 2021; Ribas et al. 2025), among which the Rondônia Center of Endemism, in southwestern Amazon, stands out as one of the most important in South America (Cracraft 1985). The avifauna of what is now Rondônia was first studied by Johann Natterer, who collected birds along the Guaporé and Madeira rivers during the 19th century (Pelzeln 1868, 1870). In the upper Guaporé, Natterer collected two species considered to be restricted to the region:

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*Tachyphonus nattereri*, now considered a hybrid (Lopes and Piacentini 2017), and the microendemic *Picumnus fuscus*, along with *Tityra leucura* (Whittaker 2008). While the specific status of the latter is still unclear, *P. fuscus* is found only in *várzea* (floodable) forests along the Guaporé River in Mato Grosso, Rondônia and adjacent Beni department in Bolivia.

Until recently, one of the largest collection of birds from Rondônia was the one made by Mr. W Hoffmanns, who collected along the Madeira and the lower Ji-Paraná (Hellmayr 1910), while the southern part of the state was visited by the Roosevelt-Rondon expedition (Naumburg 1930). In 1986 and 1988 a team from the Museu de Zoologia da Universidade de São Paulo (MZUSP), Brazil, and the Field Museum of Natural History, Chicago (FMNH), U.S.A., made an extensive inventory of birds on the left bank of the Ji-Paraná River, at Cachoeira Nazaré and Pedra Branca (Stotz et al. 1997). More recently, a series of surveys were carried out as the basis for the economic-ecological zoning of Rondônia via rapid ecological assessments, but these results remain unpublished (see Cândido 2001). Other reports came from rapid surveys carried out in a few of the state's reserves, with some information published by Olmos et al. (2011), while data and specimens from the monitoring of the area impacted by the Jirau and Santo Antonio dams in the Madeira River remain largely unpublished to date. Other avifaunal studies, especially in the west of the state, encompass works from França et al. (2011), Olmos et al. (2011), Santos et al. (2011) and Sousa et al. (2019).

Against this backdrop of relatively modest field surveys, Rondônia has been subject to ongoing high deforestation rates; between 1985 and 2021 the state's forest area was reduced from 20.2 to 13.2 Mha, a loss of 35% (MapBiomas 2022). Deforestation was initially catalyzed by the opening of the Cuiabá-Porto Velho Road (BR 364) in 1964 and exploded from 1984 onwards with the World Bank's POLONOROESTE project, which funded road paving and resettlement programs implemented by the Federal Government through INCRA (Pedlowski et al. 1997; Rosendo and Brown 1998). Public outcry over the resulting deforestation and violations of the rights of traditional and indigenous communities (including recently contacted indigenous groups) led the World Bank to foster the PLANAFLORO project, under which the newly created state (formerly a territory) implemented a system of protected areas based on ecological-economic zoning as a condition for receiving resources for further infrastructure and agricultural development (Keck 1998; Browder 2002).

Rondônia has since then become a textbook example of protected area downgrading, downsizing and degazettement, often supported by local politicians who regard public lands as appropriate targets for land grabs (see Pedlowski et al. 2005; Araújo and Barreto 2010; Bernard et al. 2014; Pack et al. 2016; Tesfaw et al. 2018; Keles et al. 2020). As a result, state (as opposed to federal) protected areas in Rondônia have had a relatively low impact on curbing deforestation/degradation (Herrera et al. 2019). The ongoing loss, fragmentation and degradation of habitats in Rondônia are the primary threats to regional avian biodiversity and patterns of biodiversity loss are likely to be similar to those documented in other parts of the basin (e.g. Lees and Peres 2008; Moura et al. 2013).

Most of the state lies in the Rondônia center of endemism, where the existence of finer-scale endemism within this biogeographic province (e.g. Fernandes 2013) highlights the challenge of adequately describing regional biodiversity and understanding its distribution in space and time, as well as its sensitivity to change before it is too late. Here we present a comprehensive assessment of the bird community in the Rio Cautário State Extractive Reserve, addressing a major gap in our understanding of Rondônia's biodiversity. Initial studies for the reserve management plan recorded only 127 bird species, with many records coming from mist-netting (Sedam 2016). This number was understood as an underestimate of local bird richness, and prompted further surveys summarized here. Our survey provides a first baseline for on-going analysis on assessing changes in bird communities over time, and the influence of variables like forest biomass, composition and structure. This inventory should be important for conservation practitioners, policymakers, and researchers working to secure the future for the region's unique biodiversity.

## Materials and methods

### Study site

The Rio Cautário Reserve covers 146,400 ha of the southwestern part of the state of Rondônia, Brazil (Fig. 1). It forms part of the Itenez-Guapore Corridor of Protected Areas shared by Brazil and Bolivia (Van damme et al. 2013) and one of the largest remaining extents of forest in southern Amazonia, comprising several protected areas and indigenous territories, including Pacaás Novos National Park (708,669.90 ha), Serra da Cutia National Park (283,501.38 ha), and Uru-Eu-Wau-Wau Indigenous Land (1,867,000.00 ha). The reserve falls within the Madeira-Tapajós Moist Forests Ecoregion (Dinerstein et al. 2020; ISA 2020) an interfluvial region recognized as one of several areas of endemism for different species groups based on breaks in their distributions typically bounded by major rivers (Cracraft 1985; Silva et al. 2005; Borges and Silva 2012; Rego et al. 2024).

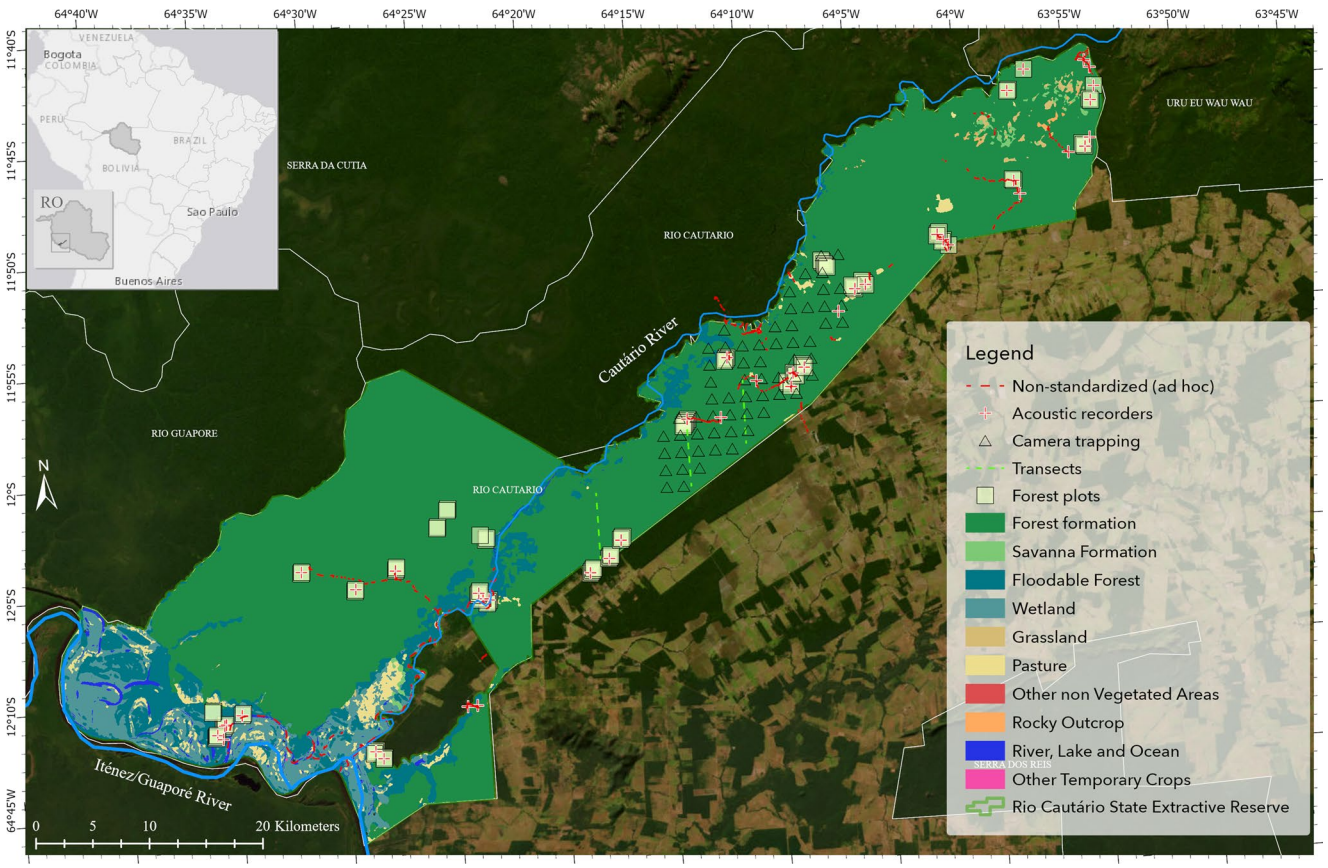


**Fig. 1** Map of the study, located within the Rio Cautário State Extractive Reserve and surrounded by additional protected areas forming the regional conservation cluster, contrasting with the deforested landscape to the east, used mainly for cattle ranching. Sampling locations for the different avifauna survey methods are shown, including forest plots, transects, autonomous acoustic recorder and camera trap deployment locations, and non-standardized (ad hoc) observations. Vegetation classes follow the land-cover classification from MapBiomas. Note, however, that the 'pasture' class is a MapBiomas misclassification; it actually refers to natural grasslands that flourish after the flood season

The reserve was established in 1995, guided by Rondônia's ecological–economic zoning and in response to demands from the rubber-tapper (*seringueiros*) movement. At the time, this movement was actively resisting land grabbing cattle ranchers, whose expansion threatened to encroach upon and ultimately degrade the neighboring São Domingos State Forest (Sedam 2016). The reserve is managed by local communities; currently, 92 families (315 people) live in seven villages under the administration of the State Secretariat of the Environmental Development of Rondônia, the state environmental agency. As part of the established Reducing Emissions from Deforestation and Forest Degradation (REDD+) project on the Rio Cautário, implemented in 2020 (Olmos et al. 2025), 92 permanent forest plots were installed to monitor long-term changes in forest composition and biomass. This monitoring network also includes a grid of camera traps, linear transects used for systematic wildlife surveys and sample units designed for passive acoustic monitoring.

The Cautário River is bounded to the west by the floodplains of the Guaporé/It nez-Mamoré River, while its easternmost sector includes part of the Pacaás Novos-Uopianes plateau and highlands, with low hills and rock outcrops of sandstones and conglomerates atop older granites and basalts. Erosion has produced sandy soils which are widespread in these upland areas, while heterogeneous relief results in a variety of vegetation types. The project area covers an altitudinal range from c. 140 m along the Guaporé floodplain to around 250 m on its north-eastern sector, with most of the area around 150–160 m. There is an extensive network of streams within the project area, all draining into the Cautário River and, through it, into the Guaporé.

The Guaporé valley is the driest part of Rondônia with mean annual precipitations 1,400-1,500 mm, and average temperatures around 24–25 °C. Daily temperatures show a broad range (easily > 10 °C), while air moisture is high even during the dry season (82% in July). Temperatures in Costa Marques (the main municipality covering the reserve)

may be as low as 10 °C following the passage of cold fronts which sometimes occur in July but may reach around 40 °C in August. The dry season extends from May to September, but every month usually has some precipitation. The onset of rain from late September onwards, quickly results in run-off and the inundation of floodplains.

According to MapBiomas (2025), approximately 80% of the reserve is covered by forest formations, including Open and Dense Ombrophylous Forests - physiognomies known as *terra firme* forests that occur in areas not subject to seasonal flooding. These are tall forests with emergent trees reaching over 40–50 m and a discontinuous canopy (60–70%), which allows light to penetrate to the lower strata, supporting a rich understory of palms, lianas, bamboo and the giant herb *Phenacospermum guyannense*. Dominant emergent and higher canopy trees are *muiracatiara* (*Astronium lecointei*), Brazil nut (*Bertholletia excelsa*), *ipê-amarelo* (*Handroanthus incanus*), *ipê-roxo* (*Handroanthus serratifolius)*, *sucupira-amarela* (*Vataireopsis speciosa*) and *sucupira-preta* (*Diplotropis purpurea*).

A closed-canopy forest (Alluvial Open Ombrophylous Forest) grows in seasonally flooded or waterlogged riparian areas. Palms such as *buriti* (*Mauritia flexuosa*) and *açaí* (*Euterpe oleracea*) are common, alongside large trees including sumaúma and the widespread, towering kapok tree (*Ceiba pentandra*), besides *ucuúba* (*Virola surinamensis*). This forest type covers approximately 9% of the reserve, primarily along the Cautário River.

Other habitats include the floodplains of the Guaporé/Itenez River and associated wetlands, which together account for about 6% of the reserve. Savanna formations (both arboreal and shrub-dominated) occur on oligotrophic, stony soils interspersed with patches of grass and scattered shrubs in areas where the soil is too shallow or damp for other plants to establish, comprising roughly 1% of the area. The remaining land-cover classes occupy 3% of the reserve, which include open areas nearby human settlements.

## Bird survey methods

The survey methods in the study area combined standardized and non-standardized approaches to document the regional species pool across multiple habitats. Standardized methods included linear transects, passive acoustic monitoring, and camera-trap sampling, which are all integrated into the reserve's REDD+ long-term wildlife monitoring program. Due to logsitical constraints, spatial overlap of differents sampling methodologies (e.g. plots, traps, recorders) was not always possible. These methods complemented the non-standardized observations, such as active searches and other ad hoc sightings, besides historical records from earlier management-plan surveys, which, despite lacking formal sampling design, contributed valuable contextual and voucher data. Together, these methods provided a comprehensive strategy for detecting both common and rarer species, refining distributional knowledge, and supporting long-term biodiversity assessments.

Our avian taxonomy follows Pacheco et al. (2021). Threatened species are classified according to national (MMA 2022) and international (IUCN 2025) Red Lists. In this study, the criteria defining significant records included species that are poorly known in the region, as well as those that are endemic or threatened. The identification of these species was conducted with particular care and verified through comparisons with previous records available in the literature and ornithological databases. Unconfirmed or dubious records were not considered in the final list.

### Non-standardized (ad hoc) surveys

The initial limited bird survey associated with the management plan was based on mist-netting and direct observations and was limited to 100 h of observation plus 42,000 h/m² of mist netting (Sedam 2016). No quantitative information about avian abundance was presented in this first study. A few records were made in the reserve by Olmos et al. (2011) as the area was used to transit to the Serra da Cutia National Park, the focus of their surveys. This data was incorporated into our final list when properly documented.

With the start of the REDD+ project, ornithological expeditions were made to the reserve with the goal of producing an inventory of the avifauna as a component of the biodiversity baseline, gathering voucher material (photos and sound records) following the framework of Lees et al. (2014). Ad hoc surveys were conducted along rivers, roads, trails, transects, both while walking (or navigating) and using point-counts, during which the authors recorded all birds detected visually or acoustically. These observations were documented as eBird checklists (some with voucher images and sound recordings were also uploaded to WikiAves), at both random and preselected locations, including human-modified habitats near communities within and around the reserve (within a 5 km buffer from its boundaries (Fig. 1). Altogether, the authors' eBird records comprise approximately 79 days of observations, totaling 275 h and 744 km of ad hoc survey effort. Species vouchers have been uploaded to the citizen science platforms eBird (www.ebird.org), WikiAves (www.wikiaves.com.br) and iNaturalist (https://www.inaturalist.org/). Community-based monitoring is also conducted in the reserve, and when appropriate, vouchers produced by members of the community are accepted in this study (e.g. *Morphnus guianensis*).

### Linear transects

To complement our bird sampling, we incorporated data from three 5-km linear transects (Fig. 1) conducted by the community and supported by the REDD+ project, which is based on the methods of *Programa Monitora* and involves annual surveys of large-bodied ground-dwelling birds and other terrestrial fauna. Local monitors walked the transects for 10 consecutive days while recording all bird species confidently detected along the route. To ensure data reliability, only confirmed records (i.e., detections supported by photographic evidence and subsequently validated by the authors) were included in our dataset. This approach strengthens community participation in biodiversity monitoring while maintaining rigorous standards for species verification. The protocol was implemented yearly during the dry season from 2022 to 2024, totaling 450 km walked over 90 days.

### Passive Acoustic Monitoring (PAM)

Our Passive Acoustic Monitoring survey design used 40 autonomous recording units (ARUs; AudioMoths v. 1.2.0 by Open Acoustic Devices); 29 were installed in the permanent forest plots whenever possible (separated by at least 500 m), and 11 outside the plots, aiming to cover as wide a range of vegetation types as possible in the study area (Fig. 1). The ARUs were configured to capture sounds with a resolution of 48 kHz and 16 bits, in wav format (de Araújo et al. 2021). We used a high temporal resolution configuration following Metcalf et al. (2022), with recordings of 1 min followed by a 4 min interval, for 24 h/day for 30 consecutive days. The ARUs were installed between October-November 2023, September-October 2024. Thus, the sampling effort was 288 min/day/ARU, totaling 8,640 min/ARU, 345,600/year, and a total of 691.200 min of recordings. After data collection, recordings were stored on the RFCx-ARBIMON platform (LeBien et al. 2022). To date, four days of recordings per sampling point (46,080 min) have been manually validated using spectrograms to identify vocalizing birds. In addition, searches for species likely to occur and not documented in the study area were automated using RFCx-ARBIMON's Pattern Matching analysis tool to identify candidate recordings and then create digital vouchers if these were correctly identified. The manual, visually based identification effort was designed to strengthen the Arbimon model, enabling future analyses of the entire dataset using automated, supervised tools as part of the REDD+ project's monitoring program.

### Camera trapping

Our camera trapping survey followed version 3.1 of the TEAM - Tropical Ecology Assessment and Monitoring Network protocol (Ahumada et al. 2013; Jansen et al. 2014). The design consists of a grid of 2 km² cells (Fig. 1), comprising 66 continuous 24-hour sampling stations operated for a minimum of 30 days to detect terrestrial mammals and ground-dwelling bird species. Sampling was conducted from October-November 2022 and 2023, and from October 2023 to January 2024, totaling 99 sampling days. All camera-trap images were processed through Wildlife Insights' AI models, with every bird detection subsequently validated through a supervised author review within the project database.

## Results

Since 2020, our field inventories have recorded 516 bird species distributed in 26 orders and 73 families (Table 1) in the reserve. Among these, five taxa are endemic to the Rondônia center of endemism: *Psophia viridis*, *Nystalus striolatus*, *Rhegmatorhina hoffmannsi*, *Dendrocolaptes concolor* and *Dendrocolaptes hoffmannsi.* The species lists are composed of the aggregation of camera-trapping photos, which recorded just 13 species, 14 were detected in linear transects and 172 with PAM (standardized methods), the remainder were obtained using ad hoc approaches (non-standardized methods) (Fig. 2). The Pattern Matching tool was applied to 23 species; of these, 13 were validated and used to create digital vouchers. Four species were registered exclusively by PAM: *Bucco capensis*, *Hydropsalis parvula*, *Leucopternis kuhli*, and *Turdus hauxwelli*. The *Conopophaga melanogaster* is the sole avian taxon included in our inventory which was not recorded by the authors in the current inventory and based on a historical documented record (Sedam 2016).

The avian assemblage includes nine globally Vulnerable (VU) species (IUCN 2025): *Tinamus tao*, *Aburria cujubi*, *Psophia viridis Calidris fuscicollis*, *Tringa flavipes*, *Harpia harpyja*, *Pionites leucogaster*, *Hypocnemis ochrogyna* and *Hylexetastes uniformis*. *Morphnus guianensis* and *Capito dayi* are both considered Near Threatened by the IUCN. At the national level (MMA 2022), 12 species are classified as Vulnerable: *Tinamus tao*; *Aburria cujubi*; *Psophia viridis*; *Morphnus guianensis*; *Harpia harpyja*; *Capito dayi*; *Pyrrhura perlata*; *Pyrrhura pallescens*; *Hypocnemis ochrogyna*; *Rhegmatorhina hoffmannsi*; *Hylopezus whittakeri* and *Hylexetastes uniformis*.

**Table 1** Avifauna of the Rio Cautário State Extractive Reserve, Rondônia, Brazil. Data are derived from the Management Plan (MP–Silva 2014) and the authors' field surveys, including Transects (TR), Ad hoc observations (AH), Passive Acoustic Monitoring (PAM), and Camera Trapping (CT)

| Family/species | Common name | MP | TR | AH | PAM | CT | MMA | IUCN | Voucher |
|---|---|---|---|---|---|---|---|---|---|
| Tinamidae | | | | | | | | | |
| *Tinamus tao* | gray tinamou | + | + | + | + | + | VU | VU | WA6548725 |
| | | | | | | | | | ML628886929 |
| *Tinamus major* | great tinamou | | + | + | + | + | | | WA6548730 |
| | | | | | | | | | ML628887383 |
| *Tinamus guttatus* | white-throated tinamou | | + | + | + | + | | NT | WA6632246 |
| *Crypturellus cinereus* | cinereous tinamou | + | + | + | + | + | | | WA4885664 |
| *Crypturellus soui* | little tinamou | | + | + | + | + | | | WA4899734 |
| *Crypturellus undulatus* | undulated tinamou | + | | + | + | | | | WA5886662 |
| *Crypturellus strigulosus* | Brazilian tinamou | | + | + | + | | | | WA4909181 |
| *Crypturellus variegatus* | variegated tinamou | + | + | + | + | + | | | WA4899860 |
| | | | | | | | | | ML628885939 |
| *Crypturellus parvirostris* | small-billed tinamou | | | + | | | | | WA4910446 |
| *Crypturellus tataupa* | tataupa tinamou | | | + | | | | | |
| Anhimidae | | | | | | | | | |
| *Anhima cornuta* | horned screamer | + | | + | + | | | | WA4686001 |
| *Chauna torquata* | southern screamer | | | + | | | | | ML610281992 |
| Anatidae | | | | | | | | | |
| *Dendrocygna viduata* | white-faced whistling-duck | | | + | | | | | |
| *Dendrocygna autumnalis* | black-bellied whistling-duck | | | + | | | | | WA4906927 |
| *Neochen jubata* | Orinoco goose | | | + | | | | NT | WA5844423 |
| *Cairina moschata* | muscovy duck | + | | + | | | | | WA4894021 |
| *Amazonetta brasiliensis* | Brazilian teal | + | | + | | | | | WA6628045 |
| Cracidae | | | | | | | | | |
| *Penelope jacquacu* | Spix's guan | + | + | + | + | + | | | WA5467270 |
| | | | | | | | | | ML628887667 |
| *Aburria cumanensis* | blue-throated piping-guan | | | + | | | | | WA6616408 |
| *Aburria cujubi* | red-throated piping-guan | + | | | | | VU | VU | |
| *Ortalis guttata* | speckled chachalaca | | | + | + | | | | WA4911803 |
| *Pauxi tuberosa* | razor-billed curassow | + | + | + | + | + | | NT | ML610282022 |
| | | | | | | | | | ML610282025 |
| Odontophoridae | | | | | | | | | |
| *Odontophorus gujanensis* | marbled wood-quail | | + | + | + | + | | | WA6614390 |
| Podicipedidae | | | | | | | | | |
| *Tachybaptus dominicus* | least grebe | + | | + | | | | | WA5372758 |
| Columbidae | | | | | | | | | |
| *Patagioenas speciosa* | scaled pigeon | + | | + | | | | | WA4901765 |
| *Patagioenas picazuro* | picazuro pigeon | | | + | | | | | WA4894061 |
| *Patagioenas cayennensis* | pale-vented pigeon | + | | + | | | | | WA4925301 |
| *Patagioenas plumbea* | plumbeous pigeon | | | + | + | | | | WA4889568 |
| *Patagioenas subvinacea* | ruddy pigeon | | | + | | | | | WA5345726 |
| *Geotrygon montana* | ruddy quail-dove | | + | + | | + | | | WA6535216 |
| *Geotrygon violacea* | violaceous quail-dove | | | + | | | | | ML551769341 |
| *Leptotila verreauxi* | white-tipped dove | | | + | + | | | | WA4925522 |
| *Leptotila rufaxilla* | gray-fronted dove | | | + | + | | | | WA6632820 |
| *Claravis pretiosa* | blue ground-dove | | | + | | | | | WA4925606 |
| *Columbina passerina* | common ground-dove | | | + | | | | | WA5350771 |
| *Columbina minuta* | plain-breasted ground-dove | | | + | | | | | WA5343153 |
| *Columbina talpacoti* | ruddy ground-dove | + | | + | | | | | WA4890394 |
| *Columbina squammata* | scaled dove | | | + | | | | | WA6548803 |
| *Columbina picui* | picui ground-dove | | | + | | | | | WA4897718 |
| Cuculidae | | | | | | | | | |
| *Guira guira* | guira cuckoo | + | | + | | | | | WA4894023 |

**Table 1** (continued)

| Family/species | Common name | MP | TR | AH | PAM | CT | MMA | IUCN | Voucher |
|---|---|---|---|---|---|---|---|---|---|
| *Crotophaga major* | greater ani | + | | + | + | | | | WA5372814 |
| *Crotophaga ani* | smooth-billed ani | + | | + | + | | | | WA4885856 |
| *Tapera naevia* | striped cuckoo | | | + | + | | | | WA6660007 |
| *Dromococcyx pavoninus* | pavonine cuckoo | | | + | | | | | ML465041651 |
| *Coccycua minuta* | little cuckoo | | | + | | | | | WA6614440 |
| *Piaya cayana* | squirrel cuckoo | + | | + | + | | | | WA4901792 |
| *Piaya melanogaster* | black-bellied cuckoo | | | + | | | | | WA6557077 |
| *Coccyzus americanus* | yellow-billed cuckoo | | | + | | | | | |
| Nyctibiidae | | | | | | | | | |
| *Nyctibius grandis* | great potoo | + | | + | + | | | | WA6557010 |
| *Nyctibius aethereus* | long-tailed potoo | | | + | | | | | WA4899719 |
| *Nyctibius griseus* | common potoo | + | | + | + | | | | WA6624866 |
| Caprimulgidae | | | | | | | | | |
| *Nyctiphrynus ocellatus* | ocellated poorwill | | | + | + | | | | WA4889712 |
| *Antrostomus rufus* | rufous nightjar | | | + | + | | | | WA6624981 |
| *Antrostomus sericocaudatus* | silky-tailed nightjar | | | + | + | | | | WA4889738 |
| *Nyctiprogne leucopyga* | band-tailed nighthawk | | | + | + | | | | WA4922894 |
| *Nyctidromus nigrescens* | blackish nightjar | | | + | | | | | WA6628082 |
| *Nyctidromus albicollis* | common pauraque | + | | + | + | | | | WA4901649 |
| *Hydropsalis parvula* | little nightjar | | | | + | | | | WA6903936 |
| *Hydropsalis climacocerca* | ladder-tailed nightjar | | | + | | | | | WA4945901 |
| *Chordeiles rupestris* | sand-colored nighthawk | + | | + | | | | | |
| Apodidae | | | | | | | | | |
| *Streptoprocne zonaris* | white-collared swift | | | + | | | | | |
| *Chaetura spinicaudus* | band-rumped swift | | | + | + | | | | WA4914849 |
| *Chaetura egregia* | pale-rumped swift | | | + | | | | | WA6584506 |
| *Chaetura chapmani* | Chapman's swift | | | + | | | | | |
| *Chaetura brachyura* | short-tailed swift | | | + | | | | | WA4925255 |
| *Tachornis squamata* | fork-tailed palm-swift | | | + | | | | | WA6627970 |
| *Panyptila cayennensis* | lesser swallow-tailed swift | | | + | | | | | |
| Trochilidae | | | | | | | | | |
| *Florisuga mellivora* | white-necked jacobin | | | + | | | | | |
| *Glaucis hirsutus* | rufous-breasted hermit | | | + | | | | | |
| *Phaethornis ruber* | reddish hermit | + | | + | | | | | WA6552264 |
| *Phaethornis hispidus* | white-bearded hermit | | | + | | | | | |
| *Phaethornis philippii* | needle-billed hermit | | | + | | | | | WA4892007 |
| *Phaethornis superciliosus* | long-tailed hermit | + | | + | | | | | WA6560907 |
| *Heliothryx auritus* | black-eared fairy | | | + | | | | | WA6534653 |
| *Polytmus theresiae* | green-tailed goldenthroat | | | + | | | | | WA5343403 |
| *Chrysolampis mosquitus* | ruby-topaz hummingbird | | | + | | | | | ML270443121 |
| *Anthracothorax nigricollis* | black-throated mango | + | | + | | | | | WA4887644 |
| *Lophornis chalybeus* | festive coquette | | | + | | | | | WA3862367 |
| *Heliomaster longirostris* | long-billed starthroat | | | + | | | | | WA6566925 |
| *Calliphlox amethystina* | amethyst woodstar | | | + | | | | | |
| *Campylopterus obscurus* | dusky sabrewing | | | + | | | | | |
| *Thalurania furcata* | fork-tailed woodnymph | | | + | | | | | WA5350826 |
| *Chionomesa fimbriata* | glittering-throated emerald | | | + | | | | | |
| *Chlorestes cyanus* | white-chinned sapphire | | | + | | | | | WA3862365 |
| Opisthocomidae | | | | | | | | | |
| *Opisthocomus hoazin* | hoatzin | + | | + | | | | | ML610436730<br>WA5844431 |
| Aramidae | | | | | | | | | |
| *Aramus guarauna* | limpkin | + | | + | + | | | | WA4911506 |
| Psophiidae | | | | | | | | | |

**Table 1** (continued)

| Family/species | Common name | MP | TR | AH | PAM | CT | MMA | IUCN | Voucher |
|---|---|---|---|---|---|---|---|---|---|
| *Psophia viridis* | green-winged trumpeter | + | + | + | + | + | VU | VU | WA6473366 |
| | | | | | | | | | ML628886593 |
| Rallidae | | | | | | | | | |
| *Porphyrio martinica* | purple gallinule | + | | + | | | | | WA6584610 |
| *Rufirallus viridis* | russet-crowned crake | | | + | | | | | WA5342516 |
| *Mustelirallus albicollis* | ash-throated crake | | | + | | | | | WA6473436 |
| *Aramides cajaneus* | gray-necked wood-rail | | | + | + | | | | WA6548816 |
| *Gallinula galeata* | common gallinule | | | + | | | | | |
| Heliornithidae | | | | | | | | | |
| *Heliornis fulica* | sungrebe | | | + | | | | | WA4898078 |
| Charadriidae | | | | | | | | | |
| *Vanellus cayanus* | pied lapwing | + | | + | | | | | WA4911720 |
| *Vanellus chilensis* | southern lapwing | + | | + | + | | | | WA4890442 |
| *Charadrius collaris* | collared plover | | | + | | | | | |
| Scolopacidae | | | | | | | | | |
| *Bartramia longicauda* | upland sandpiper | | | + | | | | | |
| *Calidris melanotos* | pectoral sandpiper | | | + | | | | | ML610436743 |
| *Calidris fuscicollis* | white-rumped sandpiper | | | + | | | | VU | ML610468142 |
| *Actitis macularius* | spotted sandpiper | | | + | | | | | WA6560863 |
| *Tringa solitaria* | solitary sandpiper | | | + | | | | | ML610468146 |
| *Tringa melanoleuca* | greater yellowlegs | | | + | | | | NT | |
| *Tringa flavipes* | lesser yellowlegs | | | + | | | | VU | ML633292741 |
| Jacanidae | | | | | | | | | |
| *Jacana jacana* | wattled jacana | + | | + | | | | | WA4887495 |
| Laridae | | | | | | | | | |
| *Rynchops niger* | black skimmer | + | | + | | | | | WA4906900 |
| *Sternula superciliaris* | yellow-billed tern | | | + | | | | | WA6268064 |
| *Phaetusa simplex* | large-billed tern | + | | + | + | | | | WA4907008 |
| Eurypygidae | | | | | | | | | |
| *Eurypyga helias* | sunbittern | + | | + | | | | | WA6473792 |
| Ciconiidae | | | | | | | | | |
| *Ciconia maguari* | maguari stork | | | + | | | | | ML557431541 |
| *Jabiru mycteria* | jabiru | + | | + | | | | | WA5844355 |
| *Mycteria americana* | wood stork | + | | + | | | | | WA4894104 |
| Anhingidae | | | | | | | | | |
| *Anhinga anhinga* | anhinga | + | | + | | | | | WA4901814 |
| Phalacrocoracidae | | | | | | | | | |
| *Nannopterum brasilianum* | Neotropic cormorant | + | | + | | | | | WA5844437 |
| Ardeidae | | | | | | | | | |
| *Tigrisoma lineatum* | rufescent tiger-heron | + | | + | | | | | WA4914575 |
| *Agamia agami* | agami heron | + | | + | | | | NT | WA5844358 |
| *Cochlearius cochlearius* | boat-billed heron | + | | + | | | | | |
| *Nycticorax nycticorax* | black-crowned night-heron | | | + | | | | | WA4901694 |
| *Butorides striata* | striated heron | + | | + | | | | | WA4915066 |
| *Bubulcus ibis* | cattle egret | + | | + | | | | | |
| *Ardea cocoi* | cocoi heron | + | | + | | | | | WA4890685 |
| *Ardea alba* | great egret | + | | + | | | | | WA4915015 |
| *Pilherodius pileatus* | capped heron | + | | + | | | | | WA4890392 |
| *Egretta thula* | snowy egret | + | | + | | | | | WA4914803 |
| *Egretta caerulea* | little blue heron | | | + | | | | | WA6613971 |
| Threskiornithidae | | | | | | | | | |
| *Mesembrinibis cayennensis* | green ibis | | | + | | | | | WA4901617 |
| *Phimosus infuscatus* | bare-faced ibis | | | + | | | | | WA6641163 |
| *Theristicus caudatus* | buff-necked ibis | | | + | + | | | | WA4906967 |

**Table 1** (continued)

| Family/species | Common name | MP | TR | AH | PAM | CT | MMA | IUCN | Voucher |
|---|---|---|---|---|---|---|---|---|---|
| *Platalea ajaja* | roseate spoonbill | | | + | | | | | WA4901855 |
| Cathartidae | | | | | | | | | |
| *Sarcoramphus papa* | king vulture | + | | + | | | | | WA4925191 |
| *Coragyps atratus* | black vulture | + | | + | | | | | WA4897876 |
| *Cathartes aura* | turkey vulture | + | | + | | | | | WA4887655 |
| *Cathartes burrovianus* | lesser yellow-headed vulture | | | + | | | | | WA4890517 |
| *Cathartes melambrotus* | greater yellow-headed vulture | + | | + | | | | | WA4897959 |
| Pandionidae | | | | | | | | | |
| *Pandion haliaetus* | osprey | | | + | | | | | WA4911566 |
| Accipitridae | | | | | | | | | |
| *Gampsonyx swainsonii* | pearl kite | | | + | | | | | |
| *Elanus leucurus* | white-tailed kite | | | + | | | | | WA4901839 |
| *Chondrohierax uncinatus* | hook-billed kite | + | | + | | | | | ML610468207 |
| *Leptodon cayanensis* | gray-headed kite | | | + | + | | | | WA4925291 |
| *Elanoides forficatus* | swallow-tailed kite | + | | + | | | | | WA6614432 |
| *Morphnus guianensis* | crested eagle | | | + | | | VU | NT | IN316501435 |
| *Harpia harpyja* | harpy eagle | + | | + | + | | VU | VU | IN128502392 |
| *Busarellus nigricollis* | black-collared hawk | + | | + | | | | | WA4906909 |
| *Rostrhamus sociabilis* | snail kite | | | + | | | | | WA4890399 |
| *Harpagus bidentatus* | double-toothed kite | | | + | | | | | WA4909289 |
| *Ictinia plumbea* | plumbeous kite | + | | + | | | | | WA6552276 |
| *Hieraspiza superciliosa* | tiny hawk | | | + | | | | | |
| *Geranospiza caerulescens* | crane hawk | | | + | | | | | WA4897659 |
| *Buteogallus schistaceus* | slate-colored hawk | | | + | + | | | | WA6616403 |
| *Heterospizias meridionalis* | savanna hawk | | | + | | | | | WA4918023 |
| *Urubitinga urubitinga* | great black hawk | | | + | | | | | WA4894351 |
| *Rupornis magnirostris* | roadside hawk | + | | + | + | | | | WA4894085 |
| *Geranoaetus albicaudatus* | white-tailed hawk | | | + | | | | | WA4888049 |
| *Leucopternis kuhli* | white-browed hawk | | | | + | | | | WA7309873 |
| *Buteo nitidus* | gray-lined hawk | + | | + | | | | | WA4887971 |
| *Buteo platypterus* | broad-winged hawk | | | + | | | | | WA6464169 |
| *Buteo brachyurus* | short-tailed hawk | | | + | | | | | |
| *Buteo albonotatus* | zone-tailed hawk | | | + | | | | | WA6542358 |
| Tytonidae | | | | | | | | | |
| *Tyto furcata* | American barn owl | + | | + | | | | | |
| Strigidae | | | | | | | | | |
| *Megascops choliba* | Tropical screech-owl | | | + | + | | | | WA4897731 |
| *Megascops usta* | variable screech-owl | | | + | + | | | | WA4906525 |
| *Lophostrix cristata* | crested owl | | | + | + | | | | WA4899706 |
| *Pulsatrix perspicillata* | spectacled owl | + | | + | + | | | | WA6622251 |
| *Strix virgata* | mottled owl | | | + | + | | | | WA6539284 |
| *Strix huhula* | black-banded owl | | | + | + | | | | WA4904141 |
| *Glaucidium hardyi* | Amazonian pygmy-owl | | | + | + | | | | WA6584585 |
| *Glaucidium brasilianum* | ferruginous pygmy-owl | | | + | + | | | | WA4894346 |
| *Athene cunicularia* | burrowing owl | | | + | | | | | WA4906788 |
| Trogonidae | | | | | | | | | |
| *Pharomachrus pavoninus* | pavonine quetzal | | | + | + | | | | WA6614417 |
| *Trogon melanurus* | black-tailed trogon | | | + | + | | | | WA5350758 |
| *Trogon viridis* | green-backed trogon | + | | + | + | | | | WA6552269 |
| *Trogon ramonianus* | Amazonian trogon | | | + | + | | | | ML556534331 |
| *Trogon curucui* | blue-crowned trogon | + | | + | + | | | | WA4894205 |
| *Trogon collaris* | collared trogon | | | + | + | | | | WA5343264 |
| Momotidae | | | | | | | | | |
| *Electron platyrhynchum* | broad-billed motmot | | | + | + | | | | WA6642155 |

**Table 1** (continued)

| Family/species | Common name | MP | TR | AH | PAM | CT | MMA | IUCN | Voucher |
|---|---|---|---|---|---|---|---|---|---|
| *Baryphthengus martii* | rufous motmot | | | + | + | | | | ML465040921 |
| *Momotus momota* | Amazonian motmot | + | + | + | | + | | | WA6473738 |
| Alcedinidae | | | | | | | | | |
| *Megaceryle torquata* | ringed kingfisher | + | | + | | | | | WA4897768 |
| *Chloroceryle amazona* | Amazon kingfisher | | | + | | | | | |
| *Chloroceryle aenea* | pygmy kingfisher | | | + | | | | | |
| *Chloroceryle americana* | green kingfisher | + | | + | | | | | WA4890458 |
| *Chloroceryle inda* | green-and-rufous kingfisher | | | + | | | | | |
| Galbulidae | | | | | | | | | |
| *Brachygalba lugubris* | brown jacamar | | | + | | | | | |
| *Galbula cyanicollis* | blue-cheeked jacamar | | | + | | | | | WA6464166 |
| *Galbula ruficauda* | rufous-tailed jacamar | | | + | + | | | | WA6542347 |
| *Galbula leucogastra* | bronzy jacamar | | | + | | | | | |
| *Galbula dea* | paradise jacamar | | | + | | | | | |
| *Jacamerops aureus* | great jacamar | | | + | + | | | | WA5343355 |
| Bucconidae | | | | | | | | | |
| *Chelidoptera tenebrosa* | swallow-winged puffbird | + | | + | | | | | WA4890605 |
| *Monasa morphoeus* | white-fronted nunbird | + | | + | + | | | | WA5346512 |
| *Monasa nigrifrons* | black-fronted nunbird | + | | + | + | | | | WA4911794 |
| *Malacoptila rufa* | rufous-necked puffbird | + | | + | | | | | WA5844352 |
| *Notharchus hyperrhynchus* | white-necked puffbird | | | + | + | | | | WA4898145 |
| *Bucco capensis* | collared puffbird | | | | + | | | | WA6709909 |
| *Nystalus striolatus* | Natterer's striolated puffbird | | | + | + | | | | WA6548754 |
| Capitonidae | | | | | | | | | |
| *Capito dayi* | black-girdled barbet | | | + | + | | VU | NT | WA6566928 |
| Ramphastidae | | | | | | | | | |
| *Ramphastos tucanus* | white-throated toucan | + | | + | + | | | | WA4918453 |
| *Ramphastos vitellinus* | channel-billed toucan | | | + | + | | | | WA4895526 |
| *Selenidera gouldii* | Gould's toucanet | | | + | + | | | | WA7309915 |
| *Pteroglossus inscriptus* | lettered aracari | | | + | | | | | WA4917745 |
| *Pteroglossus castanotis* | chestnut-eared aracari | + | | + | + | | | | WA4898036 |
| *Pteroglossus bitorquatus* | red-necked aracari | | | + | | | | NT | WA6616272 |
| Picidae | | | | | | | | | |
| *Picumnus aurifrons* | bar-breasted piculet | | | + | | | | | WA6464154 |
| *Melanerpes candidus* | white woodpecker | | | + | | | | | |
| *Melanerpes cruentatus* | yellow-tufted woodpecker | + | | + | + | | | | WA4906766 |
| *Veniliornis affinis* | red-stained woodpecker | | | + | | | | | WA5447718 |
| *Veniliornis passerinus* | little woodpecker | + | | + | | | | | |
| *Campephilus rubricollis* | red-necked woodpecker | | | + | + | | | | WA6613987 |
| *Campephilus melanoleucos* | crimson-crested woodpecker | + | | + | | | | | WA4898018 |
| *Dryocopus lineatus* | lineated woodpecker | + | | + | | | | | WA4897702 |
| *Celeus torquatus* | ringed woodpecker | | | + | + | | | | WA5345576 |
| *Celeus undatus* | waved woodpecker | | | + | + | | | | WA5872097 |
| *Celeus flavus* | cream-colored woodpecker | | | + | + | | | | WA6557078 |
| *Celeus elegans* | chestnut woodpecker | | | + | | | | | |
| *Piculus flavigula* | yellow-throated woodpecker | | | + | + | | | | WA5511141 |
| *Piculus laemostictus* | spot-throated woodpecker | | | + | + | | | | WA4889595 |
| Falconidae | | | | | | | | | |
| *Herpetotheres cachinnans* | laughing falcon | + | | + | + | | | | WA4911545 |
| *Micrastur ruficollis* | barred forest-falcon | | | + | + | | | | WA4900180 |
| *Micrastur mintoni* | cryptic forest-falcon | | + | + | + | + | | NT | WA4896118 |
| *Micrastur mirandollei* | slaty-backed forest-falcon | | | + | | | | | WA5372184 |
| *Micrastur semitorquatus* | collared forest-falcon | | | + | + | | | | WA5345581 |
| *Caracara plancus* | crested caracara | | | + | | | | | WA4911576 |

**Table 1** (continued)

| Family/species | Common name | MP | TR | AH | PAM | CT | MMA | IUCN | Voucher |
|---|---|---|---|---|---|---|---|---|---|
| *Ibycter americanus* | red-throated caracara | + | | + | + | | | | WA4911679 |
| *Daptrius ater* | black caracara | + | | + | + | | | | WA4906760 |
| *Milvago chimachima* | yellow-headed caracara | | | + | | | | | |
| *Falco sparverius* | American kestrel | | | + | | | | | ML610281991 |
| *Falco rufigularis* | bat falcon | | | + | + | | | | ML557431761 |
| Psittacidae | | | | | | | | | |
| *Brotogeris sanctithomae* | tui parakeet | + | | + | + | | | | WA5844421 |
| *Brotogeris chiriri* | yellow-chevroned parakeet | | | + | | | | | |
| *Brotogeris chrysoptera* | golden-winged parakeet | | | + | | | | | WA6552241 |
| *Pyrilia barrabandi* | orange-cheeked parrot | | | + | | | | | WA6552307 |
| *Pionus menstruus* | blue-headed parrot | + | | + | | | | | WA6539347 |
| *Amazona ochrocephala* | yellow-crowned parrot | + | | + | + | | | | WA4911649 |
| *Amazona farinosa* | mealy parrot | + | | + | + | | | | WA6566921 |
| *Amazona amazonica* | orange-winged parrot | | | + | | | | | WA4923769 |
| *Pionites leucogaster* | white-bellied parrot | | | + | | | | VU | |
| *Deroptyus accipitrinus* | red-fan parrot | | | + | | | | | |
| *Pyrrhura perlata* | crimson-bellied parakeet | + | | + | | | VU | | WA5844422 |
| *Pyrrhura pallescens* | Madeira parakeet | + | | + | | | VU | | WA4918379 |
| *Eupsittula aurea* | peach-fronted parakeet | | | + | | | | | WA4918044 |
| *Aratinga weddellii* | dusky-headed parakeet | + | | + | + | | | | WA5873350 |
| *Orthopsittaca manilatus* | red-bellied macaw | | | + | | | | | WA4890719 |
| *Primolius auricollis* | yellow-collared macaw | | | + | | | | | WA4901776 |
| *Ara ararauna* | blue-and-yellow macaw | + | | + | | | | | WA5844420 |
| *Ara severus* | chestnut-fronted macaw | + | | + | | | | | WA4911812 |
| *Ara macao* | scarlet macaw | + | | + | | | | | WA4901832 |
| *Ara chloropterus* | red-and-green macaw | + | | + | | | | | WA6584569 |
| *Diopsittaca nobilis* | red-shouldered macaw | | | + | | | | | |
| *Psittacara leucophthalmus* | white-eyed parakeet | | | + | | | | | WA4911216 |
| Thamnophilidae | | | | | | | | | |
| *Euchrepomis humeralis* | chestnut-shouldered antwren | | | + | | | | | WA4909409 |
| *Pygiptila stellaris* | spot-winged antshrike | | | + | + | | | | WA6473729 |
| *Microrhopias quixensis* | dot-winged antwren | | | + | | | | | WA5372680 |
| *Epinecrophylla leucophthalma* | white-eyed stipplethroat | | | + | | | | | WA5413582 |
| *Epinecrophylla ornata* | ornate stipplethroat | | | + | | | | | |
| *Myrmophylax atrothorax* | black-throated antbird | | | + | | | | | |
| *Myrmotherula brachyura* | pygmy antwren | | | + | | | | | WA5466778 |
| *Myrmotherula sclateri* | Sclater's antwren | | | + | | | | | WA6529016 |
| *Myrmotherula multostriata* | Amazonian streaked-antwren | | | + | | | | | WA6542360 |
| *Myrmotherula axillaris* | white-flanked antwren | | | + | | | | | WA6533782 |
| *Myrmotherula longipennis* | long-winged antwren | | | + | | | | | ML465041521 |
| *Myrmotherula menetriesii* | gray antwren | | | + | | | | | WA4904041 |
| *Myrmotherula assimilis* | leaden antwren | | | + | | | | | WA5577465 |
| *Formicivora grisea* | white-fringed antwren | | | + | + | | | | WA5346487 |
| *Formicivora rufa* | rusty-backed antwren | | | + | | | | | WA5450375 |
| *Isleria hauxwelli* | plain-throated antwren | + | | + | | | | | WA6627988 |
| *Thamnomanes caesius* | cinereous antshrike | | | + | + | | | | WA6464157 |
| *Thamnomanes saturninus* | saturnine antshrike | | | + | | | | | WA6464145 |
| *Herpsilochmus frater* | northern rufous-winged antwren | | | + | + | | | | WA6535217 |
| *Thamnophilus doliatus* | barred antshrike | + | | + | | | | | WA5346421 |
| *Thamnophilus palliatus* | chestnut-backed antshrike | | | + | + | | | | WA6473698 |
| *Thamnophilus schistaceus* | plain-winged antshrike | + | | + | + | | | | WA6566939 |
| *Thamnophilus stictocephalus* | Natterer's slaty-antshrike | | | + | | | | | WA5350760 |
| *Thamnophilus aethiops* | white-shouldered antshrike | + | | + | + | | | | WA4895919 |
| *Thamnophilus amazonicus* | Amazonian antshrike | | | + | + | | | | WA4897950 |

**Table 1** (continued)

| Family/species | Common name | MP | TR | AH | PAM | CT | MMA | IUCN | Voucher |
|---|---|---|---|---|---|---|---|---|---|
| *Cymbilaimus lineatus* | fasciated antshrike | | | + | + | | | | WA5372669 |
| *Taraba major* | great antshrike | + | | + | | | | | WA6473697 |
| *Hypocnemoides maculicauda* | band-tailed antbird | | | + | + | | | | WA4901809 |
| *Hylophylax naevius* | spot-backed antbird | | | + | | | | | |
| *Sclateria naevia* | silvered antbird | | | + | | | | | WA4895573 |
| *Myrmoborus myotherinus* | black-faced antbird | | | + | + | | | | WA5872093 |
| *Myrmoborus leucophrys* | white-browed antbird | | | + | + | | | | WA6535219 |
| *Sciaphylax pallens* | eastern white-bellied antbird | + | | + | + | | | | WA6464160 |
| *Cercomacra cinerascens* | gray antbird | | | + | + | | | | WA6566924 |
| *Cercomacroides nigrescens* | blackish antbird | | | + | + | | | | WA6464164 |
| *Hypocnemis ochrogyna* | Rondonia warbling-antbird | + | | + | + | | VU | VU | ML557430631 |
| *Willisornis poecilinotus* | common scale-backed antbird | + | | + | + | | | | WA6616477 |
| *Phlegopsis nigromaculata* | black-spotted bare-eye | | | + | + | | | | WA4889471 |
| *Rhegmatorhina hoffmannsi* | white-breasted antbird | | | + | + | | VU | | WA4899987 |
| Conopophagidae | | | | | | | | | |
| *Conopophaga melanogaster* | black-bellied gnateater | + | | | | | | | |
| *Conopophaga aurita* | chestnut-belted gnateater | | | + | + | | | | WA4913887 |
| Grallariidae | | | | | | | | | |
| *Hylopezus whittakeri* | Alta Floresta antpitta | | | + | | | | | WA6627961 |
| *Myrmothera subcanescens* | Tapajos antpitta | | | + | | | | | WA5372189 |
| Formicariidae | | | | | | | | | |
| *Formicarius colma* | rufous-capped antthrush | | | + | | | | | WA6627969 |
| Scleruridae | | | | | | | | | |
| *Sclerurus rufigularis* | short-billed leaftosser | | | + | | | | | WA5371751 |
| Dendrocolaptidae | | | | | | | | | |
| *Sittasomus griseicapillus* | olivaceous woodcreeper | | | + | | | | | |
| *Dendrocincla merula* | white-chinned woodcreeper | + | | + | | | | | |
| *Dendrocincla atrirostris* | d'Orbigny's woodcreeper | + | | + | + | | | | ML465041321 |
| *Glyphorynchus spirurus* | wedge-billed woodcreeper | + | | + | + | | | | WA4897649 |
| *Dendrexetastes paraensis* | Para woodcreeper | | | + | | | | | WA4897618 |
| *Nasica longirostris* | long-billed woodcreeper | | | + | + | | | | WA5844425 |
| *Dendrocolaptes concolor* | plain-colored woodcreeper | | | + | | | | | ML465041311 |
| *Dendrocolaptes hoffmannsi* | Hoffmanns's woodcreeper | | | + | + | | | | WA4904403 |
| *Hylexetastes uniformis* | uniform woodcreeper | | | + | + | | VU | VU | ML465041241 |
| *Xiphocolaptes promeropirhynchus* | strong-billed woodcreeper | + | | + | + | | | | WA4896112 |
| *Xiphorhynchus obsoletus* | striped woodcreeper | | | + | + | | | | WA6473727 |
| *Xiphorhynchus elegans* | elegant woodcreeper | + | | + | + | | | | WA4899831 |
| *Xiphorhynchus guttatoides* | Lafresnaye's woodcreeper | | | + | + | | | | WA4901783 |
| *Dendroplex picus* | straight-billed woodcreeper | | | + | + | | | | WA5577418 |
| *Lepidocolaptes angustirostris* | narrow-billed woodcreeper | | | + | | | | | WA6614435 |
| *Lepidocolaptes fuscicapillus* | Rondonia woodcreeper | | | + | + | | | | WA5345873 |
| Xenopidae | | | | | | | | | |
| *Xenops tenuirostris* | slender-billed xenops | | | + | | | | | WA5372621 |
| *Xenops minutus* | plain xenops | | | + | | | | | WA6566841 |
| *Xenops rutilans* | streaked xenops | | | + | + | | | | |
| Furnariidae | | | | | | | | | |
| *Philydor erythrocercum* | rufous-rumped foliage-gleaner | | | + | | | | | WA4896137 |
| *Anabacerthia ruficaudata* | rufous-tailed foliage-gleaner | | | + | | | | | |
| *Ancistrops strigilatus* | chestnut-winged hookbill | | | + | | | | | |
| *Dendroma erythroptera* | chestnut-winged foliage-gleaner | | | + | | | | | |
| *Automolus subulatus* | striped woodhaunter | | | + | | | | | WA4903950 |
| *Automolus ochrolaemus* | buff-throated foliage-gleaner | + | | + | + | | | | WA6473501 |
| *Automolus paraensis* | Para foliage-gleaner | | | + | | | | | |
| *Cranioleuca vulpina* | rusty-backed spinetail | | | + | | | | | WA5346436 |

**Table 1** (continued)

| Family/species | Common name | MP | TR | AH | PAM | CT | MMA | IUCN | Voucher |
|---|---|---|---|---|---|---|---|---|---|
| *Certhiaxis cinnamomeus* | yellow-chinned spinetail | | | + | | | | | WA4915046 |
| *Synallaxis gujanensis* | plain-crowned spinetail | | | + | | | | | |
| *Synallaxis rutilans* | ruddy spinetail | | | + | | | | | WA6473377 |
| Pipridae | | | | | | | | | |
| *Neopelma sulphureiventer* | sulphur-bellied tyrant-manakin | | | + | + | | | | ML633283832 |
| *Tyranneutes stolzmanni* | dwarf tyrant-manakin | | | + | + | | | | WA4918163 |
| *Chiroxiphia regina* | queen manakin | | | + | + | | | | WA6614453 |
| *Xenopipo atronitens* | black manakin | | | + | | | | | ML556534401 |
| *Lepidothrix nattereri* | snow-capped manakin | + | | + | + | | | | WA6529035 |
| *Manacus manacus* | white-bearded manakin | | | + | + | | | | WA6464077 |
| *Heterocercus linteatus* | flame-crowned manakin | | | + | | | | | WA6473769 |
| | | | | | | | | | ML628888423 |
| *Pipra fasciicauda* | band-tailed manakin | | | + | + | | | | WA6528933 |
| *Machaeropterus pyrocephalus* | fiery-capped manakin | | | + | | | | | |
| *Ceratopipra rubrocapilla* | red-headed manakin | + | | + | + | | | | WA6616399 |
| Cotingidae | | | | | | | | | |
| *Phoenicircus nigricollis* | black-necked red-cotinga | | | + | + | | | | WA6473489 |
| *Querula purpurata* | purple-throated fruitcrow | | | + | + | | | | WA6560881 |
| *Cephalopterus ornatus* | Amazonian umbrellabird | | | + | | | | | WA4901413 |
| *Lipaugus vociferans* | screaming piha | + | | + | + | | | | WA4894102 |
| *Cotinga cayana* | spangled cotinga | | | + | | | | | ML556519911 |
| *Gymnoderus foetidus* | bare-necked fruitcrow | | | + | | | | | ML628888355 |
| *Xipholena punicea* | pompadour cotinga | + | | | | | | | |
| Tityridae | | | | | | | | | |
| *Schiffornis turdina* | thrush-like schiffornis | | | + | + | | | | WA4885585 |
| *Laniocera hypopyrra* | cinereous mourner | + | | + | | | | | ML465041771 |
| *Iodopleura isabellae* | white-browed purpletuft | | | + | | | | | ML270443241 |
| *Tityra inquisitor* | black-crowned tityra | | | + | | | | | WA6473703 |
| *Tityra cayana* | black-tailed tityra | | | + | + | | | | |
| *Tityra semifasciata* | masked tityra | | | + | | | | | ML581269971 |
| *Pachyramphus castaneus* | chestnut-crowned becard | | | + | | | | | WA6473718 |
| *Pachyramphus polychopterus* | white-winged becard | | | + | | | | | |
| *Pachyramphus marginatus* | black-capped becard | | | + | | | | | |
| *Pachyramphus minor* | pink-throated becard | | | + | | | | | ML581270811 |
| Onychorhynchidae | | | | | | | | | |
| *Onychorhynchus coronatus* | royal flycatcher | + | | + | + | | | | WA6642654 |
| *Terenotriccus erythrurus* | ruddy-tailed flycatcher | | | + | | | | | |
| *Myiobius barbatus* | whiskered flycatcher | | | + | | | | | |
| Pipritidae | | | | | | | | | |
| *Piprites chloris* | wing-barred piprites | | | + | + | | | | WA6539358 |
| Platyrinchidae | | | | | | | | | |
| *Platyrinchus platyrhynchos* | white-crested spadebill | | | + | + | | | | WA6584613 |
| Rhynchocyclidae | | | | | | | | | |
| *Mionectes oleagineus* | ochre-bellied flycatcher | | | + | | | | | |
| *Leptopogon amaurocephalus* | sepia-capped flycatcher | | | + | | | | | WA6539370 |
| *Rhynchocyclus olivaceus* | olivaceous flatbill | | | + | | | | | WA4904002 |
| *Tolmomyias sulphurescens* | yellow-olive flycatcher | | | + | | | | | WA6528870 |
| *Tolmomyias assimilis* | yellow-margined flycatcher | | | + | | | | | WA5413615 |
| *Tolmomyias poliocephalus* | gray-crowned flycatcher | | | + | | | | | |
| *Tolmomyias flaviventris* | yellow-breasted flycatcher | | | + | + | | | | WA6627977 |
| *Todirostrum maculatum* | spotted tody-flycatcher | | | + | | | | | WA4918281 |
| *Todirostrum cinereum* | common tody-flycatcher | | | + | | | | | |
| *Todirostrum chrysocrotaphum* | yellow-browed tody-flycatcher | | | + | + | | | | |
| *Poecilotriccus latirostris* | rusty-fronted tody-flycatcher | | | + | | | | | WA6535221 |

**Table 1** (continued)

| Family/species | Common name | MP | TR | AH | PAM | CT | MMA | IUCN | Voucher |
|---|---|---|---|---|---|---|---|---|---|
| *Myiornis ecaudatus* | short-tailed pygmy-tyrant | | | + | | | | | ML557430791 |
| *Hemitriccus minor* | Snethlage's tody-tyrant | | | + | + | | | | WA6566799 |
| *Hemitriccus striaticollis* | stripe-necked tody-tyrant | | | + | | | | | WA6548821 |
| *Hemitriccus minimus* | Zimmer's tody-tyrant | | | + | | | | | WA5511227 |
| Tyrannidae | | | | | | | | | |
| *Zimmerius gracilipes* | slender-footed tyrannulet | | | + | + | | | | WA6473731 |
| *Inezia inornata* | plain tyrannulet | | | + | | | | | WA4923640 |
| *Inezia subflava* | Amazonian tyrannulet | | | + | | | | | |
| *Ornithion inerme* | white-lored tyrannulet | | | + | | | | | WA4900170 |
| *Camptostoma obsoletum* | southern beardless-tyrannulet | | | + | + | | | | WA6557074 |
| *Elaenia flavogaster* | yellow-bellied elaenia | | | + | | | | | WA6542331 |
| *Elaenia parvirostris* | small-billed elaenia | | | + | | | | | ML270443371 |
| *Elaenia cristata* | plain-crested elaenia | | | + | | | | | WA6627973 |
| *Myiopagis gaimardii* | forest elaenia | | | + | + | | | | WA4918120 |
| *Myiopagis caniceps* | gray elaenia | | | + | | | | | WA5872596 |
| *Myiopagis viridicata* | greenish elaenia | | | + | | | | | |
| *Tyrannulus elatus* | yellow-crowned tyrannulet | | | + | | | | | WA5372785 |
| *Phaeomyias murina* | mouse-colored tyrannulet | | | + | | | | | WA6560846 |
| *Attila cinnamomeus* | cinnamon attila | | | + | + | | | | WA6464155 |
| *Attila bolivianus* | dull-capped attila | | | + | + | | | | WA6622295 |
| *Attila spadiceus* | bright-rumped attila | + | | + | + | | | | WA4893497 |
| *Legatus leucophaius* | piratic flycatcher | | | + | + | | | | WA6613983 |
| *Ramphotrigon ruficauda* | rufous-tailed flatbill | | | + | + | | | | WA4901586 |
| *Myiarchus tuberculifer* | dusky-capped flycatcher | | | + | | | | | WA6464151 |
| *Myiarchus swainsoni* | Swainson´s flycatcher | | | + | | | | | WA6548805 |
| *Myiarchus ferox* | short-crested flycatcher | | | + | | | | | WA4897691 |
| *Myiarchus tyrannulus* | brown-crested flycatcher | | | + | + | | | | WA4918070 |
| *Sirystes albocinereus* | white-rumped sirystes | | | + | | | | | |
| *Rhytipterna simplex* | grayish mourner | | | + | + | | | | WA4904272 |
| *Casiornis rufus* | rufous casiornis | | | + | | | | | WA6473701 |
| *Pitangus sulphuratus* | great kiskadee | + | | + | + | | | | WA4890403 |
| *Philohydor lictor* | lesser kiskadee | | | + | | | | | WA4914836 |
| *Machetornis rixosa* | cattle tyrant | | | + | | | | | WA4897631 |
| *Myiodynastes maculatus* | streaked flycatcher | | | + | + | | | | WA4897687 |
| *Tyrannopsis sulphurea* | sulphury flycatcher | | | + | | | | | |
| *Megarynchus pitangua* | boat-billed flycatcher | | | + | + | | | | WA4918136 |
| *Myiozetetes cayanensis* | rusty-margined flycatcher | | | + | + | | | | WA4901725 |
| *Myiozetetes luteiventris* | dusky-chested flycatcher | | | + | | | | | WA6473723 |
| *Tyrannus melancholicus* | Tropical kingbird | | | + | | | | | WA4890541 |
| *Tyrannus savana* | southern fork-tailed flycatcher | | | + | | | | | WA6628047 |
| *Empidonomus varius* | variegated flycatcher | | | + | | | | | WA5350772 |
| *Griseotyrannus aurantioatrocristatus* | crowned slaty flycatcher | | | + | | | | | |
| *Sublegatus modestus* | southern scrub-flycatcher | | | + | | | | | |
| *Fluvicola albiventer* | black-backed water-tyrant | | | + | | | | | WA6641312 |
| *Pyrocephalus rubinus* | vermilion flycatcher | + | | + | | | | | WA6614458 |
| *Myiophobus fasciatus* | bran-colored flycatcher | | | + | | | | | |
| *Ochthornis littoralis* | drab water tyrant | | | + | | | | | WA4894152 |
| *Cnemotriccus fuscatus* | fuscous flycatcher | | | + | + | | | | WA4889695 |
| *Lathrotriccus euleri* | Euler's flycatcher | | | + | + | | | | WA4901574 |
| *Contopus cooperi* | olive-sided flycatcher | | | + | | | | NT | WA5372646 |
| *Contopus virens* | eastern wood-pewee | | | + | | | | | WA5372844 |
| *Knipolegus poecilocercus* | Amazonian black-tyrant | | | + | | | | | WA6473713 |
| *Knipolegus hudsoni* | Hudson's black-tyrant | | | + | | | | | WA5071022 |
| *Nengetus cinereus* | gray monjita | | | + | | | | | WA4897676 |

**Table 1** (continued)

| Family/species | Common name | MP | TR | AH | PAM | CT | MMA | IUCN | Voucher |
|---|---|---|---|---|---|---|---|---|---|
| Vireonidae | | | | | | | | | |
| *Cyclarhis gujanensis* | rufous-browed peppershrike | | | + | + | | | | WA4894294 |
| *Vireolanius leucotis* | slaty-capped shrike-vireo | | | + | + | | | | WA4903759 |
| *Hylophilus semicinereus* | gray-chested greenlet | | | + | + | | | | WA4925204 |
| *Pachysylvia muscicapina* | buff-cheeked greenlet | | | + | + | | | | WA4900120 |
| *Vireo olivaceus* | red-eyed vireo | | | + | | | | | WA6539382 |
| *Vireo chivi* | chivi vireo | | | + | | | | | |
| Corvidae | | | | | | | | | |
| *Cyanocorax chrysops* | | | | + | + | | | | WA6666302 |
| Hirundinidae | | | | | | | | | |
| *Pygochelidon melanoleuca* | black-collared swallow | | | + | | | | | |
| *Atticora fasciata* | white-banded swallow | + | | + | | | | | WA6614443 |
| *Stelgidopteryx ruficollis* | southern rough-winged swallow | | | + | | | | | WA4910428 |
| *Progne tapera* | brown-chested martin | + | | + | | | | | WA6628048 |
| *Progne subis* | purple martin | | | + | | | | | WA5345995 |
| *Progne chalybea* | gray-breasted martin | | | + | | | | | WA4890468 |
| *Tachycineta albiventer* | white-winged swallow | + | | + | | | | | WA4894121 |
| *Hirundo rustica* | barn swallow | | | + | | | | | |
| Troglodytidae | | | | | | | | | |
| *Microcerculus marginatus* | scaly-breasted wren | | | + | + | | | | ML628716596 |
| *Odontorchilus cinereus* | tooth-billed wren | | | + | | | | | WA4904311 |
| *Troglodytes musculus* | southern house wren | | | + | | | | | WA4890660 |
| *Campylorhynchus turdinus* | thrush-like wren | | | + | | | | | WA4893989 |
| | | | | | | | | | ML629209184 |
| *Pheugopedius genibarbis* | moustached wren | + | | + | + | | | | WA4910544 |
| *Cantorchilus leucotis* | buff-breasted wren | | | + | | | | | |
| *Cantorchilus guarayanus* | fawn-breasted wren | | | + | + | | | | |
| | | | | | | | | | WA6584446 |
| | | | | | | | | | ML629573385 |
| | | | | | | | | | ML629573392 |
| *Cyphorhinus interpositus* | Rondonia wren | | | + | | | | | |
| Polioptilidae | | | | | | | | | |
| *Ramphocaenus sticturus* | chattering gnatwren | | | + | + | | | | WA5342441 |
| Donacobiidae | | | | | | | | | |
| *Donacobius atricapilla* | black-capped donacobius | + | | + | | | | | WA4901358 |
| Turdidae | | | | | | | | | |
| *Turdus hauxwelli* | Hauxwell´s thrush | | | | + | | | | WA6535209 |
| *Turdus lawrencii* | Lawrence's thrush | | | + | | | | | |
| *Turdus amaurochalinus* | creamy-bellied thrush | | | + | | | | | WA6616363 |
| *Turdus albicollis* | white-necked thrush | + | | | + | | | | |
| Passeridae | | | | | | | | | |
| *Passer domesticus* | house sparrow | | | + | | | | | WA6628051 |
| Fringillidae | | | | | | | | | |
| *Euphonia chlorotica* | purple-throated euphonia | | | + | + | | | | WA6628055 |
| *Euphonia chrysopasta* | golden-bellied euphonia | | | + | | | | | WA5235599 |
| *Euphonia minuta* | white-vented euphonia | | | + | | | | | WA4894171 |
| *Euphonia laniirostris* | thick-billed euphonia | | | + | | | | | WA4901556 |
| *Euphonia xanthogaster* | orange-bellied euphonia | | | + | | | | | |
| *Euphonia rufiventris* | rufous-bellied euphonia | | | + | | | | | WA4897663 |
| Passerellidae | | | | | | | | | |
| *Ammodramus humeralis* | grassland sparrow | | | + | | | | | WA5791039 |
| *Ammodramus aurifrons* | yellow-browed sparrow | | | + | | | | | ML581228771 |
| *Arremon taciturnus* | pectoral sparrow | | | + | + | | | | WA6539291 |
| *Zonotrichia capensis* | rufous-collared sparrow | | | + | | | | | WA6614424 |
| | | | | | | | | | ML629530185 |

**Table 1** (continued)

| Family/species | Common name | MP | TR | AH | PAM | CT | MMA | IUCN | Voucher |
|---|---|---|---|---|---|---|---|---|---|
| Icteridae | | | | | | | | | |
| *Leistes militaris* | red-breasted meadowlark | | | + | | | | | WA4907045 |
| *Leistes superciliaris* | white-browed meadowlark | | | + | | | | | WA4925478 |
| *Psarocolius decumanus* | crested oropendola | + | | + | + | | | | WA4906750 |
| *Psarocolius bifasciatus* | olive oropendola | | | + | | | | | ML629207550 |
| *Cacicus solitarius* | solitary black cacique | | | + | | | | | |
| *Cacicus cela* | yellow-rumped cacique | | | + | + | | | | WA4918165 |
| *Cacicus haemorrhous* | red-rumped cacique | | | + | + | | | | WA5872264 |
| *Icterus croconotus* | orange-backed troupial | | | + | | | | | |
| *Icterus cayanensis* | epaulet oriole | | | + | | | | | |
| *Molothrus oryzivorus* | giant cowbird | | | + | | | | | WA4887677 |
| *Molothrus bonariensis* | shiny cowbird | | | + | | | | | WA4906547 |
| Parulidae | | | | | | | | | |
| *Geothlypis aequinoctialis* | masked yellowthroat | | | + | | | | | WA6473421 |
| *Myiothlypis fulvicauda* | buff-rumped warbler | | | + | | | | | WA6535215 |
| Mitrospingidae | | | | | | | | | |
| *Lamprospiza melanoleuca* | red-billed pied tanager | | | + | | | | | WA5872144 |
| Cardinalidae | | | | | | | | | |
| *Habia rubra* | scarlet-throated ant-tanager | | | + | | | | | |
| *Granatellus pelzelni* | rose-breasted chat | | | + | + | | | | WA5371673 |
| *Cyanoloxia rothschildii* | Rothschild's blue grosbeak | | | + | | | | | WA4889681 |
| Thraupidae | | | | | | | | | |
| *Parkerthraustes humeralis* | yellow-shouldered grosbeak | | | + | | | | | |
| *Nemosia pileata* | hooded tanager | | | + | | | | | |
| *Chlorophanes spiza* | green honeycreeper | | | + | | | | | WA5372192 |
| *Hemithraupis flavicollis* | yellow-backed tanager | | | + | | | | | WA4894002 |
| *Tersina viridis* | swallow tanager | + | | + | | | | | WA5345851 |
| *Cyanerpes nitidus* | short-billed honeycreeper | | | + | | | | | |
| *Cyanerpes caeruleus* | purple honeycreeper | | | + | | | | | WA6628072 |
| *Cyanerpes cyaneus* | red-legged honeycreeper | | | + | | | | | WA6473720 |
| *Dacnis flaviventer* | yellow-bellied dacnis | | | + | | | | | WA5372616 |
| *Dacnis cayana* | blue dacnis | | | + | | | | | WA5447623 |
| *Dacnis lineata* | black-faced dacnis | | | + | | | | | WA6473480 |
| *Saltator maximus* | buff-throated saltator | | | + | + | | | | WA6473449 |
| *Saltator coerulescens* | grayish saltator | | | + | | | | | WA6628064 |
| *Saltator grossus* | slate-colored grosbeak | | | + | + | | | | WA6473740 |
| *Coereba flaveola* | bananaquit | | | + | | | | | WA6613980 |
| *Volatinia jacarina* | blue-black grassquit | + | | + | | | | | WA4906575 |
| *Loriotus luctuosus* | white-shouldered tanager | | | + | | | | | WA6473716 |
| *Loriotus cristatus* | flame-crested tanager | | | + | | | | | WA4917858 |
| *Lanio versicolor* | white-winged shrike-tanager | | | + | | | | | WA6528989 |
| *Tachyphonus phoenicius* | red-shouldered tanager | | | + | | | | | |
| *Ramphocelus carbo* | silver-beaked tanager | + | | + | | | | | WA4887719 |
| *Sporophila lineola* | lined seedeater | | | + | | | | | WA6557048 |
| *Sporophila bouvronides* | Lesson's seedeater | | | + | | | | | WA5372867 |
| *Sporophila nigricollis* | yellow-bellied seedeater | | | + | | | | | |
| *Sporophila caerulescens* | double-collared seedeater | | | + | | | | | WA4911203 |
| *Sporophila leucoptera* | white-bellied seedeater | | | + | | | | | WA6616297 |
| *Sporophila angolensis* | chestnut-bellied seed-finch | | | + | | | | | WA5346077 |
| *Sicalis flaveola* | saffron finch | | | + | | | | | WA5343368 |
| *Cissopis leverianus* | magpie tanager | + | | | | | | | WA6473414 |
| *Schistochlamys melanopis* | black-faced tanager | | | + | | | | | WA6584584 |
| *Paroaria cervicalis* | Bolivian cardinal | + | | + | | | | | WA6628049 |
| *Thraupis episcopus* | blue-gray tanager | | | + | | | | | WA6293447 |

**Table 1** (continued)

| Family/species | Common name | MP | TR | AH | PAM | CT | MMA | IUCN | Voucher |
|---|---|---|---|---|---|---|---|---|---|
| *Thraupis sayaca* | sayaca tanager | | | + | | | | | |
| *Thraupis palmarum* | palm tanager | | | + | | | | | WA4887629 |
| *Stilpnia nigrocincta* | masked tanager | | | + | | | | | WA4898067 |
| *Stilpnia cayana* | burnished-buff tanager | | | + | | | | | |
| *Tangara gyrola* | bay-headed tanager | | | + | | | | | WA6464135 |
| *Tangara mexicana* | turquoise tanager | | | + | | | | | WA4894193 |
| *Tangara chilensis* | paradise tanager | + | | + | | | | | WA4897645 |
| *Tangara velia* | opal-rumped tanager | | | + | | | | | WA5346100 |

Species are listed according to their conservation status in the International (IUCN 2025) and National (MMA 2022) Red Lists of Threatened Species. Taxonomy follows the sequence proposed by Pacheco et al. (2021). Vouchers IDs are presented with taxa documentation (WA-WikiAves, ML-Macaulay Library and IN-INaturalist)

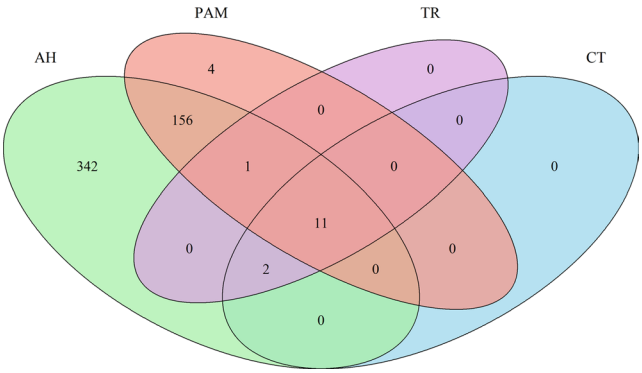


**Fig. 2** Overlap of bird records in the Rio Cautário State Extractive Reserve, Rondônia, Brazil, across different sampling methods: ad hoc observations (AH), passive acoustic monitoring (PAM), transects (TR), and camera traps (CT). Values indicate the number of unique and shared records among methods, highlighting the predominance of non-standardized observations and their contribution to detecting rare or infrequent occurrences that may be missed by systematic approaches

## Noteworthy records

- Blue-throated piping guan (*Aburria cumanensis grayi*). Photographed on the lower reaches of the Cautário River on 9 December 2021 (ML395690031). Six birds were recorded on the right bank of the Cautário (WA6616408) about 5 km from the Guaporé River on 11 September 2024 (−12.180068, −64.561802). Red-throated piping guan *Aburria cujubi nattereri* occurs both downstream of the Guaporé around Corumbiara State Park (https://ebird.org/checklist/S48523564) and further north in the upper Pacaás Novos River (https://ebird.org/checklist/S139250546). The contact zone between both taxa lies somewhere along the Guaporé River.

- Violaceous quail-dove (*Geotrygon violacea*). One individual was photographed (ML551771611, ML551769341) along a road cutting through primary forest (−11.804139, −63917222) on 30 March 2023. This species has been reported irregularly at a small number of sites in the Brazilian Amazon, mostly on the southern edge of the basin (Lees et al. 2013) and is also very rare in south-east Peru (Díaz and Dimming 2017) and may be nomadic (Lees et al. 2021).

- Plain-breasted ground-dove (*Columbina minuta*). One individual of this open habitat formation species was photographed on 30 March 2023 in an open pasture with a water reservoir by the access to road to the eastern sector of the reserve (WA5343153). Plain-breasted ground-doves are scarce in Amazonia, occurring patchily in Pará (Lees et al. 2014) Mato Grosso and Rondônia (e.g. França et al. 2011) and was recently documented in Acre (Guilherme et al. 2017). It is unclear if these recent records represent a range extension from peri-Amazonian habitats or an expansion of populations from open habitat formations within Amazonia.

- Silky-tailed nightjar (*Antrostomus sericocaudatus*). Recorded by field surveys on 28 and 30 May 2022 (WA4889738), and also by passive acoustic monitoring in October-November 2023 and September-October 2024, in both primary (−12.074252, −64.525886) and secondary forest with open understory in the central sector of the reserve (around −11.958000, −64.177000). This species is seemingly patchily distributed (but probably overlooked) across a broad swathe of southern and eastern Amazonia (e.g. Aleixo et al. 2000) with the nearest published records in Rondônia from Parque Estadual Guajará-Mirim (Whittaker 2004), Alta Floresta in Mato Grosso (Lees et al. 2014).

- Maguari stork (*Ciconia maguari*). This species is rare across most of Amazonia; and is regular only around the Araguaia valley, northern Roraima and coastal Amapá with occasional migrant or vagrant individuals recorded elsewhere. A group of ten were photographed on 28 March 2023 (WA5343385) which are likely wanderers from the Llanos de Moxos in Bolivia, where the species is common.

- Green-winged trumpeter (*Psophia viridis*). This species, endemic to the Madeira-Tapajós interfluve was frequently recorded by camera trapping and passive acoustic monitoring in *terra firme* forests, with one record from within 300 m of the forest edge bordering cattle pasture and twice recorded close to local communities on the edge of access trails to the reserve. This species complex is very

sensitive to forest loss and fragmentation, and often a target for hunters (e.g. Silva et al. 2025), so the persistence of the species near local communities is a positive sign.

- Agami heron (*Agamia agami*). During our expeditions to the reserve this species was documented on two occasions, the first on November 27, 2023, when two individuals were photographed foraging on the left bank of the Cautário River downstream (WA5844358) in the direction of the Guaporé River. Our second record was on 18 September 2024, with a single individual recorded foraging on the bank of a stream at −11.763153, −63.966942. This species is widespread but rare in Amazonia and there remain few records from Rondônia (e.g. Stotz et al. 1997; Whittaker 2004).

- Little blue heron (*Egretta caerulea*). This species is predominantly coastal in Brazil away from major wetlands such as the mainstem Amazon and Pantanal (Kirwan et al. 2015). Scattered records elsewhere across the country presumably relate to migrants or dispersing individuals, but the nature of patterns of movement in this species remains unclear. In the reserve one was photographed on 20 October 2024 on the margins of the Rio Guaporé (WA6613971). There are only records from two other municipalities in Rondônia on WikiAves.

- Yellow-collared macaw (*Primolius auricollis*). This charismatic species has a peri-Amazonian distribution in the Pantanal-Llanos de Mojos-Araguaia Valley regions, and we recorded it in the lower reaches of the Cautário and along the Guaporé on 02 June 2022 (ML459169881). It may be an irregular seasonal visitor to the area, although no obvious spatiotemporal patterns are evident in eBird data.

- Hoffmanns's Woodcreeper (*Dendrocolaptes hoffmmansi*). An endemic to the Madeira-Tapajos interfluve, this species reaches its south-western range limit at the reserve where it is uncommon in more mature forests, sometimes associated with mixed flocks (e.g. WA4904416).

- Chestnut-shouldered antwren (*Euchrepomis humeralis*). Another species at its southern Brazilian range edge at the reserve, where it was recorded several times (e.g. WA4909409) in canopy mixed-species flocks It was first recorded from Rondônia by Stotz et al. (1997) and has subsequently been recorded in the western part of the state at PARNA de Pacaás Novos (ML 618708552).

- White-breasted antbird (*Rhegmatorhina hoffmannsi*). This obligate ant following species is another endemic of the Madeira-Tapajos interfluve with its western-range limit bounded by the Guapore River. This species was recorded during both active searches (e.g. WA4899987) and by our autonomous recorders (e.g. WA6698657).

- Hudson's black-tyrant (*Knipolegus hudsoni*). This species is an austral migrant mainly wintering in the Llanos de Mojos in Bolivia (Tobias and Seddon 2007; Herzog et al. 2017). It is a scarce non-breeding visitor to western Amazonian Brazil in Mato Grosso in (Sick 1985), Mato Grosso do Sul (Nunes et al. 2018) and was first recorded in Rondônia by Whittaker (2004) on Palafitas Island on 20 June 2003. We photographed female-plumaged birds in October (ML491057241).

- Gray monjita (*Nengetus cinereus*). This species was recorded once on 29 May 2022 (WA4897676). Grey monjitas are largely absent from Amazonia with the exception of savanna formations on the border between Rondônia and Amazonas (Aleixo and Poletto 2007) and in the north-east along the lower Tocantins River (Lees et al. 2014) in Amapá (Schunck et al. 2011) and on the Sipaliwini Savanna in Suriname (Mittermeier et al. 2010). The species is regular in south-east Rondônia but there are few records away from Comodoro, although these include one seen at Pakaas Palafitas Lodge, in November 2006 (Kirwan and Shirihai 2007) along with several recent records (WA2863730, WA4899630, WA5683021 e WA6091784) from Guajará-Mirim and these may all be wanderers from the Llanos de Mojos.

- Tooth-billed wren (*Odontorchilus cinereus*). Until the mid-1990s, this species was known from just four specimens obtained in the Madeira-Tapajós interfluve. Subsequently the species has proven to be more widespread, crossing into Bolivia in north-east Santa Cruz, where common at Serrania de Huanchaca (Herzog et al. 2016). The species was listed by Aleixo et al. (2012) from the Floresta Nacional de Carajás but we are unaware of documented records east of the Rio Xingu, so confirmation of this would be desirable. First recorded in Rondônia by Stotz et al. (1997), we recorded it frequently, usually by voice accompanying canopy mixed species flocks in the reserve.

- Red-breasted blackbird (*Leistes militaris*) and White-browed blackbird (*L. superciliaris*). These non-forest species are expanding their range in Amazon into newly created agricultural habitats (Dornas et al. 2022). Syntopy between *Leistes militaris* and *L. superciliaris* was observed in pastures bordering the access road to reserve. There are historical records of *L. militaris* from Rondônia (Pelzeln 1871; Hellmayr 1910) which long predate significant deforestation and indicate the species occurred in natural open habitat formations before widespread forest loss. However, records of *L. superciliaris* only exist for the last 40 years since the paving of BR 364 was completed and likely represent a major range expansion from peri-Amazonian biomes. The nearest historical records of *L. superciliaris* come from the Vila Bela region in southwest Mato Grosso (Pelzeln 1871).

## Discussion

The high avian richness and diversity recorded in the reserve reflect a combination of regional ecological integrity and habitat heterogeneity. Environments with different

vegetation types, successional stages, and levels of structural complexity tend to offer a wide variety of ecological niches, thereby favoring the coexistence of species with distinct ecological requirements, trophic strategies, and behaviors. The occurrence of rare, endemic, and threatened species reinforces the biological and conservation importance of the region, highlighting it as an essential refuge for the maintenance of Amazonian biodiversity.

In addition to *terra firme* and floodplain forests and savanna, the reserve has several temporary environments such as sandbanks on the Cautário and Guaporé Rivers, used as foraging sites during the dry season by resident and migratory species. Among these species, *Nannopterum brasilianum* stands out, forming flocks with thousands of individuals on the banks of the Guaporé River (WA5844437). The reserve harbours many bird species of conservation interest that should be targets for monitoring, including species vulnerable to hunting and human disturbance (*Tinamus tao*, *Tinamus guttatus*, *Neochen jubata*, *Aburria cujubi*, *Pauxi tuberosa*, *Psophia viridis*, *Morphnus guianensis*, *Harpia harpyja* and *Agamia agami)*, long-distance boreal migrants (*Calidris fuscicollis*, *Tringa melanoleuca*, *Tringa flavipes*, *Contopus cooperi*), and species generally vulnerable to forest degradation and fragmentation (*Nystalus striolatus*, *Capito dayi*, *Pteroglossus bitorquatus*, *Micrastur mintoni*, *Pionites leucogaster*, *Pyrrhura perlata*, *Pyrrhura pallescens*, *Hypocnemis ochrogyna*, *Rhegmatorhina hoffmannsi*, *Dendrocolaptes concolor*, *Dendrocolaptes hoffmannsi*, and *Hylexetastes uniformis*). Those should be targets of continued monitoring using cost-effective techniques that may engage locals, as passive acoustic monitoring has proven to be.

The Madeira-Tapajós interfluve, corresponding to the Rondônia Center of Endemism, constitutes one of the most important regions of the Amazon in terms of bird endemism in South America. Haffer (1974) recorded 15 endemic taxa in the region, while Cracraft (1985) identified 21 taxa. In our study, we observed a smaller number of endemic species, represented by *Psophia viridis*, *Nystalus striolatus*, *Rhegmatorhina hoffmannsi*, *Dendrocolaptes concolor*, and *Dendrocolaptes hoffmannsi*. All these species have a wide distribution within the CER, suggesting that smaller rivers do not act as effective barriers to their dispersal.

Currently, our inventory of the reserve with 516 bird species, is the more intensive in the Rondônia center, at the best of our knowledge. For example, surveys by Stotz et al. (1997) in the Ji-Paraná region recorded 459 species. Subsequently, new studies have been carried out. Aleixo and Poletto (2007) inventoried 330 species of birds from the Marmelos River region, in the southern part of the municipality of Manicoré in Amazonas. Whittaker (2009) surveyed the region around the Pousada Rio Roosevelt, in the south of the state of Amazonas, and recorded 481 species. Santos et al. (2011) inventoried 490 species in their study in the Juruti region of Pará. In addition, short inventories were carried out in areas adjacent to reserve, such as the Uru-Eu-Wau-Wau indigenous land, generating a list of 280 species, and in the Serra da Cutia National Park with 281 species (Olmos et al. 2011). Our list eclipses these previous studies but still falls short of the higher totals from other locations southern Amazonia for example around Alta Floresta in Mato Grosso where 586 species have been recorded (Lees et al. 2013). This reinforces the need for multi-decadal survey efforts to capture the long tail of rarer species at any given site, including migrants, but we suspect that the Rio Cautário State Extractive Reserve is exceptionally biodiverse because of its ecotonal setting and high habitat heterogeneity.

Besides *terra firme* forests, the reserve includes habitats that can be considered as relictual, such as the savanna and *campinarana* enclaves associated with rock outcrops and/or shallow soils, and water-logged white-sand patches. As seen, these habitats harbor characteristic species like *Formicivora rufa*, *Lepidocolaptes angustirostris* and *Zonotrichia capensis* in the savanna and *Galbula leucogastra*, *Heterocercus linteatus*, *Xenopipo atronitens* and *Tachyphonus phoenicius* in the *campinaranas*. These taxa are commonly recorded in studies carried out on the Amazon with similar physiognomies (Aleixo and Poletto 2007; Dantas et al. 2011; Santos et al. 2011; Olmos et al. 2011; Borges et al. 2014; Guilherme 2014; Schunck 2024).

Just west of the reserve, in Bolivia, the forests merge in the complex mosaic of wetlands and savannas of the Llanos de Mojos (Larrea-Alcázar et al. 2010). Species common in this area reach Rondônia along the Guaporé River but, from WikiAves and eBird data, do not to spread much further east, as seems the case of *Primolius auricollis*, *Cyanocorax violaceus*, *Knipolegus hudsoni* (an austral migrant mainly wintering in Bolivia) and *Cantorchilus guarayanus* (see below). The Guaporé floodplain is also part of the Monte Alegre Várzea ecoregion (Olson et al. 2001), which includes seasonally flooded areas of the Madeira basin. One species that may be considered associated with this ecoregion is *Myrmotherula assimilis*, which is fairly common in the varzeas of the reserve. It is unclear if the populations of *M. assimilis* in the Guaporé/Mamoré and Madre de Dios Rivers are connected or disjunct from the ones in the Madeira downriver from Porto Velho.

The Guaporé/Itenez River marks the western boundary of the reserve and is associated with the ranges of a few bird species. *Picumnus fuscus* has a puzzling distribution as this Riverine forest specialist ranges from the upper Guaporé (*Vila Bela da Santíssima Trindade*, the type-locality) down river to around −12.472903, −63.898208 or just 38 km as the piculet flies from the town of Costa Marques (Parker

and Rocha 1991; Winkler and Christie 2020). We have yet to find this species in the reserve, despite targeted searches. Its absence is puzzling given appropriate habitat.

Another species associated with the Guaporé/Itenez is *Cantorchilus guarayanus*, one of the most conspicuous species in the riverside tangles of the Guaporé and lower Cautário. This species is common in the Bolivian lowlands of Santa Cruz and Beni but in Rondônia it hugs the Guaporé (Herzog et al. 2016) and is replaced by *Cantorchilus leucotis* further east (data in WikiAves and eBird). The contact zone between the species along the Cautário and other tributaries remains to be studied, as well as the contact zone of *Pipile cumanensis* and *P. grayi* somewhere in the reserve region is located.

Another taxon that merits further biogeographical study in Rondônia is *Tolmomyias sulphurescens pallescens*. This subspecies has a wide distribution (Caballero 2020) and is little known in the southwest region of Rondônia. An individual of this subspecies was recorded on 16 October 2024 (WA6528870) in the reserve, Costa Marques/RO, and another on 19 May 2023 (WA5409927) in the municipality of Guajará-Mirim/RO on the Brazil/Bolivia border. Meanwhile, the form *Tolmomyias assimilis calamae* occurs southeast of Amazonas, Rondônia and northern Mato Grosso on the *Serra dos Caiabis* (Lees et al. 2008) and northern Bolivia (del Hoyo et al. 2022). It was recorded by Novaes (1976) in an inventory of birds on the right bank of the Aripuanã River in Mato Grosso. In southwestern Rondônia, it was recorded on 31 March 2023 (WA5413615) in the reserve and in the *Serra dos Reis* State Park on 08 April 2023 (WA5350221).

## Species with potential occurrence

A small group of species whose presence is known from areas close to the reserve was not detected in our study area, even after applying Pattern Matching analyses across our PAM database. These species include *Odontophorus stellatus*, *Nothocrax urumutum*, *Neomorphus geoffroyi*, *Chlorostilbon mellisugus*, *Chrysuronia rondoniae*, *Spizaetus tyrannus*, *Spizaetus melanoleucus*, *Spizaetus ornatus*, *Helicolestes hamatus*, *Pteroglossus beauharnaisii* and *Colaptes punctigula*. The absence of detection of these species by our surveys, including by pattern matching, cannot guarantee their absence in the study area. In bioacoustic monitoring systems, acoustic detectability varies among species and depends on vocalization intensity and frequency, recording quality, and model adequacy. Thus, non-detection may reflect either low vocal activity or temporary silence, or methodological limitations of the model in recognizing certain types of acoustic signals. The reserve appears to contain suitable habitat for these *taxa*, and further studies may confirm their occurrence. For example, *Chlorostilbon mellisugus* was documented at Guajará-Mirim (WA1870070) and Pacaás Novos National Park (WA5961933), while *Chrysuronia rondoniae* was likewise documented at *Serra dos Parecis* (WA5695473) close to, but not inside the reserve.

We can anticipate future ornithological fieldwork recording more new species for the reserve. Avian inventories in Amazonia take decades to stabilize and hardly reach asymptotes as low density and rare resident species which form part of the core avifauna in *terra firme* forests are easy to miss without spatially extensive sampling (Robinson et al. 2018). Surveys covering rarer habitat types, including more open habitat physiognomies will also yield new resident species and many years of sampling may be needed to detect scarce boreal, austral and intratropical migrants (Lees et al. 2013). Besides, climate change and continuous human disturbance are likely to create conditions for more open-habitat species to colonise the region. Subject to increasing anthropogenic threats to Amazonian environments, inventories are necessary to understand the distributions, migration ecology and colonization processes over time.

Long-term monitoring is necessary to understand changes in ecosystem health and hence guide conservation interventions (Magurran et al. 2010; Lindenmayer et al. 2022). Our data will inform future studies to document changes in the reserve's avifauna. Sited in a climatically vulnerable region (Campos et al. 2024) and with a hard border to a largely treeless agricultural landscape mostly established since the late 1990 s, the reserve is ripe for long-term research on the broader impacts of climate change on the southern Amazon and exploring synergistic impacts arising from large-scale deforestation. As such, it is important to continue monitoring protocols to assess long-term trends in the populations of endemic birds and threatened species that make the reserve an important biodiversity hotspot.

Our results underscore the need to maintain ongoing monitoring and protection efforts in this protected area, contributing to the understanding of the composition and conservation status of the local avifauna. Collectively, the data obtained expand knowledge of the Amazonian avifauna, providing valuable support for planning management and conservation actions at a regional scale.

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**Data availability** No datasets were generated or analysed during the current study.

## Declarations

**Competing interests** The authors declare no competing interests.

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