Avifauna of a white-sand vegetation enclave in northwest Rondônia, Brazil: relevant records, body mass and morphometrics

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Avifauna of a white-sand vegetation enclave in north-west Rondônia, Brazil: relevant records, body mass and morphometrics

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Summary.—White-sand vegetation (WSV) enclaves occur throughout Amazonia. WSV, known in Brazil as campina or campinarana, possesses peculiar floral and faunal communities, different from those in adjacent forests but with biogeographic affinities to those in similar ecosystems far distant. Recent ornithological studies of these ‘islands’ have yielded new taxa for science and enabled a better understanding of the zoogeography of many poorly known species in Amazonia. Here we report the results of an ornithological survey of a campinarana enclave in north-west Rondônia, southern Amazonian Brazil. The area was inventoried three times in 2010–12, totalling 899 net / hours and 110 hours of observations. A total of 171 bird species was identified, belonging to 44 families. Among them, at least nine species are closely associated with WSV: Green-tailed Goldenthroat Polytmus theresiae, White-fringed Antwren Formicivora grisea, Natterer’s Slaty Antshrike Thamnophilus stictocephalus, Black Manakin Xenopipo atronitens, Plain-crested Elaenia Elaenia cristata, Pale-bellied Mourner Rhytipterna immunda, Campina Flycatcher Cnemotriccus fuscatus duidae, Plush-crested Jay Cyanocorax chrysops diesingii and Red-shouldered Tanager Tachyphonus phoenicius. Approximately 8% of the species recorded are migratory, most of them austral migrants. In addition, body mass and morphometrics of 136 individuals from 55 species are presented. Our results augment ornithological knowledge in Rondônia, aid our understanding of regional zoogeography, and serve as an alert to the need to preserve a region that has suffered severe anthropogenic impacts for >100 years.

Amazonia is the largest and most diverse biome on Earth (Mittermeier et al. 2003). It has the largest extent of continuous forest in the world and harbours impressive biodiversity (Kress et al. 1998, Mittermeier et al. 2003). The biome as a whole is very heterogeneous (Terborgh & Andresen 1998, ter Steege et al. 2003). It is a mosaic of different types of ecosystems resulting from variable regional edaphic and climatic conditions (Duivenvoorden et al. 2005, Haugaasen & Peres 2006, Fine & Kembel 2011, Fine et al. 2012). Among these ecosystems are several forest types, e.g., terra firme and várzea (Terborgh & Andresen 1998), as well as some non-forest environments, e.g. the enclaves or ‘islands’ of open vegetation within forests (Anderson 1981, Fine et al. 2012, Fine & Bruna 2016, Mustin et al. 2017, Demarchi et al. 2018).

Enclaves of open vegetation are distributed discontinuously throughout Amazonia (Adeney et al. 2016). The origin of these enclaves is still being discussed—one hypothesis is a Pleistocene and Holocene provenance, when the climate in Amazonia became drier as a consequence of the last glacial maximum (Pessenda et al. 2001, Clark et al. 2009). The types of open vegetation in Amazonia are distinguished by their general physiognomy dictated by floristic composition according to the local edaphic, hydrological and climatic conditions (Adeney et al. 2016). The two main groups are savanna / cerrado (Sanaiotti et al. 1997, Silva et
Edson Guilherme et al. 1997, Sanaiotti & Cintra 2001, Aleixo & Poletto 2007, Aleixo et al. 2011, Boss & Silva 2014, Mustin et al. 2017) and a special type of vegetation that grows on white-sand soils, known in Brazil as campina and campinarana (Anderson 1981, Borges 2004, Borges et al. 2016a,b, Adeney et al. 2016). Recent ornithological studies of these ‘islands’ of non-forest vegetation have revealed new taxa to science and helped to understand the zoogeography of the many patchily distributed species in Amazonia (Alvarez-Alonso & Whitney 2003, Whitney & Alvarez-Alonso 2005, Poletto & Aleixo 2009, Guilherme & Borges 2011, Alvarez-Alonso et al. 2013, Capurucho et al. 2013, Cohn-Haft et al. 2013, Whitney et al. 2013b,d, Borges et al. 2016a,b, Matos et al. 2016).

Rondônia state, in south-west Amazonian Brazil, lies within an area of endemism of the same name (Silva et al. 2005, Fernandes 2013). Although rich in endemic and / or rare species (Fernandes 2013), the state has already lost >30% of its forest cover due to logging and agroforestry (Serrão et al. 1996, Piontekowski et al. 2014, Fearnside 2017). Ornithological surveys in the state have progressively increased over the last 100 years (e.g. Hellmayr 1910, Stotz et al. 1997, Boçon 1999, Kirwan & Shirihai 2007, Olmos et al. 2011, Santos et al. 2011) and, as further areas are inventoried, several new species of birds have been discovered (Lanyon et al. 1990, Whitney et al. 2013a,b,c). Despite this, the richness of bird species and their distribution in the state as a whole are poorly known and have not been subject to major review. There are still numerous gaps in our ornithological knowledge of Rondônia because many areas are yet to be surveyed. Here, we present the results of a rapid inventory of an enclave of WSV near the BR-364 and the recently implemented Jirau hydroelectric power plant in north-west Rondônia.

Methods

Study area.—The study was undertaken in an enclave of WSV and its environs called Miratinga, located along a power transmission line west of the BR-364 (between Porto
Velho and Abunã), c.30 km from Jaci Paraná in the municipality of Porto Velho, Rondônia (09°21’38.3″S, 64°39’29.2”W; Fig. 1).

**Description of the area.**—The *campinarana* enclave is mainly covered by dense shrubs, with sparse, small trees (2–5 m tall) (Fig. 2A–C) and some *Astrocaryum acaule* and *Mauritiella armata* palms (Fig. 2C). The soil is covered by grasses (Fig. 2A–B) and, as in other WSV environments, should be of low fertility and high acidity. At the edges of the patch, in areas of sparse vegetation and where the soil is more humid, an invasive fern *Pteridium* sp. is present (Fig. 2D). Part of the *campinarana* has been deforested and sand is being commercially removed (Fig. 2E). In the vicinity, there are small black-water streams and at least one medium-sized pond. During the wet season, puddles form where vegetation is sparse (Fig. 1) and in the *campinarana*, which is surrounded by fragments of *terra firme* forest severely modified by selective logging, and open pastures (Fig. 1).

**Avifaunal sampling.**—Three visits were made to the area in 2010–12. The avifaunal survey covered both the *campinarana* and surrounding fragments of *terra firme* forest and pastures (Fig. 1). Two approaches were used to inventory the area: (a) quantitative, using mist-nets and (b) qualitative, via field observations using binoculars. The *campinarana* was inventoried on 2 June 2010 (60 net / hours and two hours of observation), 26 February–3 March 2011 (439 net / hours and 54 hours of observation) and 20–24 August 2012 (400 net / hours and 54 hours of observation). Individuals captured with mist-nets were weighed
using a Pesola® scale and their wing, tarsus and total lengths were taken with a millimetre ruler. Wing, tarsus and total lengths were measured in accordance with standard reference works, see Proctor & Lynch (1993: 295–297) and Sick (1997: 91, Fig. G). Ageing and sexing were performed whenever possible. Some specimens were collected as vouchers and were prepared using standard taxidermy techniques. Specimens were collected under ICMBio / SISBIO authorisation no. 23269-1, and deposited either at the Universidade Federal do Acre (UFAC), Rio Branco, or the Museu Paraense Emílio Goeldi (MPEG), Belém. Scientific nomenclature follows that of the Brazilian Committee of Ornithological Records (Piacentini et al. 2015).

Results and Discussion

A total of 171 species from 44 families was recorded in the campinarana enclave and its environs (Table 1). Of these, 74 (43.2%) species are non-Passeriformes and 97 (56.7%) Passeriformes. Among the latter, the families Tyrannidae (26), Thraupidae (17) and Thamnophilidae (12) were richest in species (Table 1). At least nine species recorded in the study area are closely associated with campinarana: Green-tailed Goldenthroat Polytmus theresiae, White-fringed Antwren Formicivora grisea, Natterer’s Slaty Antshrike Thamnophilus stictocephalus, Black Manakin Xenopipo atronitens, Plain-crested Elaenia Elaenia cristata, Pale-bellied Mourner Rhytipterna immunda, Campina Flycatcher Cnemotriccus fuscatus duidae, Plush-crested Jay Cyanocorax chrysops diesigii and Red-shouldered Tanager Tachyphonus phoenicus (Table 1). Two other important records included Rondônia Bushbird Clytoctantes atrogularis (Guilherme & Souza 2013) and Buff-cheeked Tody-Flycatcher Poecilotriccus senex. Approximately 8% of the species recorded are visitors, mostly austral migrants, e.g. Large Elaenia Elaenia spectabilis, Chilean Elaenia E. chilensis, Small-billed Elaenia E. parviostris, Fork-tailed Flycatcher Tyrannus savana, Crowned Slaty Flycatcher Griseotyrrannus aurantioatrocristatus, Variegated Flycatcher Empidonax varius, Southern Scrub Flycatcher Sublegatus modestus, Vermilion Flycatcher Pyrocephalus rubinus, Fuscous Flycatcher Cnemotriccus fuscatus bimaculatus, Chivi Vireo Vireo chivi, Creamy-bellied Thrush Turdus amaurochalinus, Yellow-bellied Seedeater Sporophila nigrigollis and Double-collared Seedeater S. caerulescens, while Solitary Sandpiper Tringa solitaria was the only Nearctic migrant (Table 1).

Species accounts

GREEN-TAILED GOLDENTHROAT Polytmus theresiae
Relatively common but discontinuously distributed in enclaves of open vegetation throughout Amazonia (Schuchmann 1999, Borges et al. 2001, Sanaiotti & Cintra 2001, Aleixo & Poletto 2007, Schubenrberg et al. 2007, Guilherme 2012). Hellmayr (1910) reported two collected by W. Hoffmanns around Rio Preto, in the north-east of the state, and Aleixo & Poletto (2007) the presence at MPEG of one collected by J. Hidasi at Guajará-Mirim, on the border with Bolivia. Additionally, the species was photographed in the municipalities of Cabixi and Vilhena in southern Rondônia (Wikiaves 2018). On 2 June 2010, three were collected (MPEG 70938, 70939, male, 70940) and on 22–23 August 2012 we collected another five (UFAC 507, 508, 511, 522, 523). Available records of P. theresiae in Rondônia indicate that the species is locally common, but only in enclaves of cerrado, campina and campinarana.

NATTERER’S SLATY ANTSRIKE Thamnophilus stictocephalus
Previously treated as a race of a widespread Eastern Slaty Antshrike T. punctatus (Isler et al. 1997). Distributed patchily in campina and campinarana east of the Guaporé / Madeira Rivers.
TABLE 1
Birds recorded in a campinarana (white-sand vegetation) and its environs in north-west Rondônia, Brazil. Habitat: C = campinarana; TF = terra firme forest; R = reservoirs and lakes; AO = open areas; P = pasture and man-modified areas. Record types: V = vocalisation; O = sight; S = museum specimen. Nomenclature follows Piacentini et al. (2015). 1 = follows Handbook of the birds of the world (del Hoyo & Collar 2016). * = white-sand specialists following Stotz et al. (1996) and Borges et al. (2015). ** = migrants a = austral; n = Nearctic.

| Family / Species       | English name                  | Habitat | Record |
|------------------------|-------------------------------|---------|--------|
| TINAMIDAE              |                               |         |        |
| Crypturellus cinereus  | Cinereous Tinamou             | TF      | V      |
| Crypturellus strigulosus| Brazilian Tinamou            | C       | V      |
| ANATIDAE               |                               |         |        |
| Amazonetta brasiliensis| Brazilian Teal                | R       | O      |
| CRACIDAE               |                               |         |        |
| Penelope jacquacu      | Spix’s Guan                   | TF      | O      |
| Ortalis guttata        | Speckled Chachalaca           | TF      | O      |
| ARDEIDAE               |                               |         |        |
| Tigrisoma lineatum     | Rufescent Tiger Heron         | R       | O      |
| Bubulcus ibis          | Cattle Egret                  | P       | O      |
| Ardea cocoi            | Coci Heron                    | R       | O      |
| Ardea alba             | Great Egret                   | R       | O      |
| Egretta thula          | Snowy Egret                   | R       | O      |
| CATHARTIDAE            |                               |         |        |
| Cathartes aura         | Turkey Vulture                | OA, P   | O      |
| Cathartes melambrotus  | Greater Yellow-headed Vulture | OA, P   | O      |
| Coreagps atratus       | Black Vulture                 | OA, P   | O      |
| ACCIPITRIDAE           |                               |         |        |
| Rupornis magnirostris  | Roadside Hawk                 | TF      | O      |
| Buteo nitidus          | Grey-lined Hawk               | TF      | O      |
| RALLIDAE               |                               |         |        |
| Laterallus viridis     | Russet-crowned Crake          | R       | V      |
| Laterallus melanophaius| Rufous-sided Crake            | R       | V, O   |
| Porphyrio martinicus   | Purple Gallinule              | R       | O      |
| CHARADRIIDAE           |                               |         |        |
| Vanellus chilensis     | Southern Lapwing              | P       | O      |
| SCOLOPACIDAE           |                               |         |        |
| Tringa solitaria™      | Solitary Sandpiper            | R       | O      |
| JACANIDAE              |                               |         |        |
| Jacana jacana          | Wattled Jacana                | R       | O      |
| COLUMBIDAE             |                               |         |        |
| Columbina passerina    | Common Ground Dove            | C, P    | S      |
| Columbina talpacoti    | Ruddy Ground Dove             | C, P    | S      |
| Claravis pretiosa      | Blue Ground Dove              | C       | S      |
| Patagioenas speciosa   | Scaled Pigeon                 | C       | O      |
| Leptotila verreauxi    | White-tipped Dove             | C       | S      |
| Geotrygon montana      | Ruddy Quail-Dove              | TF      | S      |

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| Family / Species | English name     | Habitat | Record |
|------------------|------------------|---------|--------|
| CUCULIDAE        |                  |         |        |
| Piaya cayana     | Squirrel Cuckoo  | TF      | O      |
| Crotophaga ani   | Smooth-billed Ani| P, C    | O      |
| TYTONIDAE        |                  |         |        |
| Tyto furcata     | American Barn Owl| TF      | V      |
| STRIGIDAE        |                  |         |        |
| Megascops choliba| Tropical Screech Owl | TF | V      |
| Athene cunicularia| Burrowing Owl   | P       | O      |
| CAPRIMULGIDAE    |                  |         |        |
| Nyctidromus nigrescens | Blackish Nightjar | C | S      |
| Nyctidromus albicollis | Common Pauraque | C, P    | V, O   |
| APODIDAE         |                  |         |        |
| Chaetura brachyura| Short-tailed Swift | OA     | O      |
| Panaptila cayennensis| Lesser Swallow-tailed Swift | OA | O      |
| TROCHILIDAE      |                  |         |        |
| Phaethornis ruber | Reddish Hermit   | TF      | O      |
| Phaethornis philippii | Needle-billed Hermit | TF | S      |
| Campylorhynchus largipennis | Grey-breasted Sabrewing | TF | S      |
| Polytmus theresiae* | Green-tailed Goldenthroat | C | S      |
| TROGONIDAE       |                  |         |        |
| Trogon curucui   | Blue-crowned Trogon| TF   | O      |
| ALCEDINIDAE      |                  |         |        |
| Megaceryle torquata | Ringed Kingfisher | R     | O      |
| Chloroceryle americana | Green Kingfisher | R     | O      |
| Chloroceryle inda | Green-and-rufous Kingfisher | R | O      |
| BUCCONIDAE       |                  |         |        |
| Bucco tamatia    | Spotted Puffbird | TF      | S      |
| Monasa nigrifrons| Black-fronted Nunbird | TF   | O      |
| Chelidoptera tenebrosa | Swallow-winged Puffbird | TF | O      |
| CAPITONIDAE      |                  |         |        |
| Capito dayi      | Black-girdled Barbet | TF | O      |
| RAMPHASTIDAE     |                  |         |        |
| Ramphastos tucanus | White-throated Toucan | TF | O, V   |
| Ramphastos vitellinus | Channel-billed Toucan | TF | O, V   |
| Pteroglossus inscriptus | Lettered Aracari | TF | O      |
| Pteroglossus castanotis | Chestnut-eared Aracari | TF | O, V   |
| PICIDAE          |                  |         |        |
| Picumnus aurifrons | Bar-breasted Piculet | TF | S      |
| Melanerpes cruentatus | Yellow-tufted Woodpecker | TF | O, V   |
| Colaptes punctigula | Spot-breasted Woodpecker | TF | O      |
| Dryocopus lineatus | Lineated Woodpecker | TF | O, V   |
| Campephilus melanoleucos | Crimson-crested Woodpecker | TF | O, V   |
| FALCONIDAE       |                  |         |        |
| Daptrius ater    | Black Caracara   | OA      | O, V   |
| Family / Species           | English name                  | Habitat | Record |
|---------------------------|-------------------------------|---------|--------|
| Ibycter americanus        | Red-throated Caracara         | TF      | O, V   |
| Caracara plancus          | Southern Caracara             | P       | O, V   |
| Milvago chimachima        | Yellow-headed Caracara        | P       | O, V   |
| Herpetotheres cachinnans  | Laughing Falcon               | TF      | O, V   |
| Falco rustigularis        | Bat Falcon                    | TF      | O      |

**PSITTACIDAE**

| Family / Species           | English name                  | Habitat | Record |
|---------------------------|-------------------------------|---------|--------|
| Ara ararauna              | Blue-and-yellow Macaw         | TF      | O, V   |
| Ara macao                 | Scarlet Macaw                 | TF      | O, V   |
| Ara chloropterus          | Red-and-green Macaw           | TF      | O, V   |
| Ara severus               | Chestnut-fronted Macaw        | TF      | O, V   |
| Orthopsittaca manilatus   | Red-bellied Macaw             | TF      | O, V   |
| Psitacara leucophthalinus | White-eyed Parakeet           | TF      | O, V   |
| Aratinga weddellii        | Dusky-headed Parakeet         | TF      | O, V   |
| Pionus menstruus          | Blue-headed Parrot            | TF      | O, V   |
| Amazona farinosa          | Mealy Parrot                  | TF      | O, V   |
| Amazona ochrocephala      | Yellow-crowned Parrot         | TF      | O, V   |

**THAMNOPHILIDAE**

| Family / Species           | English name                  | Habitat | Record |
|---------------------------|-------------------------------|---------|--------|
| Pygiptila stellaris       | Spot-winged Antshrike         | TF      | S      |
| Microrhopias quixensis    | Dot-winged Antwren            | TF      | O      |
| Clytoctantes atrogularis  | Rondônia Bushbird             | C       | S      |
| Myrmophylax atrothorax    | Black-throated Antbird        | TF      | O, V   |
| Formicivora grisea*       | White-fringed Antwren         | C       | S      |
| Thamnomanes saturninus    | Saturnine Antshrike           | TF      | S      |
| Thamnophilus deliatus     | Barred Antshrike              | TF      | O, V   |
| Thamnophilus schistaceus  | Plain-winged Antshrike        | TF      | O, V   |
| Thamnophilus stictocephalus* | Natterer’s Slaty Antshrike   | C       | S      |
| Sciaphylax hemimelaena    | Chestnut-tailed Antbird       | TF      | S, O, V |
| Hypocnemis ochrogya       | Rondônia Warbling Antbird     | TF      | S      |
| Willisornis poecilinotus  | Common Scale-backed Antbird   | TF      | O, V   |

**DENDROCOLAPTIDAE**

| Family / Species           | English name                  | Habitat | Record |
|---------------------------|-------------------------------|---------|--------|
| Glyphorynchus spirurus    | Wedge-billed Woodcreeper      | TF      | S      |
| Xiphorhynchus elegans     | Elegant Woodcreeper            | TF      | S      |
| Xiphorhynchus guttataoides| Lafresnaye’s Woodcreeper      | TF      | O, V   |
| Dendroplex picus          | Straight-billed Woodcreeper    | TF      | O, V   |

**XENOPIDAE**

| Family / Species           | English name                  | Habitat | Record |
|---------------------------|-------------------------------|---------|--------|
| Xenops minutus            | Plain Xenops                  | TF      | S      |

**FURNARIIDAE**

| Family / Species           | English name                  | Habitat | Record |
|---------------------------|-------------------------------|---------|--------|
| Berlepschia rikeri        | Point-tailed Palmcreeper       | TF      | O, V   |
| Furnarius leucopus        | Pale-legged Hornero           | TF      | O, V   |
| Anabacerthia rufcaudata   | Rufous-tailed Foliage-gleaner | TF      | O      |
| Philydor erythrocerum     | Rufous-rumped Foliage-gleaner | TF      | S      |
| Synallaxis rutilans       | Ruddy Spinetail               | C       | S      |

**PIPRIDAE**

| Family / Species           | English name                  | Habitat | Record |
|---------------------------|-------------------------------|---------|--------|
| Ceratopipra rubrocapilla   | Red-headed Manakin            | C, TF   | S      |
| Manacus manacus            | White-bearded Manakin         | C       | S      |
| Family / Species                  | English name                  | Habitat | Record |
|----------------------------------|-------------------------------|---------|--------|
| Machaeropterus pyrocephalus       | Fiery-capped Manakin         | TF, C   | S      |
| Xenopipo atronitens*             | Black Manakin                | C       | S      |
| **ONYCHORHYNCHIDAE**             |                               |         |        |
| Terenotriccus erythrurus         | Ruddy-tailed Flycatcher       | TF      | S      |
| **TITYRIDAE**                    |                               |         |        |
| Iodopleura isabellae             | White-browed Purpletuft       | TF      | O      |
| Tityra semifasciata              | Masked Tityra                 | TF      | O      |
| **COTINGIDAE**                   |                               |         |        |
| Querula purpurata                | Purple-throated Fruitcrow     | TF      | O      |
| Lipaugus vociferans              | Screaming Piha                | TF      | V, O   |
| **RHYNCHOCYCLIDAE**              |                               |         |        |
| Mionectes oleagineus             | Ochre-bellied Flycatcher      | TF      | S      |
| Tolmomyias flavicentris          | Yellow-breasted Flycatcher    | C       | S      |
| Todirostrum maculatum            | Spotted Tody-Flycatcher       | TF, C   | O, V   |
| Pecilotriccus senex              | Buff-cheeked Tody-Flycatcher  | C       | S      |
| Pecilotriccus latirostris        | Rusty-fronted Tody-Flycatcher | TF      | O, V, S|
| **TYRANNIDAE**                   |                               |         |        |
| Camptostoma obsoletum            | Southern Beardless Tyrannulet | C, TF   | O, V   |
| Elaenia spectabilis***           | Large Elaenia                 | C       | S      |
| Elaenia chilensis***             | Chilean Elaenia               | C       | S      |
| Elaenia parvirostris***          | Small-billed Elaenia          | C       | S      |
| Elaenia cristata*                | Plain-crested Elaenia         | C       | S      |
| Myiopagis viridicata             | Greenish Elaenia               | C       | O, V   |
| Tyrannulus eatus                 | Yellow-crowned Tyrannulet     | C, TF   | S      |
| Phaonopygia murina               | Mouse-coloured Tyrannulet     | C       | S, V   |
| Legatus leucophaeus              | Piratic Flycatcher            | TF      | O, V   |
| Myiarchus ferox                  | Short-crested Flycatcher      | C, TF   | S, V, O|
| Rhytipterna immunda*             | Pale-bellied Mourner          | C       | S, O   |
| Pitangus sulphuratus             | Great Kiskadee                | C, TF   | O, V   |
| Myiodynastes maculatus           | Streaked Flycatcher           | C, TF   | O, V   |
| Tyranopsis sulphurea             | Sulphury Flycatcher           | C, TF   | O, V   |
| Megarynchus pitangua             | Boat-billed Flycatcher        | C, TF   | O, V   |
| Myiozetetes cayanensis           | Rusty-margined Flycatcher     | C, TF   | O, V   |
| Myiozetetes similis              | Social Flycatcher             | C, TF   | O, V   |
| Tyranus melancholicus            | Tropical Kingbird             | C, TF   | O, V   |
| Tyranus savana***                | Fork-tailed Flycatcher        | C, P, TF| O      |
| Grisotyrannus aurantiacristatus** | Crowned Slaty Flycatcher      | C       | O      |
| Empidonous varius***             | Variegated Flycatcher         | C       | O      |
| Sublegatus modestus***           | Southern Scrub Flycatcher     | C       | S      |
| Pyrocephalus rubinus***          | Vermilion Flycatcher          | C, P    | O      |
| Cnemotriccus fuscatu duidae*     | Campina Flycatcher            | C       | S      |
| Cnemotriccus fuscatu beniensis   | Fuscous Flycatcher            | TF      | S      |
| Cnemotriccus fuscatu bimaculatus**| Fuscous Flycatcher            | C       | S      |
| **VIREONIDAE**                   |                               |         |        |
| Cyclarhis gujanensis             | Rufous-browed Peppershrike    | C, TF   | O, V   |

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| Family / Species       | English name                     | Habitat | Record  |
|-----------------------|----------------------------------|---------|---------|
| Vireo chivi**         | Chivi Vireo                      | C       | S       |
| CORVIDAE              |                                   |         |         |
| Cyanocorax chrysops diesingii* | Plush-crested Jay               | C       | O, V    |
| HIRUNDINIDAE          |                                   |         |         |
| Stelgidopteryx ruficollis | Southern Rough-winged Swallow   | OA      | O       |
| Progne tapera         | Brown-chested Martin             | OA      | O       |
| Progne chalybea       | Grey-breasted Martin             | OA      | O       |
| Tachycineta albiventer| White-winged Swallow            | R       | O       |
| TROGLODYTIDAE         |                                   |         |         |
| Troglodytes musculus  | Southern House Wren              | C, P    | O, V    |
| Campylorhynchus turdinus | Thrush-like Wren                | TF      | O, V    |
| Phoebopus genibarbis  | Moustached Wren                  | TF      | S       |
| TURDIDAE              |                                   |         |         |
| Turdus amaurochalinus** | Creamy-bellied Thrush           | TF      | S       |
| Turdus ignobilis      | Black-billed Thrush              | C, TF   | S       |
| PASSERELLIDAE         | Ammodramus aurifrons             |         |         |
| ICTERIDAE             | Psarocolius bifasciatus          | TF      | O       |
| Cacicus cela          | Yellow-rumped Cacique            | TF      | O, V    |
| Icterus cayanensis    | Epaulet Oriole                   | TF      | O       |
| Sturnella militaris   | Red-breasted Meadowlark          | P       | O       |
| THRAUPIDAE            | Schistochlamys melanopis         |         |         |
| Paroaria gularis      | Red-capped Cardinal              | R       | O       |
| Tangara episcopus     | Blue-grey Tanager                | C, P, TF| S, O, V |
| Tangara palmarum      | Palm Tanager                     | TF      | O, V    |
| Hemithraupis flavicollis | Yellow-backed Tanager           | TF      | O       |
| Volatinia jacarina    | Blue-black Grassquit             | C, P    | S       |
| Tachyphonus phoenicius* | Red-shouldered Tanager          | C       | S       |
| Ramphocelus carbo     | Silver-beaked Tanager            | C, P, TF| S, O, V |
| Tersina viridis       | Swallow Tanager                  | TF      | S       |
| Cyanerpes cyaneus     | Red-legged Honeycreeper          | TF      | O       |
| Dacnis caudata        | Blue Dacnis                      | TF      | O       |
| Dacnis lineata        | Black-faced Dacnis               | TF      | O       |
| Sporophila nigricollis** | Yellow-bellied Seed-eater       | TF, P   | S, O    |
| Sporophila caerulescens** | Double-collared Seed-eater      | C, P    | S       |
| Sporophila angolensis | Chestnut-bellied Seed Finch      | C       | O       |
| Saltator maximus      | Buff-throated Saltator           | TF      | O       |
| Saltator coerulescens | Greyish Saltator                 | TF      | O       |
| FRINGILLIDAE          | Euphonia chrysopasta             |         |         |
|                       | Golden-bellied Euphonia          | TF      | O       |
to the island of Marajó in Pará (Isler et al. 1997, Zimmer & Isler 2003). Olmos et al. (2011) reported *T. stictocephalus* in savannas at Serra da Cutia National Park, in the south-west of the state, and at Campos do Urupa within the Uru-Eu-Wau-Wau Indigenous Territory, in central Rondônia. Natterer’s Slaty-Antshrike has been found in several municipalities along the BR-364, between Vilhena and Porto Velho (Wikiaves 2018). Very common in the study area, being seen and caught in mist-nets daily (Fig. 3A). Five specimens were collected, a female on 2 June 2010 (MPEG 70950) and two pairs, on 27 February 2011 (UFAC 284, 286) and 1 March 2011 (UFAC 310, 309). Our records of *T. stictocephalus* extend the species’ range to extreme north-west Rondônia.

**RONDÔNIA BUSHBIRD** *Clytoctantes atrogularis*

A globally threatened species (BirdLife International 2017) whose unusual record in the study area was discussed by Guilherme & Santos (2013). The female collected (UFAC 473) represents the westernmost available record (Costa et al. 2017).

**WHITE-FRINGED ANTWREN** *Formicivora grisea*

Occurs from the right bank of the Madeira River east to the Atlantic coast, including all of north-east Brazil, as well as in northern South America including the Guianas, Venezuela and Colombia (Zimmer & Isler 2003). Recently found in *campinarana* in extreme south-west Amazonas (Guajará) and westernmost Acre (Cruzeiro do Sul and Mâncio Lima) (Poletto & Aleixo 2005, Guilherme 2012). In Rondônia, it was known from around Rio Preto in the north-east (Hellmayr 1910) and in savanna at Traçadal Biological Reserve and Serra da Cutia National Park (Olmos et al. 2011) in the centre-west. Abundant in *campinarana* at Miratinga. On 2 June 2010, three were collected (MPEG 70951, male, 70952, female, 70953, male). On 27–28 February 2011, four were trapped of which three were collected (UFAC 283, male, 288, female, 304, female) and on 20–23 August 2012 seven were trapped of which four were prepared as specimens (UFAC 476, juvenile male, 480, male, 510, female, 525, male). Records of *F. grisea* at Miratinga extend the species’ range in Rondônia 232 km to the north-west and 227 km north, from Rio Preto and Traçadal Biological Reserve, respectively.

**BLACK MANAKIN** *Xenopipo atronitens*

Considered an indicator species of *campinarana* (Borges et al. 2016a). Although abundant in habitat, it is patchily distributed (Aleixo & Poletto 2007, Poletto & Aleixo 2005, Guilherme & Borges 2011, Borges et al. 2014, 2016b). Previous records in Rondônia were by Whittaker (2004) at Taquaras (BR-425) and by Olmos et al. (2011) in savanna at Traçadal Biological Reserve and Serra da Cutia National Park. Since 2010, it has been photographed in several municipalities in eastern Rondônia, e.g. Machadinho d’Oeste, Parecis and Chupinguaia (Wikiaves 2018). At Miratinga, Black Manakin was seen and trapped daily. A male was collected on 6 February 2010 (MPEG 70977), while another four were collected subsequently, three in 2011 on 26 February (UFAC 276, female, 282, male) and 1 March (AC 312, female), and one on 22 August 2012 (UFAC 512, male). Records of *X. atronitens* at Miratinga extend its range to far north-west Rondônia.

**BUFF-CHEEKED TODY-FLYCATCHER** *Poecilotriccus senex*

Until very recently, known only from the type locality at Borba, Amazonas state, on the right bank of the lower Madeira River (Hellmayr 1910, Hoyo et al. 2004). In recent years, recorded at localities on the right bank of the middle (Cohn-Haft et al. 2007, Whittaker 2009) and upper Madeira (Whittaker 2004, Wikiaves 2018). In Rondônia, reported initially in 2002, at *campina* at Taquaras (BR-425), in the north-west of the state (Whittaker...
2004). On 27 February 2011, we collected one at the edge of campinarana (MPEG 74005). Unfortunately, during its preparation, mass was not taken and neither was it possible to sex the bird (Fig. 3B; Table 2). Recent records indicate that the species inhabits patches of open vegetation in a swath from northern Rondônia and extreme south-east Amazonas (e.g. Humaitá National Forest) from the right bank of the Madeira east to the Madeira / Tapajós interfluvium (Whittaker 2004, 2009, Cohn-Haft et al. 2007, Wikiaves 2018).

PALE-BELLIED MOURNER *Rhytipterna immunda* (Figure 3C)

An uncommon species readily confused with a *Myiarchus* (Lanyon 1973). *R. immunda* is unique to savanna environments in Amazonia, from easternmost Colombia to the Guianas, and in Brazil it occurs patchily in WSV through the Negro drainage east to Pará, Amapá and Tocantins, and in southern Rondônia and Mato Grosso (Lanyon 1973, Scholes 2004, Whittaker 2004, Dornas et al. 2012). It has also been recorded in north-east Bolivia (Scholes 2004, Tobias & Seddon 2007). The first record in Rondônia was documented by Whittaker (2004) in the north-west of the state, in a campina at Taquaras, Porto Velho municipality. Subsequently, it was recorded in savanna at Serra da Cutia National Park, south-west Rondônia, and in Uru-Eu-Wau-Wau Indigenous Territory, in central Rondônia (Olmos et al. 2011). Also documented in the municipalities of Guajará-Mirim and Machadinho d’Oeste (Wikiaves 2018). Among species associated with campinarana, this was one of the most
abundant in mist-nets. Ten were trapped, of which five were collected: three on 26 and 28 February 2011 (UFAC 278, 295, 296) and two on 22 August 2012 (MPEG 82235–36). Records of *R. immunda* in north-west Rondônia (e.g. Miratinga) are the south-westernmost in Brazil.

**CAMPINA FLYCATCHER** *Cnemotriccus fuscatus duidae*

Strongly associated with campina / campinarana (Borges et al. 2016a). Differs from other races of *C. fuscatus* by its much more yellowish underparts (Zimmer 1938; Fig. 4A). It occurs patchily across almost all of Amazonia (Tobias & Seddon 2007, Guilherme & Borges 2011, Borges et al. 2016a). One was collected on 22 February 2011 in campinarana (UFAC 294; Fig. 4A–B), the first record of this taxon in Rondônia. The closest previous record of *C. f. duidae* was on the Bolivia / Brazil border at Piedritas, on the left bank of the Madeira River, c.100 km south-west of our study area (Tobias & Seddon 2007). *C. f. duidae*, unlike its congeners (see below), appears to be resident in campina / campinarana in the region.

**FUSCOUS FLYCATCHER** *Cnemotriccus fuscatus*

In addition to the specimen attributed to *C. f. duidae* (above), three other specimens of *C. fuscatus* were collected. Two (MPEG 70971 and UFAC 509) match *C. f. beniensis* and a third (UFAC 477) more closely resembles *C. f. bimaculatus* (Fig. 4A–C). Although Tobias & Seddon (2007) argued that *C. f. beniensis* could be synonymous with *C. f. fuscatior*, a series collected in Acre (Guilherme 2009, 2012, 2016) plus the two from Rondônia agree with the description presented by Gyldenstolpe (1945) to differentiate it from *C. f. bimaculatus*. Some of the differences noted by Gyldenstolpe (1945) and observed in UFAC 509 are: ‘…chin and throat grayish-white, usually without any yellowish tinge; breast greyish brown without olivaceous suffusion; bill larger and stronger…’ (Fig. 4A–C). Although bill length is almost identical among specimens UFAC 509 (*beniensis*) and 477 (*bimaculatus*) (14.1 vs. 14.04 mm respectively), in UFAC 509 it is broader (5.0 vs. 3.92 mm) and flatter than in UFAC 477 (Fig. 4C). The morphological similarities, as a whole, between UFAC 509 from Rondônia (Fig. 4A–C) and the holotype of *C. f. beniensis*, from Bolivia, were proven by comparing it with the photograph of the type specimen (NRM 569425) online (http://www.nrm.se). UFAC 509 also shows clear differences from the holotype of *C. f. fuscatior* (Fig. 4D). The latter, AMNH 211013 from Ecuador, as described by Chapman (1926) has ‘…Upperparts much darker and wing-bars narrower than in any other described race of the species… the breast grayish olive, the belly pale sulphur-yellow…’ (Fig. 4D). In UFAC 509, the wingbars are broad as in UFAC 477 (*bimaculatus*) (Fig. 4B) and the back and chest are brown (Fig. 4A–B), not grey as in *C. f. fuscatior* (Fig. 4D). Additionally, *C. f. fuscatior* is associated with várzea and river islands (Tobias & Seddon 2007), while UFAC 509 (Fig. 4A–C) and MPEG 70971 are from a campinarana enclave in terra firme, which reinforces our conviction that the two latter specimens represent *beniensis*. Taxonomy of the group is confused (Chapman 1926, Zimmer 1938, Gyldenstolpe 1945, Tobias & Seddon 2007) and genetic and vocal analyses should seek to clarify how many species-level taxa are involved. The certainty is that at least three taxa of the *C. fuscatus* complex occur at Miratinga. This is the first record of *beniensis* in Rondônia (where its status is uncertain), while *bimaculatus* is an austral migrant (Hellmayr 1910, Stotz et al. 1997, Whittaker 2004, Santos et al. 2011).

**PLUSH-CRESTED JAY** *Cyanocorax chrysops diesingii*

This subspecies is the Amazonian substitute of *C. c. chrysops*, which is common in southeast Brazil, northern Argentina, Uruguay, Paraguay and Bolivia (Ridgely & Tudor 1994). *C. c. diesingii* is a specialist of campina / campinarana (Aleixo & Poletto 2007, Whittaker 2009, Borges et al. 2016a). On 1 March 2011 a pair was observed vocalising and later one was
photographed at the edge of campinarana at Miratinga (Fig. 3D). In 2012, the species was seen daily in the same place. This taxon appears to be common in enclaves of campinarana along the BR-364 between Porto Velho and Abunã, in the north-west of the state. It is possible that C. c. diesingii occurs sympatrically with the recently discovered Campina Jay C. hafferi (Cohn-Haft et al. 2013) in campina / campinarana further north, in Amazonas, e.g. in WSV enclaves around Borba (Hellmayr 1910, Wikiaves 2018).

**RED-SHOULDERED TANAGER** *Tachyphonus phoenicius*

Typical of open vegetation in Amazonia (e.g. cerrado, campina and campinarana) and present in three different biogeographic regions. North of the Solimões / Amazon River in the states of Roraima, Pará and Amapá, as well as in eastern Colombia, southern Venezuela and the Guianas; in the south, from the Madeira basin in the region of Guayaramerin
in Bolivia (Tobias & Seddon 2007) to the east; and in the extreme south-west, in north-east Peru (Loreto), western Acre (Mâncio Lima and Cruzeiro do Sul) and south-western Amazonas (municipality of Guajará) (Hilty 2011, Guilherme 2012, 2016; E. Guilherme & A. Aleixo unpubl.). In Rondônia, *T. phoenicius* was recorded by Olmos et al. (2011) at Traçaçal Biological Reserve and Serra da Cutia National Park, in the south-west of the state, with other documented records from the municipalities of Parecis and Vilhena (Naumburg 1930, Wikiaves 2018). A female was collected in *campinarana* at our study site on 20 August 2012 (UFAC 475), extending the species’ range in Rondônia to the north, c.230 km from Traçaçal Biological Reserve.

**Discussion**

Although our visits to the study site were short, totalling just nine days, a significant number of species was recorded. The avifauna found exclusively in *campinarana* represented 17.7% of all species recorded and consists of birds that colonise forest edge, open country or habitat specialists (*sensu* Stotz et al. 1996, Borges 2004, Borges et al. 2016a). Of the 35 taxa considered by Borges et al. (2016a) to be WSV specialists throughout Amazonia, 17.1% were recorded in this small *campinarana*. However, if we consider only the 11 WSV specialists from the southern Solimões / Amazon basin (*sensu* Stotz et al. 1996), representativeness increases to 54.5%. Some species (e.g. *Xenopipo atronitens*) have specialised to such an extent that they occur only in enclaves of open vegetation across Amazonia (Capurucho et al. 2013, Borges et al. 2016a). This implies that vegetation growing on white sand functions as ‘islands’ or mini-refugia (*sensu* Isler et al. 1997) within the surrounding forest. These ‘islands’ also offer a range of food resources capable of attracting seasonal migrants from other open biomes (e.g., Cerrado, Chaco, *campos sulinos*), which explains the comparatively large number of austral migrant species in this small patch of WSV. The result is a unique community of birds different from that in surrounding forest (Borges 2004). Therefore, the presence of an enclave of *campinarana* contributes significantly to regional diversity in Amazonia (Borges et al. 2016a).

**Body mass and morphometrics.**—These data, taken from 136 individuals of 55 different species (Table 2), are presented separately by age and gender (Table 2). Because many species in the study area are uncommon and patchily distributed, we consider it important to publish these mass and morphometric data. Such information forms the basis of comparative studies in various aspects of animal biology, including community structure and theoretical modelling (Hudson et al. 2013, Frasier 2016). Dunning (2008) compiled body mass data for 8,700 species worldwide, but for some the number of individuals sampled was very small and from a single locality, e.g. *Thamnophilus stictocephalus*, for which just one male from Bolivia was available to Dunning (2008). In this study, we not only increased the number of *T. stictocephalus* so measured, but we also collected mass and morphometrics for many other species from Brazil that were poorly sampled or unrepresented in Dunning’s work, e.g. Rondônia Warbling Antbird *Hypocnemis ochrogyna*, which was recently split from *H. cantator* (Isler et al. 2007; Table 2).

**Conservation.**—The small enclave of WSV at Miratinga lies within a region that is highly threatened (Vale et al. 2008, Fernandes et al. 2010). It is directly impacted by the BR-364 and, according to the Socioecological and Economic Zoning of Rondônia, forms part of 1.2 Sub-zone, which is subject to accelerated occupation and uncontrolled deforestation. Furthermore, the area is likely to witness increasing agricultural and other anthropogenic disturbance in the future (Fernandes et al. 2010). A concrete example of this is the recently implanted Jirau Hydroelectric Plant, 9.5 km from the study site. Allied to this, an energy transmission line, linking the states of Rondônia and Acre, transsects the *campinarana* (see...
### TABLE 2

Body mass and morphometrics of 55 different species captured in a *campinarana* and its environs in north-west Rondônia, Brazil. Age: A= adult; Y = young. Sex: F = female; M = male, U = undetermined. Nomenclature follows Piacentini *et al.* (2015). Wing, tarsus and total length in mm; body mass in g. * No mass data from South America in Dunning (2008). ** No mass data from Brazil in Dunning (2008). ① Sample of fewer than ten individuals in Dunning (2008). ② No mass data in Dunning (2008).

| Species name                  | Age | Sex | Body mass Mean ± SD (n) | Wing Mean ± SD (n) | Tarsus Mean ± SD (n) | Total length Mean ± SD (n) |
|-------------------------------|-----|-----|-------------------------|-------------------|----------------------|---------------------------|
| Columbina passerina*          | A   | F   | 34                       | 80                | 12                   | 160                       |
| Columbina talpacoti**         | A   | F   | 42                       | 86                | 13                   | 175                       |
| Leptotila verreauxi**         | A   | M   | 130                      | 129               | 35                   | 270                       |
| Geotrygon montana**           | A   | F   | 100                      | 125               | 32                   | 230                       |
| Nyctidromus nigriceps**       | A   | F   | 45                       | 138               | 13                   | 215                       |
| Phaethornis philippii**       | A   | U   | (2) 4                    | (2) 55–70         | (2) 4–3              | (2) 124–154               |
| Campylopterus largipennis     | A   | U   | 7                        | 74                | 3.1                  | 135                       |
| Polytmus theresiae**          | A   | F   | 3                        | 56                | 3                    | 101                       |
|                             | A   | M   | 3                        | 60                | 3                    | 102                       |
|                             | J   | U   | 4                        | 55                | 3                    | 96                        |
|                             | A   | U   | (2) 3                    | (2) 56            | (2) 4                | (2) 100–101               |
| Bucco tamatia**              | A   | U   | 35                       | 79                | 16                   | 185                       |
|                             | A   | F   | 33                       | 75                | 19                   | 181                       |
| Picumnus aurifrons①          | A   | M   | 8                        | 48                | 15                   | 82                        |
| Pyg iptila stellaris**        | A   | M   | 23                       | 81                | 16                   | 148                       |
| Clytoctantes atrogularis①     | A   | F   | 33                       | 85                | 27                   | 197                       |
| Formicivora grisea**          | A   | F   | 10.6 ± 0.8 (5)           | 54.6 ± 2.0 (5)    | 20 ± 2.5 (5)         | 134 ± 3.7 (5)             |
|                             | A   | F   | 10.6 ± 0.8 (6)           | 51.3 ± 2.5 (6)    | 21.6 ± 5.1 (6)       | 129.5 ± 6.4 (6)           |
|                             | A   | U   | 19                       | 72                | 18                   | 155                       |
|                             | A   | U   | 21                       | 80                | 16                   | 156                       |
| Thamnomanes saturninus       | A   | F   | 13                       | 54                | 22                   | 115                       |
|                             | A   | U   | 21                       | 80                | 16                   | 156                       |
| Thamnophilus stictocephalus② | A   | M   | (2) 17–19                | (2) 65–66         | (2) 25–27            | (2) 148–158               |
|                             | A   | F   | (2) 12–16                | (2) 65–66         | (2) 24–27            | (2) 135–160               |
| Sciap hy lax hemimelaena**    | A   | F   | 13                       | 54                | 22                   | 115                       |
| Hypocnemis ochrogyna②        | A   | U   | 11                       | 55                | 18                   | 124                       |
| Glyphorynchus spirurus       | A   | U   | 13 ± 0 (3)               | 73.3 ± 3 (3)      | 15 ± 1.7 (3)         | 154 ± 2 (3)               |
|                             | A   | U   | 39                       | 105               | 20                   | 226                       |
| Xiphorhynchus elegans        | A   | U   | 14                       | 65                | 15                   | 123                       |
| Xenops minutus               | A   | U   | 14                       | 65                | 15                   | 123                       |
| Philodar erythroceracum②     | A   | U   | 27                       | 95                | 20                   | 176                       |
| Sy nallaxis rutilans**       | A   | U   | 13                       | 61                | 15                   | 155                       |
| Ceratopipra rubrocapilla     | A   | M   | 12                       | 59                | 17                   | 106                       |
|                             | A   | F   | (2) 14                   | (2) 62–63         | (2) 12               | (2) 112                   |
| Manacus manacus              | A   | M   | 13.6 ± 1.1 (3)           | 51.3 ± 2 (3)      | 21.6 ± 5.5 (3)       | 105.3 ± 0.5 (3)           |
|                             | A   | F   | 13                       | 47                | 21                   | 110                       |
| Machaeropterus pyrecephalus** | A   | M   | 9                        | 48                | 18                   | 86                        |
| Species name             | Age | Sex | Body mass     | Wing          | Tarsus       | Total length  |
|--------------------------|-----|-----|---------------|---------------|--------------|--------------|
|                          |     |     | Mean ± SD (n) | max.–min.     | max.–min.    | max.–min.     |
| **Xenopipo atronitens**  | A   | F   | 8.3 ± 0.5 (3) | 8–9           | 15.6 ± 2 (3) | 85.6 ± 5.5 (3) |
|                          |     |     | 49.6 ± 1.5 (3)| 48–51         | 14–18        | 80–91        |
| **Terenotriccus erythrus**| A   | U   | 7             | 13            | 102          |              |
| **Mionectes oleagineus** | A   | M   | 10            | 56            | 105          |              |
|                          |     |     | 56 ± 1.1 (3)  | 56–58         | 122 ± 6 (3)  | 115–126      |
| **Tolmomyias flaviventris** | A   | M   | 11            | 58            | 125          |              |
| **Poecilotriccus senex** |     |     | 13            | 12–16         |              |              |
| **Poecilotriccus latirostris** | A   | U   | 6             | 43            | 101          |              |
| **Elaelia spectabilis**  | A   | U   | 22            | 92            | 165          |              |
| **Elaelia chirilensis**  | J   | U   | 14            | 68            | 113          |              |
| **Elaelia parvoirostris**| A   | U   | 12 ± 2.4 (6)  | 8–14          | 147 ± 8.3 (6)| 133–158      |
|                          |     |     | 71 ± 2.5 (6)  | 66–73         | 12–20        |              |
| **Elaelia cristata**     | A   | U   | (2) 13–17     | (2) 67–69     | (2) 14.4–15  | (2) 160      |
| **Tyrannus elatus**      | A   | U   | 9             | 60            | 112          |              |
| **Phaemyias murina**     | A   | U   | 7.75 ± 0.5 (4)| 7–8          | 122 ± 1.4 (4)| 120–123     |
|                          |     |     | 56.5 ± 1.2 (4)| 55–58        | 120–123      |              |
| **Myiarchus ferox**      | A   | U   | 27 ± 1.7 (3)  | 25–28         | 198.3 ± 5.7 (3)| 195–205    |
|                          |     |     | 86 ± 3.4 (3)  | 82–88        | 198–205      |              |
| **Rhytipterna immunda**  | A   | M   | 23            | 85            | 179          |              |
|                          |     |     | 82 ± 3.4 (3)  | 82–88        | 190–205      |              |
| **Tyrannus melancholicus** | A   | U   | 31            | 95            | 199          |              |
| **Sublegatus modestus**  | A   | U   | (2) 13–14     | (2) 66        | (2) 13–15    | (2) 138–142 |
| **Cnemotriccus fusatus duidae** | A   | U   | 11            | 66            | 145          |              |
| **Cnemotriccus fusatus beniensis** | A   | U   | 65            | 22            | 150          |              |
| **Cnemotriccus fusatus bimaculatus** | A   | U   | 12            | 69            | 156          |              |
| **Turdus ignobilis**     | A   | M   | 55            | 108           | 220          |              |
|                          |     |     | 109           | 31            |              |              |
| **Turdus amaurochalinus**| A   | U   | 60            | 122           | 206          |              |
| **Phaeopogdias genibarbis** | A   | F   | 18            | 59            | 225          |              |
| **Tangara episcopus**    | A   | U   | 21            | 88            | 170          |              |
| **Volatinia jacarina**   | J   | M   | (2) 7–10      | (2) 53–55     | (2) 114–116  |              |
|                          |     |     | (2) 12–15     | (2) 12–15     |              |              |
| **Tachyphonus phoeniclus** | A   | F   | 8             | 47            | 106          |              |
|                          |     |     | 71            | 14            | 168          |              |
| **Ranphocelus carbo**    | A   | F   | 24            | 76            | 180          |              |
|                          |     |     | 76            | 18            |              |              |
Fig. 4 in Guilherme & Santos 2013) affecting also adjacent terra firme forests. Furthermore, commercial sand mining has directly impacted this small ‘island’ of WSV in north-west Rondônia. This process completely destroys the vegetation, thereby exposing the soil (Ferreira et al. 2013, Adeney et al. 2016). Post-exploration, the mined areas are usually abandoned without any type of environmental recovery (Ferreira et al. 2013; Fig. 2E).

Finally, human impacts on this area date back many decades. One evidence of this is the Madeira / Mamoré railway, whose scar, 52 years after its decommissioning, is still visible in the centre of the study site (Fig. 1).

Although small and degraded, the patch of campinarana we surveyed still harbours many species of conservation concern (Table 1, Guilherme & Santos 2013). In general, patches of WSV in Amazonia are fragile and sensitive to anthropogenic activities, being both threatened and poorly represented within the protected area system (Adeney et al. 2016, Fine & Bruna 2016). Despite an increase in studies of these ecosystems in recent years, many remain largely unknown scientifically (Adeney et al. 2016, Fine & Bruna 2016). We recommend that the environmental authorities in Brazil aim to restore the environmental integrity of the site, and consider the possibility of incorporating our study area into a conservation unit.

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