

BIRDS OF THE BARIMA-MORA PASSAGE PROPOSED SPECIAL PROTECTED AREA



A report prepared for the Guyana Marine Conservation Society (GMCS)

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Summary

From 19-28 October 2021, we surveyed the avifauna of the proposed Special Protected Area (SPA) encompassing the lower Barima and Kaituma Rivers and the Barima-Mora Passage, an area that, along with the adjacent Shell Beach Protected Area, harbors the most extensive intact mangrove ecosystem in Guyana. The goal of this survey was to gather information on the diversity and abundance of birds in the Barima-Mora Passage area; to better inform tourism development, wildlife management, and conservation; and to support its nomination as a UNESCO World Heritage Site. We observed 187 bird species within the boundaries of the proposed SPA, and added historical data to bring the total list to 244 species. Our findings include two species not previously known to occur in Guyana, the Belted Kingfisher (*Megaceryle alcyon*) and Black-chested Tyrant (*Taeniotriccus andrei*). Although our survey efforts were hampered by weather to some degree, we still found a thriving and diverse bird community including at least ten species listed as Near Threatened or Vulnerable on the IUCN Red List, and we estimate that the area supports a minimum of 260 bird species. Numbers of some species, notably Scarlet Ibis (*Eudocimus ruber*) and Orange-winged Parrot (*Amazona amazonica*), were the highest we have seen in Guyana. Overall, the diversity, abundance, and high visibility of birds in the proposed Barima-Mora Passage SPA warrant enhanced protection of the area and are auspicious for the success of ecotourism in the region.

Introduction

The Barima-Mora Passage (hereafter BMP) is a vast region of intact mangrove, freshwater swamp, and marsh forest located just inland from the Shell Beach Protected Area, along the Barima and Kaituma Rivers (Fig. 1). Its rich resources sustain several communities within the Mabaruma Municipality and surrounding areas. The BMP harbors high biodiversity, including many IUCN- and CITES-listed species, and is known as a rich hunting, fishing and trapping ground. Most significantly, the extensive mangrove ecosystem of the BMP is contiguous with the largest mangrove forest remaining in Guyana (in Shell Beach PA). Numerous studies (summarized in Ryan and Ramessar 2020) have quantified the value of this and other mangrove ecosystems in terms of carbon sequestration, coastal protection, fisheries sustainability, and provision of raw materials. The value of services provided by the mangrove ecosystem in Region 1 alone is more than three billion US dollars annually, according to one estimate; globally, mangroves are widely recognized as a critically endangered ecosystem vulnerable to overexploitation, pollution, and coastal development. For this reason, the remarkably intact and extensive mangrove ecosystem of the BMP deserves recognition as a UNESCO World Heritage site, and its nomination as such is anticipated in the near future.

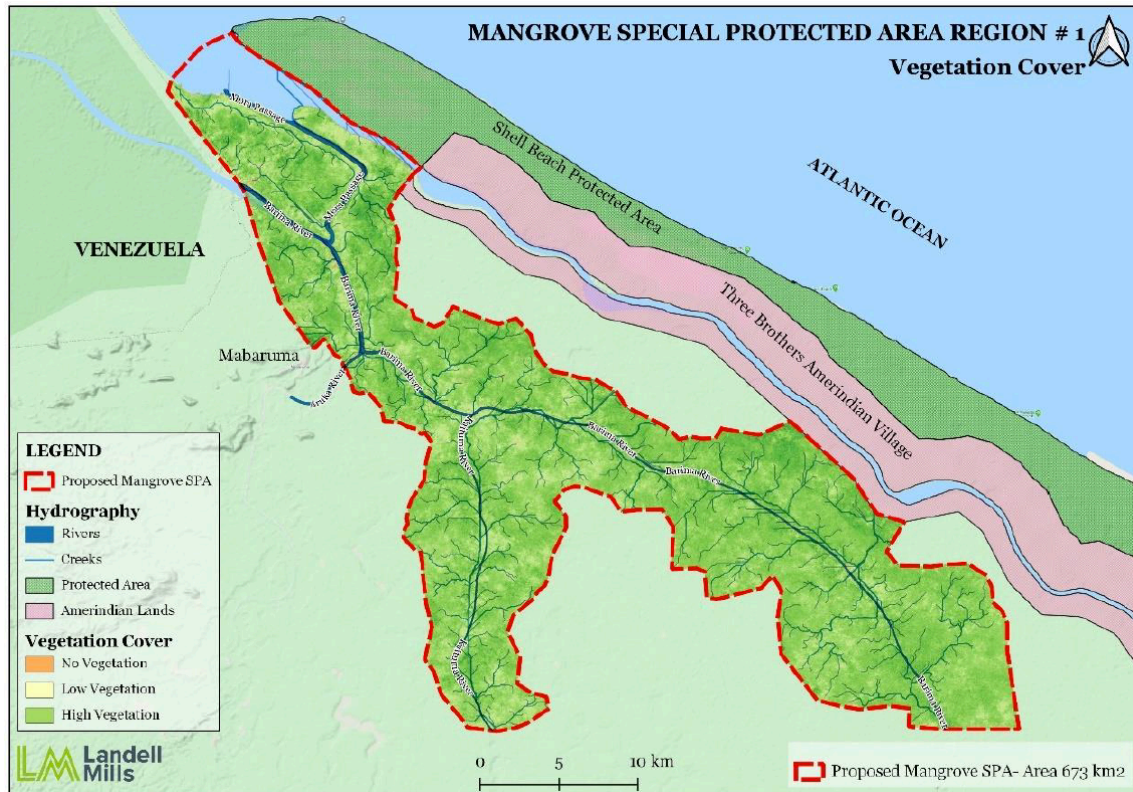


Figure 1. A map of the proposed Barima-Mora Passage Special Protected Area. From Ryan and Ramessar (2020).

The avifauna (birdlife) of the Barima-Mora Passage area has been little studied. Previous bird surveys in this region have focused on the Shell Beach Protected Area, where more than 200 species of birds have been observed (Prince et al. 2004, Mendonca et al. 2006). The only prior formal survey within the proposed Barima-Mora Passage SPA was an expedition by the Smithsonian Institution and the University of Kansas from 14-26 March 2002, which recorded 132 species of birds from a single site on the right bank of the Barima River, a short distance upriver from Morawhanna. Other incidental observations were made by various observers in the mid-2000s and entered into eBird (www.ebird.org). Finally, our partners in the current faunal inventory, visiting the BMP to set and retrieve camera traps in

February and May 2021, made opportunistic observations of birds while conducting their fieldwork. The goal of our survey was to produce the first comprehensive list of bird species for the Barima-Mora Passage. Its primary objectives were:

1. To detect, identify, and document (by photographs and sound recordings) the maximum number of bird species present in the area, using both transect counts and opportunistic observations.
2. To establish permanent transects for bird monitoring at select locations throughout the BMP Special Protected Area.
3. To train local rangers in bird identification, transect methodology and data recording, and the use of eBird, a citizen science platform for tracking bird sightings and connecting local observers with the global birding community.

Study Site and Methods

We conducted surveys over the full extent of the proposed BMP SPA, departing from Mabaruma each morning during the survey period and visiting a new location each day. We surveyed mostly along the Barima and Kaituma Rivers, entering any navigable creeks when it was possible to do so, and exploring farms and school grounds on foot whenever possible. We also surveyed the villages of Smith Creek, Morawhanna, and Imbotero, including the large farm clearing behind Morawhanna as well as the road leading back toward Mabaruma from Smith Creek. All data were entered into eBird (www.ebird.org; Fig. 2). We covered a variety of habitats. Most forest along the rivers was dominated by mangrove, which yielded to tall

marsh forest as one moved away from the rivers. Farm and schoolyard clearings were dominated by early successional vegetation, ornamental plantings, and crops. The invasive palm *Nypa fruticans* occurred throughout the SPA, but was noticeably more abundant in downstream areas, including around Imbotero, where it dominated the undergrowth (Fig. 3).

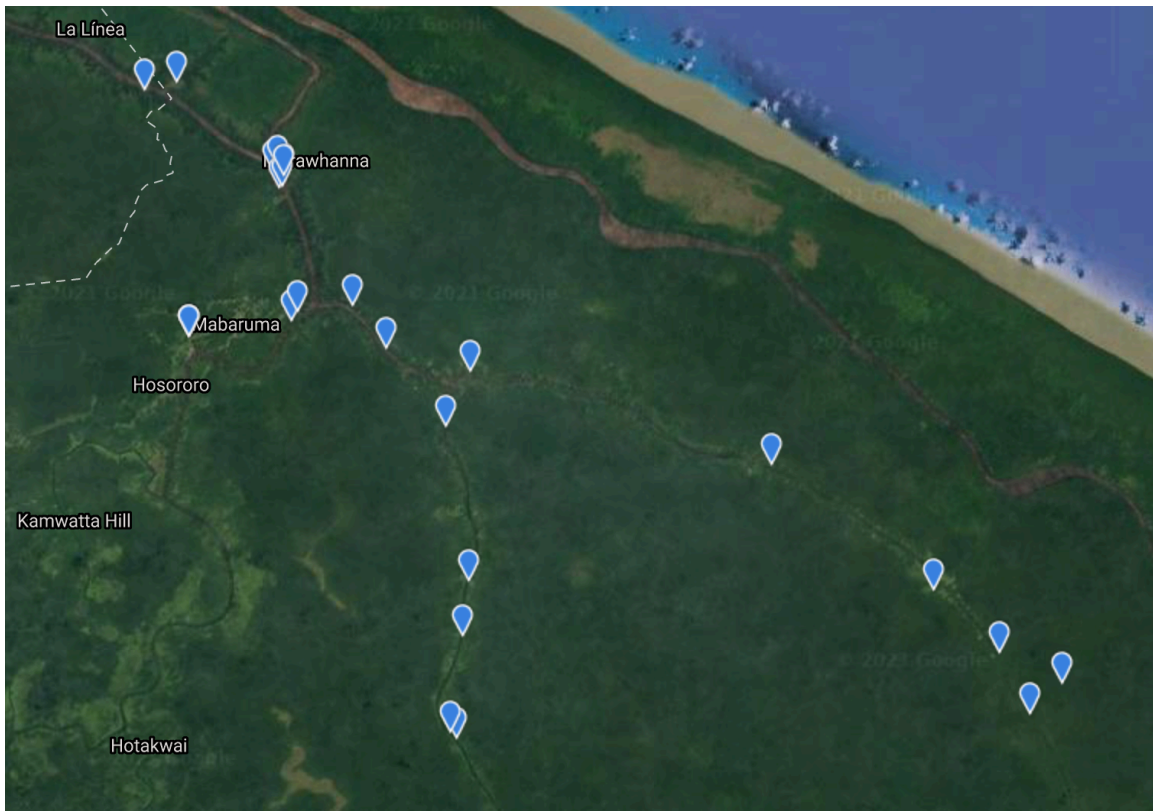


Figure 2. Map of the locations of checklists submitted to eBird by the bird survey crew, 19-28 October 2021. Note the clustering of points around Morawhanna/Smith Creek. Data from Mabaruma were excluded from our analyses, as Mabaruma is outside the boundaries of the SPA.



Figure 3. A creek near Imbotero with dense growth of the invasive palm *Nypa fruticans*. (Photo: Brian J. O'Shea)

Although our original survey design included transects, we found transect establishment to be essentially impossible given the high water and difficulty of walking through the forest at this time of year. Instead, we quantified bird diversity and abundance using the 10-species or MacKinnon list method (Mackinnon and Phillips 1993; Herzog et al. 2002, 2016). This method involves an observer recording every bird seen or heard in the order in which they are encountered, and then parsing the resulting list into

samples of 10 ten species each. The method assumes that individuals are not double-counted, and requires thorough familiarity with the resident avifauna by both sight and sound. Because they are not bound by time or distance traveled, ten-species lists cannot be analyzed using the same parametric statistical methods as more traditional survey methods, such as point counts; however, they are useful for estimating diversity when not all species in an area are detected (as is almost always the case), and they have the advantage of registering all observed species, which point counts and transects rarely do (Herzog et al. 2016). Birds were tallied in this manner at all times within the boundaries of the SPA, except when we were traveling at high speed in the boat, when most bird species could not be detected.

To estimate diversity, we used Program SpadeR (Chao et al. 2015) to analyze our ten-species list data. We generated both abundance-based and incidence-based diversity estimates. The bird community was further characterized by multiplying the total number of individuals of each species by the proportion of lists containing that species. The resulting abundance index was used to categorize species into five abundance classes (Abundant; Common; Fairly Common; Uncommon; Rare). The abundance indices derived from ten-species lists can be used to compare abundances of individual species across regions.

Results

Species diversity

We encountered 187 species within the boundaries of the proposed Barima-Mora Passage SPA, generating a dataset of 178 ten-species lists comprising 7086 individuals of 180 species (the remaining seven species were seen

when ten-species list data were not being collected). The most abundant species in our dataset, by far, was Orange-winged Parrot (*Amazona amazonica*), with 2009 individuals (28.3% of all individual birds recorded). The most widespread species, as measured by the number of lists on which it was recorded, was Bananaquit (*Coereba flaveola*), recorded on 45% of ten-species lists. Forty-five species were only recorded on a single list (i.e., they were only observed once during the survey).

Analysis of our ten-species list data yielded estimates of 199-256 bird species in the area (Table 1). The addition of 57 species observed by our GMCS colleagues, the Smithsonian Institution/University of Kansas survey expedition, and other observers during the past 20 years brings the total number of species observed in the proposed Barima-Mora Passage SPA to 244, close to the upper limit of our incidence-based diversity estimates and above the upper limits for estimates based on species abundances (Table 2). We therefore expect the total number of species in the area to be between 250 and 260, although the actual number is likely to be somewhat higher (see Discussion).

Table 1. Diversity estimates from 178 ten-species lists generated during the BMP bird survey, including 95% confidence intervals for species richness values.

Estimator	Data type	Predicted richness	Standard error	95% CI lower	95% CI upper
Chao1	Abundance	218	6.982	207	235
ACE	Abundance	210	7.839	199	231
Chao2	Incidence	236	8.877	222	256
ICE	Incidence	225	11.495	208	255

New records and unusual species

Our most noteworthy records were two species not previously documented in Guyana. In the late afternoon of 19 October, we observed a Belted Kingfisher (*Megaceryle alcyon*) at the confluence of the Aruka and Barima Rivers. Another was seen the next morning at the mouth of Severina Creek, more than 20 miles up the Barima River from the location of the first sighting. On 25 October, a third bird was seen at the same location as the first, and was possibly the same individual. Belted Kingfisher breeds in North America and occurs as far south as the southern edge of the Caribbean Basin during the northern winter. It is regular on Trinidad during this time, but there are few if any documented records from the Orinoco Delta south and eastward along the South American coast. This species was previously considered “Hypothetical” in Guyana (Braun et al. 2007); we know of only one previous (unconfirmed) record for Guyana, a bird reported from the vicinity of the Demerara Bridge, near Georgetown, in 2012.

The other significant record from our survey is the first observation in Guyana of Black-chested Tyrant (*Taeniotriccus andrei*), a small flycatcher that is considered by some to be “one of the most sought-after birds in Amazonia” (Lees and Moura 2020). This species remains very poorly known, and its distribution is apparently discontinuous over a wide swath of eastern Amazonia. It occurs in the Orinoco Delta, but is exceedingly scarce in the Guianas: it has not been observed in Suriname since the first record more than forty years ago (Ottema et al. 2009), and there are no records for French Guiana. On the morning of 20 October, we heard a Black-chested Tyrant calling along Severina Creek, on the right bank of the Barima River in the eastern portion of the proposed SPA. Recognizing the call

immediately, we performed playback and got the bird to approach closely enough for diagnostic photographs. In the following days, we found at least three other birds along the road that leads toward Mabaruma from Smith Creek. All of them were found in swamp forest understory at some distance (>500 m) from the river.

We noted several other species that are not commonly seen elsewhere in Guyana, including Magpie Tanager (*Cissopis leverianus*), Swallow Tanager (*Tersina viridis*), Velvet-fronted Grackle (*Lamprosar tanagrinus*), Streak-headed Woodcreeper (*Lepidocolaptes souleyetii*), and Slender-billed Xenops (*Xenops tenuirostris*).

Species of conservation concern

Our combined species list of 244 species includes ten species listed as Near-Threatened (NT) or Vulnerable (VU) on the IUCN Red List (IUCN 2021; Table 2).

Table 2. IUCN Red-Listed species known to occur in the proposed Barima-Mora Passage Special Protected Area.

Scientific name	English name	Red List status
<i>Tinamus major</i>	Great Tinamou	NT
<i>Crax alector</i>	Black Curassow	VU
<i>Odontophorus gujanensis</i>	Marbled Wood-Quail	NT
<i>Patagioenas subvinacea</i>	Ruddy Pigeon	VU
<i>Psophia crepitans</i>	Gray-winged Trumpeter	NT
<i>Buteogallus aequinoctialis</i>	Rufous Crab Hawk	NT
<i>Ramphastos tucanus</i>	White-throated Toucan	VU
<i>Ramphastos vitellinus</i>	Channel-billed Toucan	VU
<i>Myrmotherula surinamensis</i>	Guianan Streaked-Antwren	VU
<i>Conirostrum bicolor</i>	Bicolored Conebill	NT

Discussion

Characteristics of the bird community

We found the Barima-Mora Passage to harbor a high diversity and abundance of birds. The bird community, although somewhat less diverse than many other lowland regions in Guyana, nevertheless contained a high proportion of rare species (~73%) which is a typical community structure for lowland tropical forest. The moderate diversity relative to other regions of Guyana is most likely due to the reduced structural complexity of the vegetation (relative to tall rainforest) in the mangrove-dominated forests that we surveyed. Many birds of Guyana's species-rich interior forests are not expected to occur in mangroves and other coastal habitats, although we found some to be present at extremely low densities, providing evidence that

the Barima-Mora Passage SPA encompasses a transition zone between interior and coastal forests. Most of our observations of species typical of interior forests were made when we were able to get into extensive swamp forest at least 500 meters from the river, where mangroves were less dominant. These occasions were rather few, given the difficulty of traversing over land, and our reliance on the tides to enable our large boat to ascend small creeks providing access to the forest. Many of our survey locales were in highly disturbed habitats, including farms, school yards, and villages – areas that tend to harbor a distinct set of widespread generalist species that varies little from one place to another. These species may indeed be overrepresented in our dataset, given our restricted mobility and relatively little time spent in extensive forest. We note also that many of the species recorded by the Smithsonian Institution/University of Kansas expedition, but not by us, were forest birds common elsewhere in Guyana. For this reason, we suggest that bird diversity in the SPA as a whole is likely to exceed our upper-bound species diversity estimate of 256 species.

Another limiting factor on this survey was bad weather. On all but three mornings, rain started before dawn and continued with only minor breaks for most of the day. As a result, we sometimes did not depart from Mabaruma until mid-morning, and we spent considerable time sheltering from the rain while along the rivers. There is no doubt we would have detected more species and individuals had the weather been more favorable for bird surveys.

Survey highlights

In spite of the bad weather, the abundance of birds in the Barima-Mora Passage SPA was notable. Our average of 39.8 individuals per ten-species list was substantially higher than we have encountered using the ten-species method in other forested regions of Guyana. The three most abundant species in our dataset – Orange-winged Parrot (2009 individuals), Crested Oropendola (*Psarocolius decumanus*, 592 individuals), and Scarlet Ibis (*Eudocimus ruber*, 570 individuals) – together accounted for almost 45% of all birds observed. The concentrations of each of these species were notable. At the confluence of the Aruka and Barima Rivers, we observed a roost of Orange-winged Parrots that we tentatively estimated to contain 9000 birds. This was by far the largest concentration of this species that we had ever seen, and was a truly spectacular sight and sound. We found both Crested Oropendolas and Green Oropendolas (*Psarocolius viridis*), along with Giant Cowbird (*Molothrus oryzivorus*), roosting by the hundreds in *Nypa fruticans*-dominated undergrowth along the edge of the large farm clearing near Smith Creek, creating a smell so powerful it could be detected far out in the river. Groups of Scarlet Ibises were seen frequently, especially in and around Imbotero, where they frequented yards and allowed a close approach.

Another notable species we found was the Crimson-hooded Manakin (*Pipra aureola*), a spectacular understory bird with a complex display behavior. This species is restricted to coastal swamp forests and was more common in the Barima-Mora Passage SPA than we have found it to be elsewhere in Guyana.

The discovery of two bird species previously undocumented in Guyana was certainly a highlight of the survey, and indicates that other new species for Guyana might also be found with continued effort. Several species that occur in the Orinoco Delta, particularly Delta Amacuro Softtail (*Thripophaga amacurensis*) and Jet Antbird (*Cercomacra nigricans*), are likely to also occur on the Guyana side of the border, where there is ample potential habitat. These should be the targets of future surveys, preferably in the dry season when swamp forest habitats in the Barima-Mora Passage SPA can be sampled more extensively than we were able to do on this survey.

Local capacity building

Our local trainees were Leslin Gomez, Olivia Williams, and Ryan Jerome, who joined us every day, along with Shenica Goodman from the GMCS and Randolph Webber, our local guide from Aruka River. Everyone participated enthusiastically despite the bad weather. We focused our training activity on the use of binoculars and field guides, as well as the identification of common bird species, with special emphasis on species most likely to be sought by visiting birdwatchers. Toward the end of the survey, we also introduced the trainees to the use of the Merlin[®] bird ID app, and to eBird, an online platform that allows users to enter sightings and build lists. We had intended to use both of these apps more extensively during the survey, but we felt the trainees would derive greater benefit from more basic training. We also encountered some difficulty using the apps in the field due to unanticipated issues with their offline functionality. Nevertheless, we expect to be able to reintroduce them in the future, as they are of great value for monitoring and tourism.

Tourism potential

One of the goals of this survey was to evaluate the potential allure of the Barima-Mora Passage as an ecotourism, and specifically birdwatching, destination. We believe the site holds much promise for tourism development, of which birdwatching should be an integral component. The following is a partial list of potential selling points for the area:

- Massive roost of Orange-winged Parrots at Aruka River, easily visible at close range from a boat and only minutes from Mabaruma.
- Large numbers of Scarlet Ibis, particularly in and near Imbotero, where they are habituated to the presence of people and allow close approach for photography.
- Black-chested Tyrant, a charismatic and highly sought-after bird that appears to be fairly easy to find in the area. This could be the only place in the Guianas where the species is regularly seen. It would be the main target of serious birders visiting the region.
- Crimson-hooded Manakin, a species that does not occur in the interior of Guyana, where most birding tours focus their itineraries. This species' display sites are easily accessible in the area, providing great opportunities to view the spectacular males.
- Many species of large-bodied, charismatic birds, including Blue-throated Piping Guan (*Pipile cumanensis*), Rufous Crab Hawk (*Buteogallus aequinoctialis*), Black-collared Hawk (*Busarellus nigricollis*), several species of herons, Blue-and-yellow Macaw (*Ara ararauna*), and White-throated Toucan (*Ramphastos tucanus*). These

species are easy to observe and appreciated by both avid birders and more casual observers.

Conclusions and Recommendations

The proposed Barima-Mora Passage Special Protected Area supports a diverse avifauna that includes numerous rare species. The extensive, interconnected mangrove and swamp forest habitats in the BMP area represent an ecosystem not currently included in Guyana's network of protected areas. Many of the characteristic bird species of the BMP area are restricted to the coastal plain in Guyana, and are impressively abundant in this relatively undisturbed and lightly populated part of the country. The unique species composition and overall spectacle of birdlife in the BMP area warrants the development of tourism facilities catering to birdwatchers and photographers, especially as part of a circuit that encompasses other habitats and communities in Region One.

Due to bad weather limiting our mobility and causing us to lose survey time during our visit, we recommend that a follow-up survey be undertaken in early 2022, toward the end of the dry season when the forest is more accessible by foot. This would likely result in further additions to the species list for the area, possibly building it to well above our current predicted total of 256 species. There is also the possibility that additional new species for Guyana may be discovered in the area, given that several species that occur nearby, in the Orinoco Delta, have not yet been found in the country.

We also recommend continued training and support of local community members to enable them to guide tourists, share their knowledge of the

ecosystem, and contribute to citizen science databases such as eBird. As our focus during this survey was primarily on the use of binoculars and field guides, a logical next step would be more advanced training in the use of mobile apps that can facilitate bird ID, provide song recordings for playback, and allow lists to be kept.

Acknowledgments

We are grateful to NRG Holdings Inc. for funding this survey, and to Annette Arjoon-Martins for inviting us to participate and coordinating logistics. We would also like to thank Randolph Webber (aka Smokey) for sharing his profound knowledge of the Barima-Mora Passage area, and Herman Garraway (aka Pudding) and Dave Debedeen for providing boat transportation. We greatly appreciate the patience and dedication of our trainees – Leslin, Ryan, Olivia, and Shenica – for joining us early every morning, even in the rain. Finally, we thank the toshaos of Smith Creek and Imbotero for allowing us access to community lands.

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Appendix 1

Cumulative Bird Species List for the proposed Barima-Mora Passage Special Protected Area, Region 1, Guyana

List compiled by Brian J. O'Shea and Leon Moore, with contributions from Christopher M. Milensky, Mark B. Robbins, Matthew T. Hallett, and Fernando Li.

Key to column headings:

Survey – Species observed by the authors of this report, 19-28 October 2021.

SI/KU – Species listed by the Smithsonian Institution/University of Kansas expedition from their Barima River camp, 14-26 March 2002.

GMCS – Species noted by Matthew T. Hallett and Fernando Li during camera trap deployment in the BMP, February 2021.

Other – Species reported to eBird by various observers since 2002.

Abundance – Quantitative abundance scores from ten-species list data. For each species, the abundance score is the total number of individuals observed multiplied by the proportion of ten-species lists on which that species was recorded. Scores >1 are common and widespread species; those < 0.1 are relatively rare. Abundance scores are not given for species not observed during the current survey, or those observed when we were not collecting ten-species list data (marked with (X) in the “Survey” column).

Taxonomy and nomenclature follow the South American Checklist Committee (SACC) of the American Ornithological Society (version 27 November 2021;
<https://www.museum.lsu.edu/~Remsen/SACCBaseline.htm>).

Species	English name	Survey	SI/KU	GMCS	Other	Abundance
Tinamidae						
<i>Tinamus major</i>	Great Tinamou	X	X	X		0.045
<i>Crypturellus cinereus</i>	Cinereous Tinamou			X		-
<i>Crypturellus soui</i>	Little Tinamou	X				0.011
Anatidae						
<i>Dendrocygna autumnalis</i>	Black-bellied Whistling-Duck			X		-
<i>Cairina moschata</i>	Muscovy Duck	X	X	X		0.051
Cracidae						
<i>Penelope jacquacu</i>	Spix's Guan			X		-
<i>Pipile cumanensis</i>	Blue-throated Piping-Guan	(X)	X	X		-
<i>Ortalis motmot</i>	Variable Chachalaca		X	X		-
<i>Crax allector</i>	Black Curassow			X		-
Odontophoridae						
<i>Odontophorus gujanensis</i>	Marbled Wood-Quail		X	X		-
Columbidae						
<i>Patagioenas speciosa</i>	Scaled Pigeon	X				0.006
<i>Patagioenas cayennensis</i>	Pale-vented Pigeon	X	X	X		12.584
<i>Patagioenas subvinacea</i>	Ruddy Pigeon	X		X		0.112
<i>Geotrygon montana</i>	Ruddy Quail-Dove			X		-
<i>Leptotilia verreauxi</i>	White-tipped Dove	X				0.034
<i>Leptotilia rufaxilla</i>	Gray-fronted Dove	X	X	X		6.236
Cuculidae						
<i>Crotophaga ani</i>	Smooth-billed Ani	X				0.787
<i>Tapera naevia</i>	Striped Cuckoo	X				0.022

Species	English name	Survey	SI/KU	GMCS	Other	Abundance
<i>Coccyua minuta</i>	Little Cuckoo	X	X	X		1.910
<i>Piaya cayana</i>	Squirrel Cuckoo	X	X	X		0.006
Nyctibiidae						
<i>Nyctibius grandis</i>	Great Potoo		X			-
<i>Nyctibius griseus</i>	Common Potoo		X			-
Caprimulgidae						
<i>Lurocalis semitorquatus</i>	Short-tailed Nighthawk		X			-
<i>Nyctidromus albicollis</i>	Common Pauraque		X	X		-
Apodidae						
<i>Chaetura brachyura</i>	Short-tailed Swift	X	X			0.292
<i>Tachornis squamata</i>	Fork-tailed Palm-Swift	X				0.006
Trochilidae						
<i>Florisuga mellivora</i>	White-necked Jacobin	X	X			0.022
<i>Glaucis hirsutus</i>	Rufous-breasted Hermit	X	X	X		32.022
<i>Phaethornis longuemareus</i>	Little Hermit	X	X	X		2.865
<i>Phaethornis superciliosus</i>	Long-tailed Hermit	X	X	X		0.360
<i>Heliothrix auritus</i>	Black-eared Fairy		X			-
<i>Polytmus theresiae</i>	Green-tailed Goldenthrroat	X				0.051
<i>Chrysolampis mosquitus</i>	Ruby-topaz Hummingbird		X			-
<i>Anthracothorax nigricollis</i>	Black-throated Mango	X				0.809
<i>Chlorostilbon mellisugus</i>	Blue-tailed Emerald	X				0.006
<i>Thalurania furcata</i>	Fork-tailed Woodnymph	X	X	X		0.006
<i>Chrysuraonia brevirostris</i>	White-chested Emerald		X			-
<i>Chrysuraonia leucogaster</i>	Plain-bellied Emerald	X				0.051
<i>Chionomesa fimbriata</i>	Glittering-throated Emerald	X				0.140

Species	English name	Survey	SI/KU	GMCS	Other	Abundance
<i>Chlorestes cyanus</i>	White-chinned Sapphire		X			-
<i>Chlorestes notata</i>	Blue-chinned Sapphire		X			-
Psophiidae						
<i>Psophia crepitans</i>	Gray-winged Trumpeter			X		-
Rallidae						
<i>Aramides cajaneus</i>	Gray-cowled Wood-Rail		X	X		-
Scolopacidae						
<i>Actitis macularius</i>	Spotted Sandpiper	X		X		13.360
<i>Tringa solitaria</i>	Solitary Sandpiper	X		X		0.140
<i>Tringa melanoleuca</i>	Greater Yellowlegs	(X)				-
Rhynchopidae						
<i>Rynchops niger</i>	Black Skimmer	(X)		X		-
Laridae						
<i>Phaetusa simplex</i>	Large-billed Tern				X	-
Eurypygidae						
<i>Eurypyga helias</i>	Sunbittern	X	X	X		0.084
Phalacrocoracidae						
<i>Phalacrocorax brasilianus</i>	Neotropic Cormorant			X	X	-
Ardeidae						
<i>Tigrisoma lineatum</i>	Rufescent Tiger-Heron	X	X	X		0.022
<i>Cochlearius cochlearius</i>	Boat-billed Heron	X				0.006

Species	English name	Survey	SI/KU	GMCS	Other	Abundance
<i>Nyctanassa violacea</i>	Yellow-crowned Night-Heron	X	X	X		0.270
<i>Butorides striata</i>	Striated Heron	X		X		1.079
<i>Ardea cocoi</i>	Cocoi Heron				X	-
<i>Ardea alba</i>	Great Egret			X		-
<i>Pilherodias pileatus</i>	Capped Heron	(X)		X		-
<i>Egretta tricolor</i>	Tricolored Heron			X	X	-
<i>Egretta thula</i>	Snowy Egret	X		X		2.579
<i>Egretta caerulea</i>	Little Blue Heron	X		X		0.315
Threskiornithidae						
<i>Eudocimus ruber</i>	Scarlet Ibis	X		X		105.674
<i>Mesembrinibis cayennensis</i>	Green Ibis	X	X	X		0.354
Cathartidae						
<i>Sarcoramphus papa</i>	King Vulture		X			-
<i>Coragyps atratus</i>	Black Vulture	X	X	X		17.056
<i>Cathartes aura</i>	Turkey Vulture	X	X	X		0.843
<i>Cathartes melambrotus</i>	Greater Yellow-headed Vulture	X	X			0.404
Pandionidae						
<i>Pandion haliaetus</i>	Osprey	X		X		0.034
Accipitridae						
<i>Leptodon cayennensis</i>	Gray-headed Kite	X				0.022
<i>Elanoides forficatus</i>	Swallow-tailed Kite		X	X		-
<i>Spizaetus tyrannus</i>	Black Hawk-Eagle	X				0.051
<i>Busarellus nigricollis</i>	Black-collared Hawk	X				0.006
<i>Harpagus bidentatus</i>	Double-toothed Kite	X		X		0.006
<i>Ictinia plumbea</i>	Plumbeous Kite		X	X		-

Species	English name	Survey	SI/KU	GMCS	Other	Abundance
<i>Accipiter superciliosus</i>	Tiny Hawk	X				0.006
<i>Geranospiza caerulescens</i>	Crane Hawk	X	X			0.006
<i>Buteogallus aequinoctialis</i>	Rufous Crab Hawk	X	X	X		5.404
<i>Buteogallus urubitinga</i>	Great Black Hawk			X		-
<i>Rupornis magnirostris</i>	Roadside Hawk	X	X	X		0.140
<i>Pseudastur albicollis</i>	White Hawk	X		X		0.006
<i>Buteo nitidus</i>	Gray-lined Hawk	X		X		0.022
<i>Buteo albonotatus</i>	Zone-tailed Hawk	X		X		0.006
Strigidae						
<i>Pulsatrix perspicillata</i>	Spectacled Owl		X			-
<i>Ciccaba virgata</i>	Mottled Owl		X			-
Trogonidae						
<i>Trogon viridis</i>	Green-backed Trogon	X	X	X		1.708
Momotidae						
<i>Momotus momota</i>	Amazonian Motmot			X		-
Alcedinidae						
<i>Megaceryle torquata</i>	Ringed Kingfisher	X	X	X		0.022
<i>Megaceryle alcyon</i>	Belted Kingfisher	X				0.022
<i>Chloroceryle amazona</i>	Amazon Kingfisher	X				0.006
<i>Chloroceryle aenea</i>	American Pygmy Kingfisher	X	X	X		2.348
<i>Chloroceryle americana</i>	Green Kingfisher			X		-
<i>Chloroceryle inda</i>	Green-and-rufous Kingfisher	X	X	X		0.236
Galbulidae						
<i>Galbula galbula</i>	Green-tailed Jacamar	X				0.303

Species	English name	Survey	SI/KU	GMCS	Other	Abundance
Bucconidae						
<i>Notharchus tectus</i>	Pied Puffbird	X		X		0.045
<i>Bucco tamatia</i>	Spotted Puffbird		X	X		-
<i>Monasa atra</i>	Black Nunbird		X			-
<i>Chelidoptera tenebrosa</i>	Swallow-winged Puffbird	X				0.011
Capitonidae						
<i>Capito niger</i>	Black-spotted Barbet	X	X			0.236
Ramphastidae						
<i>Ramphastos tucanus</i>	White-throated Toucan	X	X	X		1.416
<i>Ramphastos vitellinus</i>	Channel-billed Toucan		X			-
<i>Pteroglossus aracari</i>	Black-necked Araçari	X	X			0.022
Picidae						
<i>Picumnus exilis</i>	Golden-spangled Piculet	X	X			1.388
<i>Melanerpes cruentatus</i>	Yellow-tufted Woodpecker	X				0.045
<i>Dryobates cassini</i>	Golden-collared Woodpecker	X	X			0.169
<i>Campephilus melanoleucos</i>	Crimson-crested Woodpecker	X	X			0.556
<i>Dryocopus lineatus</i>	Lineated Woodpecker	X		X		0.112
<i>Celeus undatus</i>	Waved Woodpecker	X	X			0.169
<i>Celeus flavus</i>	Cream-colored Woodpecker	X	X	X		0.011
<i>Celeus elegans</i>	Chestnut Woodpecker		X			-
<i>Colaptes punctigula</i>	Spot-breasted Woodpecker	X				0.006
Falconidae						
<i>Herpetotheres cachinnans</i>	Laughing Falcon	X	X			0.393
<i>Ibycter americanus</i>	Red-throated Caracara	X	X	X		0.017

Species	English name	Survey	SI/KU	GMCS	Other	Abundance
<i>Daptrius ater</i>	Black Caracara	X				0.045
<i>Milvago chimachima</i>	Yellow-headed Caracara	X		X		1.416
<i>Falco rufigularis</i>	Bat Falcon	(X)		X		-
Psittacidae						
<i>Amazona ochrocephala</i>	Yellow-crowned Parrot	X	X	X		0.511
<i>Amazona amazonica</i>	Orange-winged Parrot	X	X			767.483
<i>Pionites melanocephalus</i>	Black-headed Parrot		X	X		-
<i>Orthopsittaca manilatus</i>	Red-bellied Macaw	X	X			0.270
<i>Ara ararauna</i>	Blue-and-yellow Macaw	X	X	X		5.393
<i>Diopsittaca nobilis</i>	Red-shouldered Macaw	X	X			0.022
<i>Psittacara leucophthalmus</i>	White-eyed Parakeet		X			-
Thamnophilidae						
<i>Cymbilaimus lineatus</i>	Fasciated Antshrike	X				0.006
<i>Tardaba major</i>	Great Antshrike	X	X			0.140
<i>Sakesphorus canadensis</i>	Black-crested Antshrike	X	X			13.921
<i>Thamnophilus doliatus</i>	Barred Antshrike	X	X			1.022
<i>Thamnophilus murinus</i>	Mouse-colored Antshrike	X	X			0.197
<i>Thamnomanes ardesiacus</i>	Dusky-throated Antshrike		X			-
<i>Thamnomanes caesius</i>	Cinereous Antshrike		X			-
<i>Myrmotherula brachyura</i>	Pygmy Antwren	X	X			0.022
<i>Myrmotherula surinamensis</i>	Guianan Streaked-Antwren	X				0.006
<i>Myrmotherula axillaris</i>	White-flanked Antwren	X	X	X		0.236
<i>Cercomacroides tyrannina</i>	Dusky Antbird	X	X			0.253
<i>Myrmoborus leucophrys</i>	White-browed Antbird				X	-
<i>Hypocnemoides melanopogon</i>	Black-chinned Antbird	X	X			0.270
<i>Scelateria naevia</i>	Silvered Antbird	X	X			6.067
<i>Myrmelastes leucostigma</i>	Spot-winged Antbird	X				0.006

Species	English name	Survey	SI/KU	GMCS	Other	Abundance
<i>Myrmophylax atrothorax</i>	Black-throated Antbird	X				0.034
<i>Gymnopithys rufigula</i>	Rufous-throated Antbird		X	X		-
Formicariidae						
<i>Formicarius colma</i>	Rufous-capped Anthrush	X	X			0.011
Furnariidae						
<i>Dendrocina fuliginosa</i>	Plain-brown Woodcreeper		X			-
<i>Glyphorhynchus spirurus</i>	Wedge-billed Woodcreeper		X			-
<i>Dendrocolaptes certhia</i>	Amazonian Barred-Woodcreeper		X			-
<i>Xiphocolaptes</i> <i>promeropirhynchus</i>	Strong-billed Woodcreeper		X			-
<i>Xiphorhynchus obsoletus</i>	Striped Woodcreeper	X	X			0.090
<i>Xiphorhynchus pardalotus</i>	Chestnut-rumped Woodcreeper		X			-
<i>Xiphorhynchus guttatus</i>	Buff-throated Woodcreeper	X	X			0.051
<i>Dendroplex picus</i>	Straight-billed Woodcreeper	X	X			3.775
<i>Lepidocolaptes souleyetii</i>	Streak-headed Woodcreeper	X	X			0.270
<i>Xenops tenuirostris</i>	Slender-billed Xenops	X	X			0.045
<i>Xenops minutus</i>	Plain Xenops	X	X			0.202
<i>Philydor pyrrhodes</i>	Cinnamon-rumped Foliage-gleaner	X	X			0.051
<i>Automolus ochrolaemus</i>	Buff-throated Foliage-gleaner	X	X			0.022
<i>Certhiaxis cinnamomeus</i>	Yellow-chinned Spinetail	X				0.764
<i>Synallaxis guianensis</i>	Plain-crowned Spinetail	X	X			0.275
Pipridae						
<i>Tyrannus virescens</i>	Tiny Tyrant-Manakin		X			-
<i>Pipra aureola</i>	Crimson-hooded Manakin	X	X			2.438
<i>Pseudopipra pipra</i>	White-crowned Manakin	X	X	X		0.051

Species	English name	Survey	SI/KU	GMCS	Other	Abundance
Cotingidae						
<i>Lipaugus vociferans</i>	Screaming Piha	X	X	X		0.006
<i>Procnias albus</i>	White Bellbird	X				0.022
<i>Gymnoderus foetidis</i>	Bare-necked Fruitcrow	X				0.006
Titiridae						
<i>Titira cayana</i>	Black-tailed Titira	X				0.006
<i>Schiffornis olivacea</i>	Olivaceous Schiffornis	X	X			0.022
<i>Laniocera hypopyrra</i>	Cinereous Mourner	X				0.006
<i>Pachyramphus rufus</i>	Cinereous Becard	(X)				-
<i>Pachyramphus polychopterus</i>	White-winged Becard	X				0.051
Onychorhynchidae						
<i>Onychorhynchus coronatus</i>	Royal Flycatcher		X			-
Tyrannidae						
<i>Mionectes oleagineus</i>	Ochre-bellied Flycatcher	X	X			0.006
<i>Taeniotriccus andrei</i>	Black-chested Tyrant	X				0.090
<i>Rhynchocyclus olivaceus</i>	Olivaceous Flatbill		X			-
<i>Tolmomyias poliocephalus</i>	Gray-crowned Flycatcher	X	X			0.034
<i>Tolmomyias flaviventris</i>	Yellow-breasted Flycatcher	X				1.921
<i>Lophotriccus galeatus</i>	Helmeted Pygmy-Tyrant	X	X			0.562
<i>Todirostrum maculatum</i>	Spotted Tody-Flycatcher	X				13.719
<i>Todirostrum cinereum</i>	Common Tody-Flycatcher	X				1.360
<i>Camptostoma obsoletum</i>	Southern Beardless-Tyrannulet	X				0.202
<i>Elaenia flavogaster</i>	Yellow-bellied Elaenia	X		X		0.371
<i>Elaenia chiriquensis</i>	Lesser Elaenia	X				0.006
<i>Tyrannulus elatus</i>	Yellow-crowned Tyrannulet	X				0.051

Species	English name	Survey	SI/KU	GMCS	Other	Abundance
<i>Myiopagis gaimardii</i>	Forest Elaenia	X	X			5.258
<i>Myiopagis flavivertex</i>	Yellow-crowned Elaenia	X	X			0.090
<i>Phyllomyias griseiceps</i>	Sooty-headed Tyrannulet	X				0.253
<i>Phaeomyias murina</i>	Mouse-colored Tyrannulet	X				0.022
<i>Attila cinnamomeus</i>	Cinnamon Attila	X				0.680
<i>Attila spadiceus</i>	Bright-rumped Attila		X			-
<i>Legatus leucophaeus</i>	Piratic Flycatcher	X	X			0.067
<i>Ramphotrigon ruficauda</i>	Rufous-tailed Flatbill	X	X			0.045
<i>Pitangus sulphuratus</i>	Great Kiskadee	X				40.056
<i>Pitangus lictor</i>	Lesser Kiskadee	X		X		0.084
<i>Myiodynastes maculatus</i>	Streaked Flycatcher	X				0.051
<i>Myiozetetes cayanensis</i>	Rusty-margined Flycatcher	X				1.298
<i>Tyrannus melancholicus</i>	Tropical Kingbird	X		X		5.124
<i>Rhytipterna simplex</i>	Grayish Mourner		X			-
<i>Myiarchus tuberculifer</i>	Dusky-capped Flycatcher	X				0.303
<i>Myiarchus ferox</i>	Short-crested Flycatcher	X		X		1.169
<i>Cnemotriccus fuscatus</i>	Fuscous Flycatcher	X	X			0.006
<i>Lathrotriccus euleri</i>	Euler's Flycatcher	X	X			0.006
Vireonidae						
<i>Hylophilus pectoralis</i>	Ashy-headed Greenlet	X				0.674
<i>Vireo chivi</i>	Chivi Vireo	X	X			0.022
Corvidae						
<i>Cyanocorax cayanus</i>	Cayenne Jay	X	X			0.270
Hirundinidae						
<i>Progne chalybea</i>	Gray-breasted Martin	X				57.730
<i>Tachycineta albiventer</i>	White-winged Swallow	X		X		0.303

Species	English name	Survey	SI/KU	GMCS	Other	Abundance
<i>Hirundo rustica</i>	Barn Swallow	X				5.871
Troglodytidae						
<i>Troglodytes aedon</i>	House Wren	X		X		8.258
<i>Pheugopedius coraya</i>	Coraya Wren	X	X			1.809
<i>Cyphorhinus arada</i>	Musician Wren		X			-
Donacobiidae						
<i>Donacobius atricapillus</i>	Black-capped Donacobius	X				0.045
Turdidae						
<i>Turdus leucomelas</i>	Pale-breasted Thrush	X	X	X		2.562
<i>Turdus fumigatus</i>	Cocoa Thrush	X	X	X		0.006
Mimidae						
<i>Mimus gilvus</i>	Tropical Mockingbird	X		X		0.006
Fringillidae						
<i>Euphonia chlorotica</i>	Purple-throated Euphonia	X				0.006
<i>Euphonia minuta</i>	White-vented Euphonia	X	X			0.034
<i>Euphonia violacea</i>	Violaceous Euphonia	X	X			1.483
<i>Euphonia cayennensis</i>	Golden-sided Euphonia	X				0.006
Passerellidae						
<i>Arremon taciturnus</i>	Pectoral Sparrow		X			-
Icteridae						
<i>Psarocolius viridis</i>	Green Oropendola	X	X			16.635
<i>Psarocolius decumanus</i>	Crested Oropendola	X	X			116.404

Species	English name	Survey	SI/KU	GMCS	Other	Abundance
<i>Cacicus cela</i>	Yellow-rumped Cacique	X				11.371
<i>Cacicus haemorrhous</i>	Red-rumped Cacique	X				3.433
<i>Icterus cayanensis</i>	Epaulet Oriole	X				0.253
<i>Molothrus oryzivorus</i>	Giant Cowbird	X				14.039
<i>Lamprosar tanagrinus</i>	Velvet-fronted Grackle	X	X			8.646
Parulidae						
<i>Parkesia noveboracensis</i>	Northern Waterthrush	X	X			5.034
<i>Setophaga pitiauyumi</i>	Tropical Parula	X				0.006
<i>Setophaga petechia</i>	Yellow Warbler	X				0.899
<i>Myiothlypis rivularis</i>	Riverbank Warbler	X	X			0.680
Cardinalidae						
<i>Cyanoloxia rothschildii</i>	Amazonian Grosbeak		X			-
Thraupidae						
<i>Chlorophanes spiza</i>	Green Honeycreeper		X			-
<i>Conirostrum bicolor</i>	Bicolored Conebill	X				5.073
<i>Volatinia jacarina</i>	Blue-black Grassquit	X				0.017
<i>Tachyphonus surinamus</i>	Fulvous-crested Tanager		X			-
<i>Tachyphonus rufus</i>	White-lined Tanager	X	X			0.022
<i>Ramphocelus carbo</i>	Silver-beaked Tanager	X	X	X		57.573
<i>Cyanerpes caeruleus</i>	Purple Honeycreeper	X	X			0.084
<i>Cyanerpes cyaneus</i>	Red-legged Honeycreeper		X			-
<i>Tersina viridis</i>	Swallow Tanager	X				0.022
<i>Sporophila castaneiventris</i>	Chestnut-bellied Seedeater	X				0.017
<i>Sporophila minuta</i>	Ruddy-breasted Seedeater	X				0.011
<i>Sporophila americana</i>	Wing-barred Seedeater	X				0.404
<i>Saltator maximus</i>	Buff-throated Saltator	X	X			0.022

Species	English name	Survey	SI/KU	GMCS	Other	Abundance
<i>Coereba flaveola</i>	Bananaquit	X	X			72.360
<i>Cissopis leverianus</i>	Maggie Tanager	(X)				-
<i>Tangara mexicana</i>	Turquoise Tanager	X				0.944
<i>Thraupis episcopus</i>	Blue-gray Tanager	X		X		6.680
<i>Thraupis palmarum</i>	Palm Tanager	X		X		6.978

Appendix 2 -- Photo Gallery



Belted Kingfisher (*Megasceryle alcyon*) observed at the confluence of the Aruka and Barima Rivers, 19 October 2021. This is the first documentation of this species for Guyana. (Photo: Leon Moore)



Mangrove-dominated forest near Morawhanna. (Photo: Brian J. O'Shea)



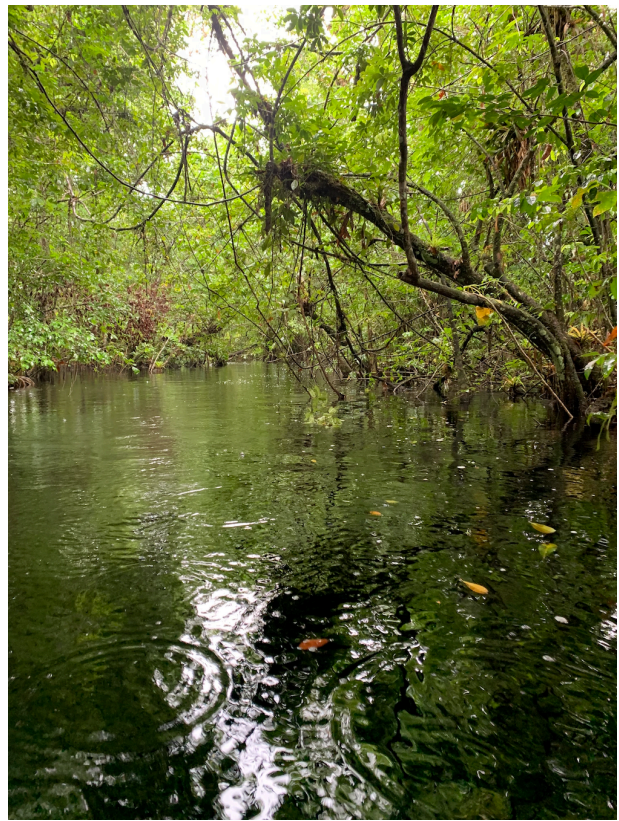
Leon Moore (R) demonstrates use of the eBird mobile app. (Photo: Brian J. O'Shea)



Black-chested Tyrant (*Taeniotriccus andrei*), observed on 20 October 2021 along Severina Creek, on the right bank of the Barima River. This species was not previously known to occur in Guyana. (Photo: Leon Moore)



Our trainees spotting birds near Smith Creek. (Photo: Brian J. O'Shea)



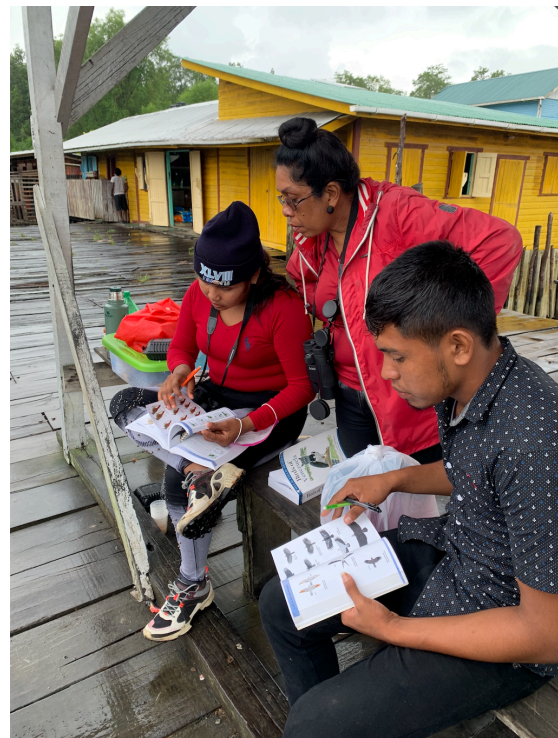
A blackwater creek along the Barima River. (Photo: Brian J. O'Shea)



Open habitat surrounding a primary school. Schoolyards and farms offered some of the best opportunities to survey the area on foot, and much time was spent in these habitats. (Photo: Brian J. O'Shea)



Waved Woodpecker (*Celeus undatus*).
(Photo: Leon Moore)



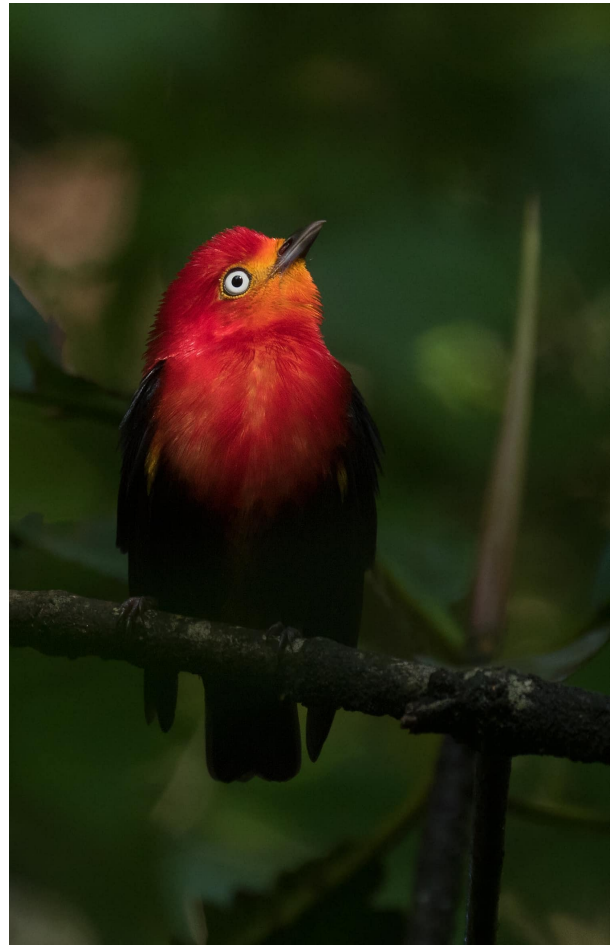
Studying field guides while sheltering from the rain in Morawhanna. (Photo: Brian J. O'Shea)



Swallow Tanagers (*Tersina viridis*), a species observed infrequently in most of Guyana. (Photo: Leon Moore)



Juvenile Rufous Crab Hawk (*Buteogallus aequinoctialis*), a specialty of the northeastern South American coast that is common in the BMP area. (Photo: Brian J. O'Shea)



A male Crimson-hooded Manakin (*Pipra aureola*). (Photo: Leon Moore)