Birds of Iwokrama Forest

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ABSTRACT—This paper is an abridged version of an earlier report describing field work on birds of Iwokrama Forest (IF) between March 1996 and September 1997. The avifauna of IF is discussed in terms of habitat heterogeneity, seasonailty and ongoing monitoring. Avian species richness in IF is similar to other tropical forest localities that have been studied with similar intensity with 476 species having been recorded furing the work reported here. Distinctive habitats such as *Humiria*-dominated low woodland and scrub with little or no grass cover that grows on areas with nutrient-poor sandy surface soil (Muri scrub) and pre-montane (foothill) forests are also found within IF and both of these habitats contribute significantly to total diversity of IF. IF has relatively high densities of larger frugivorous birds such as cracids, cotingas, and parrots.

INTRODUCTION

The birds of Guyana and adjoining parts of northern South America have been the subject of intense field and museum study in recent years. Numerous published and unpublished reports have documented species newly recorded for Guyana (Agro & Ridgely 1998; Braun et al. 2003), or contributed major updates of knowledge either of rare species (Robbins et al. 2003) or biogeographically important regions (Robbins et al. 2004), or simply reported field survey results (Barnett & Shapley 1999). Specimens collected have contributed to molecular evolutionary studies (Joseph et al. 2003, 2004) thus illustrating the complentarity of traditional collecting and modern molecular studies and they have contributed to improved knowledge of basic morphometric and plumage variation so important in clarifying the systematics of the region's birds (Cleere 1998; Hu et al. 2000; Joseph 2000, 2002). Most reports, however, have been primarily avifaunal survey reports (Hilty 1999; Ingels & Cleere 2003; Joseph 1992, 2001; Kirwan & Sharpe 1999; Larue 1999; Pérez-Emán et al. 2003; Reynaud & Thioulouse 2000; Sharpe et al. 2001). Together, they all provide a much improved basis for study of the evolution of birds in north-eastern South America.

One particular earlier study (Anon. 1999) appeared in a report of limited circulation describing work on the vertebrate fauna of the Iwokrama Forest Reserve (hereafter IF) carried out by the Academy of Natural Sciences, Philadelphia and other institutions from 1996–1998. Anon. (1999) gave an extensive report of avifaunal surveys done of Iwokrama Reserve as part of that broader study. For completion, we note parenthetically that its authors were the two senior authors of the present paper. The purpose of the present paper, which has been prepared by the junior author, is to present an abridged version of the earlier report's findings. A complete list of birds recorded in IF with estimates of relative abundance is in an electronic appendix to this paper at http://www.acnatsci.org/publication/appendix7.html.

METHODS

Survey

Field work was conducted in March, July, October and November 1996 and in March–April and June-September 1997. We used auditory and visual encounter surveys (Heyer et al. 1994), understorey mist netting, and opportunistic observations to inventory and collect birds in IF. We used call recognition during auditory surveys (Terborgh et al. 1990) that permitted rapid surveys of up to 85% of the species we expected to find in IF (Parker 1991). It has been estimated that in the Peruvian Amazon most birdcalls can be heard from a distance of 100 m. An auditory transect of 4 km is therefore equivalent to surveying an 80 ha plot for most calling bird species (Terborgh et al. 1990). High levels of vocal activity in tropical lowland forests tend to begin 15 minutes before first light and continue for 2 to 3 hours. Forest falcons and some woodcreepers call a few minutes before dawn while owls, potoos and caprimuligids may begin calling up to 15–30 minutes before dawn (Terborgh et al. 1990; M. Robbins, pers. comm.). There are also a number of

Plate 1. Night-time preparation of specimens at a field camp in Iwokrama, September 1997. Left to right around table: Robert S. Ridgely, David J. Agro, Deirdre Jafferally, and Tracy Pedersen. Two others are obscured. Photography by Robert M. Peck.

species that call at dusk (tinamous, wood-quail, owls, potoos, nightjars, woodcreepers; Terborgh et al. 1990). Surveys and collections covered between 4 and 10 km in the early morning and late afternoon. In addition we carried out nocturnal searches using auditory techniques to record the calls of birds and attract individuals for collection.

Mist-netting of the understorey avifauna complemented the visual and auditory searches by capturing birds that tended to be non-vocal members of mixed flocks. Up to twenty, 0.25 inch mesh, understorey mist nets (total length 250 metres) were used to sample the forest understorey. For each individual captured, the following data were collected: mass, wing length, plumage condition, species, and sex where possible by plumage. Clipping wing or tail feathers marked any released birds and so ensured that individuals were not counted more than once per trip.

Specimen Collection

We collected specimens with the objectives of (1) building representative collections at the Academy of Natural Sciences, Philadelphia (ANSP), the Kansas University Natural History Museum, Lawrence, Kansas (KUNHM) and the University of Guyana, Georgetown, Guyana (UG), (2) validating species and subspecies-level identifications, and (3) continuing the improvement of the foundation of specimens with which painters of Neotropical birds can work in preparing illustrations for field guides and reference books. In addition, for each specimen collected the following data were recorded: soft part colours, mass, degree of ossification of the skull (an estimate of age in passerine birds), condition of the plumage, breeding condition (size of testes or ovaries, and presence or absence of brood patches), presence or absence of bursa as an estimate of age, and stomach contents. Specimens were generally prepared as study skins, however some skeletons were also prepared. Tissue samples were taken from all of the specimens and preserved in liquid nitrogen and then stored in ultra-cold freezers at the ANSP and KUNHM. Plates 1–3 illustrate preparation and examination of specimens in the field.

RESULTS AND DISCUSSION

Avian species richness in IF is similar to other tropical forest localities that have been studied with similar intensity (Table 1). The Iwokrama Forest's avifauna at present comprises 476 species. However, IF extends south into the fringes of the Rupununi Savannas, and the avifauna therefore includes several species that are not typical of forest, but rather are either classic savanna species or inhabit more open, more deciduous woodland. In addition, distinctive habitats such as Muri scrub and pre-montane (foothill) forests are also found within IF and both of

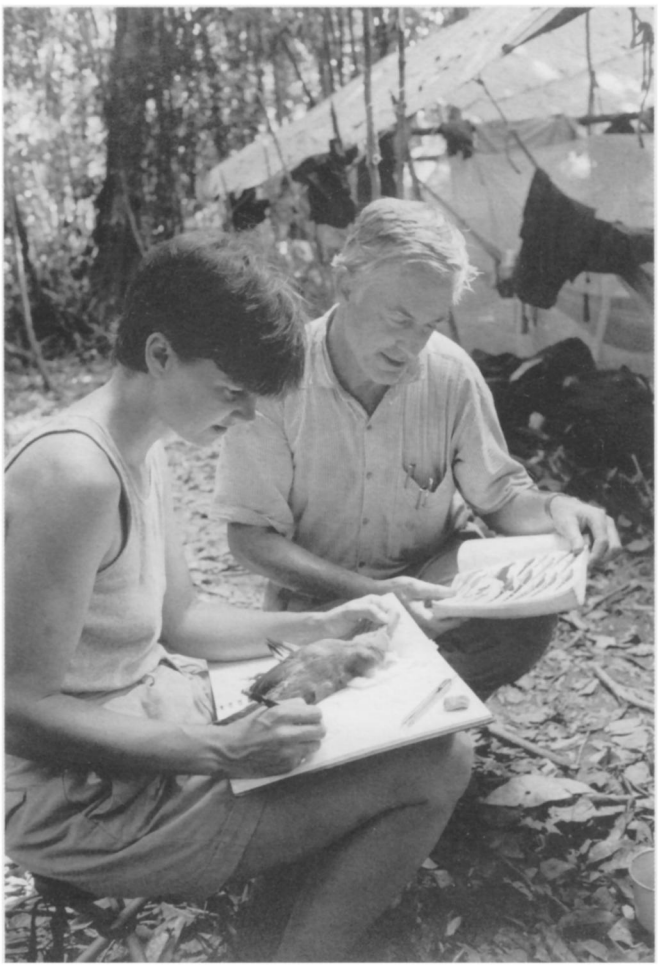

Plate 2. Robert Ridgely and artist Tracy Pedersen consult as Pedersen prepares a field sketch for a later painting, September 1997. Photography by Robert M. Peck.

these habitats contribute significantly to total diversity of IF (Table 2). In addition, IF has been studied with less intensity than all of the sites listed in Table 1 with the exception of the Kanuku Mountains.

The number of forest-restricted birds (318) found in IF is comparable to the number of forest-restricted birds found in the Manaus area (Cohn-Haft et al. 1997 and references therein). The Manaus area is the only other eastern South American Amazonian area to have been studied with similar intensity. While several areas in western Amazonia have avifaunas with more species recorded than IF, we suggest that these differences are due to the presence of more microhabitats in the sites surveyed in western Amazonia than in IF.

IF has relatively high densities of larger frugivorous birds such as cracids, cotingas, and parrots. Abundances of these birds are difficult to estimate accurately because the terrestrial frugivores tend to be secretive and the canopy frugivores highly nomadic following ephemeral food resources. However, we suspect that the high abundance of canopy frugivores (in particular toucans and cotingas) in IF may be a function of greater food availability within the Forest. We also suspect that the high abundance of ground frugivores (e.g., tinamous and cracids) is primarily a function of the currently very light hunting pressure within IF. Similar densities are likely to be found at sites in the Amazon that are lightly hunted.

Annotated List of Species of Interest

Nomenclature in the comments below generally follows Ridgely & Tudor (1989, 1994) and Ridgely & Greenfield (2001).

Two species of upland forest-inhabiting tinamous, *Tinamus major* (Great Tinamou) and *Crypturellus variegatus* (Variegated Tinamou), are unusually numerous in IF. Although their abundance was not

Plate 3. Ornithology field assistant Lucy LaCasse uses a ray of sunlight shining through a break in the forest canopy to examine the reproductive condition of a bird specimen she is preparing. Photography by Robert M. Peck, September 1997.

quantified, a qualitative impression was formed from the relative frequencies at which they were heard (both are difficult to see) and seemed to be at least as high as at other Amazonian forest sites with which we are familiar.

Though neither species was encountered regularly, two reclusive and generally scarce herons that inhabit forest-bordered streams and pools, *Agamia agami* (Agami Heron) and *Zebrilus undulatus* (Zigzag Heron), were relatively common in IF. Of the other heron species encountered in the Forest, *Egretta tricolor* (Tricolored Heron) and *E. caerulea* (Little Blue Heron) were notable. Both species are most frequently encountered along the coasts of South America (and are normally scarce inland). Their status in IF, whether resident, occasional wanderer, or boreal migrant, remains uncertain because small numbers of *E. caerulea* were noted throughout the year, but *E. tricolor* was observed only in March 1998, when conditions in central Guyana were unusually dry.

Two *Rostrhamus hamatus* (Slender-billed Kite)[2] were tape-recorded and observed in March 1998, one near Kurupukari on 5 March 1998 and another along the upper Burro-Burro River on 20 March

[2]Species newly recorded from Guyana, or for which we obtained the first specimen material for the country.

Table 1. Comparison of avian species richness of IF with other Neotropical sites.

Site	Total species	Forest species	Thamnophilidae	Tyrannidae	Cotingidae
Iwokrama Forest	476	318	35	66	13
Kanuku Mountains	349	247	30	49	11
Manaus, Brazil	351	300	34	48	6
Tapajos National Park, Brazil	448	320	44	63	10
Cocha Cashu, Manu, Peru	554	320	56	83	9
Barro Colorado Island/ Pipeline Road, Panama	443	251	23	60	5
La Selva, Costa Rica	410	244	20	51	7

Table 2. Species of birds found mainly, or exclusively, in patches of Muri scrub.

Scientific name	Common name
Crypturellus erythropus	Red-legged Tinamou
Laterallus castaeiceps	Russet-crowned Crake
Chlorestes notatus	Blue-chinned Sapphire
Amazilia chionopectus	White-chested Amazilia
Formicivora grisea	White-fringed Antwren
Elaenia ruficeps	Rufous-crowned Elaenia
Sublegatus obscurior	Amazonian Scrub-Flycatcher
Xenopipo atronitens	Black Manakin
Tachyphonus phoeniceus	Red-shouldered Tanager

1998. The status of this species, which has apparently not been previously recorded from Guyana, remains uncertain. It seems surprising that it had not been recorded during earlier surveys, and we suspect that these records refer to individuals that were wandering in response to the drought conditions in Guyana at the time.

IF contains populations of hawks and eagles that appear to be little disturbed. During the survey period, we observed *Spizaetus* hawk-eagles (*S. ornatus* and *S. tyrannus*, Ornate and Black Hawk-Eagles) on 13 occasions and *Leucopternis melanops* (Black-faced Hawk) on five occasions. However, somewhat surprisingly the two largest Neotropical eagles (*Harpia harpyja*, Harpy Eagle, and *Morphnus guianensis*, Crested Eagle) were seen on only five occasions; though during the period of the survey two Harpy Eagles were killed in the area.

Parker et al. (1993) recorded *Micrastur ruficollis* (Barred Forest-Falcon) in Guyana but there may have been some earlier confusion with the similar *Micrastur gilvicollis* (Lined Forest-Falcon). The first specimen (ANSP 186717) for Guyana of *M. ruficollis* was obtained in 1994, and examples of both species were collected in the Reserve during 1996–1997. Though secretive (and mainly recorded from their far-carrying vocalizations), the two species are now known to occur in sympatry inside upland forest through much of IF.

A pair of the rare and very local *Falco deiroleucus* (Orange-breasted Falcon) was present, at least at certain times of the year, near the summit of Turtle Mountain where they presumably breed.

Several members of the Cracidae are abundant within IF; elsewhere, populations of these birds have generally been decimated by unrestricted hunting. The two largest species, *Penelope jacquacu*, (Spix's Guan), and *Crax alector* (Black Curassow) were observed on 34 and 40 occasions, respectively, during the survey period suggesting relatively high densities of these species. The smaller guan (*Penelope marail*, Marail Guan) was also observed 44 times, while a third guan species, *Pipile pipile* (Common Piping-Guan) was seen only once and appeared very locally distributed in IF. A second curassow species (*Mitu tomentosa*, Crestless Curassow) was observed twice and was apparently restricted to seasonally flooded low woodlands along the Essequibo River upstream from Kabocalli Landing near the mouth of Ladysmith Creek. The highest priority should be placed on limiting or entirely eliminating hunting pressure on these vulnerable birds; no other group is as susceptible to over-hunting, and their continued presence in IF in substantial numbers is a potential major draw for ecotourists.

Psophia crepitans (Gray-winged Trumpeter) was observed 38 times during the survey period and appears widely distributed throughout IF. As with the cracids, this is a strong indication of the essentially undisturbed nature of IF. Except in very remote regions populations of this species have generally been reduced through hunting. This is an easy species to detect because where it is not hunted the bird tends to be tame and conspicuous. The trumpeter could therefore be especially suitable for monitoring overall hunting pressure in the future.

Two species of *Columba* pigeons, *C. subvinacea* (Ruddy Pigeon) and *C. plumbea* (Plumbeous Pigeon), were both fairly common in the sub-canopy throughout IF. Despite paying careful attention to their distribution patterns within IF, no ecological differences between them were apparent. A series of each species was obtained, some of them having been tape-recorded prior to collection. This is important because the two subspecies involved, *C. subvinacea purpureotincta* and *C. plumbea wallacei*, are virtually identical in plumage. However, they differ markedly in their primary vocalizations, which provide the only practical means of separating the two species in the field. There may also be a consistent difference in the coloration of certain soft-parts, but additional study of the collected specimens is needed.

Geotrygon violacea (Violaceous Quail-Dove) was

rare in IF. One individual was mist-netted on 13 Aug. 1997 at Mile 3 along the main road. In addition, a pair was seen on the lower slopes of Turtle Mountain on 28 Sept. 1997. These records represent the first records for this species from Guyana. In adjacent countries, *G. violacea* is known from a single sighting in Surinam and a few old specimen records from eastern Venezuela. The similar *G. montana* (Ruddy Quail-Dove) was numerous.

Of the three large *Ara* macaws present in IF (*A. ararauna*, Blue-and-yellow Macaw; *A. macao*, Scarlet Macaw; and *A. chloroptera*, Red-and-green Macaw), *A. chloroptera* was by far the most numerous. All three species, however, seem to have healthy populations in IF and are of interest to ecotourists.

A few sightings of small flocks of *Nannopsittaca panychlora* (Tepui Parrotlet), mainly of birds in flight, were slightly to the east of the species' known range. Likewise the presence of *Touit batavica* (Lilac-tailed Parrotlet) in IF represented a small southward extension of range. The diversity of *Touit* parrotlets in IF was notable: in addition to *T. batavica*, *T. purpurata* (Sapphire-rumped Parrotlet) and *T. huetii* (Scarlet-shouldered Parrotlet) were recorded. As far as we know, IF is the only site in the neotropics that supports three species of this generally rare and still poorly known genus of small, forest-canopy parrots that are again of interest to ecotourists.

Three species of *Amazona* parrots occur in IF, of which the rare *A. dufresniana* (Blue-cheeked Amazon) was the least numerous and most local. The status of this species over much of its range remains poorly understood, but separate pairs were noted repeatedly in IF, suggesting that it is a breeding resident there and not a post-breeding wanderer from forests at higher elevations.

The status of the rare cuckoo *Coccyzux euleri* (Pearly-breasted Cuckoo) in IF remains uncertain; it is possibly an austral migrant. This species was recorded only once in woodlands north of Surama.

The status of the rare and reclusive cuculiform *Dromococcyx pavoninus* (Pavonine Cuckoo) in IF is also uncertain. It was recorded only once, a mist-netted female obtained in July 1997, in upland forest at Kabocalli Landing. The distinctive vocalizations of this species were not however heard anywhere else in IF.

The large and spectacular terrestrial cuckoo *Neomorphus rufipennis* (Rufous-winged Ground-Cuckoo) was uncommon in IF. The species was found primarily in undisturbed areas but also was recorded at least once in disturbed forest near the Kurupukari base camp. It ranged the forest floor in pairs, less often in small family groups, sometimes in attendance at swarms of army ants or following herds of peccaries but at least as often was seen foraging away from either. This bird, which here is perhaps more numerous than anywhere else in its range, is potentially one of the greatest ecotourism "draws" of the Reserve.

The identity of the screech-owls that were tape-recorded and collected near the base of Turtle Mountain in September 1997 is unclear. Provisionally identified as *Otus guatemalae* (Sharpe's, or Middle American Screech-Owl) in appearance they differ from other examples of this species (notably in their brown irides), and they show some characters of *Otus watsonii* (Tawny-bellied Screech-Owl). M. B. Robbins, N. Rice et al. (pers. comm.) collected comparable screech-owls in southern Guyana in September 1998; vocally similar, their two examples will be compared directly with IF individuals. Neither species is well known in Guyana, where there are only a very few prior records of both.

The only records of *Steatornis caripensis* (Oilbird) came from the recovery of a few moulted feathers in the Central Gorge of the Iwokrama Mountains in November 1996. The unmistakable loud clicking sound given by flying birds was also heard in this area, but no roost was located. IF is at the extreme eastern range limit of this bird, which is not recorded at all from Surinam. Finding an active roosting and/or nesting site in IF—where one likely exists—would be notable, and would represent a major ecotourism attraction.

One *Nyctibius aethereus* (Long-tailed Potoo) was obtained in upland forest near the base of the Turtle Mountains on 29 September 1997. The species was not otherwise recorded in IF, despite substantial effort to hear its distinctive and far-carrying primary vocalization and despite an abundance apparently ideal habitat.

A small series of the poorly known *Nyctibius leucopterus* (White-winged Potoo) was obtained at various sites within IF where, despite its apparent rarity elsewhere, it may be the most numerous member of its family. For the most part, the birds were spotlighted at night as they fed in the sub-canopy of forest trees along larger rivers, and also along the road through the Reserve, but this may simply be a reflection of the fact that such situations were the only places where spotlighting was practical. Unlike *N. griseus* (Common Potoo), *N. leucopterus* appeared not to be present in disturbed situations. These specimens are the first to have been collected in Guyana, where the species was first reported (in the Kanuku Mountains, Parker et al. 1993); they are among the very few specimens that exist for this rare and range-restricted species which is still not known from Surinam or Venezuela.

One *Nyctibius bracteatus* (Rufous Potoo) was obtained, after having been heard vocalizing, in disturbed and seasonally flooded forest along the "corduroy road" near Kurupukari on 26 October 1996.

Our other records involved birds that were only heard, including one at Kabocalli Landing on 16–17 March 1997 and another on 5 March 1998 at Kurupukari. The species must be genuinely rare here, and present evidence would appear to indicate that it may range only in areas close to the Essequibo River. This represents only the second Guyana record, and is the first in over a century.

Caprimulgus rufus (Rufous Nightjar) was tape-recorded near Surama village, just to the south of IF, on 18 March 1998. This represents the second Guyana record of the species, which was tape-recorded and collected at Dubulay ranch in 1996 (M. Robbins, pers. comm.). It is possible that the species occurs in white sand scrub north of the southern border of IF.

As expected, swifts were difficult to identify. We suspect that a *Cypseloides* swift (likely *C. cryptus*, White-chinned Swift) ranges over IF at least occasionally—some *Cypseloides* species was seen on infrequent occasions—as perhaps does *Chaetura cinereiventris* (Gray-rumped Swift). We were able to confirm that one scarce swift, *Chaetura chapmani* (Chapman's Swift), is resident and not uncommon in IF.

A single *Phaethornis augusti* (Sooty-capped Hermit) was observed at Mile 3 along the main road on 16 October 1996.

A single *Avocettula recurvirostris* (Fiery-tailed Awlbill) was seen in a small forest opening at "Blackwater Camp" along the Siparuni River on 24 September 1997.

A single *Lophornis ornatus* (Tufted Coquette) was observed at a forest opening near the crest of the Iwokrama Mountains in late October 1996. *Discosura longicauda* (Racket-tailed Coquette) was observed periodically in IF.

Topaza pella (Crimson Topaz) was locally common throughout IF in the species' preferred habitat: along the fringes of black-water streams and smaller rivers in sandy and rocky areas.

Notable for its apparent absence was the forest undergrowth-inhabiting *Malacoptila fusca* (White-chested Puffbird). It is known from various sites in Guyana; its absence—or at least rarity in IF is at present inexplicable.

For separation of *Capito niger* (Black-spotted Barbet) from *C. auratus* (Gilded Barbet), see Haffer (1997).

Small numbers of *Aulacorhynchus derbianus* (Chestnut-tipped Toucanet) at higher elevations in the Iwokrama Mountains slightly extended the range of the species eastwards. It has since has been recorded also in the Acari Mountains (*fide* M. B. Robbins) and at one site in Surinam.

Deconychura longicauda (Long-tailed Woodcreeper) was a rare resident in upland forest, (? primarily on islands in the Essequibo River because several records, including two specimens, were obtained on islands). This obscure, inconspicuous species is generally rare and occurs at very low densities throughout its wide range.

Sittasomus griseicapillus (Olivaceous Woodcreeper) also appears to be mainly or entirely restricted to mature forests on islands in the Essequibo River. The species is here at or near its eastern range limit, and it is rare in the Reserve. It was previously known in Guyana only in the northwest; more recently it was also located at the Acari Mountains in the extreme south of the country (*fide* M. B. Robbins).

Dendrexetastes rufigula (Cinnamon-throated Woodcreeper) is rare in IF, where it appears to be restricted to forest edge habitats along the Essequibo River. A specimen obtained on 4 November 1996 at Kurupukari is the first for Guyana. The species itself was only recently first recorded from Guyana, at the Kanuku Mountains (Parker et al. 1993).

Xiphocolaptes promeropirhynchus (Strong-billed Woodcreeper) is also rare in IF, where only a few individuals were located, those mostly only heard—its voice is highly distinctive—at several points along the Essequibo River. This represents one of its few known localities in Guyana, and is the northernmost known.

A single *Cranioleuca vulpina* (Rusty-backed Spinetail) was recorded at the Rupununi River near Annai on 2 March 1998. This represents the first Guyanan record, and is cited here because of the possibility that the species may be found in the extreme southern part of Iwokrama Forest.

A pair of *Xenops tenuirostris* (Slender-billed Xenops) was recorded along the upper Burro-Burro River on 20 March 1998. This is the second record of the species from Guyana; it was previously recorded only from the lower slopes of the Kanuku Mountains (cf. Parker et al. 1993).

Herpsilochmus roraimae (Roraiman Antwren), previously known only from slopes of the tepuis and in Guyana thus far recorded only from the far northwest, was found to be fairly common in the forest canopy near the crest of the Iwokrama Mountains.

The absence of *Hylophylax naevia* (Spot-backed Antbird) from the forests of Iwokrama Forest is at present inexplicable. The species occurs widely in Amazonia, and is usually numerous; it is known from most surrounding areas.

The apparent absence of *Percnostola rufifrons* (Black-headed Antbird) from the forests and woodlands of IF is significant, as the species occurs widely in northern and central Guyana to the east of the Essequibo River. The species was present, for example, near the west bank of the Essequibo near Kurupukari. To our knowledge, this is the only in-

stance of a bird species' distribution being restricted by the Essequibo.

Chamaeza campanisona (Short-tailed Ant-thrush), previously known in Guyana only from tepui slopes in the far northwest, occurred in small numbers near the crest of the Iwokrama Mountains. This population may belong to an undescribed subspecies.

In March 1997, small numbers of *Elaenia ruficeps* (Rufous-crowned Elaenia) were present, and presumably resident, in the Muri scrub found along the main road at Mile 38 (ANSP 189123). Robbins et al. (2004) recorded the species in 1996 and our record is the second Guyanan site for this distinctive *Elaenia*—away from the mountains of the northwest, and is the first from the lowlands of Guyana (though it is found in coastal savannas of Surinam). The species has also been recorded in the Acari Mountains of southern Guyana (Robbins et al. 2004).

M. caniceps (Gray Elaenia) and *M. flavivertex* (Yellow-crowned Elaenia) were recorded in small numbers in IF, both species for the second time in Guyana. The former was recorded locally in the forest canopy on the lower slopes of the Iwokrama Mountains and near the southern border of the Forest; the latter in forest lower growth near the upper Burro Burro River and at the base of Turtle Mountain. A male of *M. caniceps* was collected on 24 June 1997, and a male of *M. flavivertex* was obtained on 27 June 1997. For both species these represent the first specimen material taken in Guyana, and both species were only recently first recorded (from sight reports) in the country.

A single *Phyllomyias griseiceps* (Sooty-headed Tyrannulet) was recorded on the slopes of the Iwokrama Mountains on 6 November 1996. This species has previously been recorded in Guyana only from old specimens taken near Annai; the supposed specimens from Bartica housed in the AMNH are misidentified *Zimmerius gracilipes* (Slender-footed Tyrannulet).

The poorly known *Phylloscartes virescens* (Olive-green Tyrannulet) was uncommon in the forest canopy in many upland areas; it had previously been recorded in Guyana at several sites in the north, but has doubtless been overlooked and has since been recorded in the far south at the Acari Mountains (M. B. Robbins, pers. comm.). As a canopy species, it always was difficult to observe and recognize, though its long-tailed silhouette, which is typical of the genus, as well as its vocalizations are distinctive.

Parallelling the distribution pattern found in *Percnostola rufifrons* (Black-headed Antbird), *Lophotriccus vitiosus* (Double-banded Pygmy-Tyrant) was not found within IF, though it does occur widely in eastern Guyana, and has also recently been recorded in the far south at the Acari Mountains (Robbins et al. 2004, pers. comm.). Its similar congener *L. galeatus* (Helmeted Pygmy-Tyrant) was common and widespread in vine tangles and forest openings throughout the Forest.

A few *Contopus cinereus* (Tropical Pewee) were found at forest borders and in lighter woodland in the Surama area, with a single specimen having been obtained on 27 June 1997. This is one of few records of this species, which elsewhere is widespread, away from coastal areas in Guyana (see Robbins et al. 2004).

Knipolegus poecilocercus (Amazonian Black-Tyrant) was found at one site in IF, in September 1997 in seasonally flooded forest along the Essequibo River near the base of Turtle Mountain, where a small series of specimens was obtained. This inconspicuous tyrannid had previously been recorded in Guyana only from the far northwest, in the Merume Mountains (Snyder 1966).

Myiozetetes luteiventris (Dusky-chested Flycatcher) was recorded once in IF, on the lower slopes of the Iwokrama Mountains on 18 June 1997. This represents the first Guyana record of this species, which has a relatively wide range in Amazonia though always at low densities. It ranges in the subcanopy and borders of upland and terra firme forests, and there are several records from Surinam.

Finding *Xenopsaris albinucha* (Xenopsaris) in the Reserve, and indeed anywhere in Guyana, came as a surprise because the species has not previously been recorded from any of the Guianas. The Xenopsaris was first noted in seasonally flooded savanna near Annai in July 1997, with one specimen being taken at that time. A single individual was later observed just inside the Reserve in savannas north of Surama on 2 March 1998. Robbins et al. (2004) record the species in southern Rupununi savannas.

IF supports an extraordinary array of cotingas. Many of these cotingas are more numerous and more easily seen here than elsewhere in their ranges. No species is of particular distributional interest, but the majority of the species are remarkable in appearance and behavior. Perhaps most notable is *Haematoderus militaris* (Crimson Fruitcrow), while also of great interest will be the tiny *Iodopleura fusca* (Dusky Purpletuft), both birds being difficult to see anywhere else. The leks of contorted and displaying *Perissocephalus tricolor* (Capuchinbird), surely one of the strangest-looking of all Neotropical birds, is likely to be extremely important to ecotourism.

The rare and inconspicuous *Cichlopsis leucogenys* (Rufous-brown Solitaire) was sighted once in the Iwokrama mountains on 10 November 1996. This is its first recorded locality in Guyana away from the tepuis of the northwest; there is, however, also a recent record from mountain ranges in southern Surinam (Haverschmidt & Mees 1994).

Table 3. Species likely to be found mainly, or exclusively, at elevations above 500 m asl in IF.

Scientific name	Common name
Colibri delphinae	Brown Violetear
Lophornis ornatus	Tufted Coquette
Trogon collaris	Collared Trogon
Aulacorhynchus derbianus	Chestnut-tipped Toucanet
Piculus rubiginosus	Golden-olive Woodpecker
Herpsilochmus roraimae	Roraiman Antwren
Chamaeza campanisoma	Short-tailed Antthrush
Phyllomyias griseiceps	Sooty-headed Tyrannulet
Oxyruncus cristatus	Sharpbill
Lepidothrix suavissima	Orange-bellied Manakin
Cichlopsis leucogenys	Rufous-brown Solitaire
Hylophilus sclateri	Tepui Greenlet
Parula pitiayumi	Tropical Parula
Tangara xanthogastra	Yellow-bellied Tanager
Chlorophonia cyanea	Blue-naped Chlorophonia
Piranga flava	Hepatic Tanager

Hylophilus sclateri (Tepui Greenlet), previously known only from slopes of the tepuis and in Guyana recorded previously only from the far northwest, was uncommon in the sub-canopy of forest near the crest of the Iwokrama Mountains. More recently, the species has also been found on the Acari Mountains of Guyana's far south (M. B. Robbins, pers. comm.).

Cyanerpes nitidus (Short-billed Honeycreeper) is a rare and perhaps local resident of the canopy and borders of humid forests in IF. Two specimens were obtained, one near the main road at the southern edge of IF on 26 June 1997, the other at Pakatau Falls on 28 July 1997. These are the first records of this species from Guyana.

The small tanager *Tangara varia* (Dotted Tanager) was seen with certainty only once, that on 15 June 1997 at Turtle Mountain, but there were also several other sightings from elsewhere in IF that likely pertained to this species but which could not be confirmed. This sighting represents the first report of this generally rare—but probably much overlooked—species from Guyana. It was recently also recorded, and collected, in September 1998 in the far south at the Acari Mountains (M. B. Robbins, pers. comm.).

Another *Tangara* tanager was also first recorded from Guyana during our survey work, *T. xanthogastra* (Yellow-bellied Tanager). A single bird was collected, of a pair seen, near the crest of the Iwokrama Mountains on 10 November 1996. No other individuals were ever seen; the species is likely to be very rare on these mountains.

Habitat Heterogeneity

The extensive mixed forests within IF provide excellent bird habitats. The distinctive patchy *Humiria*-dominated low woodland and scrub with little or no grass cover that grows on areas with nutrient-poor sandy surface soil (often apparently with a clay substrate that causes frequent shallow flooding) and locally known as "Muri scrub" supports a bird fauna (see Table 2) surprisingly distinctive from superficially similar savanna areas found mainly in the south of IF. The largest areas of Muri scrub on the Reserve proved difficult of access, and only one (a relatively small area at Mile 38 along the main road) could ever be investigated in any depth. However, we suggest that thorough exploration of similar areas within IF will reveal bird species not currently recorded, and probably species not previously known from anywhere in central Guyana.

High elevation forests, which we investigated only on the Iwokrama Mountains, are, from an avian perspective, also of high conservation significance. At least 11 species (see Table 3) occur there that probably do not occur elsewhere in IF. It is also likely that some of the species residing in areas over 500 metres above sea level (m asl) may represent undescribed subspecies. Apart from the Iwokrama Mountains, Turtle and Pakatau mountains are also likely to be important for ecotourism development and conservation. Turtle Mountain is accessible and has high habitat and avian species diversity.

Apart from the highland areas and Muri scrub, several other habitats are worthy of discussion in terms of their conservation significance. In particular, there are few open woodland or savanna areas in IF and most are restricted to the southern part of the reserve. These areas are in the Rupununi savannas but are also savanna-forest ecotones and contain many species not found otherwise in IF (Appendix 1).

Seasonality and Migration

Migratory birds are not conspicuous in IF. However, both "boreal migrants" (those occurring in Guyana during the boreal, or northern, winter) and "austral migrants" (those occurring in Guyana during the austral, or southern, winter) are found there. Fourteen species of boreal migrants (possibly 15, Appendix 2) and seven species of austral migrants (possibly 11, Appendix 2) were recorded in IF.

No migratory bird species occurs in IF in large numbers. Among boreal and austral migrants, *Hirundo rustica* (Barn Swallow) and *Tyrannus savana* (Fork-tailed Flycatcher), respectively, may be the most common.

We suggest that the relative lack of migrants is due to two factors:

1) IF is situated inland. Migratory bird species, even land-birds, tend to concentrate in coastal areas. This is apparent even in coastal Guyana, where migrants are a much more conspicuous element of the local avifauna around, for instance, Georgetown.
2) IF is situated in eastern South America. Boreal migrants in particular are much more numerous in western South America, which is closer to migrant breeding areas. Austral migrants are rarely very numerous or conspicuous in northern South America, mainly because their breeding area is so much smaller than their wintering area. In general the opposite is true for boreal migrants, i.e., breeding areas are large, wintering areas small.

Monitoring

The greatest difficulty in developing a monitoring program in IF will be adequately training in accurate identification of birds. Of most interest will be any effort to monitor understory flock numbers and composition in areas that are impacted by logging. The same effort should be directed toward comparable but pristine areas as a control. A list of species of birds that could be monitored is included in Appendix 3 (from M. Robbins, pers. comm.).

Concluding Remarks

It is clear that the specimens collected in this study have done much to redress the startling paucity of the raw materials (specimens) to adequately address questions of spatial and temporal variation in plumage and other characteristics and basic matters of distribution in this part of the Neotropics. For many of the taxa collected in IF, the specimens represent the most recent collections of these birds since the early 19th century. As such the collections are of inestimable scientific value. Many of the tissue samples collected are unique and particularly valuable because they are associated with voucher study skins that will enable researchers to cross check morphology with molecular data. Vuilleumier (1998, 2000) has recently addressed the need for further basic collecting of Neotropical birds

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APPENDIX 1

Species (Scientific name and English name) found primarily in savanna and low woodland areas at the southern edges of IF, north of Surama.

Cathartes burrovianus Lesser Yellow-headed Vulture, *Gampsonyx swainsonii* Pearl Kite, *Buteo albicaudatus* White-tailed Hawk, *Buteogallus meridionalis* Savanna Hawk, *Caracara plancus* Crested Caracara, *Milvago chimachima* Yellow-headed Caracara, *Aramus guarauna* Limpkin, *Gallinago paraguaiae* South American Snipe, *Vanellus chilensis* Southern Lapwing, *Aratinga pertinax* Brown-throated Parakeet, *Coccyzux euleri* Pearly-breasted Cuckoo, *Pseudoscops clamator* Striped Owl, *Chordeiles pusillus* Least Nighthawk, *Chordeiles acutipennis* Lesser Nighthawk, *Caprimulgus cayennensis* White-tailed Nightjar, *Tachornis squamata* Neotropical Palm-Swift, *Xenops tenuirostris* Slender-billed Xenops, *Taraba major* Great Antshrike, *Sakesphorus canadensis* Black-crested Antshrike, *Myrmoborus leucophrys* White-browed Antbird, *Myrmeciza longipes* White-bellied Antbird, *Elaenia chiriquensis* Lesser Elaenia, *Elaenia flavogaster* Yellow-bellied Elaenia, *Elaenia cristata* Plain-crested Elaenia, *Poecilotriccus sylvia* Slate-headed Tody-Flycatcher, *Contopus cinereus* Tropical Pewee, *Fluvicola pica* Pied Water-Tyrant, *Xenopsaris albinucha* Xenopsaris, *Turdus leucomelas* Pale-breasted Thrush, *Cyclarhis gujanensis* Rufous-browed Peppershrike, *Saltator coerulescens* Grayish Saltator, *Ammodramus humeralis* Grassland Sparrow, *Emberizoides*

APPENDIX 2
Tables of boreal and austral migrants to IF

Scientific name	Common name and description of migration patterns
Boreal migrants	
Anas discors	Blue-winged Teal. Scarce (habitats in IF are not suitable); recently arrived transients were recorded on two occasions along rivers in late September and October.
Pandion haliaetus	Osprey. Fairly common along rivers, numbers greatest during the northern winter months (October–March) but a few pre-breeders—this species does not breed until it is 2–3 years old—did remain through the northern summer months.
Buteo platypterus	Broad-winged Hawk. An immature seen along main road through IF, 4 March 1998. This is the second report of this highly migratory raptor from Guyana; (D. Finch (pers. comm.) made an unpublished sighting in the early 1990s).
Tringa solitaria	Solitary Sandpiper. A fairly common resident in the boreal winter on sandbars along rivers along the edge of river backwaters and in ponds such as borrow pits along the road. Recorded from September to March (but a few may linger later).
Actitis macularia	Spotted Sandpiper. A fairly common resident in the boreal winter on sandbars along rivers (where most numerous) along the edge of river backwaters and in ponds such as borrow pits along the road. Recorded from September to April with one in basic plumage on 24 July (the latter an unusual mid-boreal summer record).
Calidris fuscicollis	White-rumped Sandpiper. A single solitary southward-bound transient adult in basic plumage was collected on an Essequibo River sandbar in October.
Contopus cooperi	Olive-sided Flycatcher. One record of a (?)vagrant collected at Mile 3 along the main road on 13 November 1996. Only one previous sighting from Guyana, which is situated well to the east of its usual wintering range.
Riparia riparia	Bank Swallow. One flying with *Hirundo rustica* over the Essequibo River on 25 October 1996.
Hirundo rustica	Barn Swallow. A fairly common transient, especially on southward passage, and boreal winter resident over open areas in IF. Largest numbers occur over larger rivers where they often fly with resident swallows but Barn Swallows also often overfly forest and even occasionally are found along smaller watercourses. Recorded as late as April.
Petrochelidon pyrrhonota	Cliff Swallow. One with *Hirundo rustica* over the Essequibo River on 17 September 1997.
Catharus minimus	Gray-cheeked Thrush. One mist-netted in undergrowth of upland forest at Kabocalli Landing, 29 March 1997.
Vireo olivaceus	Red-eyed Vireo. The subspecies *vividior* breeds locally in small numbers.
Vireo altiloquus	Black-whiskered Vireo. A male collected on 29 September 1997 in sub-canopy of seasonally flooded forest at base of Turtle Mountain.
Dendroica aestiva	Yellow Warbler. Status uncertain; several in woodland around and north of Surama Lake near the southern border of IF on 2 March 1998.
Dendroica striata	Blackpoll Warbler. Rare resident in boreal winter in sub-canopy and borders of forest and woodland. Singly in mixed flocks of tanagers and other primarily insectivorous birds. Recorded at least November to March.
Austral migrants	
Rostrhamus sociabilis	Snail Kite. Groups of up to 10—mainly juveniles though some in adult plumage, seen on several occasions in late October and at other times as single individuals. Seen circling high over forest and then usually drifting northward; not seen to feed or perch in IF. Status in IF problematic. Regularly present in Georgetown area.
Coccyzus melacoryphus	Dark-billed Cuckoo. Evidently rare in IF perhaps because the secondary habitats it favors on its wintering grounds are relatively limited. One (silent) seen in shrubbery along the Essequibo River in July 1996.
Elaenia parvirostris	Small-billed Elaenia. Uncommon; forest borders and in lighter woodland of southern IF. Recorded from June to August.

APPENDIX 2 (*continued*)

Scientific name	Common name and description of migration patterns
Myiodynastes maculatus	Streaked Flycatcher. Evidently rare; perhaps favours southern edge of IF. A few silent non-territorial birds (?austral migrant race *solitarius*) in June and July but none collected. Also locally in Guyana as a breeding resident (race *tobagensis*) but not recorded from IF.
Legatus leucophaius	Piratic Flycatcher. Breeds in IF. ?Migrants present in IF. Austral migrant population cannot be distinguished from resident birds of same subspecies *L. l. leucophaius*.
Empidonomus varius	Variegated Flycatcher. Uncommon along forest borders and clearings and Muri scrub; generally solitary. Recorded at least from April to July. Two specimens both referable to austral migrant nominate race. *E. v. rufina* is resident locally in northeastern South America but we have no evidence of it in IF.
Tyrannus melancholicus	Tropical Kingbird. Common and conspicuous; probably also occurs as austral migrant to IF. Small, silent non-territorial groups noted June to September at semi-open and edge sites. Austral migrant population cannot be distinguished from resident birds of same subspecies *T. m. melancholicus*. Also a breeding resident in semi-open parts such as along rivers and roads of IF.
Tyrannus savana	Fork-tailed Flycatcher. Small flocks of austral migrant *T. s. savana* in various semi-open parts of IF, especially along larger rivers, between about April and September; even larger numbers can be observed in open areas near the Guyana coast. Resident race *monachus*, recognizable in field by much paler not as gray back, breeding in savannas around Surama and Annain not observed in IF but could occur near its southern border.
Progne tapera, P. chalybea	No certain records of migrants.
Vireo olivaceus	Red-eyed Vireo. Austral migrant race *chivi* almost certainly at forest borders and in clearings in IF but presence masked by resident *vividior*, which breeds locally in small numbers.

herbicola Wedge-tailed Grass-Finch, *Sporophila intermedia* Gray Seedeater, *Sporophila plumbea* Plumbeous Seedeater.

APPENDIX 3

List of species (Scientific name and English name) for which monitoring is feasible and potentially worthwhile (M. Robbins, pers. comm.).

Tinamus major Great Tinamou; *Crypturellus variegates* Variegated Tinamou; *Micrastur ruficollis* Barred Forest Falcon; *Micrastur gilvicollis* Lined Forest-Falcon; *Daptrius americanus* Red-throated Caracara; *Penelope jacquacu* Spix's Guan; *Penelope marail* Marail Guan; *Crax alector* Black Currassow; *Psophia crepitans* Gray-winged Trumpeter; *Columba subvinacea* Ruddy Pigeon; *Columba plumbea* Plumbeous Pigeon; *Ara ararauna* Blue-and-yellow Macaw; *Ara macao* Scarlet Macaw; *Ara chloroptera* Red-and-green Macaw; *Orthopsittaca manilata* Red-bellied Macaw; *Diopsittaca nobilis* Red-shouldered Macaw; *Pyrrhura picta* Painted Parakeet; *Brotogeris chrysopterus* Golden-winged Parakeet; *Nannopsittaca panychlora* Tepui Parrotlet; *Touit batavica* Lilac-tailed Parrotlet; *Touit purpurata* Sapphire-rumped Parrotlet; *Pionites melanocephala* Black-headed Parrot; *Pionopsitta caica* Caica Parrot; *Pionus menstruus* Blue-headed Parrot; *Pionus fuscus* Dusky Parrot; *Amazona dufresniana* Blue-cheeked Amazon; *Amazona amazonica* Orange-winged Amazon; *Amazona farinosa* Mealy Amazon; *Deroptyus accipitrinus* Red-fan Parrot; *Trogon viridis* White-tailed Trogon; *Trogon melanurus* Black-tailed Trogon; *Ramphastos vitellinus* Channel-billed Toucan; *Ramphastos tucanus* Red-billed Toucan; *Dendrocolaptes certhia* Barred Woodcreeper; *Thamnophilus murinus* Mouse-coloured Antshrike; *Herpsilochmus stictocephalus* Todd's Antwren; *Myrmeciza ferruginea* Ferruginous-backed Antbird; *Gymnopithys rufigula* Rufous-throated Antbird; *Myrmothera campanisona* Thrush-like Antpitta; *Lipaugus vociferans* Screaming Piha; *Procnias alba* White Bellbird; *Perissocephalus tricolor* Capuchin Bird; *Hylophilus muscicapinus* Buff-cheeked Greenlet; *Psarocolius viridis* Green Oropendola.