Annotated checklist of the bird species of the upper Rio Urucu, Amazonas, Brazil

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Few surveys of avian communities in Brazilian Amazonia have been undertaken. Access to surveyed sites has usually been made possible by rivers or roads. Anthropogenic changes at these sites, such as habitat disturbance, hunting, or both, then tend to obscure the composition and structure of pristine avifaunas. Moreover, accessible sites with little or no habitat disturbance usually consist of black-water (*igapó*) or white-water (*várzea*) flood-plain forests because logistical problems become severe away from navigable rivers.

Recent studies in lowland Amazonia, however, demonstrate the pervasive influence of habitat selection in birds (e.g. Terborgh *et al.* 1984, 1990). Flood-plain communities are thus likely to differ sharply from those in the more remote upland (*terra firme*) forest, particularly in areas far removed from large rivers and tributaries. Factors which help explain the wholesale dichotomy between these two major Amazonian forest types include the lack of hydroperiodicity and seasonal influx of nutrients into *terra firme* forest, as well as a sharp decrease in the level of habitat diversity the greater the distance from large rivers.

Here we report on the results of an 18-month survey of an entirely undisturbed, non-hunted *terra firme* forest site near the upper Urucu river, Tefé, Amazonas (4°50′S, 65°16′W), representing to date one of the few avian surveys in western Brazilian Amazonia.

Study site and methods

The Urucu site lies peripheral to an oil field recently developed by the Brazilian oil company, Petrobrás. This capital-intensive operation has to date minimized forest disturbance through heavy use of aircraft transportation (Peres 1988, 1990a). During the study period, access to drilling rigs was restricted to helicopters or small aeroplanes controlled by the company. Both Indians and colonists had been and remained conspicuously absent from this area. Thus selective logging, slash-and-burn agriculture, rubber-tapping of *Hevea* trees and subsistence hunting had never taken place in the study area.

The study area of 800 ha was located within a drilling polygon, and consisted primarily of undisturbed *terra firme* forest, between 60 and 72 m above sea-level (Fig. 1). Anthropogenic disturbance was restricted to two 3-ha seismic clearings. Annual rainfall was 3256 ± 589 mm ($n = 2$ years), only 9% of which fell between July and September, the three driest months of the year. Trees ≥ 10 cm in diameter had a mean density of 723 individuals per hectare ($n = 5$ ha), and treefall gaps were relatively uncommon (Peres, unpubl. data). A single meandering perennial stream cut through the study area, resulting in low levels of natural disturbance.

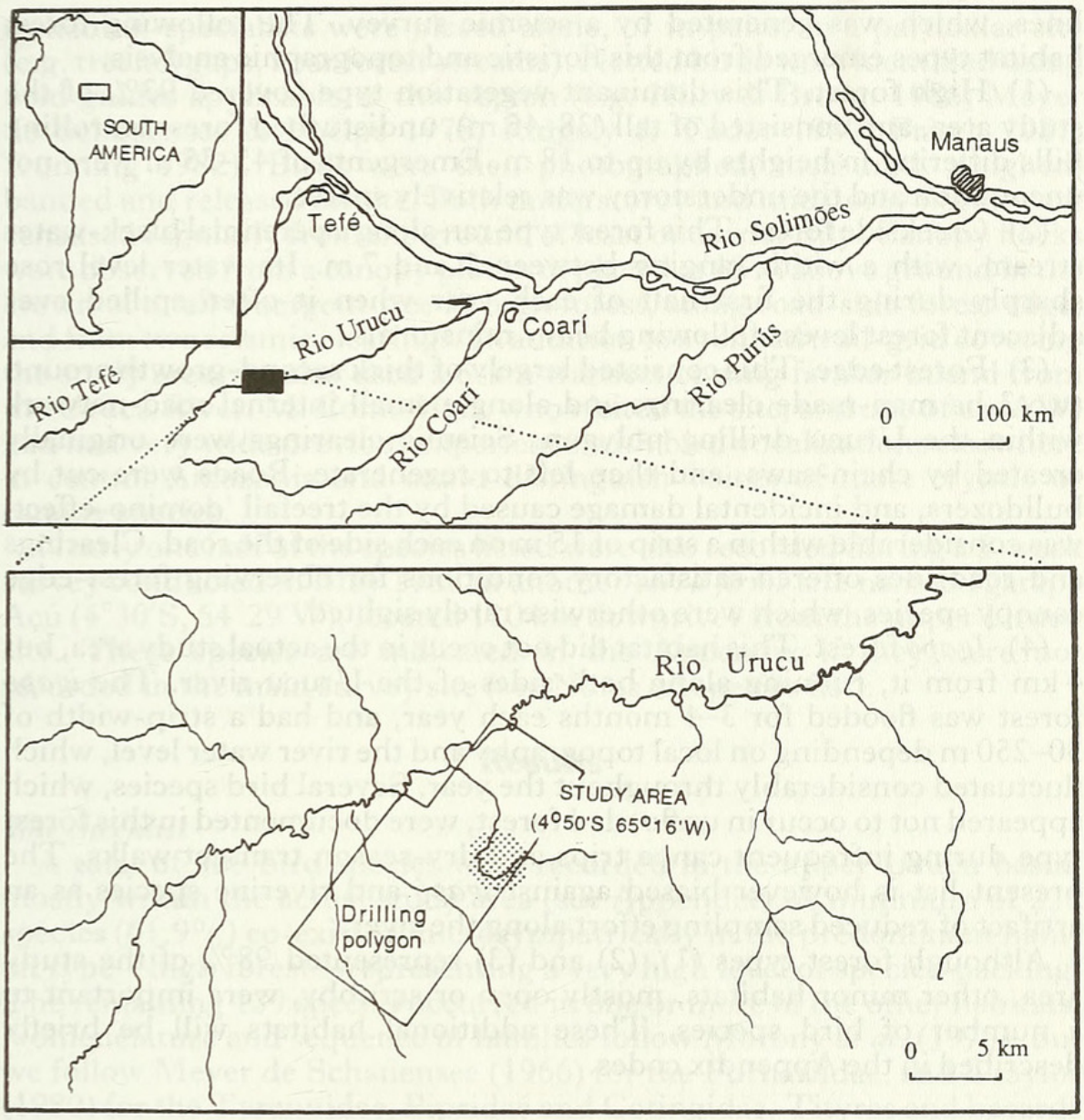

Figure 1. Location of the survey site on the upper Rio Urucu, Amazonas, Brazil. Shaded area represents the *terra firme* plot where 94% of the 365 species listed were recorded. Fine lines indicate perennial forest streams.

A number of smaller rain-fed streams flowed into this perennial creek, but dried out during the dry season. Sudden rises in the stream water-level caused temporary floods following heavy storms (>100 mm per day), particularly in the wet season. This phenomenon, locally known as *repiquete*, generated and maintained a sparser understorey, higher density of lianas, higher density of non-arborescent palms, overall lower density of trees, and an average lower canopy (Peres, unpubl. data).

Habitat types

Vegetation structure was quantified within two 1-ha floristic plots and twelve 0.25-ha plots, and along 4.9 km of transects within the study area. We also examined a topographic map of this area, defined by 5-m contour

lines, which was generated by a seismic survey. The following forest habitat types emerged from this floristic and topographic analysis:

(1) High forest. This dominant vegetation type covered 93% of the study area, and consisted of tall (38–45 m), undisturbed forest on rolling hills differing in heights by up to 18 m. Emergents of 45–55 m were not uncommon and the understorey was relatively sparse.

(2) Creekside forest. This forest type ran along a perennial black-water stream, with a width ranging between 1 and 7 m. Its water level rose sharply during the first half of each year when it often spilled over adjacent forest levées following heavy rainstorms.

(3) Forest edge. This consisted largely of thick second-growth around two 3-ha man-made clearings and along a small internal road-network within the Urucu drilling polygon. Seismic clearings were originally created by chain-saws, and then left to regenerate. Roads were cut by bulldozers, and incidental damage caused by the treefall 'domino-effect' was considerable within a strip of 15 m on each side of the road. Clearings and roadsides offered satisfactory conditions for observing forest-edge canopy species, which were otherwise rarely sighted.

(4) *Igapó* forest. This habitat did not occur in the actual study area, but 4 km from it, running along both sides of the Urucu river. The *igapó* forest was flooded for 3–4 months each year, and had a strip-width of 50–250 m depending on local topography and the river water level, which fluctuated considerably throughout the year. Several bird species, which appeared not to occur in unflooded forest, were documented in this forest type during infrequent canoe trips and dry-season transect walks. The present list is however biased against *igapó* and riverine species as an artifact of reduced sampling effort along the river.

Although forest types (1), (2) and (3) represented 98% of the study area, other minor habitats, mostly open or scrubby, were important to a number of bird species. These additional habitats will be briefly described in the Appendix codes.

Avian survey

The list here compiled began with a 3-week transect census of the Urucu primates conducted by CAP in April 1987 (Peres 1987, 1990a), only 5 months after Petrobrás began operating in the area. The other half of all species listed were recorded during a continuous study period between February 1988 and September 1989. Records were based primarily on intensive observations, and to a lesser extent mist-netting and vocalizations, live or recorded. More than 3240 h of field time were logged in 32 observer-months. A total of 252 bird species (69% of the overall total) were recorded by positive sightings, almost always confirmed by subsequent sightings and vocal cues. Another 108 (29.6%) species were recorded by captures, mostly by mist-nets. Only 5 species (1.4%) were identified on the basis of voice alone. We faced few 'difficult' species-identifications; thus collection of specimens was not a normal part of our mist-netting protocol.

We accumulated a total of 1964 mist-net hours, using mist-net lines of 5, 16 and 30 nets (2.5 × 12 m, $1\frac{1}{4}$ inch mesh) stretched along 1.5-m wide transects cutting through all vegetation types. Mist-nets targeted

to habitat-specialists were placed alone, or in pairs, in a particular site (e.g. treefall gaps, near forest streams). Netted birds were identified using field guides applicable to this region (e.g. Hilty & Brown 1986, Meyer de Schauensee & Phelps 1978, Ridgely & Tudor 1989, Frisch 1981, Dunning 1982). Birds were then photographed, measured, weighed, banded and released on site. Both understorey and midstorey flocks were censused regularly from the ground at least once monthly. Canopy flocks were observed from a canopy platform placed at 42 m above ground in the crown of a tall emergent tree in high forest, along road-side forest edge, and from two seismic clearings. In addition to a refined trail-grid covering the study area, we also used a 5-km transect cutting farther inland from the Urucu River. M. Cohn-Haft, who visited the site, and one of us (AW) had had very wide previous experience with bird vocalizations elsewhere in central Amazonia and could distinguish voices of most cryptic or canopy species.

Nearly one half of the species listed were also recorded during a 3-week survey conducted in May 1987 in another *terra firme* site named Igarapé Açú (4°30′S, 64°29′W), located 110 km downriver from the upper Urucu site. These species are indicated in the Appendix if they were not recorded in the main survey site (see Notes on species list).

Results

The checklist

A total of 365 bird species were recorded in the upper Urucu basin, mostly within the actual study area (see Appendix). A minimum of 226 species (61.9%) co-existed microsympatrically in the predominant habitat type—high forest—representing a very high level of species-packing. The remaining 139 species occurred in one or more of the other habitats. Nomenclature and sequence of families follow Morony *et al.* (1975), but we follow Meyer de Schauensee (1966) for the Furnariidae, and Traylor (1980) for the Tyrannidae, Pipridae and Cotingidae. Tityras and becards are listed in the Cotingidae.

Noteworthy records

Here we highlight important records for Neotropical ornithology, primarily in terms of species distributions. Several species recorded in the upper Urucu were not previously known from this part of Amazonia. Important records in terms of geographic locality are of two types: those outside a species' range, thus defined as actual range extensions (REx), and those inside a species' range (WR), but bridging large gaps within a poorly known distribution. One species, a puffbird, could not be easily identified and is described on the basis of two prolonged sightings. Many of these bridging records are not very surprising since this site stands almost alone in a large, poorly-known region south of the Amazon and west of the Purús river, covering a small area between regions with relatively well documented avifaunas. In addition, we provide some additional notes on the curious rarity of certain game species, or on species which were presumed to be recent colonizers of the newly created scrubby and open habitats.

Unidentified species. One of the 365 species recorded, a puffbird, presented us with a serious identification problem: it had neither been described nor illustrated in any of the reference guides. Unfortunately, we were unable to collect voucher specimens of this species. A detailed description was however recorded by CAP as follows.

The two individuals seen, undoubtedly belonging to the genus *Nystalus*, were overall similar to the Barred Puffbird *N. striolatus*. *Fine black streaks,* rather than bars, were however obvious on the rufous crown, buffy-yellow nuchal collar, sides of face and upper breast, as well as on the sharply contrasting white underparts. Black streaks were also visible on the back, but the undertail was finely barred black. The chin and surrounding mouth parts were white, and the iris and bill yellowish. On one occasion, 10 July 1989, what appeared to be a heterosexual pair perched motionless for 15 minutes on terminal overhanging twigs 2 m above a 4-m wide open-water forest stream. This pair had come from, and subsequently flew into, vine-tangle thickets bordering this perennial stream.

Range extensions. Cases of significant range extensions were recorded for seven species, some of which were previously known only from Manaus, the Guianan shield, or western Amazonia. Following, we briefly mention each of these species.

FIERY TOPAZ *Topaza pyra*

Previously known from northwestern Brazil (upper Rio Negro), southeastern Venezuela, eastern Colombia, eastern Ecuador and southeastern Peru (Hilty & Brown 1986). One specimen, probably a subadult male, was collected on 30 July 1989 (CAP) whilst it was perched over a 3-m wide forest stream, 1 m above open water. This individual and a conspecific were observed flycatching over the stream for periods of approximately 1 minute between consecutive resting bouts.

LANCEOLATED MONKLET *Micromonacha lanceolata*

Its Brazilian Amazonian range is thought to be limited to the upper Juruá river. One individual was sighted and photographed (CAP) while it perched quietly at 3 m above ground in dense high forest.

BROWN-BANDED PUFFBIRD *Notharchus ordii*

One individual of this northern Amazonian and Venezuelan species was observed (CAP) whilst it was perched some 30 m above ground on a detached, roadside snag. This species' range, however, had already been extended southwestwards to northwestern Bolivia (Parker & Remsen 1987).

RUFOUS-WINGED ANTWREN *Herpsilochmus rufimarginatus*

Its nearest previously known localities in Brazilian Amazonia are along the Rio Jarí and south of the Amazon east to Marajó Island. One pair was observed (CAP) from a canopy platform whilst foraging with a mixed-species flock.

GUIANAN GNATCATCHER *Polioptila guianensis*

Its nearest previously known localities are near Manaus (AW, pers. obs.; M. Cohn-Haft, pers. comm.) and in Rondônia (D. Stotz, pers.

comm.). This species, originally thought to be restricted to the Guianas and southwestern Venezuela, was regularly sighted in the canopy accompanying mixed-species flocks.

BLUE-BACKED TANAGER *Cyanicterus cyanicterus*

Previously known from the Guianas and Venezuela (Isler & Isler 1987), and more recently from one site north of Manaus, Brazil (M. Cohn-Haft, pers. comm.). This is to our knowledge the first record south of the Amazon. Groups of 2–5 individuals were sighted 3 times (CAP, AW) with canopy mixed-species flocks.

YELLOW-GREEN GROSBEAK *Caryothraustes canadensis*

Occasionally sighted in the upper canopy with mixed-species flocks. This record expands the species' range westwards, since its nearest known localities are on the lower Rio Negro and Rio Madeira (Ridgely & Tudor 1989).

Range reinforcements. This survey provided geographically intermediate records, or small-scale range extensions, for 9 other species with very spotty records, but likely to occur in this part of central Amazonia.

BANK SWALLOW *Riparia riparia*

The spotty localities in its winter range are strengthened by the record in the Urucu, where flocks in flight were sighted (CAP) several times from large clearings and river margins.

WHITE-THIGHED SWALLOW *Neochelidon tibialis*

Previously not known in a wide band of forest along the central Amazon valley, but known to occur 160 km north of the upper Urucu in the lower Tefé river (Johns, in press). This year-round resident in the Urucu was particularly conspicuous during crepuscular flights along open forest streams in groups of up to 12 individuals.

GREY-CHEEKED THRUSH *Catharus minimus*

The winter range of this boreal species is extended to the Urucu from southern Venezuela, Guyana, Colombia, and parts of western Brazilian Amazonia, where it is a non-breeding visitor. One individual was observed on 5 May 1989 (CAP) perched in the understorey of high forest.

RED-BILLED PIED TANAGER *Lamprospiza melanoleuca*

It was not known to occur in western Brazilian Amazonia west of the Purús and Negro rivers (e.g. Willis 1977). Common in groups of 2–5, often with mixed-species flocks in the canopy.

MAGPIE TANAGER *Cissopis leveriana*

Previously not known for a broad region north and south of the Amazon river (Isler & Isler 1987). Vocally conspicuous groups of 3–5 were often seen in forest edge, usually in multi-species flocks.

YELLOW-BACKED TANAGER *Hemithraupis flavicollis*

Very spotty records in central Amazonia, but known to occur near Manaus and in northern Mato-Grosso. In the Urucu, it was a consistent member of mixed-species flocks in the canopy.

PARADISE TANAGER *Tangara chilensis*

One of the most common tanagers in the Urucu, apparently functioning as a nuclear species in mixed-species canopy flocks. It is known from peripheral parts of Amazonia, but records are patchy 400 km north and south of the central Amazon. Nearest known localities are near Manaus (Willis 1977) and on the lower Tefé river (Johns, in press).

BANANAQUIT *Coereba flaveola*

This species is thought to be absent from much of west-central Amazonia (Ridgely & Tudor 1989). It was rare or absent in undisturbed *terra firme* forest in the study plot, but was sighted in small agricultural mosaics near the Urucu river.

SWALLOW-TANAGER *Tersina viridis*

Thought to be absent from most of central Amazonia (Ridgely & Tudor 1989). Monospecific groups of up to 8 individuals were seen in the forest edge canopy (18 Jan–23 Feb 1989). It was also common at one site near Carauarí on the west bank of the Juruá river (15 Dec 1988, CAP).

Pioneer species. The upper Urucu is at least 150 km away from the nearest extensive patches of man-disturbed habitats within *terra firme* forest. The patches of upland forest edge, second-growth and open habitats, created since late 1986 by both seismic and drilling clearings, are thus isolated and recently-formed islands of disturbed habitat, available for colonization. The following species are now resident, and can be safely assumed to be recent colonists: *Ramphocelus carbo, Columbina talpacoti, Oryzoborus angolensis, Sporophila bouvronides, Sporophila lineola.* A few migratory species, such as *Tringa solitaria,* currently use high-ground open habitats which were nonexistent as recently as early 1988.

The greater density of dead trees, which resulted from damming of high-forest streams by roads, has increased the availability of nesting and foraging sites for certain woodpeckers using borders with scattered trees such as Yellow-tufted Woodpeckers *Melanerpes cruentatus* and Lineated Woodpeckers *Dryocopus lineatus.* These species also appeared to have become more common in recent years.

Game species. Because this site had not been subject to hunting, some large game birds, which tend to be absent or rare in areas where man regularly hunts, were relatively common in the Urucu (Peres 1990b). Thus we can safely assume that the low density of some other game species was not an artifact of hunting. For instance, Razor-billed Curassows *Crax mitu* were rarely observed, or heard calling, even by two experienced curassow-hunters, perhaps because of the very low availability of residual fruits on the ground, particularly in the dry season (Peres, unpubl. data). Groups of Pale-winged Trumpeters *Psophia leucoptera* and Spix's Guans *Penelope jacquacu* were considerably more common, but both of these species' diets were heavily subsidized by items other than fruitfall (Peres, unpubl. data). Variable Chachalacas *Ortalis motmot* were also very rare, rarely vocal, and apparently transient, probably because their preferred second-growth and riparian habitats were rare in the Urucu.

Tinamous were relatively common, particularly along the main creek. Tinamou-traps (*arapucas*) set within *igapó* forest captured mostly Grey *Tinamus tao* and Cinereous Tinamous *Crypturellus cinereus*. Other tinamou species sighted previously were confirmed by voice.

Other avian surveys

The nearest locality to the Urucu where a bird survey of any kind has been conducted is Ponta da Castanha (Johns, in press) on the Tefé river, 160 km north of our site. At this site forest disturbance such as selective logging and shifting agriculture, coupled with proximity to a large river, has diversified avian habitats. However, only 266 species were detected at the Tefé site, probably because little mist-netting was undertaken. Stotz & Bierregaard (in prep.) and Stotz (unpubl. data) have conducted comprehensive surveys of the avifaunas north of Manaus and on the Rio Ji-Paraná, Rondônia (9°44′S, 61°53′W), respectively. The Urucu site lies roughly half-way between these two localities. Many more detailed avian inventories have been carried out in Colombian, Peruvian and Bolivian Amazonia (e.g. Hilty & Brown 1986, Terborgh *et al.* 1984, Parker & Remsen 1987, British Ornithologists' Union Colombia expedition). We thus hope that the Urucu survey will help to cover a small portion of the immense gap in our knowledge of avian distributions in west-central Brazilian Amazonia, particularly in large stretches of undisturbed forests deep within remote interfluvial regions.

Acknowledgements

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APPENDIX.

List of 365 bird species recorded on the upper Rio Urucu, Tefé, Amazonas, Brazil

Family and species	Documentation	Habitats	Foraging position	Sociality	Abundance
TINAMIDAE (7)					
Tinamus guttatus	C,V	Fh,Fc	T	S	C
Tinamus tao	C,V	Fh,Fc	T	S	C
Tinamus major	C,V	Fc,Fh	T	S	U
Crypturellus variegatus	V,S	Fc,Fh	T	S	C
Crypturellus cinereus	C,V	Fc,Fh	T	S	C
**Crypturellus undulatus*	C,V	Fi	T	S	U
Crypturellus soui	V,S	Fe,Fh,Fc	T	S	U
PHALACROCORACIDAE (1)					
**Phalacrocorax olivaceus*	S	R,Rm	W	S	C
ANHINGIDAE (1)					
**Anhinga anhinga*	S	Rm,R	W	S	U
ARDEIDAE (7)					
Pilherodius pileatus	S	Cm,Rm,Dw	W	S	U
**Egretta thula*	S	Rm	W	S	U
**Casmerodius albus*	S	Rm	W	S	U
Butorides striatus	S	Cm,Rm	W	S	U
Tigrisoma lineatum	S,V	Cm	W	S	U
Bubulcus ibis	S	Dw	W	G,S	U
Cochlearius cochlearius	S	Rm,Cm	W	S	U
THRESKIORNITHIDAE (2)					
†*Ajaia ajaja*	S	Rm	W	S	U
Mesembrinibis cayennensis	S	Rm,Cm	W	S	U
ANATIDAE (2)					
**Oxyura dominica*	S	R	W	G	U
**Cairina moschata*	S	R	W	S	U
CATHARTIDAE (4)					
Sarcoramphus papa	S	O,Fh,Fi	A	S	R
Cathartes aura	S	O,Fh,Fo	A	S	R
Cathartes melambrotus	S	O,Fh,Fo	A	S	R
Coragyps atratus	S	Fo,O	A	G,S	U

(Continued)

APPENDIX (Continued)

Family and species	Documentation	Habitats	Foraging position	Sociality	Abundance
ACCIPITRIDAE (16)					
Harpia harpyja	S	Fh	C	S	R
Morphnus guianensis	S	Fh	C	S	R
Spizaetus ornatus	S	Fe,Fh	C	S	R
Spizastur melanoleucus	S	Fh,Fe	C	S	R
Leucopternis albicollis	S	Fh	C,Sc	S	R
Leucopternis schistacea	S	Fh,Rm,Cm	Sc	S	R
Leucopternis kuhli	S,V	Fh	C,Sc	S,M	U
**Busarellus nigricollis*	S	Rm	Sc	S	C
**Chondrohierax uncinatus*	S	Rm,O,Fi	Sc	S	R
Buteo nitidus	S	Fh	Sc	S	R
Buteo platypterus	S	Fh	Sc	S	R
Buteogallus urubitinga	S	O,Fh	U,A	S	U
Accipiter superciliosus	S	Fe	Sc	S	R
Ictinia plumbea	S	O	A	S	C
Harpagus bidentatus	S,V	Fh,Fi	Sc	M,S	C
Elanoides forficatus	S	O	A	G	M (Feb 89)
FALCONIDAE (7)					
Falco rufigularis	S,V	Fe,Fo	A,C	S	C
Daptrius americanus	S,V	Fh,Fi	C,Sc,F	G,M	C
Daptrius ater	S,V	Fe,Rm	C,A	S	U
Herpetotheres cachinnans	S,V	Rm,Cm	C	S	U
Micrastur ruficollis	M,S	Fh,Fc	Sc,U	S	U
Micrastur gilvicollis	M,S	Fh	Sc,U	S	U
Micrastur mirandollei	M,S	Fh,Fi	Sc	S	U
CRACIDAE (4)					
Crax mitu	C,V	Fi,Fh	T	S	U
Penelope jacquacu	C,V	Fh,Fi	Sc,T,F	S	C
Aburria (Pipile) pipile	S	Fh,Fi	Sc,F	S	R
Ortalis motmot	S,V	Fo,Fe,Rm	Sc,F	S	R
PHASIANIDAE (2)					
Odontophorus stellatus	S	Fh,Fi	T	G	U
Odontophorus gujanensis	S	Fh	T	G	U
OPISTHOCOMIDAE (1)					
**Opisthocomus hoazin*	S	Rm	Sc	G,S	U
PSOPHIIDAE (1)					
Psophia leucoptera	C,S,V	Fh,Fi	T	G,A	C
RALLIDAE (3)					
Aramides calopterus	V,S	Fi,Cm	T	S	U
Aramides cajanea	V(cp)	Cm,Fi	T	S	C
Laterallus exilis	C	Cm	T	S	C
HELIORNITHIDAE (1)					
Heliornis fulica	S	C,Cm	W	S	U
EURYPYGIDAE (1)					
Eurypyga helias	S,V	Cm,Fc,Fi	T	S	U
CHARADRIIDAE (1)					
**Hoploxypterus cayanus*	S	Rm	T	S	U
SCOLOPACIDAE (1)					
Tringa solitaria	S	Dw,Fo	T	S	M (Jan–Feb 89)
RYNCHOPIDAE (1)					
**Rynchops nigra*	S	R	W	S,G	C
COLUMBIDAE (5)					
Columba subvinacea	S,V	Fc	Sc	S	C
Columba plumbea	S,V	Fe,Fi	Sc	S	C
Leptotila rufaxilla	M,V	Fe,T	T	S	C
Geotrygon montana	M	Fh,Fi	T	S	C
Columbina talpacoti	S	Fo,D,T	T	S,G	U
PSITTACIDAE (14)					
Ara ararauna	S	Fh,Fc	C,F	G,S	C
Ara macao	S	Fh,Fi	C,F	G,S	C
Ara chloroptera	S	Fh,Fi	C,F	G,S	R
Ara severa	S	Fi,Fc	C,F	G	U

(Continued)

APPENDIX (Continued)

Family and species	Documentation	Habitats	Foraging position	Sociality	Abundance
†*Ara manilata*	S	Fi,Fc	C,F	G	U
Amazona autumnalis	S	Fh,Fc	C,F	G,S	C
Amazona farinosa	S	Fh,Fc	C,F	G	C
Deroptyus accipitrinus	S,V	Fh,Fe,Fi	C,F,Sc	G	U
Pionus menstruus	S,V	Fh,Fc,Fi	C,F	G	U
Pionites leucogaster	S,V	Fh,Fc,Fi,Fe	Sc,C,F	G	C
Pionopsitta barrabandi	S	Fh,Fc	C,Sc,F	S,G	R
Pyrrhura picta	S,V	Fe,Fi,Fh	C,Sc,F	G	C
Brotogeris versicolorus	S	Fh,Fe	C,F	G	C,S (Feb–Mar 89)
Touit purpurata	S	Fh	C,F	G	U
CUCULIDAE (6)					
Neomorphus pucheranii	S,V	Fh,Fc	T	S,M	U
Piaya cayana	S	T,Fe	Sc	S	C
Piaya melanogaster	S	Fh,Fe	Sc	S,M	C
Piaya minuta	S	Fh	Sc	S	U
Crotophaga major	S,V	Cm,Rm	V	G,S	U
Crotophaga ani	S	Fo,T	V	G	C
STRIGIDAE (5)					
Ciccaba huhula	S,V	Fh	Sc	S	U
Glaucidium brasilianum	S	Cm,Fc,Fh	Sc,U	S	C
Glaucidium minutissimum	V (mch)	Fh,Fe	Sc	S	U
Otus watsonii	V (mch)	Fc	Sc	S	C
Pulsatrix perspicillata	S	Fh,Fc	Sc	S	U
NYCTIBIIDAE (2)					
Nyctibius grandis	S,V	Fh	C	S	C
Nyctibius leucopterus	H	Fh	C	S	U
CAPRIMULGIDAE (4)					
Podager nacunda	S	D	T	G	S (13 Mar 89)
Nyctidromus albicollis	S	Fe,D	T	S	C
Chordeiles minor	S	O	A	G	M (Jan–Apr 89)
Chordeiles acutipennis	H	O	A	G	M (Jan–Apr 89)
APODIDAE (5)					
Chaetura chapmani	S	O	A	G	C
Chaetura cinereiventris	S	O	A	G	C
Chaetura (spinicauda)	S	O	A	G	C
Panyptila cayennensis	S	O	A	S,G	U
Streptoprocne zonaris	H	O	A	G	U
TROCHILIDAE (14)					
Thalurania furcata	M	Fo,Cm	U	S	C
Amazilia versicolor	M	Fh	Sc,C	S	C
Phaethornis philippi	M	Fh,Fc	U	S	C
Phaethornis ruber	S	Fo,T,Fh	U	S	C
Phaethornis superciliosus	M	Fh,Fi	U	S	C
Polyplancta aurescens	M	Cm,Fw	U	S	C
Chlorostilbon mellisugus	S	Fe	U	S	U
Campylopterus largipennis	M	Cm,Fw	U	S	C
Florisuga mellivora	S	Fe,Cm	Sc	S	C
Anthracothorax nigricollis	S	Fe	C,Sc	S	U
Heliothryx aurita	M	Fh,Fi	U	S	C
Threnetes leucurus	M	Fh,Fi	U	S	C
Popelairia langsdorfii	S	Fh	C	S	C
Topaza pyra (REx)	C (cp)	Cm,Fc	U,Sc	S	U
TROGONIDAE (6)					
Pharomachrus pavoninus	S	Fe,Fh	Sc,F	S	U
Trogon viridis	S	Fh,Fe	Sc,F	S	C
Trogon violaceus	M	Fh,Fi	Sc,F	S	C
Trogon melanurus	M	Fh,Fe	Sc,F	S	C
†*Trogon curucui*	S	Fh	Sc,F	S	U
†*Trogon rufus*	S	Fc	Sc,F	S	U
ALCEDINIDAE (5)					
Ceryle torquata	S,V	R,Rm,C	Sc	S	C
Chloroceryle americana	M	C,Cm	Sc	S	C

(Continued)

APPENDIX (Continued)

Family and species	Documentation	Habitats	Foraging position	Sociality	Abundance
Chloroceryle amazona	M	C,Cm	Sc	S	C
Chloroceryle inda	M	C,Cm,Fi	U	S	C
Chloroceryle aenea	M	C,Cm,Fi	U	S	C
MOMOTIDAE (2)					
Electron platyrhynchum	S,V	Fh	Sc	S	U
Baryphthengus martii	M,V	Fh,Fi	Sc,U	S	C
GALBULIDAE (4)					
Jacamerops aurea	S	Fi,Fc	Sc	S	U
Galbula albirostris	M	Fh,Fi	Sc	S,G	C
Galbula tombacea	M	Fe,Fc	Sc	S	C
Galbula dea	S	Fe,Fo	C	S	C
BUCCONIDAE (13)					
Notharchus macrorhynchus	S	Fe,Fh	C	S	C
Notharchus ordii (REx)	S	Fe	C	S	U
Nonnula ruficapilla	S	Fh,Fi	U	S	C
†*Bucco macrodactylus*	S	Fi,Cm	U	S	U
Bucco capensis	S	Fh	Sc,U	S	C
Bucco tamatia	S	Fh,Fi	Sc	S	C
Malacoptila semicincta	S	Fh	U	S	U
Malacoptila rufa	S	Fh,Fi	Sc,U	S	U
Micromonacha lanceolata (REx)	P	Fh	U	S	C
Nystalus sp. (see text)	S (cp)	Cm,Fi	U,Sc	S	U
Monasa nigrifrons	S,V	Fh,Fi,S	C	G,S	U
Monasa morphoeus	M,V	Fe,Fo	Sc	G,S	C
Chelidoptera tenebrosa	S	Fe,Rm,Fo	C	G	C
CAPITONIDAE (2)					
Eubucco richardsoni	S	Cm,Rm,Fi	Sc	S	U
Capito niger punctatus	M	Fh,Fi	Sc,C,F	S,M	C
RAMPHASTIDAE (7)					
Ramphastos (cuvieri/tucanus)	M,V	Fh,Fc,Fi,Fe	Sc,C,F	G,S,M	C
Ramphastos vitellinus	S,V	Fh,Fc,Fi	C,Sc,F	G,S,M	U
Pteroglossus aracari	S	Fh	C	G	U
Pteroglossus flavirostris	M	Fh	C,Sc,F	G	U
Pteroglossus beauharnaesi	S,V	Fe,Fh,Fc,Fi	C,Sc,F	G	C
Pteroglossus inscriptus	S	Fh	C,Sc,F	G	U
Selenidera reinwardtii	M,V	Fh	U,Sc,F	S	C
PICIDAE (12)					
Dryocopus lineatus	S	Fo,Fe	Sc	S	U
Campephilus rubricollis	S	Fh,Fc,Fi	Sc	S,M	C
Celeus elegans	S	Fh,Fc	Sc,F	S	C
Celeus flavus	S	Fi,Fh	Sc	S	R
Celeus torquatus	S	Fh,Fi	Sc	S	C
Celeus grammicus	S	Fh,Fi,Fc	Sc,U	S	C
Piculus chrysochloros	S,V	Fh	Sc	S	U
Piculus flavigula	S,V	Fh,Fi	Sc	S	C
Melanerpes cruentatus	S,V	Fo,Fe	Sc	G,S	C
Veniliornis affinis	S	Fh,Fi	Sc,U	S,M	C
Veniliornis passerinus	S	Fh	Sc	S	U
Picumnus lafresnayi	S	Fh,Fi,Fe	U,Sc	M,S	C
DENDROCOLAPTIDAE (17)					
Dendrocolaptes picumnus	M	Fh,Fc	Sc	S,M	C
Dendrocolaptes certhia	M	Fh,Fc,Fi	Sc,U	S,M	C
Hylexetastes perrotii	S	Fh	Sc	S,M	U
Xiphocolaptes promeropirhynchus	S	Fh	Sc	S,M	U
Dendrocincla merula	M	Fh,Fc	U	A	C
Dendrocincla fuliginosa	M	Fh,Fc	U	A,M,S	C
Campylorhamphus procurvoides	S	Fh,Fc,Fi	Sc,U	M,S	U
Xiphorhynchus ocellatus	M	Fh	Sc,U	M	C
Xiphorhynchus guttatus	M	Fh	Sc,U	M	C
Xiphorhynchus pardalotus	M	Fh,Fc	Sc,U	M	C
Xiphorhynchus picus	H	Fh	Sc	S	U
Lepidocolaptes albolineatus	S	Fh	Sc	M	U

(Continued)

APPENDIX (Continued)

Family and species	Documentation	Habitats	Foraging position	Sociality	Abundance
Nasica longirostris	S	Fh,Fc	Sc	M,S	U
Deconychura longicauda	M	Fh,Fc,Fi	Sc,U	M,S	C
Deconychura stictolaema	M	Fh,Fc,Fi	Sc,U	S,M	C
Sittasomus griseicapillus	M	Fe,Fh,Fi	Sc,U	M	C
Glyphorhynchus spirurus	M	Fe,Fc,Fh,Fi	U	S,M	C
FURNARIIDAE (12)					
Automolus infuscatus	M	Fc,Fh	U,Sc	M	C
Automolus rufipileatus	H	Fh	U	M	U
Philydor ruficaudatus	S	Fh,Fc	Sc,U	M	C
Philydor erythropterus	M	Fh,Fc	Sc	M	C
Philydor erythrocercus	C	Fh	Sc,U	M	C
Ancistrops strigilatus	S	Fh	Sc	M	U
Sclerurus mexicanus	M,V	Fh,Fc	U	A,S	C
Sclerurus caudacutus	M,V	Fc,Fh	U	S,A	C
Hyloctistes subulatus	M	Fh	Sc	M	U
Xenops rutilans	M	Fh,Fc	U,Sc	M	C
Xenops minutus	M	Fh,Fc	Sc,U	M	C
Xenops milleri	M	Fh	Sc,U	M	U
FORMICARIIDAE (40)					
Formicarius colma	M,V	Fh,Fc	T	S	C
Formicarius analis	M,V	Fh	T	S	C
Conopophaga aurita	M	Fh	T	S	C
Grallaria varia	S,V	Fh	T	S	C
Chamaeza nobilis	S	Fh,Fc	T	S	C
Hylopezus macularius	S,V	Fh	T	S	C
Phlegopsis erythroptera	M	Fh,Fc	U	A	C
Rhegmatorhina melanosticta	M	Fh,Fc	U	A	C
Rhegmatorhina berlepschi	H	Fh	U	M	U
Gymnopithys salvini	M	Fh,Fc,Fi	U	A	C
Sclateria naevia	M	Fc,Fh	U	S	C
Myrmeciza fortis	M	Fh	U,T	A	C
Myrmeciza hemimelaena	M	Fo,Fc,Fe	U,T	S	C
Myrmeciza hyperythra	M	Fh	U,T	S	U
Hylophylax poecilonota	M	Fh,Fc	U	S	C
Hylophylax naevia	M	Fe,Fh,Fc	U	S,A	C
Myrmoborus myotherinus	M	Fh,Fc	U	S,M,A	C
Myrmoborus leucophrys	M	Fo,Fc,Fe	U	S,M	U
Cymbilaimus lineatus	S	T,Fe	U	S	C
Megastictus margaritatus	S	Fh,Fc	Sc	S,M	C
Thamnophilus murinus	M	Fh	U	S	U
Thamnophilus amazonicus	M	Fo,Fc,Fe	U	S	U
Thamnophilus aethiops	M	Fh,Fc,Fe	U	S,M	C
Thamnophilus schistaceus	M	Fc,Fh	U	S,M	C
Thamnomanes caesius	M	Fh,Fc	Sc,U	M,S	C
Thamnomanes saturninus	M	Fh,Fc	Sc,U	M,S	C
Cercomacra cinerascens	M	Fe,Fh,Fc	U	S	C
Cercomacra (nigrescens)	H (mch)	Fo,Fe	T	S	U
Percnostola leucostigma	M	Fh,Fo	U	S	C
Percnostola schistacea	H	Fh,Fc	U	S	U
Hypocnemis cantator	M,V	Fe,Fo	U	S	C
Drymophila devillei	M	Fo,Fc	U	S	C
Myrmotherula haematonota	M	Fh,Fc	U	M	C
Myrmotherula axillaris	M	Fh,Fc	U	M	C
Myrmotherula longipennis	M	Fh,Fc	U	M	C
Myrmotherula (brachyura/obscura)	S	Fh	Sc	S,M	C
Myrmotherula hauxwelli	M	Fh,Fc	U	M	C
Myrmotherula menetriesii	M	Fh,Fc	U	M	C
Terenura (spodioptila)	S	Fh,Fc	Sc,C	M	C
Herpsilochmus rufimarginatus (REx)	S (cp)	Fh	C	M,S	U
TYRANNIDAE (45)					
Pitangus sulphuratus	S	Fo	A	S	U
Tyrannus melancholicus	S	Fo	C	S	U

(Continued)

APPENDIX (Continued)

Family and species	Documentation	Habitats	Foraging position	Sociality	Abundance
Tyrannus savana	S	D,Dw	A,Sc	G	C
Tyrannus tyrannus	S	Fe	C	S	U
Tyrannopsis luteiventris	S,V	Cm,Fe	Fe,V,F	G	C
Myiodynastes maculatus	S	Fe,Fo	C	S,G	U
Conopias parva	S,V	Fh,Fe,Fc	C	S	C
Legatus leucophaius	S,V	Fe,Fh	C,F	S	M (2 Jan 89)
Empidonomus varius	S,V	Fe,Fh	C	S	M (Apr 89)
Empidonomus aurantioatrocristatus	S,V	Fh,Fe	C	M	M (Apr 89)
Attila spadiceus	S	Fh,Fe,Fc	Sc	S,M	C
**Attila cinnamomeus*	S	Rm,Fi	Sc	S	C
Rhytipterna simplex	S	Fh,Fc	Sc,F	S,M	C
Laniocera hypopyrrha	M,V	Fh,Fc	Sc,F	S	U
Ramphotrigon ruficauda	S,V	Fh	Sc	S	C
Ramphotrigon megacephala	S	Fh,Fc	Sc	S	C
Myiopagis caniceps	S	Fh	C	S	C
Myiopagis gaimardii	S	Fh,Fe	C	M	C
Sirystes sibilator	S,V	Fh,Fc	C	M	C
Pyrocephalus rubinus	S	Fo	Sc	S	U,M (23 May 89)
Mionectes (Pipromorpha) oleaginea	M	Fh,Fc,Fi	U,F	S,G	C
Onychorhynchus coronatus	M	Fh	U	S	U
Cnipodectes subbrunneus	M	Fh,Fc	U	S	U
Myiobius atricaudus	M	Fh,Fc	U,Sc	S	C
Contopus virens	S,V	Fo,Fe	Sc	S	M (05 Jan 89)
Camptostoma obsoletum	H	Fe	U,Sc	S	U
Cnemotriccus fuscatus	H	Fe	U	S	U
Myiarchus (ferox)	S (mch)	Fe	Sc	S	C
Elaenia parvirostris	S	Fe,Fc	Sc,C	S	C
Elaenia (flavogaster)	S	Fe	Sc	S	C
Rhynchocyclus olivaceus	H	Fh	Sc	S	U
Platyrinchus coronatus	M	Fh,Fc	U	S	C
Platyrinchus platyrhynchos	M	Fh,Fc	U	S	C
Corythopis torquata	M	Cm,Fc	T	S	C
Tolmomyias sulphurescens	S	Fh,Fc	Sc	S	C
Tolmomyias assimilis	S	Fh,Fc	Sc	S,M	C
Tolmomyias poliocephalus	H	Fh,Fe	Sc	S	U
Tyrannulus elatus	S	Fh,Fe	Sc	S	C
**Knipolegus poecilocercus*	S	Rm,Fi	U	S	C
Todirostrum chrysocrotaphum	S,V	Fh,Fe	Sc	S	C
Zimmerius (Tyranniscus) gracilipes	S	Fh,Fc	C	S	C
Lophotriccus galeatus	M,S	Fh	U	S	C
Terenotriccus erythrurus	M	Cm,Fc,Fe	U	S	C
Hemitriccus zosterops	S,V	Fe,Cm	U	S	C
Hemitriccus (minor)	S	Fh	U	S	U
PIPRIDAE (9)					
Pipra rubrocapilla	M	Fh	Sc,F	G,S	C
Pipra pipra	M	Fc	U,F	S	C
Pipra coronata caelestipileata	M	Fe	U,F	S	C
Piprites chloris	V (aw,mch)	Fh	Sc	M,S	C
Tyranneutes stolzmanni	S	Fh	Sc	S	C
Chiroxiphia pareola regina	M,V	Fc	U,Sc	S,G	C
Machaeropterus regulus	S	Fh	U	S	U
Heterocercus linteatus	S	Fc,Fi	U	S	U
Schiffornis turdinus	M	Fh	U	S	C
COTINGIDAE (11)					
Cotinga cayana	S	Fh,Fe	C,F	S	C
Xipholena punicea	S	Fh,Fe	C,F	S	C
**Querula purpurata*	S	Rm	C,Sc	S,G	U
Gymnoderus foetidus	S	Fh	C,F	S	U
**Cephalopterus ornatus*	S	Rm	C,F	S	U
Iodopleura isabellae	S	Fh	C,F	S	U
Phoenicircus nigricollis	S	Fh	C,F	S	U
Pachyramphus castaneus	S	Fh	Sc	M	U

(Continued)

APPENDIX (Continued)

Family and species	Documentation	Habitats	Foraging position	Sociality	Abundance
Platypsaris minor	S,V	Fh,Fc	Sc,F	M,S	C
Lipaugus vociferans	S,V	Fh,Fc	Sc,F	S,G	C
Tityra cayana	S	Fh	Sc,C	M,S	C
HIRUNDINIDAE (6)					
**Atticora fasciata*	S	R,Rm	A	G	C
**Tachycineta albiventer*	S	R,Rm	A	G	C
Phaeoprogne tapera	S	C,Cm	A	G	C
Riparia riparia (WR)	S (cp)	D,Dw	A	G	M (03 Dec 88)
Neochelidon tibialis (WR)	M (cp,aw)	C,Cm	A	G	C
Stelgidopteryx ruficollis	S	C,Cm	A	G	C
TROGLODYTIDAE (4)					
Cyphorhinus arada	M,V	Fh,Fc	U	S,G	C
Microcerculus marginatus	S,V	Fh	T	S	C
Thyrothorus genibarbis	M	Fh	U	S	C
**Campylorhynchus turdinus*	S,V	Rm,Fe	Sc	G	C
TURDINAE (2)					
Turdus albicollis	M,V	Fc,Fh	Sc,U,F	S	C
Catharus minimus (WR)	S (cp)	Fh	Sc	S	U,M (05 May 89)
POLIOPTILINAE (3)					
Ramphocaenus melanurus	S	Fh,Fc	Sc	M,S	C
Polioptila guianensis (REx)	S (aw,mch)	Fh	C	S	C
Polioptila plumbea	H	Fh	C	S	U
EMBERIZINAE (5)					
Cyanocompsa cyanoides	M	Fh,Fc	U,Sc	S	U
Paroaria gularis	S	Rm,Cm	V	S	C
Oryzoborus angolensis	S	Fo,D	V	S	R
Sporophila bouvronides	S (cp,mch)	Fo,D	V	S	S (Feb–Apr 89)
Sporophila (lineola)	S	D,Fo	V	S	R
CARDINALINAE (1)					
Caryothraustes canadensis (REx)	H (sp)	Fh	Sc	S	R
THRAUPINAE (30)					
Thraupis episcopus	S	Fe,Fo	Sc	G	U
Thraupis palmarum	S	Fe,Fo	Sc	S	U
Cyanicterus cyanicterus (REx)	S (cp,aw)	Fh	C	M	U
Hemithraupis flavicollis (WR)	S (cp,mch)	Fh,Fc	C,F	M	C
Ramphocelus carbo	M	T,Fe,D	V	S,G	U
Tachyphonus cristatus	S	Fh,Fi	C,Sc,F	M	C
Tachyphonus surinamus	S	Fe,Fc	Sc,U,F	M	C
Lanio versicolor	S	Fh,Fc	Sc,U	M	C
Lamprospiza melanoleuca (WR)	S,V (cp,aw)	Fh,Fe	C,F	M,G	C
Nemosia pileata	S	Fe,Fc	C	M	C
**Eucometis penicillata*	S	Rm	V	S	U
Cissopis leveriana (WR)	S (cp,aw)	Fe,Fh	C	M,G	C
Habia rubica	M	Fh,Fc	U	M	C
Piranga rubra	S	Fh	Sc	M	U,M (12 Jan 89)
Euphonia rufiventris	S	Fh	C,Sc,F	M	C
Euphonia laniirostris	S	Fh,Fc,Sc	C,F	M	C
Euphonia chrysopasta	S	Fh,Fc	C,F	S,M	C
Euphonia minuta	S	Fi,Fc	C,F	M	C
Tangara chilensis chilensis (WR)	S (cp,mch)	Fh,Fc,Fe	C,Sc,F	M,G	C
Tangara schrankii	M	Fh,Fc	Sc,C,U,F	G,M	C
Tangara velia	S	Fh,Fc,Fe	C,Sc	M,G	U
Tangara mexicana boliviana	S	Fh	C,F	M	U
Dacnis lineata	S	Fh,Fe,Fc	C,F	M	C
Dacnis cayana	S	Fh,Fe,Fc	C,F	M	C
Dacnis flaviventer	S	Fh,Fc	C,F	M	C
Chlorophanes spiza	S	Fh,Fc,Fe	C,F	M	C
Cyanerpes nitidus	S	Fh,Fe,Fc	C,F	M	C
Cyanerpes caeruleus	S	Fh,Fe,Fc	C,F	M	C
Cyanerpes cyaneus	S	Fh,Fe,Fc	C,F	M	C
Coereba flaveola (WR)	S (cp)	Fe,Fo	C,F	M	R

(Continued)

APPENDIX (Continued)

Family and species	Documentation	Habitats	Foraging position	Sociality	Abundance
TERSININAE (1)					
Tersina viridis (WR)	S (cp)	Fe	C	G,M	C (Jan–Feb 89)
PARULIDAE (1)					
Basileuterus fulvicauda fulvicauda	M,V	Cm,Fc,Fi	W	S	C
VIREONIDAE (4)					
Vireo olivaceus	S	Fh,Fc,Fe	C	M	C
Vireolanius leucotis	S,V	Fh	C	M	C
Hylophilus ochraceiceps	M	Fh,Fc	U	M	C
Hylophilus hypoxanthus	M	Fh	Sc	M	C
ICTERIDAE (4)					
Psarocolius angustifrons	S	Fi,Rm,Fc	C,F	S,M	U
Psarocolius viridis	S	Fh,Fc	C,F	S,M	C
Icterus cayanensis	S	Fo,Fe	Sc	S	S (Jan–Apr 89)
**Cacicus cela*	S	Rm	C	G	C
CORVIDAE (1)					
**Cyanocorax violaceus*	S,V	Rm	Sc	G	C

Codes used in the Appendix

Species list

(REx) Range extension; nearest known record farther than 400 km.

(WR) Within species range, but reinforces poorly known distribution.

* Species recorded along the Urucu River, but not at the study plot.

† Species record at Igarapé-Açú, but not at the study plot.

(*Genus*) Alternative or superseded name of genus.

(*species*) Positive record from the plot; species identity uncertain.

subspecies Full name listed in case of clearly distinct subspecies.

Documentation

M Mist-netted.

C Captured or collected by other means.

S Confirmed sightings.

P Sighted and photographed but not captured.

V Undisputed voice recognition.

H Hypothetical, seen or heard once, requires confirmation.

(obs.) Observer(s) identity for noteworthy records: C. Peres (cp), A. Whittaker (aw), M. Cohn-Haft (mch).

Habitats (ordered by decreasing frequency of records)

Fh Undisturbed high forest.

Fc Creekside forest; along forest streams only.

Fi *Igapó* forest; along the Urucu river only.

Fo Forest openings, usually 4-ha seismic clearings or large treefall gaps.

Habitats (*continued*)

Fe Forest edge, usually along roads.

R Urucu river, on water or overhead.

Rm Urucu river margins.

C Perennial forest creeks, on water.

Cm Creek margins.

O Overhead airspace, soaring, travelling, or feeding in flocks.

T Thickets of second-growth, usually surrounding clearings.

D Bulldozer-compacted 4-ha drilling clearings; no second-growth.

Dw Compacted clearings with standing water.

Foraging position

T Terrestrial.

U Understorey.

Sc Subcanopy.

C Canopy.

F Fruit patches.

V Vine thickets.

W Water.

A Aerial.

Sociality

S Solitary or in pairs.

G Monospecific groups.

M Mixed-species flocks or associated with mammal species.

A Mixed-species flocks following army ants.

Abundance and seasonal status

C Common.

U Uncommon.

R Rare.

M Long-distance migrant.

S Seasonal, or short-distance migrant.