

Birds of a Latitudinal Transect in the Tapajós-Xingu Interfluvium, eastern Brazilian Amazonia

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RESUMO. As aves de uma transeção latitudinal no interflúvio Tapajós-Xingu, leste da Amazônia Brasileira. Apresentamos os resultados de um inventário rápido da avifauna realizado em maio de 2002 no oeste do estado do Pará ao longo da BR-163, no interflúvio Tapajós-Xingu. Sete localidades ao longo de um gradiente latitudinal, com diferentes fitofisionomias, foram exploradas preliminarmente no intuito de caracterizar a comunidade de aves correlacionada. Por todo este eixo, um total de 408 espécies foi por nós diretamente registrado e outras 43 espécies foram consideradas por constarem em dois outros inventários disponíveis. Nas campinaranas da Serra do Cachimbo foram encontradas apenas 57 espécies neste inventário, mas pelo menos outras 23 espécies de campinaranas e savanas registradas na década de 1950 não foram detectadas, assim como algumas aves aquáticas e migrantes neárticos. Encontramos 159 espécies nas florestas baixomontanas da mesma região, enquanto aí pelo menos outras 20 espécies foram coletadas na década de 1950. Adicionalmente, registramos 133 espécies no ecótono entre campinarana / floresta ombrófila; 172 e 131 espécies na floresta ombrófila de Novo Progresso, respectivamente, nos tipos denso e aberto; 146 (densa) e 122 (aberta) na floresta ombrófila de Trairão. Nos ambientes antropizados de todo o eixo foram assinaladas 152 espécies. Nossos resultados demonstram que a região cortada pela BR-163 tem grande relevância para conservação da biodiversidade, por possuir uma rica comunidade de aves, um número significativo de espécies raras ou ameaçadas (como *Anodorhynchus hyacinthinus*, a arara mais comum no sul do traçado), além de táxons endêmicos ao interflúvio Tapajós-Xingu (como *Lepidothryx vilasboasi*), ou relacionados ao complexo do Cachimbo (como *Aratinga "pertinax" paraensis*).

Palavras-chave: aves, BR 163, campinarana, Cuiabá-Santarém, floresta de terra firme, rodovia, levantamento, Serra do Cachimbo, Tapajós, Xingu

ABSTRACT. A rapid bird survey was carried out in seven locations along a latitudinal gradient and vegetation gradient along highway BR 163 in western Pará, Amazonian Brazil. A total of 408 species were recorded on this survey, with another 43 species included from two previous studies. Only 57 species were found in the white-sand forests ("campinaranas") at Serra do Cachimbo, with at least 23 species absent in our study that were found here during the 1950's. We found 159 species in the lower montane forests of Serra do Cachimbo, also not encountering at least 20 species that were collected before. Furthermore, we found 133 species in the campinarana/high forest ecotones, followed by 172 in dense forest, 131 species in open forest at Novo Progresso, and 146 and 122 in the same forest types at the northernmost site (Trairão). In anthropic habitats, 152 species were counted. Our results show the region divided by the highway BR-163 has a rich bird fauna with an important number of rare or threatened species (such as *Anodorhynchus hyacinthinus*, the most common macaw in the southern region), endemic species in the Tapajós-Xingu interfluvium (including *Lepidothryx vilasboasi*), and species associated with the campinaranas and savannas of Serra do Cachimbo (such as *Aratinga [pertinax] paraensis*).

Keywords: birds, BR 163, campinarana, Cuiabá-Santarém, road, surveys, Serra do Cachimbo, Tapajós, terra firme Forest, Xingu, white-sand forest

The region east of the Tapajós river in northern Brazil is considered one of the most important centers of endemism in Amazonia (Cracraft 1985, Bates 2001). Some endemic, well differentiated taxa, in this region include *Dendrocolaptes picumnus transfasciatus*, *Dendrocincla fuliginosa trumaii*, *Thamnophilus aethiops atriceps* and *Pyriglena leuconota similis* (Cracraft 1985, Bates 2001). Besides, several endemic taxa show restricted ranges in this region, and have not been recorded east of the Xingú river (i.e. *Rhegmatorhina gymnops*, *Pyriglena leuconota similis* and, *Lepidothrix iris eucephala*; see Ridgely and Tudor 1994) or are found only in very limited habitats or areas west of the Xingú (*Aratinga pertinax paraensis*, *Lepidothrix vilasboasi*; Sick 1997).

The avifauna of the Tapajós and Xingu interfluvium remains little known. This vast area was first visited by Emilie Snethlage, who explored the Tapajós and crossed overland to the Xingú (Snethlage 1908, 1912). There are published data

only on collections made in southern Pará at Serra do Cachimbo (Pinto and Camargo 1957), northern Mato Grosso at Peixoto de Azevedo (Novaes and Lima 1991) and Alta Floresta (Zimmer *et al.* 1997). Serra do Cachimbo has been considered an important area for several globally threatened species as it is the source of records of species such as *Euscarthmus rufomarginatus* (Pinto and Camargo 1957), *Harpyhaliaetus coronatus* and *Primolius maracana* (BirdLife International 2004). The only available inventory on the birds of this region was made by Henriques *et al.* (2003), who studied the *terra firme* avifauna at the Tapajós National Forest, in the northwestern part of the interfluvium.

The limited geographic scope of the available information implies that birds from most of the Tapajós-Xingu interfluvium remain unknown, despite the fact that the area suffers increasing impacts of recent colonization on the wake of roads built across it, as the infamous Transamazônica and Cuiabá-Santarém, which have attracted many colonists,

resulting in high levels of deforestation (Nepstad *et al.* 1999, Silveira *et al.* 2001, MMA 2001). Due to transport limitations, previous workers (such as Snethlage) explored mostly areas accessible by boat or, more recently, by plane. Therefore, birds from areas directly affected by the roads remain largely understudied.

Here we describe the results of a rapid survey aimed to characterize the birds found along the Cuiabá-Santarém (BR 163) highway in Pará, a 700 km-long unpaved road running from the Serra do Cachimbo in the Pará/Mato Grosso border, to the intersection with the Transamazônica at Rurópolis.

METHODS

Fieldwork was carried out between 8 and 21 May 2002. We selected sites representative of the main vegetation types previously detected from satellite photos and named following Brasil (1974, 1975, 1980) and IBGE (1993). After the selection we sampled each site for its birds, spending time in each of the main vegetation types present. The main study areas were:

1 - Serra do Cachimbo, a plateau along the Mato Grosso/Pará border showing very complex vegetation mosaic. Three main habitats were studied:

- Lower montane forest and cleared areas near Cachoeiras do Curuá, a roadside lodge in the northern rim of Serra do Cachimbo (08°44'S, 54°57'W). Representative tree species in those forests are *Licania egleri* (Chrysobalanaceae), *Clusia anhosia* (Clusiaceae), *Dacryodes microcarpa* (Burseraceae), *Saccoglottis mattogrossensis* (Humiriaceae) and *Emmotum fagifolium* (Icacinaeae); ECOPLAN 2003),
- Low forest over white sand (arboreal campinaranas) and lower montane forests and their ecotones 45 km south of Cachoeiras do Curuá, on the road to Cachoeira Alta (09°03'S, 54°52'W). All surveyed areas were very similar to the "restingas" or campinaranas growing on white sand soils elsewhere in the Amazon than to true savanna or cerrados. The tree *Humiria balsamifera* (Humiriaceae) is characteristic of this formation. The vegetation is dominated by trees 4-6 m high, commonly branched from the base and in parts making a dense tangle. A dense litter and a high density of ground spongy lichens (*Cladonia* sp.) are characteristic of this area, as in other Amazonian campinaranas. Compared to moister northern areas, the Serra do Cachimbo has a distinctive dry season in June-August.
- Campinarana/forest ecotones 27 km south of Cachoeiras do Curuá (08°59'S, 54°58'W), showing taller and straighter trees compared to the campinaranas above, but many of the same species. *Xylopia amazonica* (Annonaceae) was common along forest edges and was bearing fruit, attracting many birds (especially parrots).

2 - Novo Progresso (07°05'S, 55°35'W), a boom town by the right bank of the Jamanxim river, now experiencing explosive population growth fueled by timber extraction and opening of cattle ranches. Two main habitats were studied:

- Dense ombrophilous forest and very disturbed riverine forest at Consórcio Jamanxim (07°09'S, 55°29'W). We worked mainly at a site 12 km SSW from Novo

Progresso. All forest had been selectively logged and there were large areas cut out for pasture. Dense forests grow over deeper soils, commonly with high clay content, and may have very tall trees. Representative tree species are *Bertholletia excelsa* (Lecythidaceae), *Protium opacum* (Burseraceae), *Protium spruceanum* (Burseraceae) and *Pouteria jariensis* (Sapotaceae, ECOPLAN 2003).

- Open ombrophilous forest along the *Vicinal Progresso* dirt road (07°10'S, 55°06'W), 30 km SSE from Novo Progresso. The area was being selectively logged during our stay. Open forests grow over shallow, rocky soils, and have scattered trees allowing many lianas and palms to grow among them. Representative tree species are *Goupia glabra* (Celastraceae), *Tabebuia impetiginosa* (Bignoniaceae), *Euterpe oleracea* (Arecaceae), *Helicostylis tomentosa* (Moraceae) and *Ocotea glomerata* (Lauraceae). Some trees lose their leaves during the dry season (ECOPLAN 2003).

3 - Trairão (04°30'S, 55°40'W), another pioneer town dating from the 1970's and the opening of the Transamazon highway, it has been occupied for longer compared to Novo Progresso. Two forest types were studied:

- Dense ombrophilous forest 22 km east of Trairão (04°40'S, 55°37'W). The area was being selectively logged during our stay. This forest is dense with a closed canopy about 35 m tall, broken only by emergent trees reaching over 45 m. Representative tree species are *Dodecastigma integrifolium* (Euphorbiaceae), *Bertholletia excelsa*, (Lecythidaceae), *Chimarris turbinata* (Rubiaceae), *Geissospermum sericeum* (Apocynaceae) and *Astrocaryum paramaca* (Arecaceae).
- Open ombrophilous forest at *Vicinal Batata*, three km west of Trairão (04°34'S, 55°57'W). All forest had been selectively logged. There are many lianas and *Attalea* palms, which become dominant in more disturbed areas. Representative tree species are *Dipteryx odorata* (Fabaceae), *Guarea kunthiana* (Meliaceae), *Eschweilera coriacea* (Lecythidaceae), *Neea oppositifolia* (Nyctaginaceae) and *Pouteria cladantha* (Sapotaceae, ECOPLAN 2003).

The northern areas along the transect show a marked wet season between January and Abril (the rains peaking in January), with much lower precipitations between June and July. El Niño events affect the precipitations in the entire region, causing dry years, while La Niña years are moister than the average (ECOPLAN 2003).

Sampling effort in the different habitats surveyed were: lower montane forest- 11:40 field-hours; campinarana- 05:48 field-hours; campinarana/montane forest ecotones- 14:49 field-hours; cut-over (mainly pasture) and edge areas at Serra do Cachimbo- 02:10 field-hours. However, most edge birds were recorded while driving from one site to the other. Around Novo Progresso we spent 17:59 hours in dense forests, 04:10 field-hours in open forests and 02:15 in very damaged riverine forest and associated swamps. Near Trairão we spent 08:20 hours in dense forest and 07:05 hours in open forest.

We walked dirt tracks (including logging roads) stopping at regular intervals to record every bird seen or heard. Records were made with the aid of binoculars and documented whenever possible with a Sony TCM-EV (bird version) 5000 tape recorder with a Sennheiser ME66 microphone. Most surveys were carried early in the morning, starting before sunrise, and late afternoon in order to avoid the intense heat.

Bird abundances were converted into number of individuals detected / 100 hours of observations in order to allow comparisons among sites. That was achieved by correction indexes calculated for each species in each area by dividing the number of birds actually recorded by the number of field-hours in a given site x 100 (see Willis 1979, Willis and Oniki 1981). We considered dominant species those with relative abundances ≥ 100 individuals/field-hour.

We performed a cluster analysis using the abundance index matrix of all species to assess the similarity among bird communities of the different sites. Cluster analysis was performed using the SPSS 10.0 software package (Statsoft Inc.) and used Ward's method and the square of the Euclidian distance among groups. Preliminary analyses using other measures of distance produced the same or very similar results. Species names follow the Brazilian bird list proposed by CBRO (2005).

RESULTS AND DISCUSSION

We found 408 species of birds along the BR 163 (Table 1). Other 43 species, mostly waterbirds and/or migrants, were recorded by Pinto and Camargo (1957) near the Air Force base at Serra do Cachimbo in the southernmost part of our transect. The avifauna along the entire transect may easily include over 500 species, mostly forest birds.

Serra do Cachimbo

Campinaranas. One important component of the local avifauna is found in the campinaranas of Serra do Cachimbo. This habitat had a comparatively poor avifauna, with only 57 species found by us, while at least another 15 were listed by Pinto and Camargo (1957). Nevertheless, several species are restricted to this habitat such as *Herpsilochmus sellowi*, *Elaenia cristata*, *E. parvirostris*, *Formicivora grisea*, *Tangara cayana*, *Xenopipo atronitens*, *Phaeomyias murina*, *Euscarthmus meloryphus*, *Hemitriccus margaritaceiventer*, *Schistochlamys ruficapillus*, *S. melanopis*, *Tachyphonus phoenicius* and *Cyanocorax chrysops*. *Euscarthmus rufomarginatus*, *Melanopareia torquata* and *Thamnophilus torquatus* have been collected in the area (Pinto and Camargo 1957) but were not found by us probably because of chance factors. Campinaranas studied elsewhere also had few species, with many restricted to that habitat (Borges 2004).

Some species (*Schistochlamys* spp., *Tachyphonus phoenicius*) may use cleared areas nearby, but their association with the edges and more open patches of campinarana was clear. It is interesting to note that this assemblage of species is made mostly of species widespread in Central Brazil, a few from the Amazonian campinas (*Xenopipo atronitens*, *T. phoenicius*), and a very isolated population of *Herpsilochmus sellowi*, a taxon from the xeric caatinga of northeastern Brazil (Whitney *et al.* 2000). At least one further taxon, the very isolated and distinctive *Aratinga [pertinax] paraensis* seems

to be endemic to the open habitats of Serra do Cachimbo and upper Tapajós (see below).

The dominant species in campinarana were birds taking flying insects (36% of the records among all dominant species: *Tyrannus melancholicus*, *Stelgidopteryx ruficollis*, *Chelidoptera tenebrosa*, *Tachornis squamata*, *Chaetura brachyura*, *Brachygalba lugubris*), insectivores foraging in the vegetation (19%: *Hemitriccus margaritaceiventer*, *Formicivora grisea*, *Basileuterus flaveolus*), omnivores taking arthropods and small fruit (18%: *Elaenia cristata*, *Tolmomyas flaviventris*, *Camptostoma obsoletum*, *Schistochlamys ruficapillus*, *Tachyphonus phoenicius*), seed predators (15%: *Aratinga paraensis*, *A. aurea*, *Saltator grossus*, *S. maximus*, *Zonotrichia capensis*), frugivores (5%: *Ramphastos vitellinus*, *Xenopipo atronitens*), a generalist (4%: *Coereba flaveola*), and one scavenger (3%: *Coragyps atratus*). At least *Ramphastos vitellinus* and *Saltator grossus* seem to be visitors from nearby montane forests that take advantage of the seasonal availability of fruit.

Montane Forests. A total of 159 species was found in the lower montane forests of Serra do Cachimbo. At least another 20 species listed by Pinto and Camargo (1957) probably occur in this habitat but were not found by us. Some are gamebirds (*Tinamus* spp., *Mitu tuberosum*, *Crax fasciolata*) that may have been hunted out in the forests we visited, but still occur according to local people.

The species with the greatest relative abundance in the montane forests was the swift *Cypseloides senex*, that congregated in flocks of hundreds to roost at waterfalls of the Curuá river. Excluding this species we found that most dominant species were insectivores foraging in the vegetation (40% of dominant species records: *Xiphorhynchus guttatus*, *Myrmotherula brachyura*, *Herpsilochmus rufimarginatus*, *Hemitriccus griseipectus*, *Cercomacra nigrescens*, *Myiopagis gaimardii*, *Ramphocenus melanurus*, *Hylophilus hypoxanthus*, *Myrmoborus myiotherinus*).

Small frugivore-insectivore were also important (21%: *Tangara punctata*, *Tachyphonus cristatus*, *Tersina viridis*, *Piprites chloris*, *Vireolanius leucotis*), as well as seed-predators (19%: *Pyrrhura amazonum*, *Ara chloropterus*, *Pionus menstruus*) and large frugivores also taking animal prey (14%: *Lipaugus vociferans*, *Pteroglossus aracari*). The exclusion of *Cypseloides senex* makes insectivores catching flying insects far less important among dominant the species (6%: *Chelidoptera tenebrosa*) than in the campinarana.

Several interesting species (because of their conservation or taxonomic status) were found in these montane forests, with highlights to the Brown Tinamou *Crypturellus obsoletus* (the distinctive Amazonian taxon *griseiventris*), the Red-throated Piping-guan *Pipile cujubi nattereri* (a species very vulnerable to local extinction due to hunting), the threatened Hyacinthine Macaw *Anodorhynchus hyacinthinus*, the cotinga *Xipholena lamellipennis* (seven seen together; apparently the southernmost locality for the species), and the very distinctive subspecies *paraensis* (probably a good biological species; B. Whitney, JFP and FO, pers. obs.) of the Long-winged Antwren *Myrmotherula longipennis*.

Ecotones. We found 133 species in nearby ecotones, with many species that certainly occur in taller forest (*Ibycter americanus*, *Galbula leucogastra*, *Pteroglossus inscriptus*, *Picumnus aurifrons*, *Hylocharis sapphirina*), not found there

because of sampling bias. Nevertheless, some species like *Brachygalba lugubris*, *Galbula leucogastra*, *Cyanocorax* spp., *Pipra rubrocapilla* and *Manacus manacus* do seem to prefer ecotones and were found in greater abundance there.

Both jays *Cyanocorax cristatellus* (a cerrado bird) and *C. chrysops insperatus* (a taxon with localized distribution south of the Amazon in open enclaves, apparently disjunct from nominate *chrysops*) have a distribution limit at Serra do Cachimbo. *Cyanocorax chrysops* we observed had greyish upperparts and contact calls resembling *C. cyanopogon* from northeastern Brazil and eastern Goiás and Tocantins, and deserve further taxonomic research.

The ecotones had the largest number of species with abundance indexes ≥ 100 individuals/100 hours (39). Seed predators were commonest among that group (24% of all records: *Pyrrhura amazonum*, *Aratinga aurea*, *A. pertinax*, *Pionus menstruus*, *Deropterus accipitrinus*, *Brotogeris chrysoptera*), followed by small frugivores-insectivores (22%: *Tersina viridis*, *Tangara punctata*, *T. nigrocincta*, *Thraupis palmarum*, *Dacnis cayana*, *Vireo olivaceus*, *Pipra rubrocapilla*, *Tolmomyias flaviventris*), and insectivores foraging in the vegetation (21%: *Myiopagis gaimardii*, *Myrmotherula brachyura*, *Ramphocaenus melanurus*, *Hypocnemis cantator*, *Hylophylus semicinctus*, etc). An heterogeneous group feeding on fruit but also taking animal prey made 12% (*Pteroglossus inscriptus*, *Lipaugus vociferans*, *Tityra semifasciata*, *Trogon curucui*, *Cyanocorax chrysops*, *Turdus ignobilis*, *Melanerpes cruentatus*).

Novo Progresso

Dense Forest. We found 172 species in the dense forest we surveyed at Novo Progresso, but few had abundance indexes large enough to be considered as dominant, a consequence of the large number of rare species (54 with only 1-2 records). Although badly damaged by selective logging, this habitat had many species not found elsewhere (*Lepidothrix vilasboasi*, *Deconychura stictolaema*, *Nasica longirostris*, *Capito dayi*, etc).

Swifts *Chaetura cinereiventris* and *C. brachyura* had 22% of the records among dominant species. Nevertheless, as aerial feeders their association to forest habitats is limited. The remaining species can be considered as forest-dependent. Three insectivores favoring edges (*Thryothorus coraya*, *Cercomacra nigrescens* e *Thamnophilus schistaceus*) made 24% of the records, while three seed predators (*Brotogeris chrysoptera*, *Ara chloropterus* e *Saltator grossus*) 21%.

Two species taking large insects and some fruit in the medium-upper strata (*Monasa morphoeus* e *Rhytipterna simplex*) made 14% of the records, two species eating mostly fruit but also taking animal prey (*Pteroglossus bitorquatus* e *Melanerpes cruentatus*) had 13%, and the small canopy frugivore-insectivore *Piprites chloris* had 6%.

Open Forest. A total of 131 species was found in open forest near Novo Progresso (Vicinal Progresso), including some interesting taxa such as *Pyrrhura perlata* (also found in dense forest) and some species found only this habitat such as *Tinamus guttatus*, *Amazona kawalli*, *Micrastur mintoni*, *Pharomachrus pavoninus* e *Galbula cyanicollis*. Fifty-two species were represented by only 1-2 records.

Small frugivore-insectivores were the numerically most important group (28% of all records, *Tyrannetes stolzmanni*,

Piprites chloris, *Hemithraupis flavicollis*, *Tolmomyias poliocephalus*, *Vireolanius leucotis*, *Vireo olivaceus*), a striking difference both in composition and abundance from dense forest in the same region. Two small insectivores, (*Myrmotherula brachyura*, *Pygiptila stellaris*) an important group in dense forest, made only 8.5% of the records among dominant species.

Frugivores also taking animal prey (*Pteroglossus inscriptus*, *P. aracari*, *Selenidera gouldii*, *Ramphastos tucanus*, *Lipaugus vociferans*) were unusually common and diverse, accounting for 23% of the records among dominant species, another important difference from the dense forest. Three seed predators (*Pyrrhura amazonum*, *P. perlata*, *Amazona kawalli*) made up 20% of the individual records, a similar value to that observed in the dense forest but species composition differed significantly between these habitats. Aerial insectivores (only *Chaetura cinereiventris*) and large insectivores (*Monasa morphoeus* and *Rhytipterna simplex*) accounted each for 10% of the records among dominant species

Trairão

Dense Forest. Dense forest in Trairão yielded 146 espécies. This habitat had several species not recorded in other localities, mostly birds associated to more mature and structured forests such as *Dichrozona cincta*, *Chamaeza nobilis*, *Grallaria varia* and *Dendrocincla merula*. One third of the recorded species were represented by only one or two records. Some of these rare species represented significant range extensions (see below).

Among the dominant species, small insectivores (11 species) were the most important group, with 63% of the records, a proportion well above any other habitat. Two large insectivores (*Galbula dea*, *Monasa morphoeus*) made 11%, while canopy frugivore-insectivores *Vireolanius leucotis* and *Lanio versicolor* accounted for 10% of the records. Other dominant species were the frugivore-insectivores *Lipaugus vociferans* (7%) and *Psarocolius viridis* (5%), and the seed-predator *Brotogeris chrysoptera* (5%).

Open Forest. A total of 122 species was found in open forest near Trairão. From these, 42% can be considered as rare, with only 1-2 records. Some species were found only in this habitat (*Tinamus tao*, *Amazona farinosa*, *Glaucis hirsutus*, *Lophotrix cristata*, *Pionopsitta vulturina*, *Lurocalis semitorquatus*, *Topaza pella*, *Capito cf. niger*).

The commonest species in this habitat was the swallow *Progne chalybea*, due to a migratory wave passing through the area during our censuses. If we exclude it, small insectivores looking for arthropods amid the vegetation (11 species) made 44% of the records among dominant species.

Three toucans (*Ramphastos vittelinus*, *Pteroglossus bitorquatus* and *R. tucanus*), one trogon (*Trogon viridis*), one oropendola (*Psarocolius viridis*) and one woodpecker (*Melanerpes cruentatus*) feeding both on fruit and animal protein make the second commonest group among dominant species (21% of all records), followed by small frugivore-insectivore (6 species, 15%) and seed predators (*Aratinga leucophthalma*, *Amazona farinosa*, 6%). The large sailing insectivore *Monasa morphoeus* (5%), the ground frugivore *Crypturellus cinereus* (4%) and the aerial insectivore *Chaetura spinicaudus* (2%) close the list of dominant species in this habitat.

Anthropogenic Habitats

We found 58 species in anthropogenic habitats at Serra do Cachimbo, 57 on the drive from Castelo dos Sonhos and Alvorada do Norte, 77 between Novo Progresso and Trairão, and 62 around Trairão, totaling 152 species recorded in the mosaic of disturbed habitats along the BR 163 (Table 1).

Species able to use those anthropogenic habitats belong to four main groups: 1) open-habitat, widely distributed species associated with open habitats and benefited by the opening of pastures (*Crypturellus parvirostris*, *Volatinia jacarina*, *Tyrannus melancholicus*, *Sporophila caeruleascens*, *Crotophaga ani*, *Vanellus chilensis*, *Rupornis magnirostris*, *Buteo nitidus*, *Coragyps atratus*, *Columbina talpacoti*, *Columbina passerina*, *Bubulcus ibis*, etc); 2) species adapted to forest edge or young seral stages of forest succession benefited by the spread of “capoeiras” (*Thraupis palmarum*, *T. episcopus*, *Ramphocelus carbo*, *Myiozetetes cayanensis*, *Tyrannulus elatus*, *Xiphorhynchus picus*, *Thryothorus coraya*, *Ortalis* spp., *Crypturellus cinereus*, *Thamnophilus palliatus*, *Tangara cyanicollis*, etc); 3) waterbirds taking advantage of the ponds and swamps made when the road blocked watercourses or by ranchers to water the cattle (*Egretta thula*, *Ardea alba*, *Amazonetta brasiliensis*, *Jacana jacana*, *Porphyrio martinica*, *Laterallus* spp., etc); and 4) forest species able to move among fragments or isolated trees and to use resources dispersed in a matrix of disturbed habitats (mainly macaws and birds of prey, but also several frugivores and seed predators such as *Pionites leucogaster*, *Brotogeris chrysoptera*, *Pionus menstruus*, *Psarocolius viridis*, etc).

Man-made habitats we censused at Serra do Cachimbo are a good example of the above composition, and show how the ruderal species of the first group become dominant while there is an overall loss of species richness. Obviously, the composition and richness of man-made habitats depends on how far they are transformed from the original forest, as there is a trend for simpler, ruderal-dominated communities as patches of forest and “capoeira” become smaller or more distant.

The corridor of open areas along the BR 163 makes a colonization route for species originally not found there, such as *Athene cunicularia* and, quite possibly, most of the ruderal species. This colonization, and the substitution of the local original avifauna by widely distributed pasture and edge species is another example of the “macdonaldsation” of the biosphere (Lövei 1997).

Comparisons Among Natural Habitats

The cluster analysis made with the complete matrix of abundance indexes emphasizes the similarities among areas, and is strongly influenced by species with the greater indexes that are shared by different localities because of the statistical properties of the chosen method. The cluster analysis (Figure 1) shows the mosaic of anthropogenic habitats at Serra do Cachimbo is the most dissimilar habitat, surely because of the very high abundances of open-habitat opportunists restricted to it such as *Volatinia jacarina*, *Crotophaga ani*, etc.

After anthropic areas, the most distinct habitat is the montane forest of Serra do Cachimbo (Figure 1). The neighboring campinaranas and their ecotones with the montane forest make the next group, thus agreeing with the fact that they share many abundant species and have their contacts are sometimes hard to discern. Lastly, the various dense and open forest north of Serra do Cachimbo make a congruent group, distinct from the remainder.

The cluster resulting from the presence/absence matrix, on the other hand, emphasizes differences among the species compositions of different areas, as it is not affected by species being abundant in more than one sampling point. This analysis (Figure 2) shows the open forests of Novo Progresso and the dense forests near Trairão are the most distinct of all censused habitats because of the large number of species detected only in them. Of course this result must be considered with caution because of the short sampling period.

Curiously, in this analysis the campinaranas of Serra do Cachimbo share more species with montane forests than with the nearby ecotones, and both are associated with open forests

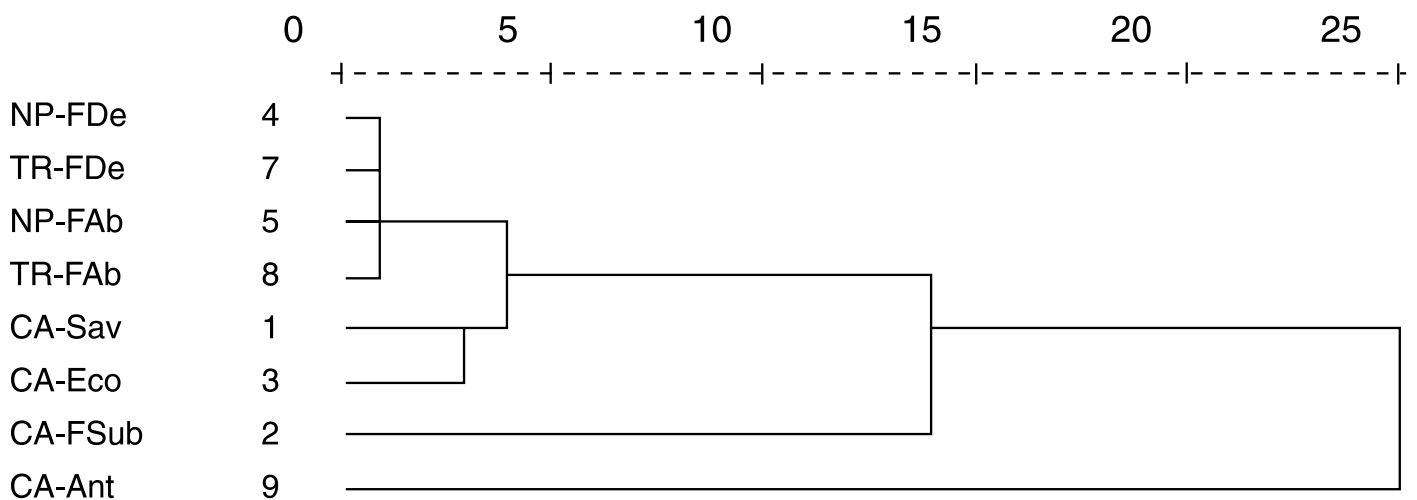


Figure 1 – Cluster resulting from the abundance index matrix with all species, showing the similarities among the different censused areas. The scale refers to the Euclidian distance among areas. CA – Serra do Cachimbo (sampling areas 1, 2, 3 and 9), NP- Novo Progresso (4 and 5), TR – Trairão (7 and 8), FDe – dense forest, FAb- open forest, FSub- montane forest, Sav- campinarana, Eco –campinarana/forest ecotone, Ant – anthropic habitats.

near Trairão. The fact that many forest species (mostly parrots and tanagers) use fruiting trees in disturbed habitats at Serra do Cachimbo (see Table 1) might explain the similarity of this habitat to the former ones. The results do not show a clear latitudinal pattern in the structure of the avifauna, the opposite of what we expected in a c. 700 km transect covering different forest and soil types and, especially, graded local climates.

Anthropogenic habitats in the study areas are made mostly of pastures in various stages of neglect and succession, commonly with palms and large Brazil nut trees left during clearing. Second-growth areas (“capoeiras”) are mostly dominated by *Cecropia* and *Vismia* spp., with a dense undergrowth and, commonly, many lianas. At the northernmost part of the transect (Trairão), babaçu palms *Attalea speciosa* were very common and may dominate abandoned pastures (just as in parts of western Maranhão and northern Tocantins), making a distinctive habitat. Açaí palm *Euterpe oleracea* groves are also much more common and extensive in this region.

Important Records

Ortalis motmot ruficeps. Endemic to eastern Amazon between the Tapajós river north of the Jamanxim’s mouth and the lower Araguaia, through the medium-lower Iriri and Xingu (Sick 1997). Henriques *et al.* (2003) found the species common at Tapajós National Forest. Four *Ortalis* observed on the road a few km to the north from Cachoeira da Serra on 12 May, and another three with clearly reddish heads seen at Consórcio Jamanxim on 15 May belonged to this species, a southern range extension of over 350 km. Chachalacas seen at Serra do Cachimbo could not be reliably identified but we believe they were *Ortalis guttata*, known from Peixoto de Azevedo, northern Mato Grosso (Novaes and Lima 1991).

Anodorhynchus hyacinthinus. Commonly recorded from Serra do Cachimbo up to c. 40 km north of Novo Progresso in lower montane forest and open forest with palms, and also in pasture mosaics with sparse palms, including buriti groves, where it is one of the commonest macaws. This region,

together with southern Pará east of the Xingú river, probably represent this specie’s stronghold in the Amazon region.

Although we did not find it further north, there are records from the lower Tapajós, Altamira (although not found in Tapajós National Forest by Henriques *et al.* 2003) and along the Iriri river to its confluence with the Xingu (Collar *et al.*, 1992). Ours, the historical records, and the fact the species occurs in northern Mato Grosso (Alta Floresta, Collar *et al.* 1992) suggest this macaw occurs along the whole BR 163. Although considered as globally “endangered” (BirdLife International 2004), the presence of strong populations in the Brazilian Pantanal and our findings suggest the species does not warrant such status and should be best considered as “vulnerable”.

Primolius maracana. On 10 May three birds were seen near Cachoeiras do Curuá in the ecotone between lower montane Forest and cleared areas near the road. Many small macaws seen in flying to their roosts at sunset in the same area could belong to this species. The Serra do Cachimbo is considered a stronghold for the species (BirdLife International 2000), and it is commonest in the semideciduous forests of its southern slope (C. Yamashita, *in litt.*).

Aratinga [pertinax] paraensis. Described by Sick (1959b) as a subspecies of *A. cactorum*, this conure was later assigned to the *A. pertinax* group (Sick 1963). The only definite localities for this taxon are the upper Cururu and Cururu-açu rivers, where it occurs in campinaranas (Sick 1959b). There is no recent information available for this species, which was not reported by Pinto and Camargo (1957) and is regarded as one of the least known Brazilian psittacids. We found it to be common in the campinaranas and ecotones along the BR 163 from the Mato Grosso-Pará border to Cachoeiras do Curuá. A gathering of over 30 birds in several different groups was seen feeding on fruits of *Xylopia amazonica* (Annonaceae) and grass seeds in an abandoned pasture near Cachoeiras do Curuá. This conure has a very disjunct and isolated distribution from other taxa of the *A. pertinax* group, which are all found north of the Amazon associated with open

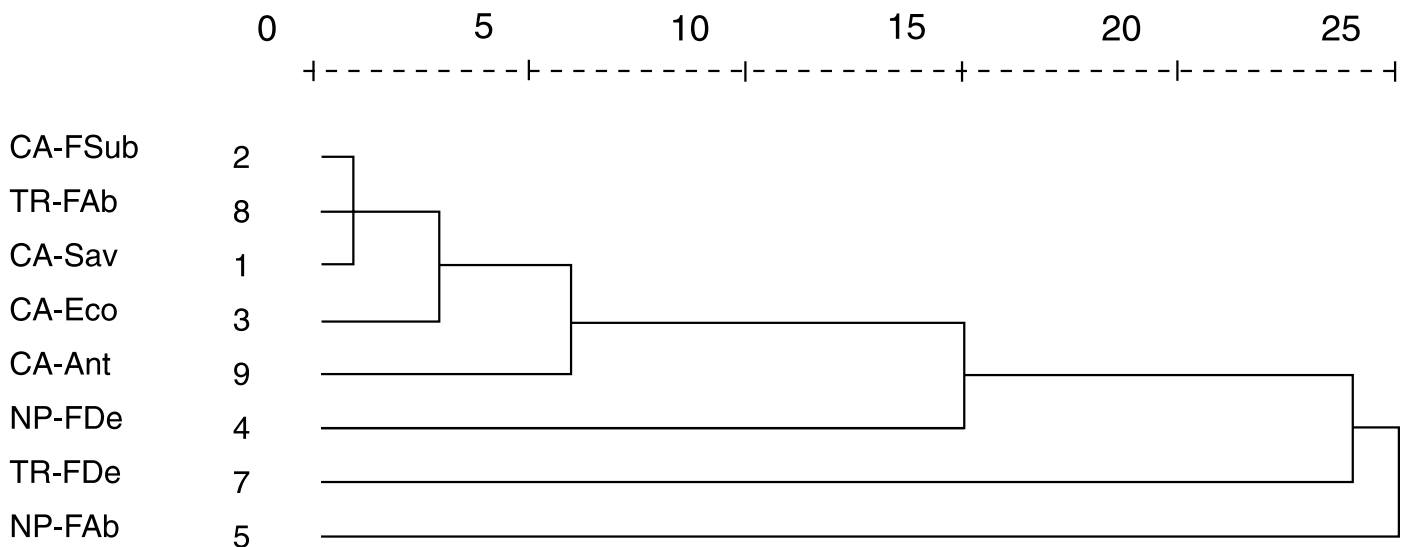


Figure 2 – Cluster resulting from the presence/absence matrix with all the censused species, showing the similarity among sites. The scale refers to the Euclidian distance among areas. Codes are the same as in Figure 1.

Table 1 - Bird species recorded along the BR 163 road in the state of Pará, between the border with Mato Grosso and the Transamazônica highway. The numbers show the abundance indexes (individuals/100 observation hours) for each species in the sampled sites. x – species recorded outside the quantified samplings. See text for site description. Taxonomy and nomenclature follow the Comitê Brasileiro de Registros Ornitológicos (CBRO 2005). C – Species recorded by Pinto and Camargo (1957) at Serra do Cachimbo; C-S – Campinarana, Serra do Cachimbo; C-E – Campinarana / forest ecotone, Serra do Cachimbo; C-M – Montane forest, Serra do Cachimbo; NP-D – Dense forest, Novo Progresso; NP-O – Open forest, Novo Progresso; NP-R – Riverine forest, Novo Progresso; T-D – Dense forest, Trairão; T-O – Open forest, Trairão; CA – Anthropic habitats, Serra do Cachimbo; T-A – Anthropic habitats, Trairão; CS-AL – Anthropic habitats between Castelo dos Sonhos and Alvorada do Norte; NP-TR – Anthropic habitats between Novo Progresso e Trairão.

Family / Species	C	C-S	C-M	C-E	NP-D	NP-O	NP-R	T-D	T-O	C-A	T-A	CS-AL	NP-TR
TINAMIDAE (10):													
<i>Tinamus tao</i>	X								14				
<i>Tinamus major</i>	X					23	89	X					
<i>Tinamus guttatus</i>						47							
<i>Crypturellus cinereus</i>	X				17	23	178	24	169	X	X	X	
<i>Crypturellus soui</i>			9	58	11	47		36	14				
<i>Crypturellus obsoletus</i>			17	29									
<i>Crypturellus undulatus</i>	X										X		
<i>Crypturellus strigulosus</i>	X							24	14				
<i>Crypturellus variegatus</i>					28	47		36	99				
<i>Crypturellus parvirostris</i>										92			
ANATIDAE (3):													
<i>Dendrocygna autumnalis</i>													X
<i>Cairina moschata</i>	X												X
<i>Amazonetta brasiliensis</i>													X
CRACIDAE (7):													
<i>Ortalis cf. guttata</i>				29									
<i>Ortalis motmot ruficeps</i>					17							X	
<i>Penelope superciliaris</i>	X	37	60	58									
<i>Penelope jacquacu</i>					11								
<i>Pipile cunjubi nattereri</i>	X		26					12					
<i>Mitu tuberosum</i>	X												
<i>Crax fasciolata</i>	X												
ODONTOPHORIDAE (1):													
<i>Odontophorus gujanensis</i>	X				67				28				
PODICIPEDIDAE (1):													
<i>Tachybaptus dominicus</i>													X
PHALACROCORACIDAE (1):													
<i>Phalacrocorax brasilianus</i>	X												
ANHINGIDAE (1):													
<i>Anhinga anhinga</i>												X	
ARDEIDAE (7):													
<i>Tigrisoma lineatum</i>												X	X
<i>Agamia agami</i>	X												
<i>Butorides striata</i>	X					X					X	X	X
<i>Bubulcus ibis</i>						X		X			X	X	X
<i>Ardea alba</i>						X	44					X	
<i>Pilherodius pileatus</i>		X			X								
<i>Egretta thula</i>						X	44				X	X	X
THRESKIORNITHIDAE (1):													
<i>Mesembrinibis cayennensis</i>	X												
CATHARTIDAE (4):													
<i>Cathartes aura</i>		91											
<i>Cathartes melambrotus</i>		18	34	58	33	X	44	24	14			X	X
<i>Coragyps atratus</i>		146	9	188	11	94	267	X	14		X	X	X
<i>Sarcoramphus papa</i>													X
ACCIPITRIDAE (11):													
<i>Elanoides forficatus</i>			43										
<i>Gampsonyx swainsonii</i>	X												X
<i>Elanus leucurus</i>										46			

Table 1 - continued...

Family / Species	C	C-S	C-M	C-E	NP-D	NP-O	NP-R	T-D	T-O	C-A	T-A	CS-AL	NP-TR
<i>Harpagus bidentatus</i>	X				11								
<i>Leucopternis albicollis</i>					28								
<i>Buteogallus urubitinga</i>				X				12					X
<i>Heterospizias meridionalis</i>	X												
<i>Rupornis magnirostris</i>	X	73	17	29							X	X	X
<i>Buteo nitidus</i>	X				6		44						X
<i>Buteo swainsoni</i>	X												
<i>Buteo brachyurus</i>													X
FALCONIDAE (10):													
<i>Daptrius ater</i>						47		24	42	X			
<i>Ibycter americanus</i>	X			58		X	44	48	56			X	
<i>Caracara plancus</i>						X				46	X	X	X
<i>Milvago chimachima</i>	X									X			
<i>Herpetotheres cachinnans</i>		X			6		89		28			X	X
<i>Micrastur ruficollis</i>		37		29	33	47							
<i>Micrastur mintoni</i>	X					47							
<i>Micrastur mirandollei</i>					22				28				
<i>Micrastur semitorquatus</i>					17	47		12					
<i>Falco ruficularis</i>			9		6							X	
RALLIDAE (7):													
<i>Aramides cajanea</i>				29				X					
<i>Laterallus viridis</i>					X					138	X	X	
<i>Laterallus melanophaius</i>												X	X
<i>Laterallus exilis</i>					X			X			X	X	X
<i>Neocrex erythrops</i>	X												
<i>Porphyrio martinica</i>								X			X		X
<i>Porphyrio flavirostris</i>													X
HELIORNITHIDAE (1):													
<i>Helionis fulica</i>	X											X	
EURYPYGIDAE (1)													
<i>Eurypyga helias</i>	X												
JACANIDAE (1):													
<i>Jacana jacana</i>						X		X			X	X	X
CHARADRIIDAE (2):													
<i>Vanellus chilensis</i>			17			X					X	X	X
<i>Pluvialis dominica</i>	X												
SCOLOPACIDAE (5)													
<i>Bartramia longicauda</i>	X												
<i>Tringa melanoleuca</i>	X												
<i>Tringa flavipes</i>	X												
<i>Tringa solitaria</i>	X												
<i>Calidris fuscicollis</i>	X												
COLUMBIDAE (11):													
<i>Columbina passerina</i>								X					X
<i>Columbina talpacoti</i>	X	37	34	58	X	X	X	X		461	X	X	X
<i>Claravis pretiosa</i>	X	37											
<i>Columba livia</i>					X	X							
<i>Patagioneas speciosa</i>	X	91	17	72								X	
<i>Patagioneas cayennensis</i>	X	37		29								X	
<i>Patagioneas plumbea</i>			17		22			48					
<i>Patagioneas subvinacea</i>					6			12					
<i>Leptotila verreauxi</i>	X							X					
<i>Leptotila rufaxilla</i>						X		X	14	46			X
<i>Geotrygon montana</i>	X				6								
PSITTACIDAE (27):													
<i>Anodorhynchus hyacinthinus</i>			17	14	33	94				138		X	X
<i>Ara ararauna</i>	X				22		133				X	X	X
<i>Ara macao</i>						47	444	24					X

Table 1 - continued...

Family / Species	C	C-S	C-M	C-E	NP-D	NP-O	NP-R	T-D	T-O	C-A	T-A	CS-AL	NP-TR
APODIDAE (8):													
<i>Cypseloides senex</i>	X		2571										
<i>Chaetura spinicaudus</i>							178	24	141		X		
<i>Chaetura cinereiventris</i>			69		256	328	1866						
<i>Chaetura egregia</i>				87									
<i>Chaetura viridipennis</i>				507		94							
<i>Chaetura brachyura</i>		128			117						X		
<i>Tachornis squamata</i>	X	237	9		X	23	89					X	
<i>Panyptila cayennensis</i>			34			94							
TROCHILIDAE (17):													
<i>Glaucis hirsutus</i>									56				
<i>Phaethornis ruber</i>			17	43	6	23			28				
<i>Phaethornis superciliosus</i>					22				14				
<i>Florisuga mellivora</i>													X
<i>Anthracothorax nigricollis</i>	X	18		43									
<i>Topaza pella</i>									14				
<i>Chrysolampis mosquitus</i>	X												
<i>Lophornis gouldii</i>	X		9	14									
<i>Chlorestes notata</i>	X												
<i>Thalurania furcata</i>	X				6				28				
<i>Hylocharis sapphirina</i>				14									
<i>Polytmus theresiae</i>			9							46			
<i>Amazilia versicolor</i>	X												
<i>Amazilia fimbriata</i>			9										
<i>Heliothryx auritus</i>	X		17					12					
<i>Heliomaster longirostris</i>	X												
<i>Calliphlox amethystina</i>				87									
TROGONIDAE (7):													
<i>Trogon viridis</i>	X		86	29	33	47		96	113				
<i>Trogon curucui</i>		91		116									
<i>Trogon violaceus</i>	X		43	29	22	94		24					
<i>Trogon collaris</i>	X												
<i>Trogon rufus</i>	X												
<i>Trogon melanurus</i>	X		17	29	33	94		24					
<i>Pharomachrus pavoninus</i>						23							
ALCEDINIDAE (4):													
<i>Ceryle torquatus</i>							44				X	X	X
<i>Chloroceryle amazona</i>	X						89	X			X		X
<i>Chloroceryle americana</i>					X								
<i>Chloroceryle inda</i>	X												
MOMOTIDAE (1):													
<i>Momotus momota</i>						70		24					
GALBULIDAE (6):													
<i>Brachygalba lugubris</i>	X	128		188									
<i>Galbula cyanicollis</i>	X					94							
<i>Galbula ruficauda</i>	X			58		X					X	X	X
<i>Galbula leucogastra</i>				116									
<i>Galbula dea</i>	X		34	29	39	47	89	120	56				
<i>Jacamerops aureus</i>					17	47		24	28				
BUCCONIDAE (6):													
<i>Notharchus tectus</i>			34		6			X	14				
<i>Bucco capensis</i>						94		24					
<i>Nonnula ruficapilla</i>								12					
<i>Monasa nigrifrons</i>	X			14							X		
<i>Monasa morphoeus</i>			34		128	187		193	226				
<i>Chelidoptera tenebrosa</i>	X	256	154	145			89		14	415	X	X	
CAPITONIDAE (2):													
<i>Capito dayi</i>					67								
<i>Capito cf. niger</i>									14				

Table 1 - continued...

Family / Species	C	C-S	C-M	C-E	NP-D	NP-O	NP-R	T-D	T-O	C-A	T-A	CS-AL	NP-TR
RAMPHASTIDAE (6):													
<i>Ramphastos tucanus</i>			77	87	89	117	267	48	141				
<i>Ramphastos vitellinus</i>	X	128	86	29	61	47		48	198	X			
<i>Selenidera gouldii</i>			17	29	X	117			28				
<i>Pteroglossus inscriptus</i>	X			174	39			72	28				
<i>Pteroglossus bitorquatus</i>					128	304		48	184				
<i>Pteroglossus aracari</i>			163		11	117		72	113				
PICIDAE (12):													
<i>Picumnus aurifrons</i>	X			14		47							
<i>Melanerpes cruentatus</i>	X		43	101	100	94	400	48	141			X	
<i>Veniliornis affinis</i>	X		17		28	47	44		28				
<i>Piculus flavigula</i>	X		17		56	47							
<i>Piculus chrysochloros</i>			34		11	47							
<i>Celeus grammicus</i>			34			70							
<i>Celeus elegans</i>	X							12					
<i>Celeus flavus</i>			9										
<i>Celeus torquatus</i>			9		22								
<i>Dryocopus lineatus</i>	X		17	29	33	23	44			46			
<i>Campephilus rubricollis</i>	X		60		6			48	113				
<i>Campephilus melanoleucos</i>					11	X							
MELANOPAREIIDAE (1):													
<i>Melanopareia torquata</i>	X												
THAMNOPHILIDAE (36):													
<i>Cymbilaimus lineatus</i>	X		51		89	47		120	226				
<i>Taraba major</i>			17			X	444	X			X	X	
<i>Sakesphorus luctuosus</i>											X	X	
<i>Thamnophilus palliatus</i>					X		178				X		
<i>Thamnophilus aethiops atriceps</i>								X					
<i>Thamnophilus schistaceus</i>			69	29	133	47		120	113				
<i>Thamnophilus stictocephalus</i>	X	37	86	58					28				
<i>Thamnophilus torquatus</i>	X												
<i>Thamnomanes caesius</i>	X		51		33	X		144	85				
<i>Pygiptila stellaris</i>			17		22	140		144	85				
<i>Myrmotherula leucophthalma</i>								48	85				
<i>Myrmotherula ornata hoffmannsi</i>					11				28				
<i>Myrmotherula brachyura</i>	X		154	261	56	140		289	141				
<i>Myrmotherula sclateri</i>			69		44	47	89	72	28				
<i>Myrmotherula hauxwelli</i>								120					
<i>Myrmotherula axillaris</i>	X		34	29	22			48					
<i>Myrmotherula longipennis paraensis</i>			17		11			24					
<i>Myrmotherula menetriesii</i>			34					48	28				
<i>Dichrozona cincta zononota</i>								24					
<i>Herpsilochmus sellowi</i>	X	73											
<i>Herpsilochmus rufimarginatus</i>			154	87	78	94		96					
<i>Microrhophias quixensis emilliae</i>					22			24	127				
<i>Formicivora grisea</i>	X	402	34	116						184			
<i>Cercomacra cinerascens</i>			69	58	178			337	282				
<i>Cercomacra nigrescens</i>			120		11	X	178		169			X	
<i>Pyriglena leuconota similis</i>					44								
<i>Myrmoborus leucophrys</i>					11								
<i>Myrmoborus myiotherinus</i>			103	116	89			120	85				
<i>Hypocnemis cantator</i>	X		17	116				96	85				
<i>Schistocichla leucostigma</i>	X												
<i>Myrmeciza hemimelaena</i>					44	94		48	85				
<i>Myrmeciza atrothorax</i>	X		86	29		X						X	X
<i>Rhegmatorhina gymnops</i>								36	28				
<i>Hylophylax naevius</i>	X		86	87	11			24					
<i>Hylophylax poecilinotus nigrigula</i>	X				11	47		48					
<i>Phlegopsis nigromaculata</i>					22			60	28				

Table 1 - continued...

Family / Species	C	C-S	C-M	C-E	NP-D	NP-O	NP-R	T-D	T-O	C-A	T-A	CS-AL	NP-TR
<i>Zimmerius gracilipes</i>			51	29	11	47			85				
<i>Myiornis ecaudatus</i>								48	85				
<i>Rhynchocyclus olivaceus</i>					11								
<i>Tolmomyias sulphurescens</i>					11		89						
<i>Tolmomyias assimilis</i>			17										
<i>Tolmomyias poliocephalus</i>			17		22	140		48	113				
<i>Tolmomyias flaviventris</i>	X	256		145			89		28			X	
<i>Platyrrhinus platyrhynchos</i>	X												
<i>Myiobius atricaudus</i>	X												
<i>Terenotriccus erythrus</i>	X				22	X							
<i>Lathrotriccus euleri</i>			34	29									
<i>Cnemotriccus fuscatus</i>				14									
<i>Colonia colonus</i>								12					
<i>Myiozetetes cayanensis</i>	X	73	51		X	X	89	X		276	X	X	X
<i>Myiozetetes luteiventris</i>				29	22	47		24	56				
<i>Pitangus sulphuratus</i>	X		17		X	x	89	X		276	X	X	X
<i>Philohydor lictor</i>					X		89	X			X	X	X
<i>Myiodynastes maculatus</i>	X							X					
<i>Megarynchus pitangua</i>										92			
<i>Empidonomus varius</i>	X		17					12			X		X
<i>Tyrannus melancholicus</i>	X	529		29	X	X				876		X	
<i>Tyrannus savana</i>	X												X
<i>Rhytipterna simplex</i>					111	140	89	24					
<i>Rhytipterna immunda</i>				29									
<i>Sirystes sibilator</i>			17	58									
<i>Myiarchus tuberculifer</i>									28				
<i>Myiarchus swainsoni</i>	X	37											
<i>Myiarchus ferox</i>	X			29			89	X	28	92	X		X
<i>Ramphotrigon ruficauda</i>				29				12					
<i>Attila cinnamomeus</i>			17	29	17		44	X					
<i>Attila spadiceus</i>							178		85				
COTINGIDAE (7):													
<i>Phoenicircus nigricollis</i>								24					
<i>Cotinga cayana</i>	X		26										
<i>Lipaugus vociferans</i>	X		214	130	67	117	178	193	56				
<i>Xipholena lamellipennis</i>			69	58				24					
<i>Gymnoderus foetidus</i>	X		9	43									
<i>Querula purpurata</i>	X		34										
<i>Cephalopterus ornatus</i>	X												
PIPRIDAE (12):													
<i>Neopelma pallescens</i>		37		29									
<i>Tyrannetes stolzmanni</i>			69		44	187		72					
<i>Piprites chloris</i>			103		100	140		24	141				
<i>Lepidotrix nattereri</i>			17	58									
<i>Lepidotrix vilasboasi</i>					22								
<i>Lepidotrix iris</i>								24					
<i>Manacus manacus</i>	X			58									
<i>Chiroxiphia pareola</i>			17										
<i>Xenopipo atronitens</i>	X	110											
<i>Heterocercus linteatus</i>	X												
<i>Dixiphia pipra</i>	X		17	29	17	47		24					
<i>Pipra rubrocapilla</i>	X		34	174					42				
TITYRIDAE (6):													
<i>Schiffornis turdina</i>					11	47		24					
<i>Iodopleura isabellae</i>	X		17	87	6								
<i>Tityra semifasciata</i>	X		60	130	11								
<i>Pachyramphus rufus</i>											X		X
<i>Pachyramphus castaneus</i>					11				85				
<i>Pachyramphus marginatus</i>			51	58		47		48	113				

Table 1 - continued...

Family / Species	C	C-S	C-M	C-E	NP-D	NP-O	NP-R	T-D	T-O	C-A	T-A	CS-AL	NP-TR
VIREONIDAE (6):													
<i>Cyclarhis gujanensis</i>	X		17				178			92			X
<i>Vireolanius leucotis</i>			103	58	83	140	89	144	28				
<i>Vireo olivaceus</i>	X		34	174		140			56				
<i>Hylophilus semicinereus</i>			34	130	22				28				
<i>Hylophilus hypoxanthus</i>	X		103	116	44	94		120	56				
<i>Hylophilus ochraceiceps</i>			51					96					
CORVIDAE (2):													
<i>Cyanocorax chrysops insperatus</i>	X		43	145						461			
<i>Cyanocorax cristatellus</i>	X			58									
HIRUNDINIDAE (9):													
<i>Tachycineta albiventer</i>		37								46	X		X
<i>Progne tapera</i>											X		
<i>Progne subis</i>									14				
<i>Progne chalybea</i>	X			72	x				424	184	X	X	X
<i>Atticora fasciata</i>											X		X
<i>Neochelidon tibialis</i>					11	94							
<i>Alopocheilidon fucata</i>	X												
<i>Stelgidopteryx ruficollis</i>		493	9	188						92	X		X
<i>Hirundo rustica</i>	X												
TROGLODYTIDAE (8):													
<i>Campylorhynchus turdinus</i>			51	203	33	47	267	24	311				
<i>Thryothorus genibarbis</i>			34		X								
<i>Thryothorus coraya</i>					100			72	282				X
<i>Thryothorus leucotis</i>							533						
<i>Troglodytes musculus</i>	X	37	17	29	X	X				184		X	
<i>Microcerculus marginatus</i>					33			72	85				
<i>Cyphorhinus arada</i>	X							24	28				
<i>Donacobius atricapilla</i>											X	X	X
POLIOPTILIDAE (2):													
<i>Ramphocaenus melanurus</i>	X		120	232	50	94		48	141				
<i>Polioptila guianensis</i>			34	29		47		24	28				
TURDIDAE (4):													
<i>Turdus leucomelas</i>	X			29						138			
<i>Turdus amaurochalinus</i>		37											
<i>Turdus ignobilis</i>	X	73		116									
<i>Turdus fumigatus</i>	X												
COEREBIDAE (1):													
<i>Coereba flaveola</i>	X	219		232			267			184	X		X
THRAUPIDAE (31):													
<i>Schistochlamys melanopsis</i>	X			43						138		X	
<i>Schistochlamys ruficapillus</i>	X	146											
<i>Cissopis leverianus</i>										X			
<i>Lamprospiza melanoleuca</i>					33			60	28				
<i>Nemosia pileata</i>		X								X			
<i>Habia rubica</i>								72	113				
<i>Tachyphonus cristatus</i>	X		120	58		47		24	28				
<i>Tachyphonus luctuosus</i>								48	42				
<i>Tachyphonus rufus</i>													X
<i>Tachyphonus phoenicius</i>	X	110								92			
<i>Lanio versicolor</i>			34		11	47		157					
<i>Ramphocelus carbo</i>	X		77	87			267	X		276	X	X	X
<i>Thraupis episcopus</i>			34		22		89	X		92	X	X	X
<i>Thraupis palmarum</i>	X		86	304			178	X	113	92	X	X	X
<i>Tangara mexicana</i>	X				11	94			85				
<i>Tangara chilensis</i>			26		44	70			28				
<i>Tangara punctata</i>	X		137	174		70							
<i>Tangara gyrola</i>	X		86				89						

habitats such as some campinaranas. The very distinctive morphology, allopatric distribution and complete lack of contact zones with other closely related taxa suggest *A. [p.] paraensis* should be considered a full species either under the biological or the phylogenetical concepts.

Guarouba guarouba. On 17 May a flock of 18 birds was seen by the highway in a pasture with many dead Brazil nut trees 239 km north of Novo Progresso. The birds flew over the road and perched in a flooded açai palm grove by it. In the Tapajós-Xingú interfluvium this species has been recorded only in terra firme and várzea forests north of the Jamanxim-Tapajós confluence (Oren and Novaes 1986), although a single record from Alta Floresta (northern Mato Grosso) suggests that it may occur farther south, perhaps between the Tapajós and middle and lower Jamanxim (Lo 1995).

Pionopsitta aurantiocephala. This recently described taxon is known from five localities along the southern part of the Tapajós basin and some of its right-bank tributaries (Cururu-açu and Cururu-ri rivers) to Itaituba, with records at Lago do Batista, on the left bank of the Amazonas river downstream the mouth of the Madeira river (Gaban-Lima *et al.* 2002). We recorded this species twice at Cachoeiras do Curuá. On the afternoon of 8 May two birds flew overhead the forest fringing the Curuá river near the hostel built by the waterfalls giving the place its name. Then, on 11 May, also during the late afternoon, three birds were seen flying over an airstrip nearby. The yellow-orange heads were quite obvious in both occasions and the calls sounded different from the ones of *P. vulturina* recorded near Trairão.

Pyrrhura perlata. Formerly known as *P. rhodogaster* and considered endemic to the Madeira-Tapajós interfluvium (Cracraft 1985), the Jamanxim river has long been known as the eastern limit of its distribution (Forshaw 1977). We found this conure in logged forest at Consórcio Jamanxim, on the left bank of the Jamanxim, and in less disturbed forest (but already being logged) at Vicinal Progresso, more than 30 km inland from the east bank of the Jamanxim. Thus, the distribution of this species ranges further east. The related *Pyrrhura lepida anerythra* apparently does not occur west of the Xingu river (Sick 1997), and it is uncertain what taxon of the *perlata/lepida* group occurs between the lower Tapajós and Xingu rivers.

Amazona kawalli. Described only in 1989, this parrot is known from only a handful of widely dispersed localities (Martuscelli and Yamashita 1997). A group of five birds was observed flying over dense forest at Vicinal Progresso on 16 May. Ours records represent the new eastern limit of this poorly known species.

Lepidotrix vilasboasi. One adult male was sighted and mist-netted, and one probable female or sub-adult was sighted in very disturbed logged forest at Consórcio Jamanxim, Novo Progresso on 15 May (Olmos and Pacheco 2003). Formerly known only from five specimens (three males) collected at the Cururu-ri river, 200 km to the east of Novo Progresso, in 1957 (Sick 1959a, BirdLife International 2000). This rediscovery suggests the species ranges between the rivers Tapajós and Cururu-ri, and the lower-mid Jamanxim.

The site where the species was found by us is just south of one area already proposed to be transformed into a conservation unit: Rio Jamanxim (area BX 059 in Capobianco *et al.* 2001: 436). *Lepidotrix vilasboasi* is considered as globally "vulnerable" (BirdLife International 2004).

Topaza pella. The sole record of this species in the Tapajós-Xingu interfluvium was the one example of *T. p. smaragdula* from rio Tapacurazinho (04°18'S, 55°54'W, Hu *et al.*, 2000) until Henriques *et al.* (2003) found it uncommon at Tapajós National Forest on the basis of sight records. One individual was sighted and tape-recorded while singing in riparian forest at Vicinal Batata, near Trairão, on 20 May, the new southeastern limit of this specie's range.

Pharomachrus pavoninus. The distribution of this species was supposedly restricted to area west of the Tapajós (Sick 1997), although it has been found in northern Mato Grosso (Alta Floresta, Zimmer *et al.* 1997). One bird was tape-recorded and latter briefly watched at Vicinal Progresso on 16 May, a new eastern limit for this species. This species was not recorded from the Tapajós National Forest (Henriques *et al.* 2003)

Capito cf. niger. One *Capito* barbet showing blackish back, uniform yellowish belly, red on the head, whitish crown and wing-bards visible during flight was briefly observed in an open forest fragment near Trairão on 19 May. Those characteristics are similar to *Capito niger niger* from the left bank of the lower Amazon (Short and Horne 2001). Whether this record represents a range extension of *C. niger niger* or another species of barbet remains to be assessed.

Dichrozona cincta. A western Amazonian species known east of the Tapajós, only from near Santarém (type-locality of *D.c. zononota*, Pinto 1978), the headwaters of the Cururu river (Sick 1997), Tapajós National Forest (where collected, Henriques *et al.* 2003), left bank of the Caxiuana river (Silva and Pimentel-Neto 1997) and Kayapó Indian Territory (Aleixo *et al.* 2000). One bird was tape-recorded and observed at length after play-back in dense forest near Trairão, a new locality suggesting a broad range east of the Tapajós river.

Herpsilochmus sellowi. First recorded in Serra do Cachimbo by Pinto and Camargo (1957, as *H. pileatus*) based on a pair collected near the Brazilian Air Force base. We found this species in dense arboreal-arbustive campinarana growing on white sand c. 45 km south of Cachoeiras do Curuá, where it was fairly common. This habitat is made of low trees with many branches, having fairly open undergrowth and a dense litter ground cover, with many large, spongy lichens amid it. The voice and morphology of birds from Cachimbo seem identical to those of birds from northeastern Brasil (Whitney *et al.* 2000).

Pyriglena leuconota similis. The subspecies of *P. leuconota* are in need of a taxonomic review, as many are distinctive enough to be recognized as full species. *Pyriglena leuconota similis*, endemic to the Tapajós-Xingu interfluvium (Pinto 1978) is considered one of the most distinctive taxa in the group and is very different from taxa found in neighboring interfluvia (Ridgely and Tudor 1994). This taxon was fairly common in selectively logged forest at Consórcio Jamanxim, the only site we found it.

Rhegmatorhina gymnops. Endemic to the Tapajós-Xingu interfluvium, this species is found to the south in northern Mato Grosso up to the Teles Pires and Peixoto de Azevedo rivers (Novaes and Lima 1991, Zimmer *et al.* 1997). We found it only in dense forest east from Trairão. On 19 May a pair followed by a begging young attended a *Labidus praedator* army-ant swarm together with *Phlegopsis nigromaculata* (also

with young), *Hylophylax poecilinotus nigrigula*, *Dendrocincla fuliginosa*, and *D. merula*. The voices of *R. gymnops* and *P. nigromaculata* (probably also following a swarm) were also heard in 20 May. Further north it was found to be common in the Tapajós National Forest (Henriques *et al.* 2003).

Chamaeza nobilis fulvipectus. Widely distributed in western Amazônia south of the Amazon-Solimões (Ridgely and Tudor 1994), *Chamaeza nobilis* was previously known, in the Tapajós-Xingu interfluvium, only from a locality near the mouth of the Tapajós river (*C. n. fulvipectus*, Pinto 1978). Two birds in intense vocal activity were heard and tape-recorded in dense ombrophylous forest east of Trairão on 19 May. This record represents a significant range extension for this species.

Conservation

The region cut by the BR 163 road in Pará has a very rich bird community, with 406 species found during this inventory, including a significant number of rare or threatened species, and endemics restricted to the Tapajós-Xingu interfluvium. Most species are forest-dependent and need significant areas of habitat. An important component of the regional avifauna is made up of several species with isolated or differentiated populations in the Serra do Cachimbo complex, which justifies the concerns with the long-term conservation of that area (Capobianco *et al.*, 2001).

The ombrophylous forests found farther north, with a large number of species, are under intensive pressure from logging companies and the activity is carried wherever there is a road a truck can pass. Many bird taxa found in these empireled forests are poorly known, and at least the threatened *Guarouba guarouba* has its main range in the lower Tapajós area. As seen elsewhere in the Amazon, there is a clear relationship between deforestation and distance from the road (MMA 2001, Silveira *et al.* 2001, Laurance *et al.* 2001 and references therein). The consequence is that the deforested corridor along the road makes a route for open-habitat generalists which dominate the pastures and young second-growth found along most of the road.

Despite its importance, the region between the Tapajós and the Xingu rivers has not a single strictly protected area. The national forests and, especially, indian lands that cover a large chunk of the region, are no guarantee of its future conservation, since logging (an activity known to be adverse to forest birds and of dubious sustainability) is the main goal of the first, while, in practice, indian lands are of uncertain conservation value in the future, since unregulated logging, gold-mining and other harmful activities are commonplace (ECOPLAN 2003), and increasing human populations and the desire for the goods available from mainstream society raise the pressure to exploit natural resources.

The bad condition of BR 163 has until recently prevented a disaster similar to the one witnessed in Rondônia, where the paving of BR 364 in the 1980's and the resulting colonization has since resulted in the loss of about 30% in forest cover (government data on deforestation in the Amazon, including time series for each state, can be obtained at <http://www.obt.inpe.br/prodes>). Better than any fancy "sustainable-use" public policy, keeping areas very difficult to reach and living conditions extremely hard have been the most efficient factors in conserving tropical forests, and the BR 163 is an example.

The proposed paving of the road, mostly to allow the export of soybeans from Mato Grosso through the Santarém port (which could be achieved by building a more efficient and environmentally friendly railroad) is already resulting in yet another tale of environmental catastrophe as the announcement was made without effective conservation measures being implemented. In the wake of land speculators, colonists and sawmills flooding the region, habitat destruction has exploded and, as we finish this paper in December 2003, the Environment Ministry has announced deforestation in the central area of BR 163 went up 511% compared to 2003 (Angelo and Amorim 2004).

Under this scenario, it is expected that 30 years after the paving of BR 163 a 100 km belt along the road will be turned into anthropic habitats, and the remaining forests beyond will be heavily damaged by logging (see Laurance *et al.* 2001). Considering the general lack of government control in the region, where a "wild west" mentality prevails, and the unwillingness of successive federal administrations in both follow and impose the environmental legislation, the odds are that the Rondônia pattern will be repeated in southern Pará. An ambitious plan to avoid that by creating protected areas, land zoning, solving land-tenure issues and other activities is being developed by the federal government to avoid the foreseen catastrophe. Whether it will ever work (or even be implemented) remains to be seen but so far the results are not encouraging.

Capobianco *et al.* (2001) list several candidate sites for protected areas in the Tapajós-Xingu interfluvium, including the Serra do Cachimbo, where a military base is now the best guarantee of conservation. Another important site is near the Jamanxim river ("BX 059", see Capobianco *et al.* 2001, p. 436), agreeing with the general area where *Lepidothrix vilasboasi* was found (Olmos and Pacheco 2003). Considering likely differences in bird communities and in intraspecific genetic variation in different parts of the interfluvium, the areas currently occupied by Itaituba 1, Itaituba 2 and/or Altamira national forests should be turned into national parks or biological reserves, ensuring that those representative areas of forest habitat will be given a higher protected status.

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Post-script (20 June 2005): Data released by the Brazilian Environment Ministry in May 2005 show 26,130 km² of forest were destroyed in the Amazon in 2003-2004, the second worse year in history. Municipalities in our study area along the BR 163, Novo Progresso and Altamira, ranked second and third among the ones losing more forest in the period, with increases of 70% and 80%, respectively, in their cleared area compared to the previous period. As an answer, the federal government decreed the Nascentes da Serra do Cachimbo Biological Reserve (342,477 ha) between the BR 163 and the

Panará and Menkragnoti Indian Territories, an area visited by us. Previously, the federal government froze logging activities along the west belt of the BR 163 as part of a plan to curb illegal logging and deforestation. The results of these actions remain to be seen.

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