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Avifaunal transects across the open zones of northern Minas Gerais, Brazil

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RESUMO. **Censos de aves através das zonas abertas do norte de Minas Gerais.** O levantamento de aves de florestas da costa atlântica (Parque Estadual do Rio Doce) através da serra central aberta (serra do Cipó) e de zonas semiabertas de cerrado/caatinga (rio do Cipó/rio São Francisco) até as florestas decíduas de caatinga (Januária) no norte de Minas Gerais registrou 324 espécies em 1977-78. Há muitos casos de simpatria ou substituição de espécies congêneres ao longo desse transecto. Foi estudado o comportamento de várias espécies pouco conhecidas como *Scytalopus novacapitalis, Phyllomyias reiseri, Phylloscartes roquettei, Knipolegus franciscanus, Curaeus forbesi* e *Embernagra longicauda.* As espécies ou subespécies endêmicas ocorreram nos campos rupestres, na caatinga arbórea ou na caatinga. Quase todas as aves endêmicas são aparentadas às do sul ou dos Andes, provavelmente via conexões em épocas frias anteriores.

PALAVRAS-CHAVE: censos, aves, Minas Gerais, mata atlântica, mata de caatinga.

ABSTRACT. Censuses of birds from Atlantic coastal forests (Rio Doce State Park) across the open central serra (serra do Cipó) and semiopen cerrado/caatinga zones (rio do Cipó/rio São Francisco) to deciduous caatinga woodlands (Januária) in northern Minas Gerais registered 324 species in 1977-78. There are many cases of replacements or sympatry of congeneric species along the transect. We studied behavior of several little-known species, notably *Scytalopus novacapitalis, Phyllomyias reiseri, Phylloscartes roquettei, Knipolegus franciscanus, Curaeus forbesi,* and *Embernagra longicauda.* Endemic species or subspecies occur in upland "campos rupestres," in "caatinga arboreal" or deciduous woodland and in "caatinga" desert scrub. Nearly all endemics are related to birds off to the south or in the Andes, probably via connections in previous colder epochs.

KEY WORDS: censuses, birds, Minas Gerais, Atlantic forest, caatinga forest.

Forests of southeastern Brazil are not connected to Amazonian ones, being separated by what Vanzolini (1974) calls the "diagonal of open formations," which crosses southwestward between the two forest zones. This diagonal is formed by semidesert "caatingas" ("caa"=leaf, "tinga"=pale, referring to pale foliage) to the northeast and "cerrado" or closed bushy savannas to the southwest. It is often 1000-1500 km wide, but is narrowed in two regions: just west of Brasília by the "Mato Grosso de Goiás", a peninsula northward from southeastern forests of the Paraná drainage, and east of Brasília by deciduous "caatinga forests" that extend southward from Maranhão to the central São Francisco drainage in northern Minas Gerais (Silva 1989).

North through Minas Gerais, a central mountain range with various sections (serras da Mantiqueira, Caraça, Cipó, Espinhaço) separates the mostly open São Francisco valley from such forested coastal rivers as the Doce and Jequitinhonha (figure 1). Southward, where cool and high, eastern forests spill over into the headwaters of the São Francisco. Northward, where hot and dry, western open zones spread east to the coastal mountains of Bahia, and caatinga forests of the north push southeast across the open zones.

Birds of the southeastern forest to open transition and of the nearby transition from open zones to caatinga forest have been studied little. In southern Bahia, coastal forest grades into inland caatinga via a low forest known as "mata de cipó" (liana forest) because of its twisted lianas. One bird of this forest (*Rhopornis ardesiaca,* the Slender Antbird) was known from only three specimens before we studied its behavior (Willis and Oniki 1981). In northern Minas Gerais, other birds have been known from a few specimens: the Buff-throated Pampa-Finch (*Embernagra longicauda*) of the central serra and the Minas Gerais Tyrannulet (*Phylloscartes roquettei*) of the São

Francisco River valley, for instance. Here we report on avifaunal transects across the forest to open border on the central serra do Cipó of Minas Gerais, and thence to dry forests on the central São Francisco River just northwest. Field studies were conducted in 1977 and 1978.

METHODS AND HABITATS STUDIED

Methods. We studied birds with binoculars, captured some in mist nets, and recorded some with a Uher 4000-Report S tape recorder. Cloacal temperatures of captured birds were taken with a Schultheis thermometer and weights with Pesola scale (Oniki 1980). Ectoparasites collected will be reported elsewhere.

Habitats studied. 1. Rio Doce State Park (Parque Estadual do rio Doce) — The tall forests of eastern Minas Gerais have mostly been cut. Even in the Parque Estadual do rio Doce, between the Piracicaba and Doce Rivers, large areas were burned in 1967. a) Burned and unburned sections of tall second growth, tall grass, marsh and lake near the headquarters were checked (6.6 h of field time) 30 July to 1 August 1977; b) unburned sections with tall forests, mainly along the main road leading to Ponte Queimada near 19° 43' S and 42° 35' W, were visited 1 August for 10.7 h. (latitudes and longitudes are based on the Carta do Brasil ao Milionésimo of the Instituto Brasileiro de Geografia e Estatística).

2. Conceição do Mato Dentro — a) Close to Conceição do Mato Dentro, we looked at birds of bushy pastures and a farm yard on the road Belo Horizonte/Conceição, Km 175, representing a human-created opening in the forest zone, on 24 July for 1.5 h. b) Patches of forests, and scattered palms remaining from them, climb the eastern and northern slopes of the serra do Cipó. We studied forest birds (9 h afield) in patchy second growth and a wooded valley at 800 m elevation at 19° 03' S and 43° 22' W, 5 km S of the town of Conceição do Mato Dentro, 24-25 July.

On rocky slopes near the Conceição study site, the forest drops to dry woodlands, bushy scrub, and weedy zones in isolated "campinas" (the term refers to any open vegetation within a forest area, and is used for other types of vegetation elsewhere in Brazil.)

3. Alto do Palácio — Most of the top of the serra do Cipó is an open high-elevation prairie or "campo rupestre",

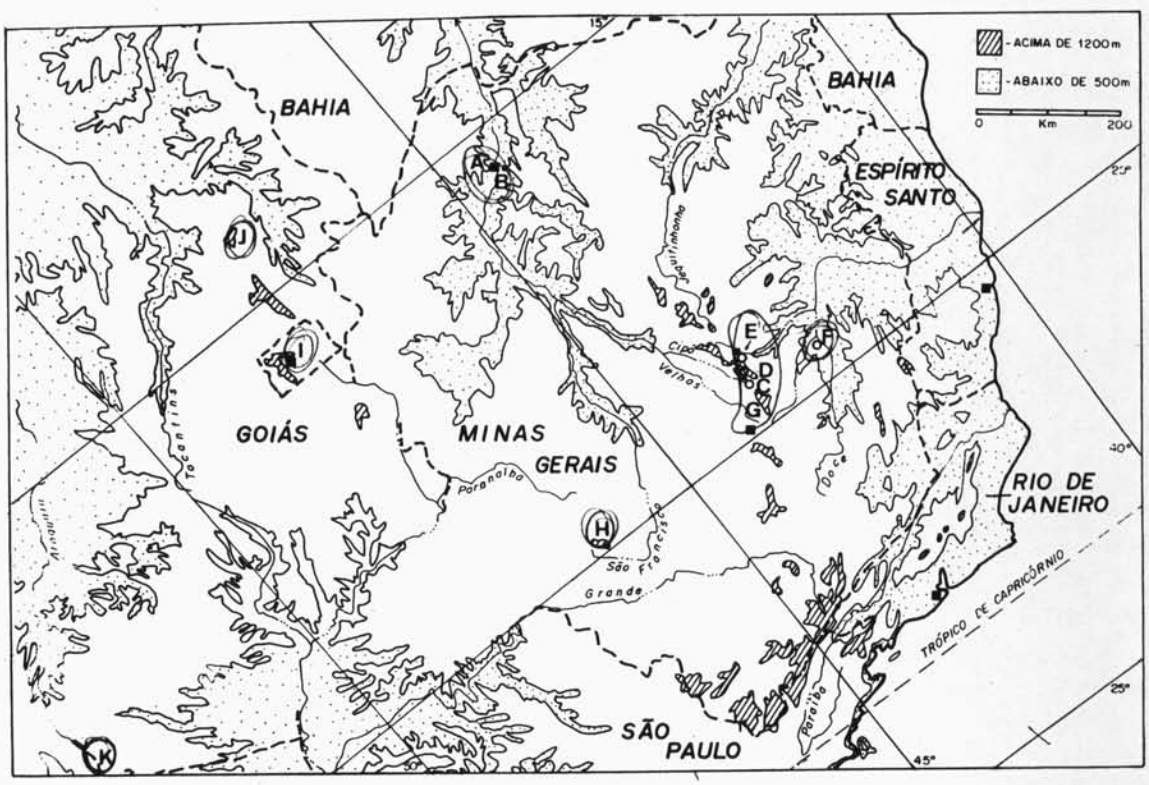

Figure 1. Study localities: (A) Januária W (Brejo do Amparo); (B) Januária E; (C) rio do Cipó woodlot and cerrados; (D) serra do Cipó (Alto do Palácio to Chapéu do Sol); (E) Km 175 near Conceição do Mato Dentro; (F) Rio Doce State Park. The last two locations and eastern lowlands are mainly humid forest, the uplands of the serras do Cipó, Caraça (G), and Canastra (H) a mixture of campos rupestres and evergreen gallery woodlands, while localities A to C (like the São Francisco lowlands) are a mixture of cerrados and deciduous gallery or escarpment woodlands. Upland campos recur in cerrado zones high on the wide divides northwest to the Tocantins drainage, where there are more escarpment deciduous woodlands at the edge of Amazon forests (near (I) Brasília, and (J) Chapada dos Veadeiros, for example); (K) Emas National Park.

with moist seeps and narrow gallery woodlands. a) The prairie was checked near the Palácio pass (2.7 h afield) on 27 July. b) Birds of the upland extreme of the Atlantic forest were studied 27 July (3.5 h afield) in a woodlot at 1350 m elevation on the Alto do Palácio at 19° 14' S and 43° 29' W, near the fork of the Conceição Road.

4. Chapéu do Sol — Southwestward at slightly lower elevations (1000-1200 m, Km 96-100), outcrops of metamorphic rocks mark a zone of bushy plains and Velloziaceae scrub, checked 26-27 July (8.0 h afield).

5. Rio do Cipó — a) Most of the plains are covered with cerrados and narrow gallery woodlands, checked 29 July (4. 4 h afield) at 19° 25' S and 43° 39' W near Km 80.

Similar cerrados were widespread from the Cipó River west and north, judging from vegetation along roads from Sete Lagoas past Curvelo to Montes Claros in 1978. On rocky hills or mountains, there were deciduous woodlands of low stature; in a few valleys, such as 10 km north of the road junction to Curvelo, there were remanescent patches of evergreen gallery forests. Truck after truck rolled southward piled high with charcoal (we counted over 150 in 8 hours of travel), showing why even bushes are sparse in many areas. Agriculture was poverty-stricken and local, except for a large government-financed sugar cane project along the Jequitai River. Cerrados at times became a dense tall scrub or cerrado-caatinga mixture, particularly on slopes beyond Montes Claros. b) On the inland escarpment, which drops from 1000 m to plains at 850 m elevation, there are a few patches of deciduous scrub, but most of the original woodland at the foot of the serra has been destroyed. The rio do Cipó at Km 87 from Belo Horizonte may once have had woodlands along it; a remaining woodland patch at Km 88 or 19° 21' S and 43° 37' W is crowded with lianas and has a continuous canopy (checked 26 and 28-29 July for 6.1 h afield).

6. Januária E — Along both sides of the São Francisco near Januária, the cerrados are broken by dry deciduous forests or "arboreal caatingas" where calcareous escarpments drop from cerrados at 600 m to the river basin at 500 m elevation. Cactus and bottle-trunked trees give this deciduous forest an unusual appearance, though to some extent it is like slope forests higher on the serra do Cipó. In back ravines and in a few places where it has survived on the plains, it forms an open-understory forest 20-25 m tall, reminding one of an eastern North American winter forest or of forests in southern Maranhão, and along streams it must once have been a partly evergreen woodland. However, most stream regions, such as near Brejo do Amparo at 7 km NW of Januária, have long been in cane or other cultivation, and evergreen trees or even early-leafing ones are rare.

A patch of valley dry forest and the nearby caatinga-cerrado mixture was studied 10 to 12 September (18.1 h afield) below the escarpment east of the river (at 15° 43' S and 44° 22' W, 3 km E of Km 137 on the Montes Claros-Januária Road.)

7. Januária W — We studied the São Francisco escarpment "dry forest" and bordering cerradòs at and below 15° 25' S and 44° 26' W along the upper valley of a permanent stream NW of Brejo do Amparo, 6 to 9 September (27.1 h afield). Another extensive dry woodland, not checked, was at Km 11 on the road west to Pandeiros.

8. Januária S — The original vegetation of the wide plain of the São Francisco between the escarpments is uncertain. Cerrados occur east of the river on sandy soils; but much of the region is a bushy thorn-scrub or caatinga with much human influence (studied 6 September for 2.4 h at Km 157, 6 km from Januária).

RESULTS

We observed 324 species in the transect (table 1). Numbers are of birds per day.

The richest avifauna was that of the Doce lowland forest, 140 species at our visit. We saw 22 other species of water birds. Pinto (1938, 1944) records additional species. Near Conceição, the avifauna was still diverse (105 species), but a number of southern plateau or upland birds made visitors from the south feel at home. In both areas, clearings and natural openings increased diversity considerably.

In the isolated woodland atop the Alto do Palácio, only 27 species were present. Several were southern highland birds (*e. g. Leucochloris albicollis, Cranioleuca pallida, Knipolegus nigerrimus, Muscipipra vetula, Pipraeidea melanonota*). The open plains and isolated gallery woodlands nearby had 19 species, some of them southern highland birds (*Anthus hellmayri*). It must be remembered that we visited in midwinter, and summer avifaunas may be larger. In the vellozia zone, 1200 to 1000 m elevation, there were 58 species despite lack of woodlands (other than scrubby ravines and a few eucalyptus plantations). In the woodlot at the Cipó River, 800 m elevation, we recorded 55 species, and in the cerrados and thin gallery woodlands beyond the river there were 64 species (10 of them strictly birds of gallery woodlands).

In cerrados beyond Januária, 56 species were noted. Escarpment woodlands had about twice as many species there, 100 east of the river and 123 westward (the last total includes 11 species restricted to cerrado). The avifauna of scrubby caatinga along the river was rather diverse: 54 species in a brief visit one dawn. Other species must occur in any remaining woodlands. A number of northeastern caatinga birds extend southward along the river (*Sericossypha loricata, Paroaria dominicana,* etc.).

Woodlands along the Cipó River probably had many more species before humans entered, as the patch of forest studied was very small. The Palácio woodlot must also have had more species before humans cut parts of it, as is true for Conceição woodlands also. Cerrado, campo, and vellozia zones on the serra and nearby seemed less affected by grazing and other desultory human use.

Replacement species. Replacement of species by similar or congeneric ones was very common along the transects from the Doce to the São Francisco. Other replacements are likely, but were not verified (in part because human interference has eliminated many species, such as *Crax* curassows).

Noted in this study were 10 cases of replacements across the deciduous forest/cerrado boundary (the dry forest or caatinga species is listed first): *Nothura boraquira* by *N. maculosa, Buteo nitidus* by *B. albi-*

Table 1. Birds/day in the north of Minas Gerais in 1977-78.

Species	Doce		Conceição		Palácio		Chapéu	Cipó		Januária		
	a	b	a	b	a	b	Sol	a	b	E	W	S
Tinamus solitarius		6										
Crypturellus soui	1.5	3								4.3	0.5	4
noctivagus										13.3	6.8	5
parvirostris												
tataupa	2.5				(1)							1
Nothura minor												
maculosa											5	
boraquira												
Ardea cocoi	0.5											
Pilherodius pileatus		2										
Butorides striatus	0.5											2
Ajaia ajaja												
Coragyps atratus				6	4		3.5	5	15	0.1		
Cathartes aura	0.5			0.5	1		2.5	2	10	0.3	1.2	
Sarcoramphus papa		2		0.5						0.3		
Dendrocygna viduata	17.5									0.7		
Amazonetta brasiliensis	2											
Cairina moschata	5											
Accipiter sp.				1						0.3		
Ictinia plumbea										0.3		
Leptodon cayanensis	0.5	2										
Geranoaetus melanoleucus							0.5					
Buteo magnirostris		5						2	4	2.3	4	3
albicaudatus					1							
nitidus											0.5	
Herpetotheres cachinnans		2	1							0.7	0.2	
Caracara plancus	0.5		1								0.5	2
Milvago chimachima	0.5	3		2	1		1	3		0.3	1.8	2
Falco sparverius			1				0.5					
femoralis							1					
Ortalis guttata				1								
Penelope sp.		10										
Odontophorus capueira		8										
Cariama cristata											2.5	
Aramides saracura	2	30										
Rallus nigricans	2.5					2						
Porzana albicollis	0.5					2					0.2	

Table 1 (continued)

Species	Doce		Conceição		Palácio		Chapéu	Cipó		Januária		
	a	b	a	b	a	b	Sol	a	b	E	W	S
Laterallus sp.	1.5					1						
Porphyrula martinica	3											
Gallinula chloropus	2.5											
Jacana jacana	1											
Vanellus chilensis	1.5											2
Sterna simplex												1
Brotogeris chiriri											8	
viridissimus								2	2			
Aratinga aurea							12.5	6	4		3	
pertinax										30	15	5
leucophthalmus		2										
auricapilla	1	10										
Ara maracana	6	25										
Forpus crassirostris	7.5	10	5.5				6	4	2		1.2	15
Pionus maximiliani	3	20						4		2	4	
Pyrrhura cruentata		20										
leucotis		30										
Amazona aestiva	1										2.5	
farinosa		6										
Columba plumbea				1								
picazuro									1		1.5	4
cayennensis	6	4										
Geotrygon montana		2										
Leptotila verreauxi	15	10		4.5			1		3	5	14.8	2
rufaxilla	1											
Columbina picui											10.8	20
talpacoti	16	10					1.5		6		4.5	
squammata		2								2.3	13.8	10
Piaya cayana	2.5	5		0.5			0.5	2	2	2.7	4	
Tapera naevia	0.5							3		2.3	4	5
Dromococcyx phasianellus										0.7		
Crotophaga ani	4	3	2.5		10				10		12.8	10
Guira guira									1	0.3	0.8	2
Nyctibius griseus										0.7		
Lurocalis semitorquatus										0.7		
Nyctidromus albicollis	5									2.3	1.5	

Table 1 (continued)

Species	Doce		Conceição		Palácio		Chapéu	Cipó		Januária		
	a	b	a	b	a	b	Sol	a	b	E	W	S
Caprimulgus rufus longirostris				0.5			1			0.7		
Hydropsalis brasiliana	3.5											
Otus choliba (species)	2.5									2.7	0.8	
Glaucidium brasilianum	1	2								3.3	4	
Athene cunicularia	1.5				1		1					
Chaetura cinereiventris		15										
Streptoprocne sp.							7.5				30	
Phaethornis pretrei idaliae		1		0.5			1.5		1			
Amazilia lactea fimbriata		2		4						0.3	2.2	6
Thalurania sp.				1					2			
Chlorostilbon aureoventris	1.5	2		3			3.5		2	0.7	0.2	
Augastes scutatus							(1.5)					
Eupetomena macroura	1.5		2	0.5			3.5	4				
Leucochloris albicollis						1						
Colibri serrirostris				5.5	5		12.5	4	4			
Heliomaster longirostris										0.7		5
Aphantochroa cirrhochloris				1								
Calliphlox amethystina							0.5					
Trogon viridis surrucura		10		1							1.8	
Baryphthengus ruficapillus		10										
Chloroceryle americana amazona	0.5	1										
Bucco chacuru maculatus								2	10	11.2	5	
Malacoptila striata	0.5											
Chelidoptera tenebrosa		2										
Galbula ruficauda	0.5									4	0.5	
Ramphastos vitellinus		15										
Pteroglossus aracari		8										
Picumnus albosquamatus cirratus	1.5	4	0.5		1				4		0.2	

Table 1 (continued)

Species	Doce		Conceição		Palácio		Chapéu Sol	Cipó		Januária		
	a	b	a	b	a	b		a	b	E	W	S
Colaptes campestris melanochloros	1.5	6	1	0.5	4		3.5	1	4		0.2	
Piculus chrysochloros									1	3.7	6.8	
Melanerpes flavifrons		10								0.3	0.5	
candidus					2		2.5					
Celeus flavescens		2								0.7	0.2	
Veniliornis passerinus									4	2.3		
(species)				0.5		1						
Campephilus robustus melanoleucus	1.5	4										
Dryocopus lineatus	1.5	3								1	0.2	
Sittasomus griseicapillus	0.5	4		4.5						0.7		
Lepidocolaptes squamatus		1								6	1	
angustirostris										7.7	6.5	
Xiphocolaptes sp.							0.5		1	0.7	4.5	3
Dendrocolaptes platyrostris		1								1		
Campylorhamphus falcularius				1						1.3	2.8	1
trochilirostris												
Furnarius rufus	5.5		1				4	8	4	0.7		
leucopus										1.3	8	10
Schoeniophylax phryganophila										2.7	7	2
Synallaxis spixi	0.5		2	2		4	3		2			3
cinerascens				2								
frontalis								1	1	4	1.5	6
albescens			1									
ruficapilla						1						
Poecilurus scutatus										4		
Phacellodomus rufifrons	5.5		2			2	2	10	4		10.8	10
Philydor lichtensteini		1										
Automolus leucophthalmus		1						1				
rectirostris								(3)				
Pseudoseisura cristata												
Certhiaxis cinnamomea	4											1
Cranioleuca pallida						3						
Xenops rutilans		1		1								
Lochmias nematura				0.5						0.3	0.2	
Scytalopus novacapitalis					(1)							

Table 1 (continued)

Species	Doce a	Doce b	Conceição a	Conceição b	Palácio a	Palácio b	Chapéu Sol	Cipó a	Cipó b	Januária E	Januária W	Januária S
Melanopareia torquata								(1)				
Mackenziaena severa				2.5						0.3	1.8	
Taraba major										2.3	4.5	2
Thamnophilus doliatus palliatus	5	6										
torquatus			(1)							15	7.8	
punctatus	1	4										
caerulescens				4.5		6	3	8	6			
Myrmotherula axillaris		6								4.7		
Myrmorchilus strigilatus									2			
Formicivora serrana melanogaster				3.5						6	2	
Herpsilochmus pileatus rufimarginatus		15		3.5				6	6	11.7	6	
Terenura maculata		6										
Drymophila ferruginea ochropyga				2								
Pyriglena leucoptera				6.5								
Myrmeciza loricata				10								
Chamaeza sp.				0.5								
Conopophaga lineata				1					3			
Phyllomyias fasciatus	1		3	2		10	0.5	2	3	4.3	5.8	5
reiseri										(9.3)		
Phylloscartes roquettei										3.3	0.5	
Capsiempis flaveola	1	4										
Camptostoma obsoletum				3.5		2	3	2	2	2.7	4	
Polystictus superciliaris			(1)				(3)					
Xolmis velata							2	1				
cinerea					2		0.5	1				
Gubernetes yetapa	2											
Knipolegus lophotes			4.5				4	10				
nigerrimus						1						
aterrimus											(1.8)	
cyanirostris	0.5							2	4		1.5	
Hirundinea ferruginea				2.5				5	2			
Elaenia cristata							3.5					
flavogaster	1.5	2	1				2	2				

Table 1 (continued)

Species	Doce		Conceição		Palácio		Chapéu	Cipó		Januária		
	a	b	a	b	a	b	Sol	a	b	E	W	S
obscura	0.5			10.5			0.5					
Platyrinchus mystaceus				0.5								
Todirostrum cinereum											1	2
poliocephalum	2	2		3								
plumbeiceps				1		2						
Hemitriccus diops				3.5								
nidipendulus				1								
margaritaceiventer										3.7	6.8	6
striaticollis											0.2	
Tolmomyias sulphurescens		5		4				2	4	4.7	2.5	
flaviventris										2.7	5	
Myiornis auricularis		2							1			
Myiopagis caniceps	1.5	10								5.7	2.5	
viridicata											0.2	
Myiobius atricaudus			0.5							0.5		
Myiophobus fasciatus	3	2		2		1	1					
Phaeomyias murina											0.2	
Corythopis delalandi		1										
Contopus cinereus				1.5				1	3	7.7	2.5	1
Lathrotriccus euleri	3.5	10		1.5				2	2	5.3	0.4	
Cnemotriccus fuscatus	1								4	0.3	0.5	
Leptopogon amaurocephalus		1		2					4		1	
Mionectes rufiventris				1.5								
Satrapa icterophrys	1						0.5					
Suiriri affinis											2	
Muscipipra vetula						1						
Arundinicola leucocephala	1.5											
Fluvicola nengeta	0.5											
Colonia colonus	1.5	2		4								
Tityra cayana		3								3.3	2.2	
inquisitor										0.7		
Attila rufus	0.5	2		1								
Pachyramphus marginatus		4										
polychopterus											0.2	
validus		1										
viridis										0.3	0.2	
castaneus				1								

Table 1 (continued)

Species	Doce		Conceição		Palácio		Chapéu Sol	Cipó		Januária		
	a	b	a	b	a	b		a	b	E	W	S
Myiarchus ferox	1.5	4		2.5		3	1.5		1		0.4	
swainsoni											1	
tyrannulus								2		5.3	13.2	5
Casiornis fusca										6	2	
Sirystes sibilator		10								10	6.5	
Rhytipterna simplex		4										
Machetornis rixosus									1			6
Empidonomus varius										0.3		
aurantioatrocristatus											4.2	
Myiodynastes maculatus										5.3	0.5	
Myiozetetes similis	6	8							1	2.3	5	
cayanensis	1											
Megarynchus pitangua	1	15		0.5						3	8	
Pitangus sulphuratus	7.5	5			2		2.5	1	4	3	9	6
Tyrannus melancholicus	2									2	9.2	6
savana											0.2	
Schiffornis virescens				3.5								
Manacus manacus	0.5	5		3								
Chiroxiphia caudata				2								
Ilicura militaris				4.5								
Pyroderus scutatus		1										
Progne chalybea	5											10
Phaeoprogne tapera	1											
Tachycineta albiventer	2.5											
Stelgidopteryx ruficollis	10	15					5	5			1.2	
Alopochelidon fucata					8		2					
Notiochelidon cyanoleuca	1		3	4.5	3			6				
Cyanocorax cristatellus								(5)	(5)		(12)	
cyanopogon										5.3	12.5	6
Thryothorus genibarbis	10	6										
longirostris											0.2	
Troglodytes aedon	4.5	4	1	2			3	3	2	7.3	7.5	3
Donacobius atricapillus	2	4									1.2	
Mimus saturninus	9		3.5		4		6	6	4		6	10
Turdus rufiventris	5	20		5		4			0.3	1		
amaurochalinus	2.5			0.5						5	1.2	
leucomelas			0.5	5.5			6	3	5	4.3	6.5	1
albicollis										3.3	0.2	

Table 1 (continued)

Species	Doce		Conceição		Palácio		Chapéu	Cipó		Januária		
	a	b	a	b	a	b	Sol	a	b	E	W	S
Anthus hellmayri					1							
Polioptila plumbea										3		1
Hylophilus sp.				4								
Vireo olivaceus		10										
Cyclarhis gujanensis	3	2		4		6	2	4	5	5.3	8	5
Parula pitiayumi									1	8	1	
Basileuterus flaveolus								2	10	0.3	2.5	
hypoleucus				1			3	4			0.5	
culicivorus				10		6					2.5	
Geothlypis aequinoctialis			2			6		3			1.5	
Molothrus badius												15
bonariensis								8		2	7.5	15
Psomocolax oryzivorus		1										
Pseudoleistes guirahuro						8						
Cacicus haemorrhous	5.5	40										
Gnorimopsar chopi			6.5				11	6	10	8.3	37.5	20
Curaeus forbesi	1.5										0.2	
Agelaius cyanopus	4											
Icterus icterus										2	9.2	10
cayanensis											0.4	
Coereba flaveola	2.5	3	4.5			3					0.2	
Conirostrum speciosum	4	12								7.7	3	
Dacnis cayana	2	4	5									
Tersina viridis								4	10			
Euphonia pectoralis		2										
chlorotica		2		0.5		1		1	1	0.3	4.5	2
xanthogaster		2										
Thraupis sayaca	6	6	7.5	3		4	3.5	4	3	3.7	10.8	10
Pipraeidea melanonota						1						
Tangara cayana	2			2.5			4		4		1.5	
seledon		15										
cyanoventris				9								
Schistochlamys ruficapillus	1		3	3.5		1	2	3				
Hemithraupis guira										7.3	4.5	
flavicollis		20										
ruficapillus				2.5				2				

Table 1 (continued)

Species	Doce a	Doce b	Conceição a	Conceição b	Palácio a	Palácio b	Chapéu Sol	Cipó a	Cipó b	Januária E	Januária W	Januária S
Ramphocelus carbo	5	15										
Tachyphonus sp.	0.5											
cristatus		10										
Trichothraupis melanops				3								
penicillata									4			
Sericossypha loricata										0.7		
Nemosia pileata	1								1	4.7	2	
× *Neothraupis fasciata*								(10)				
Cissopis leveriana	0.5	2										
Saltator maximus	1.5	10										
similis		1	22.5			2		1	2			
× *atricollis*							(1)		(1)			
Volatinia jacarina	15										4	6
Sporophila nigricollis	2.5									1	0.5	
caerulescens	1		0.5	0.5		2	5	1				
collaris	0.5										0,5	
leucoptera												
Passerina brissoni	1			0.5			0.5					20
Paroaria dominicana								(4)				
× *Porphyrospiza caerulescens*									2			
Coryphospingus pileatus	4.5	2		1				15				
Sicalis citrina												
flaveola	3.5											
Arremon taciturnus				0.5								
flavirostris									2			
Emberizoides herbicola	3		1		4			6				
Myospiza humeralis			0.5	0.5	10		1	8				
Zonotrichia capensis	3		5	7.5		15	12.5		5	0.7	0.5	
× *Embernagra longicauda*				(2.5)			(2.5)					
Passer domesticus												30
Days	2	1	2	2	1	1	2	1	1	3	4	1
Species	110	101	31	85	18	32	57	59	63	97	121	54

caudatus, Falco sparverius by *F. femoralis, Aratinga cactorum* by *A. aurea, Nystalus maculatus* by *N. chacuru, Colaptes melanochloros* by *C. campestris, Lepidocolaptes squamatus* by *L. angustirostris, Eurnarius leucopus* by *F. rufus, Knipolegus franciscanus* by *K. lophotes* and *Cyanocorax cyanopogon* by *C. cristatellus.*

Wet (edges of the "brejo" or valleys of permanent streams, now mostly in sugar cane) and dry parts of woodlands west of Januária were occupied by *Basileuterus culicivorus* and *B. hypoleucus,* respectively; they occasionally fought and must be interspecifically territorial. Other cases of replacement were up the moisture gradient closer to the Serra rather than near the dry forest boundary, including a change from *B. hypoleucus* back to *B. culicivorus* across the open vellozia zone (isolated *B. hypoleucus* also reappeared at dry-wooded edges of the campina at Conceição, where the main species was *B. culicivorus* in all moist woodlands.) Eight cases were in the gradient from deciduous woods to evergreen gallery woodlands between Januária and the rio Cipó: *Brotogeris chiriri* to *B. viridissimus, Amazilia fimbriata* to *A. lactea, Picumnus albosquamatus* to *P. cirratus, Automolus (=Hylocryptus) rectirostris* to *A. leucophthalmus, Thamnophilus punctatus* to *T. caerulescens* (see below), *Formicivora melanogaster* to *F. serrana, Hemithraupis guira* to *H. ruficollis,* and *Saltador atricollis* (a cerrado bird) to *S. similis.* Three cases were on the open west slope of the Serra: *Caprimulgus parvulus* of cerrado to *C. longirostris* of the vellozia zone, *Knipolegus lophotes* to *K. nigerrimus,* and *Stelgidopteryx ruficollis* to *S. (=Alopochelidon) fucata.*

In 17 cases, the Serra open/forest boundary apparently divided replacement species: *Columba picazuro* from *C. plumbea, Aratinga aurea* from *A. auricapilla, Veniliornis passerinus* from *V. maculifrons, Campephilus melanoleucos* from *C. robustus, Xiphocolaptes* sp. from *X. albicollis, Lepidocolaptes angustirostris* back to *L. squamatus* (see above), *Campylorhamphus trochilirostris* from *C. falcularius, Synallaxis frontalis* from *S. ruficapillus, Herpsilochmus pileatus* from *H. rufimarginatus, Pachyramphus viridis* from *P. castaneus, Todirostrum cinereum* from *T. poliocephalum, Hemitriccus margaritaceiventer* from *H. nidipendulus, Thryothorus leucotis* from *T. longirostris, Basileuterus hypoleucus* from *B. culicivorus* (see above), *Trichothraupis (=Eucometis) penicillata* from *T. melanops, Sicalis citrina* from *S. flaveola,* and *Arremon flavirostris* from *A. taciturnus.* While this is a large number of replacements, it is not even the majority of cases in the transect, and some cases may later be shown to be westward if remanescent woodlands can be studied in the headwaters of the Cipó-São Francisco drainage. Some eastern species have been recorded westward and vice versa by earlier authors (Pinto 1938, 1944), notably *Pachyramphus viridis* eastward and *Trichothraupis melanops* and *Sicalis flaveola* westward. Many of the members of these pairs occur southward into São Paulo, and meet along deciduous/evergreen forest transitions well inland from the serra there. It seems likely that vegetation change rather than presence of the serra is the major factor in species replacements both in Minas Gerais and São Paulo.

Eight replacements occurred in evergreen forests between Conceição and the rio Doce: *Amazona aestiva* to *A. farinosa* from open to closed forests at the Doce itself, *Phaethornis pretrei* to *P. idaliae, Colaptes campestris* back to *C. melanochloros* (see above), *Thamnophilus caerulescens* back to *T. punctatus* (see above), *Pachyramphus castaneus* to *P. marginatus, Stelgidopteryx fucata* back to *S. ruficollis* (see above), *Tangara cyanoventris* to *T. seledon,* and *Saltator similis* (one bird at the Doce may have been wintering) to *S. maximus.* Often these changes are of upland to lowland forms, or of birds of partly closed to ones of partly open habitats. There were thus 46 cases of geographic replacement of species pairs.

Sympatric species. In addition to occasional overlap of some species pairs above (with interspecific territoriality likely in some cases), there were many congeners that occurred together. *Crypturellus soui* and *C. tataupa* were together at the Rio Doce. *Buteo magnirostris* of woodlands and edges overlapped with *B. albicaudatus* of open zones and *B. nitidus* of deciduous woodland. *Columbina talpacoti* was in wetter clearings in the Doce and Januária areas, *C. picui* in drier caatinga at Januária only. *Leptotila rufaxilla* was in forests at Doce, *L. verreauxi* in scrub to woodland everywhere. *Aratinga leucophthalmus* and *A. auricapillus, Pyrrhura cruentata* and *P. leucotis,* occurred together at the Doce as if these long-tailed parakeets have some way to avoid competitive exclusion principles.

Synallaxis spixi was in open campinas, *S. cinerascens* in bamboo tangles in the forest at Conceição. *Thamnophilus doliatus* in the Januária region and *T. palliatus* on the Doce take scrubby tangles and second growth while *T. punctatus* takes closed cover or woodlands in both areas. In the Conceição area, *T. torquatus* was in bushy pastures and *T. caerulescens* in closed woodlands. There, *Drymophila ferruginea* was in tangled woodlands and *D. ochropyga* low in bamboo tangles near it. *Tityra cayana* and *T. inquisitor* lived in treetops at Januária, as they do in many other regions, with no evident differences in niche. *Xolmis cinerea* and *X. velata* were often together in open zones west of the top of the serra, the former catching close to bushes and the latter more in open areas. *Empidonomus varius* of edges and *E. aurantioatrocristatus* of bushy cerrados at Januária over-

lapped even less in habitat. *Myiozetetes similis* of semi-open woodlands everywhere overlapped *M. cayanensis* only at marsh borders on the Doce. *Pitangus sulphuratus* of open zones overlapped extensively with possibly congeneric *Megarynchus pitangua* of the tops of more closed woodlands, as did *Myiarchus tyrannulus* of open scrub with *M. ferox* at woodland edges and with *M. swainsoni* of cerrados (and possibly treetops, as in summer southward). *Tolmomyias flaviventris* was common with widespread *T. sulphurescens* only at Januária, where the last species has a different voice and plumage (*T. s. pallescens*) than the nominate subspecies elsewhere on the transect (it may be a form of a different species). Both were in the deciduous forest understory there, with no obvious differences in niche. *Todirostrum plumbeiceps* was at tangle edges below *T. poliocephalum* and close to *Hemitriccus nidipendulus* at Conceição, a situation often seen off southward in São Paulo (where *T. cinereum* also occurs at more open edges). Habitats differ, but study is needed. *H. striaticolle* was only at the edge of wetter forest at Januária, *H. margaritaceiventer* in all dry scrub. *Elaenia flavogaster* of edges sometimes occurred with *E. cristata* of cerrados or with *E. obscura* (a wintering bird that favors bushy openings in forest zones). *Myiopagis caniceps* of the Doce and Januária was a treetop bird, *M. viridicata* a summering understory to midlevel one.

Progne (=Phaeoprogne) tapera was with *P. chalybea* in the Doce. *Turdus* thrushes overlapped widely, in part because of wintering movements. *Turdus rufiventris* tended to be a woodland bird, *T. leucomelas* to be a cerrado bird, and *T. amaurochalinus* to be intermediate, in the dry Januária region, *T. rufiventris* was partly replaced in woods by *T. amaurochalinus* and by the pale *T. albicollis* of northeastern Brazil. *Molothrus badius* was strictly in scrub by deciduous caatinga at Januária, while *M. bonariensis* was in green pastures there and on the Cipó. At Januária, *Icterus cayanensis* was in woodlands and *I. icterus* in more open areas. *Basileuterus flaveolus* hops on the ground and does not forage near the understory-fluttering other species of genus inland from the serra. *Euphonia xanthogaster* was in forest midlevels, *E. pectoralis* in treetops, and *E. chlorotica* at edges at the Doce; only the two last species were together at Conceição. *Tangara cayana* is a widespread edge and bushland species, and its two congeners are evergreen forest birds. *Tachyphonus* sp. was low in scrub, *T. cristatus* in forest treetops, at the Doce. The *Sporophila* species were together at weedy edges of the Doce airport, without evident foraging differences.

There were 30 cases of habitat differences between species pairs, 6 other cases of species foraging at different levels in the same habitat, and 11 cases where species seemed to forage similarly in similar habitats.

Family changes. Families of birds often showed changes like those between temperate and tropical zones as one moved from western deciduous to eastern evergreen forests (table 1). Hummingbirds (Trochilidae) were most diverse at intermediate elevations on either side of the serra, and less diverse in lowlands or atop the ridge. Large fruit-eating birds (Tinamidae, Columbidae, Cracidae, Phasianidae, Psittacidae, Trogonidae, Ramphastidae, Cotingidae) were most diverse in the lowlands and rare in the uplands. Some birds that eat fruit and insects (Pipridae, Tyrannidae, Turdidae, Icteridae, Thraupidae) were less restricted to lowlands, but generally were less diverse in very open zones atop the serra. The Pipridae were absent from Januária deciduous forests, but Turdidae diverse there as in North American deciduous forests. Raptors were also diverse in the dry forests, but those of humid forests may be difficult to see, as many are known from the Doce (Pinto 1938). Parrots and tinamous were fairly diverse in the dry forests, unlike northern deciduous woodlands. Cuculidae and Corvidae are lowland forms that were somewhat more diverse in open or deciduous woodlands than in evergreen forests east of the serra. Caprimulgidae showed the same pattern, probably because evergreen woodlands are too dark at night. Emberizidae were less diverse in dry forests than in eastern wet ones, but were quite diverse in cerrados.

Trunk-gleaning woodpeckers (Picidae) and woodcreepers (Dendrocolaptidae) were most diverse in the lowlands; both remained quite diverse in deciduous forests at Januária, where the woodcreepers gave the impression of humid forest. Three other neotropical families, the Furnariidae, Formicariidae, and Tyrannidae, were also diverse everywhere except in very open areas, and added to a humid forest appearance even in deciduous woodlands. All were less diverse in the highlands, but formed high proportions of the reduced avifaunas there. Tyrannidae, with 59 species in the transects, were the single most important family. 20-30 species occur together in lowland woodlands and edges, about half that number in bushy areas like cerrados and vellozia zones, and a quarter of that number in upland woods and plains.

Unusual species. Several little-known species were encountered in the transects. Here we give brief notes on our observations of them, of other species that are recorded far from previously known ranges, and of nesting records.

Speckled Chachalaca, *Ortalis guttata* — A pair observed at dry-forested campina edges near Conceição on the west side of the road at Km 175; previously recorded only in northern Minas Gerais.

Screech Owl, *Otus* sp. — The song at Januária was like that of *O. atricapillus* of southern Brazil, a long series of *"hu-hu-hu..."*. A bird seen in the day-

time there was either it or *O. choliba,* a bird with a different song heard only at the rio Doce. If *O. atricapillus,* it is recorded in the caatinga zone for the first time.

Hyacinth Visorbearer, *Augastes scutatus* — An endemic of the central serra of Minas Gerais and southern Bahia, this species was only in scattered bushes and vellozias of the vellozia zone at about 1000 m elevation. It was flycatching from tall shrubs and visiting low flowers, as noted by Sazima (1977).

Moustached Woodcreeper, *Xiphocolaptes falcirostris*? — At dawn east of Januária, a narrow-billed bird with strong white moustache stripe and lightly streaked crown was digging in a knothole 5 m up in the woodland. Several sang at dusk (recorded), descending whistles *"cochio, cochio, cochio, cochio, cochio"*, like that of *X. albicollis* at Conceição and southward. Silva (1989) indicates that *X. franciscanus* is a synonym of *X. falcirostris.*

Scaled Woodcreeper, *Lepidocolaptes squamatus* — Common on trunks and upper limbs in woodlands and cerrado edges both east and west of Januária, often joining bird flocks. This is the spot-crowned subspecies *L. s. wagleri,* previously known from Piaui. The Doce and southern Brazilian subspecies live in evergreen forests, often wet montane ones. The call note is a *"pri-i-iu"* similar to that of *L. s. squamatus* or *L. albolineatus.*

Rufous-capped Spinetail, *Synallaxis ruficapilla,* Gray-bellied Spinetail, *Synallaxis cinerascens,* Pallid Spinetail, *Cranioleuca pallida* — Some species of southeastern Brazil occur well north in the serra do Cipó.

Pale-legged Hornero, *Furnarius leucopus* — Common at Januária, even in woodlands, while *F. rufus* tended to be in more open areas. Not recorded by Meyer de Schauensee (1970) from Minas Gerais, but common just northward in Bahia. Registered without specified locality from Minas Gerais (Sick 1985).

Chestnut-capped Foliage-Gleaner, *Automolus rectirostris* — a chicken-like cackling, at times resembling that of a blackbird, came from three birds low in a line of gallery scrub in the cerrados west of the rio Cipó. They clambered over low branches much like *A. leucophthalmus,* which was noted in denser woodlands farther up the same ravine.

Stripe-backed Antbird, *Myrmorchilus strigilatus* — The loud, long *"seeeeeeeeeee"* whistles of these antbirds were everywhere in dense thorn scrub east of Januária, but not in woodlands. They forage near or on the ground. Registered from Almenara (Sick 1985).

Serra Antbird, *Formicivora serrana* — Pairs hopped low in dense second growth and the bushy edges of campinas at Conceição, and inside the woodland at Km 88; they behave much like others of the genus (except for *F. iheringi,* which forages 2-10 m up). As in *F. melanogaster* and *F. grisea,* the song is a series of slow clucking *"tuk"* whistles. Calls included a loud *"tew tew,"* a jacamarlike *"peeyuk,"* and nuthatchlike faint *"storr stun stun stunt"* series.

Brasilia Tapaculo, *Scytalopus novacapitalis* — In a patch of dense gallery scrub along a stream from the upland plains near the Alto do Palácio, a loud *"chip chip chip chip chip chip"* at 5 notes/second rising in volume led Willis to a tame dark bluish gray bird, paler on the throat and center underparts, with dark bars and brown on the flanks, pale legs and rusty undertail and rump. Song was not heard. We and others have found it in similar habitat in the serra de Canastra (figure 1H) in western Minas Gerais (Vielliard 1990a).

Reiser's Tyrannulet, *Phyllomyias reiseri* — Common and singing in leafless forests east of Januária, where it occurs from the undergrowth to the canopy, in general 2-10 m from the ground. The song is a rough downscale *"briu-briu-briu-briu-briu-briu-briu"*. We did not register any song like that of *P. virescens* in São Paulo State.

Minas Gerais Tyrannulet, *Phylloscartes roquettei* — Known only from the type specimen from Brejo Januária, it was rediscovered in dry forests on both sides of the São Francisco. During our visit, most of the trees were leafless, and the species was almost always in pairs in the few green trees and bushes between 10 to 20 m from the ground. Sometimes it descended to the green cotton bushes (*Gossypium* sp.) of a plantation, always looking for insects next to the green leaves. Hopping constantly, it often raised the tail above the horizontal or raised the wings slightly as it danced about, sallying short distances for insects. In some cases it joined mixed flocks. In the field, it seems golden rather than reddish on the head. Pairs call a sharp *"peep"* back and forth; we also recorded a fast twittery song (figure 2).

Streak-breasted Pygmy-Tyrant, *Hemitriccus striaticollis* — Registered low in the dry forests at Januária.

Yellow-olive Flycatcher, *Tolmomyias sulphurescens* — The form *T. s. pallescens* of the interior, later found at Paulo de Faria (SP), on the Transpantaneira Road (MT) and in Brasília, has a whistled call *"seest"* quite different from *T. s. sulphurescens* of the southeast (including the localities from the rio Doce to rio do Cipó in this work). Possibly it is a different species. Building a nest 11 September 1978, 4 m at the tip of a branch over a dry stream, east of Januária.

Tropical Pewee, *Contopus cinereus* — Building a nest 11 m from the ground, on a thin horizontal fork, in the forest east of Januária on 11 September 1978.

Gray-backed Tachuri, *Polystictus superciliaris* — Registered in pairs in the bushy pasture near Conceição do Mato Dentro and on shrubs of the rocky zones (campos rupestres) of Chapéu do Sol, 1-2 m up,

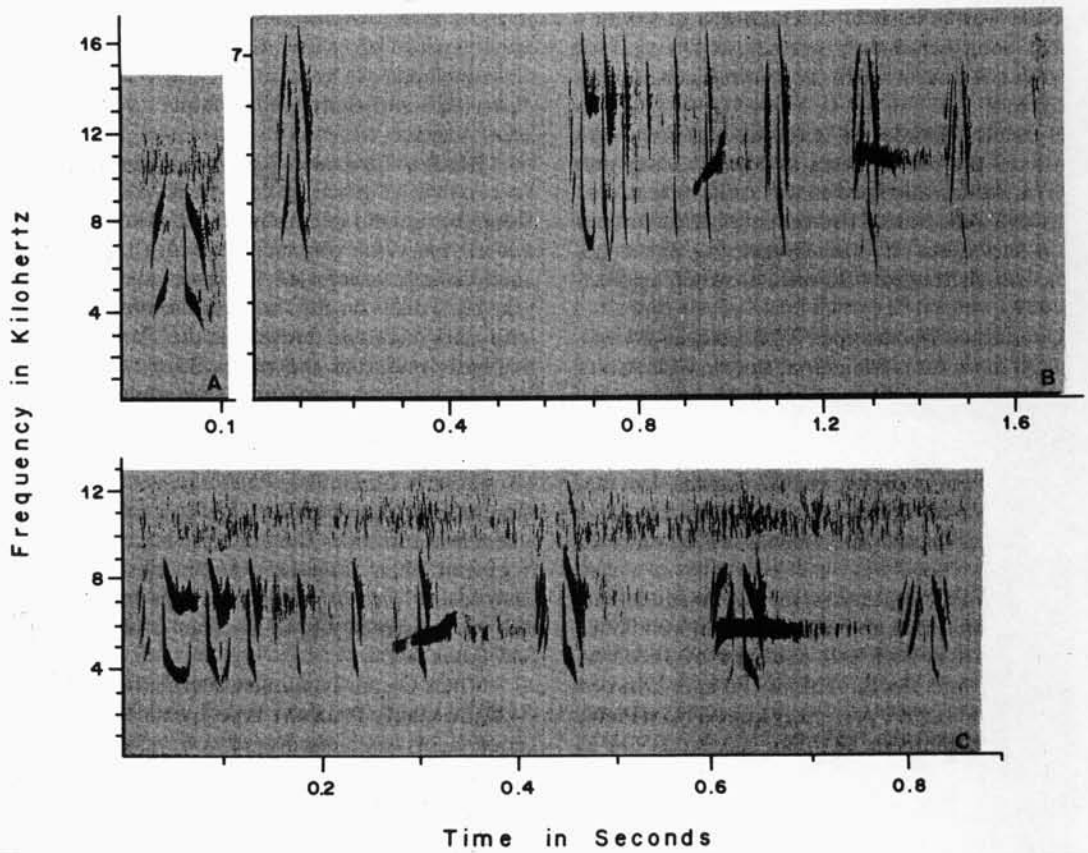

Figure 2. Call (A,B) and *"pr'r'r'r' it tit-tit-tit (-t)"* song (B,C) of *Phylloscartes roquettei* cast of Januária. Copies of recordings are in sound libraries at University of Florida and Universidade Estadual de Campinas.

flying short distances to catch small insects on the foliage. Short faint calls *"hu"* and a descending song *"cri-ri-i-i-i-i-i-i-i-i-i-hu,"* were heard. One was carrying material to a nest (not located) at Conceição.

Caatinga Black-Tyrant, *Knipolegus franciscanus* — Treetops and down to the ground inside scrub around rock formations west of Januária, often in pairs. Jerks tail upward several times when disturbed. Originally described (Snethlage 1928) as a subspecies of the Andean *K. aterrimus*, but its range and habitat are very different, and females seem unlike. Meyer de Schauensee (1970) omits this form when discussing *K. aterrimus*. We agree with Silva (1989) in treating it as a separate species.

Ash-throated Casiornis, *Casiornis fusca* — Common low in woodlands, often in pairs in bird flocks, at Januária. Note is a sharp *"chip,"* different from *"steel"* of *Casiornis rufa* seen two days later at Brasília. Registered from the São Francisco River in Minas Gerais (Oniki 1980, Sick 1985).

Tropical Gnatcatcher, *Polioptila plumbea* — Common at Januária in dry woodlands and edges, even if not registered by Meyer de Schauensee (1970) for Minas Gerais. Registered without specified locality from Minas Gerais (Sick 1985).

Golden-crowned Warbler/White-bellied Warbler, *Basileuterus culicivorus/hypoleucus* — At Km 175, a pair of *B. hypoleucus* was observed in the dry forests on the west side of the road and various pairs of *B. culicivorus* in the evergreen forests of the east side. At Brejo do Amparo, pairs of *B. culicivorus* were only in grottoes of evergreen forest, with pairs of *B. hypoleucus* in the surrounding leafless forest. Mixed pairs such as in São Paulo and Mato Grosso, were not detected. *B. hypoleucus* occur in more evergreen forests in northern São Paulo, in the absence of *B. culicivorus*.

Forbes Blackbird, *Curaeus forbesi* — Three individuals were poking their beaks in rolled-up leaves of tall grass at the edge of the Doce Park headquarters clearing, giving *"preck"* and *"wop"* calls and rough loud *"check-check-check-check-check"* songs. What seemed the same species was slipping low through sugar cane along the creek above Brejo at Januária.

Gray-headed Tanager, *Trichothraupis penicillata* — Following *Labidus praedator* ants in the woodlot at the rio Cipó, a considerable extension of range

eastward, and the second record for the São Francisco basin and for Minas Gerais (a specimen from Arinos is in the Louisiana State University Museum). We (Willis 1985) consider it congeneric with *T. melanops*, which followed both *Eciton burchelli* and *L. praedator* ants with White-winged Fire-Eyes (*Pyriglena leucoptera*) and other birds just across the serra at Conceição. Only *L. praedator* was found at the cerrado edge west of Januária, where it was followed by the professional *Dendrocolaptes platyrostris* and by *Taraba major, Cyanocorax cyanopogon,* and other amateur ant followers. *E. burchelli* has yet to be found anywhere in the cerrado or caatinga regions of Brazil, perhaps explaining why *D. platyrostris* and *T. penicillata* are the only regular ant followers of the whole region; both forage away from ants readily. It must be noted, however, that *Pyriglena leucoptera* seemed absent from the deep forests at the rio Doce; there, such species as *Neomorphus geoffroyi* and *Dendrocincla turdina* presumably follow ants (Pinto 1938).

Scarlet-throated Tanager, *Sericossypha loricata* — Repeated monotonous tooting *"chunt"* owllike sounds at dawn, from edges of woods and from thorn scrub, marked cowbirdlike males wandering to different perches over their wide home ranges. H. Sick and J. Vielliard have seen it even farther south along the São Francisco River at Pirapora (Sick 1985).

Red-cowled Cardinal, *Paroaria dominicana* — Common in the clearings along the São Francisco River, near Januária. Registered from Pirapora (Sick 1985).

Buff-throated Pampa-Finch, *Embernagra longicauda* — Endemic in the central serra from Bahia (Morro do Chapéu) to central Minas Gerais (Mattos and Sick 1985; another specimen from the serra do Caraça, in the Museu de Zoologia of the Universidade de São Paulo, was collected by Rolf Grantsau in 1965); it is replaced at higher elevations eastward (serra do Caparaó) and southward (Itatiaia) by larger *E. platensis*. It was very common in dry, rocky weeds and bushes of the Conceição campina and less common in rocky, bushy areas of the vellozia zone across the ridge; it was not seen along creeks like its relative. The gray head and broken white ring around the eye are more conspicuous than the buff throat in the field. Calls include *"stek"* and *"pree-zee-zee-zee,"* and the song is an abrupt *"switishik"* twitter. I. Sazima has collected it on the serra do Cipó (specimen at the Universidade Estadual de Campinas).

DISCUSSION

Northern Minas Gerais has been little visited by ornithologists, and the present study is only one step in understanding distribution of birds there. Endemic species turn out to be associated with unusual habitats, namely the upland campina-vellozia scrub zones and the deciduous forest.

The upland scrub or "campo rupestre" has many endemic species of plants and frogs (W. Bokermann and I. and M. Sazima, pers. comm. 1978). Seasonally cold temperatures plus rain-shadow lack of moisture probably keep out trees and bushes. Similar zones, often with other endemics, occur southward and westward at high elevations in Brazil and spread out as the "pampas" of Uruguay and Argentina. These pampas in the central serras of Minas Gerais are somewhat isolated from ones further south by forests, but differ primarily in climate: the winters are not so cold. *Scytalopus, Embernagra* and *Polystictus* endemics seem derived by isolation from relatives to the south, and *Augastes* perhaps from the south via some former connection with its Andean relative *Schistes geoffroyi.*

The deciduous woodland has several endemic birds, mostly species or subspecies that have relatives in montane evergreen forests of southern Brazil: *Lepidocolaptes, Xiphocolaptes, Phylloscartes, Phyllomyias.* No endemic species comes from nearby lowland habitats, most of which are open or semi-open. Presumably the endemic birds arrived via dispersal across open zones or along vegetational corridors, despite climatic differences between hot deciduous forest and cool southern evergreen woodland. Endemic species in serras of Alagoas also have southern relatives. Most non-endemic species of deciduous woodland are Amazonian, or rather are widespread in semideciduous forests that fringe the southern edge of Amazônia from Maranhão to Mato Grosso.

The caatinga-edge endemics *Sericossypha, Knipolegus,* and *Automolus (=Hylocryptus)* have relatives in the Andes, suggesting that scrub with a colder climate once crossed to the Andes. Sick (1985:539) has indicated other cases of Andean/Patagonian birds in central-southern Brazil, and Vielliard (1990b) has found a new *Asthenes* in the serra do Cipó. We agree with Sick that dispersal from the south and Andes has been important for endemic speciation in central to northeastern Brazil.

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Errata

No artigo "Levantamento preliminar das aves de inverno em dez áreas do sudoeste do Mato Grosso, Brasil" (*Ararajuba* 1: 19-38), certos dados na tabela 1 (p. 28-29) foram impressos fora do lugar e devem ser:

Phloeoceastes melanoleucos	0-1-1-1^{b}-0-0,9^{b}-0,5-0,2-0-0
Xiphorhynchus picus	0-1-0-b-1^{b}-3^{b}-b-0-0-c
Microrhopias quixensis	0-0-0-0-0-0-0-0-b-0