TERRA FIRME FOREST: A BRIEF AVIAN ANALYSIS

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INTRODUCTION

The ecoturism company, Rainforest Expeditions, organized an educational program on Tropical Ecology for high-school students for a 5-day period on April 1995 (rainy season). The company manages the Tropical Research Center (TRC) lodge, an area that harbors an outstanding diversity of flora and fauna and a variety of forest habitats. Viewed from a satellite photograph, the site is located in lowland forests, a tertiary zone framed by the Tambopata river. The exact lodge's location is on the left margin (west side) of the Tambopata river (13 08.5 S, 69 36.4 W), about 69.8 Km west from the Pampas del Heath, about 77.3 Km south-west from the city of Pto. Maldonado and about 29.2 Km north from the foothills of the Andes.

From the 23rd to the 28th of April the ornithological training course took place at the "Bamboo," Terra Firme rainforest. This type of forest comprises about 70% (average) of south-western Amazonia (Terborgh, 1985). It is a terrain that is elevated above the highest flood levels having brown sand soils, usually invaded by bamboo (Guadua weberbaueri). Not much is scientifically known about the extreme diversity of flora, nor of the bird community that the habitat shelters. Lacking documentation, we decided to run a short avian survey in conjuction with the programmed ornithological schedule.

The main ornithological purpose for this program was to teach and train the basic technics that an ornithologist applies when studying a community of birds. A special methodology used for instructor-student communicative learning relation was practiced by the former author's personal experience. This, was a very important and transcendental fact to achieve the program's objective.

Evolutionary and ecological aspects on the science of tropical ornithology were taught throughout the course. For that, we established the following ways by which students practiced those views: active instructional explanations during trail walks; eliciting comments on the adaptive features of birds trapped on mist-nets; and an afterwork, detailed scientific analysis of the facts observed that day.

The present report shows conservatively some of the avian results that were possible to gather while dictating the course.

METHODS

A schedule was prepared to go through the Terra Firme trail system on morning hours (5:30 to 11:30) and at night[1]* (7:30 to 9:30). We categorized our observations of bird counts in three standard manners: (1) casual observations (binoculars abilities were taught to have a natural sight of the occupancy of niches by birds); (2) vocalizations (those loud and relatively first audible bird songs were identified explaining their probable purpose); and (3) mist netting (an excellent method for birds that escape our vision and audition senses and a great device to have birds on-hand was used to explain the anatomical adaptations of birds to tropical environments). Nylon bags, pesolas (15, 50 and 300g) and verniers were tools used on mist-net data taking.

Based on the methods explained above we zonified a 12 ha. plot. We selected a five-hundred meter transect that permitted us to census birds (casual observations and vocalizations) 100 m. to both sides and 50 m. at its ends. We set up three mist-nets along the transect in selected, cryptic and relatively obscure patches of forest. Much effort was considered in opening mist-nets at 6:00 or 6:30 though the division of time per method varied entirely on the students' behavioral basis and bird activity or findings. In this way we could conservatively appreciate the structure of the Terra Firme bird community at TRC.

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[1] These results are presented in other report.

RESULTS

All results were obtained from a 12 ha. plot in Terra Firme habitat, in a total time period of 25 hours of field work, applying the technics already explained. A species density of forty nine species of birds were registered for the plot. These pertained to 19 families and were organized in 15 guilds (see Appendix).

Population densities and biomass estimates were impossible to calculate due to the short period span and the missing spot-mapping census method. However, we could obtain a rough estimate of the bird biomass: 14 Kg/12 ha (see DISCUSSION below). Seventy-nine percent of the whole bird mass was distributed among birds that weighted from 5 to 451 g (see fig1), these being mainly insectivores (75.67%), (see fig 2).

Of those birds captured in mist-nets, 5 were accountable for a minimum ecological and statistical appreciation (see DISCUSSION below). These are listed in table 1.

DISCUSSION

Scientific studies on "Bamboo" bird communities are scarce or practically not existent. Some of the sources by which we can compare our results are those studies made on a few tropical localities that were made on floodplains and high ground habitats.

The majority of places studied have failed in covering a minimum size scale plot, and this has prevented the accurate determination of population densities and biomasses. Unfortunately, due to a short sampling period of time (mainly), the present work may not be an exception to the latter.

If we begin to make some comparisons we may be supported by the completeness and accuracy of the results obtained at Cocha Cashu Biological Station in Manu National Park (Terborgh, 1990). Terborgh found 245 resident species for a 97 ha plot in floodplain forest. By making a simple arithmetic calculation we will obtain that the same plot would harbor 30 resident species in 12 ha. This rough estimate, although simplistic, gives us expectant data in contrast to our results. In our area we found 47 resident species in 12 ha of "upland" forest (Terra Firme), 17 species more to that roughly calculated for Cocha Cashu. No doubt, this difference can be explained on the account of overlapping territories and, on a little extent, on the difference of vegetation structure. Certainly, the number of species in 12 ha of mature floodplain and high ground forest at Cashu would render a similar amount. We may moderately conclude that the extended area of Terra Firme forests does not show a significative difference to the average species density found on floodplains and high grounds in western Amazonia.

In the case of guilds, similarities were somewhat notorious. Insectivores correspond the major group in both places. Our study plot had a 59.57% of insectivores compared to that of Cashu's 51.02%. Granivores (10.64% to 8.98%), frugivores (6.38% to 10.20%) and omnivores (10.64% to 14.29%) showed a similar pattern. Also, for those birds that weighted from 5 to 451 g the explosive group of insectivores was the greatest (75% to that of 60.29% for Cashu), (see fig 2). Nevertheless, our numbers suggest a smaller number of frugivores and a greater number of insectivores that could be the "rule of thumb" for Terra Firme forests in contrast to flooded forests. This needs to be confirmed with more quantitave data, and, a botanical analysis on the terra firme vegetational composition.

The biomass calculation is severely understated. We have not counted the number of pairs (spot-mapping), the number of individuals missed in the 200 m wide area (transect method), the number of migrants and local species that did not occupy the plot regularly, nor the number of individuals per mixed flock (visual counts). The natural history of most of the species recorded has been described (Terborgh 1990, Ridgely 1995), we could have use the density of pairs found in Cashu to extrapolate potential densities for those territorial species in our plot, and then double and multiply this times the average species weight. But this would lead to extreme low numbers of species-mass per area. Furthermore, territorial behavior in Terra Firme forests (bird territory sizes) may be variable enough from those in flooded, and account for potential quantitative errors. Also, we would, again, be neglecting that 12 hectares do fail to cover species with big home ranges as *Sarcoramphus papa* or *Pionus menstruus,* thus having densities too low to measure. We decided to simply add the bird masses of all the species, considering that any of the species would find some resources in the plot. We consider just one individual per species. The probable low density value obtained, 14 Kg/ 12 ha, may be compare with that likely to occur for Cashu, 22.8 Kg/ 12 ha.

Five bird species (see table 1) were captured on mistnets most commonly. This is certainly expected for 4 of the 5 species: *Picumnus rufiventris*, this is a territorial but anomalously non-vocal species; well established populations were at the place (Foster et.al. 1994), (3 captured at the same time); *Phlegopsis nigromaculata*, an ant-follower species that attends different swarms of ants; *Pipra fasciicauda*, a lek forming species that clusters in great numbers at traditional sites; and *Lathrotriccus euleri*, a small size bird with one of the smallest tropical bird territories of about 5 hectares (mistnets were twice moved along the 500 m transect). However one species, *Percnostola lophotes*, showed a little variance on its abundance, and this may regard in someway the efficiency of the spot-mapping method for this particular species. The universal spot-mapping method, not used here, counts all those birds observed and/or that vocalize during a transect census. By this method we would have the number of territorial pairs for a given area. This however, will not discriminate possible juveniles (males and females) or vagrants among the birds censused, as happens clearly with the specialist cooperative breeders as *Monasa nigrifrons*. This may also be the case for *P. lophotes*, although the number of individuals (N = 5) may not be still adequate for accurate conclusions (the species was quiet abundant during trail walks; a spot-mapping census would be needed).

Another unusual fact, found by mist-netting, was that of manakin females (*P. fasciicauda*) "visiting" leks during the month of April. If this is actually a fact, there may be a number of factors that can explain it, but that escapes the scope of the present report. We can anyway think on two hypothesis: the species exhibits an extended behavioral breeding period (as in *Manacus manacus*); or, roaming females were wondering randomly around male clusters, a fact that could in anyway help females to become familiar of leks that fall into their home ranges, an idea that would support Bradbury's female preference hypothesis (Bradbury 1981).

Biometric data for the latter five species provides additional important registrations for museums and for scientists involved on comparative anatomical studies. In the case of molting, no patterns were observed. Indeed, few studies on tropical birds' molting phenomenon have been made. Tropical molt should follow the same yearly cycle as occur on temperate birds (a basic and an alternate molt), but this being based on a rainy and a dry season. Our data does not show any conceivable or apparent molt pattern.

LITERATURE CITED

BRADBURY, J. W. 1981. Evolutions of leks. In: Natural selection of social behavior. R. D. Alexander and D. Tinkle, eds. New York, USA.

FOSTER, R. B, CARR, J. L. AND FORSYTH, A. B (EDS.). 1984. The Tambopata-Candamo Reserved Zone of southeastern Perú: a biological assessment. RAP working papers 6. Conservation International,Washington D.C., USA.

RIDGELY, R. S. AND TUDOR, G. 1989. The birds of southamerica. Volumes I and II. Univ. of Texas Press, Texas, USA.

ROBBINS, M. B. 1983. The display repertoire of the Band-tailed Manakin (*Pipra fascicauda*). Wilson Bull 95(3): 321-342.

TERBORGH, J. 1985. Habitat selection in Amazonian birds. In M. L. Cody, editor. Habitat selection in birds. Academic Press, New York, New York, U.S.A.

TERBORGH, J., S. K. ROBINSON, T. A. PARKER III, C. A. MUNN, AND N. PIERPONT. 1990. Structure and organization of an amazonian forest bird community. Ecological Monographs 60(2): 213-238.

APPENDIX. Bird list for a 12 ha Terra Firme forest at the Tropical Research Center, Tambopata, Peru .

	Evidence *	Guild * *	Mass (g, average)
CATHARTIDAE (2 species)			
Coragyps atratus	CO	Carr.	1375
Sarcoramphus papa	CO	Carr.	3125
ACCIPITRIDAE (2 species)			
Leptodon cayanensis	CO	R,D	550
Ictinea plumbea	CO	I,Aer	240
FALCONIDAE (2 species)			
Daptrius americanus	CO,V	R,D	583
Herpetotheres cachinnans	CO,V	R,D	650
CRACIDAE (1 species)			
Pipile cumanensis	V	F,A	1200
PSITTACIDAE (5 species)			
Ara ararauna	CO,V	G,A	1125
Ara macao	CO,V	G,A	1015
Brotogeris cyanoptera	CO,V	G,A	67
Pionus menstruus	CO,V	G,A	295
Amazona farinosa	V	G,A	800
STRIGIDAE (2 species)			
Otus watsonii	V	R,N	145
Pulsatrix perspicillata	V	R,N	795
TROCHILIDAE (1 species)			
Threnetes leucurus	MN	N	5
BUCCONIDAE (1 species)			
Monasa nigrifrons	V	I,A,S	85
RAMPHASTIDAE (1 species)			
Ramphastos tucanus	V	F,A	734
PICIDAE (2 species)			
Picumnus rufiventris	MN	I,B,I	21
Veniliornis passerinus	MN	I,B,I	32
DENDROCOLAPTIDAE (2 species)			
Glyphorynchus spirurus	MN	I,B,S	14
Campylorhamphus trochilirostris	CO	I,B,S	38
FURNARIIDAE (1 species)			
Automolus melanopezus	MN	I,A,DL	49
FORMICARIIDAE (12 species)			
Cymbiliamus sanctaemariae	MN.V	I,A,G	31
Taraba major	V	I,A,G	60
Thamnomanes schistogynus	MN	I,A,S	16
Drymophila devillei	CO,V	I,A,G	14
Cercomacra manu	V	I,A,G	18
Cercomacra nigrescens	V	I,A,G	18
Hypocnemis cantator	MN,V	I,A,G	13
Percnostola lophotes	MN,V	I,A,G	33
Gymnopithys salvini	CO	I,A,F	25
Formicarius analis	MN	I,T,G	57
Phlegopsis nigromaculata	MN,V	I,AF	47
Hylopezus berlepschi	V	I,T,G	48
PIPRIDAE (1 species)			
Pipra fasciicauda	MN,V	F,A	17

TYRANNIDAE (8 species)			
Todirostrum chrysocrotaphum	CO	I,A,S	7
Poecilotriccus albifacies	CO	I,A,S	11
Ramphotrigon megacephala	V	I,A,S	16
Terenotriccus erythrurus	MN	I,A,S	7
Lathrotriccus euleri	MN,V	I,A,S	10
Megarynchus pitangua	V	I,A,S	48
Myiodynastes maculatus	CO,V	I,A,S	44
Tityra inquisitor	CO	I,A,S	64
TROGLODYTIDAE (1 species)			
Thryothorus genibarbis	V	I,A,G	19
CORVIDAE (1 species)			
Cyanocorax cyanomelas/violaceus	V	O,A	262
FRINGILLIDAE (2 species)			
Arremon taciturnus	MN	O,A	27
Cyanocompsa cyanoides	MN	O,A	24
THRAUPIDAE (2 species)	CO,V		
Thraupis palmarum	CO,V	O,A	36
Dacnis cayana	CO	O,A	14

*Key: CO = Casual observation, MN=Mistnetting, V=Vocalization

**Key Carr.=Carrion, F,A=Arboreal frugivore; G,A=Arboreal granivore; I,A,DL=Dead leaf-searching-arboreal insectivore; I,Aer=Aerial insectivore (i.e. swifts); I,AF=Ant-following insectivore; I,A,G=Arboreal gleaning insectivore; I,A,S=Arboreal, sallying insectivore; I,B,I=Bark dwelling insectivors feeding in trunk interiors; I,B,S=Bark-dwelling insectivores feeding superficially; I,T,G= Gleaning terrestrial insectivore, N=Nectarivore; O,A=Arboreal omnivore; R,D=Diuunal raptor; R,N=Nocturnal raptor.

Table 1. Biometric data shown for five bird species most commonly trapped on mist-nets. April 1995.

		Weight (g)	**Culmen** (cm)	**Wing** chord (cm)	**Molt**	**Sex**
Picumnus rufiventris	Mean	21.433	1.733	5.866		
	SD	0,929	0,025	0,422	?	
	N	3	3	3		
Percnostola lophotes	Mean	33,42	2.013	7.719	All molting	
	SD	2.717		0,075	different	
	N	5	5	5	body parts	
Phegopsis nigromaculata	Mean	47.366	1.965	8.427	All molting	
	SD	5.822	0,105	0,332	(variable	
	N	3	7	7	on wings & rectrices)	
Pipra fasciicauda	Mean	16,72	1.254	6.411	4 don't	Adult
	SD	0,818	0,278	0,243	molt, 3	males
	N	7	7	7	light molt	
	Mean	16.866	1.151	6.315	No	Juv.
	SD	0,55	0,15	0,149	patterns	males
	N	3	3	3		
	Mean	15.816	0,868	5.988	3 don't	Adult or
	SD	1.213	0,232	0,368	molt, 3	juv.
	N	6	6	6	light molt	femal.?
Lathrotriccus euleri	Mean	10,75	1.219	6.248	None	All mixed
	SD	1.246	0,293	0,168	(one	(one
	N	6	6	6	rectrix)	juv.)