A COMPARISON OF THE UNDERSTORY AVIFAUNAL COMMUNITIES IN THREE COSTA RICAN FORESTS

Teri C. Balser, Jeffry L. Dudycha, Kimberly A. Isaacs, Catherine N. O'Neill, and Alan B. Shabel

Abstract. The 1992 FSP comparative project on understory bird communities was conducted in Palo Verde, Monteverde, and Corcovado. We predicted that the structurally complex forest of Corcovado, with its high year-round primary productivity, would support a greater number and biomass of birds as well as a more species rich community than either Monteverde or Palo Verde. Data from mist netting and species sighting records were used to analyze the community structure of each site. The number of birds caught per mist net hour, the biomass of birds caught per net hour, the total number of species caught, and the number of species sighted per day increased from Palo Verde to Monteverde to Corcovado in support of our prediction. We also found that oscines were more abundant than sub-oscines in Monteverde while the reverse was true in Palo Verde and Corcovado. Finally, the guild of each netted bird was determined so that the foraging methods characteristic of the birds at each site could be compared. (ABS)

INTRODUCTION (TCB)

Bird community structure in both the temperate zone and the tropics varies with changes in forest structure complexity and spatial heterogeneity. A more complex habitat may have greater niche diversification and a higher resource base, allowing for greater species diversity and individual abundance (Orians 1969).

Costa Rica has many different bird communities in varying habitats. This study attempts to characterize the understory bird community differences that exist between three sites around the country: a lowland deciduous forest, a montane cloud forest, and a lowland wet forest. We looked at species richness, bird abundance, bird biomass and feeding guild composition at the three sites, comparing them to forest structure and resource base. We predicted that community species richness and bird abundance would be highest where structural complexity and resources were highest. We also predicted that guild composition would reflect the resource base at each site.

METHODS (CNO)

We used mist nets to capture birds in three forests: Palo Verde National Park, a tropical dry forest with a low canopy and open understory; Campbell's Farm at Monteverde, a dense montane cloud forest with a high canopy; and Corcovado National Park, a tropical wet forest with a high canopy, but less dense understory than Monteverde. At each site, ten mist nets (12m x 2m) were open throughout the morning (Table 1) in clearings and on paths in the forests. All birds caught were identified to species and assigned to foraging guilds based on information given in *A Guide to the Birds of Costa Rica* (Stiles and Skutch 1989). Measurements of their bill size, tarsus length, wing length, and weight were taken. To eliminate the possibility of recording a repeat capture we clipped a tail feather on each bird for identification before releasing it.

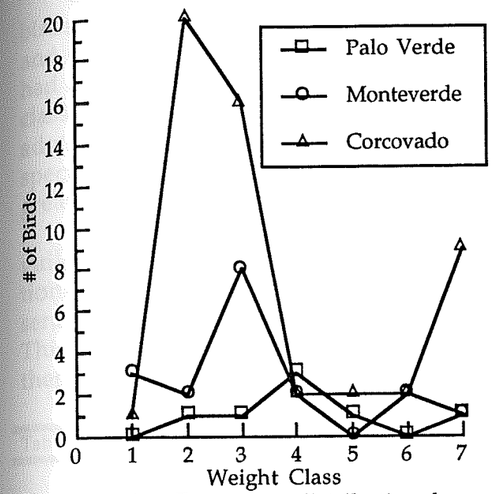

Figure 1. Frequency distribution by weight class of captured birds in three forests. Class 1, 0-5g; Class 2, 5-10g; Class 3, 10-15g; etc.

RESULTS (KAI)

Data from mistnetting (Table 2) indicated that the number of individual birds, number of species, overall biomass, and total number of birds captured per net hour increased from Palo Verde to Monteverde to Corcovado. The number of species sighted per day illustrated this same increasing trend. Of the netted birds, we found suboscines to be more prevalent in Palo Verde and Corcovado, whereas oscines were the dominant group of Passerines in Monteverde.

The bird populations in Monteverde and Corcovado were dominated by small birds (5-15g), whereas at Palo Verde the distribution was more even across size classes (Figure 1). Along with the greater number of small birds at Corcovado we found more large birds (>30g) than at any other site. In these calculations of biomass, the netted White-Tipped Dove from Palo Verde was eliminated because it alone accounted for half of the sample's total biomass.

A comparison of guilds from the three sites indicated that in Corcovado and Monteverde insectivores were the most prevalent birds, followed closely by nectarivores and omnivores (Table 3). On the other hand, in Palo Verde the population was equally divided between frugivores and insectivores, with only one omnivore and no nectarivores.

DISCUSSION (JLD)

Three of our measurements indicate that bird abundance increases from Palo Verde to Monteverde to Corcovado. Birds caught per net hour, total birds netted, and bird biomass caught per net hour all increased in this fashion (Table 2). We believe this is partially due to the fact that bole volume index also increased in this

Table 1. Mist net times.

	Palo Verde	Monteverde	Corcovado	
			I	II
Date	11 Jan. 92	17 Jan. 92	25 Jan. 92	29 Jan. 92
Number of nets	10	10	10	10
Time nets open	0720	0720	0630	0635
Time nets close	1105	1215	1130	0950
Net hours	32.25	41.3	47.67	26.67

Table 2. Site comparisons.

	Palo Verde	Monteverde	Corcovado		
			I	II	Total
Indiv. netted	8	20	40	13	53
#birds/net hr	0.25	0.48	0.84	0.49	0.71
Species netted	6	12	18	10	21
Total biomass of netted birds (g)*	97.2(262.2)	292.8	575.05	223.8	798.85
Mean biomass of netted birds (g)*	13.9(37.5)	14.6	14.38	17.2	15.07
Biomass netted/net hr*	3.01(18.13)	7.09	12.06	8.39	10.74
Oscines netted	2	9	7	7	10
Suboscines netted	5	6	16	3	23
# of species sighted	61	60	–	–	136
# of species sighted/day	7.63	12.0	–	–	17.0

*White-Tipped Dove eliminated (original #).

pattern (Burnaford, et al. 1992). This suggests that primary productivity may be greatest at Corcovado, enabling it to support more biomass at each trophic level.

Species richness also increased from Palo Verde to Monteverde to Corcovado. This is shown by the number of species caught and the average number of new species sighted per day at each site (Table 2). The greatest complexity of forest structure was found in Corcovado and the least in Palo Verde (Burnaford, et al. 1992). Increasing complexity of forest structure produces a greater number of microhabitats in a forest and hence, more available niches. This gives rise to the ability to support a greater number of bird species because resources are more finely divided.

In Monteverde, more oscines were netted than suboscines, in contrast to Palo Verde and Corcovado. This may be due to the evolutionary history of the two groups. Oscines are the dominant group in the temperate zone and suboscines are dominant in the Neotropics. The pre-montane forest of Monteverde is similar to a temperate climate, this may explain why oscines dominate there.

We found that weight classes were evenly distributed in Palo Verde, but not in Monteverde and Corcovado (Figure 1). It must be noted that comparisons of bird biomass in Palo Verde may be affected by the small sample size there. It was further complicated by the netting of a White-Tipped Dove (mass=165g). This is unusual, because our nets would normally not be able to hold a bird this large. Hence, it has been excluded from comparisons of biomass (Table 2). It may be that with a sample size similar to Monteverde and Corcovado, the weight classes would have shown a peak in small

birds (5-15g), as existed at Monteverde and Corcovado (Figure 1). Corcovado had a second peak in the >30g weight class. This is probably due to Corcovado's greater bird abundance and species richness, which would yield a greater chance of netting larger birds.

We also compared the feeding guilds of each bird (Table 3). Proportionally, frugivores were underrepresented at Corcovado and Monteverde. This may be because the canopy in these places is higher than at Palo Verde (Burnaford, et al. 1992). Therefore, frugivores may be higher in the canopy, and not at the height of our nets. Nectarivores were not netted at all in Palo Verde. Although they were seen, they were less common than at other sites (pers. obs.). This may be due to the extreme seasonality of Palo Verde, preventing year-round flower availability. Also, the trees that were in flower tended not to have hummingbird pollination morphology (pers. obs.).

Table 3. Guild comparisons.

	Total # of individuals captured		
	Palo Verde	Monteverde	Corcovado
Insectivores	3	10	16
Frugivores	3	1	7
Omnivores	1	4	14
Nectarivores	0	5	14
Total	7	20	51

Note: The White-Tipped Dove and the kingfisher were eliminated from guild ratings.

Appendix A

Orders and families of birds netted at Palo Verde.

I. Columbiformes
  1. Columbidae
    Leptotila verreauxi (White-Tipped Dove)
II. Passiformes
  1. Emberizidae
    Vermivora peregrina (Tennessee Warbler)
    Basileuterus rufifrons (Rufous-Capped Warbler)
  2. Pipridae
    Chiroxiphia linearis (3, Long Tailed Manakin)
  3. Tyrannidae
    Myiarchus nuttingi (Nutting's Flycatcher)
    Oncostoma Cihereigulare (Northern Bentbill)

Appendix B

Orders and families of birds netted at Monteverde

I. Apodiformes
  1. Trochilidae
    Eupherusa eximia (3, Striped Tail Hummingbird)
    Lampornis caldaema (Purple Throated Mountain Gem)
    Unidentified
II. Passeriformes
Suboscines
  1. Dendrocolaptidae
    Xiphorhynchus erythropyquis (Spotted Woodcreeper)
  2. Fumaridae

Premnoplex brunnescens (2, Spotted Barbtail)

3. Tyrannidae

Rhynchocyclus brevirostris (Eye-Ringed Flatbill)

Mionectes olivaceus (2, Olive Striped Flycatcher)

Oscines

4. Emberizidae—Parulinae

Basileuterus culicivorus (2, Golden Crowned Warbler)

Oporornis formosus (Kentucky Warbler)

Basileuterus tristriatus (2, Three Striped Warbler)

5. Emberizidae—Thraupinae

Chlorospinqus ophthalmicus (2, Common Bush-Tanager)

6. Troglodytidae

Henicorhina leucophrys (Gray Breasted Wood-Wren)

7. Turdinae

Myadestes melanops (Black-Faced Solitaire)

APPENDIX C

Orders and families of birds netted at Corcovado

I. Trochilidiformes

Glaucis aenea (Bronzy Hermit)

Threnetes ruckeri (2, Band-tailed Barbthroat)

Phaethornis superciliosus (12, Long Tailed Hermit)

Hylocharis eliciae (Blue-Throated Goldentail)

Amazilia decora (Beryl-Crowned Hummingbird)

II. Coraciiformes

1. Alcedinidae

Chloroceryle americana (2, Green Kingfisher)

III. Passiformes

Suboscines

1. Furnaridae

Xenopus minutus (Plain Xenops)

2. Dendrocolaptidae

Dendrocincla anabatina (2, Tawny Winged Woodcreeper)

3. Formicaridae

Thamnophilus bridgesi (Black Hooded Antshrike)

Myrmotherula schishcolor (2, Slaty Antwren)

Myrmeciza exsul (2, Chestnut-Backed Antbird)

4. Tyrannidae

Mionectes oleagineus (5, Ochre Bellied Flycatcher)

Myiobius sulphureipygius (2, Sulphur-rumbed Flycatcher)

5. Pipridae

Pipra coronata (6, Blue-Crowned Manakin)

Pipra mentalis (2, Red-Capped Manakin)

Oscines

6. Emberizidae

Oporornis formosus (Kentucky Warbler)

Phaeothlypis fulvicauda (2, Buff-Rumped Warbler)

Euphonia imitans (Spot-Crowned Euphonia)

Eucometis penicillata (2, Gray-Headed Tanager)

Lanio leucothorax (White-Throated Shrike-Tanager)

Arremon aurantiirostris (3, Orange-Billed Sparrow)