

EARTHWATCH INSTITUTE FIELD REPORT

Project Title: Ecuador Cloud Forest Birds

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Research Sites:

(1) Loma Alta, Guayas, Ecuador: (01°49'S 80°36'W)

The Reserva Ecológica de la Comuna Loma Alta (RECLA) is in the northern third of the Community of Loma Alta's 6, 842 Ha, 17 km inland from the Pacific Ocean, due west of Manglaralto.

(2) Tangaras Reserve, Mindo, Pichincha, Ecuador

Las Tangaras is a 48 hectare private reserve located west of the Nambillo River, two kilometres south of the village of Mindo in the Canton of San Miguel de Los Bancos, Pichincha, Ecuador.

Study Species: avian community

Key Research Objectives:

- Long-term monitoring of cloud forest birds at Loma Alta & Las Tangaras, Ecuador
- Compare avian communities by season, forest type, and year
- Determine avian movements between moist and dry forests
- Test hypotheses about gene flow to the Colonche Hills from the Andes
- Identify sensitive species by comparing avian aggregations in fragmented and second growth versus closed-canopy mature cloud forest
- Estimate survival based on mark-recapture for abundant species
- Document change in local attitudes about preservation of forests and biodiversity.
- Identify and characterize the importance of nectar resources for maintaining hummingbird diversity and populations of the endangered Woodstar hummingbird species
- Evaluate capture techniques for investigating questions about hummingbird diversity

Date this report was completed: March 25, 2006

Data Collection and Results:

Field Seasons 2005:

Four Earthwatch teams were conducted this year: two at Las Tangaras in July and August, and two at Loma Alta during December and January.

Progress:

At Loma Alta monitoring on Cerro la Torre has been sustained for 10 years. Our data provided the foundation for making Loma Alta an international IBA (Important Bird Area). This designation may help attract nature tourism to the region providing additional incentives for local people to maintain the community-protected forest. This 2005 winter field season was the second to include a focus on nectar resources and hummingbird capture rates. Movements between the lowland dry forest and highland moist tropical forest habitats were also studied. Given the potential need for water and reprieve from dry and hot conditions in the lowlands, we predicted that many birds would move uphill during the dry season. We called this the oasis hypothesis. We also predicted that moist forest birds might extend their distribution downhill during the rainy season as moist conditions expanded for them.

At Las Tangaras we completed a second field season in 2005. We modified the sampling design to control for variation in elevation comparing avian aggregations in fragmented second growth and closed-canopy mature cloud forest in riparian lowlands and upland sites. Presence/absence patterns will help assess a species' sensitivity to fragmentation and degradation of closed canopy forest. We also predict that bird community composition will be more stable and have more recaptures in the closed canopy forest than along edges and fragments of the same type of forest. In other words, bird aggregations in disturbed forest will be more transient and diverse than in the closed canopy forest.

Summary of Results:

I. Movements between moist and dry forest at Loma Alta (Tumbesian Endemic Bird Area).

Netting in both sites resulted in a sample of 141 species, 66% insectivores, 15% nectar-feeders, 15% frugivores, and 7% seed-eaters and carnivores. Of the 67 species that reside mainly in the dry forest and scrub in the lowlands, 12 (18%) species move up to the moist forest on a seasonal basis. Three hummingbird species (Baron's Hermit, Amazilia Hummingbird, Rufous-tailed Hummingbird), three seedeaters (Crimson-breasted Finch, Variable Seed-eater, Black-capped Sparrow), and two insectivorous species (Gray-and-gold Warbler & Pacific Elaenia) supported the oasis hypothesis, moving from dry to moist forest during the dry season. Four species common to lowland dry habitats moved uphill during the wet season, two frugivores and two large-bodied insectivores.

Of the 51 species that reside mainly in upland moist forest, 20 (39%) move down to the dry forest. Most of these species (16) are insectivores. We conclude that food resources rather than need for water are driving these movements.

II. Hummingbirds and nectar

Figure 1 shows the production of nectar by *Psychotria alba*, sampled at 5 time periods daily. This coffee family shrub is a very important resource for small territorial species like *Damophila julie* (violet-bellied hummingbird) and endangered woodstar hummingbirds. The mean sugar concentration of nectar of flowers was 25 +/- 7.7 % (Figure2).

Our data shows that *P. alba* produces the amount and concentration of nectar required to attract hummingbirds as pollinators, but its flowers are small and white, not the typical traits associated with bird pollination. Given that bees are abundant and also visit the shrubs, these nectar properties may reflect an evolutionary switch from bee pollination towards hummingbird pollination.

mm of nectar

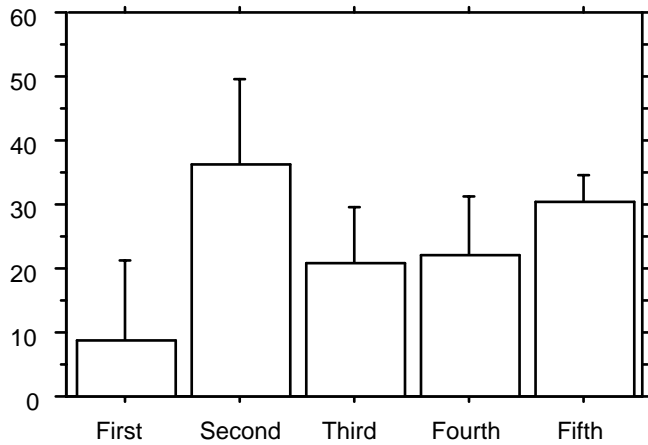


Figure 1. Relative production of nectar by time period in *Psychotria alba* (Rubiaceae). (7.5 mm = 1 μ l)

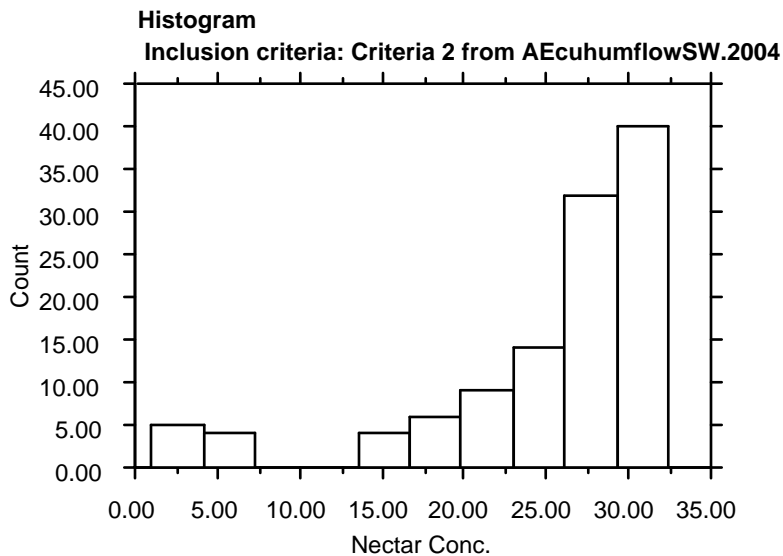


Figure 2. Most measurements of nectar concentration were between 25 and 30 % sugar.

III. Hummingbird Diversity and Behavior Studies: *Feeder watch results and a comparison of capture techniques.*

In 2005, we evaluated hummingbird diversity patterns using feeder observations, captures from mist netting, and captures from trapping where feeders are used as bait. Each project provided information which adds to our understanding of hummingbird diversity at Loma Alta. To fully characterize hummingbird diversity, both methodologies are likely needed. In Table 1, we compare hummingbird capture rates for the different hummingbird species found at Cerro la Torre. In 2005-2006, the mist net data would under-estimate the number of Violet-bellied Hummingbirds, and Andean Emeralds here. The data from the Hall trapping would under estimate the number of Baron's Hermits, Speckled Hummingbirds, and Green-crowned Brilliants. Each trapping technique detected a different rare species. We captured a Purple-crowned Fairy in the mist nets and observed a Brown Violet-eared visiting the feeders.

The feeder observations (Table 2) indicate that the violet-bellied hummingbird utilized the feeders most and were the most aggressive species at the feeders. Many chases were recorded and most were won by the violet-bellied hummingbirds.

It was an extremely dry year in 2005, and *Psychotria alba* was not in bloom during the Earthwatch teams. Consequently, we could not complete the nectar studies started in 2003. Instead, we gathered information about the location of *Psychotria alba* in relationship to the mist nets. We can now evaluate the ten years of capture data from the mist nets to determine the importance of *Psychotria alba* as a nectar resource for hummingbirds at Loma Alta.

TABLE 1. Summary of hummingbird captures at mistnets along the ridge at the Casita and at Hall traps in the El Pasto, an area at the top of the Cerro la Torre ridge. Twenty mistnets were used 3 consecutive days for 5 hours per day beginning at sunrise for both teams. Mist net hours = $3 \times 5 \times 20 = 300$ per team. Two Hall traps were used two days, one day occurred between the trapping days. Trapping started mid-afternoon and lasted for 2.5 hours except for the last trapping day for team 6 when rain ended the session 1 hour early. For Team 5 there were 10 trap hours ($2 \times 2 \times 2.5 = 10$); for Team 6 trap hours equal 8 ($2 \times (2.5 + 1.5)$). Highest capture numbers are in **bold** for each trapping technique.

Species Name		Team 5		Team 6	
Common name	Scientific name	mist net captures	Hall trap captures	mist net captures	Hall trap captures
Common Species					
Baron's Hermit ^R	<i>Phaethornis baroni</i>	44	0	26	2
Speckled Hummingbird ^R	<i>Adelomyia melanogerys</i>	17	1	16	0
Green-Crowned Brilliant ^R	<i>Heliodoxa jacula</i>	44	6	31	15
Violet-bellied Hummingbird ^R	<i>Damophila julie</i>	14	28	5	33
Rufous-tailed Hummingbird ^R	<i>Amazilia tzacatl</i>	3	4	1	1
Andean Emerald	<i>Amazilia franciae</i>	6	10	0	10
Uncommon Species					
Green-Crowned Woodnymph	<i>Thalurania fann</i>	0	1	1	0
Amazilia Hummingbird ^{R*}	<i>Amazilia amazilia</i>	5	1	2	1

Rare Species				
Brown Violet-eared	<i>Colibri delphinae</i>			
?Purple-crowned Fairy	<i>Heliodyx ??</i>	1	0	
TOTAL captures		134	51	82 62
TOTAL captures per net or trap hour		0.45	5.1	0.27 7.75

TABLE 2. Summary of the feeder watch data. The number of visits by hummingbird species was recorded for 1.5 hours on multiple afternoons. The mean number of visits is the average of all visits per species per feeder per day. Species with the highest visitation rate are in **bold**.

Species Name		Team 5	Team 6
Common name	Scientific name	mean number of visits (\pm std dev)	mean number of visits (\pm std dev)
Common Species			
Baron's Hermit ^R	<i>Phaethornis baroni</i>	0.5 \pm 0.7	1.1 \pm 1.4
Speckled Hummingbird ^R	<i>Adelomyia melanogerys</i>	2.1 \pm 2.4	3.9 \pm 3.7
Green-Crowned Brilliant ^R	<i>Heliodyx jacula</i>	4.0\pm5.0	10.4\pm8.4
Violet-bellied Hummingbird ^R	<i>Damophila julie</i>	45.6\pm26.6	117.1\pm87.1
Rufous-tailed Hummingbird ^R	<i>Amazilia tzacatl</i>	19.0\pm25.2	24\pm21
Andean Emerald	<i>Amazilia franciae</i>	7.1\pm5.3	40.3\pm27.6
Uncommon Species			
Amazilia Hummingbird ^{R*}	<i>Amazilia amazilia</i>	0.5 \pm 1.5	2.8 \pm 4.1
Green-Crowned Woodnymph	<i>Thalurania fannyi</i>	1.6 \pm 2.9	2.8 \pm 3.4
Rare Species			
Brown Violet-eared	<i>Colibri delphinae</i>	0	0.4 \pm 0.8
Purple-crowned Fairy	<i>Heliodyx</i>		

IV. Bird Aggregations at Las Tangaras

In 2004, we captured 166 individual birds during 700 net hours (nh), for a rate of 24 per 100 nh. The rate in 2005 was nearly the same at 23/100 nh. The most common species netted were: Tawny-bellied Hermit (*Phaethornis syrmatorphorus*), Gray-breasted Woodwren (*Henicorhina leucophrys*), Orange-bellied Euphonia (*Euphonia xanthogaster*), Spotted Barbtail (*Premnoplex brunnescens*). Sample sizes are still not large enough to make robust comparisons of species composition by habitat type.

In comparing captures during 600 nh completed in August 2005, the small sample suggests distinctive differences in bird aggregations in edge/pasture versus closed-canopy montane tropical forest at the same elevation. For example, although 14 species were found in both habitats, 14 different species were recorded only in the disturbed edge, while 13 species were unique to closed canopy forest. Hummingbirds represented 57% of the unique species in the edge, but represented only 15% in closed

canopy forest. Given the small sample sizes for each species there were only two species that had a significant preference. Green-crowned woodnymphs (a hummingbird) prefer edge to closed canopy forest, while orange-bellied euphonia showed the opposite pattern.

The species considered most important for conservation due to rarity or having restricted ranges (Ridgely et al. 1998) included: Violet-tailed Sylph (*Agelaiocercus coelestis*), Olive Finch (*Lysurus castaneiceps*), Purple-bibbed Whitetip (*Urosticte benjamini*), Wedge-billed Hummingbird (*Schistes geoffroyi*), White-tailed Hillstar (*Urochroa bougugeri*), and White-whiskered Hermit (*Phaethornis yaruqui*). Clearly, even a small reserve like Las Tangaras is playing an important role by sustaining individuals from these species of conservation concern. Mark-recapture data will help determine population sizes of these important species at Las Tangaras and further quantify the value of networks of small protected areas.

Significance/Benefits of Research:

1. Data on endemic and endangered species at Loma Alta resulted in the designation of the area as an Important Bird Area (IBA). This should elevate visitation by birders to Loma Alta bringing more income to local people who are hoping that ecotourism will add to the local economy.
2. Monitoring results and process have raised local awareness about the value of bird biodiversity and conservation.
3. Monitoring results and observations focused on hummingbirds should help identify the important nectar resources which help maintain hummingbird diversity at Loma Alta and identify resources that are important for maintaining populations of the endangered Woodstar species.
4. Work at Las Tangaras should help determine bird species that are sensitive to loss of primary or mature interior forest in the Mindo region.

The results have value at local, national, and international levels. Knowledge about the sensitivity of species within landscapes can contribute to restoration or preservation strategies and thus contributes to sustainability of biological diversity across scales.

At the local level, our monitoring of fog and birds created incentives for community-level action to protect forest in the Colonche Hills. These rare cloud forests form from fog capture and their loss leads to declines in water needed by people living in the lowlands. Collaboration with NGOs and government at the national level has been required to hire guards and provide training to protect the forest. Our data was used at the international level by Birdlife International to designate Loma Alta as an IBA (Important Bird Area).

In addition our research provides employment and income to people in communities used to short-term opportunities.

Contribution to Sustainability

We have been able to provide consistent employment and training at Loma Alta since 1995. Our research contributes greatly to sustaining rural families, rare cloud forests, and a great number of endemic and endangered bird species. Unfortunately, our

project's ability to recruit volunteers has declined and our project was not awarded a 4-year renewal by Earthwatch Institute. We seek funding from NGOs and international donors interested in sustaining tropical forests and their biological diversity. Our last monitoring effort under Earthwatch will be January 2007.

Dissemination of Results

Scientific Papers:

C. Dustin Becker, Ana Agreda, Evelyng Astudillo, Melina Costantino, & Pascual Torres. 2005. Community-based Surveys of Fog capture and Biodiversity Monitoring at Loma Alta, Ecuador Enhance Social Capital and Institutional Cooperation. *Biodiversity and Conservation* 14: 2695-2707.

Becker, C. D. and A. Agreda. 2005. Bird community differences in mature and second growth *garúa* forest in Machalilla National Park, Ecuador. *Neotropical Ornithology* 16: 289-306.

Management Plans and Reports: Earthwatch Field Report 2005, Annual Report to Ecuadorian Ministry of the Environment

Presentations:

Becker, C. D. 2005. South American Forest Birds: Ecotourism, Enterprise, & Extinction. Royal Geographic Society & Earthwatch Institute Lecture Series. June 23. London.

Becker, C. D. 2006. A long-term relationship with a local community helps protect biodiversity in western Ecuador. Departmental Seminar. University of California Santa Cruz.

Costantino, M., E. Astudillo, D. Becker & N. Hilgert. 2005. Importancia de la Reserva Ecológica Comunal Loma Alta como AICA en el Ecuador y la participación local para su conservación. Pp. 34 en *Resúmenes del VI Congreso Nacional de Ornitología*. Chiclayo – Perú: Universidad Católica Santo Toribio de Mogrovejo.