

# COLOMBIAN EBA PROJECT

## RAPID BIODIVERSITY ASSESSMENTS AND CONSERVATION EVALUATIONS IN THE COLOMBIAN ANDES: NORTHEAST ANTIOQUIA & HIGHLANDS OF SERRANÍA DE LOS CHURUMBELOS

EDITED BY  
THOMAS M. DONEGAN & PAUL G.W. SALAMAN

BY  
ANDRÉS M. CUERVO, THOMAS M. DONEGAN, CARLOS E. GONZÁLEZ,  
JOSÉ M. OCHOA, JUAN LÁZARO TORO, & PAUL G.W. SALAMAN

**“Rains flooded the forest, the rivers became torrents, and finally,  
after seventeen days, the men returned sick and exhausted to Pitalito.”**

*January 1943, Prof. Richard E. Schultes exploration of the upper Río Villalobus (Davis 1996, pp. 310)  
~location of fieldwork in 1999*

IN COLLABORATION WITH:

INSTITUTO DE CIENCIAS NATURALES, UNIVERSIDAD NACIONAL DE COLOMBIA  
CORPORACIÓN AUTÓNOMA RÉGIONAL DEL CENTRO DE ANTIOQUIA (CORANTIOQUIA)

MUSEO DE HISTORIA NATURAL, UNIVERSIDAD DE CAUCA

CORPORACIÓN AUTÓNOMA RÉGIONAL DEL CAUCA

CAMBRIDGE UNIVERSITY EXPEDITIONS COMMITTEE

FUNDACIÓN PROAVES

## Colombian EBA Project Report Series No. 2



Published by Fundación Proaves

*Abajo el extremo dosel; arriba la naturaleza*

## CONTENTS

CONTENTS	2
EXECUTIVE SUMMARY	3
RESUMEN EJECUTIVO	5
SPONSORS AND ACKNOWLEDGEMENTS	7
Abbreviations	7
INTRODUCTION	8
Physical geography	8
Serranía de los Churumbelos	8
Northeast Antioquia	10
Study sites	11
Serranía de los Churumbelos	12
Expedition translocation justification	12
Northeast Antioquia	12
Expedition field itinerary	12
Location of study sites and fieldwork effort	13
RAPID BIODIVERSITY ASSESSMENT	14
Plants ~ Botánica	14
Birds ~ Aves	15
Amphibians and reptiles ~ Herpetos	23
Mammals ~ Mamíferos	26
CONSERVATION ASSESSMENT	28
1. Serranía de los Churumbelos	28
Biological Importance	28
Vulnerability assessment	28
Conservation feasibility	29
2. Northeast Antioquia	30
Biological Importance	30
Vulnerability assessment	30
Conservation feasibility	31
REFERENCES	32
APPENDICES	33
Appendix I: Systematic inventory of birds recorded in Serranía de los Churumbelos	33
Appendix II: Systematic inventory of birds recorded in northeast Antioquia	36
Appendix III: Bird specimens collected during EBA '99 expedition in Serranía de los Churumbelos (July 1999) and northeast Antioquia (August 1999)	38
Appendix IV: Inventory of Reptiles and Amphibians captured at each site in Serranía de los Churumbelos	40
Appendix V: Expedition Budget	41

**Suggested citation:** Donegan T. M. & Salaman P. G. W. (eds.) (1999) Colombian EBA Project: Rapid Biodiversity Assessments and Conservation Evaluations in the Colombian Andes: northeast Antioquia & highlands of Serranía de los Churumbelos. *Colombian EBA Project Report Series No. 2*. Fundación Proaves, Colombia, 1999, 41 pp.

**To save resources and time please contact Fundación Proaves at:**  
 presidente@proaves.org  
**To receive a free downloaded copy of this report.**

## EXECUTIVE SUMMARY

**Colombian EBA Project '99** is an Anglo-Colombian student initiative which conducted rapid biodiversity surveys and conservation assessments in the Colombian Andes in the Summer of 1999. As a follow-up expedition to "Colombia '98", our experienced 5-person team completed six flora and fauna study sites at elevational steps along two altitudinal transects of the Central and Eastern Cordilleras of Colombia from July to September 1999.

The aim was to document as fully and effectively as possible the biodiversity of our study areas, using standardised methods in order to collect comparable data and have targeted searches for species at risk. Fieldwork concentrated on birds, plants, amphibians, reptiles and mammals. A 1000m transect was used at each study area along which mist-nets, were placed, and direct observations and collection occurred, with additional information gathered from informal interviews with local hunters. These assessments were urgently needed in order to obtain biological information, which is planned to lead to the conservation of two highly threatened and poorly-known regions.

This Preliminary Report presents the results and conservation assessment from two regions investigated in the Colombian Andes: (i) **Serranía de los Churumbelos**, eastern slope of the Cordillera Oriental (seven study sites including three locations from 1999; 350-700-1,100-1,500-1,900-2,200-2,450 m asl) and (ii) **northeast Antioquia**, Cordillera Central (three lowland and foothill sites; 300-800-1,550 m asl).

### 1. Serranía de los Churumbelos

Study Sites were situated at SS1 - lowland humid forest (300 m); SS2 - foothill humid forest (700 m); SS3 - premontane very humid forest (1,100 m); SS4 - upper premontane humid forest (1,450 m); SS5 - lower montane humid forest (1900 m); SS6 - montane cloud forest (2,200 m); SS7 - upper montane cloud forest (2,450 m). The three upper elevation sites were studied in 1999, to complete the altitudinal analysis of habitats and associated biota from Amazonia through foothills to montane forest on the eastern slope of the Cordillera Oriental, Colombia. A total of 45 fieldwork days with 324 person days effort was employed over the two years.

Detailed **botanical** descriptions of each site were completed. SS 3 to SS 7 were found to correspond closest to the Northern Andean characterisation, with SS 1 and SS 2 resembling Amazonia North Ecoregion. Several new species were discovered (in *Gesneriaceae*, *Piperaceae* and others). Increasing elevation corresponded to a lower canopy (30 to 10 m) and increasing epiphyte diversity. A high diversity of plant species in primary forest was encountered at all sites, excellent for conservation.

Using observation and mist-netting, a total of 421 **bird** species have been registered in Serranía de los Churumbelos, including the addition of 93 species in 1999 to those recorded in 1998. A total of 2,834 mist-net captures (1,057 in 1999) were made up of 229 species over 142,730 Mist-net Metre Hours. A total of two Threatened and 10 Near-Threatened species were recorded, with five Ecuador-Peru East Andes EBA (SS2 - SS4) and four Colombian Inter-Andean Slopes EBA (SS5 - SS7) endemics recorded. It is estimated that the probable total bird species inventory exceeds 550 species: an exceptional diversity, making the Serranía a global avian "hotspot" and extremely important for bird diversity.

A total of 46 species of **amphibians** (30 spp.) and **reptiles** (16 spp.) were recorded in 1998 and 1999. Many poorly-known species were recorded, with several significant range extensions including two new species for Colombia. Several unidentified individuals potentially relate to undescribed species. **Mammals** registered include Spectacled Bear *Tremarctos ornatus* and Mountain Tapir *Tapirus pinchaque*.

Our **Conservation assessment** draws attention to the many biological justifications, and critical urgency for conservation to be implemented in Serranía de los Churumbelos, as road construction projects and uncontrolled colonisation threaten the region. The Serranía de los Churumbelos encompasses an immense variety of ecosystems, with a complex topography and variable climatic conditions, influencing an outstandingly high biodiversity. The direct biological justifications for the implementation of conservation are many. The eastern slope of the Andes has been subject to great human population pressures and associated habitat degradation in recent years, but fortunately the Churumbelos Mountains have largely avoided the catastrophic human impact that other regions have suffered. However, threats to the area associated to the recently completed Mocoa-Bogotá highway, the proposed Puerto Asís-Florencia road, and the recent discovery and exploitation of petroleum and precious metals will lead to escalating human encroachment, exploitation and deforestation.

Colombian EBA Project '99 and Colombia '98 demonstrate the great conservation importance of, and looming threats to, the Serranía de los Churumbelos. Our conclusions strongly support the idea of legal protection. It is important to incorporate the entire altitudinal gradient from lowland humid forest to cloud forest, maximising the biodiversity of any protected area. Perhaps the most feasible protective measure would be in the form of a Parque Régional Natural administered by CRC. Another plan already proposed by the Colombian National Parks Authority following our work involves extending Parque Nacional Natural Cueva de los Guácharos into the Churumbelos. The third phase of the project is now being implemented to develop a conservation strategy for the entire Serranía, involving the CRC, expedition team members, the Parks Authority, and local communities. The final report will specify a conservation strategy for future investigations and protection of the Serranía de los Churumbelos.

## 2. Northeast Antioquia

In the north-eastern Cordillera Central and mid-Magdalena valley, Study Sites were situated at SS1 - lowland humid forest (300 m); SS2 - foothill humid forest (800 m); and SS3 - premontane humid forest (1,550 m). A total of 14 fieldwork days with 70 person days effort in August 1999.

Detailed **botanical** descriptions of each site were completed, with SS 1 and SS 2 resembling Northern Colombia-Nechí Ecoregions and SS3 containing characteristics of the North Andean Ecoregion. Good primary forest, with a high variety of plant species was encountered at all sites, although increasing epiphyte content and changing flora groups was most prominent between SS1/2 with SS3.

A total of 318 **bird** species were registered with observation and mist-netting, with a total of 811 mist-net captures of 92 species. Avifauna assemblages showed close affinities between SS1 and SS2, with SS3 being highly distinct. A total of 3 Threatened and 6 Near-Threatened species were recorded, with 11 Endemic Bird Area endemics. Notably range and/or elevation extensions for 40 species were recorded. The most notable find was a new species for science in the genus *Lipaugus*. Conservation measures in this area should be instigated as a matter of extreme urgency, especially in lowland areas to protect the Blue-knobbed Curassow *Crax alberti* and premontane areas for the new species of *Lipaugus* and many other Threatened species.

12 species of **amphibians** (9 spp.) and **reptiles** (3 spp.) were recorded, including several range extensions, and one species described as recently as 1997. With several poorly-known or unknown species on both transects, SS2 and SS3 in particular appear important areas for conservation, based on limited herpetological results. **Mammals** recorded include the first evidence of Spectacled Bear *Tremarctos ornatus* in Serranía de San Lucas, and sightings of 6 Primates (5 of which are Threatened species): Silvery-brown Bare-face Tamarin *Saguinus leucopus*, Lemurine Night Monkey *Aotus (l.) lemurinus*, White-fronted Capuchin Monkey *Cebus albifrons*, Red Howler Monkey *Alouatta seniculus*, Common Woolly Monkey *Lagothrix lagothricha* and (White-bellied?) Spider Monkey *Ateles sp. (belzebuth?)*. Jaguar *Panthera onca* was photographed in captivity.

**Conservation assessment:** The conservation situation in the north-eastern Antioquia (Central Cordillera and Serranía de San Lucas) is an ecological catastrophe. Gold-mining was rampant across the region, contaminating freshwater and endangering wildlife in even the remotest of locations. Subsequent colonisation and deforestation has been on a scale unseen in Colombia in recent years. The region suffers from local government apathy, severe political turmoil, coca and coffee production, and frequent armed conflict. Based on the difference between aerial maps in 1995 and surveys in 1999, we consider that at least 30% forest cover has been lost in Serranía de San Lucas area and surrounding lowlands; an area once considered the largest tract of forest in north-western South America.

The future plight of the endemic Blue-knobbed Curassow and other species endemic to the northern lowlands of Colombia is very bleak. And above 1000 m, only a few isolated forest patches survive. However, owing to the foresight of one farmer, Luis Angel Ramirez, 300 ha of primary premontane humid forest at 1,500 – 1,820 m. has been set aside with all forms of human intervention prohibited, despite immense social and economic pressures. This land was recently purchased by the local environmental authority, CORANTIOQUIA. It is hoped that this newly-protected region can be extended and enforced further into the highly-threatened lowland and foothill areas.

## RESUMEN EJECUTIVO

El **Proyecto EBA de Colombia '99** es una iniciativa estudiantil Anglo-Colombiana que llevó a cabo evaluaciones rápidas de la biodiversidad y de la conservación en los Andes colombianos durante julio-agosto de 1999. Esto como una continuación a la expedición "Colombia '98", nuestro equipo de cinco experimentadas personas completaron seis sitios de estudio de flora y fauna a lo largo de dos gradientes altitudinales, uno en la Cordillera Central de Colombia y otro en la Oriental.

El objeto era documentar efectiva y completamente, como fuera posible la biodiversidad de nuestras áreas en estudio, usando métodos estandarizados con el fin de coleccionar datos comparables y prestar especial atención a especies con riesgo. El trabajo de campo se concentró en aves, plantas, anfibios, reptiles y mamíferos. Un transecto de 1000 m. fue usado en cada sitio de estudio, a lo largo del cual se instalaron las redes de niebla y donde se realizaron las observaciones, además se colectó información adicional suministrada por los cazadores locales. Estas evaluaciones eran requeridas urgentemente con el fin de obtener información biológica básica, la cual es planeada para liderar la conservación de dos regiones altamente amenazadas y pobremente conocidas. Este reporte preliminar presenta los resultados y la evaluación de conservación de dos regiones investigadas en los Andes de Colombia: (i) **Serranía de los Churumbelos**, en el flanco este de la Cordillera Oriental (siete sitios de estudio, incluyendo tres localidades en 1999; 350-700-1,100-1,500-1,900-2,200-2,450 msnm) y (ii) **Nordeste de Antioquia** en la Cordillera Central (tres sitios en bosques bajos y de piedemonte; 300-800-1,550 msnm)

### 1. Serranía de los Churumbelos

Sitios de Estudio (SS) se situaron en SS 1-bosque húmedo tropical (300m); SS 2-bosque húmedo tropical/premontano (700 m); SS 3-bosque muy húmedo premontano bajo (1,100 m); SS 4-bosque muy húmedo premontano (1,450 m); SS 5-bosque húmedo montano bajo (1,900m); SS 6-bosque montano bajo de niebla (2,200m); SS 7-bosque de neblina (2,450 m). Las tres elevaciones superiores fueron estudiadas este año para completar el análisis altitudinal de los hábitats y la biota asociada desde la Amazonía a través del piedemonte hasta el bosque montano en el costado este de la Cordillera Oriental, Colombia. Un total de 45 días de campo con 324 persona-día de esfuerzo empleado en los dos años.

Descripciones **botánicas** detalladas de cada sitio fueron completadas. De SS 3 a SS 7 se encontró que correspondían más cercanamente a la caracterización del Norte de los Andes, con SS 1 y SS 2 caracterizando la Ecoregión de la Amazonia del Norte. Varias especies nuevas fueron descubiertas (i.e. Gesneriaceae, Piperaceae, etc.). Al aumentar la elevación se presentó una disminución en la altura del dosel promedio (30 a 10 m) y se incrementó la abundancia y diversidad de epífitas. Una alta diversidad de plantas en bosque primario fue encontrada en todos los sitios.

Empleando observaciones y captura con redes de niebla, un total de 421 especies de **aves** fueron registradas en la Serranía de los Churumbelos, incluyendo una adición de 93 especies con respecto a 1998. Un total de 2,834 capturas (1,057 en 1999) fueron realizadas de 229 especies durante 142,730 horas-red-metro. Un total de dos especies amenazadas y diez casi amenazadas fueron registradas, con cinco especies del área de endemismo de aves (EBA) de los Andes Orientales de Ecuador -Perú (SS2 - SS4) y cuatro especies del EBA de las laderas interandinas de Colombia (SS5 - SS7) fueron registradas. Se estima que el probable inventario total de las especies de aves excedería las 550 especies: una excepcional diversidad, la cual hace de la Serranía un "hotspot" ornitológico global de extrema importancia para la conservación de la diversidad aviar.

Cuerenta y seis especies de **anfibios** (30 spp.) y **reptiles** (16 spp) fueron registrados en 1998 y 1999. Muchas especies pobremente conocidas fueron registradas, incluyendo algunas significativas extensiones de rango de distribución (incluyendo dos especies nuevas para Colombia) y algunos individuos no identificados a la fecha, los cuales pueden estar relacionados a especies no descritas. Algunos **Mamíferos** registrados incluyen al Oso de Anteojos *Tremarctos ornatus* y el Tapir de montaña *Tapirus pinchaque*.

Nuestra evaluación de Conservación presta especial atención a muchas justificaciones biológicas y a la urgente y crítica acción de conservación que en la Serranía de los Churumbelos se requiere implementar, ya que proyectos de construcción de vías y colonización incontrolada están amenazando la región La Serranía de los Churumbelos alberga una inmensa variedad de ecosistemas con una compleja topografía y variaciones climáticas variables. La cual influye en el mantenimiento de una alta biodiversidad. Las directas justificaciones biológicas para la implementación de la conservación son numerosas. El costado este de los Andes ha sido sujeto de gran presión por las poblaciones humanas y asociada degradación de hábitat en años recientes, pero afortunadamente las montañas de los Churumbelos han escapado, en gran parte, al impacto catastrófico humano, que otras regiones han sufrido. Sin embargo, las amenazas asociadas a la recientemente terminada vía Mocoa-Bogotá, el proyecto

Puerto Asis-Florencia, y el reciente descubrimiento y explotación de petróleo y metales preciosos, llevarán a una invasión humana en escala, a una explotación y deforestación.

El proyecto EBA de Colombia 99 y Colombia '98 demostrarán la gran importancia de conservación, y las amenazas que se ejercen, en la Serranía de los Churumbelos. Nuestras conclusiones soportan fuertemente la idea de protección legal. Es importante incorporar el gradiente altitudinal entero desde las tierras bajas hasta el bosque nublado, maximizando la diversidad de cualquier área protegida. Tal vez la medida de protección más factible sería la formación de un Parque Regional Natural administrado por la CRC. Otro plan propuesto por las autoridades ambientales colombianas del sistema de parques nacionales, es la de continuar nuestro trabajo, lo cual incluye una extensión del Parque Nacional Natural Cueva de los Guácharos hacia los Churumbelos. La tercera fase del proyecto está ahora siendo implementada para desarrollar una estrategia de conservación para la totalidad de la Serranía, involucrando la CRC, los miembros de la expedición, las autoridades de Parques y las comunidades locales. El reporte final especificará una estrategia de conservación para futuras investigaciones y protección de la Serranía de los Churumbelos.

## 2. Nordeste Antioqueño

En el costado noreste de la Cordillera Central y en el valle medio del río Magdalena, se estudiaron tres sitios: SS 1 - bosque húmedo tropical (300 m); SS 2 - bosque húmedo tropical/premontano (800 m); y SS 3 - bosque húmedo premontano (1,550 m). Un total de 14 días de trabajo de campo con 70 días-persona de esfuerzo en agosto de 1999. Detalladas descripciones **botánicas** de cada sitio fueron completadas, con SS 1 y SS 2, pertenecientes a la Ecoregión de Nechí-Colombia y SS 3, con características de la Ecoregión del Norte de los Andes. Buen bosque primario, con una alta variedad de especies de plantas fue encontrado en todos los sitios, aunque el incremento del epifitismo y el cambio en la composición de flora fue más prominente entre los SS 1/2 y SS 3.

Un total de 318 especies de **aves** fueron registradas con observaciones y captura con redes de niebla con un total de 811 capturas de 92 especies. El ensamble de la avifauna mostró gran afinidad entre SS 1 y SS 2; el SS 3 fue altamente distintivo. Un total de 3 especies amenazadas y 6 casi amenazadas fueron registradas, con 11 endémicos. Además notables extensiones altitudinales o de rango de distribución fueron reportadas para 40 especies. El más notable hecho fue el descubrimiento de una nueva especie para la ciencia del género *Lipaugus*. Medidas de conservación en esta área deben ser tratadas como un asunto de extrema urgencia, especialmente en tierras bajas para proteger al Paujil de Pico Azul *Crax alberti*, y el bosque subandino para la nueva especie. Doce especies de **anfibios** (9 spp.) y **reptiles** (3 spp.) fueron registrados, incluyendo algunas extensiones de rango y una especie descrita recientemente en 1997. Con algunas especies pobremente conocidas o desconocidas en ambos transectos, SS 2 y SS 3 en particular son importantes áreas para la conservación, basados en resultados herpetológicos limitados. Los **mamíferos** registrados incluye la primera evidencia del Oso de Anteojos *Tremarctos ornatus* en la Serranía de San Lucas. Y observaciones de 6 especies de primates (5 de los cuales están amenazados): Tití maicero *Saguinus leucopus*, Marmosa *Aotus cf. lemurinus*, Mono maicero *Cebus albifrons*, Mono aullador *Alouatta seniculus*, Mono cariblanco *Lagothrix lagothricha*, Mono araña *Ateles sp.* El Jaguar *Panthera onca* fue fotografiado en cautiverio.

**Evaluación de la Conservación:** La situación de conservación en el noreste de Antioquia (Cordillera Central y Serranía de San Lucas) es una catástrofe ecológica. La minería del oro es agresiva en toda la región, contaminando las aguas y poniendo en peligro la vida silvestre aún en localidades remotas. La colonización subsecuente y la deforestación se han presentado en una escala no vista en Colombia en recientes años. La región sufre de la apatía del gobierno, severa coyuntura política, cultivos extensivos de café y coca, y frecuentes combates armados. Basados en la diferencia entre los mapas aéreos de 1995 y la evaluación de 1999, consideramos que se ha perdido al menos el 30 % de la cobertura boscosa de la Serranía de San Lucas y áreas adyacentes, un área considerada como el parche de bosque más grande de noroeste de Suramérica.

El incierto futuro de el endémico paujil de pico azul y otras endémicas de las tierras bajas del norte de Colombia es muy oscuro. Además por encima de 1000 m., sólo pocos parches de bosque permanecen. Sin embargo, debido a la visión de un campesino, Luis Angel Ramírez, se han conservado 300 ha de bosque húmedo premontano primario, entre 1500- 1820 msnm, donde se ha prohibido todas las formas de intervención humana, a pesar de las inmensas presiones económicas y sociales. Esta finca fue recientemente comprada por la autoridad ambiental local CORANTIOQUIA. Se espera que esta región, recientemente protegida, pueda ser extendida y fortalecida entre las áreas de piedemonte y de tierras bajas, altamente amenazadas.

## SPONSORS AND ACKNOWLEDGEMENTS

We are extremely grateful for all the advice, hospitality and encouragement from the many individuals and organisations who made the expedition successful throughout its various stages.

### Institutional Support

Colombian EBA Project was approved by the **Cambridge Expeditions Committee**, and took place under the Cambridge University Expedition Society (CUEx) as a registered charity (No. 311460). We were supported in Colombia by **Instituto de Ciencias Naturales (ICN)**, **Universidad Nacional de Colombia** in Bogotá, the country's leading zoology department. Many thanks especially to Prof. M. Gonzalo Andrade, Prof. F. Gary Stiles and Dr. John Lynch for their support and help to the project. **Proyecto Ognorhynchus**, the Yellow-eared Parrot conservation project, assisted and supported the project, with field equipment loaned and methodological support.

In Serranía de los Churumbelos our research was made possible by: **Museo de Historia Natural, Universidad de Cauca**, with thanks to Dra. Patricia Torres; **Corporación Autónoma Regional del Cauca (CRC)**, the regional governmental environmental agency, has been extremely supportive of EBA, with special thanks to Luis Alfonso Ortega for his help at all stages of the project, especially in organising permissions.

In Antioquia our research was made possible through **Corporación Autónoma Regional de Antioquia (CORANTIOQUIA)**. Additional support was received by UMATAs, especially from Silvia and Jairo of the Alcaldías of Anori and El Bagre, and the communities of Anori, El Bagre, Puerto Lopez and many others.

### Sponsors

We are very grateful to the many organisations, and individuals who, through their generosity have made the expedition possible. The following gave generous financial support: Royal Geographical Society, World Pheasant Association, Cambridge Expeditions Fund with AJ Burton Charitable Trust, PD Lindeth Charitable Trust, Albert Reckitt Charitable Trust, People's Trust for Endangered Species, AS Butler Charitable Trust, The Percy Sladen Memorial Fund, British Ornithologists' Union, and the Duke of Edinburgh Royal Soc. of St. George Award, with additional personal contributions.

### Technical and Logistical Support

Thanks also are especially due to the following people: To Dr. Mark Mulligan (King's College, London); Luis Alfonso Ortega (CRC); Dr. Susan Bayly and Dr. Andrew Bainham (Christ's College, Cambridge University); and David Wege (BirdLife International) for producing Referees' Statements and other organisational help. To Richard Wilson (Christ's College, Cambridge University) for acting as nominate expedition secretary. To Emmet Donegan for organising funds transfers from the UK to Colombia. To Jules Jones (St. Catherine's College, Cambridge University) for assistance towards CEC support. To Prof. F. Gary Stiles for giving a two-day pre-expedition fieldwork training course. To Dr. John Lynch for identifying the herpetological collection. The following people assisted with advice, technical or logistical support: Dr. Dan Brooks (Cracid Specialist Group); Javier Bustos (UniValle); Luis Mazariegos; Jimena Puyana; and Walter H. Weber (Sociedad Antioqueña de Ornitología). Thanks to Caracol journalists in Pitalito for producing Radio and TV programmes about the project. Thanks to our Patron, David Bellamy, for raising the profile of the expedition. Many thanks are due members of the Colombia '98 team who collected data at 350 – 1450 m. This is presented here in some instances for reasons of completeness.

Special and most sincere thanks goes to the local people of our study areas, for their warmth, generosity and their support of our work. In particular, the guides who worked with us in the field were exceptional: great cooks, hard-working and very good company: Ariel and Mariano in Serranía de los Churumbelos; Don Roger in Apollo 13; Don Ignacio and Don Pedro in Alto los Tarros; Bernardo in Alto Combate. We could not have completed the project without them. Finally, Don Gustavo in the Churumbelos helped with logistics and allowed us to work on his land.

### Abbreviations

<b>EBA</b>	Endemic Bird Area (Stattersfield <i>et al.</i> 1997)		
<b>m</b>	metres;	<b>km</b>	kilometre
<b>sp.</b>	species (spp. in plural form)	<b>SS</b>	Study Site (sitio de estudio)

## INTRODUCTION

Paul Salaman and Thomas Donegan

### Physical Geography

Colombia lies in the northwest corner of South America at the base of the Central American isthmus. It stretches from the Caribbean Sea to the Río Amazon and from the Río Orinoco to the Pacific Ocean, covering 1,141,748 km<sup>2</sup>. The western half of the country encompasses the northern Andean mountain chain, featuring the most complex topography in South America. This topography supports an extremely wide variety of ecosystems and high levels of endemism localised to specific parts of the country. Colombia contains a large proportion of the planet's biodiversity, including 20% of all bird species, in what is just 0.77% of the Earth's land surface (Gentry 1993).

### Serranía de los Churumbelos

The Serranía de los Churumbelos is situated where Colombia's two greatest mountain ranges, the Cordilleras Central and Oriental, collide. The Cordillera Oriental extends from Serranía de Perijá (10°30'N) to just east of Mocoa (1°09'N; 6°37'W), with an average ridgeline of 2,500 m, and is the widest of the three Andean cordilleras that characterise Colombia. At about 1°32'N 76°14'W the Cordillera Oriental divides. The main ridge, Picos Fragua, links up to the Cordillera Central and forms the headwaters to the Río Magdalena. A second range spurs southwards and abruptly ends at the Río Caquetá, to form the Serranía de los Churumbelos. This range is 60 km long, 25-30 km wide at the base and rising to around 3,000 m, with an average ridgeline of 1,500 m. The East slope of this main Andean range in Colombia forms a 190 km-long "wall" to the Ecuadorian frontier, with an average 2,000 m sharp descent from the High Andes into the Amazonian basin.

Serranía de los Churumbelos is located entirely in the Department of Cauca, southern Colombia and was biologically unknown until the Colombia '98 expedition. The Churumbelos are characterised by their distinctive geology - a large anticline with a north-east to south-west axis, formed by various sedimentary rocks, principally limestone, conglomerates and shales, together with igneous intrusions and associated fringe metamorphic rocks. The resultant topography is spectacular, with rivers eroding along the weak points of the anticline axis to form steep linear drainage patterns, with the Río Fragua and Río Mandiyaco flowing from north to south. However, the most distinctive features are erosional remnants of limestone that form large flat "mesetas" or Table Mountains. Unlike most tabletop mountains, they have deep organic and underlying clay soils and a dense forest covering. The mesetas are surrounded by 50-200 m sheer cliffs overshadowing steep slopes, intersected by streams and scarred by numerous landslides of up to 400 metres length.

The western flank of the Churumbelos gently shelves into the Río Mandiyaco and Río Villalobos, where a sharp spine called Serranía de Otún rises, parallel to los Churumbelos. The eastern flank abruptly rises out of the vast flat Amazonian plain at 300 metres altitude and steeply climbs to almost 3,000 metres. This ridge receives high levels of rainfall from vast Amazonian convectional cloud formations. These cloud formations have formed steep valleys, which drop straight into the Amazonian plains, producing large alluvial fans at their bases. Extensive aerial photographs and video footage were taken of the southern half of the Serranía during a helicopter flight sponsored by Argosy International in 1998.

**Vegetation:** The Serranía de los Churumbelos encompasses several major vegetation zones rising from 250 m to c.2,800 m with various influences from the Amazon and Andes. These zones correspond closely to the prevailing climate and altitude change. The local conditions (temperature, humidity, and rainfall) vary considerably over the Serranía, but the principal life zones in the region are:

- Tropical Lowland humid forest (ca.3,000 mm rainfall/year, Amazonian lowlands at 250 m to ca.900 m)
  - Tropical Premontane (subtropical) humid forest (ca.4,000 mm rainfall/year, ca.900-1,800 m)
  - Tropical Montane humid [cloud] forest (>3,000 mm rainfall/year, ca.1,800 m-2,800 m)
- In additional, with detailed rainfall information, there is probably a localised narrow belt of;
- Foothill pluvial forest (>4,000 mm rainfall/year, foothills; ca.500-700 m)

The most important forest ecosystems in the Serranía are Tropical Montane Cloud Forests (TMCF), which occur over a relatively narrow altitudinal zone. Whilst TMCF normally occurs above 2,000 m in the Andes, insular mountains such as Serranía de los Churumbelos, have an atmospheric environment characterised by persistent cloud cover at the vegetation level to as low as 1,200 m, and very high levels of biodiversity.

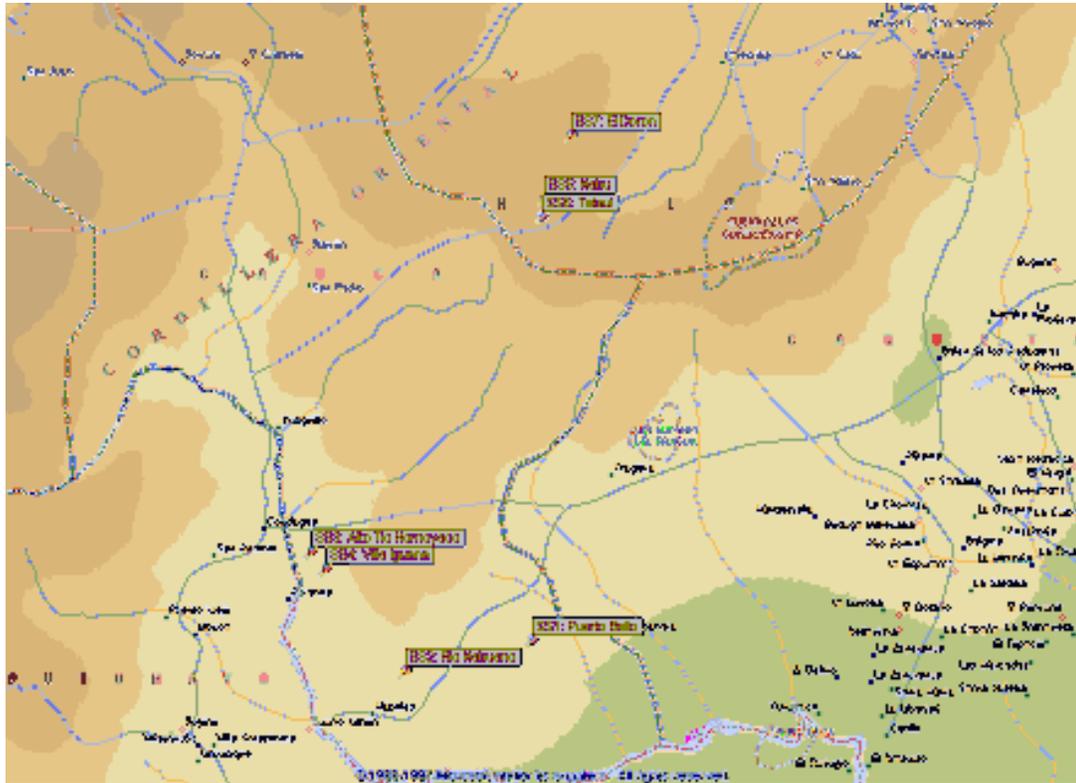


Figure 1: Map of central Colombia with Cauca and Antioquia biodiversity study transects marked.



Figure 2: Northeast Antioquia showing 3 study sites in north-eastern Cordillera central

Figure 3: Bota Caucana, eastern Cauca and southern Huila Departments showing 7 study sites.



### Northeast Antioquia

The Central Cordillera of Colombia is a 650 km-long mountain range that spurs northwards from the bifurcation of the northern Andes at the Macizo Colombiano - Serranía de los Churumbelos - at 2°N. The Central Cordillera's diverse topography, broad altitudinal span and great climatic variations support a wide variety of ecosystems and associated high levels of endemism. Topographical and ecological isolation from other Andean ranges by the arid Cauca and Magdalena river valleys, which flank the Cordillera, has accentuated local endemism. Above 1000 m asl, the c.41,000 km<sup>2</sup> Central Cordillera supports 29 Endemic Bird Area species: one of the greatest concentrations of montane range-restricted bird species in the world.

The Central Cordillera's rich volcanic soils and mild climate have attracted human colonisation and exploitation for many centuries. Farming of Colombia's most important economic commodity, coffee, is based on the subtropical slopes of the Central Cordillera. Today, this supports the greatest population concentration in the country, including major cities such as Medellín, Ibagué, Pereira and Armenia. During the past century, relatively good infrastructure has encouraged many bird collectors to explore the Central Cordillera. Whilst our avifaunal knowledge of the Central Cordillera is relatively good compared to e.g. the eastern slope of the Andes (Salaman *et al.* in prep.), the Central Cordillera has demonstrated its ability to reveal new species for science in all taxa, even within recent years.

Sixteen of the Cordillera's 29 range-restricted bird species are considered globally threatened (Stattersfield *et al.* 1997) - a stunning proportion that gives much alarm for ornithological conservation. The plight of these species is directly reflected in the continued severe landscape modification and lack of protected areas in the region. Furthermore, most of the few protected areas in the Central Cordillera are situated on the highest massifs dominated by páramo and snow-capped peaks (e.g. Parque Nacional Los Nevados), thus the subtropical forests remain at considerable risk. Less than 10% of original forest cover in the Central Cordillera remains (Henderson *et al.* 1997), but we estimate this figure to be closer to 4% at 1000-2000 m elevations.

For a long time, Northeastern Antioquia has been heavily colonised by gold-miners and subsequently agriculturists, particularly coffee-growers and cattle-ranchers. Above 1000 m asl, the region is almost completely deforested, with just a few isolated forest patches surviving. However, owing to the dedication and foresight of one local farmer, Luis Angel Ramirez, 300 ha of primary forest has been set aside with all forms of human intervention prohibited, despite immense social and economic pressures. This unaltered forest fragment, called

La Forzosa, encompasses pristine upper premontane humid forest (1500-1820 m asl) within the watershed of the Quebrada La Soledad. This pristine forest fragment, where SS3 was situated, has very recently been purchased by the local environmental authority, CORANTIOQUIA, following previous work by AC, JO *et al* (Cuervo *et al.* 1999). CORANTIOQUIA are considering plans to protect further forested areas in the region, possibly extending downslope.

## Study sites

### Serranía de los Churumbelos

A small expedition team in 1999 was essential in overcoming complex logistical problems in the Serranía de los Churumbelos highlands. Whilst aerial photographs and LANDSAT maps had assisted our site allocation, terrain and vegetation meant that enormous efforts were necessary to cut trails to new Study Sites.

All seven study sites were within one continuous tract of primary forest on the eastern and southern slope of the mountain range. Forest classification follows Holdridge (1967). Note SS1-4 were studied in 1998 by 'Colombia '98' team members. Details of biological results from these sites are found in Salaman and Donegan (eds.) (1998).

**SS1: Puerto Bello** (14-21 July 1998), Municipality of Piamonte, Dpto. Cauca (01°08'14"N, 76°16'55" W; 350 m); Tropical Lowland humid forest (c.3,000 mm rainfall/year) situated in the westernmost Amazonian lowlands and the base of the Churumbelos foothills. A new road had been constructed to the village of Puerto Bello in the last five years and deforestation was evident along the roadside. Our 1,200 m transect extended from the forest edge through a transition from tall, selectively logged forest to primary forest with a canopy at c. 30 m.

**SS2: Río Nabueno** (24-30 July 1998), Municipality of Piamonte, Dpto. Cauca (01°06'48" N, 76°24'86"W; 700 m). An extensive tract of primary Tropical Lower Premontane (subtropical) humid forest (c.4000 mm rainfall/year) on a steep eastern flank of Serranía de los Churumbelos was studied. The transect was an old hunters' trail from Río Nabueno and which climbed steeply to a flat ridgetop in the Churumbelos. The site was pristine primary forest, with vegetation strongly influenced by the high rainfall and steep terrain with ridgetop effects, with a relatively low canopy (c. 20 m) and dense understorey.

**SS3: Alto Río Hornoyaco** (3-9 August 1998), Municipality of Santa Rosa, Dpto. Cauca (01°13'59"N, 76°31'58"W; 1,100 m); Tropical Premontane very humid forest (c.>4,000 mm rainfall/year). The southern base of Serranía de los Churumbelos rises steeply from the Caquetá valley and is heavily dissected by several southward flowing streams, including the Río Hornoyaco. A 700 m transect ran through 400 m of primary forest on steep slopes, then into dense young secondary forest (3-5 years growth) up to a 4 ha pasture clearing. This forest was similar in floristic composition and stratifications to montane forest.

**SS4: Villa Iguaña** (11-17 August 1998), Municipality of Santa Rosa, Dpto. Cauca (01°14'18"N, 76°31'11"W; 1,450 m); Tropical Lower Montane humid [cloud] forest (c.3,000 mm rainfall/year). Our transect extended 800m over a plateau between two table mountains (mesetas), and brief surveys of Alto Cagadero meseta at 1,600 m were also undertaken. The forest at this site is remarkable in containing many elements characteristic of a forest over 600 m higher in altitude, having a high abundance and diversity of vascular epiphytes, bryophytes and a low canopy (c.12 m).

**SS5: Nabú** (4-9 July 1999), Finca Playon, Vereda La Petrolera, Municipality of Santa Rosa, Dpto. Cauca (01°36'N, 76°16'W; 1,900 m); Tropical Lower Montane humid forest (c.2,500 mm rainfall/year). The northwestern flank of the Serranía de los Churumbelos is flanked by the Río Villalobos and Mocoa-Pitalito highway. From La Petrolera at Km 90 along the Mocoa-Pitalito road, a trail crosses the Río Villalobos and provides access to the northwestern edge of the Serranía. Our transect extended 800 m along a ridge of primary forest, characterised by a dense understorey, dense arboreal epiphytes, and a canopy of c.20-25 m dominated by white oak (*Quercus* spp.).

**SS6: Tatauí** (10-14 July 1999), Finca Playon, Vereda La Petrolera, Municipality of Santa Rosa, Dpto. Cauca (01°37'N, 76°16'W; 2,200 m); Tropical Montane cloud forest (c.2,500 mm rainfall/year). Ascending 2 km above SS5, a 600 m transect along a flat ridgeline was studied. The sites dense low understorey (c.3 m high) was dominated by terrestrial bromeliads and *Sphagnum* spp. mosses and a canopy level of c.7 m, is a stunted forest physiognomy, similar to treeline elfin forest, and influenced by perpetual mists and strong lateral winds.

**SS7: El Dorón** (16-20 July 1999), El Cable telecom station, Municipality of Santa Rosa, Dpto. Cauca (01°40'N, 76°14'W; 2450 m); Tropical Upper Montane humid [cloud] forest (c.2,000 mm rainfall/year). SS7 was located above two telecommunication towers at Km 100 along the Mocoa-Pitalito road on the Cauca / Huila department border, where a ridge formed the watershed of the Río Villalobos and tributaries of the Río Magdalena. Our transect ran from an abandoned military installation clearing through primary forest with some selective logging and clearings made by soldiers. The forest physiognomy was dominated by stunted white oak (*Quercus* spp.) to c.15 m with large canopy epiphyte burdens, and an understorey dominated by flowering Ericaceae, epiphytes and bushes.

### Expedition translocation justification

Whilst good forest was surveyed at SS7, the continued ascent of the Churumbelos was suspended to security situation deterioration. As stated in our proposal, the EBA team intended to conduct fieldwork in Serranía de los Churumbelos, with four to five additional Study Sites. However, after a deterioration in the security situation, including cessation of all transportation and a prolonged major guerrilla-military battle (c.10 km from our study site) (see *El Tiempo* newspaper from 18-22 July), the volatile situation dictated that we withdrew from the zone. This decision was made less difficult given that almost all of our biological objectives had been successfully achieved. However, with funds, time and equipment in place, we decided to mount further studies.

As the Evaluation of Biodiversity in the Andes (EBA) Project, we looked for a further site within our aims: unprotected, poorly-known and with high threat levels. The Northeastern Antioquia site was chosen following suggestions of AC and JO, who had previously conducted work in the region and recorded an astonishing number of rare and Threatened species. CORANTIOQUIA were considering extending the recently-established protected zone there, thus a rapid biodiversity assessment by the EBA team could help speed up this process.

### Northeast Antioquia Transect

**SS1: Apollo 13** (3-8 August 1999), Finca La Esperanza, Vereda Río Bagre, Municipality of Segovia, Dpto. Antioquia (7°21'14" N; 74°40'95" W; 300 m). Lowland humid forest (c.2,000 mm rainfall/year) located south-east of the gold-mining commune of Puerto Lopez. Despite extensive recent forest clearance for agriculture and gold mining, ridge and steep slopes generally still contain remnants of primary forest, although this is selective logged and intensive hunted for food. A lowland forest patch (c.1500 m x 500 m) straddling three ridges about a low peak (base camp), formed the basis of our transect. The forest core was in good condition with minimal selective logging, and several trees with DBH of >10 m. The canopy was c.35 m with emergents to c. 40 m, high subcanopy and understorey to c.5 m. The understorey was sparsely vegetated, although characterised by dense *Heliconia* spp. thickets and spiny palm clusters, whilst there was a low abundance and diversity of epiphytes. Considerable tree fruiting activity was noted.

**SS2: Alto de los Tarros** (20-24 August 1999), Reserva Regional Bajo Cauca-Nechí, Vereda La Tirana, Municipality of Anorí, Dpto. Antioquia (7°18'49"N; 75°05'85" W, 800 m). This site lay within an extensive forest fragment (ca. 45,000 ha) of foothill humid forest (c.3,000 mm rainfall/year), lying between the Río Anorí and Río Nechí. A little-used trail along a high ridge through primary forest in the Río Anorí watershed was used as a transect, 27 km north of Anorí and 45 km directly west of SS1. The site was strongly influenced by lowland flora and fauna as the nearest terrain below 1,000 m was c.15 km distant. The forest physiognomy is similar to SS1, although with lower vegetation strata (canopy c.30 m), more broken canopy by treefalls on steep slopes, higher epiphytes abundance and notably more woody stem plants in the understorey. The forest was much less disturbed than SS1 and within a larger forest fragment, resulting in more animal activities and forest-restricted species than SS1.

**SS3: Alto Combate** (26-29 August 1999), Reserva Regional La Forzosa, Vereda Las Ánimas, Municipality of Anorí, Dpto. Antioquia (6°59'58 N; 75°08'33 W; 1,550 m). Premontane humid forest (c.3,000 mm rainfall/year). La Forzosa encompasses 300 ha of primary premontane humid forest in the Quebrada La Soledad watershed beside the Medellín–Anorí road, 10 km south of Anorí, 37 km south of SS2 and 68 km southwest of SS1. The site has been undisturbed by logging or hunting in the past three decades. Historical evidence (>100 years) of indigenous land use at the site survives, e.g. canalised stream courses. The forest retains characteristics of primary forest, although along the transect, large trees (DBH >150 cm) are largely absent on a thick organic topsoil, suggesting historical selective logging (c. 50 years prior) without complete clearance. A 300 m transect was cut ascending a ridge through dense understorey, while surveys were also conducted along the Quebrada La Soledad. Upper slope and ridgetop forest was extraordinary, reminiscent of timberline forest, being stunted and gnarled (similar to Churumbelos SS6) with a canopy height from 5-8 m, and terrestrial and arboreal epiphytes abundant, especially mosses, lichens and bromeliads, probably influenced by strong lateral winds. Vegetation on the lower slopes and valleys were typical of forest at 1500 m., with a canopy to 15-20 m and a moderately dense understorey composed of woody stem bushes and sparse herbaceous cover, with a moderate abundance of arboreal epiphytes.

### Expedition Field Itinerary

#### Serranía de los Churumbelos

July 1st	Expedition group meets in Pitalito, Dept. Huila. Preparations take place.
July 3rd	Depart Pitalito (1 hour bus ride and 2 hour trek) and arrive at SS5.
July 4 <sup>th</sup>	<b>Fieldwork at SS5: Nabú</b> , Municipality of Santa Rosa, Dpto. Cauca ( <b>6 days</b> )
July 9 <sup>th</sup>	Packed camp and moved to SS 2 (2 hour trek). Set up camp at SS6.
July 10 <sup>th</sup>	<b>Fieldwork at SS6: Tatauí</b> , Municipality of Santa Rosa, Dpto. Cauca ( <b>5 days</b> )
July 14 <sup>th</sup>	Packed camp and returned to Pitalito for supplies

July 15 <sup>th</sup>	Depart Pitalito (1 hour bus ride) and arrive at SS7.
<b>July 16<sup>th</sup></b>	<b>Fieldwork at SS7: El Dorón</b> , Municipality of Santa Rosa, Dpto. Cauca ( <b>5 days</b> )
July 20 <sup>th</sup>	Packed camp and returned to Pitalito after guerrilla-military battle escalates.
July 21 <sup>st</sup>	Regional TV and radio interviews with team members about project
July 22 <sup>nd</sup>	Depart for Bogota (PS) to deposit specimens and Medellín, Antioquia (TD, CG, AC).
<b>Northeast Antioquia, northern Cordillera central</b>	
July 23 <sup>rd</sup> -27 <sup>th</sup>	Preparing expedition and obtaining permission from CORANTIOQUIA
July 28 <sup>th</sup>	Depart Medellín for Cauca (6 hours taxi) and El Bagre (5 hours boat)
July 30 <sup>th</sup>	Depart El Bagre with community and political permission. Arrive in Puerto Lopez.
August 2 <sup>nd</sup>	Depart Puerto Lopez with community permission for SS1 (7 hour trek)
<b>August 3<sup>rd</sup></b>	<b>Fieldwork at SS1: Apollo 13</b> , Municipality of Segovia ( <b>5 days</b> )
August 8 <sup>th</sup>	Packed camp and returned to El Bagre
August 11 <sup>th</sup>	Departed El Bagre (by boat and taxi).
August 12 <sup>th</sup>	Arrived back in Medellín via Cauca. Preparation for Municipio Anori study.
August 16 <sup>th</sup>	AC and JO arrived in Anori to prepare logistics and permission.
August 18 <sup>th</sup>	TD, CG, PS arrive and entire team departs Anori for Verada La Tirana (10 hours trek)
August 19 <sup>th</sup>	Depart Verada La Tirana for Alto de los Tarros (3 hours trek). Set up camp at SS2.
<b>August 20<sup>th</sup></b>	<b>Fieldwork at SS2: Alto de los Tarros</b> , Municipio Anori ( <b>5 days</b> )
August 24 <sup>th</sup>	Packed camp (p.m.) and departed for Verada La Tirana.
August 25 <sup>th</sup>	Depart Verada La Tirana for Anori (11 hours trek).
August 25 <sup>th</sup>	Depart Anori for Alto Combate (2 hour trek). Set up camp at SS3.
<b>August 26<sup>th</sup></b>	<b>Fieldwork at SS3: Alto Combate</b> , Municipality of Anori ( <b>4 days</b> )
August 29 <sup>th</sup>	Depart SS3 (midday) and return to Medellín.
September 1st	Finished expedition.

## Location of sites and fieldwork effort

**Table 1:** Summary of location and field effort at each study site in Serranía de los Churumbelos, Cauca, 1998-1999. (Note SS1-4 at Serranía de los Churumbelos completed in 1998 by the Colombia '98 Expedition.)

Location	Days at site	Person-days	Co-ordinates	Altitude	Forest type
<b>SS 1: Puerto Bello</b>	8	<b>108</b>	01° 08' 14 N 76° 16' 55 W	<b>350 m</b>	Lowland humid forest
<b>SS2: Río Nabueno</b>	7	<b>88</b>	01° 06' 48 N 76° 24' 86 W	<b>700 m</b>	Foothill humid forest
<b>SS3: Alto Río Hornoyaco</b>	7	<b>71</b>	01° 13' 59 N 76° 31' 58 W	<b>1,100 m</b>	Premontane very humid forest
<b>SS4: Villa Iguana</b>	7	<b>77</b>	01° 14' 18 N 76° 31' 11 W	<b>1,450 m</b>	Upper Premontane humid [cloud] forest
<b>SS5: Nabú</b>	6	<b>20</b>	1° 36' 71N 76° 16' 23 W	<b>1,900 m</b>	Lower Montane humid forest
<b>SS6: Tatauí</b>	5	<b>20</b>	1° 36' 892 N 76° 15' 91 W	<b>2,200 m</b>	Montane cloud forest
<b>SS7: El Dorón</b>	5	<b>20</b>	1° 40' 41 N 76° 14' 21 W	<b>2,450 m</b>	Upper montane cloud forest

**Table 2:** Summary of location and field effort at each study site in northeast Antioquia, Cordillera Central, 1999.

Location	Days at site	Person-days	Co-ordinates	Altitude	Forest type
<b>SS 1: Apollo 13</b>	5	<b>25</b>	7° 21' 14 N 74° 40' 95 W	<b>300 m</b>	Lowland humid forest
<b>SS2: Alto los Tarros</b>	5	<b>25</b>	7° 18' 49 N 75° 05' 85 W	<b>800 m</b>	Foothill humid forest
<b>SS3: Alto Combate</b>	4	<b>20</b>	6° 59' 58 N 75° 08' 33 W	<b>1,550 m</b>	Premontane humid forest

## RAPID BIODIVERSITY ASSESSMENT

### Plants ~ Botánica

Carlos Eduardo Gonzales Orozco

#### Summary

The botanical fieldwork involved two complimentary methods: firstly, work along a linear transect in order to characterise the vegetation-type of each site; secondly, non-systematic collection of interesting plant species to supplement those found along the transect, concentrating on Gesneriaceae. From both sites, probable new species have been discovered in this family. However, identification to species or genus level has not been completed for most of the collection. Detailed descriptions of each site are presented below, with a list of families encountered. Good primary forest was encountered in all study sites, ideal for conservation.

#### Metodología

El método utilizado fué de transecto linear (Gentry 1993), que permite realizar un análisis estructural del Bosque; además, mediante colecta al azar se conoció la diversidad florística. La caracterización ecológica se basó en el tipo de bosque observado, se presentaron bosques secundarios, primarios que posteriormente fueron entresacados y primarios.

#### Resultados

Las estaciones estudiadas fueron respectivamente:

##### Serranía de los Churumbelos

###### SS 1: Puerto Bello, 350 m, Bosque Húmedo ~ Lowland humid forest

Bosque sobre relieve ondulado, se observan algunas laderas contiguas al lugar de trabajo que van de 30 a 40 % de pendiente. Vegetación con árboles emergentes de 35 m y el dosél aproximadamente a 30 m, alta cantidad de lianas, estrato arbustivo con juveniles de hasta 3-4 metros y baja presencia del estrato herbáceo. Por condiciones ambientales corresponde a la zona de vida Bosque Húmedo tropical bh-T (Holdridge 1967), la humedad es media-alta, epifitismo bajo y cantidad de luz media-baja. Bio-geográficamente la estación es considerada como piedemonte amazónico por características estructurales típicas del bosque, como las anteriormente descritas.

Las familias botánicas más representativas fueron: Lecythidaceae, Moraceae, Myristicaceae, Sapindaceae, Sapotaceae, Rubiaceae y las de menor representación son Lauraceae, Guttiferae, Papilionaceae, Caesalpinaceae, Mimosaceae, Piperaceae, Gesneriaceae, Melastomataceae, Lauraceae, Olacaceae, Passifloraceae, Myrsinaceae, Convolvulaceae, Eriocaulaceae, Loranthaceae, Flacourtiaceae, Anacardiaceae, Araliaceae, Palmae, Burseraceae, Bombacaceae, Sabiaceae, Myrtaceae, Boraginaceae, Monimiaceae, Bromeliaceae, etc. Algunas especies de Cedrela sp y Guarea sp son las de mayor presión antrópica por la excelente calidad de su madera y fácil comercio.

###### SS 2: Río Nabueno, 700 m, Bosque húmedo Premontano ~ Lower Premontane humid forest

El paisaje está dominado por relieve quebrado con escarpes que van de 25 a 35 % de pendiente, algunos lugares con planicies cortas. Vegetación bien conservada, árboles emergentes a 25 m y el dosél se mantiene a 20 m, la cantidad de lianas es media en relación a la estación uno. El estrato arbustivo con diámetros dominantes de 10 cm, árboles de gran envergadura están en mediana cantidad, el epifitismo es medio-bajo. Existe buena cantidad de arbustos, hierbas, helechos y algunas orquídeas. El bosque presenta una baja presión antrópica debido a la difícil acceso de la zona de trabajo.

Las principales familias presentes fueron: Lauraceae, Melastomataceae, Piperaceae, Rubiaceae y las de menor representatividad son Acanthaceae, Annonaceae, Apocynaceae, Araceae, Araliaceae, Burseraceae, Bromeliaceae, Campanulaceae, Cecropiaceae, Ericaceae, Gesneriaceae, Guttiferae, Lauraceae, Meliaceae, Mimosaceae, Monimiaceae, Myrtaceae, Myrsinaceae, Olacaceae, Orchidaceae, Palmae, Passifloraceae, Rutaceae, Sapindaceae, Vochysiaceae etc.

###### SS 3: Alto Río Hornoyaco, 1,100 m, Bosque muy húmedo Premontano ~ Premontane very humid forest

La vegetación está caracterizada por 3 estratos, árboles emergentes a 20 m y el dosél a 18 m aproximadamente, predominan árboles de mediana envergadura, epifitismo medio-alto debido a que se presenta constantemente la influencia de la lluvia horizontal lo cual ayuda a mantener esta característica, disminuye notablemente la presencia de las lianas. Aparecen individuos como Weimmania sp y Hedyosmum sp indicando la presencia de

un Bosque Andino, posiblemente bosque muy humedo Premontano bmh-Pm (Holdridge 1967) también se presenta un incremento en la cantidad de individuos de Orquídeas y Helechos, la luminosidad es media. Dominancia de árboles con diámetros más delgados y una buena conservación del ecosistema.

Las familias de mayor predominio son Guttiferae, Lauraceae, Moraceae, Rubiaceae, Sapindaceae y las de menor representatividad son Acanthaceae, Anacardiaceae, Annonaceae, Apocynaceae, Araliaceae, Araceae, Begoniaceae, Boraginaceae, Burseraceae, Campanulaceae, Cecropiaceae, Elaeocarpaceae, Euphorbiaceae, Ericaceae, Flacourtiaceae, Gesneriaceae, Hippocastanaceae, Leguminosae, Loranthaceae, Maranthaceae, Melastomataceae, Meliaceae, Myristicaceae, Myrsinaceae, Myrtaceae, Musaceae, Palmae, Passifloraceae, Sapotaceae, Sabiaceae, Solanaceae, Sterculiaceae, etc.

#### **SS 4: Villa Iguana, 1450 m, Bosque humedo nublado Premontano ~ Upper Premontane humid [cloud] forest**

Paisaje dominado por la presencia de mesetas con cornizas entre 200 a 275 % de pendiente, cortas laderas. Los principales árboles emergentes se encuentran a 20 m y el dosél está entre 15 -20 m, arbolitos hasta de 10 m, poca o baja presencia de lianas lo cual es inversamente proporcional al elevado epifitismo, incluyendo en este una buena cantidad de Bromelias y orquídeas; por el alto epifitismo y la presencia de vientos frecuentes, la caída de árboles viejos es frecuente y en contados casos árboles jóvenes lo cual en algunas partes del bosque encontramos claros, nos indica que en estos sitios existe una dinámica muy intensa, contrastante a lo anterior, las zonas del bosque que están mejor protegidas presentan mayor cantidad de árboles con diámetros mayores demarcando así la gran influencia de los vientos en el mantenimiento de este tipo de ecosistema boscoso. Posee características marcadas de un Bosque nublado sin rastros de haber sufrido intervención alguna por parte del hombre.

Las familias con mayor predominio son Bromeliaceae, Ericaceae, Guttiferae, Lauraceae, Melastomataceae, Orchidaceae, Rubiaceae y las de menor representación son Acanthaceae, Annonaceae, Araceae, Araliaceae, Begoniaceae, Bignoniaceae, Bombacaceae, Caesalpinaceae, Campanulaceae, Cecropiaceae, Euphorbiaceae, Flacourtiaceae, Gesneriaceae, Moraceae, Myrtaceae, Myrsinaceae, Meliaceae, Olacaceae, Papilionaceae, Rosaceae, Sabiaceae etc.

#### **SS5: Nabú, 1900 m, Bosque Montano Húmedo ~ Lower Montane humid forest**

Relieve inter-andino con estribaciones suaves, paisaje de laderas con pendientes entre 20- 25 m. El ecosistema presenta antropización en la parte baja, lo cual lo condiciona como en **estado de riesgo: Altamente Crítico**, ya que presenta entresaca selectiva de algunas especies maderables de las familias Lauraceae y Meliaceae. Los árboles emergentes son de 20 a 25 metros y un sotobosque de 10 a 12 metros de alto. El epifitismo se presenta con mayor cobertura sobre los troncos de las especies arbóreas y algunas veces en ramas de arbustos. Hay poca entrada de luz al suelo del bosque lo cual proporciona condiciones óptimas para la producción de biomasa y mantenimiento de la temperatura en el ecosistema.

La estructura está representada principalmente por: Helechos, Monocotiledóneas Araceae (*Anthurium* sp.), Orchidaceae, Palmae, Dicotiledóneas Actinidaceae (*Saurauia* sp.), Araliaceae (*Shefflera* sp.), Begoniaceae (*Begonia* sp.), Bombacaceae (*Matisia* sp., *Ochroma* sp.), Burseraceae, Cunoniaceae (*Weimannia* sp.), Ericaceae (*Cavendishia* sp.), Euphorbiaceae, Fagaceae (*Quercus* sp.), Gesneriaceae (*Alloplectus*, *Besleria*, *Columnea* y *Episcia*), Guttiferae (*Clusia* sp.), Hippocastanaceae (*Billia colombiana*), Lauraceae (*Nectandra* y *Ocotea*), Melastomataceae (*Blakea*, *Miconia* y *Meriania* sp.), Meliaceae (*Cabralea* sp.), Monimiaceae (*Siparuna* sp.), Moraceae (*Ficus* sp., *Cecropia* sp.), Rubiaceae.

#### **SS6: Tatauí, 2,250 m, Bosque Montano (nublado) Medio ~ Montane humid [cloud] forest**

Relieve con pendientes fuertes entre 30-35 m. El ecosistema se encuentra en buen estado de conservación ya que no es accesible por estar cerca de los filos de las estribaciones suaves del piedemonte de la cordillera oriental. El ecosistema representa condiciones de recurso hídrico primario. Está expuesto a condiciones ambientales altamente desecantes por la influencia directa de los vientos del valle del Río Villalobos.

Bosque ralo o achatado, la parte alta es a 7 metros y el sotobosque a 4 metros. Presenta gran cantidad de epifitismo en el tronco y las ramas bajas, principalmente especies de musgos y hepáticas, lo cual tiene implicaciones ecológicas importantes. Las plantas presentan adaptaciones a la desecación como hojas gruesas y ramas fuertes, estructuralmente es heterogéneo. Tiene c.5 especies de bromelias distribuidas en el suelo y árboles. Las condiciones de vientos no permiten la presencia de familias como Gesneriaceae, y si las hay solamente con un género *Besleria* sp. El suelo es el principal reservorio de agua y humedad, es altamente lixivigado. **Estado de riesgo: Bajo Crítico.** La estructura está representada principalmente por: Musgos, Hepáticas, Monocotiledóneas, Palmae (*Wettinia* sp.), Orchidaceae (*Pleurothallis*, *Masdevallia* y *Elleanthus* sp.), Bromeliaceae, Dicotiledóneas, Araliaceae (*Schefflera* sp.1, sp.2), Campanulaceae (*Centropogon* sp.), Compositae (*Acharis* sp.), Chletraceae (*Chletra* sp.), Cunoniaceae (*Weimannia* sp.) Ericaceae (*Cavendishia*, *Pernetia*), Guttiferae (*Clusia* sp.1, sp.2), Lauraceae (*Nectandra* sp.), Melastomataceae (*Miconia* sp.1, sp.2), Myrsinaceae

(*Myrsine* sp., *Cybianthus* sp., *Grammadenia* sp.), Myricaceae (*Myrica* sp.), Theaceae (*Ternstroemia* sp.), Winteraceae (*Drimis* sp.)

**SS7: El Dorón, 2,500 m, Bosque Montano (nublado) ~ Montane cloud forest**

Relieve con escarpes suaves, con pendientes de 20 m. El ecosistema presentó características con intervención tardía de 5 años y se ubica como factor de **estado de riesgo: Altamente Crítico**, por estar cercano a la principal arteria vial de la zona y por la proximidad a la frontera agrícola.

La parte alta del bosque esta entre 15-20 metros y el sotobosque a 10 metros. El epifitismo esta distribuido por todo la estructura de los árboles pero principalmente en las ramas finales y en la parte alta del tronco. Asociación de Quercetum, *Quercus humboldtii*, con especies asociadas como *Clusia* aff. *multiflora* y *Miconia* sp. La estructura esté representada principalmente por: Musgos, Hepáticas, Monocotiledóneas Araceae (*Anthurium* sp.), Palmae, Orchidaceae, Dicotiledóneas, Anacardiaceae, Araliaceae (*Oreopanax* sp.), Cunoniaceae (*Weimannia* sp.), Caprifoliaceae (*Viburnum* sp.), Guttiferae (*Clusia* sp.), Fagaceae (*Quercus* sp.), Rubiaceae (*Palicourea* sp.), Melastomataceae (*Miconia* sp.).

**Northeast Antioquia**

**SS1: Apollo 13, 350 m, Lowland humid forest ~ Bosque húmedo Tropical (B-hT).**

Colinas de bajas alturas que están ubicadas en el piedemonte occidental de la Serranía; paisaje de montañas quebradas de poca altura, pendientes entre 15-20 grados. La vegetación presenta tres estratos verticalmente:

- A- Estrato arbóreo** (30-35 m) con individuos de troncos grandes, raíces tablares y follajes amplios que dominan la estructura de la comunidad y aportan estabilidad al la dinámica del dosél del bosque. La presencia de lianas es notoria, ya que se desarrollan principalmente en la parte más alta. Las principales especies son: CARYOCARACEAE Caguí amarillo- *Caryocar amygdaliferum* Mutis, Caguí rojo- *Caryocar glabrum* (Aublet.) Pers.; BIGNONIACEAE Chingalé *Jacaranda copaia* (Aublet.) D. Don.; LEGUMINOSAE Guayacán jobo- *Centrolobium paraense* Tul., Suribio- *Pithecelobium* sp.; LECYTHIDACEAE Abarco- *Cariniana pyriformis* Miers., Coco olleto *Lecythis* sp., Coco cristal- *Eschweilera* sp., BOMBACACEAE Ceiba bonga- *Ceiba pentandra* (L.) Gaertn.; ANACARDIACEAE Caracolí- *Anacardium excelsum* (B. et B.) Skeels; MELIACEAE Cedro- *Cedrela* sp., Caoba- *Sweitenia* sp.; MORACEAE Guaímaro- *Brosimum cf. potabile* Ducke, Sande- *Brosimum utile* H.B.K.
- B- Estrato medio o sub-dosél** (15-30 m) En esta capa del bosque se observan mayor cantidad de individuos y especies, se disminuyen la cantidad de árboles de troncos gruesos. Las principales especies son: SAPOTACEAE Caimo- *Pouteria pedicellosa* Milbr., *Pouteria pomifera* (Eyma) Baheni; BURSERACEAE Caraño- *Dacryodes colombiana* Cuatr., VOCHYSIACEAE Dormilón- *Vochysia ferruginea* Mart.; ANACARDIACEAE Ffresno- *Matayba trianae* Dugand.; MELIACEAE Mazábalo- *Carapa guianensis* Aubl.; BIGNONIACEAE Polvillo- *Tabebuia guayacan* (Seem.) Helms.; MYRISTICACEAE Sangre de toro- *Virola sebifera* Aublet.
- C- Estrato bajo** (0-20 m) Se presentan la mayoría de especies que regulan y aportan estabilidad al ecosistema, aumenta la cantidad de individuos de diámetros menores. Las principales especies son: OCHNACEAE Alejandro- *Cespedezia macrophylla* Seem.; MYRTACEAE Arrayán- *Myrcia* sp., Balsillo- *Cordia nodosa*; GUTTIFERAE Carate- *Vismia* sp.; EUPHORBIACEAE Cargamanto- *Hieronyma cf. chocoensis* Cuatr, Zoquete- *mabea cf. occidentalis* benth; SIMAROUBACEAE Cedrón- *Simaba cedron* Planch.; MORACEAE Yarumo- *Pourouma* sp, *Pseudolmedia* sp; ANNONACEAE Escobo- *Xylopia* sp., Yaya amarilla- *Annona* sp., Yaya anón- *Guatteria* sp; MELASTOMATACEAE Coronillo -*Bellucia* sp., Niguíto-*Miconia* sp, MIMOSOIDEAE Guamo- *Inga* sp; ULMACEAE Guácimo- *Guazuma ulmifolia* Lam; MYRISTICACEAE Zoquete- *Iryanthera ulei* Warb.

**SS2: Alto de los Tarros, 800 m, Foothill humid forest**

The site was strongly influenced by lowland flora and fauna as the nearest terrain >1,000 m asl was c.15 km distant. The forest physiognomy is similar to SS1, although with lower vegetation strata (canopy c.30 m), more broken canopy by treefalls on steep slopes, higher epiphytes abundance and notably more woody stem plants in the understorey.

**SS3: Alto Combate, 1,550 m Bosque humedo (nublado) Premontano ~ Premontane humid [cloud] forest**

Bosque montano medio de los Andes Centrales de Colombia. Paisaje mixto de pequeños valles y cordilleras. Relieve montañoso, de escarpes pronunciados y pendientes entre 20-30 grados. Selva Andina con dosél a 20 metros y sotobosque abajo de los 10 metros. El hábitat presenta características de un pobre nivel de epifitismo, sin embargo presenta las familias predominantes como: Epifitas: Araceae, Bromeliaceae, Poaceae, Gesneriaceae. Las principales familias predominantes en orden de importancia para la comunidad boscosa: Árboles y arbustos: Melastomataceae, Guttiferae, Araliaceae, Myristicaceae, Rubiaceae, Myrtaceae, Annonaceae, Bombacaceae, Hippocastanaceae, Gesneriaceae, Ericaceae Leguminosae, Palmae.

## Birds ~ Aves

Paul Salaman, Thomas Donegan, Andrés Cuervo, & José Ochoa.

### Summary

A total of 421 bird species were recorded in **Serranía de los Churumbelos** using observation and mist-netting, including the addition of 93 species to the list from 162 species recorded in 1999. A total of 2,834 mist-net captures (1,057 in 1999) of 229 species were captured over 142,730 MNH. Avifauna assemblages showed close affinities between SS1-SS2; SS3-SS4 and SS5-SS6-SS7. A total of 2 Threatened and 10 Near-Threatened species were recorded, with five Ecuador-Peru East Andes EBA and four Colombian Inter-Andean Slopes EBA endemics. Over 100 species recorded represent major range/altitude extensions. It is estimated that the probable total number of resident bird species exceeds 550 species: an exceptional diversity, making the Serranía a global avian "hotspot" and meriting conservation action for the region.

In **Northeast Antioquia**, a total of 318 bird species were recorded, with 811 mist-net captures of 92 species. Avifauna assemblages showed close affinities between SS1 and SS2, with SS3 distinct. A total of 3 Threatened and 6 Near-Threatened species were recorded, with 11 EBA endemics. Notable range and/or elevation extensions for 40 species were recorded. The most notable find was a new species for science in the genus *Lipaugus*. Conservation measures in this area should be instigated as a matter of extreme urgency, especially in lowland areas to protect the Blue-knobbed Curassow *Crax alberti*.

### Resumen

Un total de 421 especies de aves fueron registradas en la **Serranía de los Churumbelos** empleando observaciones y captura con redes de niebla, incluyendo una adición de 93 especies de 162 registradas en 1999. Un total de 2,834 capturas (1,057 en 1999) fueron realizadas de 229 especies durante 142,730 horas-red-metro. El ensamble de la avifauna mostró cercanas afinidades entre SS1 y SS2, SS3 y SS4, SS5 a SS7. Un total de dos especies amenazadas y diez casi amenazadas fueron registradas, con cinco especies del área de endemismo de aves (EBA) de los Andes Orientales de Ecuador -Perú (SS2 - SS4) y cuatro especies del EBA de las laderas internadinas de Colombia (SS5 - SS7) fueron registradas. Se estima que el número de especies residentes excede 550 especies: una excepcional diversidad, la cual hace de la Serranía un "hotspot" ornitológico global de extrema importancia para la conservación de la diversidad aviar.

En el **Nordeste Antioqueño** un total de 318 especies de aves fueron registradas con observaciones y captura con redes de niebla con un total de 811 capturas de 92 especies. El ensamble de la avifauna mostró gran afinidad entre SS 1 y SS 2. El SS 3 fue altamente distintivo. Un total de 3 especies amenazadas y 6 casi amenazadas fueron registradas, con 11 endemismos. Además notables extensiones altitudinales o de rango de distribución fueron reportados para 40 especies. El más notable hecho fue el descubrimiento de una nueva especie para la ciencia del género *Lipaugus*. Medidas de conservación en esta área debe ser tratado como un asunto de extrema urgencia, especialmente en tierras bajas para proteger al Paujil de Pico Azul *Crax alberti* y el bosque subandino para la nueva especie..

### Introduction

Surveying and documenting the poorly-known avifauna of the tropics can play an important role in assisting biological conservation. Birds are excellent preliminary indicators for biological conservation, because avian taxonomy and geographical distribution has already been widely documented. Conservation of tropical birds and their entire ecosystem requires an in-depth knowledge of species' ecology; for example their ability to survive habitat alteration; their specific habitat requirements; and variations in their abundance due to changing environmental conditions. Without such information conservation efforts may be significantly undermined.

### Methods

To determine the composition and relative abundance of bird communities at each study site, a two-fold standardised effort was employed by 3-4 ornithologists (Andrés Cuervo, Thomas Donegan, and Paul Salaman at all sites; José Ochoa in northeast Antioquia sites only):

1. Intensive diurnal non-systematic field observations, supplemented with tape recording and playback of skulking and nocturnal birds, were conducted by 2-4 team members at all times. This was preferable to the use of point counts or variable circular plots, where any population estimates would be highly inaccurate in such a short time, and would create biases strongly in favour of highly-recognisable and vocal species. With targeted intensive, non-systematic observation data, relatively constant at each site, a more complete

inventory was achieved without the constraints of routine transects.

- Diurnal mist-netting (246-368 m along transects) was conducted at each site. At SS1 (Churumbelos) two transects were conducted as artificial poles allowed easy and fast net installation.

These methods complement one other well to produce a good first-cut assessment at each site. Additional information from local hunters was collected. Our primary aim in the field was to produce comprehensive species inventories for each site and to assess the current status and ecological requirements of poorly known, rare and threatened species.

## Results

### (i) Serranía de los Churumbelos

421 bird species were recorded in Serranía de los Churumbelos, including the addition of 93 species from a total of 162 species recorded during 48 ornithological person-days in 1999. A total of 2,834 mist-net captures (1,057 in 1999) and over 229 species were caught over 142,730 MNH. The bird species inventory with mist-net captures for each site is presented in Appendix I. A breakdown of bird results and fieldwork effort for all sites is provided in Table 3. A total of two Threatened and 10 Near-Threatened species were recorded, with five Ecuador-Peru East Andes EBA and four Colombian Inter-Andean Slopes EBA endemics. Specific information and recommendations on each Red Data Book and EBA species recorded will be presented in the forthcoming final report.

Various species were tape-recorded, with tapes deposited with Wildlife Sounds, National Sound Archives (British Library) and the Center for Bioacoustics, Texas A&M University. A total of 41 birds were collected (from a combination of mist-netting mortality and a few selectively-taken specimens) and have been deposited at ICN, Universidad Nacional, Bogotá (see Appendix III). For many species, a great deal of information, from ecology and range distribution to biometrics and plumage variations, was collected, and will be presented in the final report (March 2000) and in scientific publications (e.g. Salaman *et al.* in prep.).

It is estimated that the probable total number of resident bird species exceeds 550 species: an exceptional diversity, making the Serranía a global avian "hotspot" and meriting conservation action for the region.

**Table 3:** Summary of ornithological fieldwork effort and results, Churumbelos 1998-1999.

Location	Person-days <sup>7</sup>	Total sp.	Forest Sp. <sup>1</sup>	PB <sup>2</sup>	RN <sup>2</sup>	AH <sup>2</sup>	VI <sup>2</sup>	NA <sup>2</sup>	TA <sup>2</sup>	ED <sup>2</sup>	RDB sp. <sup>3</sup>	Mist-net hrs	MNH <sup>4</sup>	Total caps.s	Re-traps	Sp. caps.
Puerto Bello (SS1)	40	165	120	<b>75</b>	78	37	17	9	7	12	0	72.30	32,535	611	119	60
Río Nabueno (SS2)	35	137	125	78	<b>35</b>	48	23	20	6	9	2NT; 1E	60.00	27,000	660	164	85
Alto Hornoyaco (SS3)	35	114	101	37	48	<b>25</b>	46	23	6	9	1T; 2NT; 4E	45.00	19,710	297	31	75
Villa Iguana (SS4)	35	106	100	17	23	46	<b>12</b>	48	16	30	1T; 2NT; 2E	60.00	26,280	209	32	47
Nabú (SS5)	18	106	101	9	20	23	48	<b>18</b>	31	56	1T; 2NT; 3E	52.00	19,130	386	-	59
Tatauí (SS6)	15	60	58	7	6	6	16	31	<b>4</b>	49	1NT	40.00	9,840	212	-	39
El Dorón (SS7)	15	109	99	12	9	9	30	56	49	<b>24</b>	4NT; 3E	30.30	8,235	459	-	49
<b>Totals<sup>5</sup></b>	<b>193</b>	<b>421 / 797</b>	<b>352 / 704</b>								<b>2T; 10NT</b>	<b>360.00</b>	<b>142730</b>	<b>2,834</b>	<b>375</b>	<b>229 / 414</b>

<sup>1</sup> Forest dependant species (total less characteristically open country species)

<sup>2</sup> Uniqueness (in bold) and overlap between sites is represented in the number of species

<sup>3</sup> RDB= Red Data Book sp. (Collar *et al.* 1992); T= Threatened; N= Near-threatened; E= EBA sp.

<sup>4</sup> MNH = Mist-Net Hours per meterage (1 metre of net per hour = 1).

<sup>5</sup> Where two numbers appear in the totals, the first number refers to the total number of species in the Churumbelos. The second number is the sum of the column (i.e. a total of every site-species).

### Distributional patterns

Appendix I illustrates species distributional patterns from the lowlands to highlands in the Cordillera Oriental for certain groups, particularly within families and genera. For example, within the genera *Dendrocincla*, *Thripadectes*, *Mionectes*, *Henicorhina* and *Cyclarhis*, clear altitudinal species replacements are seen. Avifauna assemblages showed close affinities between SS1 to SS2, SS3 to SS4, and SS5 to SS7.

In 1998, "unique" species (only recorded at one site) from SS1 to 4 respectively were 76, 37, 29 and 48. In 1999, all these figures are reduced with new data from higher elevations, SS4 significantly so. From the three study sites in 1999, a high degree of overlap was recorded. Of the 162 species recorded, 36% were recorded at either all three sites or at SS5 and SS7 only. Only a small number of species (60) were recorded at SS6 owing to harsh climatic conditions and terrain with associated stunted forest along the ridgetop.

Only two species, Orange-bellied Euphonia *Euphonia xanthogaster* and Andean Solitaire *Myadestes ralliodes* (0.5%), recorded at all sites, and 21% average uniqueness at each site. Two other species, Black Vulture *Coragyps atratus* and White-collared Swift *Streptoprocne zonaris*, were present at all but one site. SS1 had the highest uniqueness (45%). Of the 1999 sites, SS7 (22%) had the highest uniqueness. Table 1 illustrates the extent of species overlap between sites. Sites 1 & 2; 3 & 4; and 5 & 6 & 7 show closest affinities. The overlap between sites shows a consistent pattern, with affinities decreasing with increasing elevational distance from each site. The affinity between SS1 and SS7 shows a surprising deviation from this trend, because of the partially secondary habitat which only these sites shared, leading to a greater than expected similarity. SS6 also provides deviations from the norm, as with only 60 species, overlaps with other sites are low.

Site species richness totals reveal a general decrease in diversity along the altitudinal gradient, from SS1 in the Amazonian foothills to SS7 in upper premontane Andean forest (although SS6 is much reduced for reasons already stated). This may be attributed to three important factors: decreasing habitat structural complexity (physiognomy); decrease in productivity and reduced biomass; and decrease in area size with altitude, therefore less available space. However, when non-forest-dependent species are excluded from each site's species richness total (c.69 characteristically open-country species), all site inventory totals are similar (with the exception of SS6 as previously explained). Forest-dependent accounted for 84% (352) of all species recorded. The exceptionally high level of species congruity to forest at all sites (with the exception of SS1 and SS7 which encompassed some non-forest areas) is a reflection each study area's forest situation. Interestingly, significantly lower person-effort in 1999 (3 ornithologists) versus 1998 (5 ornithologists) did not result in any significant changes in species richness measured, e.g. 106 species recorded at both SS4 (1998) and SS5 (1999). With comparable results between years, considerable benefits of the smaller team included large savings and easier logistics.

Taking into account variations in fieldwork effort, several patterns of avifauna distribution emerge:

- overall avian species richness gradually declines along the altitudinal gradient from 350 m to 2,450 m,
- forest-dependent species richness remains almost constant with increasing elevation;
- the majority of threatened species were encountered at premontane and lower montane elevations.
- range-restricted species define Study Site zoogeographical affiliations, with two major zoogeographic regions, the *Northern Andean* (NAN) and *Amazonia North* (AMN), strongly influencing the Serranía;
  - a) SS 1 & SS 2 (**below 1,000 m**) = great biological affinities to **AMN zoogeographic region**.
  - b) SS 3 - SS 7 (**above 1,000 m**) = close biological affinities to the **NAN zoogeographic region**.
- greater definition can be assigned as a large proportion of species originate from two zoogeographic subregions; *Eastern Slope Andes* (within NAN) and *Río Negro West* (within AMN).

#### Study site avifauna summaries

The principal avian elements and interesting species recorded at each site from 1999 are summarised below. A general summary of all sites (including those from 1998) is presented in *Cotinga* (Salaman *et al.* 1999).

##### SS5 - Nabú, 1,900 m

A total of 106 species were recorded, with *Thraupidae* (14 sp.) predictably diverse, but with surprisingly high diversity in *Tyrannidae* (16 sp.) and *Furnariidae* (10 sp.). Two individuals of the Vulnerable<sup>1</sup> Hooded Antpitta *Grallaricula cucullata* were captured and photographed at this site. Other poorly-known species and important range extensions noted include Red-billed Parrot *Pionus sordidus*, Spectacled Prickletail *Siptornis striaticollis*, Scalloped Antthrush *Chamaeza turdina* and White-capped Tanager *Sericossypha albo cristata*.

##### SS6 - Tatauí, 2,200 m

A significantly reduced avian richness was recorded (60 species), with few arboreal insectivores e.g. *Furnariidae* and *Dendrocolaptidae*. However, the ridgetop physiognomy facilitated improved canopy observations, and a greater number of supercanopy species, e.g. *Psittacidae* and *Accipitridae*, were recorded. Nectivorous birds were encouraged by the high density of terrestrial flowering *Bromelia*, with *Trochilidae* the most dominant family. *Diglossa* flowerpiercers (four spp.) dominated multi-species foraging flocks. The Near-Threatened Black-and-Chestnut Eagle *Oroaetus isidorei* was observed soaring over the forest. Other notable range extensions include Andean Potoo *Nyctibius maculosus* and Flammulated Treehunter *Thripadectes flammulatus*. A male Purple Honeycreeper *Cyanerpes caeruleus* observed foraging on bromeliads on an exposed summit peak at 2,300m, presents a substantial elevation extension from 1,400 m.

##### SS7 - El Dorón, 2500 m

A total of 109 species were recorded, despite observations being hampered by several days of military-guerrilla combat at 10km distance. *Trochilidae* were extremely abundant and diverse with 15 species recorded, including the poorly-known Gorgeted Woodstar *Acestrura heliodor* and Rufous-vented Whitetip *Urostitte ruficrissa*, endemic to EBA 044. Three Galliformes, especially vulnerable to human settlement, were recorded; Wattled

Guan *Aburria aburri* (Near-Threatened), Chestnut Wood-Quail *Odontophorus hyperythrus* (Near-Threatened), and Sickie-winged Guan *Chaemepetes goudotii*. Dusky-headed Brush-Finch *Atlapetes fuscolivaceus* (Near-Threatened) was observed twice briefly in scrub growth around the communication installations, in multi-species foraging flocks. Other interesting range extensions include Ashy-tailed Swift *Chaetura andrei*, Stygian Owl *Asio stygius* and Ocellated Tapaculo *Acropternis orthonyx*.

### Species at risk

Two threatened species were recorded; Military Macaw *Ara militaris* (observed daily in large flocks up to 12 birds at SS3 and SS4) and Hooded Antpitta *Grallaricula cucullata* (two caught and photographed at SS5). Ten Near-Threatened species were recorded; Pink-throated Brilliant *Heliodoxa gularis* (SS2); Ecuadorian Piedtail *Phlogophilus hemileucurus* (SS3); Scaled Fruiteater *Ampelioides tschudii* (SS4); Fiery-throated Fruiteater *Pipreola chlorolepidota* (SS3-4); Lanceolated Monklet *Micromonacha lanceolata* (SS2); Black-billed Mountain-Toucan *Andigena nigrirostris* (SS5, SS7); Black-and-Chestnut Eagle *Oroaetus isidorei* (SS6); Chestnut Wood-Quail *Odontophorus hyperythrus* (SS5-7); Wattled Guan *Aburria aburri* (SS7); and Dusky-headed Brush-Finch *Atlapetes fuscolivaceus* (SS7).

Nine EBA species were recorded; Napo Sabrewing *Campylopterus villaviscensio* (SS3) (EBA 044; Ecuador-Peru East Andes); Ecuadorian Piedtail *Phlogophilus hemileucurus* (SS3) (EBA 044); Pink-throated Brilliant *Heliodoxa gularis* (044) (SS2); Rufous-vented Whitetip *Urostitte ruficrissa* (SS4, SS7) (044, EBA 040; Colombian inter-Andean slopes); Golden-winged Tody-Flycatcher *Todirostrum calopterum* (SS3) (066; Upper Amazon-Napo lowlands); White-streaked Antvireo *Dysithamnus leucostictus* (SS3, SS4) (044); Chestnut Wood-Quail *Odontophorus hyperythrus* (SS5, SS7) (040); Hooded Antpitta *Grallaricula cucullata* (SS5) (040); and Dusky-headed Brush-Finch *Atlapetes fuscolivaceus* (SS7) (040).

Five endemics originated from the Ecuador-Peru East Andes EBA (044), and four endemics (one shared) from the Colombian Inter-Andean Slopes EBA (040). The five EBA 044 species represent a significant northerly range-extension as well as the northward enlargement of the EBA's zone of influence. EBA 044 characterises sites from SS2-SS4 (650 – 1450 m) whereas EBA 040 characterises SS5-SS7 (1800 – 2500 m).

### Mist-netting results

Mist-netting was very successful with 2,834 captures (1,777 in 1998; 1,057 in 1999) over 37 days of net deployment (an average of 77 birds per day) - a significant capture rate for the tropics. The most productive site for mist-netting was SS7, with over 200 individuals caught in one day, whilst SS2 produced over 100 captures on three consecutive days. The most abundant species caught across all sites are summarised in Table 4.

Between bird families, Trochilidae (Hummingbirds) dominated captures, with 784 captures (28% overall) of 38 species, closely followed by Tyrannidae (Tyrant-Flycatchers) with 619 captures (22% overall) of 56 species (33 captured). Dendrocolaptidae (Woodcreepers) and Thamnophilidae (Typical Antbirds) both represented 7% of captures, but interestingly species diversity was very different, with 12 versus 27 species respectively. Thamnophilidae diversity showed strong affinities to altitude with greatest diversity represented at 300 m with 48% captures /12 spp. declining to 7% captures /3 spp. at 1,450 m and <1% captures/ 2 species at 2,450 m. Furthermore, Thamnophilidae diversity correlated strongly with terrestrial ant diversity (J. Bustos in Salaman and Donegan, 1998). The mist-net data will be further examined and a full report presented in the final report.

**Table 4:** The most abundant species mist-netted in Serranía de los Churumbelos (all those with >20 captures).

Species	# of captures	Species	# of captures
Olive-striped Flycatcher <i>Mionectes olivaceus</i>	212	Buff-tailed Sicklebill <i>Eutoxeres condamini</i>	30
Streak-necked Flycatcher <i>Mionectes striaticollis</i>	182	White-flanked Antwren <i>Myrmotherula axillaris</i>	30
Blue-crowned Manakin <i>Pipra coronata</i>	137	Blue-rumped Manakin <i>Pipra isidorei</i>	27
Wedge-billed Woodcreeper <i>Glyphorhynchus spirurus</i>	135	Purple Honeycreeper <i>Cyanerpes caeruleus</i>	26
Speckled Hummingbird <i>Adelomyia melanogenys</i>	109	Spotted Barbtail <i>Premnoplex brunnescens</i>	25
Collared Inca <i>Coeligena torquata</i>	78	Straight-billed Hermit <i>Phaethornis bourcieri</i>	24
Long-tailed Hermit <i>Phaethornis longirostris</i>	71	Ocellated Woodcreeper <i>Xiphorhynchus ocellatus</i>	24
Ochre-bellied Flycatcher <i>Mionectes oleagineus</i>	65	Black-faced Antbird <i>Myrmoborus myotherinus</i>	22
Andean Solitaire <i>Myadestes ralloides</i>	64	White-crowned Manakin <i>Pipra pipra</i>	22
Pale-tailed Barbthroat <i>Threnetes leucurus</i>	61	Bluish Flower-Piercer <i>Diglossa caerulescens</i>	22
Emerald-bellied Puffleg <i>Eriocnemis alinae</i>	60	Black-throated Tody-Tyrant <i>Hemitriccus granadensis</i>	21
Orange-bellied Euphonia <i>Euphonia xanthogaster</i>	55	Tourmaline Sunangel <i>Heliangelus exortis</i>	21
Greenish Puffleg <i>Haplophaedia aureliae</i>	54	Blue-fronted Lancebill <i>Doryfera johannae</i>	22
White-plumed Antbird <i>Pithys albifrons</i>	49		
Golden-headed Manakin <i>Pipra erythrocephala</i>	37		
Tawny-bellied Hermit <i>Phaethornis syrmpatophorus</i>	32		
Golden-winged Manakin <i>Masius chrysopterus</i>	32		
Bronzy Inca <i>Coeligena coeligena</i>	31		

## (ii) Northeast Antioquia Transect

A total of 318 species were recorded in 60 person-days, with 258 species registered in study sites and the remainder (60) found in secondary areas surrounding our study sites. Fieldwork in Anorí aims at providing a firm foundation for future mid-elevation and montane surveys. Additional fieldwork by JO and AC has been on-going at 1800 m in 1999 (Cuervo *et al.* 1999). Much important data was collected in this transect, providing an insight into bird distributional patterns at the northern base of the Central Andes. A summary of results from all standard sites is provided in Table 5 below.

**Table 5:** Summary of ornithological fieldwork effort and results from northeast Antioquia in 1999.

Location	Person-days <sup>7</sup>	Total sp. recorded <sup>5</sup>	For. Sp. <sup>1</sup>	1 <sup>2</sup>	2 <sup>2</sup>	3 <sup>2</sup>	RDB sp. <sup>3</sup>	Mist-net hrs	MNH <sup>4</sup>	Total captures	Retraps	Species caught
Apollo 13 (SS1)	24	149 (55a)	96	<b>74</b>	64	22	3 T; 3 N; 7 E	51.00	18,768	433	105	45
Alto de los Tarros (SS2)	20	108 (27b)	91	64	<b>33</b>	22	1 N; 7 E	46.00	16,670	260	43	46
Alto Combate (SS3)	16	97	86	22	22	<b>65</b>	4T; 2N; 4 E	33.00	9176	118	15	33
<b>Totals</b>	<b>60</b>	<b>258 (317)</b>					<b>7T; 8 N; 11 E</b>	<b>130</b>	<b>44,614</b>	<b>811</b>	<b>163</b>	<b>92/124</b>

<sup>1</sup> Forest dependant species (total less characteristically open country species)

<sup>2</sup> Uniqueness (in bold) and overlap between sites is represented in the number of species

<sup>3</sup> RDB= Red Data Book sp. (Collar *et al.* 1992); T= Threatened; N= Near-threatened; E= EBA species.

<sup>4</sup> MNH = Mist-Net Hours per meterage (1 metre of net per hour = 1).

<sup>5</sup> Figures in parentheses refers to observations from forest outside of the immediate study site.

Species observed en route to SS1 and SS2 are noted in Appendix II and in parentheses in Table 5 as coming from "a" and "b", respectively. Of these observations, 60 species were not recorded within the study sites. Of the 258 species, eleven (4%) were recorded at all three sites. This small number was largely because 65 of the 98 species (67%) recorded at SS3 were unique to the site. SS1 and SS2 showed a large overlap, with 64 species recorded at both sites (43% of SS1; 59% of SS2).

### Study site avifauna summaries

The principal avian elements and interesting species recorded at each site are summarised below.

#### SS1 - Apollo 13; 300 m

A total of 149 species were recorded, including many secondary forest and open-country species. The Threatened endemic Saffron-headed Parrot *Pionopsitta pyrilia*, was relatively regularly seen in small groups of between 2-10 feeding in the canopy. The presence of *C. alberti* was confirmed here by the two landowners of the study site forest, with one sighting three days prior to our arrival. Despite intensive searching, we were unable to locate the species. White-mantled Barbet *Capito hypoleucus* (Vulnerable) was observed several times in multi-species foraging flocks in the high canopy. An adult Near-Threatened Plumbeous Hawk *Leucopternis plumbea* was captured, representing a significant range extension from the Pacific slope of the Western Andes.

#### SS1a - Puerto Lopez area, 150 m

Brief observations were conducted in scrubby overgrown growth surrounding the town and along rivers on the journey to and from the zone. A small number of birds were captured during a day spent demonstrating our work to a local school. A total of 110 species were recorded here, including 55 species not seen at SS1. Northern Screamer *Chauna chavaria* (Vulnerable) was observed from a boat along the Río Nechí. A pair of Blue-billed Curassow *Crax alberti* and *Chauna chavaria* were photographed in captivity. Some hunters reported killing as many as twenty *C. alberti* within the past few years. Live trapped birds (typically chicks) are sold for up to US\$100 (greater than average monthly income). Unless conservation action is undertaken soon, this Nechí endemic may soon become extinct.

#### SS2 - Alto de los Tarros; 800 m

A total of 108 species were recorded, with notably less secondary species than at SS1. Notable species included Colombian Tinamou *Crypterellus columbianus*, Ferruginous Pygmy-Owl *Glaucidium brasilianum* (range extension from the Caribbean coast) and Near-Threatened Nechí endemic, Sooty Ant-Tanager *Habia gutturalis* (7 individuals caught and photographed).

#### SS2b - Anorí trail to Alto de los Tarros trail, 650-1,600 m

Amongst 60 species recorded, important records include the first record for the Cordillera Central of Least Grebe *Podiceps dominicus* and sightings of Colombian Chachalaca *Ortalis colombiana* (sspp. of Variable Chachalaca *O. motmot*).

**SS3 - Alto Combate; 1,550 m**

Of 97 species recorded, five were Threatened or Near-Threatened: Wattled Guan *Aburria aburri* (Near-Threatened); Chestnut Wood-Quail *Odontophorus hyperythrus* (Near-Threatened); Parker's Antbird *Cercomacera parkeri* (Vulnerable); Red-bellied Grackle *Hypopyrrhus pyrohypogaster* (Vulnerable) and Purplish-mantled Tanager *Iridosornis porphyrocephala* (Near-Threatened). The first record for the Cordillera Central was made of Rufous-browed Tyrannulet *Phylloscartes superciliaris*. Finally, a new species for science in the genus *Lipaugus* was collected and is currently being described (Cuervo *et al.* in prep.).

## Conclusions

These two expeditions have provided the first comprehensive analysis of altitudinal distribution patterns of birds on the eastern slope of the Andes in southern Colombia from 300 m to 2,500 m and northern slope of the Cordillera Central from 300 to 1,550 m.

The analysis of our results will be completed by the time of the Final Report. From preliminary analyses our ornithological fieldwork of **Serranía de los Churumbelos** tentatively reveals the following conclusions:

- The Serranía de los Churumbelos is a global avian “hotspot”—extremely important for bird diversity. It is estimated that the total bird species inventory contained within the Serranía would exceed 550 species;
- The region encompasses a very interesting assemblage of avian taxa; including some of Colombia's most poorly known species and communities showing a high degree of subspecies endemism, which highlights the need for conservation attention and further study;
- Changes in species compositions and shifts in community structure with increasing altitude revealed by this rapid study emphasise various interesting trends that warrant further scientific investigation;
- The vast majority of species recorded (83%) are forest-dependant, thus impending forest destruction over the Serranía de los Churumbelos will irrevocably destroy critical habitat needed for these many species.

Ornithological results merit the recommendation that the Serranía de los Churumbelos be considered for immediate conservation action.

Preliminary results from **Northeast Antioquia** demonstrate a clear need for protective measures. A more detailed ecological analysis of results from Anori will be presented in further EBA publications once further studies have taken place into premontane elevations *c.* 1,000–1,300 m and above 1,700 m. A detailed conservation assessment for the region to be presented to CORANTIOQUIA will take into account future studies, and will be published on the EBA website on the Internet in due course.

This region contains many poorly-known species, not least one new species for science (*Lipaugus* sp. nov.), a species described as recently as 1997 (*Cercomacera parkeri*) and the Critically Endangered *Crax alberti*. The ecological catastrophe in the lowlands suggests a bleak future for these three species, unless conservationists and others act quickly and decisively. The conservation initiative commenced by CORANTIOQUIA in the La Forzosa forest fragment is extremely important in protecting many outstanding species including the *Lipaugus* sp. nov. Hopefully this new protected area can gradually be extended to cover a broader elevational span.

# Amphibians and Reptiles ~ Herpetos

Thomas Donegan

Collection identified by Dr. John D. Lynch, Instituto de Ciencias Naturales, Universidad Nacional.

## Summary

A collection of herptiles was made at each site, using random encounters and night searches. Species inventories are presented below and in Appendix IV. A number of new distributional records are presented, including newly-described species and several forms which relate to undescribed, unstudied or unknown species.

## Introduction

Colombia is one of the most diverse countries in the world in terms of herpetofauna. 475 species of reptiles are known from the country, making Colombia the fourth most diverse country in the world in this group (Sanchez *et al.* 1995). Colombia is known to host at least 620 species of Amphibians, the world's No. 1 species total (Conservation International, 1997). But even this figure must be an underestimate, evidenced by the high rate of new discoveries. For instance, Lynch and Ruiz-Carranza (1996) considered that around 30 of the estimated 100 frog species of the genus *Eleutherodactylus* in the west Andes to be undescribed. Relative ease of identification and continuing new discoveries make herptiles a particularly exciting group to study on an expedition such as this. It was therefore considered a worthwhile use of expedition time to collect any herptiles encountered by team members, and additionally for TD to conduct 2-3 night searches for a few hours at each site.

The Amazonian regions surrounding the Serranía de los Churumbelos were surveyed briefly for amphibians and reptiles in 1988 (Piamonte for 2 days - see ICN Herpetology Collection). However, until Colombia '98 and the EBA Project, the upper elevations remained completely unknown. No herptile surveys have taken place around Anori or in the foothills of San Lucas.

## Methodology

Herptiles were sampled non-systematically, non-intensively and non-comprehensively, combining the efforts of all team members and using the following three techniques:

(i) Night Searches; Two to three night searches were conducted at each site by TD. Where possible, transects were cut along a c. 400 m length of a stream. Potential herptile habitats were left undisturbed where possible, allowing for navigation along the stream with minimal disturbance. Alternatively or additionally, the main mist-net transect was used for searches. Once located (usually by voice), herptiles were placed in plastic zip-bags with a little water, and left overnight for inspection the following morning.

(ii) Random encounters; All team members and guides were instructed in herpetological capture techniques and were asked to catch any herptiles encountered and put them in plastic specimen bags supplied.

Identification Protocol; For each individual caught the following were noted:

- Time, location and micro-habitat caught;
- Measurements of Eye-Nose; Body; Eye Dimensions; Head width; tail and scale counts (for Reptilia);
- General morphological / colour description taken

Some photographs were taken: A specimen was taken of each morphospecies caught. Due to the lack of identification guides, and the real chance of discovery of new species, this was considered necessary. One of Colombia's leading herpetologists, Dr John Lynch, has identified the collection, which is now catalogued at ICN.

## Results and Discussion

### (i) Serranía de los Churumbelos

A species list combining results from 1999 is provided in Appendix IV. The species caught at Serranía de los Churumbelos in 1999 were as follows.

Species	SS5 (1800 m)	SS6 (2100 m)	SS7 (2450 m)
<b>Class Amphibia, Order Anura (Frogs and Toads)</b>			
<b>Leptodactylidae</b>			
<i>Eleutherodactylus sp.</i>	5 (2)	1	2
<i>Eleutherodactylus w-nigrum</i>	3 (3)		(1)
<b>Class Reptilia, Order Squamata, Suborder Sauria (Lizards)</b>			
<b>Iguanidae</b>			
<i>Phenacosaurus heterodermus</i>			1
<b>Class Reptilia, Order Squamata, Suborder Ophidia (Snakes)</b>			
<b>Colubridae</b>			
<i>Chironius monticola</i>		1	

KEY: 1(2) means 1 specimen taken; 2 individuals captured and released.

It was strange that at SS5-7, where a fair number of frogs were captured, that only two species were encountered: *E. sp.* in the forests, and *E. w-nigrum* in secondary growth. *E. sp.* has not yet been identified. It was common at all sites, found on the forest floor or in low undergrowth, and was active both at day and night. Dr. John Lynch is currently undertaking a study into *Eleutherodactylus* frogs of the Cordillera Oriental. These specimens will be useful for that study, relating to an unstudied / unknown / unidentified / undescribed species. The two Reptilia are expected to be present.

A disappointing diversity and number of herptiles were recorded at Churumbelos SS5-7, compared to the more lowland sites. This is considered to be due to (i) 4 team members compared to 14 last year for random encounters; (ii) the lack of entomologists using pitfall traps which produced many specimens in 1998; (iii) the lack of a bat specialist also looking for frogs at night; (iv) predominantly herptile-poor ridge-top habitat (especially at SS6); and (v) decreasing biodiversity with increased altitude.

### (ii) Anori

Herptiles captured were as follows (same key as above):

Species	SSA (200 m)	SS1 (250 m)	SS2 (800 m)	SS3 (1550 m)
<b>Class Amphibia, Order Anura (Frogs and Toads)</b>				
<b>Bufonidae</b>				
<i>Bufo marinus</i>	3 (lots)	(lots)		
<b>Dendrobatidae</b>				
<i>Dendrobates truncatus</i>		1 (8)		
<b>Leptodactylidae</b>				
<i>Eleutherodactylus fallax</i>			1	
<i>Eleutherodactylus frater sp.?</i>				2
<i>Eleutherodactylus raniformis</i>			2	
<i>Eleutherodactylus sp.</i>			1	
<i>Eleutherodactylus taeniatus</i>			1	
<b>Hylidae</b>				
<i>Smilisca phaeota</i>		1		
<b>Class Amphibia, Order Gymnophiona (Caecilians)</b>				
<b>Typhlonectidae</b>				
<i>Typhlonectes natans</i>	1			
<b>Class Reptilia, Order Squamata, Suborder Sauria (Lizards)</b>				
<b>Iguanidae</b>				
<i>Anolis (fusco-oratus) tolimensis?</i>			2	
<i>Anolis sp.?</i>				1
<b>Class Reptilia, Order Squamata, Suborder Ophidia (Snakes)</b>				
<b>Colubridae</b>				
<i>Clelia clelia</i>	(1)	1		

The collection from Anori and the lowlands of San Lucas was more productive than in the Churumbelos, probably due to sites being located in more favourable habitat with more streams for transects and less ridge-top effects.

*Dendrobates truncatus* presents a downslope elevation extension to 250 m, with previous records only as low as 530 m (Ruiz-Carranza *et al.* 1996). *Eleutherodactylus fallax* is recently described (1997) from the northern Central Cordillera. The record at SS2 thus provides an important new site for the species. *Eleutherodactylus frater*, apparently the most closely-related species to this specimen, is known only from the Cordillera Oriental and Serranía de Macarena (Ruiz-Camarra *et al.*, 1996). Thus, this record is either a significant range extension or may relate to an undescribed form. Likewise, *E. sp.* remains undescribed, unknown or unstudied.

## Conclusions

The ongoing effort to document and describe the Amphibia and Reptilia of Colombia is a Herculean task which is only partly completed. A large amount of new distributional data has been collected both this year and in 1998, with no previous herpetological studies in either Serranía de los Churumbelos or the Anori area. Perhaps more importantly, several forms have been collected which remain undescribed, or for which no description yet exists. These await further study. Herptile surveys have thus produced some important results which can only increase our knowledge of *la naturaleza Colombiana*.

Herptiles are a group which demonstrate well the need for more effective conservation of the Andean forests of Colombia. Unless protective measures become effective, undescribed species will become extinct before we have the chance to know that they once existed. Even from this brief non-comprehensive study, it is clear that both Anori and the Churumbelos, containing several poorly-known or undescribed forms in pristine forest, would be excellent new sites in which to implement conservation measures.

# Mammals ~ Mamíferos

Andrés Cuervo, José Ochoa and Thomas Donegan

## Summary

Using opportunistic sightings, a small number of night searches and talks with local people, a large number of Threatened large mammal species and important new ecological and distributional data was recorded. Of all the Study Sites, SS2 at Anorí is of the most critical importance to conservation with six Primate species recorded, of which five are considered Threatened with extinction by the IUCN.

## Introduction

Mammals form an important part of forest ecosystems, yet as relatively little is known of their ecology and distribution in the Neotropics, further studies are important in establishing species distributions and the ecological role of mammals within the forest community. Mammal fieldwork aimed to compile a basic large mammal species inventory for each site. Although the richest diversity in Neotropical mammals is found in *Chiroptera* and *Rodentia*, large mammal surveys gives a global idea of the status of forest and hunting pressures and are a good tool for approaching this group of vertebrates. Furthermore, Threatened species analyses in the Neotropics concentrate on large mammal groups which are relatively well-known and capable of identification.

## Methodology

Observations for large mammal species were largely opportunistic. Whilst observation transects were being conducted as part of bird surveys, any mammals viewed were identified and recorded. Additionally, AC and JO conducted 1-2 mammal searches at night, and TD looked for mammals whilst making herptile searches. Whilst in local towns and villages, talks with local people focused on large mammals as well as birds. Several species in captivity were observed and photographed, following leads from local people.

Identification was made possible using Emmons and Feer (1997) and further with Tirira (1999). It was considered a productive use of expedition resources to spend a small amount of time identifying species and collecting ecological information on the mammals found in Study Sites, many of which are Threatened and are charismatic species which could potentially act as 'umbrella' species for protective measures. Due to general low encounter rates, these methods were considered more resource-efficient than employing a mammal-specialist.

## Results

A large number of Bat, Rat and Squirrel species were observed at all sites. However, the vast majority of these were not capable of being identified by team members and no collection was made. A small number of bat specimens were taken and preserved in alcohol in Serranía de los Churumbelos SS6 from mist-net captures. These have been deposited at the ICN mammalogy collection. Below follows a synopsis of the large mammals recorded at all sites.

### (i) Serranía de los Churumbelos

At **SS5**, an **Olingo** *Bassaricyon sp.* was observed once at dusk. It was very inquisitive, moving through the lower canopy towards our torchlights. At **SS6**, another member of the Raccoon family, the **Kinkajou** *Potos flavus* was heard calling once. This represents an elevation extension with previous records only to 1,750 m. At **SS7** evidence of the presence of **Spectacled Bear** *Tremarctos ornatus* was noted, with several trees extensively scarred with claw-marks, specially palm sprouts. **Puma** *Puma concolor* and **Mountain Tapir** *Tapirus pinchaque* were recognised in informal interviews with local people.

### (ii) Northeast Antioquia transect

At **SS1** and **SS2**, large number of Primates were recorded. **Silvery-brown Bare-face Tamarin** *Saguinus leucopus*, an IUCN Vulnerable endemic of the Nechí basin of Colombia, was the most common primate at SS1, where several 'record' photographs and tape recordings were taken. Smaller numbers were also observed at SS2. Individuals were observed in primary forest and frequently in disturbed secondary forest. Up to 12-18 individuals would forage together in the subcanopy and lower canopy, calling regularly with high-pitched squeaks. Three individuals of the IUCN 'Vulnerable' **Lemurine Night Monkey** *Aotus (l.) lemurinus* were spotted roosting during the day in a cavity in the top of a c. 5 m. high dead tree trunk at SS2. **White-fronted Capuchin Monkey** *Cebus albifrons* was observed in an active group of up to 8 individuals. Several females were carrying young on their back. **Red Howler Monkey** *Alouatta*

*seniculus* (IUCN Vulnerable) was heard more often than seen at SS1 and SS2, but was observed several times in small groups (c. 5-7) eating fruit in the canopy. Small parties (up to 6-8 individuals) of the Vulnerable **Common Woolly Monkey** *Lagothrix lagothricha* were observed on a few occasions at SS2 moving quickly through the canopy feeding on fruit. Solitary individuals were also observed feeding in the subcanopy (JO). This is the most significant primate record as this species is very poorly known west of the Andes, with only one specimen of a juvenile of this species from Nechí area (Hernández-Camacho, pers. comm.). (**White-bellied Spider Monkey** *Ateles sp.*, apparently the *belzebuth* species, another IUCN Red List species, was recorded several times at SS2 in groups up to 8 individuals, and their voices were frequently heard all day. One individual of this species was observed in captivity along the Anorí - Cruces 'road', beside the Anorí river. These records represent a significant range extension, with previous Colombian records only from east of the Andes in Colombia (Emmons and Feer, 1997). However, photographic confirmation is needed, because of the possible occurrence of *Ateles geoffroyi*

**Kinkajou** *Potos flavus* was heard and observed once during a mammal night-search at SS1. **Central American Agouti** *Dasyprocta punctata* was observed once and heard calling at SS2. Local hunters note the presence of this species both at SS1 and SS2. The Anteater, **Northern Tamandua** *Tamandua mexicana* was observed on one occasion at about 18:00 hrs, walking along the nest transect at SS1. This follows a sighting of **Southern Tamandua** *Tamandua tetradactyla* from SS1 at Serranía de los Churumbelos in 1998.

Whilst in Puerto López, an immature **Jaguar** *Panthera onca* was observed and photographed in captivity, bound for illegal trade. Evidence of the species' presence was noted at SS1 and SS2 where pungent territorial odours and scratching on trees probably referred to this species. **Red Brocket Deer** *Mazama americana* was also photographed in captivity at Puerto López. **Paca Agouti** *paca*, **Nine-banded Long-nosed Armadillo** *Dasytus novemcinctus* and **Northern Naked-tailed Armadillo** *Cabassous centralis* were common items on restaurant menus in Puerto López. *C. centralis* "Cola de trapo", was considered by local hunters to be less common than *D. novemcinctus*.

At Anorí **SS3**, no large mammals were recorded during our fieldwork. However, a comprehensive inventory of large mammal species produced from surveys at 1700-1820 m, close to SS3 is provided in Cuervo *et al.* (1999).

## Conclusions

Although important records have been made, our mammal analysis is restricted in that small mammals such as bats and rodents – the most diverse and abundant groups in the mammal community - were not studied. However, with only a small additional effort to other fieldwork, which focused on birds and plants, much useful new data has been collected.

Sites for a number of Threatened species have been determined, with important new distributional and ecological data recorded on several mammal species. Of all the Study Sites, SS2 at Anorí is of critical importance to conservation with a great diversity of Primates including 5 species considered threatened with extinction by the IUCN. The forest fragments studied presently encompass a relatively safe haven for the large fauna of the region. Almost all of these species are now much reduced in range due to landscape modification, making these study areas very important sites for conservation.

---

---

## CONSERVATION ASSESSMENT

---

---

Paul Salaman and Thomas Donegan

This report is aimed at providing initial biological data and an account of our activities. Detailed conservation assessments with firm justifications backed will be provided for both study regions in future work. However, general conservation priorities have emerged from our two study transects. The following conservation priorities are based on our preliminary results, as well as discussion sessions held on-site by team members.

### 1. Serranía de los Churumbelos

#### Biological Importance

General biological findings reveal two major zoogeographic regions, the *Northern Andean* (NAN) and *Amazonia North* (AMN), which strongly influence the biodiversity of Serranía de los Churumbelos. A large number of species were recorded in birds and plants, resulting in the conclusion that two distinct biodiversity groups are defined:

SS 1 & SS 2 (**below 1,000 m**) = great biological affinities to **AMN zoogeographic region**.

SS 3 - SS 7 (**above 1,000 m**) = close biological affinities to the **NAN zoogeographic region**.

Using avian taxa, greater definition can be assigned to the biological compositions, with a large proportion of species restricted to the *Eastern Slope Andes* (within NAN) or *Río Negro West* (within AMN) zoogeographic subregions.

Whilst the entire Eastern slope of the Andes is influenced by these two zoogeographic regions, it is interesting to encounter such a high species diversity in Serranía de los Churumbelos. The Serranía encompasses an immense variety of ecosystems and micro-habitats, reflected its extraordinarily high biodiversity, and encouraged by its complex topography, made up of steep east-facing and gentle west-facing slopes and meseta landforms.

The direct biological justifications for the implementation of conservation are many, and are outlined in greater detail under each group where possible. Over 550 species of birds are estimated to occur in the Serranía, including at least 12 Threatened or Near-Threatened species and 10 restricted-range species. Furthermore, at least 15 bird spp. known from only 1 other location in Colombia were recorded. Two frogs represent the first record in each case for Colombia, with several unidentified herptiles potentially relating to undescribed taxa.

#### Vulnerability assessment

The eastern slope of the Andes in Colombia, as well as adjacent Ecuador, has been subject to enormous human population pressures and associated habitat degradation in recent years. Despite mounting human pressures on the eastern slope of the Andes in Colombia, research activities have largely neglected this region. Past collections have been particularly sparse along the eastern slope of the Andes, owing to historical difficulties with access. However, recent leaps in infrastructure development, although heavily exploited by human colonisers, have not seen a growth in biological research owing to fears regarding political instability and the widespread cultivation of coca.

The large expanse of virgin tropical lowland to montane forests in the Serranía is extremely important. Andean forests in Colombia have been considerably reduced in the last 50 years (Hamilton 1997). Only 15% of premontane and montane forests of Colombia remained intact two decades ago (Orejuela 1985), and these have certainly undergone further drastic reductions in recent years. Although no statistics are available, the foothills of the East Andes have undergone a massive transformation to agriculture in recent decades. Whilst premontane and montane forests contain a greater concentration of endemic, range-restricted and threatened species, protection of a full altitudinal span of forest types would be an efficient use of resources, given that the diversity of the Churumbelos is contained within such a restricted area. Furthermore, destruction of foothill Amazonian forest will have serious effects for many mobile species that may depend on the area for seasonal food resources.

What is most disturbing is the lack of protected areas on the eastern slope of the Andes in Colombia. Parque Nacional Cueva de los Guácharos provides some protection to the forests of the region although is a small Park (c.5,000 ha) and suffers greatly from illegal colonists (Salaman pers. obs.). Fortunately, whilst much of the Andean Cordilleras and Eastern Andean slopes have undergone irreversible changes, Serranía de los Churumbelos has largely avoided the catastrophic human impact that other regions have suffered. However, this is changing rapidly as Serranía de los

Churumbelos is increasingly viewed as a treasure box of mineral (petroleum and precious metals) and natural resources (timber and rich organic soils for agriculture).

Mocoa has historically been a poor frontier town owing to a treacherous and often impassable single road access from Pasto, Nariño. However, within the last 10 years this has changed on completion of the Bogotá-Mocoa highway. The final road section from Mocoa to Pitalito was a major breakthrough for the regional economy, allowing the fast and reliable transportation of goods from Mocoa to the heart of Colombia. A ten-year sustained economic boom has attracted many immigrants that have colonised rural areas, including marginal lands on the fringe of Serranía de los Churumbelos. The most significant recent development is the development and ongoing paving of the Mocoa to Pitalito road, running parallel to the Serranía. This is scheduled to be completed by 2002 and will greatly facilitate rapid transportation links between Mocoa and the rest of the country, thus further stimulating economic growth and demand, particularly along the road from which SS5-7 were accessed. In addition, further road infrastructure projects are planned in the region, including a new major highway from the Ecuadorian border near Puerto Asís to Villavicencio. This proposed road would pass along the edge of the eastern base of the Serranía from Villagarzón to San José de Fragua and Florencia in Caquetá.

**It is clear that the Serranía de los Churumbelos will shortly become the focus for large-scale deforestation and colonisation. Thus, there is a very real sense of urgency for conservation action to be implemented now, if it is to be effective in the region.**

### **Conservation feasibility**

Colombia '98 and Colombian EBA Project '99 demonstrate the great conservation importance and potential vast threats that are looming for the Serranía de los Churumbelos. Considering the mounting threats and unique biological properties of the Serranía, we unhesitatingly propose that legal protection in the form of establishing a protected area is the only option available to ensure the future protection of the forests in the Churumbelos.

Two options are already under consideration by local authorities. Firstly, the CRC are considering establishing a regionally-administered protected area in the Serranía (Luis Alfonso Ortega *in litt.* 1999). The second alternative would be a significant southerly extension of PNN Cueva de los Guácharos to encompass Picos Fragua down the central spine of los Churumbelos to the Río Caquetá. All of this land is property of the state (uncolonised and virgin forest) and largely non-conflictive with local communities that are currently only within a short distance from new roads bordering the mountain range. Importantly, the National Park could expand 20 fold (to over 100,000 ha.) with minimal increases of costs of infrastructure or administration.

The MMA (Ministerio del Medio Ambiente), who control the designation of National Parks and state environmental policies, have now proposed to enact this expansion of PNN Cueva de los Guácharos to encompass parts of the Churumbelos based on the recommendations of Colombia '98 and Colombian EBA Project '99.

Defining the precise boundaries of any protected area is a difficult decision. We consider it important to incorporate the entire altitudinal gradient from lowland humid forest to cloud forest, maximising the biodiversity protected. Colonists dominate the peripheral zone of the Serranía and, once informed of the threats and value of the Serranía, tentatively appear supportive of protection of a core area. A map of critical areas requiring conservation and proposed expansion of PNN Cueva de los Guácharos will be presented in the future reports.

## 2. Northeast Antioquia Transect

### Biological Importance

The three sites studied by the EBA project in northeast Antioquia each have different, but highly compelling biological importance and conservation worth.

The forested areas around SS1 are immensely important as a fairly extant remnant of forest in the Nechí Endemic Bird Area. The forest of this EBA has been almost completely converted to farmland, resulting in a perilous position for endemics to this biogeographical zone. Blue-knobbed Curassow *Crax alberti*, in particular, is in critical danger of extinction, largely due to the heavy persecution by hunting for food which has followed infiltration by colonisers and gold-panners to the region. A lack of any protected area in the range of this species and other Nechí endemics creates much cause for concern.

Around SS2, most of the important species registered are mammals. With six species of Primate recorded, five of which are globally endangered, the premontane elevations of the northern base of the Cordillera Central are of great importance to the conservation of some of the Americas' most endangered and charismatic species. Protected areas are also urgently needed for bird species such as Sooty Ant-Tanager *Habia gutturalis* and White-mantled Barbet *Capito hypoleucus* as none of the Nechí basin is officially protected.

The patch of forest known as La Forzosa, in which SS3 was situated, has already been purchased by CORANTIOQUIA, following work there earlier this year by AC, JO *et al.* Other Threatened species recorded by them, in addition to the 6 Threatened or Near-Threatened species recorded by us in the higher elevations, include Black Tinamou *Tinamus osgoodi* (Data-Deficient) and Multicoloured Tanager *Chlorochrysa nitidissima* (Vulnerable) (Cuervo *et al.*, 1999). Furthermore, the new species of *Lipaugus* Piha currently being described is being recommended for Critically Endangered status (Cuervo *et al.* in prep.) based on the very limited fragments of forest at 1500-1800 m elevation in the Cordillera Central and critical threat levels.

### Vulnerability assessment

The Colombian economy's major resource, coffee farming, is centred on the subtropical slopes of the Central Cordillera, and supports a high population concentration featuring major cities such as Medellín and Armenia. As is often the case, the subtropical forests of the zone and their communities have borne the brunt of economic development, with 16 of the Central Cordillera's 29 range-restricted bird species considered globally threatened (Stattersfield *et al.* 1997). The plight of these species is directly reflected in continued severe landscape modification and lack of protected areas in the region. Furthermore, as most of the few protected areas in the Central Cordillera are situated on the highest massifs dominated by páramo (e.g. Parque Natural National Los Nevados), the subtropical forests remain at considerable risk. Less than 10% of original forest cover in the Central Cordillera remains (Henderson *et al.* 1997), but we estimate this figure to be closer to 4% between 1000-2000 m elevations where only a few isolated forest fragments survive.

The existence of the patch of forest at La Forzosa owes much to the conscientious efforts of Luis Angel Ramirez in preventing hunters from entering the land and in resisting commercial pressures towards deforestation. CORANTIOQUIA have been instrumental in ensuring that this special forest is protected, paying Luis Angel Ramirez as a guard and initiating a programme with local communities. It is hoped that this scheme can be continued to ensure that the regional reserve is effectively enforced with the respect and support of local people. With so many exceptionally rare species, prospects for ecotourism appear good if security concerns can successfully be allayed.

Infrastructure in the Anori region continues to be improved with the recent paving of half of the main road from Antioquia opening up communications routes to farming communities. Beyond Anori downslope, there exists a large fragment of premontane forest known as La Morena, in which SS2 was situated. This largely primary forest is being slowly infiltrated by sprawling expansion of farms. We hope that CORANTIOQUIA's innovative programme can be extended to help reduce the rate of infiltration, due to the wealth of threatened species present in the foothills.

Despite forest coverage maps suggesting continuous forest in northeast Antioquia and Sur de Bolívar, the region has been heavily fragmented within the past ten years. Most fluvial systems have been devastated by heavy mechanised gold-mining, which has resulted in numerous stagnant pools encouraging mosquitoes and a recent malaria epidemic.

Subsequent to mining, valley slopes have been deforested for bananas, cattle pasture, maize and other crops. The illicit coca *Erythroxylon* spp. is not grown on the western slopes of Serranía de San Lucas due to prohibition by ELN guerillas who currently control the zone. Ridges and steep slopes generally still contain remnant patches of primary forest, although selective logging has impacted significantly through the region's forests. As lower farmed slopes become less productive, clearings are encroaching on important watershed forest patches.

Whereas action taken and planned in the higher elevations around Anori offers some hope to conservationists, the situation in the Puerto Lopez region at the foothills of San Lucas is an ecological catastrophe. Our maps from 1995 showed almost complete forest cover in the San Lucas foothills extending into the northern lowlands. However, based on talks with local people and our own observations, we estimate that just 4 years later, at least 30% of the forest extant in 1995 is now no more. Usually, colonisation follows closely alongside major roads, with forests not opened up until infrastructural improvements facilitate more rapid human access. However, in the San Lucas foothills, loggers are currently extracting timber from a distance up to 2-3 days' horse-ride from the nearest dirt road. Having walked for c. 7 hours from Puerto Lopez, we were only able to reach intervened forest. This unprecedented rate of human intervention is being caused by a 'gold rush' of colonists to the zone. News of the discovery of gold in the region has spread, leading to a cosmopolitan population of prospectors from all around the country. Whereas the amounts of gold potentially available are low in value (a typical worker can expect to find only up to 5000 pesos (\$3) worth of gold per day), the potential for a big discovery continues to attract more and more colonists. And in order to support the population explosion resulting from the gold rush, uncontrolled deforestation (for firewood and subsistence farming) and hunting (for food) are causing unsustainable pressures on remaining forests. Unless action is taken urgently, forest-dependant species in the northern lowlands of Colombia such as *Crax alberti*, will soon become extinct. Sadly, the eastern foothills of Serranía de San Lucas are now effectively 'gone'. Plans for protection are probably best centred further South around Segovia where primary forest still exists, but should be initiated and enforced as a matter of extreme urgency before the tragic deforestation and environmental disaster of Puerto Lopez spread.

### **Conservation feasibility**

In the La Forzosa forest, CORANTIOQUIA have already initiated a (so far) successful conservation programme. Our forthcoming recommendations will set out options for the protected area to be extended downslope to encompass forests surrounding SS2. As CORANTIOQUIA and our own talks with local communities have shown, this is a feasible plan which has attracted support from local communities, local government and farming unions.

The conservation feasibility of the lowland areas is less certain. At present, the current authorities in the zone (the ELN [National Liberation Army] guerillas) have developed several conservation-minded initiatives which will ensure some degree of protection to biological communities at least in the short term. Hunting of certain endangered species (e.g. Tapir) has been prohibited with severe penalties for breach of these "regulations". More importantly, the ELN have set aside protected forested areas within Serranía de San Lucas into which entry is prohibited. These areas are situated on watershed lines to protect drinking water from infestation by Mercury, Cyanide and other bi-products from mining processes. Some of these unofficial "Nature Reserves" are protected by landmines. Although primarily designed for health reasons to prevent water pollution, these areas also act as an effective conservation strategy for the endangered species in the zone. With efficient and sometimes brutal enforcement of protected zones, these areas are more than the 'paper parks' often found in government-controlled areas. However, the conflict in Colombia is such that one can never be sure who will have control of these regions in the future, and whether local communities will continue with water cleanliness schemes when they need firewood to cook, hunting for food and see the potential benefits of farming.

## REFERENCES

- Baillie, J. and Groombridge, B.** (1996) *1996 IUCN Red List of Threatened Animals. International Union for Conservation of Nature and Natural Resources*. The IUCN Species Survival Comision. The World Conservation Union. Gland. pp 378.
- Collar, N. J., Crosby, M. J., and Stattersfield, A. J.** (1994) *Birds to Watch 2: The World List of Threatened Birds*. BirdLife Conservation Series. Cambridge UK.: BirdLife International.
- Collar, N. J., Gonzaga, L. P., Krabbe, N., Madroño-Nieto, A., Naranjo, L. G., Parker III, T. A. and Wege, D. C.** (1992) *Threatened birds of the Americas: The ICBP/IUCN Red Data Book*. Third edition (part 2). Cambridge U.K.: ICBP.
- Cuervo, A. M., J. M. Ochoa, C. Delgado and J. A. Palacio** (1999) *Evaluación de la aviofauna y de la mastofauna del proyecto de reserva regional LA FORZOSA, Municipio de Anorí, Departamento de Antioquia*. Corporación Autónoma Regional del Centro de Antioquia CORANTIOQUIA.
- Cuervo, A. C., Salaman, P. G. W., Ochoa, J. M and Donegan, T. M.** (in prep) A new species of Piha *Lipaugus* (Cotingidae) from the Central Cordillera of Colombia.
- Davis, W.** (1996) *One River: explorations and discoveries in the Amazon rain forest*. Touchstone, New York.
- Emmons, L. H. and Feer, F.** (1997) *Neotropical Rainforest Mammals: a field guide*. Chicago: University of Chicago Press.
- Emmons, L. H., B. M. Whitney and D.L. Ross Jr.** (1997). *Sounds of Neotropical Rainforest Mammals: An Audio Field Guide*. Cornell Laboratory of Ornithology. NY.
- Fjeldsá, J. and Krabbe, N.** (1990) *Birds of the high Andes*. Copenhagen: Univ. of Copenhagen Zoological Mus.
- Gentry, A. H.** (1993) *A field guide to the families and genera of Woody Plants of Northwest South America*. Washington, D.C.; Cons. Inter.
- Graves, G. S.** (1997) *Colorimetric and morphometric gradients in colombian populations of Dusky Antbirds (*Cercomacra tyrannina*), with a description of a new species, *Cercomacra parkeri**. pp21-35. In: *Studies in Neotropical Ornithology honoring Ted Parker III*. (J. V. Remsen, Jr. ed). Ornithol. Monogr. #48.
- Henderson, A, S. Churchill, J. Luteyn.** (1991) *Neotropical Plant Diversity*. Nature. #351 pp 21-22.
- Hernández Camacho, J., R. O. Quijano, T. Walschburger and A. H. Guerra** (1997) Estado de la Biodiversidad en Colombia. In *Biodiversidad de América Latina*, G. Halffter, ed. URL: <http://dell.ieco.conacyt.mx/index1.html>
- Hilty, S. L. and Brown, W. L.** (1986) *A Guide to the Birds of Colombia*. Princeton, New Jersey: Princeton University Press.
- Holdridge, L. R.** (1967) *Life zone ecology*. San José, Costa Rica: Tropical Science Center.
- Lynch, J. D. and Ruiz-Carranza P. M.** (1996) New sister species of *Eleutherodactylus* from the Cordillera Occidental of Southwest Colombia (Amphibia: Salienta: Leptodactylidae). *Rev. Acad. Colomb. Cienc.* 20 (77): 347-363, 1996.
- O'Shea, M.** (1992) *Expedition field techniques: reptiles and amphibians*. Expedition Advisory Centre. London.
- Orejuela, J. E.** (1985) Tropical forest birds of Colombia: a survey of problems and a plan for their conservation. Pp. 95-114 in A. W. Diamond and T. E. Lovejoy, eds. *op. cit.*
- Ridgely, R. S. and Tudor, G.** (1989) *The birds of South America: Vol. 1, the Oscine Passerines*. Oxford: OUP.
- Ridgely, R. S. and Tudor, G.** (1994) *The birds of South America: Vol. 2, the Suboscine Passerines*. Oxford: OUP.
- Ruiz-Carranza, P. M., Ardila-Robayo, M. C., and Lynch, J. D.,** (1996) Lista Actualizada de la Fauna de Amphibia de Colombia. *Rev. Acad. Colomb. Cienc.* 20 (77) 365-415, 1996. ISSN 0370-3908.
- Salaman, P. G. W. and Donegan, T. M., (eds.)** (1998) Colombia '98 expedition to Serranía de los Churumbelos: preliminary report. URL: <http://www.proaxis.com/~salaman/colombia98.html>
- Salaman, P. G. W., Donegan, T. M. and Cuervo, A. M.** (1999) Ornithological surveys in Serranía de los Churumbelos, southern Colombia. *Cotinga* 12: 29-39.
- Salaman, P. G. W., Donegan, T. M., Mauricio, G., Stiles, F. G. and Cuervo, A. M.** (in prep.) Range extensions from the Cordillera Oriental of Colombia.
- Salaman, P. G. W., ed.** (1994) Surveys and conservation of biodiversity in the Chocó, south-west Colombia. Cambridge, U.K.: *BirdLife International Study Report* 61.
- Sanchez, H., Castaño, O., Cardenas, G.,** (1995) Diversidad de los Reptiles en Colombia. In *Colombia Diversidad Biotica 1*. Bogotá: ICN.
- Stattersfield, A. J., Crosby, M. J., Long, A. J. and Wege, D. C.** (1997) *Endemic Bird Areas of the World: Priorities for Biodiversity Conservation*. BirdLife Conservation Series. Cambridge, U.K.: BirdLife International.
- Tirira, D.** (1999) *Mamíferos del Ecuador*. Museo de Zoología. Centro de Biodiversidad y Ambiente. Pontificia Universidad Católica del Ecuador. Sociedad para la Investigación y el Monitoreo de la Biodiversidad Ecuatoriana. pp 392. Quito
- Wege, D. C. and Long, A. J.** (1995) *Key Areas for threatened birds in the Neotropics*. BirdLife Conservation Series No. 5. Cambridge, U.K.: BirdLife International.





Citrine Warbler <i>Basileuterus luteoviridis</i>							1	4
Russet-crowned Warbler <i>Basileuterus coronatus</i>						14		4
Three-striped Warbler <i>Basileuterus tristriatus</i>					x	14		
Buff-rumped Warbler <i>Basileuterus fulvicauda</i>	x							
Capped Conebill <i>Conirostrum albifrons</i>								x
Bananaquit <i>Coereba flaveola</i>			4			x		
Bluish Flower-Piercer <i>Diglossa caerulea</i>					x		19	3
Masked Flower-Piercer <i>Diglossa cyanea</i>					x		3	11
Deep-blue Flower-Piercer <i>Diglossa glauca</i>					x	4	1	1
White-sided Flower-Piercer <i>Diglossa albilatera</i>							2	9
Purple Honeycreeper <i>Cyanerpes caeruleus</i>	x	26			x		x	
Red-legged Honeycreeper <i>Cyanerpes cyaneus</i>	x							
Green Honeycreeper <i>Cyanerpes spiza</i>	x							
Blue Dacnis <i>Dacnis cayana</i>	x	x						
Golden-collared Honeycreeper <i>Iridophanes pulcherrima</i>				X	x			
Black-faced Dacnis <i>Dacnis lineata</i>			x					
Yellow-bellied Dacnis <i>Dacnis flaviventer</i>	x							
Swallow Tanager <i>Tersina viridis</i>	x							
Orange-bellied Euphonia <i>Euphonia xanthogaster</i>	12		3	14	5	15	3	3
Thick-billed Euphonia <i>Euphonia lanirostris</i>	x		x		5			
Rufous-bellied Euphonia <i>Euphonia rufiventris</i>	1							
Orange-eared Tanager <i>Chlorochrysa calliparaea</i>				4	3	x		
Opal-rumped Tanager <i>Tangara velia</i>	x							
Paradise Tanager <i>Tangara chilensis</i>	x	x	X					
Green-and-gold Tanager <i>Tangara schrankii</i>		2						
Speckled Tanager <i>Tangara guttata</i>		x						
Yellow-bellied Tanager <i>Tangara xanthogastra</i>		4						
Golden Tanager <i>Tangara arthus</i>				3	x			
Saffron-crowned Tanager <i>Tangara xanthocephala</i>					x	x		x
Golden-eared Tanager <i>Tangara chrysolis</i>			1		x			
Flame-faced Tanager <i>Tangara parzudakii</i>					x	x		
Metallic-green Tanager <i>Tangara labradorides</i>						x		
Blue-necked Tanager <i>Tangara cyanicollis</i>			1	x				
Masked Tanager <i>Tangara nigrocincta</i>						x		
Golden-naped Tanager <i>Tangara ruficervix</i>						x		
Bay-headed Tanager <i>Tangara gyrola</i>		1	X					
Scrub Tanager <i>Tangara vitriolina</i>				X				
Beryl-spangled Tanager <i>Tangara nigroviridis</i>					x	1	1	1
Blue-and-black Tanager <i>Tangara vassorii</i>								x
Yellow-throated Tanager <i>Iridosornis analis</i>					x			
Golden-crowned Tanager <i>Iridosornis rufivertex</i>							5	3
Blue-winged Mountain-Tanager <i>Anisognathus flavinucha</i>					x	1		x
Hooded Mountain-Tanager <i>Buthraupis montana</i>							2	2
Blue-gray Tanager <i>Thraupis episcopus</i>	x			x				
Palm Tanager <i>Thraupis palmarum</i>	x							
Silver-beaked Tanager <i>Ramphocelus carbo</i>	x			6				
Masked Crimson Tanager <i>Ramphocelus nigrogularis</i>	x							
Vermillion Tanager <i>Calochaetes coccineus</i>	x			x	x			
White-winged Tanager <i>Piranga leucoptera</i>								x
Red-hooded Tanager <i>Piranga rubriceps</i>								
Olive Tanager <i>Chlorothraupis carmoli</i>		10	3					
Fulvous Shrike-Tanager <i>Lanio fulvus</i>		3	2					
White-lined Tanager <i>Tachyphonus rufus</i>	x							
Flame-crested Tanager <i>Tachyphonus cristatus</i>		x						
Fulvous-crested Tanager <i>Tachyphonus surinamus</i>	x	4						
Rufous-crested Tanager <i>Creurgops verticalis</i>					x	1		
Yellow-backed Tanager <i>Hemithraupis flavicollis</i>	x	x						
White-capped Tanager <i>Sericossypha albocristata</i>						x	x	x
Common Bush-Tanager <i>Chlorospingus ophthalmicus</i>						2	1	6
Yellow-throated Bush-Tanager <i>Chlorospingus flavigularis</i>				8	x	x		
Grey-hooded Bush-Tanager <i>Cnemoscopus rubrirostris</i>							x	x
Grass-green Tanager <i>Chlorornis riefferii</i>							3	3
Magpie Tanager <i>Cissopis leveriana</i>	x	x						
Oleaginous Hemispingus <i>Hemispingus frontalis</i>						12		
Red-capped Cardinal <i>Paroaria gularis</i>	x							
Slate-colored Grosbeak <i>Pitylus grossus</i>	x	3						
Buff-throated Saltator <i>Saltator maximus</i>	x	5	2					
Blue-black Grosbeak <i>Cyanocompsa cyanoides</i>	6	5						
Yellow-browed Sparrow <i>Ammodramus aurifrons</i>	x							
Blue-black Grassquit <i>Volatinia jacarina</i>	x							
Caquetá Seed-eater <i>Sporophila (americana) murallae</i>	x							
Yellow-bellied Seed-eater <i>Sporophila nigricollis</i>								x
Chestnut-bellied Seed-eater <i>Sporophila castaneiventris</i>	x							
Slaty Finch <i>Haplospiza rustica</i>						2	4	
Rufous-collared Sparrow <i>Zonotrichia capensis</i>				2				x
Chestnut-bellied Seed-finch <i>Oryzoborus angolensis</i>	x							
Orange-billed Sparrow <i>Arremon aurantiostris</i>								x
Dusky-headed Brush-Finch <i>Atlapetes fuscoolivaceus</i>								x
Slaty Brush-Finch <i>Atlapetes schistaceus</i>							x	
Chestnut-capped Brush-Finch <i>Atlapetes brunneinucha</i>					3	6		2
Olive Finch <i>Lysurus castaneiceps</i>			5	x				

## Appendix II: Systematic inventory of birds recorded in northeast Antioquia.

Taxonomy and nomenclature largely follows Stotz *et al.* (1996), Ridgley and Tudor (1989 and 1994), Sibley and Monroe (1990 and 1993), and Ridgley and Greenfield (in prep.). Sequence follows Hilty and Brown (1986).

### Key: Species observed and caught at each site:

SS1: Finca La Esperanza, Municipio Segovia, 3 - 8 August, 350m

SS2: Alto los Tarros, Municipio Anori. 19 - 23 August, 700m

SS3: Reserva La Forzosa, Municipio Anori, 26 - 29 August, 1550 m

(a) Puerto Lopez, Rio Tigui and Rio Nechi: Secondary growth and riverine. 1-3, 11-12 August. 200-400 m

(b) Anori, Cruces, La Tyrana and roads between. Sec. growth and riverine 17-19 and 24 August 600 - 1600 m

Species	SS1	SS2	SS3
Great Tinamou <i>Tinamus major</i>	X	x	
Colombian Tinamou <i>Crypterellus columbianus</i>		x	
Little Tinamou <i>Crypterellus soui</i>	x (a)	x (b)	x
Least Grebe <i>Podiceps dominicus</i>		(b)	
Neotropical Cormorant <i>Phalacrocorax brasilianus</i>	(a)		
Cocoi Heron <i>Ardea cocoi</i>	(a)		
Great Egret <i>Casmerodius alba</i>	(a)		
Snowy Egret <i>Egretta thula</i>	(a)		
Striated Heron <i>Butorides striatus</i>	(a)		
Capped Heron <i>Ptilerodius pileatus</i>	(a)		
Common Cattle Egret <i>Bubulcus ibis</i>	(a)		
Fasciated Tiger-Heron <i>Tigrisoma fasciatum</i>	N	(a)	
Wood Stork <i>Mycteria americana</i>	(a)		
Roseate Spoonbill <i>Ajaia ajaja</i>	(a)		
Northern Screamer <i>Chauna chavaria</i>	N	(a)	
Turkey Vulture <i>Cathartes aura</i>	x (a)	x (b)	x
Lesser Yellow-headed Vulture <i>Cathartes burrovianus</i>	(a)		
Black Vulture <i>Coragyps atratus</i>	x (a)	x (b)	x
King Vulture <i>Sarcoramphus papa</i>	x (a)	x (b)	
Osprey <i>Pandion haliaetus</i>	(a)		
American Swallow-tailed Kite <i>Elanoides forficatus</i>	x (a)		
White-tailed Kite <i>Elanus (caeruleus) leucurus</i>	(a)		
Double-toothed Kite <i>Harpagus bidentatus</i>	x		
Plumbeous Kite <i>Ictinia plumbea</i>	(a)	x	
Plumbeous Hawk <i>Leucopternis plumbea</i>	N	x	
Semiplumbeous Hawk <i>Leucopternis semiplumbea</i>		x	
White Hawk <i>Leucopternis albicollis</i>	x		x
Savanna Hawk <i>Buteogallus meridionalis</i>	(a)		
Gray-lined Hawk <i>Asturina nitida</i>	x		
Roadside Hawk <i>Buteo magnirostris</i>	x (a)	(b)	x
Black Hawk-Eagle <i>Spizaetus tyrannus</i>	x		x
Red-throated Caracara <i>Daptrius americanus</i>	x	x (b)	x
Yellow-headed Caracara <i>Milvago chimachima</i>	x (a)	(b)	
Laughing Falcon <i>Herpotheres cachinnans</i>	x	x	x
Barred Forest-Falcon <i>Micrastur ruficollis</i>	x		x
American Kestrel <i>Falco sparverius</i>	(a)		x
Bat Falcon <i>Falco rufigularis</i>	x (a)		
Colombian Chachalaca <i>Ortalis colombiana</i>		(b)	x
Chestnut-winged Chachalaca <i>Ortalis garrula</i>	(a)		
Crested Guan <i>Penelope purpurascens</i>	x	x	
Wattled Guan <i>Aburria aburri</i>			x
Blue-knobbed Curassow <i>Crax alberti</i>	T E	(x)	(x)
Crested Bobwhite <i>Colinus cristatus</i>	(a)		
Marbled Wood-Quail <i>Odontophorus gujanensis</i>	x	x	
Chestnut Wood-Quail <i>Odontophorus hyperythrus</i>			x
Tawny-faced Quail <i>Rhynchortyx cinctus</i>		x	
Purple Gallinule <i>Porphyrio martinica</i>	(a)		
Sunbittern <i>Eurypyga helias</i>	x		
Wattled Jacana <i>Jacana jacana</i>	(a)		
Southern Lapwing <i>Vanellus chilensis</i>	(a)		
Collared Plover <i>Charadrius collaris</i>	(a)		
Spotted Sandpiper <i>Actitis maularia</i>		(b)	
Pectoral Sandpiper <i>Calidris melanotos</i>		(b)	
Feral (Rock) Pigeon <i>Columba livia</i>	(a)	(b)	
Scaled Pigeon <i>Columba spectiosa</i>	x		
Pale-vented Pigeon <i>Columba cayennensis</i>	(a)		
Band-tailed Pigeon <i>Columba fasciata</i>		(b)	
Plumbeous Pigeon <i>Columba plumbea</i>		x	
Ruddy Pigeon <i>Columba subvinacea</i>		x	x
Eared Dove <i>Zenaidura macroura</i>	(a)		
Common Ground-Dove <i>Columbina passerina</i>	(a)		
Plain-breasted Ground-Dove <i>Columbina minuta</i>	(a)		
Ruddy Ground-Dove <i>Columbina talpacoti</i>	x (a)		
White-tipped Dove <i>Leptotila verreauxi</i>	x (a)	(b)	
Blue Ground-Dove <i>Claravis pretiosa</i>	a		
Ruddy Quail-Dove <i>Geotrygon montana</i>	x		

Violaceous Quail-Dove <i>Geotrygon violacea</i>	x		
Olive-backed Quail-Dove <i>Geotrygon veraguensis</i>	x		
Brown-throated Parakeet <i>Aratinga pertinax</i>	x (a)		
Orange-chinned Parakeet <i>Brotogeris jugularis</i>	x (a)	(b)	
Red-winged Parrotlet <i>Touit dilectissima</i>			x
Saffron-headed Parrot <i>Pionopsitta pyrilia</i>	N	x	x
Blue-headed Parrot <i>Pionus menstruus</i>	x (a)		
Red-ored Parrot <i>Amazona autumnalis</i>	x (a)		
Yellow-crowned Parrot <i>Amazona ochrocephala</i>	(a)		
Orange-winged Parrot <i>Amazona amazonica</i>	(a)		
Mealy Parrot <i>Amazona farinosa</i>	x (a)	x	
Striped Cuckoo <i>Tapera naevia</i>	(a)	(b)	x
Squirrel Cuckoo <i>Piaya cayana</i>		(b)	x
Smooth-billed Ani <i>Crotophaga ani</i>	x (a)		x
Groove-billed Ani <i>Crotophaga sulcirostris</i>	(a)		
Spectacled Owl <i>Pulsatrix perspicillata</i>	x		
Ferruginous Pygmy-Owl <i>Glaucidium brasilianum</i>			x
Mottled Owl <i>Sirix virgata</i>		x	x
Owl sp.			x
Band-winged Nightjar <i>Caprimulgus longirostris</i>			x
White-collared Swift <i>Streptoprocne zonaris</i>	x (a)	x (b)	x
Chestnut-collared Swift <i>Cypseloides nutilus</i>			x
Gray-rumped Swift <i>Chaetura cinereiventris</i>	x		
Band-rumped Swift <i>Chaetura spinicauda</i>		(b)	
Rufous-breasted Hermit <i>Glaucis hirsuta</i>	x (a)		
Band-tailed Barbthroat <i>Threnetes ruckeri</i>	x		
Long-tailed Hermit <i>Phaethornis (superciliosus) longirostris*</i>	x	x	
Pale-bellied Hermit <i>Phaethornis anthophilus</i>	x		
Green Hermit <i>Phaethornis guy</i>		x	x
Little Hermit <i>Phaethornis longuemareus</i>	x	x	
Tooth-billed Hummingbird <i>Androdon aequatorialis</i>			x
White-tipped Sicklebill <i>Eutoxeres aquila</i>		x	x
Green-fronted Lancebill <i>Doryfera ludovicicae</i>			x
White-necked Jacobin <i>Florisuga mellivora</i>	x (a)	x	
Black-throated Mango <i>Anthracoceros nigricollis</i>	(a)		
Blue-tailed Emerald <i>Chlorostilbon mellisugus</i>	x		?
Red-billed Emerald <i>Chlorostilbon gibsoni</i>	x		
Blue-chested Hummingbird <i>Amazilia amabilis</i>	x		
Green-crowned Woodnymph <i>Thalurania colombica</i>		x	x
Andean Emerald <i>Amazilia franciae</i>		x	x
Rufous-tailed Hummingbird <i>Amazilia tzacatl</i>	x (a)	(b)	
Bronze-tailed Plumeleteer <i>Chalybura urochrysis</i>	x	x	
Green-crowned Brilliant <i>Heliodoxa jacula</i>	x	x	
Greenish Puffleg <i>Haplophaedia aureliana</i>			x
Booted Racket-tail <i>Ocreatus underwoodii</i>			x
Purple-crowned Fairy <i>Heliodytes barrotii</i>	x		
Collared Trogon <i>Trogon collaris</i>			x
Black-tailed Trogon <i>Trogon melanurus</i>	x (a)	x	
Masked Trogon <i>Trogon personatus</i>			x
Black-throated Trogon <i>Trogon rufus</i>			x
White-tailed Trogon <i>Trogon viridis</i>	x (a)	x	
Violaceous Trogon <i>Trogon violaceus</i>	x		
Ringed Kingfisher <i>Megascyle torquata</i>	(a)		
Amazon Kingfisher <i>Chloroceryle amazona</i>	(a)		
Green Kingfisher <i>Chloroceryle americana</i>	x (a)		x
Rufous Motmot <i>Baryphthengus martii</i>	x		
Blue-crowned Motmot <i>Motmota motmota</i>			x
Rufous-tailed Jacamar <i>Galbula ruficauda</i>			x
White-necked Puffbird <i>Notharchus macrorhynchos</i>	x	x	
Black-breasted Puffbird <i>Notharchus pectoralis</i>	x	x	
White-whiskered Puffbird <i>Malacoptila panamensis</i>	x	x	
White-fronted Nunbird <i>Monasa morphoeus</i>	x (a)		
Spot-crowned Barbet <i>Capito maculicoronatus</i>	x (a)		
White-mantled Barbet <i>Capito hypoleucus</i>	T E	x (a)	x
Red-headed Barbet <i>Eubucco bourcierii</i>			x
Crimson-rumped Toucanet <i>Aulacorhynchus haematopygus</i>			x
Collared Araçari <i>Pteroglossus torquatus</i>	x (a)	x (b)	
Citron-throated Toucan <i>Ramphastos citreolaemus</i>	x (a)	x	

Chestnut-mandibled Toucan <i>Ramphastos swainsonii</i>		x (a)	x (b)	
Spot-breasted Woodpecker <i>Colaptes punctigula</i>		x (a)		x
Golden-green Woodpecker <i>Piculus chrysochloros</i>		x		
White-throated Woodpecker <i>Piculus litae</i>			x	
Cinnamon Woodpecker <i>Ceelus loricator</i>		x	x	
Beautiful Woodpecker <i>Melanerpes (chrysauchen) pulcher</i>	E	x	x	
Red-crowned Woodpecker <i>Melanerpes rubricapillus</i>		x (a)		
Smoky-brown Woodpecker <i>Veniliornis fumigatus</i>				x
Red-rumped Woodpecker <i>Veniliornis kirkii</i>		x		
Crimson-crested Woodpecker <i>Campophilus melanoleucos</i>		x (a)	x	
Crimson-bellied Woodpecker <i>Campophilus haematogaster</i>		x		
Plain-brown Woodcreeper <i>Dendrocincla fuliginosa</i>		x	x	
Olivaceous Woodcreeper <i>Sittasomus griseicapillus</i>			x	x
Wedge-billed Woodcreeper <i>Glyphorhynchus spirurus</i>		x	x	
Strong-billed Woodcreeper <i>Xiphocolaptes promeropirhynchus</i>		x		
Northern Barred-Woodcreeper <i>D. (certhia) sanctithomae*</i>		x	x	
Spotted Woodcreeper <i>Xiphorhynchus erythropyrrhus</i>			x	
Straight-billed Woodcreeper <i>Xiphorhynchus picus</i>		x		
Black-striped Woodcreeper <i>Xiphorhynchus lachrymosus</i>		x	x	
Olive-backed Woodcreeper <i>Xiphorhynchus triangularis</i>				x
Streaked-headed Woodcreeper <i>Lepidocolaptes souleyetii</i>		x		
Brown-billed Scythebill <i>Campylorhynchus pusillus</i>				x
Pale-breasted Spinetail <i>Synallaxis albescens</i>		(a)	(b)	
Azara's Spinetail <i>Synallaxis azarae</i>				x
Spotted Barbtail <i>Premnoplex brunescens</i>				x
Striped Woodhaunter <i>Hylocistetes subulatus</i>			x	x
Slaty-winged Foliage-gleaner <i>Phylidor fuscipennis</i>		x	x	
Buff-fronted Foliage-gleaner <i>Phyllator rufus</i>			x	x
Buff-throated Foliage-gleaner <i>Automolus ochrolaemus</i>		x	x	
Plain Xenops <i>Xenops minutus</i>		x	x	x
Tawny-throated Leaf-tosser <i>Sclerurus mexicanus</i>		x	x	
Scaly-throated Leaf-tosser <i>Sclerurus guatemalensis</i>		x		
Fasciated Antshrike <i>Cymbilaimus lineatus</i>			x	
Bar-crested Antshrike <i>Thamnophilus multistriatus</i>		x		
Western Slaty Antshrike <i>Thamnophilus atrinucha*</i>		x (a)	x	x
Uniform Antshrike <i>Thamnophilus unicolor</i>				x
Plain Antvireo <i>Dysithamnus mentalis</i>				x
Checker-throated Antwren <i>Myrmotherula fulviventris</i>		x (a)	x	
White-flanked Antwren <i>Myrmotherula axillaris</i>		x (a)	x	
Slaty Antwren <i>Myrmotherula schisticolor</i>				x
Streaked Antwren <i>Myrmotherula surinamensis</i>			(b)	
Rufous-winged Antwren <i>Herpsilochmus rufimarginatus</i>		x		
Dot-winged Antwren <i>Microrhopias quixensis</i>		x	x	
White-fringed Antwren <i>Fornicivora grisea</i>		x		
Parker's Antbird <i>Cercomacra parkeri</i>				x
Dusky Antbird <i>Cercomacra tyrannina</i>		x		
Chestnut-backed Antbird <i>Myrmeciza exsul</i>		x (a)		
Dull-mantled Antbird <i>Myrmeciza laeosticta</i>				x
Bicolored Antbird <i>Gymnopythys bicolor</i>		x	x	
Spotted Antbird <i>Hylophylax naevioides</i>		x		
Black-faced Antthrush <i>Fornicarius analis</i>		x		
Bay-backed Antpitta <i>Grallaria hypoleuca</i>				x
Rufous-vented Tapaculo sp. <i>Scytalopus femoralis sp.</i>				x
Golden-headed Manakin <i>Pipra erythrocephala</i>		x	x	
White-crowned Manakin <i>Pipra pipra</i>				x
Velvety Manakin <i>Pipra (coronata) velutina (*)</i>		x	x	
Golden-winged Manakin <i>Masius chrysopterus</i>				x
White-bearded Manakin <i>Manacus manacus</i>		x (a)		
Striped Manakin <i>Machaeropterus regulus</i>			x	
Green Manakin <i>Chloropipo holochlora</i>			x	
Thrush-like Mourner <i>Schiffornis turdinus</i>		x	x (b)	
Rufous Piha <i>Lipaugus unirufus</i>		x	x	
Piha <i>Lipaugus sp. nov.</i>				x
Blue Cotinga <i>Cotinga nattererii</i>			x	
Purple-throated Fruitcrow <i>Querula purpurata</i>		x	(b)	
Brown-capped Tyrannulet <i>Ornithion brunneicapillum</i>		x (a)		
Golden-faced Tyrannulet <i>Zimmerius viridiflavus</i>				x
Yellow-crowned Tyrannulet <i>Tyrannulus elatus</i>		x		
Yellow-bellied Elaenia <i>Elaenia flavogaster</i>		(a)	(b)	x
Olive-striped Flycatcher <i>Mionectes olivaceus</i>		(a)	x	x
Ochre-bellied Flycatcher <i>Mionectes oleagineus</i>		x	x	
Rufous-browed Tyrannulet <i>Phylloscartes superciliosus</i>				x
Marble-faced Bristle-Tyrant <i>Pogoniticus ophthalmicus</i>				x
Black-capped Pygmy-Tyrant <i>Myiornis atricapillus</i>		x	x	
Scale-crested Pygmy-Tyrant <i>Lophotriccus pileatus</i>				x
Southern Bentbill <i>Oncostoma olivaceum</i>			x	
Black-headed Tody-Flycatcher <i>Todirostrum nigriceps</i>		x		
Common Tody-Flycatcher <i>Todirostrum cinereum</i>		(a)		
Slate-headed Tody-Flycatcher <i>Todirostrum sylvia</i>		(a)		
Brownish Flycatcher <i>Cnipodectes subbrunneus</i>			x	
Olivaceous Flatbill <i>Rhynchoocylus olivaceus</i>		x		
White-throated Spadebill <i>Platyrhynchus mystaceus</i>				x
Ornate Flycatcher <i>Myiotoxicus ornatus</i>				x
Ruddy-tailed Flycatcher <i>Terenotriccus erythrus</i>		x		

Black-tailed Flycatcher <i>Myiobius atricaudus</i>		x	x	
Long-tailed Tyrant <i>Colonia colonus</i>		x		
Cattle Tyrant <i>Machetornis rixosus</i>		(a)		
Bright-rumped Attila <i>Attila spadiceus</i>		x		
Speckled Mourner <i>Laniocera rufescens</i>				x
Pale-edged Flycatcher <i>Myiarchus cephalotes</i>				x
Dusky-capped Flycatcher <i>Myiarchus tuberculifer</i>		x		
Great Kiskadee <i>Pitangus sulphuratus</i>		(a)	(b)	
Rusty-margined Flycatcher <i>Myiozetetes cayanensis</i>		x (a)	(b)	
Streaked Flycatcher <i>Myiodynastes maculatus</i>		x		
Piratic Flycatcher <i>Legatus leucophaeus</i>		(a)		
Tropical Kingbird <i>Tyrannus melancholicus</i>		x (a)	(b)	x
Barred Becard <i>Pachyrhamphus versicolor</i>				x
Cinereous Becard <i>Pachyrhamphus rufus</i>		x		
Cinnamon Becard <i>Pachyrhamphus cinnamomeus</i>			(b)	
Black-tailed Tityra <i>Tityra cayana</i>				x
Masked Tityra <i>Tityra semifasciata</i>		x		
Black-crowned Tityra <i>Tityra inquisitor</i>		x		
White-winged Swallow <i>Tachycineta albiventer</i>		(a)		
Brown-chested Martin <i>Progne tapera</i>		(a)		
Blue-and-white Swallow <i>Notiochelidon cyanoleuca</i>		(a)	(b)	x
White-thighed Swallow <i>Neochelidon (tibialis) minima</i>			(b)	
Southern Rough-winged Swallow <i>Stelgidopteryx ruficollis</i>		x (a)	x (b)	x
Black-chested Jay <i>Cyanocorax affinis</i>		x (a)	x (b)	x
Green Jay <i>Cyanocorax yncas</i>				x
White-capped Dipper <i>Cinclus leucocephalus</i>			(b)	
Bicolored Wren <i>Campylorhynchus griseus</i>		x (a)		
Band-backed Wren <i>Campylorhynchus zonatus</i>		x		
Sooty-headed Wren <i>Thryothorus spadix</i>			x	X
Black-bellied Wren <i>Thryothorus fasciatoventris</i>		x (a)		
Bay Wren <i>Thryothorus nigricapillus</i>		x	(b)	x
House Wren <i>Troglodytes aedon</i>				x
Grey-breasted Wood-Wren <i>Henicorhina leucophrys</i>				x
White-breasted Wood-Wren <i>Henicorhina leucosticta</i>		x (a)	x	
Southern Nightingale-Wren <i>Microcerculus marginatus</i>		x	x	
Song Wren <i>Cyphorhinus phaeocephalus</i>		x	x	
Tropical Mockingbird <i>Mimus gilvus</i>		(b)		
Andean Solitaire <i>Myadestes ralloides</i>				x
Great Thrush <i>Turdus fasciater</i>				x
Glossy-black Thrush <i>Turdus serranus</i>				x
Black-billed Thrush <i>Turdus ignobilis</i>				x
Tawny-faced Gnatwren <i>Microbates cinereiventris</i>		x	x	
Long-billed Gnatwren <i>Ramphocaelus melanurus</i>		x (a)		
Slate-throated Gnatcatcher <i>Poliopitila schistaceigula</i>				x
Rufous-browed Peppershrike <i>Cyclarhis gujanensis</i>		x	x	
Black-billed Peppershrike <i>Cyclarhis nigrirostris</i>				x
Tawny-crowned Greenlet <i>Hylophilus ochraceiceps</i>				x
Slate-throated Whitestart <i>Myioborus miniatus</i>				x
Buff-rumped Warbler <i>Basileuterus fulvicauda</i>		(a)	(b)	x
Shiny Cowbird <i>Molothrus bonariensis</i>		(a)	(b)	
Crested Oropendola <i>Psarocolius decumanus</i>		(a)	x (b)	
Yellow-rumped Cacique <i>Cacicus cela</i>		(a)		
Red-bellied Grackle <i>Hypopyrrhus pyrohypogaster</i>				x
Orange-crowned Oriole <i>Icterus auricapillus</i>		x (a)		
Bananaquit <i>Coereba flaveola</i>		(a)	(b)	x
Purple Honeycreeper <i>Cyanerpes caeruleus</i>		x (a)	x	
Green Honeycreeper <i>Cyanerpes spiza</i>		x (a)	x (b)	
Blue Dacnis <i>Dacnis cayana</i>		x		
Black-faced Dacnis <i>Dacnis lineata</i>			(b)	
Yellow-bellied Dacnis <i>Dacnis falviventris</i>				x
Scarlet-thighed Dacnis <i>Dacnis venusta</i>				x
Thick-billed Euphonia <i>Euphonia lamirostris</i>		x		
White-vented Euphonia <i>Euphonia minuta</i>			(b)	
Orange-bellied Euphonia <i>Euphonia xanthogaster</i>				x
Speckled Tanager <i>Tangara guttata</i>				x
Golden Tanager <i>Tangara arthus</i>				x
Bay-headed Tanager <i>Tangara gyrula</i>			(b)	
Golden-hooded Tanager <i>Tangara larvata</i>		x	(b)	
Plain-coloured Tanager <i>Tangara inornata</i>				x
Beryl-spangled Tanager <i>Tangara nigroviridis</i>			(b)	x
Purplish-mantled Tanager <i>Iridosornis porphyrrhynchus</i>				x
Blue-gray Tanager <i>Thraupis episcopus</i>		x (a)	(b)	x
Palm Tanager <i>Thraupis palmarum</i>		x (a)	(b)	
Crimson-backed Tanager <i>Ramphocelus dimidiatus</i>		x (a)	(b)	
Lemon-rumped Tanager <i>Ramphocelus icteronotus</i>		(a)	(b)	
White-winged Tanager <i>Piranga leucoptera</i>				x
Sooty Ant-Tanager <i>Habia gutturalis</i>		N E	x	x (b)
White-lined Tanager <i>Tachyphonus rufus</i>		(a)		
Tawny-crested Tanager <i>Tachyphonus delatrii</i>				x (b)
Scarlet-browed Tanager <i>Heterospingus xanthopygius</i>		x	x	
Dusky-faced Tanager <i>Mitrospingus cassinii</i>		x	(b)	
Guira Tanager <i>Hemithraupis guira</i>				x
Yellow-backed Tanager <i>Hemithraupis flavicollis</i>				x
Scarlet-and-white Tanager <i>Erythrorhynchus salmoni</i>				x

Yellow-throated Bush-Tanager <i>Chlorospingus flavigularis</i>			x
Oleaginous Hemispingus <i>Hemispingus frontalis</i>			x
Buff-throated Saltator <i>Saltator maximus</i>	x	x (b)	
Black-winged Saltator <i>Saltator atripennis</i>			x
Grayish Saltator <i>Saltator coerulescens</i>	x	(b)	
Blue-black Grosbeak <i>Cyanocmpsa cyanoides</i>	x		
Yellow-throated Brush-Finch <i>Atlapetes gutturalis</i>			x
Yellow-faced Grassquit <i>Tiaris olivacea</i>			x
Blue-black Grassquit <i>Volatinia jacarina</i>	x	(b)	
Slate-colored Seedeater <i>Sporophila schistacea</i>	?		

Yellow-bellied Seedeater <i>Sporophila nigricollis</i>	x (a)	(b)	x
Ruddy-breasted Seedeater <i>Sporophila minuta</i>	(a)		
Lesser Seed-Finch <i>Oryzoborus angolensis</i>	N	x (a)	
Black-striped Sparrow <i>Arremonops controstris</i>	(a)		x
Rufous-collared Sparrow <i>Zonotrichia capensis</i>		(b)	
<b>TOTAL</b>	<b>205 (55a)</b>	<b>135</b>	<b>99</b>

### Appendix III: Bird specimens collected during EBA '99 expedition in Serranía de los Churumbelos (July 1999) and the northeast Antioquia (August 1999).

**Collectors:** Paul G. W. Salaman (PS), Andres M. Cuervo Maya (AM), Jose Ochoa (JO) and Thomas Donegan (TD).

The following information was omitted from each specimens account, but available on request; colouration of iris, bill, and legs; fat; stomach content; notes. All bird specimens and material deposited at ICN, Universidad Nacional.

#### Northeast Antioquia, northern Cordillera central

SS1 APOLLO 13. Finca La Esperanza, Vda Rio Bagre Malena, Mpio Segovia

SS2 ALTO LOS TARROS. Oba. La Moranita, Vda. La Tirana, Mpio Anori

SS3 ALTO COMBATE. Reserva La Forzosa, Mpio Anori

#### Eastern Cordillera, Serrania de los Churumbelos, Bota Caucana, Cauca.

SS5 NABU, Finca Playon, Vda. La Petrolera, Mpio. Santa Rosa

SS6 TATAUI, Finca Playon, Vda. La Petrolera, Mpio. Santa Rosa

SS7 EL DORON, El Cable telcom station, Mpio. Santa Rosa

EBA#	Collector	site	Species	Ossifica.	sex	gonadas
EBA1	PS 01	SS5	Hemispingus frontalis	partial	m	>1.0
EBA2	AC 01	SS5	Myiophobus pulcher (bellus)	partial	m	6.3
EBA3	AC 02	SS5	Haplospiza rustica	100%	m	3.5
EBA5	PS 02	SS5	Wedge-billed Hummingbird	-	f	>0.5
EBA6	AC 03	SS5	Bristle-tyrant spp. (?)	-	m	5.0
EBA7	AC 04	SS5	Baileuterus tristratus	100%	m	7.1
EBA8	PS 03	SS5	Foliage-gleaner spp. (?)	100%	f	>0.2
EBA9	PS 04	SS5	Hooded Antpitta	100%	m	2.5
EBA10	AC 05	SS5	Common Bush-tanager	100%	m	-
EBA11	AC 04	SS5	Rusty-winged Treerunner	100%	m	8.9
EBA12	PS 05	SS5	Ecuadorian Bristle-tyrant (?)	30-40%	m	1.2
EBA13	PS 06	SS5	Rufous-tailed Antthrush	50%	m	7.2
EBA14	PS07	SS5	Blue-winged Mountain-tanager	100%	f	<0.1
EBA15	PS 08	SS5	Golden-winged Manakin	40%	m	1.0
EBA16	AC 06	SS5	Long-tailed Sylph	100%	m	2.5
EBA17	AC 07	SS5	Andean Solitaire	90%	m	3.5
EBA18	AC08	SS5	Golden-winged Manakin	-	-	-
EBA19	PS 09	SS5	Streaked tuftedcheek	100%	f	1.5
EBA20	AC 09	SS5	Ashy-headed Tyrannulet	70%	m	6.0
EBA21	AC 10	SS5	Speckled Hummingbird	80%	m	9.0
EBA22	AC 11	SS5	Black-capped tyrannulet	>20%	m	0.5
EBA23	AC 12	SS5	Spectacled Prickletail	100%	f	3.9
EBA24	PS 10	SS6	Tapaculo spp. (Unicolored)	0-10%	f	1.7
EBA25	AC 13	SS6	Citrine Warbler	40%	m	5.7
EBA26	PS 11	SS6	Collared Inca	0%	m	2.2
EBA27	TD 1	SS6	Andean Solitaire	0%		
EBA28	PS 12	SS6	Dusky Piha	100%	m	9.7
EBA29	AC 14	SS6	Cinamon Flycatcher	>20%	?	
EBA30	PS 13	SS6	Flammulated Treehunter	100%	f	9.7
EBA31	AC15	SS7	Black-throated Tody-tyrant	>20%	?	

EBA32	AC16	SS7	Collared Inca	90%	f	
EBA33	PS14	SS7	Emerald-bellied Puffleg		m	
EBA34	PS15	SS7	Rufous-vented Whitetip		m	
EBA35	AC17	SS7	Buff-tailed Coronet		m	
EBA36	AC19	SS7	Speckled hummer			
EBA37	AC20	SS7	Speckled hummer		?	
EBA38	PS18	SS7	Speckled hummer			
EBA39	AC18	SS7	Tourmaline Sunangel		m	
EBA40	PS17	SS7	Tourmaline Sunangel		?	
EBA41	PS16	SS7	<b>Tapaculo spp. (Andean?)</b>		f	
EBA42	AC19	SS1	Checker-throated Antwren	>25%	f	
EBA43	AC20	SS1	Long-tailed Hermit	m	2.3	
EBA44	JO1	SS1	Golden-headed Manakin	100%	m	2.0
EBA45	AC21	SS1	Little Hermit			
EBA46	AC22	SS1	White-breasted Wood-wren	100%	f	5.3
EBA47	PS19	SS1	Red-billed Emerald			
EBA48	PS20	SS1	Long-tailed Hermit		m	3.4
EBA49	PS21	SS1	Checker-throated Antwren	100%	f	0.5
EBA50	PS22	SS1	Golden-headed Manakin	100%	f	
EBA51	PS23	SS1	Golden-headed Manakin	100%	m	4.5
EBA52	PS24	SS1	Golden-headed Manakin	100%	m	4.1
EBA53	PS25	SS1	Golden-headed Manakin	100%	m	4.4
EBA54	PS26	SS1	Ochre-bellied Flycatcher	>25%	m	0.6
EBA55	PS27	SS1	Ochre-bellied Flycatcher	100%	f	0.8
EBA56	PS28	SS1	Ochre-bellied Flycatcher	80%	m	2.6
EBA57	PS29	SS1	Wedge-billed Woodcreeper	100%	m	2.1
EBA58	PS30	SS1	Wedge-billed Woodcreeper	100%	f	<0.5
EBA59	AC23	SS2	Striped Foliage-gleaner	100%	m	9.4x5.3
EBA60	PS34	SS2	White-tipped Sicklebill		f	>0.5
EBA61	AC24	SS2	Bronze-tailed Plumeleteer		f	2.7
EBA62	JO2	SS2	Ruddy-tailed Flycatcher	50%		
EBA63	PS35	SS2	Dull-mantled Antbird	100%	m	3.3x1.3
EBA64	AC25	SS2	Green manakin	90%	m	2.8x2.0
EBA65	PS36	SS2	Tooth-billed Hummingbird		m	5.3x2.6
EBA66	AC26	SS2	Wedge-billed Woodcreeper	100%	m	1.3
EBA67	AC27	SS2	Andean Emerald		m	3.4x2.0
EBA68	PS37	SS3	Green-crowned Woodnymph		m	3.1
EBA69	PS38	SS3	White-throated Spadebill	100%	m	1.4
EBA70	PS39	SS3	Buff-fronted Foliage-gleaner	95%	m	1.5
EBA71	PS40	SS3	Parker's Antbird	100%	m	1.5
EBA72	PS41	SS3	Green-crowned Woodnymph		m	2.2
EBA73	PS42	SS3	House Wren	50%	f	3.9
EBA74	PS43	SS3	Green-crowned Woodnymph		m	2.3
EBA75	PS44	SS3	Yellow-throated Bush-tanager	100%	m	4.2
EBA76	AC28	SS3	<b>Lipaugus sp. nov.</b>	100%	m	
EBA77	AC29	SS3	Parker's Antbird	100%	f	4.4
EBA78	PS45	SS3	Parker's Antbird	100%	f	4.2
EBA79	PS46	SS3	Olive-striped /Streak-necked Flycatcher	25%	f	5.6
EBA80	PS47	SS3	Striped Foliage-gleaner (?)	20%	m	1.8
EBA81	PS48	SS3	Striped Foliage-gleaner	50%	f	4.0
EBA82	PS49	SS3	West Andean Emerald		m	1.7
EBA86	PS50	SS3	<b>Lipaugus sp. nov.</b>	100%	f	
EBA87	AC30	SS3	Green-crowned Woodnymph		f	3.3 (0.7)
EBA88	<b>skeleton</b>	SS1	<b>Seedeater spp.</b>		f/imm?	
EBA89	PS31	SS1	Buff-throated Foliage-gleaner (?)			
EBA90	PS32	SS1	Dusky Antbird		f	
EBA91	PS33	SS1	Pale-bellied Hermit			
EBA92	<b>skeleton</b>	SS3	Orange-bellied Euphonia		f	
EBA93	<b>skeleton</b>	SS3	Green-crowned Woodnymph		m	

## Appendix IV: Inventory of Reptiles and Amphibians captured at each site in Serranía de los Churumbelos

Species	Colombia '98				EBA '99		
	SS1 (350 m)	SS2 (650 m)	SS3 (1000m)	SS4 (1400m)	SS5 (1800m)	SS6 (2100m)	SS7 (2450m)
<b>Class Amphibia, Order Anura (Frogs and Toads)</b>							
<b>Bufonidae</b>							
<i>Bufo marinus</i>	4(3)		1				
<i>Bufo</i> sp.							
<i>Bufo</i> "thyphonius" sp. 1	4	4					
<i>Bufo</i> "thyphonius" sp. 2		2					
<i>Dendrophryniscus minutus</i>	1						
<b>Centrolenidae</b>							
<i>Centrolene audax</i>				1			
<i>Cochranella cochrani</i>			1				
<b>Dendrobatidae</b>							
<i>Epipedobates hahneli</i>	1						
<i>Epipedobates trivittatus</i>		2 *					
<b>Leptodactylidae</b>							
<i>Adenomera andreae</i>	1	1					
<i>Eleutherodactylus "peruvianus"</i>				1			
<i>Eleutherodactylus lanthanites</i>		2					
<i>Eleutherodactylus ockendeni</i>	1	1					
<i>Eleutherodactylus</i> sp. 1			1	1			
<i>Eleutherodactylus</i> sp. 2				1			
<i>Eleutherodactylus</i> sp. 3			1				
<i>Eleutherodactylus</i> sp. 4			1				
<i>Eleutherodactylus</i> sp. 5			1				
<i>Eleutherodactylus</i> sp. 6					5 (2)	1	2
<i>Eleutherodactylus sulcatus</i>		3		1			
<i>Eleutherodactylus w-nigrum</i>					3 (3)		(1)
<i>Physalaemus petersi</i>	1						
<b>Hylidae</b>							
<i>Hyla boans</i>	1						
<i>Hyla geographica</i>	1 (3)						
<i>Hyla lanceforis</i>	1						
<i>Hyla punctata</i>	1						
<i>Hyla triangulum</i>	1						
<i>Scinax cruentomma</i>	1						
<b>Microhylidae</b>							
<i>Synapturanus rabus</i> (?)		1					
<b>Ranidae</b>							
<i>Rana palmipes</i>	1						
<b>Class Reptilia, Order Squamata, Suborder Sauria (Lizards)</b>							
<b>Gekkonidae</b>							
<i>Gonatodes concinnatus</i>		1					
<b>Gymnophthalmidae</b>							
<i>Leposoma parietale</i>			1	1			
<i>Neusticurus cochrani</i>				2			
<i>Neusticurus eupleopus</i>			1	1			
<i>Prionodactylus argulus</i>			1				
<b>Iguanidae</b>							
<i>Anolis nitens scypheus</i>		1					
<i>Anolis punctatus</i> (?)	1						
<i>Anolis trachyderma</i>	1						
<i>Morunasaurus annularis</i>			1				
<i>Phenacosaurus heterodermus</i>							1
<b>Teiidae</b>							
<i>Ameiva ameiva</i>	1						
<b>Class Reptilia, Order Squamata, Suborder Ophidia (Snakes)</b>							
<b>Colubridae</b>							
<i>Atractus elaps</i>	1					1	
<i>Chironius monticola</i>							
<i>Drymoluber dichrous</i>		1					
<i>Helicops angulatus</i>	1						
<i>Imantodes cenchoa</i>			2				
<b>TOTAL SPECIES PER SITE</b>	<b>20</b>	<b>10</b>	<b>11</b>	<b>9</b>	<b>2</b>	<b>2</b>	<b>3</b>

**KEY:** 3(4) means 7 individuals captured; 3 collected, and 4 released; \*1tadpole also collected

## Appendix V: Expedition Budget

<b>Money received</b>		<b>£</b>
Royal Geographical Society		1000
Cambridge Expeditions Fund (including £700 from AJ Burton Charitable Trust)		800
Albert Reckitt Charitable Trust		750
British Ornithologists' Union		400
Percy Sladen Memorial Society		400
PD Lindeth Charitable Trust		250
World Pheasant Association		200
People's Trust for Endangered Species		200
AS Butler Charitable Trust		100
Interest on Bank Account		2
<b>Total Raised</b> (inc. Duke of Edinburgh Royal Soc. of St. George Award -amount not to be disclosed)		<b>4402</b>
Personal Contributions (@£750 per UK member)		1500
<b>Expedition Budget</b>		<b>5902</b>
<b>Expedition expenditure</b>		
<b>Pre-expedition Expenses</b>		<b>£</b>
Admin / Fundraising		215
Insurance (Equipment premium on personal policy)		26
Pre-Expedition Reconnaissance Trip		100
International Travel		899
Medical		30
Fieldwork Equipment		675
Photographic (includes development)		240
<b>TOTAL</b>		<b>2185</b>
<b>Expedition Expenses</b>		<b>£</b>
<b>1. CHURUMBELOS</b>		
Expenses in Bogotá for 3 days		70
Purchase of Maps		40
Transport to and from Pitalito (Bus)		210
Transport to and from Study Sites (Taxi)		155
Hotel Accommodation		255
Hire of local guides		130
Extra local fieldwork equipment / gasoline etc		180
Food in field		180
<b>TOTAL SPENT IN CHURUMBELOS:</b>	<b>£1220 (\$3,350,000 pesos @ \$2,750/£)</b>	
<b>2. ANORI</b>		
Transport to Medellín / Expenses in Medellín		160
Taxi to Caucaasia - El Bagre / back		310
Expenses in El Bagre (2 days)		80
Food and other expenses in Puerto Lopez (6 days)		280
Puerto Lopez Accommodation		155
Transport to / from Anorí (Bus)		70
Transport to / from Study Sites (Mule)		85
Hire of local guides		180
Extra local fieldwork equipment / gasoline etc		140
Food in field		180
<b>TOTAL SPENT IN ANORI</b>	<b>1640 (\$4,600,000 pesos (@ \$2,800/£)</b>	
<b>Post-Expedition</b>		<b>£</b>
Transport of TD/PS/CG to Bogotá		80
Expenses in Medellín / Bogotá		170
Report Production (estimated)		430
Copying and distributing slides		120
Colombian Airport Tax (x2)		57
<b>TOTAL POST-EXPEDITION:</b>		<b>£857</b>
<b>Summary totals:</b>	<b>£Cr</b>	<b>£Dr</b>
Total Raised	4402	
Personal Contributions	1500	
Pre-expedition		2185
Churumbelos		1220
Anorí		1640
Post-Expedition		857
<b>TOTAL</b>	<b>5902</b>	<b>5902</b>

24 October 1999.