



# Colombian EBA Project Report Series 5

## Threatened Species of Serranía de los Yariguíes



### Final Report

October 2005

*Thomas M. Donegan & Blanca Huertas (Eds.)*

*Sections by: Thomas Donegan, Blanca Huertas, John Jairo Arias,  
Elkin Briceño & Martin Donegan*

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Photographs: © Thomas Donegan & Blanca Huertas / Proyecto EBA Colombia unless otherwise noted. The cover photograph shows a view from our remote páramo study site, Lepipuerto, accessed by helicopter drop during January 2005.

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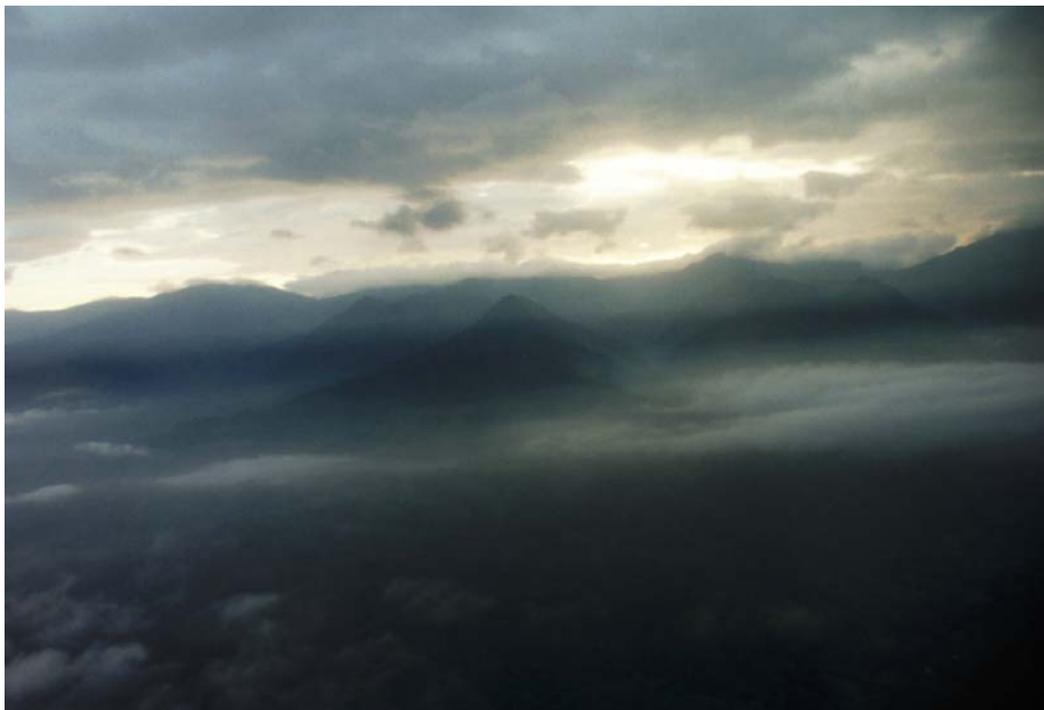
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**Important note:** Our preliminary report was published previously in Spanish and English as *Colombian EBA Project Report Series 5* in October 2004. That version of the report has been updated with information from an additional site studied in January 2005 and with an addendum relating to conservation action achieved, as well as with some other more general editorial revisions to the text.



Above: Serranía de los Yariguíes at dawn from the air, during helicopter flight in January 2005.

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## Executive Summary

We undertook the first detailed biological assessment of Serranía de los Yariguíes, an isolated eastern spur of Colombia's East Andean range. Our aims were to analyse the conservation value of the massif from a biological perspective and to identify and recommend zones for protection. The region had long been subject to a conservation plan involving a possible national park, but this plan lacked biological justification.

**Methods** included rapid assessment inventories and ecological assessments of birds, butterflies, beetles and mammals at elevationally distinct sites. We selected 5 primary forest sites all located within one of northern Colombia's largest remaining fragments of premontane and montane forest. Sites were located at 1000, 1300, 2000, 2450 and 2900m on the humid western slope of the massif. The highest elevation site was accessed via helicopter insertion and extraction. We also used satellite maps and GIS analysis to identify sites and assess conservation priorities and chartered a light aircraft for aerial surveys of the entire massif.

Rapid assessment techniques have the objective of obtaining a relatively complete inventory of species for a site in a relatively short period of time in a standardized manner:

- *Birds*: 12-15 mist-nets at each site were installed to sample the understorey. Birds captured were photographed and biometrics were taken. Non-systematic observations and sound recording and playback techniques were employed to supplement mist-netting work. Interviews with the community were used to collect additional information.
- *Butterflies*: A "patrolling" strategy was employed to cover as wide a range of elevations and habitats as possible without the establishment of multiple fixed collecting points. Standard butterfly nets for tropical habitats were used. In addition, 15-20 VSR butterfly traps were installed at each site, baited with rotting banana, sardines and rotting fish and seafood. Other attracting methods were used.
- *Beetles*: 15 pitfall traps were installed in each site using human excrement bait. Traps were checked at morning and dusk to separate nocturnal and diurnal species.
- *Mammals*: We conducted informal interviews with farmers and hunters to obtain information about the mammals of the region. Information was supplemented with data from direct observations in the field and fingerprints and track marks.
- *Mountaineering*: Team members were trained in basic mountaineering and helicopter descending techniques. At the highest elevation site, exploration of region and scaling of virgin peaks were undertaken, exploring new methods for mountaineering in pristine forest habitats.

**GIS work** and **aerial surveys** revealed Serranía de los Yariguíes to constitute one of the largest remaining humid premontane and montane forest fragments in northern Colombia. These forests include continuous habitats ranging from tropical lowland through premontane and montane forest to páramos. Primary habitats extend across the bulk of the western flank and ridgeline of the massif. However, the dry eastern slope has been largely deforested.

317 **bird** species were recorded during our surveys. Given that the Serranía de los Yariguíes was essentially unexplored ornithologically before our expedition, a large quantity of new information about the ecology and distribution of the avifauna of the region was collected. In almost every premontane and montane forest-specialist species, significant range extensions of 100km or more were found. We found four lowland species not formerly recorded in Colombia's Magdalena Valley region, and three montane species not formerly recorded in Colombia's East Andes. We discovered the world's largest surviving population of Gorgeted Wood-Quail *Odontophorus strophium*, a critically endangered species considered on the verge of extinction before this study. In total, 3 species rated Critically Endangered, 1 Endangered, 5 Vulnerable and 4 Near-Threatened were recorded. A further two Critical-rated bird species have also recently been reported from the Yariguíes mountains in follow-up work. Few sites globally have 5 Critically endangered bird species. The Yariguíes mountains are characterized by two Critical rated Endemic Bird Areas (EBAs), Nechí EBA in the lowlands and Colombian East Andes EBA in the highlands. New bird taxa for science were discovered including in the genera *Atlapetes*, *Grallaricula*, *Scytalopus*, *Basileuterus* and *Phaethornis*. The region emerges as a major global conservation priority for birds on multiple levels.

In **butterflies**, 248 species were recorded in Serranía de los Yariguíes. These include at least three undescribed species (in the genera *Tamania/Idioneurula*, *Euptychia* and *Tegosa*) and at least six undescribed subspecies. Recorded species richness was greatest in the lowland forests of the region, with a decrease towards sites at high elevations. However, the species found in the highlands were distinct from those found in lowlands and highland forests included similar numbers of butterfly taxa with a small geographical range to lowland forests. A high rate of species turnover across the elevational gradient is typical of a biological “hotspot” and indicates that the Serranía de los Yariguíes is a priority region for butterfly conservation.

In **beetles**, a high diversity was found in various sites studied, principally in the lowlands. Conversely, no scarab beetles were found in the very highest part of the mountains (páramo). Some of the species recorded are indicators of well-conserved habitats.

In **mammals**, 38 species were recorded or reported from Serranía de los Yariguíes during fieldwork and interviews with local people. Four mammal species found or reported in Serranía de los Yariguíes are categorized as endangered with extinction (all Vulnerable): Giant Anteater *Myrmecophaga tridactyla*, Colombian Night-Monkey *Aotus aff. lemurinus*, Spectacled Bear *Tremarctos ornatus* and Ocelot *Leopardis pardalis*. Interviews with local people evidence worrying decreases in populations of various species, particularly Jaguar *Panthera onca* and Spectacled Bear. Various mammal species of the region are persecuted in the region, principally due to hunting and pest control.

**Mountaineering** fieldwork resulted in the first ascents of two unnamed major peaks and one minor peak, for which provisional names have been assigned. New techniques for the ascent of Andean peaks covered in primary forest and unexplored by humans were tested.

Our **results** establish firmly the conservation importance of the Yariguíes mountains from a biological perspective. Our results were presented to various NGOs and to the Colombian Environment Ministry in meetings and correspondence and through the publication of an earlier draft of this report in October 2004. This project has been an important factor behind the declaration of a new “Serranía de los Yariguíes National Park” in the region, established in May 2005, the establishment in the region of a private reserve at one of our study sites, El Talisman by Fundación ProAves. Based on the results of this project, the Yariguíes region was recently declared an “Important Bird Area”.

## Sumario Ejecutivo

Durante el desarrollo del Proyecto EBA, se realizó el primer estudio biológico detallado de la Serranía de los Yariguíes, un brazo aislado de la cordillera oriental de los Andes Colombianos. Nuestros objetivos principales fueron el análisis de la Serranía a través de la identificación y planteamiento de zonas a ser protegidas con el objetivo primordial de su conservación. Esta región había estado involucrada en un plan de conservación como posible parque natural nacional, pero éste carecía de una apropiada justificación biológica.

Entre los **métodos** utilizados, se incluyeron inventarios rápidos y estudios ecológicos en aves, mariposas, escarabajos y mamíferos en sitios con diferente elevación. Cinco bosques primarios fueron seleccionados dentro de los límites de la Serranía de la Yariguíes, uno de los más grandes fragmentos de bosque montano y premontano en el norte de Colombia. Los sitios de estudio fueron localizados a 1000, 1300, 2000, 2450 y 2900m en la vertiente húmeda occidental de la Serranía. Para el estudio del sitio con mayor elevación fue necesario arribar y partir transportados por un helicóptero. Se utilizaron también mapas satelitales y análisis SIG para identificar los sitios de estudio y evaluar sus prioridades de conservación. Adicionalmente, se realizó un sobrevuelo en una avioneta alrededor de la Serranía.

Las técnicas de evaluaciones rápidas de biodiversidad (RAPs) tienen el objetivo de obtener un relativamente completo inventario de especies de un lugar en un periodo de tiempo relativamente corto y de una forma estandarizada:

- **Aves:** De 12 a 15 redes de niebla fueron instaladas en cada sitio de estudio para muestrear el sotobosque. Las aves capturadas, fueron fotografiadas y se tomaron medidas biométricas en cada una. Adicionalmente, se realizaron observaciones no sistemáticas y se usaron técnicas de grabación de sonidos y “playback” para complementar el trabajo realizado con las redes. Para coleccionar mayor información, se realizaron entrevistas con los habitantes locales acerca de la avifauna.
- **Mariposas:** La técnica de “Patrulleo” fue empleada para cubrir el mayor rango de elevaciones y hábitats como fuese posible sin establecer puntos fijos de colecta. Se utilizaron redes estándar para capturar mariposas en ambientes tropicales. Entre 15 y 20 trampas tipo VSR fueron instaladas en cada sitio, cebadas con banana fermentada, sardinas y pescado y comida de mar putrefacta. Otras técnicas de colecta fueron utilizados.
- **Escarabajos coprófagos:** 15 trampas de caída (pitfall) fueron instaladas en cada sitio de estudio, cada una de ellas cebada directamente con excremento humano. Las trampas fueron revisadas y separadas al amanecer y al atardecer para el establecimiento de gremios de hábitos diurnos y nocturnos.
- **Mamíferos:** Fueron realizadas varias entrevistas informales con campesinos y cazadores para obtener información sobre la fauna de mamíferos de la región. Esta última, fue complementada con observaciones directas en el campo y búsqueda de huellas y marcas de camino de los mamíferos.
- **Montañismo:** Los miembros del equipo fueron capacitados en técnicas básicas de ascenso y descenso desde helicópteros y en montañas de difícil topografía. Cerca al pico mas alto de elevación estudiado, se exploraron otros hábitats entre los cuales se encontraban varios otros picos vírgenes.

El trabajo de **SIG** y los **sobrevuelos** revelaron que la Serranía de los Yariguíes se constituye en uno de los más grandes remanentes de bosque húmedo montano y premontano del norte de Colombia. Estos bosques comprenden un rango amplio de hábitats continuos desde tierras bajas, pasando por los bosques premontanos a montanos hasta el páramo. Estos bosques se extienden a lo largo de la vertiente occidental y en el filo de la Serranía. Sin embargo, los bosques de la vertiente seca oriental han sido intensamente deforestados.

317 especies de **aves** fueron registradas durante los estudios realizados. Dado que la Serranía de los Yariguíes estaba muy poco conocida en su avifauna antes de las expediciones de este proyecto, una gran cantidad de nueva información sobre la ecología y distribución de la avifauna de la región fue recopilada. Se encontraron extensiones significativas de rango de ocupación de 100Km o más en casi todas las especies de aves de bosque premontano y montano registradas. Además, fueron encontradas cuatro especies de tierras bajas sin registrarse antes en el Valle del Magdalena y tres

especies de bosque montano sin ser registradas en los andes orientales de Colombia. De igual manera, se descubrió la población sobreviviente mas grande mundial de la perdiz santandereana *Odontophorus strophium*, una especie críticamente amenazada y considerada en el borde de su extinción antes de este estudio. En total fueron registradas en la Serranía, 3 especies catalogadas como Críticamente Amenazadas, 1 Amenazada, 5 Vulnerables y 4 Casi- Amenazadas de extinción por la IUCN. Otras dos especies de aves en categoría crítica han sido recientemente reportadas en los Yariguíes en subsecuentes estudios realizados por miembros del proyecto EBA. Cabe anotar, muy pocos sitios en el planeta albergan en el mismo lugar 5 especies de aves críticamente amenazadas de extinción. La montañas de los Yariguíes están influenciados por dos Áreas de Endemismo de Aves (EBAs), ambas categorizadas como críticas para su prioridad de conservación como son el área conocida como Nechí en las tierras bajas y el área de los Andes Orientales Colombianas en las tierras altas. Se descubrieron varios nuevos taxa para la ciencia, incluidos en los géneros *Atlapetes*, *Grallaricula*, *Scytalopus*, *Basileuterus* y *Phaethornis*. La región se identifica como una prioridad global para la conservación de aves en múltiples niveles.

En **mariposas**, 248 especies fueron registradas en la Serranía de los Yariguíes. Entre estas, se incluyen por lo menos tres especies sin describir para la ciencia (en los géneros *Tamania/Idioneurula*, *Euptychia* y *Tegosa*) y por lo menos seis subespecies tampoco descritas. La riqueza de especies registrada fue mayor en los bosques de tierras bajas, con un descenso en número de especies con el incremento de la altitud. Sin embargo, las especies encontradas en las elevaciones más altas, fueron diferentes a las encontradas en las tierras bajas. La tasa de cambio de especies observada a través del gradiente elevacional de los Yariguíes, es típico de un "hotspot" e indica que la Serranía es una prioridad para la conservación de mariposas.

En los **escarabajos coprófagos**, se encontró una gran diversidad de especies en algunas áreas colectadas principalmente en aquellas de tierras bajas. Contrario a ello, no se encontraron escarabajos en las partes más altas (páramo). Se han encontrado algunas especies indicadores de hábitats bien conservados.

En el grupo de los **mamíferos**, 38 especies fueron registradas en campo o reportadas por habitantes locales en la Serranía de los Yariguíes. Cuatro de dichas especies se encuentran en la categoría de amenaza de extinción (Vulnerable), incluyendo al Oso Hormiguero *Myrmecophaga tridactyla*, Mico de Noche Andino *Aotus aff. lemurinus*, el Oso de Anteojos *Tremarctos ornatus* y al Tigrillo *Leopardis pardalis*. A través de las entrevistas, se registró la posible disminución de poblaciones de varias especies de mamíferos en la zona, especialmente del Oso de Anteojos y del Jaguar *Panthera onca*. Varias especies de mamíferos están perseguidas en la región principalmente debido a la cacería y el control de especies considerados como plagas.

El trabajo de **montañismo** resultó en el primer ascenso realizado a dos de los picos más altos de la Serranía y a un pico menor, para los cuales se asignaron nombres provisionales en razón a la carencia de éstos en la cartografía local. Nuevas técnicas para el ascenso de picos cubiertos de bosques primarios e inexplorados en montañas alto-andinas fueron probados y mejorados.

Los **resultados** de las expediciones del proyecto EBA establecen firmemente la importancia biológica de las montañas de la Serranía de los Yariguíes. Los resultados obtenidos a lo largo de este proyecto, han sido presentados a varias organizaciones no gubernamentales, corporaciones regionales y Ministerio del Medio Ambiente además a la comunidad de municipios aledaños a la Serranía mediante reuniones, comunicaciones y la entrega de la versión anterior de este informe. Como un resultado de este proyecto, se cuenta la contribución a la declaración del nuevo "Parque Nacional Natural Serranía de los Yariguíes", declarado en Mayo de 2005, y la evaluación de áreas con potencial de ecoturismo entre las cuáles la Fundación ProAves ya ha hecho algunas adquisiciones. Adicionalmente, la región de los Yariguíes en razón a los descubrimientos de este proyecto, fue recientemente designada como Área Importante para la Conservación de las Aves (AICA).

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## The Team

*Thomas M. Donegan.* Ornithologist and Expedition Leader. MA Christ's College, Cambridge University, UK. Trustee and Secretary of ProAves Foundation and Council member of Neotropical Bird Club. Leader or participant in 10 ornithological expeditions in Colombia since 1997. Wide experience in the field using mist-nets and playback techniques. Has published a number of scientific articles on Neotropical birds including two new species descriptions. Email: thomasdonegan AT yahoo.co.uk or tdonegan AT proaves.org



*Blanca Huertas.* Colombia Coordinator, Entomologist and First Aider. MSc. in Advanced Methods in Taxonomy and Biodiversity from Imperial College and The Natural History Museum, UK. BSc from Universidad Pedagógica Nacional and post-graduate degree in Education and Environmental Management from Universidad Distrital, Colombia. Diploma in Tropical Butterflies, University of Valle, Colombia. Colombian logistics coordinator and entomologist in 6 Anglo-Colombian expeditions. Publications in butterflies and beetles. Winner of National Prize in Entomology with John Arias with project: Diurnal butterflies of the Churumbelos mountains: altitudinal distribution and species diversity. Email: blancahuertas AT yahoo.com or b.huertas AT nhm.ac.uk

*Elkin R. Briceño.* Mammalogist and ornithologist. Graduate in Environmental Engineering from Universidad Industrial de Santander. Research biologist at Corporación Autónoma Regional para la Defensa de la Meseta de Bucaramanga (CDMB), a governmental environmental agency in the study region. Much experience of fieldwork in Magdalena Medio region and experience working in wild animal rescue with CDMB. Email: elkinbl AT hotmail.com.



*John Jairo Arias.* Entomologist. Graduate in Biology and Education, Universidad Pedagógica Nacional. Diploma in Tropical Butterflies, University of Valle, Colombia. Wide fieldwork experience in Colombia since 1994 and entomologist in four Anglo-Colombian Expeditions. Winner of National Prize in Entomology described above with Blanca Huertas. Curator of beetle and butterfly collections in Universidad Pedagógica Nacional during two years. Email: jarias AT proaves.org or jarias AT mixmail.com



*Martin D. Donegan.* Mountaineer. Computer Science student at Open University, UK. Member of British Mountaineering Club and former committee member of University of Wales Swansea Mountaineering Club. Email martin.donegan AT gmail.com

*José Pinto (below left), Hernando Figueroa (below middle) and Joaquin Montaña (below right)* were our local guides, all from San Vicente.

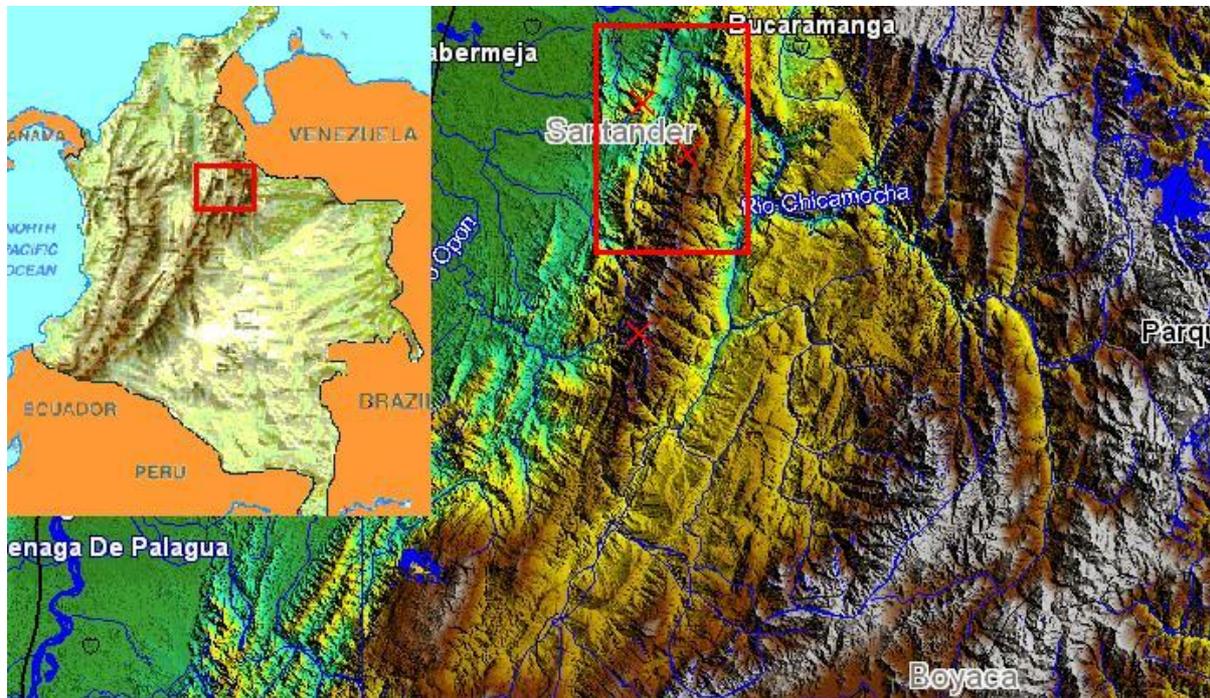


# Introduction

By Thomas Donegan & Blanca Huertas

## The Colombian Andes and Serranía de los Yariguíes

In Colombia, the main Andean range splits into three more or less parallel, north-south oriented mountain ranges (or Cordilleras): the Western, Central and Eastern Andes. These three Andean ranges are isolated by two long and low valleys, the Cauca Valley between the Western and Central Cordilleras, and the Magdalena Valley between the Central and Eastern Cordilleras. To the west of the Colombian Andes lies the Chocó, one of the world's most biologically diverse regions (Hilty & Brown, 1986; Rangel & Aguilar, 1995; Galeano *et al.*, 1998) and to their east, the Amazon basin. The Eastern Cordillera or East Andes extends from just north of the equator to the Caribbean coast in Colombia. It peaks at 5500m, has an average ridgeline of 2500m and is the longest and widest of Colombia's three cordilleras (IGAC, 2003). Between 6°N and 7°N, the Eastern Cordillera reaches its widest point. Here, the Serranía de los Yariguíes (or Serranía de los Cobardes) forms an isolated northwest spur of the main Eastern Cordillera, rising to approximately 3400m above sea level (Figure 1).



**Figure 1.** Digital elevation map showing location of Serranía de los Yariguíes, Santander department, Colombia. Insert shows location of enlarged area in northern South America. Red box on main map denotes the northern section of Serranía de los Yariguíes, shown in greater detail in GIS map in Figure 3. The three crosses denote the regions of our study sites, from north to South, (i) Cerro de la Paz (1000-1300m); (ii) El Talisman / Siberia / Alto Cantagallo / Quebrada de las Cruces (1150 – 2450m) and (iii) Lepipuerto (2900-3000m). The precise locations of sites in (i) and (ii) are shown in Figure 3. Note the isolation of the Yariguíes massif from the rest of the eastern cordillera at the c.2500m contour.

The Serranía de los Yariguíes is located entirely within Colombia's Santander department, and spans various municipalities (Simacota, Contratación, Guacamayo, Hato, Palmar, Galán, Zapatota, Betulia, San Vicente de Chucurí, el Carmen de Chucurí, Santa Helena del Opón, Landázuri, Vélez, Cimitarra, la Paz and Aguada). It extends to 500,000 ha in area, of which 39% remains intact with forest, 26% is farmed for crops (mostly coffee and cocoa) and 35% is pasture. The Yariguíes mountains are characterised by some of the steepest slopes in the Colombian Andes, with stream valleys having produced deep gullies and gradients greater than 50% in many places. The Yariguíes mountains are characterised geologically by a sedimentary base with soils of acid pH (4 to 5). Lower elevations are characterised by sandy soils and higher elevations and steeper slopes by more clayey soils, with a combination of loams in intermediate zones (Moncayo, 1987; IGAC, 1995).

The temperate climate and flat, high elevation savannas of the Eastern Cordillera have long attracted colonisation and human development. Colombia's capital, Bogotá, and other major urban centres such as Bucaramanga are situated there. The forests of the East Andes have thus been subject to extensive degradation (Collar *et al.*, 1992), with progressive deforestation of the lower slopes (Wege & Long, 1995). Remaining primary forest has been largely converted to agriculture or narcotics cultivation, although some forested fragments still remain. The Colombia East Andes Endemic Bird Area has suffered major habitat loss and is of the highest biological importance, being assigned "critical" level for conservation priority (Stattersfield *et al.*, 1998).

As recently as 1998, the relatively small Guanentá-Alto Río Fonce reserve was considered to comprise the only remaining humid temperate oak forest tract in the northern Eastern Cordillera (Stattersfield *et al.*, 1998). However, in surveys in 2002, the Anglo-Colombian research initiative EBA (Evaluation of Biodiversity in the Andes) Project discovered a significant forest wilderness in Serranía de los Yariguíes, which had gone unstudied for decades due to political instability and occupation by revolutionary armed forces (Donegan *et al.*, 2003). The only known significant biological study of the massif was a brief lowland study of vertebrates in which a few tens of specimens were collected (Borrero & Hernandez, 1957), with various further sporadic vertebrate records occurring in the literature (e.g. Romero, 1983). The foothill or higher elevations of the Yariguíes mountains have barely before been subject to previous study in any biological group.

High quality land-use satellite maps (IGAC, 1995) and maps showing land communication routes and human populations showed Serranía de los Yariguíes possibly to constitute a rare remaining forest wilderness. Aerial surveys in July 2004 revealed its humid western slope to constitute primary forest almost throughout. However, the massif's drier eastern slope has been over 90% deforested.

Serranía de los Yariguíes was selected as a study area due to its well-conserved forests at different elevations, its isolation from the main Andean cordillera and potential endemism, mounting anthropological threats, unprotected status and conservation potential.

## Study Sites

Seven study sites was selected based upon a consideration of various factors: (i) encompassing as broad a range of elevation as possible; (ii) in primary or less disturbed forest; (iii) considering logistical concerns such as topography and access routes (within 2 days maximum hard hike from vehicle access routes); and (iv) security of fieldworkers (working in safe areas). Study sites were located in San Vicente de Chucurí, Zapatoca and El Carmen Municipalities, with one site on limits with Simacota municipality. Details of each study site are presented in Table 1 and described below. Photographs showing forest composition are set out in Figure 2.

It has been proposed that in studies such as this along elevational gradients, study sites should be reasonably evenly distributed across the gradient, and a number of study sites sufficient to include all major habitats along the gradient, but these two requirements are rarely fulfilled (Rahbek, 1995). Like some other Andean mountains, Serranía de los Yariguíes presents an example of extreme topography. It is typified by knife-back ridges, meaning that it is not possible to locate base camps or study transects along a continuous linear transect as has been undertaken in other studies (e.g. Fleishman *et al.*, 1997; Brehm *et al.*, 2003).

We studied a total of 7 sites in Serranía de los Yariguíes, located on an elevational gradient between 1000 and 2900m above sea level. Each site (except secondary areas SS1 and SS4) was subject to 4-5 days' intensive fieldwork in birds, butterflies, beetles, mammals and plants. Further data is presented in Table 1 and photographs showing the habitat of each site are set out in Figure 2.

**Table 1.** Summary of main characteristics of each study site (SS) in Serranía de los Yariguíes.

<b>Study Site (SS)</b>	<b>Site Name</b>	<b>Elevations range</b>	<b>Latitude-longitude</b>	<b>Life Zone*</b>	<b>Mean Temp.</b>	<b>Days with rain** (mm rain)</b>
SS1	Parque Mun. de Miraflores, San Vicente de Chucurí	600-750	06° 53' N 73° 24' W	Secondary Dry Forest	24-28° C	1 (8mm)
SS2	Vda. Montebello, Altoviento E slope Cuchilla La Paz.	800-1100	06° 59' N 73° 26' W	Tropical Dry Forest	24-28° C	1 (3)
SS3	Vda. Barro Amarillo, Cuchilla La Paz. W slope	1230-1340	06° 59' N 73° 26' W	Premontane Humid Forest	22-26° C	3 (11, 6, 7)
SS4	Quebrada de las Cruces, Vda. Cantagallos	1150-1550	06° 49' N 73° 22' W	Premontane Humid Forest	18-24° C	1 (1)
SS5a	Camino del Lenguerke, La Siberia	1400-1750	06° 51' N 73° 22' W	Premontane Humid (Cloud) Forest	18-24° C	0
SS5b	Camino del Lenguerke, El Talisman	1800-2050	06° 51' N 73° 22' W	Premontane Humid (Cloud) Forest	18-24° C	0
SS6	Vereda Cantagallos alto, mountain ridge	2200-2500	06° 49' N 73° 22' W	Very Humid Lower Montane Forest and subpáramo	12-18° C	0
SS7	Lepipuerto, Alto Río Chimera	2900-3000	6° 28' N 73° 28' W	Páramo and ecotone	8-16° C	7 (>25mm daily)

Study sites are assigned a number according to elevation. (\*) Life zones follow Holdridge (1967). (\*\*) Days with rain is expressed in number of days' rain during the collection period and rain per day in millimetres (IDEAM, 2004).

**SS1. Parque Miraflores (600-750m)** To the east of San Vicente de Chucurí's town centre is a municipal park. The small woodland in Parque Miraflores is largely dominated by exotic vegetation and secondary growth. Non-qualitative observations and collections were made here and in other nearby lowland secondary areas.

**SS2. Altoviento, Cuchilla La Paz (800-1100m).** A trail was followed ascending from Montebello into the Cuchilla La Paz, and a camp site and transect established at 1000m elevation. The site was dominated by lowland tree species, with many trees over 2.5m diameter at breast height, and rising to over 25-30m height and a thin understorey. Huge lianas were prevalent, with some over 0.3m diameter. The site was located on steep dry eastward-facing slopes of the Río Chucurí valley within primary forest. Deforestation for farms and non-agricultural crops were observed here.

**SS3. Barro Amarillo, Cuchilla La Paz (1200-1340m).** This site was located on the western slope and ridge of the Cuchilla La Paz. The site was accessed from mule trails leading from the road from San Vicente de Chucurí to Barro Amarillo. The historic Camino de Lenguerke and ridgeline of the Serranía were used as a basis for the transect. Forest was characterized a canopy of c.16-18m, moderate epiphytism and moss presence, and greater humidity than on the eastern slope (SS2). The understorey was moderately sparse. This forest appears to be ancient, but has been subject to historic selective deforestation. Observations and collections were made along the trail down to 1200m elevation.

**SS4. Quebrada de las Cruces, Cantagallos (1150-1550m).** This study site is situated along a trail used by a small number of local farmers to travel from settlements below Cantagallos Alto (SS6), following a mountain stream. The trail is characterised by forest edge, stream and secondary habitats and is very humid, with frequent ground-level cloud. No study site was established here, but collections and observations down the trail on route to and from SS6 were undertaken. Results complement data from lower elevations of SS5a (1400-1600m) which involved less forested habitat of similar elevation.

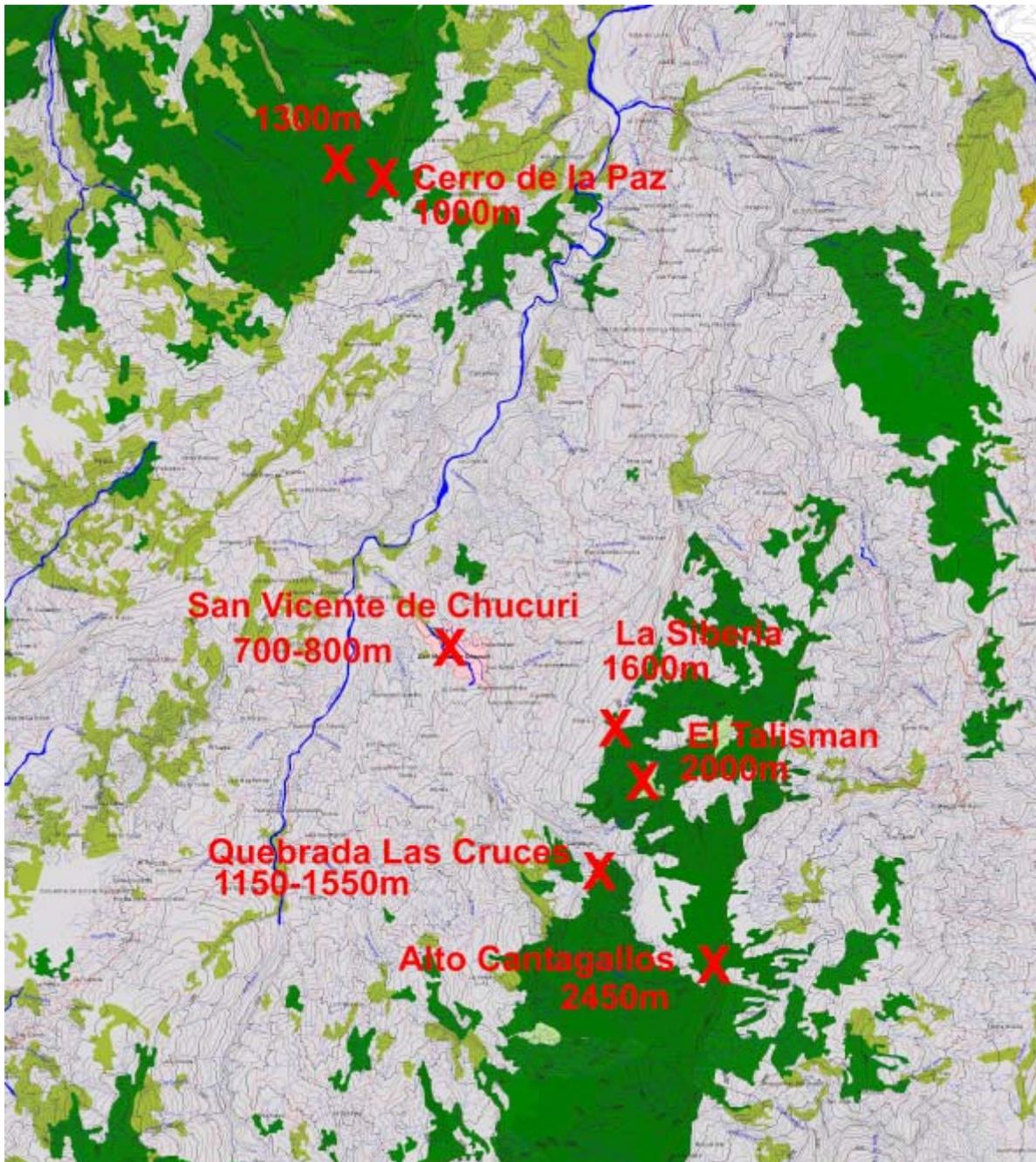
**SS5a and SS5b. La Siberia and El Talisman. (1400-1750 and 1800-2050m).** An historic stone trail traverses the Serranía de los Yariguíes from Montebello, through San Vicente de Chucurí to Zapatoca town. The trail was laid in the 1840s, but subsequently fell into disuse and became overgrown. It was recently re-opened by the Colombian tourist board, and is now used for recreational purposes by walkers and hunters. Above 1600m, the trail starts to enter forest. A campsite was located at 2000m elevation along a ridgetop below a reforestation area called El Talisman. The forest is temperate and humid with frequent ground-level cloud. The average canopy height is c.12m, with emergent trees rising to 15m, and dense epiphytism and moss cover. This site is treated in two parts (a and b) in butterfly studies due to its larger elevational range. Bird studies concentrated at forest at 2000m, with only observations below this elevation.

**SS6. Cantagallos Alto (2200-2500m).** This remote site is located in high mountains on the western slope of the Serranía. It was accessed through the trail at SS4, following Quebrada las Cruces for a c.10 hours uphill trek to the last human settlement at 2250m elevation. From there, a long-abandoned hunters' trail was re-opened into an expanse of primary montane forest, climbing to a ridge at almost 2500m elevation, on which and below which a study transect was established. Forest was supersaturated, characterised by perpetual ground-level fog with a low canopy (up to c.12m on slopes; only 3m along ridgetops), with high levels of vegetation succession and treefall and a homogenous understorey and mid-storey.

**SS7. Lepipuerto (2800-2950m).** This site was accessed and is accessible only by helicopter drop. This is a pristine primary habitat approximately 30km from any human population. This habitat is subject to quite extraordinary levels of precipitation, violent thunderstorms with torrential downpours lasting several hours occurring each afternoon during our fieldwork in the "dry" season, and frequent ground-level cloud cover. However, bright and clear periods in the morning facilitated fieldwork. Forest fragments extend up in sheltered valleys below the páramo and ecotone. Forests here have very thick moss cover, many treefall gaps and bamboo abundant with a low canopy (up to c.8m). Páramo is characterised by low vegetation with spiny plants (due to strong winds). We observed tall *Speletias* (Frallejones), Blechnaceae ferns (*Blechnum schomburgkii*), Eriocaulaceae (*Paepalanthus*), Ericaceae sp., *Clusia* sp, Bromeliaceae, Melastomataceae, Orchidaceae and Asteraceae (identifications with thanks to Kehan Harman). Other shrub species were present, with some isolated tall palms (Palmaceae) (4-6m tall) in this habitat.



**Figure 2.** Study sites in Serranía de los Yariguíes. Photographs of Lepipuerto (SS7) are presented in the Mountaineering Report below (pages 48 and 51) and on the front and inside cover of this report.



**Figure 3.** Forest cover map from GIS work showing extent of forest in Cerro de la Paz and El Talisman / Alto Cantagallos regions. The location of each of our study sites is marked (except Lepipuerto at 2900-3000m, for which see Figure 1 and map in Mountaineering Results section). Dark green areas show primary forest. Light green shows secondary forest. Uncoloured regions are farmland or otherwise deforested. The forest fragment in which Alto Cantagallos and El Talisman are located extends and expands greatly south of the region shown in this map. Unedited map © Fundación ProAves.

## Methods

### Introduction

Colombian EBA (Evaluation of Biodiversity in the Andes) Project is an ongoing research and conservation initiative which conducts rapid biodiversity assessment (RAP) studies during expeditions to remote and unstudied sites in the Colombian Andes.

Methods were based on rapid assessment protocols developed by Colombian EBA Project to collect a large amount of ecological data and as complete an inventory as possible in specified groups within a rapid timeframe (see further Donegan & Salaman, 1999).

### GIS

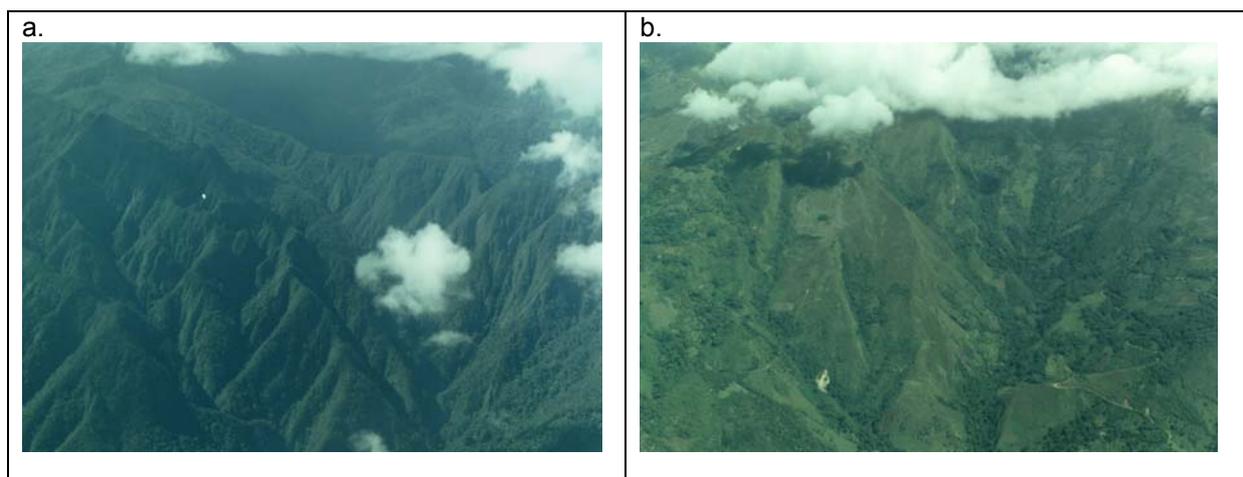
High quality land-use satellite maps have been produced by Instituto Geografico Agustin Codazzi (IGAC), and have proved immensely useful in EBA Project work in the past. Such maps were used to pinpoint accessible sites within continuous forest patches at suitable elevations. In connection with this project and with a view to establishing a reserve in the region, ProAves commissioned a study to use satellite maps to produce a 3-dimensional land use map of the entire Serranía.

### Flight over Serranía de los Yariguíes

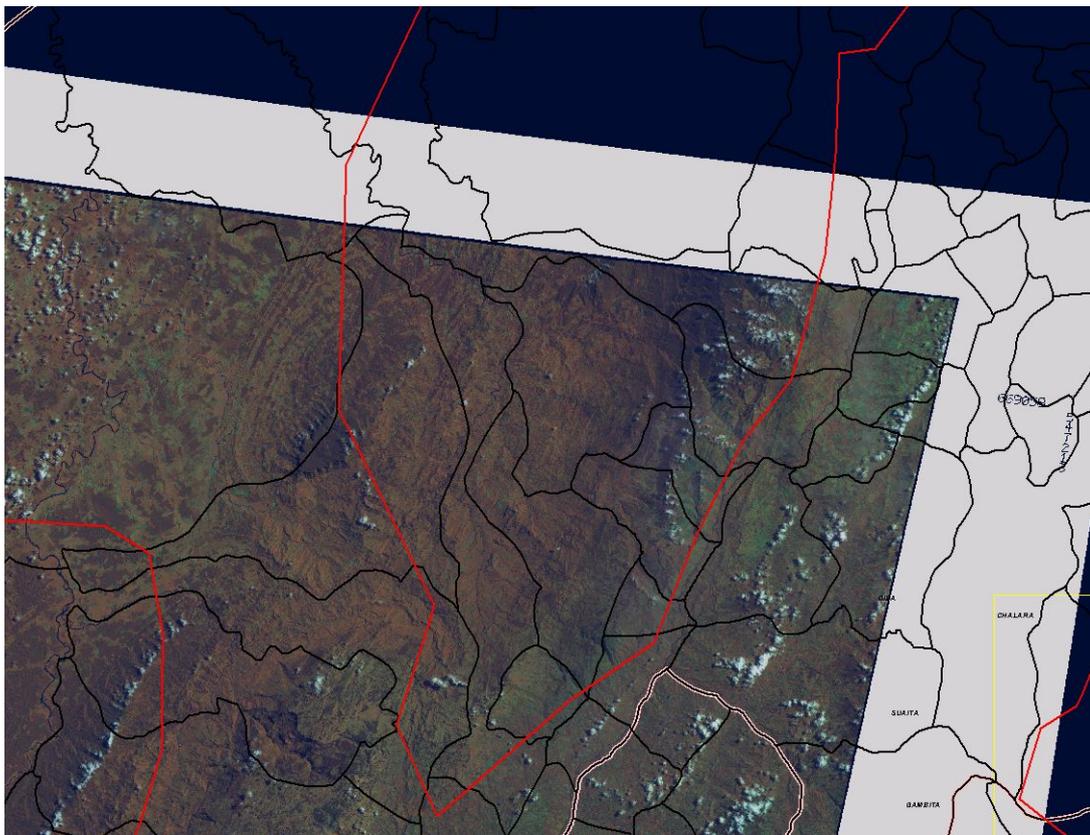
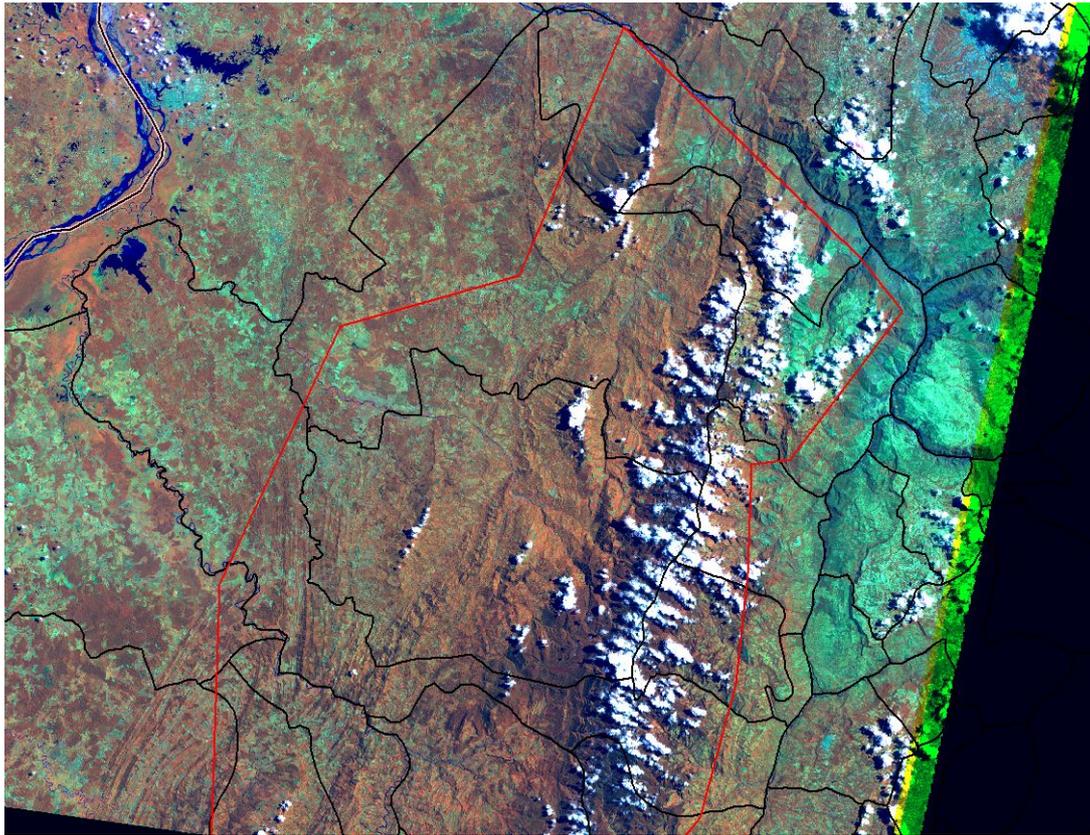
We chartered a light aircraft to fly from Bogotá, Colombia's capital and pass over both western and eastern flanks of Serranía de los Yariguíes for the purposes of assessing the extent of remaining forested habitat in the mountain range and identifying possible study sites. We took a series of digital and paper photographs and video footage, which were of great use to conservation decision makers in delimiting protected areas in the region. The flight was approximately two hours long. Two photographs of habitat from this flight are set out in Figure 4.



Right: fieldworkers with light aircraft used for aerial survey.



**Figure 4.** Aerial view of Serranía de los Yariguíes- photos taken by TD and BH during flight over Serranía de los Yariguíes (July 2004) to assess extent of forest. a. = western slope, covered in primary premontane and montane forest and páramo; b. = largely deforested eastern slope, with some secondary tree growth along river valleys.



**Figure 5.** Satellite images of Serranía de los Yariquíes used to assess forest cover and select study sites. Red line indicates extent of proposed National Park. Forested regions produce a reddish/orange colour; deforested regions are shown in light blue / turquoise and rivers in blue. Maps provided with thanks to Conservation International.

## Community work

The support of local government leaders including the mayorality of San Vicente de Chucurí and agricultural collectives to our project was obtained whilst in towns preparing for fieldwork. We organised various meetings with mayorality offices such as the environmental office and UMATA during each fieldwork stage. At the same time, we discussed the project aims and provided the mayorality and local authorities with previous reports and posters.

We printed over 200 small posters (see Figure 6) before leaving for the field, depicting threatened species to raise awareness, and encouraging people to protect such species and the forests they inhabit (e.g. the critically endangered Blue-billed Curassow *Crax alberti* and Gorgeted Wood-Quail *Odontophorus strophium*). We talked to local people, schoolchildren, farmers and hunters at all opportunities about our project and conservation issues. Pictures in our posters were used as a basis for such discussions.

We held a painting competition for local children in San Vicente de Chucurí.



Above: talking with children in the field in San Vicente region.



Figure 6. Project Poster.

**Aves en peligro de extinción en la Serranía de los Yariguíes: ¡su protección es responsabilidad de todos!**

**Paujil pico de piedra (Paují paují)**  
(Derecha, en la mitad) y **Paujil de pico azul (Cax alberti)**  
(derecha abajo)

Estos paujiles están restringidos a los pocos bosques en tierra caliente en el norte de Colombia, donde están muy perseguidos para cacería. El paujil del pico azul (arriba) se encuentran entre las especies más amenazadas del mundo.

**Perdiz santandereana (Odontophorus strophium)** (Izquierda)

Esta perdiz es una de las especies de aves más amenazadas del mundo, pues solamente se ha encontrado en dos lugares (únicamente en Colombia). Uno de ellos, es la Serranía de los Yariguíes, en donde se encuentra amenazada por acciones humanas como la cacería.

**Colibri Inca negro (Coeligena prunelle)**

Este colibri no se encuentra en ningún otro lugar, sino en los bosques de la cordillera oriental de Colombia. Se encuentra en peligro de extinción debido a la pérdida de su hábitat.

**Serranía de los Yariguíes, Santander**

Además de su interés histórico (Camino de Lenguerke y ruinas indígenas), esta serranía alberga en sus bosques, ríos y montañas una gran diversidad de especies de plantas, aves, insectos, mamíferos, anfibios y otros animales. Es por ello, que es considerada como patrimonio biológico del MUNDO y su protección es responsabilidad de TODOS!

**Tinamú del Magdalena (Cryptellus saltarius)**  
Esta tinamú o "gallineta" de patas rojas, solamente se encuentra en el Magdalena medio colombiano, aunque no ha sido vista desde 1943, y posiblemente ya esté extinta.

**Pava negra (o Aburria) (Aburria aburri)** (Derecha)

Esta pava es conocida por su canto "aburrrrrria". Aunque aún la podemos encontrar en los Andes, está seriamente amenazada de extinción por la pérdida de su hábitat y por la cacería.

**El Proyecto EBA Colombia** es un proyecto de conservación e investigación biológica que se ha venido realizando en Colombia desde 1997. Los investigadores del Proyecto EBA Colombia han estudiado varias zonas de nuestro país. (Ver puntos rojos en el mapa).

Somos un grupo de biólogos y conservacionistas voluntarios, no pertenecientes a ningún gobierno ni entidad privada, quienes trabajamos en pro de la conservación de los bosques colombianos.

**Contactenos: [www.proaves.org](http://www.proaves.org)**  
Equipo de Investigadores: Thomas Donegan, Blanca Huertas, Elkin Briceño y John Jairo Arias

## Biological Fieldwork



### (a) Birds methods

By Thomas Donegan & Elkin Briceño

#### i. Intensive diurnal mist-netting



Consistently, mist-netting has proved reliable and beneficial in the tropics, reducing variability in data and providing considerable insights into the dynamics of avian populations and communities in a relatively short period of time (Karr, 1981). Mist-netting is vital in maximising species encounter rates (to collect the largest community sample), producing standardised data to allow comparisons between sites and a source of photographic confirmation of records. The following protocol has been developed by the EBA Project for rapid assessments of birds in Colombia.

A combination of between 12-15 mist-nets each 12m long were operated at each site (depending on terrain). Nets remained open over 5 continuous days at each site, opened before dawn (0530hrs) and closed around dusk (1800hrs) each day.

Left: Crimson-rumped Toucanet *Aulacorhynchus haematopygus*, mist-netted in Serranía de los Yariquíes, one of many forest-dependant premontane bird species the record of which during our fieldwork represents a significant range extension.

Nets were checked on a continuous basis (every 30 minutes in the early morning until 9 am, and thereafter hourly, or half-hourly in drizzle or mist). Save for a handful of possible new taxa, all birds were released after processing. The processing of trapped birds was standardised to increase reliability, accuracy and efficiency of data collection, with birds processed in the following order:

- i) identified to species and subspecies where possible (largely based on Hilty & Brown, 1986),
- ii) metal ring placed on tarsus with unique serial number (or tail feather snipped for hummingbirds where tarsus is short at some sites; hummingbird rings used in other sites),
- iii) age and sex determination (based on plumage; brood patch or cloacal protuberance noted if present),
- iv) moult examination (body, wing and tail),
- v) biometrics: weight, wing, body, tail, tarsus and culmen length taken,
- vi) time the bird is caught to nearest 60 minutes.

For re-captured birds, the time and ring number only were noted. In order to confirm identifications, photographs of each plumage type (adult male, adult female, immature) of each species were taken from various angles.

A small number of specimens from mist-net mortality were deposited in the collection of the Museo de Historia Natural, Instituto de Ciencias Naturales, Universidad Nacional (MHN-ICN) in Bogotá with a smaller number of duplicates in the Museo de Historia Natural of Universidad Industrial de Santander (MHN-UIS), a local collection.



Above: mist-nets in cloud forest at Lepipuerto.

*ii. non-systematic observations:*

- Transects were walked at each site when fieldworkers not engaged in mist-netting work.
- Close attention was paid to multi-species foraging flocks.
- Fruiting and flowering trees were regularly visited, as they attract large concentrations of frugivores and nectarivores.
- Observations were made at viewpoints over the forest canopy where possible to provide opportunities to see large supra-canopy species, e.g. Acciptridae (Hawks and Eagles).
- Night surveys were conducted at each site to survey crepuscular and nocturnal species, e.g. Caprimulgiformes (Nightjars and allies) and Strigidae (Owls).
- During observation periods, details of selected species were noted, such as species, age and sex; number of individuals; other species present in association; vocalisations; habitat preferences; canopy stratum occupied; foraging strategies and food.



Above: Variable Chachalaca *Ortalis motmot columbiana* in Serranía de los Yarigües

- Counts per transect and population estimates for threatened species.
- Sound-recording equipment in the form of a Mini-Disc recorder and active microphone and speakers were used for sound recording and playback. Identification by call is essential in tropical forests, where many species are difficult both to see and to identify visually. Recordings were used for voice-playback, to lure species from thick vegetation or to distances closer to the observer, for positive identification or mist-netting.

*iii. Local knowledge*

Further information on bird species present in the region was collated during unstructured talks over drinks and snacks with local people in which notes were taken, following techniques described in Donegan *et al.* (2003).

Right: An immature Amethyst-throated Sunangel *Heliangelus amethysticollis clarisse*, a common species in the highlands of the Yarigües mountains.



## (b) Butterflies methods

By Blanca Huertas & John Jairo Arias

A “patrolling” strategy was employed at each study site to cover as wide a range of elevations and habitats as possible from each base camp without the establishment of multiple fixed collecting points (Huertas, 2004). The use of a technique employing several person-days’ effort at different elevational belts using lower elevational intervals may improve collections (e.g. Pycz & Wojtusiak, 1999; 2002). However, the technique employed here allows a wider range of elevations to be studied and is likely to increase the effectiveness in recording fauna within a shorter period of time.



Above: Canopy nets (left) and manual collection (right)

Butterflies were collected by two fieldworkers working full-time at each study site between daylight hours (0600-1800 hrs) each day. Standard butterfly nets were used. In order to collect in a wider range of habitats, 15-20 butterfly bait traps (DeVries, 1987 model or VSR) were set as high as possible in the vegetation at each site, 5-15m above ground level (see photograph above). Traps were baited with fermented banana, sardines, rotting fish and seafood, to attract different butterfly groups. Traps were installed randomly in a combination of sun and shade locations in paths or inside the forest. Additionally, human urine and excrement baits were placed at ground level.

Basic data such as location, elevation, coordinates and date were noted for each specimen taken or observation made. Coordinates were taken with a global positioning system (Magellan GPS 301) and elevation with a Casio altimeter watch. In addition, field observations (described in detail below) were noted for each butterfly collected or observed in the field.

Specimens were collected by administering a sharp pinch to the thorax and were then placed immediately in glassine envelopes (following DeVries, 1987; Neild, 1996). Not all butterflies encountered were collected; those easily recognisable and identifiable based on previous experience of the taxa concerned and multiple duplicates were released with notes taken (see further Neild, 1996). In the laboratory, specimens were mounted on pins, spread, labelled, and placed in the museum of Universidad de Caldas. Digital photos were taken of dorsal and ventral views of male and female examples of each taxon collected. Identifications were conducted in the field using key reference works, comparisons in museums and consulting some specialists on difficult groups.

**Table 2.** Specialists and museum collections consulted.

Specialist	Specialist area	Institution
<i>Zsolt Balint</i>	Lycaenidae	Hungarian Natural History Museum, Budapest.
<i>Jason Hall</i>	Riodininae	National Museum of Natural History, Smithsonian Institution, Washington
<i>Thomas Pycz</i>	Satyrinae	Muzeum Zoologiczne Uniwersytet Jagielloński, Kraków, Poland.
<i>Julián Salazar</i>	Colombian Butterflies	Museo Universidad de Caldas, Manizales, Colombia.
<i>Keith Willmott</i>	Ithomiinae	The Natural History Museum, London, UK.
Abbreviation	Collection	
NHM	The Natural History Museum, London, UK.	
IAvH	Instituto de Investigaciones Científicas, Alexander von Humboldt, Villa de Leyva, Colombia	
MLS	Museo La Salle, Bogotá, Colombia.	
JFL	Personal Collection Jean Francois Le Crom, Bogotá, Colombia	
MUC	Museo Universidad de Caldas, Manizales, Colombia	

### (c) Dung Beetles methods

By John Jairo Arias & Blanca Huertas



Above: Dung beetle *Deltochilum* sp. in Serranía de los Yariquíes.

Dung beetles (Coleoptera: Scarabaeinae) were collected using 15 pitfall traps baited with human excrement installed at ground level at 25m intervals at each of the study sites (following the methodology described in Southwood, 1966 and improved). Traps were baited with human excrement, changed every 48 hours and checked every 12 hours, separating diurnal from nocturnal guilds. As we do not use any other material in pitfall traps other than bait, specimens were kept alive. Series of morphospecies were cleaned with hypochlorite and preserved in marked sealed plastic bags and hermetic flasks in the field with 95% alcohol. Duplicates were released unharmed.

### (d) Plants methods

Preliminary observations were made to undertake a general forest characterisation: records of epiphyte density; trees, shrubs and herbaceous plants, forest strata, dominant family groups, canopy height etc. Ivan Camargo from Herbarium of the Botanical Gardens of Bucaramanga accompanied us to Alto Cantagallos. He took some samples that were photographed, collected, pressed, preserved by spraying pure ethanol and deposited in the Herbarium.



Right: Passifloraceae (passion-vine) species in Serranía de los Yariquíes.

### (e) Mammals methods

By Elkin Briceño

We undertook informal interviews with farmers and hunters in most communities visited and in farms close to our study sites. Fieldworkers and inhabitants of San Vicente de Chucurí provided additional information about the mammals of the region. During interviews, people were asked about the mammal species of the region, which kind of habitat those species prefer, how people use or hunt species, the state of populations. Species were identified and discussed with local people using Emmons & Feer (1997)'s field guide.

Some animal skins and skeletons were donated by hunters and deposited in the Centro de Rescate de Fauna Silvestre (Wild Fauna Rescue Centre) of Corporación Autónoma Regional para la Defensa de la Meseta de Bucaramanga (CDMB). We also took photographs of such material. After fieldwork, skins and other body parts donated by local people from hunted animals were compared with material in museums. Information was supplemented with data from direct observations in the field and fingerprints, track marks and dung (excrement) records following methods described further in Navarro & Muñoz (2000).

## **(f) Helicopter insertion and extraction methods**

By Martin Donegan

Almost all primary forest high elevation sites (above 2500m) on the western slope of Serranía de los Yariguíes are essentially inaccessible without causing significant environmental impact due to the extreme topography and impenetrable primary forest that exists across most of the range. Such high elevation sites were also considered to be a potential centre of local endemism due to isolation of this massif from the rest of the Cordillera (see Figure 1) and of interest biologically as they comprise páramo and subpáramo habitats not found at other elevations. With a view to surveying these unknown and interesting habitats, we formulated a detailed plan for a helicopter insertion and extraction, together with ex-military commercial helicopter pilots.

The insertion of five people and 300kg of equipment into montane forest and páramo at an elevation of approximately 2900m was achieved by helicopter insertion and the subsequent extraction. The target area (SS7: Lepipuerto) was at an elevation of 2900m with a horizontal displacement of approximately 40km from the nearest serviced road on that flank of the mountain range. This, combined with the vertical displacement of 2900m, makes the study site one of the most pure and remote primary forests having been subject to biological study of any location in the world. The primary montane forest and precipitous slopes isolating this site from human populations are demonstrated in the photographs taken during aerial surveys in the Introduction section.

### *Preparation*

We took enough equipment to Colombia from UK specialist providers to facilitate the insertion of 5 people from a helicopter into a mountainous jungle with an expected maximum canopy height of approximately 4-5m. The equipment taken was as follows: 50m x 10.5mm static rope; soft, padded harness; 4 x light weight alpine harnesses; figure of eight; rope protector; assorted slings; and assorted karabiners.

Preliminary discussions with the helicopter pilot and team revealed a certain amount of apprehension regarding the load-carrying ability of the helicopter at the destination altitude of 3000m. It became clear that we would be able to reach the nearest lowland settlement of El Carmen to get fairly close to the site with all people and equipment on board, but that the last leg of the journey that would take us up to high altitude would have to be done in two trips to minimise weight and allow for the helicopter's reduced load carrying ability at high altitudes. The equipment to be taken with us was greatly minimised. "Non-essentials" such as more than 2 changes of clothing, extra food and isolation mats of some team members were sacrificed for reduced weight. We took the opportunity to fix the abseiling equipment to the helicopter in a test run so as to reassure all parties that this was a safe way to perform an insertion. Concerns were raised about the possibility of the rope becoming tangled in either the primary or tail rotor.

### *Insertion*

On the morning of the insertion, we had clear skies and no fog at c.900m elevation in Bucaramanga. We left Bucaramanga airport under strong security measures. Three team members (MD, TD, BH), pilot, co-pilot and the bulk of the equipment made the c.45 minute trip to El Carmen. In El Carmen, we met with the other two team members (JJA and JP) who had travelled in advance to confirm our use of the helipad (the local football field: see Figure 7) with the military and local authorities and carrying some heavy equipment. Various members of the army were present on our arrival and our planned location and intentions were discussed with them briefly.

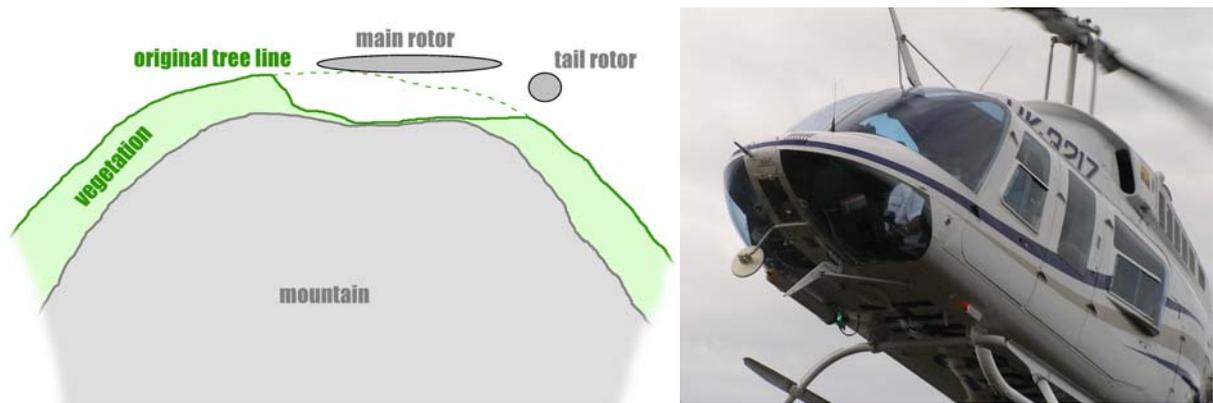


**Figure 7.** El Carmen town. Area marked "H" shows football field used as base heliport for insertion and extraction. Photo: M. Donegan.

From El Carmen, the first group (MD, TD, BH) set off for the proposed high altitude site. After some half an hour searching for an appropriate landing spot, the pilot and team members located a peak with ridge-top vegetation as our landing site. The pilot was able to maintain a steady hover as we first threw our equipment and then jumped the 3-4m from the helicopter into the ridge-top vegetation. The first batch of equipment was carefully planned and included sufficient tents for the three persons involved, some food, gasoline, a stove, machete, first aid kit and mist-nets for bird capture in the event of prolonged isolation. The pilot returned approximately 30 minutes later with the other members of the team (JJA, JP) and the rest of the equipment. By this time we had cut back the vegetation sufficiently to allow the helicopter to get within 2-3m of the 'ground'. Various problems were faced by the pilot due to the tall grasses, isolated palm trees, bromeliads and Eriocaulaceae that were prevalent in the area. The force of the air generated by the helicopter bent the tall grasses down to a certain extent, but other more rugged vegetation and the lack of a level surface worked against us. The flora of this region is constantly regenerating, which means that there is no ground as such; it is more a mixture of dead, decaying and live plants and roots. The majority of these plants appeared to be bromeliads of between 1 and 3m in height which cushioned our landing to some extent but which also caused some small lacerations and grazes to exposed skin. It is fortunate that we were able to locate a suitable insertion point with relative ease and did not have to use the abseiling equipment which would have increased the risk somewhat.

### *Extraction*

We agreed to meet the pilot 7 days after the insertion at the same location at approximately 6:30am. If poor visibility made our extraction impossible then he was to return the following day at the same time, or, if not, the following day until visibility was sufficient. During quiet times during the study, we had cut a helipad for the pilot to land on in order to facilitate an extraction that was safer and more elegant than the insertion. We cut back a great deal of the flora on the isolated mountain-top, Lepuerto during the last two days of the site visit, with a major push being made on the morning of our extraction. A helicopter needs a great deal of space on which to land, which means it is essential for the team to have a good grasp of improvised helipad construction. We determined the point where the helicopter would be most able to touch down, then proceeded to flatten all vegetation within a 6m diameter circle for the runners of the helicopter to touch down on, and reduced all vegetation within a 30m diameter circle to at most 1m in height (see Figure 8). Considering the expected approach route of the helicopter, we also reduced vegetation to at most 1m in height where we foresaw the rotor of the helicopter to be. This also created a suitable approach route.



**Figure 8.** Diagram showing Lepipuerto mountain peak, as modified immediately prior to the helicopter extraction (M. Donegan). Above right: the moment of arrival of the helicopter for the extraction.

We flew a large Colombian flag that we had taken with us to assist our location by the pilot. An area of high vegetation close to the landing site provided us with some convenient shelter from flying debris whilst the helicopter was making its approach. As with the insertion, two trips were necessary due to the weight restrictions of the helicopter at this altitude. Participants were airlifted to El Carmen in two trips, then the whole team was taken to Bucaramanga thereafter. A larger number of people could be taken on the return journey due to the slightly lower weight of equipment (water, food and gasoline having been spent). Again, the equipment retained in the field after the first extraction was planned to alleviate safety concerns for the remaining team members.



Above: Team in Bucaramanga airport on our successful return from the field, with our pilots.

**Mountaineering Methods**

By Martin Donegan

At the highest elevation site (Lepipuerto), among the objectives of the expedition was to achieve first ascents of some significant peaks. The Yariquíes mountains are almost entirely unexplored. On the western slope and ridgeline of the massif, only the southernmost section (in the region of Landazurí) and the northernmost section (in the region of San Vicente de Chucurí and Zapatoca), which have been deforested or have had small trails or unmetalled roads laid, have ever been accessed by humans. The western slope and ridgeline are carpeted in primary forest, subpáramo and páramo habitats that are essentially impregnable without the time-consuming and hard work involved in cutting trails by machete and are generally situated above knife-back mountain “walls” that are very difficult and dangerous to scale. The ultimate objective of the expedition (if feasible) was to scale one of the Yariquíes’ two most significant peaks. The northernmost of these peaks appears to be unnamed. The southernmost peak is named Cuchilla Guamito. Rising to over 3400m, these two peaks represent probably among the most substantial and isolated peaks in northern South America yet to have been scaled by man.



Above: Cuchilla Guamito, at some 3400m elevation, the southernmost peak of the Yariquíes mountains. Photograph taken from our study transect (Alto Atlapetes) at c.2850m elevation. This substantial mountain has apparently never been scaled. It is shrouded in forest with rivers and landslides scarring the páramo habitat.

We first sought a possible landing point near the northern peak. However, due to levels of cloud cover there, helicopter insertion was not possible. We therefore made for a site below the southern peak, Cuchilla Guamito. We were inserted at a point at c.2900m but probably at least 2 – 3 weeks' hike opening paths from the southernmost peak. With helicopter extraction scheduled for a date 7 days after insertion, an expedition to the peak was not feasible. Mountaineering work thus had as its objective the first human ascent and naming of significant peaks in the region of the insertion, all of which were virgin peaks. In addition, MD assisted in opening trails for the purposes of the biological study. Various slings and ropes were installed along parts of the study transect that were difficult to scale or pass.

# Results

## Birds

By Thomas Donegan & Elkin Briceño

### Summary of Key Results

During this project, we encountered a total of 318 bird species in Serranía de los Yariguíes. Mist-netting resulted in captures of 846 individuals of 137 species for all of which we have obtained biometrical data and photographic confirmation. All individuals were released, with the exception of mist-net mortalities, seriously injured birds and a handful of specimens of taxa thought probably to be undescribed. The 181 other species were identified through field observations, voice or sound-recordings, with a handful of species reported during interviews with local communities but not confirmed. Of the 181 species not mist-netted, 61 were found only in secondary areas and are typically widespread species of limited conservation interest that are relatively simple to identify. At our forest study sites, mist-netting meant that just over 50% of all species recorded were documented with photographic evidence. The bird species inventory from this study, including details of abundance of each species and numbers of mist-net captures is presented in Appendix 1.

The most species-rich families in the study were: Tyrant-Flycatchers (Tyrannidae: 41 species), Hummingbirds (Trochilidae: 29); Tanagers (Thraupidae: 29<sup>1</sup>); Woodcreepers, Spinetails, Foliage-Gleaners and allies (Furnariidae<sup>2</sup>: 24); New World Warblers (Parulidae: 15); Antbirds (Thamnophilidae: 13); Emberizine Finches (Emberizidae: 11); New World Blackbirds (Icteridae: 10); Pigeons (Columbidae: 9); Parrots (Psittacidae: 9); and Wrens (Troglodytidae: 9). These totals reflect the primary nature of the majority of the sites, with high hummingbird, tanager and furnariid diversity and relatively low finch diversity characteristic of a forest avifauna. The high tyrant flycatcher count includes many forest-dependant species and is boosted by species found in secondary areas.

Given that the Serranía de los Yariguíes was essentially unexplored ornithologically before our expedition, a large quantity of new information about the ecology and distribution of the avifauna of the region was collected. For example, in almost every premontane and montane forest-specialist species, significant range extensions of 100km or more were found. We found many birds formerly not recorded in Santander department, four lowland species not formerly recorded in Colombia's Magdalena Valley region and many new departmental records. Key findings include:

- The discovery of previously unknown populations of two Critically Endangered species: Gorgeted Wood-Quail *Odontophorus strophium* and Mountain Grackle *Macroagelaius subalaris*.
- The discovery of populations of other species threatened with global extinction, including Saffron-headed Parrot *Pionopsitta pyrilia* (Vulnerable) and Black Inca *Coeligena prunellei* (Endangered).
- Undescribed species and subspecies for science including in the genera *Atlapetes*, *Grallaricula*, *Scytalopus*, *Basileuterus* and *Phaethornis* various of which are already in the process of description and/or peer review.
- Significant range extensions in over 60 other species.

Details of the first of these discoveries is set out in a recent article in the ornithological journal *Cotinga* entitled "Discovery of a population stronghold of Gorgeted Wood-Quail *Odontophorus strophium*, a critically endangered Colombian endemic, with notes on ecology and vocalisations" (Donegan *et al.*, 2005). New ecological information and articles describing new taxa are already in preparation and will be published in the future. For many species, undescribed vocalisations were recorded. Our data

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<sup>1</sup> Would be 33 species if *Chlorospingus*, *Habia* and *Piranga* are included. These genera are classed in this study as Incertae Sedis (following Remsen *et al.*, 2005).

<sup>2</sup> Including all former woodcreepers (old Dendrocolaptidae) together with ovenbirds, spinetails, foliage-gleaners and allies (old Furnariidae) (following Irestedt *et al.*, 2004; Chesser, 2004; and Remsen *et al.*, 2005).

taken as a whole presents a significant contribution to our knowledge of Colombian bird distribution, filling a significant “gap” in information. We have already begun producing scientific literature from expedition results.

Papers already in preparation or accepted include:

- Discovery of a population stronghold of Gorgeted Wood-Quail, with notes on the species vocalisations (published in *Cotinga*)
- Bird range extensions from the Magdalena Medio region of Colombia (intended for Bulletin of the British Ornithologists Club)
- A new Brush-Finch in the *Atlapetes latinuchus* complex (submitted to an international bird journal)



Above: Rufous-naped Brush-Finch *Atlapetes "latinuchus"* sp nov in Serranía de los Yariguíes.



We also intend to produce a number of scientific articles about elevational distribution and the avifauna of the region and popular and scientific articles over coming months drawing attention to the Serranía de los Yariguíes as an important region for conservation of species threatened with extinction.

Left: Slate-crowned Antpitta *Grallaricula nana*. The subspecies involved has yet to be determined but has apparently never been recorded previously in Colombia's East Andes. It seems clear from our research that at least one undescribed taxon exists in this group in the Eastern Andes.

### Threatened species of Serranía de los Yariguíes

The bird species detailed below are classified as Threatened or Near-Threatened by BirdLife International (2000) or Renjifo *et al.* (2002). As these species are in danger of global or national extinction, it is of the utmost importance that where such species are found, information on ecology should be collected and distributed, and that suitable habitats are protected. The protection of Threatened species also helps protect the forests in which they live, their biological communities and other non-threatened species. A total of 12 endangered bird species (3 Critical, 1 Endangered, 4 Vulnerable, 1 nationally Vulnerable and 4 Near-Threatened species) were recorded in the study region. In addition to the species described below, a further Critical-rated species, Chestnut-bellied Hummingbird *Amazilia castaneiventris*, was recently captured in secondary habitats below our El Talisman site during 2005 (J.C. Luna *pers. comm.*)

#### Northern Screamer *Chauna chavaria*

**Status: Near-Threatened**

This enormous bird is endemic to aquatic regions of the northern lowlands of Colombia and Venezuela. Although more common further north where wetlands are more extensive (see further Salaman *et al.*, 2002), this species was reliably reported to be present by local people in lowland marshland areas adjacent to the Río Chucurí adjacent to the northern section of the massif. Such records, if confirmed, would represent a small range extension.

**Wattled Guan** *Aburria aburri*

**Status: Near-Threatened**

Wattled Guan is regarded as a Very High Conservation Priority by the *Cracid Specialist Group* (Brooks & Strahl, 2000) and as Near-Threatened (BirdLife International, 2000), due to high levels of hunting and deforestation in its range. It is described by hunters as extremely rare in most areas (Brooks & Strahl, 2000). We made sound-recordings of this species at El Talisman, where at least 3 males were audible from our campsite at dawn.

Wattled Guan was also present in the Cerro de la Paz at both sites, at 1000m and 1300m. Our records at 1000m elevation are unusually low for the species, though only one male was heard calling along our transect there. We were surprised to find Wattled Guan so common in the region, given that it appears to be widely persecuted by recreational hunting. However, it was notably not as common here as in the Serranía de San Lucas, in the adjacent Central Cordillera border of the Magdalena Medio, where hunting bans are more rigorously enforced (see Donegan *et al.*, 2001).

**Northern Helmeted Curassow** *Pauxi pauxi*

**Status: Vulnerable**



*Pauxi pauxi* was reported as present by many local people in San Vicente from the Cerro de la Paz region. We did not confirm these reports, but the number of independent reports in interviews (over 30 different people) and the strength of the descriptions were noteworthy. This species has previously been reported from the San Vicente region (Franco-Maya & Alvarez, 2002).

Left: Northern Helmeted Curassow. Photo: © Cracid Specialist Group.

**Blue-billed Curassow** *Crax alberti*

**Status: Critical**

This is another of Colombia's rarest endemic species, now known only from a handful of sites in Colombia's northern lowlands. Its global population stronghold is considered to be the lowlands south and west of the Serranía de San Lucas (Cuervo, 2002a) and in lowland forests of Serranía de las Quinchas (Quevedo *et al.*, 2005) to the South of Serranía de los Yariguíes in the Magdalena Valley. Blue-billed Curassow was reported as present in the extensive lowland and foothill forests in the southern end of the Serranía de los Yariguíes, which our aerial survey showed to include large tracts of potentially suitable primary forest habitat. Due to political instability and difficulty of access, we were unable to study these forests.



Right: Blue-billed Curassow *Crax alberti*. Painting not by authors.

**Gorgeted Wood-Quail** *Odontophorus strophium*

**Status: Critical**

Gorgeted Wood-quail is one of the world's rarest and most poorly known birds, being restricted to the western slope of Colombia's Eastern Andean Cordillera (Hilty & Brown, 1986) between c.04°30 and 06°50'N. It is considered Critically Endangered, both globally and nationally (BirdLife International, 2000; Sarria & Alvarez, 2002), and of high priority for conservation action (Fuller *et al.*, 2000). Small populations have been observed around just two localities in the past 20 years: Reserva Biológica Cachalú and Alto Río Fonce, both in Santander, Colombia. Almost all (92%) of the species' historical range has been deforested. A principal conservation priority for the species was considered field work in Serranía de los Yariguíes to determine its status there (Cadena *et al.*, 2002; Sarria & Alvarez, 2002).

Although Serranía de los Yariguíes has never been the subject of a comprehensive ornithological study, a male Gorgeted Wood-quail was taken near Zapatoca (06°48'N 73°16'W) in 1970 (Romero, 1983), and another specimen, taken in oak forest near Betulia in the Cuchilla del Ramo north of Serranía de los Yariguíes in 1972 (King, 1979), was considered possibly to be a Gorgeted Wood-quail (Hilty & Brown, 1986).

We found Gorgeted Wood-quail at our El Talisman site (SS5a-b). We heard at least two calling males at lower elevations (mostly at 1800–1950m), below our transects, and none was heard calling above 1950m. During observations along the Camino de Lenguerke, we heard at least two further males above c.1700m in habitats including mature secondary forest. At the two lower elevation study sites in Cuchilla de la Paz, Gorgeted Wood-quail was replaced by Marbled Wood-quail *O. gujanensis*. At Alto Cantagallos, no *Odontophorus* were encountered. Further south in its range, Gorgeted Wood-quail has been recorded at 1800–2050m (Sarria & Alvarez, 2002).

Gorgeted Wood-quail doubtless occurs further south in the Serranía de los Yarigués to Cerro de las Armas. It may well be present in mountains above the nature reserve recently created by Fundación ProAves in the Serranía de las Quinchas, within the río Minero watershed, which have not yet been investigated ornithologically, although only Marbled Wood-quail and perhaps Rufous-fronted Wood-quail *O. erythrops* have been recorded in adjacent lower elevation sites to date (Stiles *et al.*, 1999). Based on its density and the extent of forest cover at suitable elevations, we hypothesise that this population of Gorgeted Wood-quail in Serranía de los Yarigués may comprise >250 individuals, making the Yarigués range the species' global population stronghold.



Above: Gorgeted Wood-Quail. © Paul Salaman / Fundación ProAves, 2004.

We heard Gorgeted Wood-quail daily at El Talisman (most frequently around 0630–0730hrs) and made sound-recordings. A recording is available for free download from Fundación ProAves' website at [www.proaves.org/ostrophium.wav](http://www.proaves.org/ostrophium.wav).

#### **Rusty-faced Parrot *Hapalopsittaca amazonina***

**Status: Vulnerable**

At least one flock of this species was heard and seen on various occasions at Alto Cantagallos. Flocks were observed frequently daily and sound recorded at Lepuerto where the open páramo habitat facilitates supra-canopy observation of the forest below. Flocks were sound recorded on various occasions. This species is considered rare throughout its range in Colombia, with a very localised distribution (Hilty & Brown, 1986) and has disappeared from various sites, apparently due to deforestation and human intervention (Rodriguez & Hernandez, 2001).



Right: Rusty-faced Parrot in Central Cordillera of Colombia. Photo: © J. Velasquez / Fundación ProAves.

The abundance of Rusty-faced Parrot in the isolated and inaccessible high elevation primary forests of Lepipuerto raises some hope as to the future survival of this species. Serranía de los Yariguíes emerges as an important site for the conservation of this species.

**Saffron-headed Parrot** *Pionopsitta pyrilia*

**Status: Vulnerable**

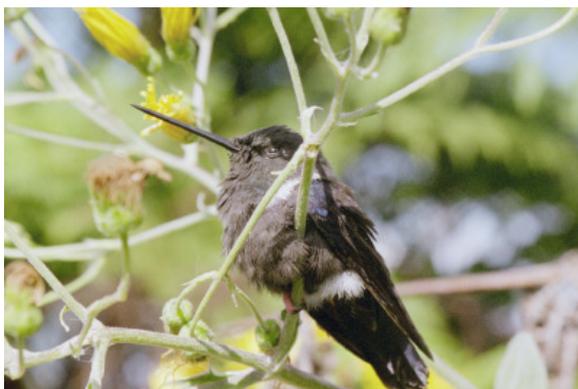


This distinctive and colourful forest parrot is known from lowland and foothill humid forest habitats in Panama, Colombia and Venezuela. Due to deforestation, it now occupies a much-reduced range. Saffron-headed Parrot was common in our lower elevation site in Cerro de la Paz, where several groups were observed feeding in the canopy and sound recordings were made. A solitary individual was also observed at our higher elevation site in Cerro de la Paz inspecting a large hole c.5m above ground level in a tree trunk. As the species generally forages in the canopy, it seems likely that this individual was searching for a potential nesting site. Although the nesting of Saffron-headed Parrot is undescribed, Fundación ProAves fieldworkers in nearby Serranía de las Quinchas have observed this species nesting in a hollow tree trunk (P. Salaman *in litt.*).

Left: Saffron-headed Parrot in Serranía de las Quinchas, Boyacá, Colombia inspecting a nesting site in a tree trunk of very similar nature to that observed in Cerro de la Paz (Photo © Fundación ProAves).

This parrot is known only from a handful of sites, thus a new locality is of great importance. Its high abundance at Cerro de la Paz in good quality lowland forest is interesting when considered alongside data by Salaman *et al.* (2002) who note a possible correlation between habitat quality (maturity and level of disturbance of forest) and abundance for this species.

**Black Inca** *Coeligena prunellei* **Status: Endangered**



Above: Black Inca in Serranía de los Yariguíes.

This hummingbird is endemic to the western slope of Colombia's eastern Cordillera, known currently from only a handful of localities (BirdLife International, 2000; Renjifo *et al.*, 2002). This was one of the most common species at El Talisman (2000m, observations down to 1900m) – we caught 16 individuals with one retrapped, and photographed several individuals. We also observed a single individual feeding on flowers in scrub in secondary farmland habitat some 500m from forest at SS4. At Alto Cantagallos (2450m), and Lepipuerto (2900m) this species was replaced with the widespread Collared Inca *Coeligena torquata*.

These records present an important c.60km northwards range extension for the species, as well as an important formerly unknown but apparently large population. BirdLife International (2000) suggest that the species' global population is just 1000-2400. We consider that, were the abundance of the species to be similar in forested regions of suitable elevation across the western slope of the Serranía de los Yariguíes, that its population in Serranía alone would exceed the higher of these figures. Black

Inca was frequently observed feeding on the plants of the genera *Cavendishia* (Ericaceae) and *Psitacanthus* (Loranthaceae). Habitat protection in the Serranía de los Yariguíes is of importance for the protection of this species, although its presence in disturbed and border habitats offers some hope for its conservation.

**Beautiful Woodpecker** *Melanerpes pulcher*

**Status: Nationally Vulnerable**

This Woodpecker is endemic to Colombia's northern lowlands. In the Magdalena Valley, its range extends south to San Vicente de Chucurí (Cuervo, 2002b). A pair of this species was observed in Cerro de la Paz (1000m). They were observed feeding on the trunk of a large dead tree in a small forest clearing. During observations here and elsewhere in the Magdalena Medio by TD, this species has always been present on dead trees. It seems to prefer forest border habitat, dryer forest and mature secondary growth where such trees are more prevalent.

**Mountain Grackle** *Macroagelaius subalaris*

**Status: Critical**

A vocal individual was seen briefly and tentatively identified to this species was observed close to our campsite at Alto Cantagallos (2400m). Other individuals were possibly seen among mixed large frugivore flocks together with Mountain Cacique *Icterus leucoramphus* which flocks sometimes also included Grass-green Tanager *Chlorornis riefferii* and Green Jay *Cyanocorax yncas* but were not confirmed. The bird's call consisted of a loud squawk "caaaaaa ca-ca-ca-ca", typical of the genus. This species, like Gorgeted Wood-Quail, is considered among the most threatened birds in the world, known only from a handful of montane forest sites in Colombia's Eastern Cordillera. Until recently, there have been very few records of this species since the 1960s, although two old specimens apparently from 2750m elevation in San Vicente de Chucurí municipality are reported (Amaya & Renjifo, 2002; Cadena *et al.*, 2002).

**Cerulean Warbler** *Dendroica cerulea*

**Status: Vulnerable**

Individuals, including an adult male, were observed over-wintering in Cerro de la Paz where they joined multi-species foraging flocks. Follow-up work in the region by EB and others has revealed the Yariguíes region to form important wintering grounds for this species, the only threatened Nearctic migrant passerine. Wintering sites for this species globally are few, thus the Yariguíes mountains appear an important site for it. This species was recorded in both forest and shade plantations, meaning that habitat protection in the region may not be of such relevance to this species as it may be to other threatened species.

**Scarlet-rumped Cacique** *Cacicus uropygialis*

**Status: Nationally Near-Threatened**

The montane and lowland forms of this icterid have recently been split (see Jaramillo & Burke, 1999). The montane form, *C. uropygialis*, is poorly-known in Colombia and has been assigned threatened status nationally. We heard and observed flocks of up to 15 individuals of this species at El Talisman. The most common vocalisation was a disyllabic whistle. This species was previously unknown north of Cundinamarca department on the western slope of the East Andes. New records represent a c.200km northwards range extension, suggesting that the species may be more widely distributed than is currently thought.

**Sooty Ant-Tanager** *Habia gutturalis*

**Status: Near-Threatened**



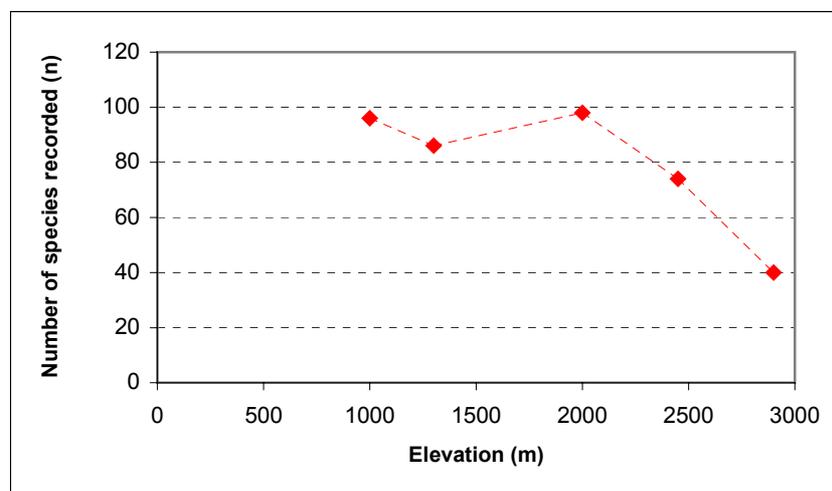
*H. gutturalis* is an endemic of the Nechí Endemic Bird Area of northern Colombia. It was common by voice and seen frequently in the understorey at both in Cerro de la Paz, where 7 were captured (with one retrap) at 1000m and 2 were captured (with two retraps) at 1300m.

Left: Sooty Ant-Tanager in Serranía de los Yariguíes.

## Bird species diversity

The number of bird species recorded at each site should be comparable given that each site was subject to standardised techniques and similar effort (in terms of mist-net hours and observations) by two ornithological fieldworkers for the same period of time in days. Data from observations in secondary sites are excluded from this analysis as such sites were not subject to the same sampling effort. Recorded bird species diversity at the different sites was fairly similar at sites at 1000 – 2000m, with just under 100 species recorded at each site. Lowland bird species diversity may have been slightly underestimated in this study compared to highland bird species diversity due to the lower relative effectiveness of mist-nets in forests of a high canopy (where only the understorey is sampled) compared to forests of a low canopy (where a greater proportion of the forest is sampled).

Recorded bird species diversity falls off dramatically towards higher elevations, as shown in Figure 9. Whereas tall lowland forest and complex premontane forest appear capable of supporting a large number of niches for bird species, higher elevation forest with its lower canopy and stunted subpáramo and páramo habitats appear to support fewer species. The lower elevation and premontane elevations emerge from this analysis as priorities for the protection of local bird diversity.



**Figure 9.** Bird species diversity recorded in Serranía de los Yariguíes as a function of elevation at our primary forest study sites.

We note that the 317 species we have recorded, whilst probably including a good estimate of the forest-dependant highland bird species of the region, do not include a good saturation for species found in secondary areas or those of lowland forest (<1000m). Doubtless, more work remains to be done in the region and other bird species remain to be found.

## Range-restricted Bird Species

Bird diversity data alone is not always a good measure of conservation importance as threatened and range-restricted species are often concentrated in areas where bird diversity is low. To prevent extinctions, which is the ultimate aim of conservation programmes, a more sophisticated approach to bird conservation is necessary, taking into account those regions rich in range-restricted or threatened species.

Through the Endemic Bird Area programme, BirdLife International has sought to highlight regions rich in bird species of a restricted range such that their habitats can be prioritised for conservation action (Stattersfield *et al.*, 1998). Endemic Bird Areas are defined as linked regions containing more than one bird species with a range of 50,000km<sup>2</sup> or less. An analysis of the species recorded in our study reveals the Yariguíes mountains to be influenced by three Endemic Bird Areas: the Nechí (037), Chocó (041) and Colombian East Andes (038) EBAs. Table 3 contains a list of range-restricted bird species recorded during this study.

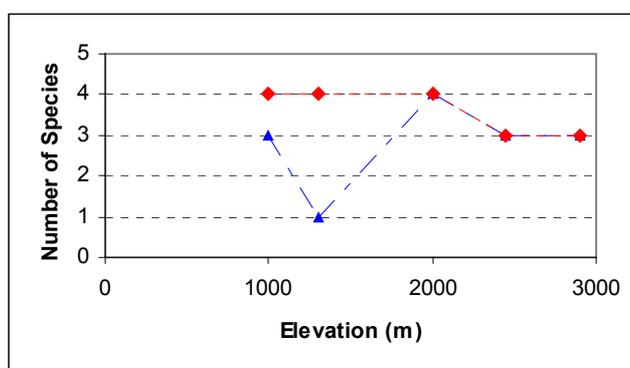
**Table 3.** Range-restricted bird species recorded in Serranía de los Yariguíes following Stattersfield *et al.* (1998) and including two undescribed bird species discovered during this project.

Species name	Threat category	EBA no.	SS2: Cerro Paz 1000m	SS3: Cerro Paz 1300m	SS5: Talisman 2000m	EI	SS6: Alto Cantagallo 2450m	SS7: Lepipuerto 2900m
Gorgeted Wood-Quail <i>Odontophorus strophium</i>	CR	038			X			
Rusty-faced Parrot <i>Hapalopsittaca amazonina</i>	VU	038					X	X
Coppery Emerald <i>Chlorostilbon russatus</i>	Lr	038			X			
Blanca Inca <i>Coeligena prunellei</i>	EN	038			X			
Golden-naped Woodpecker <i>Melanerpes chrysauchen</i>	Lr	037	X					
Lita Woodpecker <i>Piculus litae</i>	Lr	041	X					
Nariño Tapaculo <i>Scytalopus viciniior</i>	Lr	041			X			
Tapaculo <i>Scytalopus sp nov</i>	NE	[038]						X
Mountain Grackle <i>Macroagelaius subalaris</i>	CR	038					X	
Brush-Finch <i>Atlapetes "latinuchus" sp</i>	NE	[038]					X	X
Sooty Ant-Tanager <i>Habia gutturalis</i>	NT	037	X	X				
<i>Total Nechí lowlands EBA</i>	CR	037	2	1				
<i>Total Colombian East Andes EBA</i>	CR	038			3		3	3
<i>Total Chocó EBA</i>	UR	041	1		1			
<i>Total Range-restricted bird species</i>			3	1	4		3	3

Key: X = presence at site. For species: CR = critically endangered; EN = endangered; VU = vulnerable; NT = near-threatened; Lr = low risk; NE = not evaluated. For EBAs: CR = critical; UR = Urgent. For *Scytalopus sp* and *Atlapetes "latinuchus" sp*, EBA classifications in square brackets represent recommendations in articles describing these taxa.

As might be expected, the higher elevations of the Yariguíes mountains are characterised principally by the Colombian East Andes EBA. Our sites below 1500m, conversely, were characterised principally by the Nechí lowlands EBA.

Species from the Chocó EBA were recorded at sites between 1000 and 2000m, with *Scytalopus viciniior* in particular representing a significant range extension of some 300km north-east. This species was identified by voice and confirmed by comparing or sonograms with those published in Krabbe & Schulenberg (1997). Interestingly, the habitats of Serranía de los Yariguíes are not dissimilar from those of the Chocó. The Yariguíes mountains are an extremely humid region, particularly at higher elevations which are characterised by perpetual cloud (fog) cover and torrential downpours, quite similar to those found at higher elevations of the western slope (discussed in Salaman *et al.*, 2003).



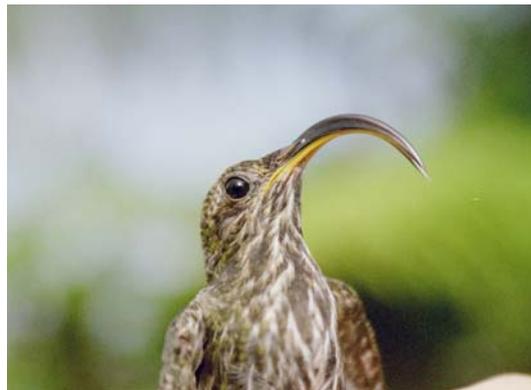
**Figure 10.** Number of range-restricted species (blue) and threatened species (red) recorded as a function of elevation in Serranía de los Yariguíes. Data includes undescribed taxa in *Atlapetes* and *Scytalopus* as threatened species. Note the differing pattern between this graph and the diversity graph.

Interestingly, whereas bird diversity decreased with elevation, the number of range-restricted and threatened species recorded at each site was apparently not affected by elevation. Indeed, the two new species for science found in this study were each found only at the highest elevations of the Yariguíes mountains. This study is a further example of diversity perhaps being a misleading measure of a site's conservation importance (Orme *et al.*, 2005).

The Colombian East Andes EBA is rated Critical with high biological importance and current threat levels. The Nechí lowlands EBA is also rated Critical, with the Chocó rated Urgent (Stattersfield *et al.*, 1998). The coincidence of two Critical rated endemic bird areas in the Yariguíes mountains is noteworthy and emphasises its international importance to the conservation of bird diversity. The presence of both a lowland and highland Critical rated threatened bird species and endemic bird areas further demonstrates the importance of conservation efforts being applied to both montane and lowland forests in this region.



Above: Hummingbird Purple-crowned Woodnymph *Thalunaria colombica* recorded in El Talisman, Serranía de los Yariguíes.



Above: White-tipped Sicklebill *Eutoxeres aquila* recorded in Cerro de la Paz and El Talisman.

## Butterflies

By Blanca Huertas & John Jairo Arias

Butterflies (together with birds and mammals) are considered one of the most potentially suitable indicator taxa worldwide (Ricketts *et al.*, 1999) and are one of the best-studied invertebrate groups. In the Colombian Andes, butterfly diversity remains not fully documented, although 3500 described species have been recorded to date in the country (Le Crom *et al.*, 2002).

The Lepidoptera order comprises three main groups: Papilionoidea (true butterflies), Hesperioidea (skippers) and Heterocera (moths) (Ackery *et al.*, 1999). This study focuses on the better-known diurnal groups, the Papilionoidea (true butterflies) and Hesperioidea (skippers) together referred as *butterflies*. Moths were not recorded or collected during this study.



Above: *Morpho* butterfly "one of the most conspicuous and famous denizens of the tropical forest" (Smart, 1991) in Serranía de los Yariguíes: Photo: John Arias & Elkin Briceño/ EBA Project.

A total of 248 species of butterflies were recorded in Serranía de los Yariguíes during the EBA Project research. A preliminary inventory of the butterfly species in the massif is presented in Appendix 2, although more species have been found in further surveys conducted by same team members during Proyecto YARE in 2005. We conducted an analysis of the distribution of butterflies in the Yariguíes mountains across the elevational ranges and habitats surveyed.

Three species considered to represent undescribed species were collected, in the genera *Tamania/Idioneurula*, *Euptychia* and *Tegosa*. Several subspecies in the collection are considered undescribed, including in the species *Oxeochistus submaculatus*, *Oleria makrena*, *Parides eurimedes*, *Eretris calixto*, and *Pedaliodes plotina*. Descriptions of these taxa are already being subject to collaborative work together with specialists and will be published in future editions of scientific journals.

We have already begun producing scientific literature from expedition results. In addition to new taxa descriptions referred to above, papers already in preparation include:

- The elevational distribution of butterflies (Lepidoptera: Papilionoidea) in the Serranía de los Yariguíes, Colombia.
- Butterflies of Serranía de los Yariguíes, Santander (annotated list intended for Biota Colombiana).

In Serranía de los Yariguíes, the pristine tropical dry forest at 1000-1200m (SS2) was the habitat in which butterfly diversity was highest. Butterfly species richness in Serranía de los Yariguíes showed an increase towards this elevation and a corresponding decrease towards higher elevations (SS6 and SS7).

Although the relationship between species richness and elevation fits well with the generally accepted proposition that lowland tropical forest supports the richest biota on earth (Erwin, 1988; MacArthur, 1972), we registered three peculiar results in Serranía de los Yariguíes: (i) the low values at 600-750m (SS1) in butterfly species richness are likely biased by differences in sampling methodology and forest composition (secondary habitat); (ii) the low values at SS4-SS5a are also probably due to the lack of primary forests studied at these elevations in the study region; and (iii) in higher elevations at 2800-3000m (SS7), a higher number of butterfly species were recorded than at 2200-2500m (SS6). The latter pattern is interesting and could perhaps be due to the cloud belt at 2200-2700m, which reduces direct sunlight input. Butterflies, being ectothermic invertebrates, must derive their body heat from external resources and lower temperatures slow their development and metabolism (Smart, 1991; Gilbert & Singer, 1975). Temperature, which is correlated negatively with elevation (Krebs, 2001) may therefore be of greater importance to butterflies than to some other taxa. Increased cloud cover, humidity and precipitation at higher elevations accentuate the effects of decreasing temperature (Fleishman *et al.*, 1997). The páramo habitat (SS7) is above the cloud belt

for significant periods each day, particularly during the morning, meaning that insolation was greater, which could be the reason why recorded butterfly diversity was higher here than in the humid forests.

### Measurements of diversity across the elevational gradient

Using interpolation analyses (i.e. 200m elevation intervals) of number of species recorded in each family of butterflies, we found a similar general trend for most butterfly families, as observed in the above analysis for butterflies as a whole. Figure 11 below shows changes in recorded species richness for the butterfly families studied. A maximum is recorded species richness is reached at 1000m, with declines both above and below that elevation. The dramatic decrease at 2600-2800m and significant increment at 2800m was not expected and is discussed above (see further Huertas, 2004).

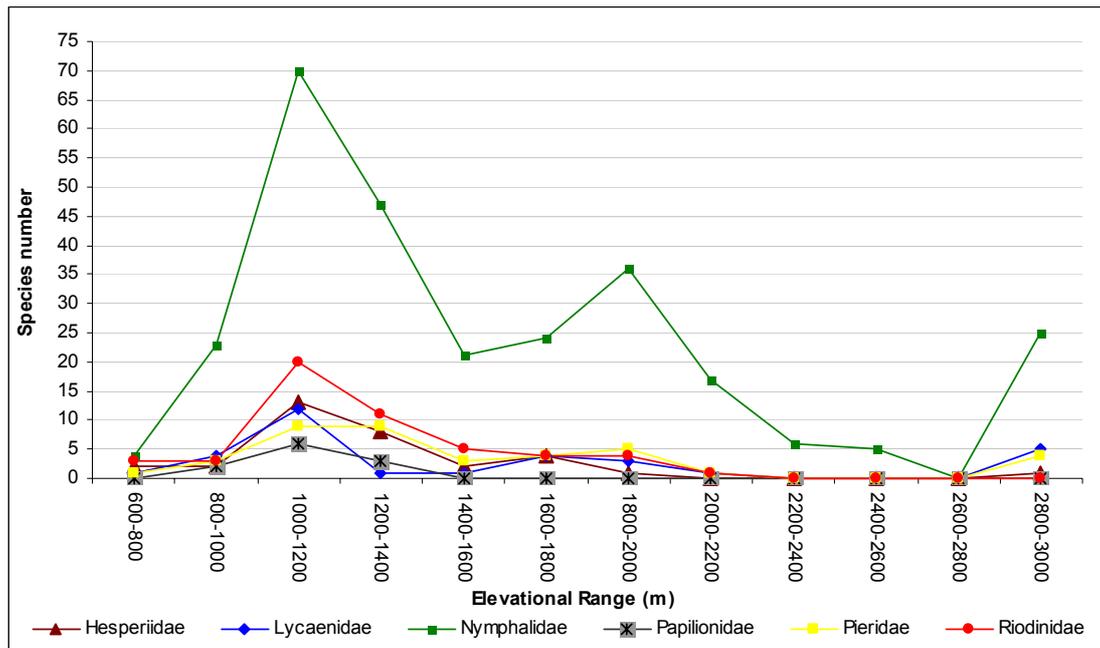


Figure 11. Species richness recorded across each butterfly family towards the elevational gradient.

Nymphalidae (fritillaries, browns, ithomiids, morphos, passion vine, and owl butterflies) is the largest family. It was also the most elevationally widespread family, present in sites studied in Serranía de los Yariguíes, whereas Papilionidae family (Swallowtails), for example, was only recorded in the lowlands during this survey. Hesperidae (skippers), Riodinidae (metalmarks), Pieridae (yellows) and Lycaenidae (hairstreaks) families show a similar elevational pattern, also peaking in richness at 1000m. The general shape of butterfly elevational distribution observed appears to be largely a product of the Nymphalidae distribution, perhaps due to this family comprising such a majority of the total species sample. For example, none of the other families show another apparent secondary peaks showed by Nymphalidae around 1800-2000m and 2800-3000m (and by the general butterfly distribution as a result).

Families showing an apparently very narrow elevational range may not be as restricted in elevational range as the data suggests, as such species may be rare (Lieberman, *et al.*, 1996) and may have been under-sampled (see further Huertas, 2004). It appears that the maximum point of species richness reached at 1000m may be a “mid-elevation peak” in diversity, although the effect of elevation on diversity below this peak could not be tested due to a lack of data from comparable primary forests.



Right: Common Brown butterfly *Euptychia* in habitats disturbed by humans in Serranía de los Yariguíes.

Due to deforestation, there are very few remaining patches of suitable forest between 200 and 1000m in the northern section of Yariguíes. Furthermore, in the southern part of the massif, where some forest still exists at such elevations, the complicated security situation made fieldwork and study site establishment complicated. Moreover, a complete elevational assessment to sea level is not possible as Serranía de los Yariguíes does not comprise elevations below 300m (which do however exist in nearby marshlands of the Magdalena Valley) (IGAC, 2003).

### Sampling methods and butterfly distributional trends

Although butterfly collection techniques have been standardised and methods for assessing butterfly abundance are widely used (e.g. Pollard, 1977), a suitable strategy for sampling butterflies along elevational gradients has not yet been developed for all groups (Pyrzcz & Wojtusiak, 2002).

The development of sampling methods for butterflies across elevational gradients in the Andes depends on particular local environmental and biological factors (see e.g. Pyrcz & Wojtusiak, 2002; Arias & Huertas, 2001). Rapid Assessment Protocols (RAPs) for sampling along an elevational transect can allow a variety of habitats and different species to be studied in a relatively short period of time (Donegan & Salaman, 1999; Huertas, 2004).

The methods used in this study were compared and analysed for each butterfly family (see further Huertas, 2004). Figure 12 shows the substantially higher number of families and species collected (85%) using hand-nets than by using attracting methods. As noted above, attracting methods used baited traps (rotting fish and sea food), human dung and urine as bait.

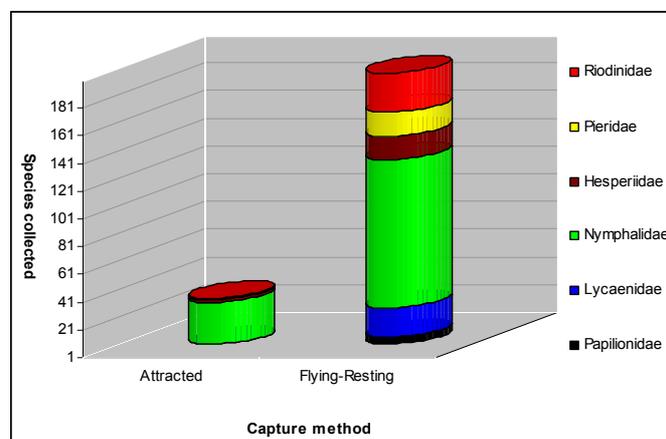


Figure 12. Comparison between collecting methods in butterfly families.



Above: Nymphalids lovers of rotting fish baited traps (*Catonephele chromis chromis* and *Corades enyo almo*, above and below respectively).

Although fewer species were collected in traps than through the use of nets, we found more species of Nymphalidae in traps, probably due to high diversity and specificity in guilds and subfamilies in this family. However, traps were not effective as desired due to the small number available and the difficulty in setting them in the canopy (i.e. in lowland forest sometimes too high (c.30m) or in páramos sometimes too low (less than 2m)).

However, results also suggest that the use of traps and the employment of a variety of tested baits (or, if one is studying a particular group, specific baits) are important in studies at all elevations of tropical forest, as captures of species not found using manual capture were made with traps at almost all sites. The use of baited traps enables a greater range of the microhabitats present (e.g. canopy) to be sampled, and a wider spectrum of butterfly taxa with different nutritional habits to be observed.

For each individual butterfly collected, various microhabitat and behavioral data were collected. One of those data was whether the butterfly was collected in forest, forest edge or secondary habitat. Figure 13 is indicative of the high quality of the habitats studied, with the vast majority of species found in forest or on the forest edge, where collection can be easier.

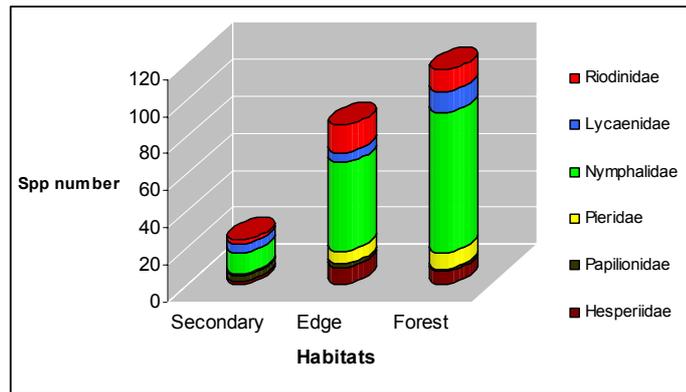


Figure 13. Habitat of butterfly species captured in this study.

Data analysis shows a break in species complements between lower montane butterfly faunas (found in the Cerro de la Paz region) and upper montane butterfly faunas (found in El Talisman – Cantagallo – Lepipuerto region) (see further Huertas, 2004). This trend has been observed in other studies and groups of butterflies (e.g. Willmott, 2003; Kattan & Franco, 2004) and was also shown in this study in birds (see above), where lowlands corresponded to the Nechí endemic region, and highlands to the Colombia East Andes region (EBAs). A high rate of species turnover with elevation and low similarity between butterfly populations across the elevational gradient in Serranía de los Yariquíes is characteristic of a “hot spot” of butterfly diversity, indicating that the Yariquíes mountains may be a priority for conservation measures. Primary lowland and highland forest in the Magdalena Valley are reported to be very scarce (Stiles *et al.*, 1999; Stattersfield *et al.*, 1998).

Butterfly taxa considered to be endemic to the Magdalena Medio region were found fairly uniformly across all elevations studied in Serranía de los Yariquíes in both lowland and premontane areas, although not in the very highest elevations (Huertas, 2004). This more uniform relationship between certain range restricted species and elevation illustrates the need to conserve habitats at a variety of elevations.

Although butterfly species richness observed in Serranía de los Yariquíes was lower at higher elevations, more species restricted to the northern Andean region were recorded at higher elevations (Huertas, 2004). It has been argued that human pressure is highest in lower elevations. However, highland forest habitat in the Andes is endangered by the extraction of fine woody plant species such as oak and caoba, many of which may be larval host plants. These factors and others discussed during this analysis may help assess how to implement future conservation strategies in the Serranía de los Yariquíes. Both lowland and highland butterfly communities in this region emerge as probable conservation priorities.



Above: *Heliconius clysonimus*, passion vine butterfly (Heliconiinae: Nymphalidae).

## Beetles

John Jairo Arias & Blanca Huertas

Dung beetles (Coleoptera: Scarabaeidae: Scarabaeinae) are so named as they feed on vertebrate excrement in adult and immature phases, with females also using dung for the incubation of eggs (see references in Huertas *et al.*, 2003). Dung beetles are very susceptible to changes in habitat and also are relatively easy to capture using dung-baited pitfall traps, meaning that they have been used as an indicator taxon for evaluating the state of habitats (Halffter, 1991; Pardo, 1992; Halffter & Favila, 1993).



Above: Dung beetle *Phaneus* sp in a path rolling a piece of horse dung.

Preliminary identification of specimens in field has been made to genus level. However, most specimens have not yet been identified to species level due to the time required in the lab to identify species. Through preliminary identification work, species in genera such as *Canthon*, *Deltochilum*, *Dichotomius*, *Eurysternus* and *Phaneus* have been identified. It seems evident from observations made in the field that diurnal, nocturnal and crepuscular species were collected in traps during the study. Furthermore, it is evident that the vast majority of the genera found are those typical of primary forests rather than those of secondary habitats, reflecting the well-conserved nature of the habitats studied.

A gradual decline in species richness in dung beetles with increasing elevation was evident across the elevational gradient studied. Indeed, no species were collected at the highest elevation páramo site (SS7). This trend of decreasing diversity in this group with increasing elevation, if confirmed, would reflect results found in studies in other Andean mountains in Colombia (Medina *et al.*, 2001; Huertas *et al.*, 2003).

Identification of many Scarabaeinae is difficult, requiring laboratory work with stereoscopes and comparative work in museums. The lack of keys for many tropical genera makes this process a difficult one. A preliminary identification of genera and morphospecies was made using available keys (Blackwelder, 1944; Edmonds 1972, 1994; Halffter & Martínez, 1977; Howden & Young, 1981; Arnaud, 1982; Jessop 1985; Medina *et al.*, 2001). Specimens will be deposited in local collections when the identification of species and mounting of specimens is complete. As part of Proyecto YARE (discussed further in the Addendum below), a more detailed study of the dung beetles of the Yariguíes mountains is taking place. The material from this fieldwork is being analysed alongside that collected in Proyecto YARE, with a view to producing a complete inventory of the species encountered and a more detailed study of patterns of changing diversity with elevation.

## Mammals and Community Work

By Elkin Briceño

A total of 38 mammal species were recorded or reported from Serranía de los Yariguíes from interviews and fieldwork. A list of species recorded is set out in Appendix 3. 49 large mammal species were recorded in a study of the wider Magdalena Medio region, 77.5% of which were recorded in the Serranía de los Yariguíes showing its importance as a centre for the region in general. 24 species (49%) were confirmed in the field; 23 were reported by local people (47%) and the remaining 2 species (4%) were found in the museum at Universidad Industrial de Santander (UIS). The most species-rich orders were Carnivora (14 species, 28.5%), Rodentia (9 species, 18.3%), Xenartha (8 species, 16.3%) and Primates (5 species, 10.2%). It should be noted that this study did not include methods for the capture of terrestrial or flying mammals, such as Sherman traps or mist-netting, nor systematic searches for prints. As such, the results here comprise merely a preliminary analysis of the composition of the mammal species and their conservation status in the Serranía de los Yariguíes and surrounding lower Magdalena valley.

Four mammal species found or reported in Serranía de los Yariguíes are categorized as endangered with extinction (all Vulnerable): Giant Anteater *Myrmecophaga tridactyla*, Colombian Night-Monkey *Aotus aff. lemurinus*, Spectacled Bear *Tremarctos ornatus* and Ocelot *Leopardis pardalis*. Seven species are categorised as Near-Threatened: Western Woolly Opossum *Caluromys lanatus*, Water Opossum *Chironectes minimus*, Puma *Puma concolor*, Jaguar *Panthera onca*, Little Red Brocket Deer *Mazama rufina*, Paca *Agouti paca* and Mountain Paca *Agouti taczanowskii*. Three species recorded are categorized as Data Deficient: Little Coatí *Nasuella olivacea*, Northern naked-tailed Armadillo *Cabassous centralis* and Red Brocket Deer *Mazama americana*. Three of the species recorded are endemic to Colombia: Colombian Night-Monkey, Silvery-brown Bare-faced Tamarin and the squirrel *Microsciurus santanderensis*, the latter being endemic to Santander department.

Due to the presence of several mammal species considered threatened with extinction, Serranía de los Yariguíes emerges as an important region for the conservation of mammals. Humans appear to be in increasing conflict with many mammal species of the region, various of which are considered pests (as they prey on livestock) and others of which are hunted for food. An annotated checklist of the mammals of the Yariguíes region follows below.

**MARSUPIALIA. Opossums – Didelphidae.** Three species were reported, of which two were observed in the field. The Common Opossum *Didelphis marsupialis* was observed at night in the region of our campsite in Cerro de la Paz (1000m), whilst it fed on baited butterfly traps. This species was frequently reported by local people and an individual was collected by Borrero & Hernández (1957) in the San Vicente region. The Western Woolly Opossum *Caluromys lanatus* (Near-Threatened) was observed north of the Yariguíes region in rural areas of the municipality of San Martín, Cesar department. It was found during daylight resting inside an abandoned or predated nest of Orange-chinned Parakeet *Brotogeris jugularis* in the top of a *Gliricidia sepium* tree. The Water Opossum *Chironectes minimus* (Near-Threatened) was associated with aquatic habitats and was reported by local hunters during the fishing season. These three species are each perceived as pests, particularly for poultry, and are subject to pest control, particularly around chicken coops and farms. Brown Four Eyed Opossum *Metachirus nudicaudatus* is also reported in the Yariguíes region by Borrero & Hernández (1957), though we did not record it.

**XENARTHRA. Anteaters – Myrmecophagidae.** The threatened Giant Anteater *Myrmecophaga tridactyla* (Vulnerable) is known from very few records in northern Colombia. It was reported present in lowland valleys near forest in Cerro de la Paz. It is possible that this species has been intensely hunted due to its large size, possibly for meat. According to hunters, this animal can be killed by hunting dogs. Southern Tamandua *Tamandua tetradactyla* is reported from the Cerro de la Paz region by Borrero & Hernández (1957) and by local people during our studies. Outside of the Yariguíes region, in January 2002, we found a dead Southern Tamandua, which had been killed by road traffic close to Corpocesar's headquarters just north of Aguachica, Cesar department. This individual appeared to have been killed in the early hours of the morning. Although this species is not categorised as endangered, populations in this region may have been affected by destruction and fragmentation of their habitat and by unlawful hunting, as for the Giant Anteater. Another species known from very few records is the Silky Anteater *Cyclopes didactylus*, also known as the "Large

Beast” by local people. In May 2002, a male Silky Anteater was rescued from captivity, originating from the municipality of Sabana de Torres, Santander department (150m). This animal was liberated near El Porvenir, 36 km away, in a humid forest fragment of approximately 80 hectares in size.

**Sloths – Bradypodidae and Megalonychidae.** The Brown-throated Three-toed Sloth *Bradypus variegatus*, a widespread species, was common in areas of secondary forest in the Yariguíes region and is hunted for its meat. The presence of Hoffman’s Two-toed Sloth *Choloepus hoffmani* was reported in the region of El Talisman by local hunters, who hunted the species for its meat.

**Armadillos – Dasypodidae.** The Nine-banded Armadillo *Dasypus novemcinctus* is perhaps the most intensely hunted mammal species in the Yariguíes mountains. The meat of this species is reported as being particularly appetising. Its “shell” is used as an ornament and for the making of utensils and handicrafts. In Cerro de la Paz, local people reported the presence of a second species, which according to descriptions appeared to be Northern Naked-tailed Armadillo *Cabassous centralis*. This species is categorised as Data Deficient for conservation purposes, thus records are of interest.

**CHIROPTERA – Bats. Phyllostomidae.** Mist-netting specifically for bat capture was not undertaken during fieldwork. However, some captures were made during ornithological studies. In Cerro de la Paz at 1000m, a pregnant adult female Yellow-eared Macconnell’s Bat *Mesophylla macconnelli* was captured. This bat was disturbed together with other individuals (approximately 8), which were roosting below low leaves of an Aracaceae Nacuna Palm (approximately 80cm tall), in the interior of dry forest at this site. Local people further noted the presence of the Vampire Bat *Desmodus rotundus*, a bloodsucking species known by farmers for attacking cattle and sheep, principally. Bats in the genera *Carollia* and *Artibeus* were also mist-netted and photographed. Doubtless many other bat species are present in the region (e.g. Greater Dog-Like Bat *Peropteryx kappleri*, reported by Borrero & Hernández (1957).



Right: Yellow-eared Macconnell’s Bat *Mesophylla macconnelli* captured in Serranía de los Yariguíes (Cerro de la Paz).

**PRIMATES – Primates. Cebidae.** The Red Howler Monkey *Alouatta seniculus* was frequently reported by local people in Yariguíes mountains, up to an altitude of approximately 2300m. This species is considered to be low risk (non-threatened). However, it is difficult to assess the species’ true status in Colombia (Defler, 2003). New records are thus of interest. Vocalisations of this species were heard frequently in Cerro de la Paz, especially in the morning (0900-1100hrs) and were sound recorded. This species was also observed several times at this site. The species was observed in Montebello, close to our Cerro de la Paz study sites, in the 1950s by Borrero & Hernández (1957). Local people mentioned that this species is not appetising to eat: no skulls, skins or other remains of this species were found among those of animals hunted in the region in farms. Conversely, Defler (2003) considered that this species has for a long time been persecuted for food in the upper and mid Magdalena valley. He considered that it is now difficult to find the species in relict forests of the region. The Yariguíes population may therefore be an important one. In addition to these records in the Yariguíes mountains, there are further records from the Wild Fauna Rescue Centre of CDMB of live Red Howler Monkeys that are taken for the pet trade in Bucaramanga. It is probable that such individuals come from localities in the mid- Magdalena valley, such as the Cerro de la Paz, Barrancabermeja, Puerto Wilches and south Cesar. However, data concerning the origin of these animals is scarce.

The White-fronted Capuchin *Cebus albifrons* was reported by hunters as common in Cerro de la Paz and also to the north of the Yariguíes in South Cesar and was reported by Borrero & Hernández (1957) in the Yariguíes region. In May 2002, EB and Rancé Caicedo observed a troop of 8 individuals of this species in a humid secondary forest in Finca El Porvenir, vereda km. 36, Sabana de Torres municipality, Santander department, in a humid forest fragment at approximately 125m elevation. This species is the object of severe illegal specimen trafficking for the commercial pet trade. It is may

be that individuals from this region, south Cesar and the Atlantic coast are commercialised and exported through the Panamericana highway to other parts of the Americas.

During expedition fieldwork, we observed Colombian Night-Monkey *Aotus aff. lemurinus* (Vulnerable) in Cerro de la Paz. Two individuals observed at around 1900 – 2000 hrs at our site at 1000m, with a group of four very active individuals observed at our 1350m site at dusk, approximately 12m from ground level. This species is very poorly known and is threatened by forest destruction and hunting (Defler, 2003). At El Talisman and Alto Cantagallos, “moaning” vocalizations like those described for this species by Defler (2003) were heard. In UIS, there is a specimen collected in Sabana de Torres municipality, Santander department in 1972 that appears to be *Aotus griseimembra* (following Defler, 2003) and not *Aotus trivirgatus*, as labelled. *A. griseimembra* was also collected in the San Vicente region by Borrero & Hernández (1957).

One of the primates most under pressure from illegal trafficking (according to CDMB records) is the Silvery-brown bare-faced Tamarin *Saguinus leucopus*. This species is listed on Appendix 1 of CITES and is categorized as Vulnerable by IUCN. It is essentially endemic to the northern lowlands of Colombia (Defler, 2003). This combination of a small geographical range and high levels of persecution is alarming. An average of 20 individuals annually were rescued by CDMB during 2003 and 2004, with a greater number of records in the latter year. It is possible that these individuals could have come from the region of Yondó (Antioquia), in the eastern limit of the known distribution of the species (M. Orozco, pers. comm.) as we did not record the species in Serranía de los Yariquíes. However, the species may be present in better conserved lowland forest to the south-west of the massif that we were not able to study. The recent trade in this species in Bucaramanga further coincides with the construction of a large bridge uniting Santander and Antioquia departments between Yondó and Barrancabermeja. Habitat destruction and hunting for the pet trade could be severely affecting the status of populations of this species in this region.

Although Defler (2003) shows the distribution of the Brown Spider Monkey *Ateles hybridus* (Critical) to include our study region, we did not record this species during fieldwork, nor did local people report its presence. However, two specimens which are of this species<sup>3</sup> (labelled as *Ateles belzebuth* as under former taxonomic treatments) are found in UIS, originating from municipio Sabana de Torres (Llano Adentro, from marshland forest). Borrero & Hernández (1957) also recorded this species in the Magdalena Medio region. Its absence from sites we have studied to date in the Yariquíes mountains is a cause of concern.

**CARNIVORA. Dogs – Canidae.** One species in this family was recorded in Serranía de los Yariquíes, Crab-eating Fox *Cerdocyon thous*. A specimen was obtained from an immature male killed by hunting dogs in Mata de Cacao (Betulia) in Serranía de los Yariquíes in January 2004. According to local people, this species is killed as a pest as it attacks domesticated birds and fruit crops. It is considered common in forests, agricultural land and fields. In 2003 in South Cesar, BH observed a fox, apparently also of this species, in La Tapia (mun. Pelaya, dept. Cesar) which was attracted by the smell of bait used for entomological surveys, particularly sardines in tomato juice.

**Bears – Ursidae.** It was not possible to confirm the presence of the Spectacled Bear *Tremarctos ornatus* (Vulnerable) in the localities studied in Serranía de los Yariquíes. However, one local report was obtained in the region of Cerro de la Paz, over 20 years ago, of an animal hunted in “sparse forest” of the highlands, the meat of which was eaten, appeared to refer to this species. In Cantagallos Alto, a non-intensive search of bear prints and tree scratchings was undertaken in forest and along the mountain ridge without any positive result. The subpáramo of the ridge at this site included palms and bromeliads, species which are generally considered food for the Spectacled Bear. Likewise, the species was not observed in Lepipuerto, a remote location with considerable potentially suitable habitat, although no inspection for animal signs was undertaken at this site. In a farm near Alto Cantagallos, the probable presence of the species was noted by local people, who mentioned that they had found sites where palms had been eaten and where tree trunks had been scratched. Attacks on domestic animals by this species were not, however, reported. The forest on the ridge above Alto Cantagallos and along most of the ridge of the Yariquíes mountains are in an excellent state and almost throughout are essentially inaccessible to humans, making them an ideal site for

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<sup>3</sup> Following treatment of Froehlich *et al.*, 1991; Collins & Dubach, 2000; and Defler, 2003.

populations of this species. A juvenile was reported in captivity in a farm located probably between the municipalities of La Fuente and Zapatoca, in the higher part of the Serranía. The individual was captured following the killing of an adult female that was attacking domestic ovine species in the region. Given the difficult security situation in that region, it has not been possible to confirm this report, though it seems fairly compelling.

**Raccoons, coatis, kinkajous, olingos and allies – Procyonidae.** The presence of the Kinkajou *Potos flavus* was confirmed in Cerro de la Paz, with individuals observed by night. This species was reported by local people in all localities studied (with the exception of Lepipuerto). It appears to have healthy populations in the region, although it is intensely hunted for its meat and the use of its skins. A female of this species was collected in the region by Borrero & Hernández (1957). Also reported were two species of Coatimundi. In El Talisman and Cantagallos Alto, Mountain Coatimundi *Nasuella olivacea* was reported by local people. This species is rare, classified as Data Deficient by IUCN. In Cerro de la Paz (and also in South Cesar), local people mentioned the presence of Ring-tailed Coati *Nasua nasua*, a rare species in Colombia. It was also possible to note tracks and passage-ways of these animals in the forest floor. These species are hunted for their meat where they occur. The Crab-eating Raccoon *Procyon cancrivorus* was reported only in south Cesar, probably due to its preference for aquatic habitats, which we have not yet studied in the Yariquíes region.

**Otters, weasels and allies – Mustelidae.** Populations of Neotropical Otter *Lontra longicaudis* (Data Deficient) and other members of this family have historically been subject to pressure through hunting, pest control by fishermen and the skin trade. The eyes of hunted animals are used locally as a supposed treatment for human myopia. These factors together make the Neotropical Otter rare. It was not reported in the Yariquíes region. However, the Neotropical Otter was reported further north in south Cesar. Some individuals were recently rescued by CDMB from trade, one of these coming from the region of Aguachica, Cesar. In Mata de Cacao (Zapatoca), on the eastern slope of Serranía de los Yariquíes, a skin of the Tayra *Eira barbara* was obtained. This individual was hunted 2 years ago for pest control purposes, close to agricultural crop fields. The Tayra is treated as a pest as it predated on domestic animals, particularly poultry. The Long-tailed Weasel *Mustela frenata* was reported as common in the region of Cerro de la Paz and also in South Cesar. In January 2002, a Grison *Galictis vittata* was found in a farm bordering the lowland lake, Ciénaga de Pita, vereda Puerto Limón, municipio San Martín, Cesar department. This individual was an approximately 4 month-old juvenile male. The species is reported as common in the San Martín region in Cesar, but was not found in the Yariquíes region.

**Cats – Felidae.** The large cats include among them many species endangered with extinction. This is a result of a long history of persecution for skins, “trophies” and pest control, as well as habitat destruction, which has led to various feline species now being on the brink of extinction.

The cat species most frequently reported by local people in Serranía de los Yariquíes was the Ocelot *Leopardus pardalis* (Vulnerable). This species was also reported present in south Cesar. An Ocelot skin, from an individual hunted near our higher elevation site in Cerro de la Paz, was identified in a local farm in 2003. It was an adult female of approximately 10 kg in weight and was killed at the forest border at night, after having become ensnared in a trap set for Agouti.



Right: Ocelot in captivity in South Cesar.

Another feline reported in the region was the Jaguarundi *Herpailurus yagouaroundi*, a rare and inconspicuous species of secretive habits that is very difficult to observe. It was identified by local people due to its dark coloration (dark brown to black) and greater size when compared to other cats such as Ocelot. This species is sometimes known as the “Pantera” (Panther) by local people. In UIS, two skins of this species from the Magdalena Medio region are from Sabana de Torres (collected in 1973) and a recent skin at UIS, received approximately 1 year ago from vereda El Tablazo, Mun. Girón, Santander. A third species (*Leopardus sp?*), smaller than the Ocelot, was reported from the

Alto Cantagallo region, though it was not possible to identify the species involved due to a lack of detailed information from persons interviewed.

The Mountain Lion or Puma *Puma concolor* (Near-Threatened) was reported in the region of El Talisman and Alto Cantagallo. It was also reported as present in La Tapia, south Cesar. In UIS is a 1975 skin of an adult male from the region of Sabana de Torres (locality El Almendro).

In Colombia, populations of the Jaguar *Panthera onca* (Near-Threatened) has been severely reduced in regions such as the Chocó, pacific coast, Catatumbo, the Amazonian foothills and much of the eastern plains or Llanos, whilst in few regions outside of Amazonia are populations considered stable (Swank & Teer, 1987). This species has been considered virtually extinct in the Magdalena and Cauca valleys (Swank & Teer, 1987). Although the presence of Jaguar was reported in Serranía de los Yariquíes, it is probably now largely extinct in the region of the localities we studied due to their relative proximity to human settlements. However, the species certainly used to be in the region and probably still persists in virgin lowland forest to the south-west of the Serranía.

Reports in the newspapers El Tiempo (1997) and Vanguardia Liberal (1997) drew attention to the issue of farmers from the San Vicente de Chucurí region, who complained of the predation of domestic animals by "tigers" and demanded the attention of environmental authorities. This campaign unfortunately resulted in the killing of two Jaguars. Later, in the same region, further cases of predation on domestic animals and observations of this species by local people were reported, according to a witness statement dated 2 April 1998 and made at the Albania police inspection point. This document was presented by a group of farmers to the office of the Defensoría del Pueblo (Town Defence) in Bucaramanga, who were accompanied by Olando Beltrán, president of the Asociación Defensora de los Animales y la Naturaleza (Association for the Defence of Animals and the Environment: ADAN) and myself. Reports of more than 20 separate events of predation were specified, including of young cattle, horses, donkeys and dogs, presenting strong evidence of the presence of the Jaguar in the Yariquíes region.

In August 1998, I visited a house in the municipality of Barrancabermeja, accompanied by CAS employees, in which 2 Jaguars were kept in a small cage (1.80m long x 1.20m wide x 1.50m height). This cage was located on the patio of a house containing various other captive animals. The individuals involved were both subadult males and had been captured in the rural region of mun. Puerto Wilches (no exact locality), where they were apparently captured following the killing of their mother.

**ARTIODACTYLA. Peccaries – Tayassuidae.** Two species were recorded, White-lipped Peccary *Tayassu pecari* which was reported by local people in Cerro de la Paz (and also south Cesar) and Collared Peccary *Tayassu tajacu*, of which a museum skin exists at UIS from the Magdalena Medio region but which was not recorded during fieldwork.

**Cervidae.** Two species were reported, Red Brocket Deer *Mazama americana* (Data Deficient) in Cerro de la Paz and Little Red Brocket Deer *Mazama rufina* (Near-Threatened) in Alto Cantagallo and El Talisman.

**SIRENIA. Manatees – Trichechidae.** The American Manatee *Trichechus manatus* (Vulnerable) was reported in the region of the lowland lakes of Ciénaga de Pita (San Martín, Cesar, January 2002) and Ciénaga de Sahaya (Pelaya, Cesar, January 2002). In the latter case, local people noted the presence of at least 4 individuals. This species may occur further south in wetlands bordering the northern section of the Serranía de los Yariquíes. However, we have not yet studied such habitats.

National and local newspapers El Tiempo (2003) and Vanguardia Liberal (2003) reported that 6 individuals were found stranded on the edge of Ciénaga de Paredes, a lake in the region of El Cerrito and Campo Dur, between the municipalities of Sabana de Torres and Puerto Wilches, Santander. According to A. Prada (CAS), such situations occur during the dry season, when levels of water in the lakes fall. Also, natural canals between different ciénaga complexes in the region are being drained for agricultural land, meaning that animals are sometimes unable to move to sites of greater water depth. According to some reports, this region of the Magdalena medio, some distance from the Yariquíes mountains, could maintain a population of approximately 50 individuals.

The manatee is considered endangered (Vulnerable) principally due to habitat destruction, hunting for its meat, the contamination of water habitats and accidents and collisions with outboard motor engines. In Ciénaga de Paredes, the fishing community has established protocols to attend to the problem of stranded manatees, attending to affected individuals and assisting them to return to deeper waters. The issue of manatee conservation has been brought to the attention of local authorities, the press and the community in general through such measures.

**RODENTIA. Squirrels – Sciuridae.** Two squirrel species were recorded in Serranía de los Yariguíes, Red-tailed Squirrel *Sciurus granatensis* and a Western Dwarf Squirrel *Microsciurus mimulus*. The Red-tailed Squirrel is a common and widespread species. Tails of individuals of this species from individuals hunted for pest control purposes were frequently found in farms.



Right: tails of the squirrel *Sciurus granatensis* in a hunter's home in Serranía de los Yariguíes.

The species is apparently a pest of the cocoa plant *Theobroma cacao*. The río Chucurí valley and San Vicente region are one of the most important regions for the farming of cocoa in Colombia. We captured an individual of *Microsciurus mimulus* in a mist-net in Cerro de la Paz at 1300m. The specimen was an adult male of 110g weight, generally dark brown with a black head. A black band with white spots extended along the back to the base of the tail. This species had a cream throat and vent a little lighter, small ears with small cream marks on their underside and a black iris. This species is known in Colombia from the pacific lowlands in Antioquia, Chocó and Valle del Cauca departments. This record probably represents a new distributional record, consistent with some bird species recorded in Serranía de los Yariguíes (see above) which show lowlands of this region to share affinities with the Nechí and Chocó endemic regions. This species is, however, considered scarce by local people. It is reported to prefer lowland forests close to streams. Also present in the region is the endemic squirrel species Santander Dwarf Squirrel *Microsciurus santanderensis*, of which various specimens exist in UIS, from Llano Adentro, mun. Puerto Wilches and which was described from skins including some taken in the Yariguíes region (Borrero & Hernández, 1957).

**Porcupines – Erethizontidae.** The nocturnal and arboreal habits of the porcupines make them difficult to observe, meaning that they are poorly known and are rare in collections. However, they are frequently attacked by pet dogs, are reported widely by farmers and probably are much more abundant in Neotropical forests than may appear to be the case (Husson, 1978; Alberico *et al.*, 1999). Hunters in the region of Cerro de la Paz noted the presence of the species *Coendu aff. prehensilis*. A specimen of *C. prehensilis* at UIS is from Puerto Cayumba, Puerto Wilches municipality. In El Talisman and adjoining La Siberia, a second highland species of porcupine was reported by local people. It is apparently of a generally dark coloration (between black and dark brown), probably *Coendu quichua* or a relative of that species. *C. quichua* is considered by Titira (1999 at pp.82-83) to be an endemic of Ecuador and found in temperate regions of the north of that country (Albuja, 1991; Emmons & Feer, 1997). However, Alberico *et al.* (1999) report this species in Colombia. Interestingly, the only known locality for this species in Colombia is in San Vicente de Chucurí in Serranía de los Yariguíes. Surprisingly, Borrero & Hernández (1957), who conducted the only previous mammal study of this region, do not report the species in this region.

**Capybaras – Hydrochaeridae.** The Capybara *Hydrochaeris hydrochaeris* was reported as abundant in Ciénaga de Pita, vda. Pita Limón, mun. San Martín in January 2002. An immature female was found in captivity in a house bordering one of the ciénagas. The meat of this species is considered to be very appetising, meaning that it is frequently hunted. However, this species was not reported in the Yariguíes region.



**Agouti and Paca – Agoutidae and Dasyproctidae.**

The Paca *Agouti paca* (Near-Threatened) is one of the species most hunted in the localities studied (particularly in Cerro de la Paz). Its meat is considered to be of very good quality. 6 skulls of specimens hunted in the region were photographed at a farm near to our study site at 1300m. The skull of an adult female was also shown to us by a hunter in San Vicente de Chucurí. The Mountain Paca *Agouti taczanowskii* (Near-Threatened) is also reported in the region. This species was reported in vda. Altamira, mun. Zapatoca, on the eastern slope of the Yariquíes mountains, where it is known as “Tinajo de Lanás”. The Central American Agouti *Dasyprocta punctata* is a common species in the region. It is subject to pest control due to the damage done to crops of cassava *Manihot dulcis* and is hunted for its meat.

Left: Skulls of Paca *Agouti paca* hunted in Serranía de los Yariquíes. Photo: Elkin Briceño.

**Rats – Cricetidae and Echimyidae.** No studies of small mammals were made in this study. However, for completeness, we note that the Spiny Rat *Proechimys guyannensis* and Borrero’s Rice Rat *Oryzomys borreroi* were each reported in the region by Borrero & Hernández (1957).

**LAGOMORPHA. Rabbits – Leporidae.** The Forest Rabbit *Sylvilagus brasiliensis* was reported as common and widespread in the region of Cerro de la Paz and also was recorded in this region by Borrero & Hernández (1957). An individual of this species was also observed in January 2002 in finca El Tesoro, vereda. Minas, San Martín municipality, southern Cesar.

## Mountaineering

By Martin Donegan

Mountaineering fieldwork resulted in the first ascents of two major peaks: Lepipuerto ( $06^{\circ}27'42''\text{N}$ ;  $73^{\circ}27'43''\text{W}$ ; c.2865-2900m) and Pico Las Puyas ( $06^{\circ}27'40''\text{N}$ ;  $73^{\circ}27'44''\text{W}$ ; c.2910-2945m) and one minor peak: Alto Atlapetes, below Lepipuerto. These peaks are each shown in Figure 14 below. The map in Figure 15 shows their position. Due to the remoteness and pristine nature of the region, accessible only by helicopter drop, we are fairly confident that our work resulted in first ascents. Techniques for the ascent of mountainous peaks covered in primary forest and unexplored by humans have been little tested. The techniques successfully used in this expedition are described below. In general, the opening of fresh transects in primary forest is not to be recommended as doing so will tend to expose pristine habitats to unwanted activities such as hunting and deforestation. However, given our helicopter insertion and the remoteness and inaccessibility of the site to surrounding human populations, it seems probable that paths we cut during fieldwork will never be used again (unless a follow-up biological or mountaineering expedition is mounted, in which case such paths would be of use for researchers). The adverse ecological affects of opening new trails in a situation such as this are minimal in the short term and nil in the long-term.

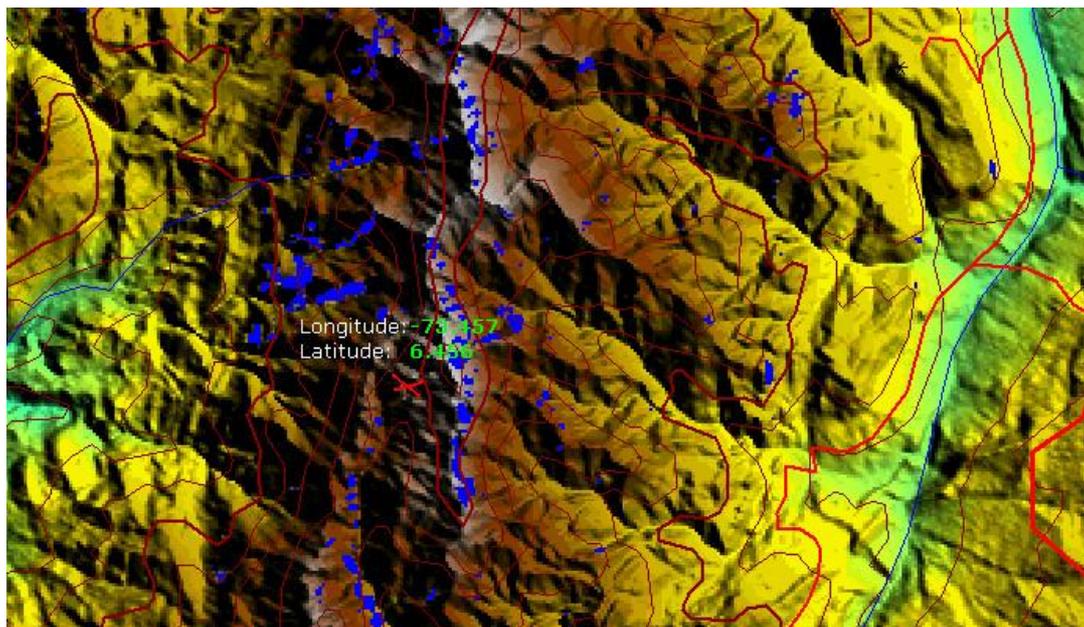


**Figure 14.** Lepipuerto (1: the site of our helicopter insertion and extraction), Alto Atlapetes (2), our base campsite (3, located at the lowest point of the ridge to minimise lightning risk) and point showing direction of Pico Galletas (4). Photo taken from ridge on ascent to Pico Las Puyas. Note the taller forest habitat extending up the sheltered valley between the peaks and ridges, with stunted páramo elsewhere.

*Day 1* was spent clearing a path from the insertion point to our camp and setting up the camp. Due to the lack of detail available in contour maps and the unpredictability of the search for a suitable insertion point, it was not possible to perform a detailed analysis of the terrain in the vicinity of the insertion point prior to our arrival. The insertion point itself was situated just below a significant peak that we called “Lepipuerto” (coordinates above). This name is a fusion of the order of butterflies (Lepidoptera) and the Spanish for heliport (heliuerto). It is named for its proximity to our insertion

point and due to the success of fieldwork by at this point for butterfly collecting. Butterflies seemed to accumulate at this peak during periods of strong insolation.

On our arrival, we cut three pilot pathways extending in different directions from Lepipuerto with the objective of finding a viewpoint and campsite. The habitat was characterised largely by Graminae and Bromeliaceae species rising to c.3m above ground level with isolated Palmaceae species rising to c.8m. This vegetation proved remarkably dense and tough to cut through, perhaps more difficult than other primary habitats (e.g. tropical lowland or cloud forest, which involve softer or more sparse vegetation at ground level). We evaluated the terrain and searched for a location from which to survey the landscape and identify possible camp sites. A possible relatively flat site was identified in the saddle between Lepipuerto and a peak we did not scale. We provisionally named this other peak “Pico Galletas” (Cracker Peak) for its crumbling rock formation (probably lightning-induced). We proceeded towards this location in single file with each team member improving the path as we progressed and our guide José Pinto undertaking the bulk of cutting work. The camp was established at the location we had identified earlier, which provided us with relatively good protection from the elements and afforded us a clear view of the surrounding area. Fearsome thunderstorms occur almost daily at high elevations on the western slope of the Yariquíes mountains at this time of year, thus it was important to set up camp in an area that was not prone to flooding (e.g. in a basin), landslides (e.g. below a steep slope) or lightening (not on a significant peak). This location, on the lowest point of the ridgeline, met all of those objectives. We arrived at this point at approximately 1500 hrs on the date of our insertion. Team members then proceeded to cut down the undergrowth sufficiently to establish a campsite and small covered area for work, whilst others made repeated trips to our insertion point, some 1km away, to collect our equipment.



**Figure 15.** Digitised elevational map, red cross showing the approximate position of peaks scaled. Thick black line shows 3000m contour. Map is © Multimaps.com

In the course of the first day's fieldwork, we succeeded in making first human access of the isolated peak “Lepipuerto” and also a further minor peak along the ridge, Alto Atlapetes. “Alto Atlapetes” was named for a new bird taxon in the genus *Atlapetes* observed and sound-recorded from this point, illustrated in the Birds Results section above.

*Day 2 and Day 3.* Together with ornithological fieldworkers and our guide, a transect was cut from the campsite through ecotone habitat to the border of a forest patch, which resulted in 9 mist-nets being set up, five of which continued on from our original location towards Pico Las Puyas. The last three of these mist-nets crossed the páramo / forest ecotone and entered primary forest. The remainder followed the transect we had cut on the first day, ending at the peak of Alto Atlapetes.

*Day 4 and Day 5.* On these days, the main push was made through mostly primary montane cloud forest to a low section of the opposite ridge. Most of the vegetation we came across consisted of trees that were relatively easy to cut through shrouded in epiphytes, with rubber trees being the easiest to cut through. The amount of moss on the trees and plants made them very slippery. There was no 'ground' as such due to the fact that the forest is in a constant state of decomposition and re-growth, which makes keeping a steady footing at times very difficult. The superficial nature of the "forest floor" (essentially, a network of roots), meant that on the initial and subsequent ascents, one would often put one's foot on the ground and promptly fall through a root hole to thigh depth. Some recent tree-falls provided us with natural clearings and – if they were sufficiently large – a bridge between more dense patches, making progress easier. Cutting a path through this habitat generally required less effort than cutting through the páramo on the first day.

Key equipment for such a mountaineering expedition in primary forest habitats differs significantly from that used in other expeditions:

- The machete is the most useful item of mountaineering equipment in this habitat. One approximately 40-50cm in length and 10-20cm in width is ideal. A machete file was used to sharpen the tool each night. Cuts must be made away from the body and away from other field workers.
- The Wellington boots we were wearing came up to just below our knees and provided essential protection against the uncertain ground conditions that were always very moist, although water and foliage would frequently find their way in to the top of these boots. Regular taling by night was essential. Climbing shoes or walking boots are thoroughly impractical in this habitat.
- Riggers' gloves provided a suitable level of protection that allowed us to handle the foliage better than is possible with bare hands, although wearing these gloves meant that machetes had a tendency to fly from one's hand, which occasionally necessitated very awkward retrieval. The high levels of humidity and general forest moisture caught up in mosses and other epiphytic growth meant that the gloves had to be regularly cleaned by scraping them with the blade of a machete.
- Slings, tied round strong roots or branches, were often of greater utility than mountaineering ropes.

Large Horsefly species (Diptera: Tabanidae) are a constant irritation in tropical montane cloud forest and páramos. These insects have a deep and painful bite. They appeared to be attracted to clothes by the smell of sweat. Fortunately they make a distinctive noise and are easily despatched by administering a sharp blow with the hand.



Above Left: Pico Las Puyas from our campsite. Above right: from Alto Atlapetes. Mountain to the right of Pico Las Puyas in right photograph is the southernmost peak of the Yariquíes mountains, Cuchilla Guamito.

Once we had passed through the majority of the primary forest we started the ascent of the ridge towards Pico Las Puyas. The base of the ridge shared the same type of foliage as the primary forest, but at a slight incline of approximately 25% and a larger proportion of rubber trees. As we approached the crest of the ridge, there was another marked change in vegetation (ecotone), as at the entry to the forest near our campsite. Above this point, bromeliads, tall (3m+) grasses and palm trees dominated, as near Lepipuerto. Before we reached the crest of the ridge, there was a significant near-vertical section to overcome. We approached this at an angle as the near vertical section was itself at the top of a sheer vertical drop of approximately 10m. The drop was obscured by heavy vegetation. We overcame this near-vertical section by using the base of severed bromeliads as one would rungs and steps on a ladder. It was difficult to assess the strength of these plants, although we found that most would not support the full weight of an adult. We kept three points of contact on three separate plants at all times and spread our weight sufficiently to allow the plants to collectively support us, although they would frequently fail and tumble into the canopy below. After this section, the gradient became a more civilised 45% which allowed us to quickly gain the crest of the ridge and appreciate the more sparse foliage that is characteristic of ridge-top habitats in this locality. At this location, Jose Pinto discovered an as yet unidentified amphibian. We cut an alternative path back down due to safety concerns associated with the original path. However, this secondary route itself necessitated the use of slings to scale.

*Day 6:* We returned to the crest of the ridge and proceeded to take a direct route to the peak of the ridge (Pico Las Puyas), which, together with Lepipuerto, was the other significant peak in the region. The transect cut was also used for bird observations, resulting in at least two further species being recorded at the site. After approximately two hours of non-stop cutting we had progressed 300m but had to stop as a ferocious storm was upon us that prevented any more cutting that day.



Above left: The moment of reaching Pico Las Puyas (see also photo of MD in “Team” section above). Above right: Pico Galletas.

*Day 7:* We once again returned to the crest of the ridge and continued towards the peak, which was gained after approximately three hours of cutting. From the top there was an excellent view of mountain ranges and clouds below. We named this peak Pico Las Puyas, “puya” being a local name for the spiny bromeliad vegetation predominant at this site.

# Conservation Assessment and Conclusions

By Thomas Donegan & Blanca Huertas

## 1. Status and extent of forest wilderness

Our aerial surveys and GIS work reveal Serranía de los Yariguíes to constitute one of the largest remaining premontane and montane forest fragments in the Eastern Cordillera and northern Colombia (see Figures 2, 3, 4 and 6). This forest comprises a broad range of continuous habitats from lowland through premontane to montane forest and páramo and includes habitats influenced by endemic regions given the highest category of threat and biological importance by conservation NGOs.

The humid western slope of Serranía de los Yariguíes to harbour primary forest almost throughout. However, the massif's drier eastern slope has been over 90% deforested. The western slope of Serranía de los Yariguíes, adjacent lowlands (particularly those to the south-west of the massif) and ridgeline constitute an ideal candidate for a forest wilderness National Park. Colombia's unique and endangered Eastern Cordillera oak forests and the equally endangered humid forest of the Magdalena Valley were each highlighted as among the most unique and threatened habitats in the world with least levels of protected areas (Rodrigues *et al.*, 2004).

## 2. Increasing human threats

For many years, Serranía de los Yariguíes has gone unstudied and ignored. Since the 1970s, commercial development in the region has been restricted by political instability, the San Vicente region being infamous as the birthplace of one of the leaders of one of Colombia's rebel insurgent groups. With stability in the form of government control returning to the region just a small number of years ago, there is a risk that human populations will expand into remaining pristine forest areas, bringing the all too familiar results of deforestation and biodiversity loss.

In lowland areas, deforestation is most frequently for subsistence farming and some non-agricultural crops. Non-agricultural crops are typically located within forest to avoid detection by the authorities, which means that the most pristine forests are targeted (Alvarez, 2002). In highland areas, deforestation for agriculture, primarily farming for raspberry and other temperate climate fruits is among the greatest threats.



Above: deforestation in Serranía de los Yariguíes. Left: farming of precious woods for timber linked with clearance of forest small plantations in Cerro de la Paz. Right: deforestation of montane forests for raspberry farms near Alto Cantagallo.

## 3. Lowland and highland regions of Serranía de los Yariguíes are each of immense importance to biodiversity conservation

Lowland regions, particularly those adjacent to the southwest flank of the massif are characterised by the Nechí Endemic Bird Area, rated Critical by BirdLife International. Work with local communities suggest that lowland forests are likely to support populations of species considered to be on the verge of extinction such as Blue-billed Curassow *Crax alberti*. This region further supports one of the last remaining populations of Jaguar *Pantera onca* in the Magdalena valley. Lowland forest has also shown to support the greatest diversity of butterfly species. Lowland and foothill forests of Serranía

de los Yariguíes comprise some of the most extensive tracts of one of the most threatened lowland forest habitats in South America.

The premontane forests of Serranía de los Yariguíes support the world's largest remaining population of the critically endangered Gorgeted Wood-Quail *Odontophorus strophium*. Montane forests also support the Critical rated Mountain Grackle *Macroagelaius subalaris* and support threatened mammals such as Spectacled Bear *Tremarctos ornatus*. These parts of the mountains are characterised by the Colombia East Andes EBA, also rated Critical. Mountain regions also contain unique elements, including several undescribed butterfly and bird taxa, at least some of which are likely to be endemic to the Yariguíes massif.

Our surveys have focused on the humid forested western slope of the massif. Recent brief observations on the eastern slope of the Yariguíes in 2004 revealed the presence of a further critically endangered bird, Niceforo's Wren *Thryotorus nicefori* (J. Avendaño *pers. comm.*). This part of the massif does not appear to be a viable candidate for national park status given the patchy nature of remaining forested habitats here revealed during our aerial surveys. The creation of private reserves and projects involving community work and ecotourism could however be considered there.

#### 4. Increasing local awareness

We found local people in communities surrounding Serranía de los Yariguíes generally to be supportive of conservation issues. However many people are not aware of the true global importance of this mountain range and the species it contains to conservation. Through the distribution of posters depicting threatened species and talks with local people, including hunters, and a painting competition for local children, we sought to increase awareness in the region about conservation issues. There is a great deal of pride among local people for endemic species, the Yariguíes mountains, their history and ancestors. This regional pride and general interest in conservation should be built upon and harnessed in future conservation action. Schools and education are in general a key resource for conservation.

#### 5. Potential for ecotourism

Long-term conservation measures could focus on San Vicente de Chucurí and Zapatoca as a zone for ecotourism. The San Vicente region is rich in artefacts of the Yariguíes people who formerly inhabited these lands. Until recently, the Serranía de los Yariguíes massif was known as "Serranía de los Cobardes" (Mountain Range of the Cowards). This former name derives from the Spanish colonial period. The Yariguíes indigenous people who used to inhabit these mountains resisted Spanish colonisation, waging war against their invaders. However, their resistance was doomed to be unsuccessful in the face of a technologically superior military power. Rather than submit to the Spanish, the Yariguíes people committed mass suicide, and history lost forever a people, their customs, language and art. The Spanish viewed this not as an act of dignity, but as an act of cowardice, hence the mountain range's former name.



Above: Left: the Camino de Lenguerke; Centre: Sign marking path along 40km Camino de Lenguerke; Right: large stone with indigenous markings, San Vicente de Chucurí.

San Vicente de Chucurí and Zapatoca region have five important draws for ecotourism:

- The spectacular forests and mountains of Serranía de los Yarigués and their threatened inhabitants.
- The Camino de Lenguerke, an historic stone trail built in the 1800s which leads from San Vicente de Chucurí (750m elevation) to El Talisman and above (2300m) through primary montane forest to the old colonial town of Zapatoca is a day-long historic and hard trek that would be attractive to ecotourists from both Colombia and elsewhere.
- The indigenous history and artefacts of the region, some of which are within San Vicente town, such as the carved stone depicted above.
- Zapatoca, San Vicente and other old towns surrounding the massif have interesting colonial and more recent architecture including San Vicente's beautiful domed church and Montebello residence.
- The products of the region, which include "Chocolate Chucureño" (Chucurí chocolate and hot chocolate) and "Café Chucureño" (Chucurí organic



Above: Chocolate Chucureño and Café Chucureño.

Below: Above Left: Montebello, an historic colonial residence; Below Left: the Río Chucurí; Right: San Vicente Church.



## Addendum: Conservation Action Achieved

By Thomas Donegan

### New ProAves bird reserve at El Talisman

As a result of this research, a new nature reserve has been established in the region of our El Talisman site by Fundación ProAves. The site was chosen to protect the populations of critical-rated Gorgeted Wood-Quail *Odontophorus strophium* and other threatened species. The reserve is strategically located in the northernmost buffer of montane forest in the region (see Figure 3) and comprises some 1050 hectares including 800 ha of forest, the remainder being a reforestation zone. The purchase was facilitated through the active cooperation of the expedition team, with the bulk of the donation provided by British conservationist Robert Giles, ProAves Foundation and the American Bird Conservancy with additional donations from other persons and the support of Richard Farrow and Louise Donegan. Matching funding for the establishment of a protected areas endowment to cover reserve costs was provided by Conservation International and a Salaman-Meech family donation to ProAves Foundation. The new reserve is close to San Vicente town and situated on the historic Lenguerke path, offering ecotourism opportunities and a good location for birders to look for Gorgeted Wood-Quail and other rare and threatened species of the region. This initiative is a very important one for the region. Such reserves administered by ProAves have proved to be successful in the past (see e.g. Quevedo *et al.*, 2005). Fundación ProAves has also entered into an agreement with the Mayorality of San Vicente de Chucurí to manage an adjacent municipal reserve and reforestation region and has permanent and visiting research staff at the reserve. Further details are available at [www.proaves.org](http://www.proaves.org) and a recent press release by BirdLife International (2005).

### Proyecto YARE

As a follow-up to this research and to build on the results and long-term impact of it, BH has initiated Proyecto YARE, a BP Conservation Programme Award-supported project to build upon the biological research carried out here and to conduct additional work with communities to draw their attention to conservation issues. Proyecto YARE is aimed at complementing this study with surveys in the regions of the Yariguíes mountains that we were not able to study (e.g. eastern slope, lowlands). Together, the results of the two projects should be key in informing the limits of the new National Park. Another important YARE project aim is to establish conservation networks within local communities and to assess areas of the Yariguíes mountains for ecotourism potential. This project has a major community element. Further details of this project are available on the Proyecto YARE website at [www.proaves.org](http://www.proaves.org).

### Important Bird Area – Area Importante para la Conservación de las Aves

We provided a detailed submission to BirdLife International and Instituto Alexander von Humboldt recommending Serranía de los Yariguíes for Important Bird Area (IBA or AICA) status. This designation was achieved in 2005, the relevant documentation making much reference to our work in the region (Boyla & Estrada, 2005). Further information is available at [www.birdlife.org](http://www.birdlife.org). We have also proposed the Yariguíes mountains for Alliance for Zero Extinction (AZE) status.

### Serranía de los Yariguíes National Park

In September 2004, Elkin Briceño of our expedition team attended a meeting at which our preliminary results were presented to Colombia's Environment Ministry, CAS (the regional environmental authority for Santander department) and other NGOs such as Conservation International and Fundación Natura. Soon after, on 15 October 2004, the Environment Ministry, CAS and the 17 municipalities comprising the Serranía de los Yariguíes signed an agreement initiating concrete measures towards the establishment of a National Park in Serranía de los Yariguíes. The limits of the proposed National Park are set out in red in the GIS Map in the Introduction section of this report.

In December 2004, we were requested to present a letter of support or "concept" detailing our perspectives on whether Serranía de los Yariguíes should be subject to protective measures in the form of the creation of a National Park. We duly obliged and presented an executive summary of the work, results and conclusions set out in this report to the Santander regional government and the

Colombian Environment Ministry. In January 2005, we entered copies of the preliminary version of this report (this section excluded) in both Spanish and English language to key persons at the government authorities involved in this process (CAS and MMA) as well as to NGOs involved in the declaration process such as Conservation International and ProAves. Our video and photographic materials from aerial surveys were also handed to these persons to assist with the declaration process. A copy of this footage is available on request from Fundación ProAves' library. A predecessor to this report was also published online in English and Spanish at [www.proaves.org](http://www.proaves.org) and has been freely available for download since November 2004.

Finally, in May 2005, the official government documentation pursuant to which Serranía de los Yariguíes became a national park was signed and officially announced. A document supposedly evaluating the need for conservation action in the Serranía was published (Ministerio del Medio Ambiente, Desarrollo y Vivienda, 2005). This declaration was an enormous step forward for conservation in Colombia and could be regarded as an important output of this project.

Unfortunately, despite this full report in Spanish having been made available (and delivered) to the persons responsible for the declaration process and our oral and written presentations mentioned above, the results and conclusions set out in this report were barely cited in official documentation, which instead included a general, vague and fairly meaningless essay about the importance of the flora and fauna of the Andes as the biological justification for the new National Park. Although some points from our letter of support were cited and although that letter was annexed to the declaration document, the justification for conservation action in Serranía de los Yariguíes from a biological perspective was extremely poor. No mention was made of the fact that the presence of five Critically endangered bird species makes the Yariguíes a site of almost unparalleled importance both nationally and globally for conservation action, for example (although a list of threatened bird species – the names of many of which were mis-spelt – was buried deep in the report). The principal conclusion of the document from a biological perspective in the groups we had studied essentially was that it was not possible to evaluate whether or not the Serranía de los Yariguíes was worthy of conservation action, a conclusion completely contradictory to that we reached, as set out in our reports, presentations and scientific publications made available to the declaration team.

Despite the short shrift given to our project and its results in official documentation, these results present the only relatively comprehensive analysis of the biological components of the Serranía de los Yariguíes and their conservation value. This project and its members have participated as much as has been possible during the National Park declaration process and have sought to support the implementation of concrete conservation measures in the Yariguíes mountains. Our project appears to have been an important factor in encouraging the support of NGOs to the declaration process. At least three NGOs who supported the National Park declaration process presented facts based on the results of this project in press releases referring to the National Park declaration, noting the biological importance of the region (although notably none cited our research, all presenting these results as their own). Photos taken by us were included by Conservation International on their website and our video footage of the forest in the Serranía was presented in towns surrounding the Yariguíes mountains to many people as part of the declaration process, again apparently with no acknowledgement made of this study. The results of this project have also formed the basis of popular articles describing the threatened species protected by the new National Park and its importance (e.g. Amodeo, 2004) and have encouraged young conservationists in Colombia to take part in the Yariguíes conservation process in further projects.

In conclusion, this project on paper has achieved what many have not. We conducted the first biological assessment of an unknown mountain range that had gone unprotected for decades despite plans to do so, supposedly due to a lack of biological information. Seemingly, as a result of that research, a National Park was established in the region. However, given the lack of compelling, well-argued or meaningful biological analysis in the relevant government documentation, it is difficult to evaluate whether this project was regarded as anything other than decorative by conservation decision-makers.

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## Appendix 1: List of Bird Species

By Thomas Donegan & Elkin Briceño

In the following table, for each species at a site, the letter indicates its abundance and the number indicates the number of times the species was captured with mist-nets at each site. For abundance: A = abundant (seen each day in numbers); C = common (observed or heard daily); F = fairly common (observed or heard on 50% of fieldwork days); U = uncommon (observed or heard on less than 50% of fieldwork days). For mist-net captures, 3+1 means 3 captures and 1 recaptured. Small differences between this list and other material published relating to Serranía de los Yariguíes (see e.g. Donegan *et al.*, 2003) are due to some additional identifications resulting from further study of sound recordings and due to following a different taxonomic treatment. The species names and order herein follow Remsen *et al.*, 2005. Note that secondary areas have been subject to relatively little study (essentially, only observations in transit between sites), reflecting low scores. Species included in square brackets are additional species reported by Borrero & Hernández (1957) but not recorded during this study. Borrero & Hernández (1957) studied some lower elevation forest sites to the west and east of Cerro de la Paz that have now apparently been largely deforested. Most of these additional species are those typical of lower elevations.

Family	Species	Elevation	Secondary habitats		Primary forest study sites				
			Parque Miraflores SS1	Other Second. SS4 etc.	Cerro de La Paz SS2	Cerro de La Paz SS3	El Talisman SS5	Alto Cantagallo SS6	Lepi-puerto SS7
			760m	500-2200m	1000m	1350m	2000m	2450m	3000m
<b>TINAMOUS</b> Tinamidae	Little Tinamou <i>Crypturellus soui</i>				C	U			
<b>SCREAMERS</b> Anhimidae	Northern Screamer <i>Chauna chavaria</i>			R					
<b>CRACIDS</b> Cracidae	Variable Chachalaca <i>Ortalis motmot columbiana</i> Andean Guan <i>Penelope montagnii</i> Wattled Guan Aburria aburri Sickle-winged Guan <i>Chamaepetes goudotii</i> Helmeted Curassow <i>Pauxi pauxi</i> Blue-billed Curassow <i>Crax alberti</i>			R	U  F  R R	C	C  U	F	F
<b>QUAILS</b> Odontophidae	Crested Bobwhite <i>Colinus cristatus</i> Marbled Wood-Quail <i>Odontophorus gujanensis</i> Gorgeted Wood-Quail <i>Odontophorus strophium</i>			R	U	C	F		
<b>HERONS, EGRETS</b> Ardeidae	Striated Heron <i>Butorides striata</i> Cattle Egret <i>Bubulcus ibis</i> Great Egret <i>Ardea alba</i> Snowy Egret <i>Egretta thula</i>		F	F U U					
<b>VULTURES</b> Cathartidae	Turkey Vulture <i>Cathartes aura</i> Black Vulture <i>Coragyps atratus</i> King Vulture <i>Sarcoramphus papa</i>		A	A	F U R	F U	F		
<b>HAWKS etc</b> Accipitridae	Sharp-shinned Hawk <i>Accipiter striatus</i> Barred Hawk <i>Leucopternis princeps</i> Roadside Hawk <i>Buteo magnirostris</i> Black Hawk-Eagle <i>Spizaetus tyrannus</i>			U	U		C F	F	1
<b>FALCONS, CARACARAS</b> Falconidae	Crested Caracara <i>Caracara cheriway</i> Yellow-headed Caracara <i>Milvago chimachima</i> Laughing Falcon <i>Herpetotheres cachinnans</i> Barred Forest-Falcon <i>Micrastur ruficollis interstes</i> Bat Falcon <i>Falco ruficularis</i> Peregrine Falcon <i>Falco peregrinus</i>			U F  U  U	U  U F	1	C		U
								F	

			Secondary habitats		Primary forest study sites					
			Parque Miraflores SS1	Other Second. SS4 etc.	Cerro de La Paz SS2	Cerro de La Paz SS3	El Talisman SS5	Alto Cantagallo SS6	Lepi-puerto SS7	
Family	Species	Elevation	760m	500-2200m	1000m	1350m	2000m	2450m	3000m	
<b>PIGEONS, DOVES</b> <b>Columbidae</b>	Ruddy Ground-Dove <i>Columbina talpacoti</i>		C	C						
	Feral Pigeon <i>Columba livia</i>		A	F						
	African Collared Dove <i>Streptopelia roseogrisea</i>			U						
	Band-tailed Pigeon <i>Patagioenas fasciata</i>			U			A	C	F	
	Pale-vented Pigeon <i>Patagioenas cayennensis</i>				C					
	Plumbeous Pigeon <i>Patagioenas plumbea</i>				F	F	U			
	White-tipped Dove <i>Leptotila verreauxi</i>		F	F						
	Lined Quail-Dove <i>Geotrygon linearis</i>				U	1	U	1		
	Ruddy Quail-Dove <i>Geotrygon montana</i>				F	3				
	<b>PARROTS</b> <b>Psittacidae</b>	Blue-and-yellow Macaw <i>Ara ararauna</i>				R				
		Scarlet Macaw <i>Ara macao</i>				R				
		Spectacled Parakeet <i>Forpus conspicillatus</i>		F	F		U			
Orange-chinned Parakeet <i>Brotogeris jugularis</i>			F	F						
Saffron-headed Parrot <i>Pionopsitta pyrrhia</i>					C	F				
Rusty-faced Parrot <i>Hapalopsittaca amazonina</i>								F	C	
Blue-headed Parrot <i>Pionus menstruus</i>					U					
Speckle-faced Parrot <i>Pionus tumultuosus</i>								F		
Scaly-naped Parrot <i>Amazona mercenaria</i>									C	
[Mealy Parrot <i>Amazona farinosa</i> ]										
<b>CUCKOOS</b> <b>Cuculidae</b>		Squirrel Cuckoo <i>Piaya cayana</i>					C		U	
		Smooth-billed Ani <i>Crotophaga ani</i>		C	C					
		Striped Cuckoo <i>Tapera naevia</i>			F					
<b>OWLS</b> <b>Strigidae</b>	Tropical Screech-Owl <i>Megascops choliba</i>				U					
	White-throated Screech-Owl <i>Megascops albogularis</i>						U	C		
	Great Horned Owl <i>Bubo virginianus</i>				U		U			
	Mottled Owl <i>Ciccaba virgata</i>				F					
	Ferruginous Pygmy-Owl <i>Glaucidium (brasilianum) ridgwayi</i>				C					
	Andean Pygmy-Owl <i>Glaucidium jardinii</i>								U	
	<b>POTOOS</b> <b>Nyctiidae</b>	Common Potoo <i>Nyctibius griseus</i>				U				
<b>NIGHTJARS etc</b> <b>Caprimulgidae</b>	Common Pauraque <i>Nyctidromus albicollis</i>				U					
	Band-winged Nightjar <i>Caprimulgus longirostris</i>							U		
	Lyre-tailed Nightjar <i>Uropsalis lyra</i>						F			
<b>SWIFTS</b> <b>Apodidae</b>	White-tipped Swift <i>Aeronautes montivagus</i>		F	C			C			

			Secondary habitats		Primary forest study sites					
			Parque Miraflores SS1	Other Second. SS4 etc.	Cerro de La Paz SS2	Cerro de La Paz SS3	EI Talisman SS5	Alto Cantagallo SS6	Lepi-puerto SS7	
Family	Species	Elevation	760m	500-2200m	1000m	1350m	2000m	2450m	3000m	
<b>HUMMING-BIRDS</b> <b>Trochilidae</b>	White-tipped Sicklebill <i>Eutoxeres aquila</i>				F 6	F 11+	U 1			
	Rufous-breasted Hermit <i>Glaucis hirsutus</i>				U 1	U 2				
	Band-tailed Barbthroat <i>Threnetes ruckeri</i>				F 3+1	U 2				
	Stripe-throated Hermit <i>Phaethornis striigularis</i>			U	U	U 1				
	Green Hermit <i>Phaethornis guy</i>				A 52+	A 39+				
	Tawny-bellied Hermit <i>Phaethornis symmatophorus</i> ssp nov						U 1	U 1	U 1	
	Western Long-tailed Hermit <i>Phaethornis longirostris</i>					F 6+1	U 2			
	Green-fronted Lancebill <i>Doryfera ludovicae</i>						U 2			
	White-necked Jacobin <i>Florisuga mellivora</i>				U	U 1	U 1			
	Brown Violet-ear <i>Colibri delphinae</i>						U 2			
	Green Violet-ear <i>Colibri thalassinus</i>							U		
	Black-throated Mango <i>Anthracothorax nigricollis</i>	F								
	Violet-headed Hummingbird <i>Klais guimeti</i>						U 3			
	Red-billed Emerald <i>Chlorostilbon gibsoni</i>				U	1				
	Coppery Emerald <i>Chlorostilbon russatus</i>							U 1		
	Purple-crowned Woodnymph <i>Thalurania colombica</i>				U	1	C 3	F 1		
	Rufous-tailed Hummingbird <i>Amazilia tzacati</i>	F		F						
	[Chestnut-bellied Hummingbird <i>Amazilia castaneiventris</i> ]									
	Andean Emerald <i>Amazilia franciae</i>						C 9+2			
	Blue-chested Hummingbird <i>Amazilia amabilis</i>				U	2	U			
	White-vented Plumeteer <i>Chalybura buffonii</i>				F	6+4	U 1			
	Speckled Hummingbird <i>Adelomyia melanogenys</i>							A 19+	C 9+1	U 3
	Green-crowned Brilliant <i>Heliodoxa jacula</i>				F	11+	C 19+			
	Buff-tailed Coronet <i>Boissonneaua flavescens</i>								U 1	F 2
	Black Inca <i>Coeligena prunellei</i>							C 16+		
	Collared Inca <i>Coeligena torquata</i>							C	9	C 2
	Amethyst-throated Sunangel <i>Heliangelus amethysticollis clarisse</i>								C 7	A 20+
	Booted Racket-tail <i>Ocreatus underwoodii</i>							U 1	U 1	
	Tyrian Metaltail <i>Metallura tyrianthina</i>								U 1	C 5+1
	Long-tailed Sylph <i>Agelaiocercus kingi</i>							U	U 1	
	<b>TROGONS</b> <b>Trogonidae</b>	Collared Trogon <i>Trogon collaris</i>					F 1+1	U		
		Masked Trogon <i>Trogon personatus</i>			U			F	F	
Golden-headed Quetzal <i>Pharomachrus auriceps</i>							U	F		

			Secondary habitats		Primary forest study sites						
			Parque Miraflores SS1	Other Second. SS4 etc.	Cerro de La Paz SS2	Cerro de La Paz SS3	El Talisman SS5	Alto Cantagillos SS6	Lepi-puerto SS7		
Family	Species	Elevation	760m	500-2200m	1000m	1350m	2000m	2450m	3000m		
<b>JACAMARS</b> <b>Galbulidae</b>	Rufous-tailed Jacamar <i>Galbula ruficauda</i>			R							
<b>PUFFBIRDS</b> <b>Bucconidae</b>	White-necked Puffbird <i>Notharchus hyperrhynchus</i> [Black-breasted Puffbird <i>Notharcus pectoralis</i> ] [Barred Puffbird <i>Nystalus radiatus</i> ] Moustached Puffbird <i>Malacoptila mystacalis</i> [Gray-cheeked Nunlet <i>Nonnula frontalis</i> ]					U	U 1				
<b>TOUCANS</b> <b>Ramphastidae</b>	Black-mandibled Toucan <i>Ramphastos ambiguus ambiguus</i> Black-mandibled Toucan <i>Ramphastos ambiguus swainsonii</i> [Keel-billed Toucan <i>Ramphastos vitellinus</i> ] Emerald Toucanet <i>Aulacorhynchus prasinus</i> Crimson-rumped Toucanet <i>Aulacorhynchus haematopygus</i> Collared Aracari <i>Pteroglossus torquatus</i>				C	C	U	F 2F			
<b>WOOD-PECKERS</b> <b>Picidae</b>	Olivaceous Piculet <i>Picumnus olivaceus</i> Beautiful Woodpecker <i>Melanerpes pulcher</i> Red-crowned Woodpecker <i>Melanerpes rubricapillus</i> White-throated Woodpecker <i>Piculus litae</i> Crimson-mantled Woodpecker <i>Piculus rivolii</i> Spot-breasted Woodpecker <i>Colaptes punctigula</i> Crimson-crested Woodpecker <i>Campephilus melanoleucos</i>		U			U					
<b>WOOD-CREEPERS, SPINETAILS, FOLIAGE-GLEANERS AND ALLIES</b> <b>Furnariidae</b>	Azara's Spinetail <i>Synallaxis azarae</i> Rufous Spinetail <i>Synallaxis unirufa</i> White-browed Spinetail <i>Hellmayrea gularis</i> Rusty-winged Barbtail <i>Premnornis guttuligera</i> Spotted Barbtail <i>Premnoplex brunnescens</i> Pearled Treerunner <i>Margarornis squamiger</i> Streaked Tuftedcheek <i>Pseudocolaptes biossonneautii</i> Montane Foliage-Gleaner <i>Anabacerthia striaticollis</i> Lineated Foliage-Gleaner <i>Syndactyla subalaris</i> Slaty-winged Foliage-Gleaner <i>Philydor fuscipenne</i> Flammulated Treehunter <i>Thripadectes flammulatus</i> Tawny-throated Leafscraper <i>Sclerurus mexicanus</i> Plain Xenops <i>Xenops minutus</i> Plain-brown Woodcreeper <i>Dendrocincla fuliginosa</i>			F			C	2U	C	3F	1
			C	C						U	2
					F			U	2U	1	
							U	1U			
								F	3		
								U			
							C	3U			
							F	4+2	U	1	
					F	F					
					F	1					
					F	3F	3				
					F	2F	3				
									U	1	

			Secondary habitats		Primary forest study sites				
			Parque Miraflores SS1	Other Second. SS4 etc.	Cerro de La Paz SS2	Cerro de La Paz SS3	El Talisman SS5	Alto Cantagallo SS6	Lepi-puerto SS7
Family	Species	Elevation	760m	500-2200m	1000m	1350m	2000m	2450m	3000m
	Olivaceous Woodcreeper <i>Sittasomus griseicapillus</i> Wedge-billed Woodcreeper <i>Glyphorhynchus spirurus</i> Northern Barred Woodcreeper <i>Dendrocolaptes sanctithomae</i> Black-banded Woodcreeper <i>Dendrocolaptes picumnus</i> Straight-billed Woodcreeper <i>Xiphorhynchus picus</i> [Buff-throated Woodcreeper <i>Xiphorhynchus guttatus nanus</i> ] Black-striped Woodcreeper <i>Xiphorhynchus lachrymosus</i> Olive-backed Woodcreeper <i>Xiphorhynchus triangularis</i> Streak-headed Woodcreeper <i>Lepidocolaptes souleyetii</i> Spot-crowned Woodcreeper <i>Lepidocolaptes lacrymiger</i> Brown-billed Scythebill <i>Campylorhynchus pusillus</i>		C	U	U	U C 5+1 F U 1 F 2 U	F U 1 U 1	1 F 1	
<b>ANTBIRDS</b> <b>Thamnophilidae</b>	Bar-crested Antshrike <i>Thamnophilus multistriatus</i> [Black Antshrike <i>Thamnophilus nigriceps</i> ] Uniform Antshrike <i>Thamnophilus unicolor</i> Western Slaty-Antshrike <i>Thamnophilus atrinucha</i> Plain Antvireo <i>Dysithamnus mentalis semicinereus</i> Checker-throated Antwren <i>Myrmotherula fulviventris</i> Pacific Antwren <i>Myrmotherula pacifica</i> White-flanked Antwren <i>Myrmotherula axillaris</i> Slaty Antwren <i>Myrmotherula schisticolor</i> Dot-winged Antwren <i>Microrhopias quixensis</i> Rufous-rumped Antwren <i>Terenura callinota</i> [Dusky Antbird <i>Cercomacera tyrannina</i> ] Parker's Antbird <i>Cercomacera parkeri</i> [Chestnut-backed Antbird <i>Myrmeciza exsul</i> ] Dull-mantled Antbird <i>Myrmeciza laemosticta</i> Bicoloured Antbird <i>Gymnopathys (leucapsis) bicolor</i>		F		U	U F U F 6C 6 U 1U 2 U 2 U U	F F 3 F 2 U		
<b>ANTPITTAS</b> <b>Formicariidae</b>	[Black-faced Antthrush <i>Formicarius analis</i> ] White-bellied Antpitta <i>Grallaria hypoleuca</i> Spectacled Antpitta <i>Hylopezus perspicillatus</i> Slate-crowned Antpitta <i>Grallaricula nana</i>				C	1	C	C	F 2+1

Family	Species	Elevation	Secondary habitats		Primary forest study sites				
			Parque Miraflores SS1	Other Second. SS4 etc.	Cerro de La Paz SS2	Cerro de La Paz SS3	El Talisman SS5	Alto Cantagallo SS6	Lepi-puerto SS7
			760m	500-2200m	1000m	1350m	2000m	2450m	3000m
TAPACULOS Rhinocryptidae	Blackish Tapaculo <i>Scytalopus latrans</i>							F	
	Narino Tapaculo <i>Scytalopus vicini</i>						C		
	Tapaculo <i>Scytalopus</i> sp nov								F
	Matorral / Colombian Tapaculo <i>Scytalopus griseicollis/infasciatus</i>							C	C
	ssp nov								
TYRANT- FLYCATHERS Tyrannidae	Ashy-headed Tyrannulet <i>Phylomyias cinereiceps</i>							F	1
	Brown-capped Tyrannulet <i>Ornithion burnneicapillus</i>				U				
	Southern Beardless Tyrannulet <i>Camptostoma obsoletum</i>	U							
	Rufous-headed Pygmy-Tyrant <i>Pseudotriccus ruficeps</i>							U	2U 1
	Golden-faced Tyrannulet <i>Zimmerius viridiflavus</i>						U	U	1
	Marble-faced Bristle-Tyrant <i>Phylloscartes ophthalmicus</i>			F	1F	2			
	Streak-necked Flycatcher <i>Mionectes striaticollis</i>						F	4U	1
	Olive-striped Flycatcher <i>Mionectes olivaceus</i>					12+			
	Ochre-bellied Flycatcher <i>Mionectes oleagineus</i>			24+	F	2			
	[Sepia-capped Flycatcher <i>Leptopogon amaurocephalus</i> ]			A	6	U			
	Slaty-capped Flycatcher <i>Leptopogon superciliaris</i>			F		2U	U	1	
	Rufous-breasted Flycatcher <i>Leptopogon rufipectus</i>						F	1	
	Ornate Flycatcher <i>Myiobius ornatus</i>					F	4+1	F	1
	Southern Bentbill <i>Oncostoma olivaceum</i>			F		2U			
	Scale-crested Pygmy-Tyrant <i>Lophotriccus pileatus</i>					C	3U	U	U
	Black-throated Tody-Tyrant <i>Hemitriccus granadensis</i>							C	3+1
	Common Tody-Flycatcher <i>Todirostrum cinereum</i>	C	F						
	Brownish Twistwing <i>Cnipodectes subbrunneus</i>				F				
	Golden-crowned Spadebill <i>Platyrinchus coronatus</i>				F	4+1			
	Flavescent Flycatcher <i>Myiophobus flavicans</i>							F	1
	Handsome Flycatcher <i>Myiophobus pulcher bellus</i>							F	1
	Bran-coloured Flycatcher <i>Myiophobus fasciatus</i>		U						
	Black-tailed Flycatcher <i>Myiobius atricaudus</i>					U	1		
	Ruddy-tailed Flycatcher <i>Terentotriccus erythrurus</i>				U	3			
	Cinnamon Flycatcher <i>Pyrhomyias cinnamomea</i>							C	C
	Acadian Flycatcher <i>Empidonax virescens</i>	F		F		3F	2		
	Vermillion Flycatcher <i>Pyrocephalus rubinus</i>	C	C						
	Smoke-coloured Pewee <i>Contopus fumigatus</i>		U						

Family	Species	Elevation	Secondary habitats		Primary forest study sites				
			Parque Miraflores SS1	Other Second. SS4 etc.	Cerro de La Paz SS2	Cerro de La Paz SS3	El Talisman SS5	Alto Cantagallo SS6	Lepi-puerto SS7
			760m	500-2200m	1000m	1350m	2000m	2450m	3000m
	Tropical Pewee <i>Contopus cinereus</i>				F				
	Black Phoebe <i>Sayornis nigricans</i>		F	F					
	Smoky Bush-Tyrant								
	<i>Myiotheretes fumigatus</i>								U
	[Long-tailed Tyrant								
	<i>Colonia colonus</i> ]								
	Yellow-bellied Chat-Tyrant								
	<i>Ochthoeca diadema</i>							C	5U 1+1
	Slaty-backed Chat-Tyrant								
	<i>Ochthoeca cinnamomeiventris</i>							U	
	Cattle Tyrant <i>Machetornis rixosa</i>			U					
	Rusty-margined Flycatcher								
	<i>Myiozetetes cayennensis</i>		F						
	Social Flycatcher								
	<i>Myiozetetes similis</i>			F					
	Great Kiskadee								
	<i>Pitangus sulphuratus</i>		C	C					
	Golden-crowned Flycatcher								
	<i>Myiodynastes chrysocephalus</i>					F	U		
	Streaked Flycatcher								
	<i>Myiodynastes maculatus</i>		U						
	Boat-billed Flycatcher								
	<i>Megarhynchus pitangua</i>		U						
	Tropical Kingbird								
	<i>Tyrannus melancholicus</i>		A	A			U	U	
	[Short-crested Flycatcher								
	<i>Myiarchus ferox</i> ]								
	Dusky-capped Flycatcher								
	<i>Myiarchus tuberculifer</i>				F		C?		
COTINGAS Cotingidae	Green-and-black Fruiteater							F	2U 1
	<i>Pipreola riefferii</i>								
	Dusky Piha							C	
	<i>Lipaugus fuscocinereus</i>								
	[Purple-throated Fruitcrow								
	<i>Querula purpurata</i> ]								
MANAKINS Pipridae	Golden-winged Manakin						F	3	
	<i>Masius chrysopterus</i>								
	White-bibbed Manakin								
	<i>Corapipo leucorrhoea</i>				C 9+4	C 7+5			
	Striped Manakin								
	<i>Machaeopterus regulus</i>					F 9			
	White-bearded Manakin								
<i>Manacus manacus</i>				U 1					
Golden-headed Manakin									
<i>Pipra erythrocephala</i>				U 1					
INCERTAE SEDIS	Masked Tityra <i>Tityra semifasciata</i>				F				
	[Thrush-like Schiffornis								
	<i>Schiffornis turdina</i> ]								
	Speckled Mourner								
	<i>Laniocera rufescens</i>				U 1				
	Barred Becard								
	<i>Pachyramphus versicolor</i>							U	
Cinereous Becard									
<i>Pachyramphus rufus</i>				F					
Cinnamon Becard									
<i>Pachyramphus cinnamomeus</i>						F			
VIREOS Vireonidae	Rufous-browed Peppershrike								
	<i>Cyclarhis gujanensis</i>		F		F	U			
	Black-billed Peppershrike								
	<i>Cyclarhis nigrirostris</i>						U		
	Yellow-browed Shrike-Vireo								
<i>Vireolanus eximius</i>				F					

Family	Species	Elevation	Secondary habitats		Primary forest study sites				
			Parque Miraflores SS1	Other Second. SS4 etc.	Cerro de La Paz SS2	Cerro de La Paz SS3	El Talisman SS5	Alto Cantagallo SS6	Lepi-puerto SS7
			760m	500-2200m	1000m	1350m	2000m	2450m	3000m
	Yellow-throated Vireo <i>Vireo flavifrons</i> Rufous-naped Greenlet <i>Hylophilus semibrunneus</i>					U			
					U	U	U		
<b>JAYS Corvidae</b>	[Black-chested Jay <i>Cyanocorax affinis</i> ] Green Jay <i>Cyanocorax yncas</i>						C	U	
<b>SWALLOWS, MARTINS Hirundinidae</b>	White-winged Swallow <i>Tachycineta albiventer</i> Brown-chested Martin <i>Progne tapera</i> Grey-breasted Martin <i>Progne chalybea</i> Blue-and-white Swallow <i>Pygochelidon cyanoleuca</i> Brown-bellied Swallow <i>Notiochelidon murina</i> Southern Rough-winged Swallow <i>Stelgidopteryx ruficollis</i>		F F F C C	U C F			C	U	C
<b>WRENS Troglodytidae</b>	House Wren <i>Troglodytes aedon</i> Bicoloured Wren <i>Campylorhynchus griseus</i> Sooty-headed Wren <i>Thryotorus spadix</i> [Black-bellied Wren <i>Thryotorus fasciatoventris</i> ] Whiskered Wren <i>Thryotorus mysticalis</i> Stripe-throated Wren <i>Thryotorus leucopogon</i> Sharpe's Wren <i>Cinnycerthia olivascens</i> White-breasted Wood-Wren <i>Henicorhina leucosticta</i> Grey-breasted Wood-wren <i>Henicorhina leucophrys</i> Song Wren <i>Cyphorhinus phaeocephalus</i>		C C U U U	C C U F U	C F F 5+1 U 3U	3 4 U U 3	U C C C 2F	5F 1F	4 1
<b>GNATWRENS etc Poliptolidae</b>	Half-collared Gnatwren <i>Microbates cinereiventris</i> [Long-billed Gnatwren <i>Ramphocaenus melanurus</i> ]				U	1F			
<b>THRUSHES, SOLITAIRES Turdidae</b>	Andean Solitaire <i>Myadestes ralloides</i> Grey-cheeked Thrush <i>Catharus minimus</i> Swainson's Thrush <i>Catharus ustulatus</i> Great Thrush <i>Turdus fuscater</i> Glossy-black Thrush <i>Turdus serranus</i> Black-billed Thrush <i>Turdus ignobilis</i> Pale-vented Thrush <i>Turdus obsoletus</i>		F		F U	8+4 3F U 3	U 1 6+1 U F U 3	F U F U	1 1 1 1
<b>MOCKING-BIRDS Mimidae</b>	Tropical Mockingbird <i>Mimus gilvus</i>			U	U				
<b>TANAGERS Thraupidae</b>	Oleaginous Hemispingus <i>Hemispingus frontalis</i> Black-eared Hemispingus <i>Hemispingus melanotis</i> Grey-headed Tanager <i>Eucometis penicillata</i>						F	3 F	C 2
					F	2			

Family	Species	Elevation	Secondary habitats		Primary forest study sites					
			Parque Miraflores SS1	Other Second. SS4 etc.	Cerro de La Paz SS2	Cerro de La Paz SS3	El Talisman SS5	Alto Cantagillos SS6	Lepi-puerto SS7	
			760m	500-2200m	1000m	1350m	2000m	2450m	3000m	
	White-lined Tanager <i>Tachyphonus rufus</i>			U						
	Crimson-backed Tanager <i>Ramphocelus dimidiatus</i>		C	C	U			F		
	Flame-rumped Tanager <i>Ramphocelus flammigerus</i>									
	<i>icteronotus</i>		U	U						
	Blue-grey Tanager <i>Thraupis episcopus</i>		A	C				U		
	Palm Tanager <i>Thraupis palmarum</i>		F	U						
	Hooded Mountain-Tanager <i>Buthraupis montana</i>							U	U	F
	Lacrimose Mountain-Tanager <i>Anisognathus lacrymosus</i>									C 2
	Scarlet-bellied Mountain-Tanager <i>Anisognathus igniventris</i>								U	
	Blue-winged Mountain-Tanager <i>Anisognathus somptuosus</i>							C	U	
	Grass-green Tanager <i>Chlorornis riefferii</i>								C	1F
	Golden-crowned Tanager <i>Iridosornis analis</i>									F 1
	Golden Tanager <i>Tangara arthus</i>					F	4F		U	
	Saffron-crowned Tanager <i>Tangara xanthocephala</i>							F		
	Flame-faced Tanager <i>Tangara parzadukii</i>							F		
	Speckled Tanager <i>Tangara guttata</i>					F	2F			
	Bay-headed Tanager <i>Tangara gyrola</i>				A	C	10			
	Blue-necked Tanager <i>Tangara cyanicollis</i>		C		F	F				
	Beryl-spangled Tanager <i>Tangara nigroviridis</i>							F	1	
	Black-capped Tanager <i>Tangara heinei</i>							F		
	Purple Honeycreeper <i>Cyanerpes caeruleus</i>				U	F	4+1			
	Green Honeycreeper <i>Chlorophanes spiza</i>				F	F	7			
	Blue Dacnis <i>Dacnis cyana</i>			U						
	Capped Conebill <i>Conirostrum albifrons</i>								U	
	White-sided Flower-Piercer <i>Diglossa albilatera</i>							F	3+1	C 6+1 C 4+1
	Bluish Flower-peircer <i>Diglossa caerulescens</i>								U	1F 3+1
	Masked Flower-Piercer <i>Diglossa cyanea</i>							F	2F	5F 3
<b>INCERTAE SEDIS</b>	Common Bush-Tanager <i>Chlorospingus ophthalmicus</i>							C	6A	9+1 C 1
	Ashy-throated Bush-Tanager <i>Chlorospingus canigularis</i>							F		
	Hepatic Tanager <i>Piranga flava</i>					U				
	Summer Tanager <i>Piranga rubra</i>		F	F	F	C	3+1	U		
	Sooty Ant-Tanager <i>Habia gutturalis</i>				C	7+1	F	2+2		
	Bananaquit <i>Coereba flaveola</i>		C		F					
	Sooty Grassquit <i>Tiaris fuliginosa</i>					U	1			
	Yellow-faced Grassquit <i>Tiaris olivacea</i>			U				U	1	

Family	Species	Elevation	Secondary habitats		Primary forest study sites					
			Parque Miraflores SS1	Other Second. SS4 etc.	Cerro de La Paz SS2	Cerro de La Paz SS3	El Talisman SS5	Alto Cantagallo SS6	Lepi-puerto SS7	
			760m	500-2200m	1000m	1350m	2000m	2450m	3000m	
	Dull-coloured Grassquit <i>Tiaris obscura</i>			F						
FINCHES Emberizidae	Rufous-collared Sparrow <i>Zonotrichia capensis</i>			A			F			
	Saffron Finch <i>Sicalis flaveola</i>	F	C							
	Blue-black Grassquit <i>Volatina jacarina</i>		C							
	Black-and-white Seedeater <i>Sporophila luctuosa</i>		U							
	Yellow-bellied Seedeater <i>Sporophila nigricollis</i>	U	U							
	Ruddy-breasted Seedeater <i>Sporophila minuta</i>	U								
	Orange-billed Sparrow <i>Arremon aurantirostris</i>				U	1				
	Chestnut-capped Brush-Finch <i>Buarremon brunneinucha</i>						C	8		
	Stripe-headed Brush-Finch <i>Buarremon torquatus</i>		U							
	Northern Rufous-naped Brush-Finch <i>Atlapetes "latinuchus" sp nov</i>							U	1 U	
	Yellow-throated Brush-Finch <i>Atlapetes gutturalis</i>						C	2		
	FINCHES Cardinalidae	Rose-breasted Grosbeak <i>Pheucticus ludovicianus</i>					F	1		
		Slate-coloured Grosbeak <i>Saltator grossus</i>					U	1		
		Buff-throated Saltator <i>Saltator maximus</i>	F	F						
Black-winged Saltator <i>Saltator atripennis</i>							U			
Blue-black Grosbeak <i>Cyanocompsa cyanooides</i>				F	2+1	U	1			
NEW WORLD WARBLERS Parulidae		Golden-winged Warbler <i>Vermivora chrysoptera</i>					U			
		Chestnut-sided Warbler <i>Dendroica pensylvanica</i>	F							
	Yellow Warbler <i>Dendroica petechia aestiva</i>	C								
	Bay-breasted Warbler <i>Dendroica castanea</i>					F				
	Blackburnian Warbler <i>Denroica fusca</i>	F				F	F	F		
	Cerulean Warbler <i>Dendroica cerulea</i>					U				
	American Redstart <i>Setophaga ruticilla</i>					F	1			
	Black-and-white Warbler <i>Mniotilta varia</i>			F		U	1 F			
	Northern Waterthrush <i>Seiurus motacilla</i>	F	F							
	Canada Warbler <i>Wilsonia canadensis</i>			F	2 C	5+2	C	6		
	Slate-throated Whitestart <i>Myioborus miniatus</i>						A	6+1	F	
	Golden-fronted Whitestart <i>Myioborus ornatus</i>						U	1 C	2 C 4+1	
	Citrine Warbler <i>Basileuterus luteoviridis</i>								F 1	
	Russet-crowned Warbler <i>Basileuterus coronatus</i>						F	3 F	2	
	Three-striped Warbler <i>Basileuterus tristriatus</i>						C	9		

Family	Species	Elevation	Secondary habitats		Primary forest study sites					
			Parque Miraflores SS1	Other Second. SS4 etc.	Cerro de La Paz SS2	Cerro de La Paz SS3	El Talisman SS5	Alto Cantagallo SS6	Lepi-puerto SS7	
			760m	500-2200m	1000m	1350m	2000m	2450m	3000m	
	[Buff-rumped Warbler <i>Phaetholypis fulvicauda</i> ]									
<b>ICTERIDS</b> Icteridae	Russet-backed Oropendola <i>Psarocolius angustifrons</i>					U	C			
	[Chestnut-headed Oropendola <i>Psarocolius wagleri</i> ]									
	Crested Oropendola <i>Psarocolius decumanus</i>			F						
	Mountain Cacique <i>Cacicus chrysonotus</i>							C		
	[Yellow-rumped Cacique <i>Cacicus cela</i> ]									
	Scarlet-rumped Cacique <i>Cacicus uropygialis</i>						F			
	Yellow-billed Cacique <i>Amblycercus holosericeus</i>								U	
	Yellow-tailed Oriole <i>Icterus nigrogularis</i>			U						
	Yellow-backed Oriole <i>Icterus chrysater</i>			F						
	Mountain Grackle <i>Macroagelaius subalaris</i>							U		
	Shiny Cowbird <i>Molothrus bonariensis</i>		A	C						
	Eastern Meadowlark <i>Sturnella magna</i>			F						
	<b>FINCHES</b> Fringillidae	Yellow-bellied Siskin <i>Carduelis xanthogastra</i>			U			F		U
		Lesser Goldfinch <i>Carduelis psaltria</i>		U						
		Thick-billed Euphonia <i>Euphonia laniirostris</i>		C		U				
		Golden-rumped Euphonia <i>Euphonia cyanocephala</i>			F					
Orange-bellied Euphonia <i>Euphonia xanthogaster</i>					U	F	3F			
<b>TOTAL NO. OF SPECIES</b>				<b>52</b>	<b>65</b>	<b>96</b>	<b>86</b>	<b>98</b>	<b>74</b>	<b>40</b>

## Appendix 2: List of Butterfly Species

By Blanca Huertas & John Jairo Arias

This is a preliminary list of butterfly species as some specimens have yet to be identified. Altitudinal ranges and new distributional information will be published elsewhere. Taxonomic arrangement and order follows Lamas (ed.) (2004).

Superfamily	Family	Subfamily	Taxon
Hesperioidea Skippers	Hesperiidae Skippers	Hesperiinae	<i>Orses cynisca</i> (Swainson, 1821) <i>Perichares adela</i> Reakirt, 1868 <i>Pompeius aff. amblyspila</i> (Mabille, 1898) <i>Vettius</i> sp
		Pyrginae	<i>Astraptus aff. alardus</i> (Stoll, 1790) <i>Autochton aff. neis</i> (Geyer, 1832) <i>Calliades zeutus</i> (Möschler, 1879) <i>Carrehenes aff. canescens</i> (R. Felder, 1869) <i>Cycloglypha</i> sp <i>Cycloglypha tisia</i> (Godman & Salvin, 1896) <i>Epargyreus</i> sp <i>Heliopetes alana</i> (Reakirt, 1868) <i>Hesperiidae</i> sp1. <i>Hesperiidae</i> sp2. <i>Hesperiidae</i> sp3. <i>Mylon aff. maimon</i> (Fabricius, 1775) <i>Phocides</i> sp <i>Urbanus doryssus doryssus</i> (Swainson, 1831) <i>Urbanus aff. proteus</i> (Linnaeus, 1758)
Papilionoidea True Butterflies	Papilionidae Swallowtails	Papilioninae	<i>Battus polydamas polydamas</i> (Linnaeus, 1758) <i>Heraclides thoas nealces</i> (Rothschild & Jordan, 1906) <i>Parides erithalion erithalion</i> (Boisduval, 1836) <i>Parides eurimedes</i> ssp (Stoll, 1782) <i>Parides iphidamas elatos</i> Fabricius, 1793 <i>Parides panares erythrus</i> (Rothschild & Jordan, 1906)
		Coliadinae	<i>Eurema albula marginella</i> (C. Felder & R. Felder, 1861) <i>Eurema arbela gratiosa</i> (Doubleday, 1847) <i>Eurema xantochlora edentata</i> Le Crom & Constantino, 2004 <i>Phoebis argante</i> ssp nov <i>Phoebis</i> sp
	Pieridae Yellows and whites	Dismorphiinae	<i>Dismorphia amphione beroe</i> (Lucas, 1852) <i>Dismorphia crisis foedora</i> (Lucas, 1852) <i>Dismorphia lewyi lewyi</i> (Lucas, 1852) <i>Dismorphia thermesia</i> ssp nov Godart, 1817 <i>Dismorphia theucarilla siloe</i> (Hewitson, [1858]) <i>Dismorphia medora medora</i> (Doubleday, 1844)
		Pierinae	<i>Catasticta hebra hebra</i> (Lucas, 1852) <i>Catasticta sisamnus telasco</i> (Lucas, 1852) <i>Catasticta cinerea rochereau</i> Le Cerf, 1924 <i>Catasticta semiraris costarum</i> Lamas & Bollino, 2004 <i>Catasticta uricoecheae inopa</i> Wojtusiak & Rey, 1999 <i>Catasticta philone philone</i> (C. Felder & R. Felder, 1865) <i>Leptophobia aripa aripa</i> (Boisduval, 1836) <i>Leptophobia eleusis eleusis</i> (Lucas, 1852)

Superfamily	Family	Subfamily	Taxon
			<i>Leptophobia penthica penthica</i> (Kollar, 1850) <i>Pieriballia viardi locusta</i> (C. Felder & R. Felder, 1861)
	Nymphalidae Brush-footed	Biblidinae	<i>Callicore pitheas pitheas</i> (Latreille, [1813]) <i>Catonephele chromis chromis</i> (Doubleday, [1848]) <i>Catonephele numilia esite</i> (R. Felder, 1869) <i>Catonephele nyctimus nyctimus</i> (Westwood, 1850) <i>Catonephele orites orites</i> Stichel, 1899 <i>Diaethria euclides ssp</i> (Latreille, [1809]) <i>Diaethria gabaza gabaza</i> (Hewitson, [1855]) <i>Diaethria clymena dodone</i> (Guenée, 1872) <i>Dynamine athemon maeon</i> (Doubleday, 1849) <i>Dynamine postverta postverta</i> (Cramer, 1779) <i>Dynamine setabis setabis</i> (Doubleday, 1849) <i>Ectima erycinoides erycinoides</i> C. & R. Felder, 1867 <i>Epiphile dilecta jenkinsi</i> Lamas, 1995 <i>Epiphile epicaste epicaste</i> Hewitson, 1857 <i>Epiphile eriopsis eriopsis</i> Hewitson, 1857 <i>Hamadryas arinome arienis</i> (Godman & Salvin, 1883) <i>Hamadryas fornax fornax</i> (Hübner, [1823]) <i>Hamadryas laodamia laodamia</i> (Cramer, 1777) <i>Marpesia marcella marcella</i> (C. & R. Felder, 1861) <i>Marpesia zerynthia dentigera</i> (Frushstorfer, 1907) <i>Panacea prola prola</i> (Doubleday, [1848]) <i>Pyrrhogyra otolais nasica</i> Staudinger, 1886 <i>Temenis pulchra pallidior</i> (Hewitson, 1861)
		Charaxinae Charaxines	<i>Archaeoprepona demophon aff. muson</i> (Frushstorfer, 1905) <i>Fontainea nessus nessus</i> (Latreille, [1813]) <i>Memphis cleomestra cleomestra</i> Hewitson, 1869 <i>Memphis laura laura</i> (H. Druce, 1877) <i>Prepona pylene gnorima</i> H.W. Bates, 1865
		Danainae Milkweed	<i>Danaus gilipus aff. hermippus</i> (C. & R. Felder, 1865) <i>Lycorea halia atergatis</i> Doubleday, [1847]
		Heliconiinae Passion-vine butterflies	<i>Actinote pellenea ssp</i> Hübner, [1821] <i>Actinote sp</i> <i>Dione glycera glycera</i> (C. & R. Felder, 1861) <i>Dryas iulia iulia</i> (Fabricius, 1775) <i>Eueides isabella huebneri</i> Ménétris, 1857 <i>Heliconius clysonimus clysonimus</i> Latreille, [1817] <i>Heliconius cydno wanningeri</i> Neukirchen, 1991 <i>Heliconius hecalesia hecalesia</i> Hewitson, [1854] <i>Heliconius melpomene melpomene</i> (Linnaeus, 1758) <i>Heliconius sapho sapho</i> (Drury, 1782) <i>Heliconius sara sara</i> (Fabricius, 1793) <i>Laparus doris obscurus</i> (Weymer, 1891)
		Ithomiinae Ithomiids	<i>Aeria eurimedia ssp</i> (Cramer, 1777) <i>Athesis clearista ssp</i> Doubleday, 1847 <i>Callithomia hezia tridactyla</i> Dewitz, 1877 <i>Ceratinia tutia aff. azara</i> (Hewitson, [1854]) <i>Godyris kedema ssp</i> (Hewitson, [1855]) <i>Godyris zavaleta gonussa</i> (Hewitson, [1856])

Superfamily	Family	Subfamily	Taxon
			<p><i>Greta andromica andromica</i> (Hewitson, [1855])  <i>Greta depauperata umbrosa</i> (Haensch, 1903)  <i>Hyposcada illinissa abida</i> (Hewitson, [1852])  <i>Hypothyris lycaste ssp</i> (Fabricius, 1793)  <i>Ithomia celemia celemia</i> Hewitson, [1854]  <i>Ithomia iphianassa anaphissa</i> Herrich-Schäffer, 1865  <i>Mechanitis lysimnia macrinus</i> Hewitson, 1860  <i>Mechanitis polymnia veritabilis</i> Butler, 1873  <i>Melinaea lilis messatis</i> (Hewitson, [1856])  <i>Napeogenes stella ssp</i> (Hewitson, [1855])  <i>Oleria amalda amalda</i> (Hewitson, [1857])  <i>Oleria santineza ssp</i> (Haensch, 1903)  <i>Oleria makrena ssp nov</i>  <i>Pseudoscada timna saturata</i> (Staudinger, 1885)  <i>Pteronymia picta picta</i> (Salvin, 1869)  <i>Tithorea harmonia furina</i> Godman &amp; Salvin, 1898  <i>Tithorea tarricinia hecalesina</i> C. &amp; R. Felder, 1865</p>
		Limenitidinae Adelphas	<p><i>Adelpha alala completa</i> Frushstorfer, 1907  <i>Adelpha cocala ssp</i> (Cramer, 1780)  <i>Adelpha cytherea daguana</i> Fruhstorfer, 1913  <i>Adelpha leucophthalma leucophthalma</i> (Latreille, [1809])  <i>Adelpha seriphia pione</i> Godman &amp; Salvin, 1884  <i>Adelpha zina ssp</i> (Hewitson, 1867)</p>
		Morphinae Morphos and owls	<p><i>Antirrhea geryon ssp</i> C. &amp; R. Felder, 1862  <i>Brassolis isthmia granadensis</i> Stichel, 1902  <i>Caligo atreus atreus</i> (Kollar, 1850)  <i>Caligo eurilochus aff. delectans</i> Joicey &amp; Kaye, 1917  <i>Caligo illioneus ssp</i> (Cramer, 1775)  <i>Caligo oedipus oedipus</i> Stichel, 1903  <i>Caligo sp</i>  <i>Dynastor darius ssp</i> (Fabricius, 1775)  <i>Morpho deidamia granadensis</i> C. &amp; R. Felder, 1867  <i>Morpho sp</i>  <i>Morpho helenor peleides</i> Kollar, 1850  <i>Opsiphanes bogotanus phrataphernes</i> Frushstorfer  <i>Opsiphanes quiteria badius</i> (Stoll [1782])</p>
		Nymphalinae Nymphalids	<p><i>Anartia amathea ssp</i> (Linnaeus, 1758)  <i>Anartia jatrophae ssp</i> (Linnaeus, 1763)  <i>Castilia ofella ssp</i> Hewitson, [1864]  <i>Chlosyne lacinia saundersi</i> (Doubleday, [1847])  <i>Chlosyne narva narva</i> (Fabricius, 1793)  <i>Colobura annulata annulata</i> Willmott, Constantino &amp; Hall, 2001  <i>Eresia emerantia emerantia</i> Hewitson, 1857  <i>Eresia eunice drypetis</i> Godman &amp; Salvin, 1878  <i>Eresia ithomioides mimas</i> (Staudinger, 1885)  <i>Junonia evarete ssp</i> Cramer, 1775  <i>Siproeta epaphus aff. gadoui</i> Masters, 1967  <i>Smyrna blomfieldia blomfieldia</i> Fabricius, (1781)  <i>Tegosa sp nov</i></p>

Superfamily	Family	Subfamily	Taxon
			<i>Victorina stelenes ssp</i> Linnaeus
		Satyrinae	<i>Altopedaliodes sp1</i>
		Satyrids	<i>Cissia confusa confusa</i> (Staudinger, 1887)
			<i>Cithaerias pireta magdalenensis</i> Constantino, 1995
			<i>Corades enyo almo</i> Thieme, 1907
			<i>Corades chelonis ssp</i> Hewitson, 1863
			<i>Daedalma drusilla drusilla</i> Hewitson, 1858
			<i>Eretris calisto ssp nov</i>
			<i>Eretris aff. ocellifera</i> C. & R. Felder, 1867
			<i>Euptichooides saturnus saturnus</i> (Butler, 1867)
			<i>Euptychia insolata insolata</i> Butler & H. Druce, 1872
			<i>Euptychia molina molina</i> (Hübner, [1813])
			<i>Euptychia westwoodi westwoodi</i> Butler, 1867
			<i>Euptychia sp</i>
			<i>Euptychia sp1</i>
			<i>Euptychia sp2</i>
			<i>Euptychia sp3</i>
			<i>Euptychia sp4</i>
			<i>Euptychia sp nov</i>
			<i>Euptichooides griphe griphe</i> (C. & R. Felder, 1867)
			<i>Forsternaria aff. necys</i> (Godart, [1824])
			<i>Forsternaria neonympha neonympha</i> C. & R. Felder, 1867
			<i>Hermeuptychia harmonia harmonia</i> (Butler, 1877)
			<i>Hermeuptychia hermes hermes</i> (Fabricius, 1775)
			<i>Tamania/Idioneurula sp nov</i>
			<i>Lymanopoda albocincta albocincta</i> Hewitson, 1861
			<i>Magneuptychia aff. libye</i> (Linnaeus, 1767)
			<i>Manerebia sp1</i>
			<i>Mygona irmina irmina</i> (Doubleday & Hewitson [1849])
			<i>Oressinoma typhla typhla</i> Doubleday, [1849]
			<i>Oxeoschistus puerta simplex</i> Butler, 1868
			<i>Oxeoschistus submaculatus ssp nov</i> Butler & H. Druce, 1874
			<i>Panyapedaliodes phila ssp</i> (Hewitson, 1862)
			<i>Parataygetis lineata lineata</i> Godman & Salvin, 1880
			<i>Pareuptychia ocyrrhoe ssp</i> (Fabricius, 1776)
			<i>Pedaliodes peucestas peucestas</i> (Hewitson, 1862)
			<i>Pedaliodes sp1</i>
			<i>Pedaliodes aff. polla</i> Thieme, 1905
			<i>Pedaliodes sp2</i>
			<i>Pedaliodes manis manis</i> (C. & R. Felder, 1867)
			<i>Pedaliodes plotina ssp nov</i> Hewitson, 1862
			<i>Pedaliodes poesia poesia</i> (Hewitson, 1862)
			<i>Corderopedaliodes corderoi corderoi</i> (Dognin, 1893)
			<i>Pierella helvina helvina</i> (Hewitson, 1859)
			<i>Pierella luna lesbia</i> Staudinger, 1887
			<i>Praepronophila perpena perpena</i> Hewitson, 1861
			<i>Pronophila epidipnis orcheowitsoni</i> Adams & Bernard, 1979
			<i>Pronophila unifasciata bogotensis</i> Lathy, 1906
			<i>Pronophila orcus orcus</i> (Latreille, [1813])

Superfamily	Family	Subfamily	Taxon
			<i>Pseudohaetera hypaesia hypaesia</i> (Hewitson, 1854) <i>Steroma aff. bega</i>
	Lycaenidae Hairstreaks	Polyommatainae	<i>Cupido comyntas comyntas</i> (Godart, [1824]) <i>Zizula cyna cyna</i> W. H. Edwards, 1881
		Theclinae	" <i>Thecla</i> " sp <i>Podanotum aff. salaeides</i> (Draudt, 1919) <i>Arawacus togarna togarna</i> (Hewitson, 1867) <i>Calycopsis cerata cerata</i> (Hewitson, 1877) <i>Calycopsis sp1</i> <i>Calycopsis sp2</i> <i>Calycopsis sp3</i> <i>Celmia celmus celmus</i> (Cramer, 1775) <i>Laothus gibberosa gibberosa</i> (Hewitson, 1867) <i>Nicolaea sp</i> <i>Penaincisalia magnifica magnifica</i> (K. Johnson, 1992) <i>Penaincisalia loxurina loxurina</i> (C. & R. Felder, 1865) <i>Rhamma sp</i> <i>Strephonota aff. ericeta</i> (Hewitson, 1867) <i>Symbiopsis beon beon</i> (Stoll, 1780) <i>Theclopsis demeia demeia</i> (Hewitson, 1874) <i>Theritas sp1</i> <i>Theritas lissus lissus</i> (Godman & Salvin, 1887) <i>Theritas sp2</i> <i>Theritas mavors mavors</i> (Hubner [1818]) <i>Theritas sp3</i> <i>Timaeta timaeus timaeus</i> (C. & R. Felder, 1865) <i>Ziegleria hesperitis hesperitis</i> (Butler & H. Druce, 1872)
	Riodinidae Metalmarks	Euselasiinae	<i>Hades noctula noctula</i> Westwood, 1851
		Riodininae	<i>Adelotypa densemaculata densemaculata</i> (Hewitson, 1870) <i>Anteros allectus allectus</i> Westwood, 1851 <i>Calephelis laverna ssp</i> (Godman & Salvin, 1886) <i>Charis aff. anius</i> (Cramer, 1776) <i>Crocozona pheretima pheretima</i> C. & R. Felder, 1865 <i>Detritivora barnesi barnesi</i> (Hall & Harvey, 2001) <i>Emesis cypria cypria</i> C. & R. Felder, 1861 <i>Emesis ocyprora aethalia</i> H.W. Bates, 1868 <i>Eurybia donna donna</i> C. & R. Felder, 1862 <i>Eurybia lycisca lycisca</i> Westwood, 1851 <i>Hyphilaria anophthalma anophthalma</i> (C. & R. Felder, 1865) <i>Ithomeis eulema eulema</i> Hewitson, 1870 <i>Leucochimona aff. vestalis</i> (H.W. Bates, 1865) <i>Leucochimona lagora lagora</i> (Herrich-Schäffer, [1853]) <i>Melanis electron electron</i> (Fabricius, 1793) <i>Melanis marathos ssp</i> C. & R. Felder, 1865 <i>Mesosemia mevania mevania</i> Hewitson, [1857] <i>Mesosemia telegone telegone</i> (Boisduval, 1836) <i>Mesosemia zonalis zonalis</i> (Godman & Salvin, 1885) <i>Metacharis victrix victrix</i> (Hewitson, 1870) <i>Necyria bellona manco</i> Saunders, 1859 <i>Nymphidium aff. cachrus</i> (Fabricius, 1787)

Superfamily	Family	Subfamily	Taxon
			<i>Perophtalma tullius tullius</i> (Fabricius, 1787) <i>Rhetus dysonii ssp</i> (Saunders, 1850) <i>Sarota aff. acantus</i> (Stoll, 1781) <i>Sarota sp</i> <i>Synargis phliasus velabrum</i> (Godman & Salvin, 1878) <i>Thisbe lycorias lycorias</i> (Hewitson, [1853])

### Appendix 3: List of Mammal Species of Magdalena Medio region

By Elkin Briceño

Species list follows Emmons & Feer (1997).

Scientific Name	Common or local name	Locality	Population	IUCN	Use	Observations
<b>MARSUPIALIA</b>						
<b>Didelphidae</b>						
<i>Caluromys lanatus</i>	Ratón Fara	SC-LP	A	NT		Observed in field
<i>Didelphis marsupialis</i>	Fara	SC-LP	A		P-A	Observed in field
<i>Chironectes minimus</i>	Fara de Agua	LP		NT	P	Reported by locals
<b>XENARTHRA</b>						
<b>Myrmecophagidae</b>						
<i>Myrmecophaga tridactyla</i>	Hormiguero Palmero*	SC-LP	F	VU	D	Reported by locals
<i>Tamandua tetradactyla</i>	Oso Hormiguero	SC-LP	C			Observed in field
<i>Cyclopes didactylus</i>	La Gran Bestia*	SC-LP	F			Observed in field
<b>Bradypodidae</b>						
<i>Bradypus variegatus</i>	Perezoso Tres Dedos	SC-LP	C		A	Reported by locals
<b>Megalonychidae</b>						
<i>Choloepus hoffmani</i>	Perezoso Dos Dedos	S	F		A	Reported by locals
<b>Dasypodidae</b>						
<i>Dasypus novemcinctus</i>	Armadillo Nueve Bandas	Todas				Specimen
<i>Cabassous centralis</i>	Armadillo Rabo e Trapo*	LP		DD	A	Reported by locals
<b>CHIROPTERA</b>						
<b>Phyllostomidae</b>						
<i>Carollia sp.</i>	Murciélago frutero	LP	A			Mist-netted
<i>Mesophylla aff. macconnelli</i>	Murciélago Blanquecino	LP	D			Mist-netted
<i>Artibeus sp.</i>	Murciélago Frutero	LP	A			Mist-netted
<i>Desmodus rotundus</i>	Murciélago Vampiro*	SC-LP-CG	C		P	Reported by locals
<b>PRIMATES</b>						
<b>Cebidae</b>						
<i>Cebus albifrons</i>	Mico Cariblanco*	LP	D		M	Reported by locals
<i>Aotus aff. lemurinus</i>	Marteja*	CG - LP	A	VU	M	Observed in field
<i>Aotus griseimembra</i>	Marteja*	UIS		EN		In museum
<i>Ateles hybridus</i>	Marimonda del Magdalena	UIS		CR		In museum
<i>Alouatta seniculus</i>	Mono Aullador o Cotudo*	SC-LP-S	A		A	Sound recorded
<b>CARNIVORA</b>						
<b>Canidae</b>						
<i>Cerdocyon thous</i>	Zorro Perruno*	SC-LP	A		P	Specimen
<b>Ursidae</b>						
<i>Tremarctos ornatus</i>	Oso Andino	CG	D	VU	P-A	Reported by locals
<b>Procyonidae</b>						
<i>Procyon cancrivorus</i>	Mapache	SC	F		P	Reported by locals
<i>Nasua nasua</i>	Guache Tejón*	SC-LP	C		A	Reported by locals
<i>Nasuella olivacea</i>	Guache de Montaña*	S-CG	D	DD	A	Reported by locals
<i>Potos flavus</i>	Maco*	Todas	C		A-S	Observed in field
<b>Mustelidae</b>						
<i>Mustela frenata</i>	Comadreja	SC-LP	C		P	Reported by locals
<i>Galictis vittata</i>	Hurón*	SC	C		P-M	In captivity
<i>Eira barbara</i>	Umba* ó Zorro Gato*	SC-LP	C		P	Specimen
<i>Lontra longicaudis</i>	Nutria*	SC	V	DD	S	Reported by locals

<b>Felidae</b>						
<i>Leopardus pardalis</i>	Tigrillo	SC-LP	U	VU	P-S	Specimen
<i>Leopardus sp.</i>	Tigrillo	CG	U		P-S	Reported by locals
<i>Herpailurus yaguarondi</i>	Yaguarundi					In museum
<i>Puma concolor</i>	León de Montaña*	SC-CG	U	NT	P-S	Reported by locals
<i>Panthera onca</i>	Tigre* - Jaguar		V	NT	P-S	Reported by locals
<b>ARTIODACTYLA</b>						
<b>Tayassuidae</b>						
<i>Tayassu pecari</i>	Bauiro* ó Zaíno	SC-LP		LR	A	Specimen
<i>Tayassu tajacu</i>	Bauiro* ó Zaíno					In museum
<b>Cervidae</b>						
<i>Mazama americana</i>	Venado	SC-LP		DD	A	Reported by locals
<i>Mazama rufina</i>	Venado Locho	S-CG	U	NT		Reported by locals
<b>SIRENIA</b>						
<b>Trichechidae</b>						
<i>Trichechus manatus</i>	Manatí	SC	V	VU		Reported by locals
<b>RODENTIA</b>						
<b>Sciuridae</b>						
<i>Sciurus granatensis</i>	Ardita*	SC-LP	A		P	Specimen
<i>Microsciurus mimulus</i>	Ardita Piojita*	LP	F			Field capture
<i>Microsciurus santanderensis</i>	Ardilla Pioja o Rabicana*	UIS				In museum
<b>Erethizontidae</b>						
<i>Coendou aff. prehensiles</i>	Puerco Espin	SC-LP	F		A	Reported by locals
<i>Coendou aff. quichua</i>	Puerco Espin Andino	S	V		A	Reported by locals
<b>Hydrocheridae</b>						
<i>Hydrochaeris hydrochaeris</i>	Ponche*	SC	C		A	In captivity
<b>Agoutidae</b>						
<i>Agouti paca</i>	Tinajo*	SC-LP	C	NT	A	Specimens
<i>Agouti taczanowskii</i>	Tinajo de Lanás*	S-CG	U	NT	A	Reported by locals
<b>Dasyproctidae</b>						
<i>Dasyprocta punctata</i>	Picure* ó Ñeque*	SC-LP	C		A-P	Reported by locals
<b>LAGOMORPHA</b>						
<b>Leporidae</b>						
<i>Silvilagus brasiliensis</i>	Conejo	SC-LP	C			Observed in field

Key:

Locality:

LP: Cerro de La Paz (1000-1350m: SS2-SS3)  
S: Talismán y Siberia (1300-2000m: SS5a-SS5b)  
CG: Canta Gallos Alto (2000-2500m: SS6)  
UIS: Universidad Industrial de Santander  
SC: Sur del Cesar (100-300m: not in Yariguíes)

IUCN:

CR: Critical  
EN: Endangered  
VU: Vulnerable  
NT: Near-Threatened  
DD: Data Deficient

Local use:

A: Food  
P: Hunting for pest control  
S: Skins / hides  
M: Mascotas = Pets  
\* Local name

Population

A: Abundant  
C: Common  
F: Fairly Common  
U: Uncommon  
V: Very uncommon

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**Appendix 4: Budget**

Available on request.

