

Conservation of Quail in the Neotropics

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Rapid Assessments and Conservation of Quail along Three Altitudinal Transects in the Colombian Andes

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Valoraciones Rápidas y Conservación de Odontophoridos a lo largo de Tres Transectos Altitudinales en los Andes Colombianos - Las prospecciones de Valoración Biológica Rápida fueron dirigidos por equipos de ornitólogos en diferentes cotas a lo largo de tres transectos altitudinales, uno en cada una de las Cordilleras Occidentales, Centrales y Orientales de Colombia. Las prospecciones se realizaron en las siguientes localidades: (I) siete sitios a 180–3500 m a lo largo de la vertiente Pacífica Andina en el Dpto. Nariño; (II) siete sitios a 350–2500 m a lo largo de la vertiente Amazónica de la Cordillera Oriental en la Serranía de Los Churumbelos, Dpto. Cauca; y (III) tres sitios a 300-1550 m en la vertiente Caribeña de la Cordillera Central, Dpto. Antioquia. El trabajo de campo incluyó el uso de redes de niebla y observaciones de campo a través de 2-5 observadores, complementado con entrevistas informales con personas locales (principalmente cazadores). Un total de 6 especies de Odontophoridos se registraron en los tres transectos Andinos. Muy importante y nueva información ecológica y de distribución ha sido obtenida para algunas de las especies en peligro y menos conocidas del Neotrópico, especialmente *Odontophorus hyperythrus* y *O. melanonotus*. Con el beneficio de información biológica adicional de otros taxa (aves y no aves), se han producido valoraciones de conservación para cada uno de las tres regiones estudiadas. Siguiendo nuestra investigación, se han establecido reservas naturales en el transecto Nariño (Río Ñambí) y Noreste de Antioquia (La Forzosa) y una extensión del Parque Nacional se propone abarcar partes de la Serranía de Los Churumbelos, como resultado de nuestro trabajo allí.

Rápido Levantamento e Conservação de Odontophoridos em Três Transectos Altitudinais nos Andes Colombianos - Rápidos levantamentos biológicos foram conduzidos por equipes de ornitologistas em degraus elevacionais ao longo de três transectos altitudinais, um na Cordilheira Colombiana Oeste, outro na Central e outro na Leste. Os estudos foram conduzidos nas seguintes localidades: (I) sete locais a 180 – 3500 m ao longo da encosta Andina Pacífica em Nariño; (II) sete locais a 350 – 2500 m ao longo da encosta amazônica da Cordilheira Leste em Serranía de los Churumbelos, Cauca; e (III) três locais

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a 300 - 1550 m na encosta caribenha da Cordilheira Central, em Antioquia. A metodologia de trabalho de campo incluiu rede de neblina e observações em campo por 2 a 5 observadores e entrevistas informais com pessoas das comunidades locais (principalmente caçadores). Um total de 6 espécies de Odontophoridos foram registradas nos três transectos andinos. Foram coletados novos dados de distribuição e informações ecológicas para muitas espécies neotropicais pouco conhecidas, especialmente *Odontophorus hyperythrus* e *O. melanonotus*. Com a informação biológica adicional para outros táxons (aves e não-aves), planos de conservação têm sido elaborados para cada uma das três regiões estudadas. Após nossas pesquisas serem feitas, reservas naturais foram estabelecidas no transecto de Nariño (Rio Ñambí) e ao noroeste de Antioquia (La Forzosa) e uma extensão de um Parque Nacional foi proposta para englobar partes da Serranía de los Churumbelos.

ABSTRACT

Rapid Biological Assessment surveys were conducted by teams of ornithologists at elevational steps along 3 altitudinal transects, 1 on each of the Western, Central and Eastern Cordilleras of Colombia. Surveys were conducted at the following locations: (1) 7 sites at 180–3,500 m along the Pacific Andean slope in Dpto. Nariño, (2) 7 sites at 350–2,500 m along the Amazonian slope of the Eastern Cordillera in Serranía de los Churumbelos, Dpto. Cauca; and (3) 3 sites at 300-1,550 m on the Caribbean slope of the Central Cordillera, Dpto. Antioquia. Fieldwork methodologies included mist netting and field observations by 2-5 observers, supplemented with informal interviews with local people (mainly hunters). A total of 6 quail species were recorded across the 3 Andean transects. Much new distributional and ecological information have been collected on some of the Neotropics' most poorly known and endangered species, notably Chestnut Wood-quail (*Odontophorus hyperythrus*) and Dark-backed Wood-quail (*O. melanonotus*). With the benefit of additional biological information for other taxa (avian and non-avian), conservation assessments have been produced for each of the 3 regions. Following our research, nature reserves have been established in the Nariño transect (Río Ñambí) and Northeast Antioquia (La Forzosa) and a National Park extension is proposed to encompass parts of Serranía de los Churumbelos following our work there.

Colombia lies in the northwest corner of South America at the base of the Central American isthmus. It stretches from the Caribbean Sea to the Río Amazon, and from the Río Orinoco to the Pacific Ocean, covering 1,141,748 km². The western half of the country encompasses the northern Andean mountain chain, featuring the most complex topography in South America. This topography supports an extremely wide variety of ecosystems and high levels of endemism localized to specific parts of the country. Colombia contains a large proportion of the planet's biodiversity, including ~20% of all bird species (1,850 species), in what is just 0.77% of the Earth's land surface.

Quail are ecologically important primary forest birds, but are highly susceptible to human disturbance from both hunting and habitat destruction. Odontophoridae in the northern

Neotropics include a large number of range restricted Sub-Andean and Andean forest-dependant species, many of which are threatened. They are also a frequent target of hunting and are highly sensitive to human impact.

Because of the conservation priority of many quail species, and their potential use as 'figurehead species', targeted searches were made for species potentially present at study sites. The projects, Colombia '91, Colombia '92, Colombia '93, Colombia '98 and Colombian EBA Project '99 were Anglo-Colombian student initiatives, which conducted rapid biodiversity surveys and conservation assessments along 3 transects in the Colombian Andes: (1) Western Nariño (West Andes), (2) Serranía de los Churumbelos (East Andes) and (3) Northeast Antioquia (Central Andes).

STUDY REGIONS

I. Western Nariño – Pacific Coast of the Western Andes

The Chocó Endemic Bird Area (EBA), situated on the Pacific slope of the Western Andes in Colombia and northwestern Ecuador, contains the most species rich biological communities in the world (Salaman, 1994). It supports 64 endemic bird species and over 150 endemic bird taxa, more than any mainland EBA in the world. Seventeen of these endemic species are threatened. The Chocó EBA is still considered 1 of the least biologically known regions in the Neotropics. However, deforestation accompanying Colombia's rapid demographic and economic growth is estimated at 100,000 ha/year for southwestern Colombia alone (Salaman, 1994). The Chocó EBA is consistently considered the world's most biologically unique and critically endangered ecosystem by global and regional conservation assessments – it is the world's most important conservation priority.

Seven study sites along the western slope of the Western Andes in western Nariño, encompassed the following broad biogeographical zones:

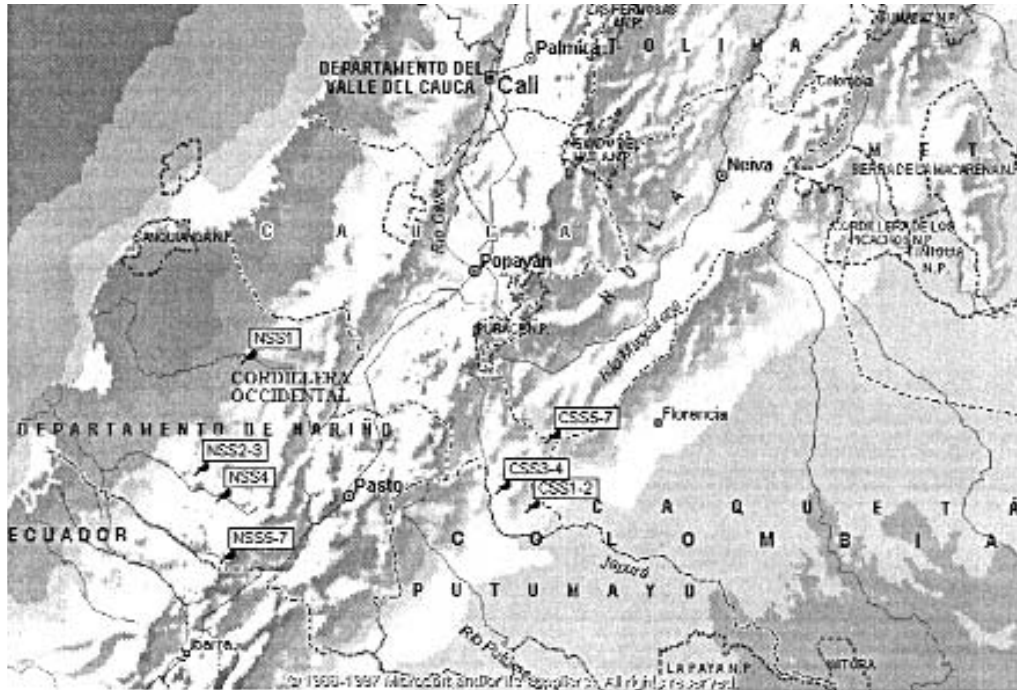
- Equatorial Pacific plain - extends from the Pacific Ocean coast eastwards across the lowland humid forest plain to the base of the Andean foothills (0-500 m).
- Sub-Andean foothills - rising from the wide Pacific plain at ~500 m, the Sub-Andean foothills lie in between with the lowlands and base of the High Andes which start at ~2,000 m.
- High Andes - above 2,000 m in the Nudo de los Pastos Massif, being dominated by volcanoes Cumbal, Chiles, Galeras and Azufral, which all tower over 4,000 m.

Western Nariño Study Sites

A total of 7 Nariño Study Sites (NSS) were investigated during 3 expeditions (Fig. 1). Detailed descriptions of physical geography, vegetational types, itinerary of dates and additional information are described in Salaman (1994).

NSS1: Laguna del Trueno (29 July-14 August 1993), Municipality of Barbacoas, Nariño (1° 21' N, 77° 57' W; 180 m); tropical lowland humid forest. This site is by a large lake situated in one of the most remote locations in western Colombia. There has been little human activity around the lake, owing to its inaccessibility and local myths concerning it. An extensive tract of pristine tropical, very humid forest encompasses the lake and surrounding foothills, with many evergreen emergent and canopy trees > 35 m high.

Figure 1. Nariño and Churumbelos study regions



NSS2: Patio (2-18 August 1992, and 11-24 July 1993), Junín, Municipality of Barbacoas, Nariño (1° 27' N, 78° 01' W; 500 m); tropical foothill pluvial forest. A small clearing 15 km north of Junín is set in moderately undisturbed forest on the Andean foothills beside the Río Ñambí. Fieldwork was conducted in a large block of primary tropical pluvial forest around a small clearing and tall secondary forest. The tropical pluvial forest is characterized by a high canopy (> 25 m), high floral diversity, but lower epiphyte density than NSS3.

NSS3: Río Ñambí (7 August-3 September 1991 and 4-25 July 1992), Altaquer, Municipality of Barbacoas, Nariño (1° 18' N, 78° 05' W; 1,400 m); premontane pluvial forest (7,100 mm/yr rainfall). Located 2.5 km from El Barro on the Pasto-Tumaco highway. This habitat is unique and only found in 2 narrow bands within the Chocó EBA. The Río Ñambí area supports predominantly primary forest, which is characterized by a moderately high canopy level (~20-25 m), very high levels of epiphytes and many palms. The high representation of palms is typical for many pluvial forests in the Neotropics.

NSS4: La Planada Nature Reserve (25 July-4 August 1991), Municipality of Ricaurte, Nariño (1° 07' N, 77° 54' W; 1,850 m), upper premontane very humid forest (4,600 mm/yr rainfall). La Planada NR (1,800 ha) is located above Ricaurte, on a large plateau of largely secondary forest and surrounded by forested slopes that descend into the Río Güiza and Río Flora. The forests contain a high species diversity and local plant endemism with an abundance of epiphytes (particularly Orchidaceae).

NSS5: San Felipe (24 August-2 September 1992), Volcán Chiles, Municipality of Chiles, Nariño (0° 51' N, 78° 07' W; 2,250 m); lower montane humid forest. Located 15 km west of El Tambo on the Chiles-Mayasquer road, San Felipe consists of 2 small fragmented montane humid forest patches, in a steep river valley. The forests were heavily disturbed, being deforested for timber, firewood, and pasturelands. The montane humid “cloud” forest is characterized by a low canopy (~10-20 m), heavily festooned with epiphytes and scattered patches of mountain bamboo (*Chusquea* sp.).

NSS6: La Ceja (5-14 September 1992), Volcán Chiles, Municipality of Chiles, Nariño (0° 50' N, 78° 03' W; 2,700 m); montane humid “cloud” forest. La Ceja is a small forest plateau above the Río Blanco valley, 10 km west of El Tambo, which has been deforested with the exception of a small ~50 ha sized montane, very humid “cloud” forest fragment. The forest is characterized by a gnarled and stunted appearance, low canopy (10 - 15 m), and extremely heavily moss- and epiphyte-laden trees. Dense mountain bamboo (*Chusquea* sp.) thickets dominate the understory.

NSS7: El Tambo (7-23 July 1991), Volcán Chiles, Municipality of Chiles, Nariño (0° 52' N, 77° 58' W; 3,100-3,800 m); upper montane humid forest, wet páramo and *Polylepis* woodland. Located 5 km northwest of the Volcán Chiles peak, the site consists of *Polylepis* woodland and wet páramo grassland in the Río Blanco watershed. Fieldwork was undertaken in 3 main areas: treeline of humid montane forest (3,100 m), 2 large fragments of *Polylepis* woodland (3,400-3,600 m), and the surrounding extensive area of páramo (3,100-3,800 m). The forest is characterized by a low canopy, gnarled and stunted appearance with many epiphytes.

II. Serranía de los Churumbelos – Amazonian Slope of the Eastern Andes

The Eastern Andes extend from Serranía de Perijá (10° 30' N) to Mocoa (1° 09' N), with an average ridgeline of 2,500 m, and is the widest of the 3 Andean cordilleras that characterize Colombia. At ~1° 32' N, the Eastern Andes divide, with the main ridge, Picos Fragua, linking to the Cordillera Central to form the watershed for the headwaters to the Río Magdalena. A second range spurs southwards and abruptly ends at the Río Caquetá to form the Serranía de los Churumbelos. This southern extremity of the Eastern Andes is 60 km long, 25-30 km wide at the base, and rises to ~2,800 m, with an average ridgeline of 1,500 m. The serranía is a sedimentary anticline characterized by limestone remnants forming large flat “mesetas.” The eastern flank abruptly rises from the flat Amazonian plain at 250 m and ascends to over 1,500 m altitude.

Serranía de los Churumbelos Study Sites

During July-August 1998 and 1999, 7 largely primary forest study sites (CSS) within 1 continuous tract of primary forest covering the serranía were investigated (Fig. 1). Intensive observation and mist netting surveys were conducted for an average 6 days, at ~300 m elevational steps from 350-2,450 m. Detailed descriptions of physical geography and vegetational types, itinerary of dates and additional information are described in Salaman and Donegan (in prep.).

CSS1: Puerto Bello (14 - 21 July 1998), Municipality of Piamonte, Dpto. Cauca (1° 08' 14" N, 76° 16' 55" W; 350 m); tropical lowland humid forest (~3,000 mm rainfall/year) situated in the westernmost Amazonian lowlands, the base of the Churumbelos foothills. A new road had been constructed to the hamlet of Puerto Bello in the last 5 years and deforestation was evident along the roadside. A 1,200 m transect extended from the forest edge through a transition of tall secondary forest to primary forest with a canopy at ~30 m.

CSS2: Río Nabueno (24-30 July 1998), Municipality of Piamonte, Dpto. Cauca (1° 06' 48" N, 76° 24' 86" W; 700 m); an extensive tract of primary tropical foothill humid forest (~4,000 mm rainfall/year) on a steep eastern flank of Serranía de los Churumbelos. An old hunters' trail climbing steeply from Río Nabueno to a flat ridgetop formed the transect. The structure of the vegetation is strongly influenced by the high rainfall and steep terrain, resulting in a relatively low canopy (~20 m) and dense understory.

CSS3: Alto Río Hornoyaco (3-9 August 1998), Municipality of Santa Rosa, Dpto. Cauca (1° 13' 59" N, 76° 31' 58" W; 1,100 m); tropical premontane very humid forest (~ > 4,000 mm rainfall/year). The southern base of Serranía de los Churumbelos rises steeply from the Caquetá valley and is heavily dissected by several southward-flowing streams, including the Río Hornoyaco. A 700 m transect ran through 400 m of primary forest on steep slopes, then into dense young secondary forest (3-5 year growth) up to a 4-ha pasture clearing. This forest was similar in floristic composition and stratifications to montane forest.

CSS4: Villa Iguana (11-17 August 1998), Municipality of Santa Rosa, Dpto. Cauca (1° 14' 18" N, 76° 31' 11" W; 1,450 m); tropical lower montane humid (cloud) forest (~3,000 mm rainfall/year). The transect extended 800 m over a plateau between 2 mesetas, and brief surveys of Alto Cagadero meseta at 1,600 m were also undertaken. The forest at this site contains many elements characteristic of higher elevations, such as high abundance and diversity of vascular epiphytes, bryophytes and a low canopy (~12 m).

CSS5: Nabú (4 - 9 July 1999), Municipality of Santa Rosa, Dpto. Cauca (1° 36' N, 76° 16' W; 1,900 m); tropical lower montane humid forest (~2,500 mm rainfall/year). The northwestern flank of the Serranía de los Churumbelos is flanked by the Río Villalobos and Mocoa-Pitalito Highway. Our transect extended 800 m along a ridge of primary forest characterized by a dense understory, dense arboreal epiphytes, and a canopy of ~20-25 m dominated by white oak (*Quercus* spp.).

CSS6: Tatauí (10-14 July 1999), Municipality of Santa Rosa, Dpto. Cauca (1° 37' N, 76° 16' W; 2,250 m); tropical montane cloud forest (~2,500 mm rainfall/year). Ascending 2 km above CSS5, a 600 m transect along a flat ridgeline was studied. This site's dense, low understory (~3 m high) was dominated by terrestrial bromeliads and *Sphagnum* spp. mosses, had a canopy of ~7 m and is a stunted forest physiognomy, similar to treeline elfin forest influenced by perpetual mists and strong lateral winds.

CSS7: El Dorón (16-20 July 1999), Municipality of Santa Rosa, Dpto. Cauca (1° 40' N, 76° 14' W; 2,500 m); tropical upper montane humid (cloud) forest (~2,000 mm rainfall/year). Situated on a ridge at the head of the Serranía de los Churumbelos and the Río Magdalena valley, our transect ran from a clearing through primary forest with some selective logging. The forest physiognomy was dominated by stunted white oak to ~15 m with large canopy epiphyte burdens, and an understory dominated by flowering Ericaceae, epiphytes and bushes.

III. Northeast Antioquia – Caribbean Slope of the Central Andes

The Central Cordillera of Colombia is a 750 km long mountain range that spurs northward from the bifurcation of the northern Andes at the Macizo Colombiano (~2° N). The Central Cordillera's diverse topography, broad altitudinal span and great climatic variations support a wide variety of ecosystems and associated high levels of endemism. Topographical and ecological isolation from other Andean ranges by the Cauca and Magdalena river valleys, which flank the Cordillera, has accentuated local endemism. Above 1,000 m amsl, the ~41,000 km² Central Cordillera supports 29 Endemic Bird Area species: one of the greatest concentrations of montane, range restricted bird species in the world.

The Central Cordillera's rich volcanic soils and mild climate have attracted human colonization and exploitation for many centuries. Cultivation of Colombia's most important economic commodity, coffee, is based on the subtropical slopes of the Central Cordillera. Today, this supports the greatest population concentration in the country, including major cities such as Medellín, Ibagué, Pereira and Armenia. During the past century, relatively good infrastructure has encouraged many bird collectors to explore the Central Cordillera.

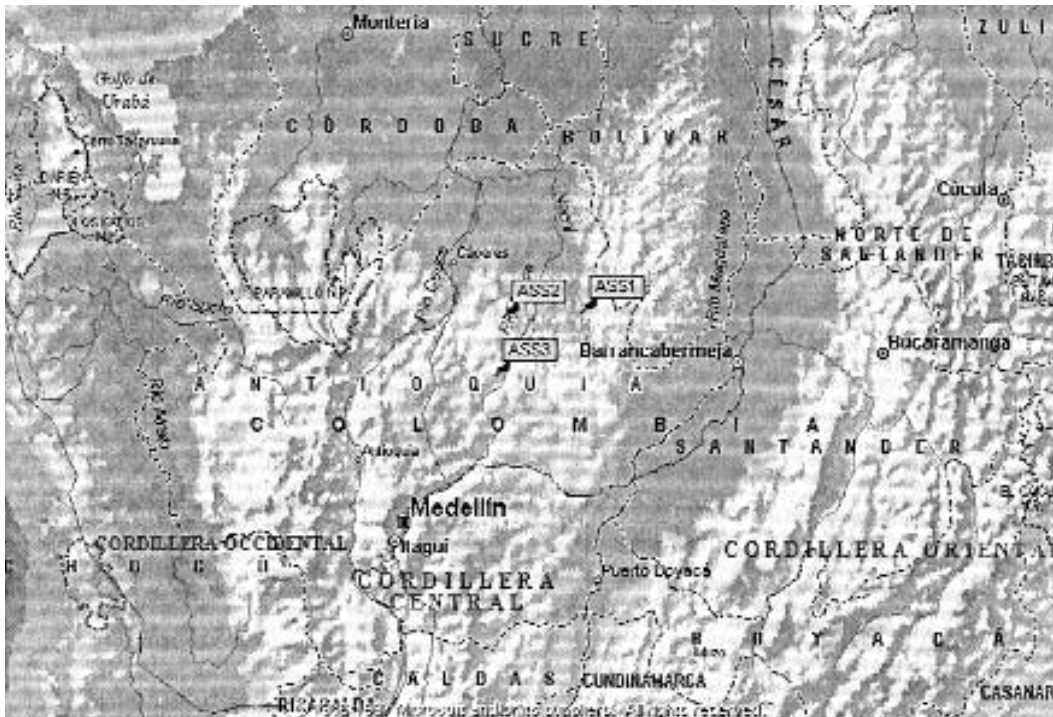
Northeast Antioquia Study Sites

Three Antioquia study sites (ASS) were investigated in 1999 (Fig. 2). Details of other biological and conservation results are presented in Donegan and Salaman (1999).

ASS1: Apollo 13 (3-8 August 1999), Finca La Esperanza, Vereda Río Bagre, Municipality of Segovia, Dpto. Antioquia (7° 21' 14" N, 74° 40' 95" W; 300 m); lowland humid forest (~2,000 mm rainfall/year) located southeast of Puerto Lopez. A lowland forest patch (~1,500 x 500 m) straddling 3 ridges formed the basis of our transect. The canopy was ~35 m with emergents to ~40 m. The understory was sparsely vegetated, although characterized by dense *Heliconia* spp. thickets, spiny palm clusters, and a low diversity of epiphytes.

ASS2: Alto Los Tarros (20-24 August 1999), Reserva Regional Bajo Cauca-Nechí, Vereda La Tirana, Municipality of Anorí, Dpto. Antioquia (7° 18' 49" N, 75° 05' 85" W; 800 m); foothill humid forest (~3,000 mm rainfall/year), lying between the Río Anorí and Río Nechí in an extensive forest fragment (~45,000 ha). The forest physiognomy is similar to SS1, although with lower vegetation strata (canopy ~30 m), more broken canopy by treefalls on steep slopes, higher epiphyte diversity and notably more understory woody stem plants.

Figure 2 Study sites on the Caribbean slope of the Central Andes



ASS3: Alto Combate (26-29 August 1999), Reserva Regional La Forzosa, Vereda Las Ánimas, Municipality of Anorí, Dpto. Antioquia (6° 59' 58" N, 75° 08' 33" W; 1,550 m). Premontane humid forest (~3,000 mm rainfall/year). The Quebrada La Soledad watershed, beside the Medellín–Anorí road, encompasses 300 ha of primary forest. Surveys were conducted through the dense understory of ridgetop forest that was stunted and gnarled, and influenced by strong lateral winds (reminiscent of CSS6), with a canopy height from 5-8 m, and epiphytes abundant, especially mosses, lichens and bromeliads. Vegetation in the valleys as typical of forest at 1,500 m., with a canopy to ~20 m and a moderately dense understory composed of woody stem bushes and sparse herbaceous cover, with a moderate abundance of arboreal epiphytes.

SURVEY METHODS

We used mist nets, sound recording and direct observation along transects at each site with the objectives of: (1) collecting standardized and replicable data rapidly, (2) documenting the species composition and biological variation, and (3) producing conservation priorities across the region. To determine the composition of bird communities at each study site, a 3-fold standardized effort was used by 2-5 ornithologists: Western Nariño (PGWS, David Gandy, Anthony Payne, and Carl Downing), Serranía de los Churumbelos (PGWS, TD, AC, Liliana Dávalos and Dan Davison); and Northeast Antioquia (PGWS, TD, AC, JO). The following methodology is relatively simple and easily used:

1. Intensive diurnal non-systematic field observations, supplemented with sound recording. Observations were maximized in the morning (0530-1000 h) and late evening (1700-2000 h).
2. Diurnal mist netting (up to 450 m length of net) at each site: This method consistently proved indispensable in surveying understory bird species. However, it unlikely of such relevance to quail, although 2 species of *Odontophorus* were caught.
3. Interviews with local people, especially hunters: Interviews focused on recognisable and frequently hunted species, principally quail. Local names were transcribed using plates from Hilty and Brown (1986).

The 3 methods complemented each other well to produce a rapid and reliable firsthand assessment of each site by combining the aims of producing standardized field data with a targeted search of threatened species. All sound recordings have been deposited with Wildlife Sounds (The British Library, London) and selected photographs deposited with VIREO (Philadelphia, PA, USA).

Although we attempted to produce population estimates at some sites, it quickly became apparent that various population assessment methods were unsuitable for such a rapid assessment. Point counts and variable circular plots would be inaccurate in such a short period of time, and would create biases against elusive quail. With targeted intensive, non-systematic observation data relatively constant at each site, a more complete inventory was achieved without the constraints of routine transects. However, meaningful encounter rates in terms of individuals were noted where possible in terms of Mist Net Hours (MNH) or encounters/day of observation.

RESULTS

I. Western Nariño - Pacific slope of the West Andes

In Western Nariño, a total of 525 bird species were recorded in 348 person-days of field-work (148 days), and included 3 *Odontophorids* (Table 1).

In the lowlands, widescale species such as Rufous-fronted Wood-quail (*Odontophorus*) were recorded infrequently in primary forest. *O. erythrops* is replaced above 1,000 m by the threatened Dark-backed Wood-quail (*Odontophorus melanonotus*), which is locally common from 1,200 -1,900 m in primary forest. Much new breeding biology and ecology information has been collected on *O. melanonotus*. Details of all biological results from these sites are found in Salaman (1994).

Table 1. Quail records at 7 study sites in Western Nariño - West Andes in 1998 and 1999

Species	NSS1	NSS2	NSS3	NSS4	NSS5	NSS6	NSS7
<i>Odontophorus erythrops</i>	U	R					
<i>Odontophorus melanonotus</i>			C	C			
<i>Rynchortyx cinctus</i>	U						

Sites: NSS1 = Laguna del Trueno (170 m), NSS2 = Patio - Municipio Barbacoas (500 m), NSS3 = Rio Nambi - Municipio Barbacoas (1,400 m), NSS4 = La Planada N.R. - Municipio Ricaurte (1,850 m), NSS5 = San Felipe - Municipio Chiles (2,250 m), NSS6 = La Ceja - Municipio Chiles (2,700 m), NSS7 = El Tambo - Municipio Chiles (3,100-3,500 m).

Abundance: R = Rare (only 1 observation), U = Uncommon (2-10 records), C = Common (1-10 individuals daily).

II. Serranía de los Churumbelos - Amazonian slope of the East Andes

A total 421 bird species were recorded during 192 person-days throughout the Serranía. These included 2 quail species (Table 2).

Table 2. Quail records at 7 study sites in Serranía de los Churumbelos - East Andes in 1998 and 1999

Species	CSS1	CSS2	CSS3	CSS4	CSS5	CSS6	CSS7
<i>Odontophorus gujanensis</i>	C	C					
<i>Odontophorus hyperythrus</i>				R	U	U	C

Sites: CSS1 = Puerto Bello (300 m), CSS2 = Rio Nabueno (700 m), CSS3 = Alto Rio Hornoyaco (1,100 m), CSS4 = Villa Iguana (1,450 m), CSS5 = Nabú (1,900 m), CSS6 = Tatauí (2,200 m), CSS7 = El Dorón (2,500 m).

Abundance: R = Rare (only 1 observation), U = Uncommon (2-10 records), C = Common (1-10 individuals daily).

Marbled Wood-quail (*Odontophorus gujanensis*) was confirmed below 700 m. The near-threatened and Colombian endemic Chestnut Wood-quail (*Odontophorus hyperythrus*) was heard at sites from 1,400-2,500 m. Details of other biological results are presented in Salaman and Donegan (in prep.).

III. Northeast Antioquia ~ northern slope of the Central Andes

In Northeast Antioquia, a total of 318 bird species were recorded in 60 person-days of fieldwork. Despite spending considerably less fieldwork time here than at the previous transect, 4 species of quail were registered (Table 3).

Table 3 - Quail records at 5 study sites in Northeast Antioquia - Central Andes in 1998 and 1999

Species	ASSA	ASSB	ASS1	ASS2	ASS3
<i>Colinus cristatus</i>	C				
<i>Odontophorus gujanensis</i>			U	S	
<i>Odontophorus hyperythrus</i>					S
<i>Rynchotyx cinctus</i>				R	

Sites: ASSA = Puerto Lopez - 2nd growth (200-400 m), ASSB = Anori to Cruces - 2nd growth (600-1,600 m), ASS I = Finca La Esperanza - Segovia (350 m), ASS2 = Alto los Tarros - Municipio Anori (700 m), ASS3 = Reserva La Forzosa - Anori (1,550 m). Abundance: R = Rare (only 1 observation), U = Uncommon (2-10 records), S = Seen regularly (every 1-2 days), C = Common (1-10 individuals daily), H = Unconfirmed records (reported by local people); C = Photographed in captivity.

In the lowlands, Crested Bobwhite *Colinus cristatus* was recorded in degraded habitats (i.e., pasture) and secondary forest. Marbled Wood-quail was notably common in the 2 lowland sites (300 and 800 m), but was replaced by Chestnut Wood-quail at 1,500 m as in the Churumbelos. General ornithological results are presented in Salaman et al. (1999).

Species Accounts

For each species, our data is presented, followed by a conservation assessment of the species needs.

Crested Bobwhite (*Colinus cristatus*) - Common and widespread in Colombia. Several birds were seen beside and along the road between El Bagre and Puerto López in pastureland.

Marbled Wood-Quail (*Odontophorus gujanensis*) - This species is not considered at risk, being common throughout the humid forest lowlands of Amazonia and northern Colombia (Hilty and Brown, 1986). Large groups (6-10 individuals) were observed on several occasions foraging in the leaf litter of primary forest at CSS1 and CSS2, and also at ASS1 in disturbed primary forest. Flocks were often encountered along mist net rides, and on several occasions were flushed into nets, though they frequently “bounced out” and escaped. At CSS2, 2 individuals were successfully captured in mist nets (mean = 316 g, S.D. = 1.41).

Rufous-fronted Wood-Quail (*Odontophorus erythrops*) - This pacific lowlands specialist was heard calling and tape recorded at dawn in primary forest at NSS1 (uncommon) and NSS2 (rare).

Chestnut Wood-Quail (*Odontophorus hyperythrus*) - The near-threatened *O. hyperythrus* is a Colombian endemic, restricted to 3 disjunct subpopulations in the Western Cordillera, northwestern Central Cordillera and head of the Magdalena valley in Huila. It is uncommon and local in montane humid forest at elevations of 1,600-2,700 m (Hilty and Brown, 1986). The total population is unknown, but has been estimated to total < 10,000 in 3 subpopulations (McGowan et al., 1995), although this figure is considered to be greatly underestimated (PGWS pers. obs.). Further degradation because of agricultural expansion is projected for the Central Andes, and slopes of the Cauca and Magdalena Valleys are now characterized by pasture, coffee, banana, and sugarcane plantations and a few remnant (largely secondary) forest patches (Collar et al., 1992; Wege and Long, 1995).

This species was identified by hunters as being present about CSS4, CSS5 and CSS6. We confirmed the presence of the species at CSS4 (heard), CSS5 (seen and heard), CSS6 (heard) and CSS7 (heard and tape recorded). One hunter distinguished between this species and similar *O. gujanensis*, correctly pointing out the elevational segregation of the 2 species. The species was regularly recorded almost daily in the morning at CSS7, with probably 2 family groups occurring along the 1,000 m transect of heterogeneous forest dominated by the Colombian endemic oak, *Quercus humboldtii*. *O. hyperythrus* was commonly heard by PGWS in humid primary forest in July 1994 at PNN Cueva de los Guácharos, Dpto. Huila (1° 35' N, 76° 00' W).

At least 2 flocks of *O. hyperythrus* were audible from the ridgetop section of our transect at ASS3. Groups were heard calling regularly, especially in the morning (0600 - 0800 h). Further records from the same fragment (Cuervo et al., 1999) show that the species is present throughout the reserve from 1,500-1,850 m. La Forzosa is thus a critically important site for the particularly endangered Central Andean subpopulation.

Recent records of *O. hyperythrus* from the Western Andes population come from Tambito Nature Reserve, Pacific slope of the Cordillera Occidental, Dpto. Cauca (2° 32' N, 77° 00' W) at 1,800-2,000 m, where individuals can be heard regularly and are considered fairly common (TMD, PGWS). However, *O. hyperythrus* is replaced in Nariño by Dark-backed Wood-quail, which was recorded at NSS3 and NSS4.

These 3 locations redefine the northern, western and southern limits of this species' range. The Churumbelos records present a small geographical range extension from populations at the head of the Magdalena valley, but a more noteworthy ecological extension, being the first records for the eastern (amazonian) slope of the East Andes. As the head of the Magdalena Valley appears not to be the southern limit of this subpopulation, the species' range may extend further south into the Dpto. of Nariño and Putumayo and possibly into

northern Ecuador. Our records from Antioquia represent a northerly range extension for this Colombian endemic, with previous records only as far north as Medellín in the Central Cordillera. Records from Tambito Nature Reserve, Cordillera Occidental are the southwesternmost records, a small range extension from PNN Munchique.

Dark-backed Wood-Quail (*Odontophorus melanonotus*) - This species, a wet subtropical forest specialist found from 1,100-1,900 m, is endemic to the western Andes of southwestern Colombia and northwestern Ecuador. This species is fairly common (by voice) in wet primary forest where there is little or no hunting pressure. The population is estimated to be between 10,000-20,000 individuals, although declining over its extremely restricted range.

Records of pairs and family groups of up to 10 birds were observed daily or located by their characteristic 'corcovado' song at NSS3. The species was fairly common at NSS4. Groups are particularly vocal at dawn during the wet season (March-June), when it is considered that an area of 100 ha supports ~2-3 groups (probably at least 2-3 pairs), exclusively in undisturbed, closed canopy forest. Chicks have been observed and caught in July and August. Birds feed on terrestrial invertebrates and fruits.

On 19 August 1993, a family of 5 adults and at least 3 newly hatched chicks (~2 days old) were encountered in the dense undergrowth of primary forest at NSS3. Several adults were distressed and aggressive, calling frantically (recordings deposited with Wildlife Sounds, The British Library), and approached PGWS to < 1 m with wings outstretched. A description and photographs (deposited with VIREO) were taken of 1 chick that was caught. Three adults were caught at NSS3 at dawn (on 2 mornings), probably descending from roosting trees. Each bird was measured (mean wt = 256 g), banded and released after photographs.

Deforestation is the principal threat to this species which is sensitive to human intervention. It is regularly shot for food, although largely opportunistically, and not targeted for hunting. Large wilderness areas remain in the species' narrow elevational range, but road infrastructure improvements and developments coupled with commercial logging pressures in the past decade have surely resulted in a sharp decline for the species.

Tawny-faced Quail (*Rhynchortyx cinctus*) - This secretive, poorly known and uncommon species is known from the Pacific slope of Honduras south to northwest Ecuador with records extending across the humid lowlands of northern Colombia (Hilty and Brown, 1986). At ASS2, a pair was observed foraging along the primary forest transect, and when surprised, they flew into dense understory calling soft whistles. Pairs and small groups were observed uncommonly in mature, closed-canopy forest with open understory at NSS1.

CONSERVATION PRIORITIES

Western Nariño

The forests of the southern Chocó EBA have long been sustainably used by the Awá indigenous people. However, upon the completion of the Pasto-Tumaco Highway in 1995, along with other projects of the Colombian Government's "Plan Pacifico" development effort, the region rapidly began to be used unsustainably. Its megadiversity is being exploited by the loss of large quantities of precious metals, minerals, and fine timbers. Within the past decade, the forest wilderness of the Colombian Pacific has radically changed as road construction, associated colonization and deforestation, and economic development escalate uncontrolled. At present, there is an inadequate proportion of the Chocó EBA foothill and premontane forests protected, despite this region supporting one of the world's biologically richest centers of endemism.

The Pasto-Tumaco Highway has seemingly brought prosperity and greater material wealth to those along its path. However, the environmental devastation it has wreaked is irreversible. After the removal of timber, extreme rainfall rapidly erodes the volcanic-enriched soils. Brief prosperity vanishes and local people are left even deeper in poverty. To survive under these harsher circumstances, people have leaned more heavily on the remaining forests, logging for cash and hunting for food.

Conservation feasibility - The extraordinary diversity and richness of the Chocó EBA's fauna and flora in western Nariño reflect both its geographical position and isolation on the equatorial Andes and extreme levels of annual rainfall. The resulting diverse topography and lush vegetation on the Pacific slope of the Andes have created a dense stratum of strikingly unique habitats with associated dependent fauna.

Interviews with hunters demonstrated that populations of *Odontophorous* species were more abundant 20 years ago and that hunting for food with shotguns resulted in a steep decline in numbers in even primary forests. The montane forest sites of NSS5, NSS6, and NSS7 have little value for quail. NSS4 (La Planada Nature Reserve) has been protected for almost 2 decades and contains a healthy population of *O. melanonotus* as well as many other endemic bird species. Unfortunately, the reserve is increasingly isolated as forests outside of the reserve's "zone of influence" have largely been heavily exploited for timber and colonized.

The wettest forests (NSS2 and NSS3) support some of the greatest concentrations of endemic avifauna ever recorded on earth, and also populations of the endemic and threatened *O. melanonotus*. Priority should be given to these forests, as they are particularly susceptible to human degradation through deforestation, mining, and colonization.

As a result of the Rapid Biological Assessments, the Rio Ñambí Conservation Programme commenced with the creation of the Rio Ñambí Community Nature Reserve in 1992 with

the help of local and international conservation NGOs. The reserve is owned and managed by the community of Altaquer (a local village) and helps to protect a substantial population of *O. melanonotus*. Further ornithological research is recommended, concentrating on the lowland and foothill areas of western Colombia.

Serranía de los Churumbelos

The eastern slope of the Andes in Colombia was once an unbroken continuum of humid forest propagated by high precipitation from Amazonian convectional cloud formations. Exceptionally steep terrain has until recently deterred human colonization and development. Since the 1960s, the Colombian government undertook massive infrastructural development with road construction projects aimed at providing access to exploit the vast Llanos and Amazonian regions that comprise over half of Colombia's land area. Presently, 5 main routes penetrate the lowlands from the High Andean interior, with a major highway being constructed along the entire eastern Andean foothills of Colombia that will connect Ecuador to Venezuela. Increased and improved access routes have stimulated the destruction of mature tropical forests for pasture lands and petroleum exploitation. Deforestation rates in lowland moist forest on foothills of the eastern Andes of Colombia are rapidly accelerating from 1.4% (1961-1979) to 4.4% (1979-1988) and are correlated with increasing human population density (Viña and Cavelier, 1999).

Despite mounting human pressures on the eastern slope of the Andes in Colombia, research activities have largely neglected this region, owing to fears regarding political instability and the widespread cultivation of coca. What is most disturbing is the lack of protected areas on the eastern slope of the Andes in southern Colombia. PNN Cueva de los Guácharos provides some protection, although it covers a small area (~5000 ha) and suffers greatly from illegal colonists (PGWS, pers. obs.). Furthermore, PNN Cueva de los Guácharos principally encompasses only montane humid forest with premontane and foothill forest unprotected; thus, the protected area is ineffective for seasonal altitudinal transients and migrants.

Fortunately, while much of the Andean Cordilleras and eastern Andean slopes have undergone irreversible changes, Serranía de los Churumbelos has largely avoided the catastrophic human impact that other regions have suffered. The large expanse of virgin tropical lowland to montane forests in the Serranía is extremely important. However, the Serranía de los Churumbelos is increasingly viewed as a treasure box of mineral (petroleum and precious metals) and natural resources (timber and rich organic soils for agriculture).

Mocoa has historically been a poor frontier town, owing to a treacherous and often impassable, single road access from Pasto, Nariño. However, within the last 10 years this has changed on completion of the Bogotá-Mocoa Highway. The final road section from Mocoa to Pitalito was a major breakthrough for the regional economy, allowing the fast and reliable transportation of goods from Mocoa to the heart of Colombia. A 10-year, sustained economic boom has attracted many immigrants that have colonized rural areas, including marginal lands on the fringe of Serranía de los Churumbelos. The most signif-

icant recent development is the development and ongoing paving of the Mocoa to Pitalito road, running parallel to the Serranía. This is scheduled to be completed by 2002 and will greatly facilitate rapid transportation links between Mocoa and the rest of the country, thus further stimulating economic growth and demand, particularly along the road from which CSS5-CSS7 were accessed. In addition, further road infrastructure projects are planned in the region, including a new major highway from the Ecuadorian border near Puerto Asís to Villavicencio. This proposed road would pass along the edge of the eastern base of the Serranía from Villagarzón to San José de Fragua and Florencia in Caquetá.

There is a very real sense of urgency for conservation action to be implemented now, if it is to be effective in the region. It is clear that unless we act soon, the lowland and highland forests of Serranía de los Churumbelos will shortly become the focus for large-scale deforestation and colonization with potentially profound affects on quail populations. The species most susceptible to these changes is the small disjunct population of *O. hyperythrus*. The most important sites for quail in the Churumbelos are those ranging from 1,500-2,400 m, where apparently healthy populations of *O. hyperythrus* still exist. The lowland sites are considered to be of less conservation concern for quail.

Conservation feasibility - The Colombian EBA projects demonstrate the conservation importance of Serranía de los Churumbelos for quail and potential looming threats. Considering these factors, we have proposed that legal protection in the form of establishing a protected area is the only option available to insure the future protection of the forests. It is considered vital to incorporate the entire altitudinal gradient from lowland humid forest to cloud forest, maximizing the biodiversity protected. Colonists dominate the peripheral zone of the Serranía and, once informed of the threats and value of the Serranía, tentatively appear supportive of protecting a core area.

The most feasible and practicable conservation action would be a significant southern extension of PNN Cueva de los Guácharos to encompass Picos Fragua down the central spine of los Churumbelos to the Río Caquetá. All of this land is property of the state (uncolonized and virgin forest) and largely non-conflictive with local communities that are currently only within a short distance from new roads bordering the mountain range. Importantly, the National Park could expand 20 fold (to over 100,000 ha.) with minimal increases of costs of infrastructure or administration.

The Ministerio del Medio Ambiente (MMA), who controls the designation of National Parks and state environmental policies, is now considering enacting this expansion of PNN Cueva de los Guácharos to encompass parts of the Churumbelos as proposed by the results of Colombia '98 and Colombian EBA Project '99.

Northeast Antioquia

Few places in South America have sustained such extensive habitat modification as the Nechí EBA of Colombia. The mid to lower Río Magdalena and Río Cauca valleys have

been almost completely deforested, mainly for agriculture, from the 19th Century to the present day. The moist tropical forests of the coastal plains in northern Colombia have been subjected to extensive deforestation with almost complete forest clearance (Salaman et al., 1999). Two large humid forest fragments survive - the lowlands of Nudo de Paramillo (PNN Paramillo) and the west slope of Serranía de San Lucas. Sadly, old and new threats loom over these remaining forests and include:

- Human population pressures that have forced the conversion of marginal land for subsistence and cash crops.
- Multimillion-ounce gold discoveries on both the eastern slope (Dpto. Bolivar) and western slope (Antioquia, Dpto. Córdoba and Sucre) of Serranía de San Lucas have resulted in a massive and uncontrolled gold rush to previously inaccessible areas of the mountain range.
- Deforestation for timber and agriculture as well as hunting have drastically increased with the gold rush.
- Road and oil pipeline infrastructure projects continue to penetrate previously inaccessible wilderness areas.
- The present construction of the Urra II hydroelectric plant will flood the lowlands of PNN Paramillo, producing immediate changes (massive forest loss and fragmentation from flooding) and long-term changes (increased infrastructure development, colonization, and landscape modification). Furthermore, the future of the indigenous Emberà-Katíos, of southern Dpto. Córdoba poses a complex social and political problem for governmental decision makers.

The situation in the lowlands and foothills of Serranía de San Lucas is the making of an ecological catastrophe. Despite forest coverage maps suggesting continuous forest in northeast Antioquia and Sur de Bolivar, the region has been heavily fragmented within the past 5 years. Based on interviews with local people, aerial maps, and our own observations, we estimate that at least 30% of the forest extant in 1995 is now either deforested or heavily fragmented. Usually, colonization follows closely alongside roads. Forests do not open up until infrastructural improvements facilitate more rapid human access. However, in the San Lucas foothills, loggers are currently extracting timber from a distance up to 2-3 days horse ride from the nearest dirt road. Having walked for ~7 h from Puerto Lopez, we were only able to reach relatively small forest fragments at ASS1. This unprecedented rate of human intervention is being caused by a 'gold rush' of colonists to the zone. The gold rush population explosion has greatly contributed to uncontrolled and unsustainable pressures on remaining forests, particularly with hunting for food. Sadly, the eastern foothills of Serranía de San Lucas are now effectively 'gone.'

Colombia's major economic resource, coffee, is centred on the subtropical slopes of the Central Cordillera. A high human population density exists here. The subtropical forests of the zone have borne the brunt of economic development and caused 16 of the Central Cordillera's 29 range restricted bird species to be considered globally threatened (Stattersfield et al., 1997). The plight of these species is directly reflected in continued severe landscape modification and lack of protected areas in the region. Furthermore, as

most of the few protected areas in the Central Cordillera are situated on the highest masifs dominated by páramo and snow-capped peaks (e.g., PNN Los Nevados), the subtropical forests remain at considerable risk. Less than 10% of original forest cover in the Central Cordillera remains (Henderson et al., 1991), but we estimate this figure to be closer to 4% between 1,000-2,000 m elevation, where only a few isolated forest fragments survive.

Conservation feasibility - *O. hyperythrus* is considered to be seriously at risk in the region and is restricted to the small 300 ha La Forzosa forest fragment (ASS3), which has already been purchased by CORANTIOQUIA as a nature reserve.

At present, the current authorities in the zone, the insurgent ELN (National Liberation Army) guerrilla, have developed several conservation-minded initiatives, which will insure some degree of protection to biological communities at least in the short-term. The illicit coca (*Erythroxylon* spp.) is not grown on the western slopes of Serranía de San Lucas because of insurgent group prohibition. Hunting of certain endangered species (e.g., *Tapirus*) has been prohibited. Severe fines are enforced for breach of these “regulations.” Furthermore, an ELN designated and protected nature reserve in central-south Serranía de San Lucas needs official recognition and investigation.

CONCLUSIONS

Despite variable levels of field effort within each of the 3 study regions, it is noteworthy that all 3 regional transects were comprised of 2 - 4 quail species with a combined diversity of 6 species. Species pairs of *Odontophorus* wood-quails occurred along each transect, altitudinally separated at about 1,000 m elevation. Both species of highland *Odontophorus* wood-quails are threatened and range restricted, although they are relatively common inside undisturbed primary forest.

From all 3 regions, we have encountered important new locations and ecological information for several poorly known and threatened quail species. However, the most important outcome has been in terms of conservation action. Once the presence of threatened species was established in our study areas, we used this information to make conservation recommendations to national and international conservation bodies, and indeed acted ourselves in facilitating and implementing protective measures.

Conservation is enforced in each of the 3 zones by different means. In northeast Antioquia, CORANTIOQUIA has purchased La Forzosa and deterred local people from entering the area with protection enforced with the respect of local communities. In western Nariño, a Community Nature Reserve has been set up, where local people surrounding the forest have been given the power to make their own decisions as to the forest's future. Both these methods appear to have had some success, despite being highly contrasting formulas: one excluding local people from the process; the other empowering

them. Following our work in the Churumbelos, a National Park extension is proposed to encompass part of the Serranía. It is also hoped that the National Park will also receive the support of local communities, who ultimately threaten any protected area.

In summary, we present examples of knowledge-based conservation that is both efficient and economical. Rapid Biological Assessments, concentrating on threatened and indicator species, has facilitated conservation priority setting, whilst *in-situ* protective measures have been enhanced. Without the biological field information, conservation has little impetus and lesser chances of success. It is through such studies that biologists can practically assist the preservation of remaining Neotropical forests into the new millennium and beyond.

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