

## AVIFAUNA OF A HIGH ANDEAN FOREST: BOSQUE PROTECTOR CASHCA TOTORAS, BOLIVAR PROVINCE, ECUADOR

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**Resumen.** – Avifauna de un bosque andino de altura: Bosque Protector Cashca Totoras, Provincia de Bolívar, Ecuador. – Se registró un total de 86 especies de aves en el Bosque Protector Cashca Totoras, una localidad de bosque andino y páramo de la Cordillera Occidental del Ecuador. La lista incluye una especie considerada como vulnerable, el Perico cachetidorado (*Leptosittaca branickii*), además de tres especies endémicas de la región altoandina ecuatoriana: el Caracara curianguino (*Phalcoboenus carunculatus*), la Estrella ecuatoriana (*Oreotrochilus chimborazo*) y el Matorralero aliblanco (*Atlapetes leucopterus*). Adicionalmente, se amplía el rango de distribución de dos especies endémicas de las tierras altas del suroeste ecuatoriano: el Frentiestrella arcoiris (*Coeligena iris*) y el Solángel gorjipúrpura (*Helianthus viola*). Los resultados obtenidos en este trabajo junto a observaciones previas suman un total de 94 especies de aves para el Bosque Protector Cashca Totoras. La comparación de la lista de especies obtenida con listas de especies de otras localidades similares revela que la avifauna del área es típicamente altoandina.

**Abstract.** – I recorded 86 bird species at Bosque Protector Cashca Totoras, a high andean forest and paramo site in the Cordillera Occidental of Ecuador. The list includes one vulnerable species, the Golden-plumed Parakeet (*Leptosittaca branickii*), and three species endemic to the Ecuadorian High Andes: the Carunculated Caracara (*Phalcoboenus carunculatus*), the Ecuadorian Hillstar (*Oreotrochilus chimborazo*), and the White-winged Bush-finch (*Atlapetes leucopterus*). Additionally, my records extend the known distributions of two species endemic to the southwestern highlands of Ecuador, the Rainbow Starfrontlet (*Coeligena iris*) and the Purple-throated Sunangel (*Helianthus viola*). This study, combined with previous work, documents 94 species from this area. Overall, the species list of Cashca Totoras shows that it is a typical high andean locality with respect to bird-species composition. *Accepted 29 April 2004.*

**Key words:** Birds, Cashca Totoras, inventory, new records, Andes, Ecuador.

### INTRODUCTION

Among the Ecuadorian physiographic regions, the andean western slope and the interandean valleys have been the most affected by human activities. Since pre-Incan times, high population density and diverse agricultural activities have resulted in drastic modification and destruction of natural ecosystems (Ulloa & Jørgensen 1995). Efforts to

quantify the natural vegetation present in these regions estimate that only 3% of the original montane forests remains (Lips *et al.* 1997). Despite forest destruction and fragmentation, the interandean slopes and valleys endemic center (*sensu* Ridgely & Greenfield 2001a) still sustain 16 endemic species of birds, a few of them ranging into adjacent Peru or Colombia (Ridgely & Greenfield 2001a). This center incorporates areas found

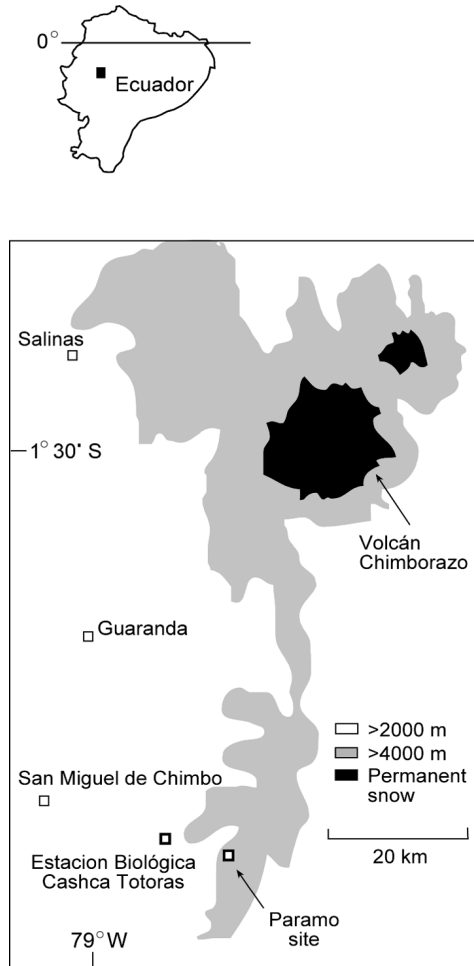


FIG. 1. Map of the portion of the western Andes around Volcán Chimborazo, showing the relative positions of Estación Biológica Cashca Totoras and other sites relevant to this study.

at and above treeline on both western and eastern Andes (Ridgely & Greenfield 2001a).

The Bosque Protector Cashca Totoras is located in the west-central Ecuadorian Andes and contains one of the last remaining stands of temperate montane forest in this part of the country (Wiens & Coloma 1992). Previous research (Kizirian & Coloma 1991, Wiens & Coloma 1992, Mateu 1993, Barragán 1999)

indicates that Cashca Totoras occupies a zone of distributional overlap for northern, southern, and western species of plants and animals and, as such, it sustains high species diversity. Although occasional bird species lists have been generated for the area (Barragán 1999, Freile unpubl.), no intensive study has produced a complete list of species. Herein, I present a preliminary avifaunal inventory for the Bosque Protector Cashca Totoras. Selected species accounts are provided for some endemic, threatened or poorly known species.

#### STUDY AREA AND METHODS

The Bosque Protector Cashca Totoras is a 6500-ha area in the Río Chimbo Basin, Bolívar Province, on the western slope of the Cordillera Occidental, Ecuador (Fig. 1). Fieldwork was conducted around the Estación Biológica Cashca Totoras ( $01^{\circ}45'S$ ,  $78^{\circ}58'W$ ; 2600–3200 m) from 14 to 30 July and from 5 to 15 August 2003. On 21 July and 12 August, I made observations in the paramo areas along the Santa Rosa de Totoras–Riobamba road ( $01^{\circ}45'S$ ,  $78^{\circ}53'W$ ; 3200–4000 m) and in the paramo that surrounds Laguna Llagrestes and Laguna Patococho ( $01^{\circ}44'24''S$ ,  $78^{\circ}52'48''W$ ; 4000 m). Most of the sampled paramo area is not included in the Bosque Protector Cashca Totoras, but it is less than 5 km (airline) from its border; therefore, it is likely that all the species observed in the paramo are present also in the paramo of Cashca Totoras.

Because the Bosque Protector Cashca Totoras was established from privately owned land, the conditions of the habitat in different areas depend on the size of the properties and the activities developed by different owners. The disturbed area of Cashca Totoras occupies 1200 ha between 2600 and 3200 m, and is formed by several small parcels owned by different local families (Barragán 1999). Pri-

mary forest is present mainly along streams, where the steep slopes have prevented deforestation. Secondary forest is found around the primary forest and occurs as natural fences in between smaller parcels of land; in the past, these areas were heavily disturbed by selective logging and grazing. Some cleared areas are currently used for non-intensive grazing or small-scale agriculture, whereas others are undergoing natural regeneration. At the same altitude, 300 ha of primary forest are owned by one family, and have not supported agricultural use in the recent past. Above 3200 m, 5000 ha are covered by paramo (Barragán 1999).

The forests in both secondary and primary areas have uneven canopies. Trees range from 10 to 20 m in primary forest, and from 10 to 15 m in secondary forest. The most abundant tree species include *Clusia multiflora* (Clusiaceae), *Myrcianthes alternifolia* (Myrtaceae), *Styloceras laurifolium* (Buxaceae), *Saurauia tomentosa* (Actinidaceae), *Meriania* sp. (Melastomaceae), *Otholobium munyense* (Fabaceae), *Tournefortia fuliginosa* (Boraginaceae), *Miconia papillosa* (Melastomaceae). Secondary forest areas frequently support *Chusquea* bamboo (Poaceae), whereas *Chinchona* (Rubiaceae) is the dominant genus around cleared areas. The paramo is dominated by *Calamagrostis* and *Festuca* species (Poaceae); however, near the treeline, extensive areas of paramo have been forested with *Pinus radiata*, as promoted by the Government of Ecuador.

Cashca Totoras is located in the humid montane forest life zone of Ecuador according to the Holdridge classification. The average annual rainfall for this region ranges from 500 to 1000 mm, and the average annual temperature ranges from 12 to 18°C (Cañadas 1983). The climate is highly seasonal, with a rainy, cold period between November and May, and a warmer, drier period between June and October. During this study, the only precipitation was on 8 August, when it rained

finely for about 2 h; humidity was maintained by afternoon mists.

Six mist-nets were opened on 17, 18 and 22–26 July, and 12 nets were maintained from 9 to 11 August. Nets were opened from 06:00 to 11:00 h and from 16:00 to 19:00 h. Mist-netting effort was focused in the secondary-open areas (4032 net-h) and in primary forest (3456 net-h). Except for days dedicated to mist-netting, observation and tape-recording were conducted daily (5–7 h/day). Additionally, one morning and one afternoon were used to survey paramo areas. Nocturnal fieldwork was limited to three nights during August, and from 0.5 to 1 h of predawn surveys every day.

Specimens collected were deposited at the Museo de Zoología of the Universidad Católica del Ecuador (QCAZ) in Quito. Identification of songs and tape recordings was accomplished consulting Krabe *et al.* (2001). Tape recordings will be deposited at the Library of Natural Sounds, Cornell Laboratory of Ornithology (LNS). Bird and habitat photographs will be deposited at Fundación Numashir and will be available on the Fundación Numashir web site (<http://www.numashir.org>). The final species list was combined with results from earlier work conducted from 6 to 8 September 1999 by J. F. Freile (unpubl.) to provide a more complete list.

## RESULTS

During this study, 86 species of birds were recorded; these, summed to eight species previously recorded, produce a total of 94 species for the Bosque Protector Cashca Totoras (Appendix 1). The list includes one vulnerable species (BirdLife International 2000), the Golden-plumed Parakeet (*Leptosittaca branickii*), and three species endemic to the interandean slopes and valleys of Ecuador: the Carunculated Caracara (*Phalcoboenus carunculata*).

*tus*), the Ecuadorian Hillstar (*Oreotrochilus chimborazo*), and the White-winged Bush-finch (*Atlapetes leucopterus*). Additionally, I extend the known distribution of two species considered endemic to the southwestern highlands of Ecuador: the Rainbow Starfrontlet (*Coeligena iris*) and the Purple-throated Sunangel (*Helianthelus viola*) (See species accounts).

Hummingbirds were abundant and diverse at Cashca Totoras, probably because of the abundance and diversity of flowering plants in open areas and forest borders. In all, 13 species of hummingbirds have been recorded in the area (Appendix 1). The Giant Hummingbird (*Patagona gigas*) was observed by J. F. Freile in September 1999, but not during my surveys. It is possible that the species is present only during certain period of the year in Cashca Totoras. Seasonal movements of the Giant Hummingbird have been documented also at Río Mazán, in Azuay Province (King 1988).

I also found three species of flowerpiercers, the Black (*Diglossa humeralis*), Glossy (*D. lafresnayii*), and White-sided (*D. albilatera*) flowerpiercers. All were foraging around at 3200 m, and the Black Flowerpiercer also was found at 2600 m. Further studies are needed to determine whether competition among flowerpiercer species, and between flowerpiercers and hummingbirds, affects their use of different resources in Cashca Totoras.

Immature individuals were observed for the following species: Andean Teal (*Anas andium*), Carunculated Caracara (*Phalacrocorax carunculatus*), Aplomado Falcon (*Falco femoralis*), Azara's Spinetail (*Synallaxis azarae*), Red-crested Cotinga (*Ampelion rubrocristatus*), Masked (*Diglossopsis cyanea*) and Black flowerpiercers, and Scarlet-bellied Mountain-tanager (*Anisognathus igniventris*). These observations from the mid-dry season suggest that these species might have reproduced in the previous wet season.

Although mist-netting was useful in detecting some species present but not observed, observation and tape-recording were more efficient methods of compiling the species list for the area. Ground-dwelling species were restricted to dense undergrowth and *Chusquea* bamboo areas where mist-netting was difficult to conduct; in those cases, intensive searching and tape-recording allowed detection of most of the species.

Mixed flocks were common in the canopy and forest borders of primary and secondary forest (Appendix 1). The species most frequently associated in mixed flocks were Pearled Treerunner (*Margarornis squamiger*), White-banded Tyrannulet (*Mecocerculus stictopterus*), Spectacled Whitestart (*Myioborus melanocephalus*), Russet-crowned Warbler (*Basileuterus coronatus*), Superciliated Hemispingus (*Hemispingus superciliaris*), and Rufous-naped Brush-finch (*Atlapetes latinuchus*). Most of the species recorded in Appendix 1 as members of mixed flocks have been observed to form mixed flocks in a secondary forest of the andean eastern slope (Poulsen 1996). However, it has been suggested that the composition of these flocks in the andean forests tends to be unstable compared with well-studied systems in the Amazonian forests (Poulsen 1996). Detailed research about this subject would be easy to perform in Cashca Totoras because of the conspicuousness of mixed flocks along the forest borders.

Nocturnal vocal activity was pronounced shortly before dawn and early after dusk. The Andean Pygmy (*Glaucidium jardi*) and Rufous-banded (*Strix albitarsis*) owls, as well as the White-throated Screech Owl (*Otus albigularis*) were heard on several occasions during the survey. However, I could not determine the relative abundances of these species because, in many cases, vocalizations were heard far from the sampled points. The Band-winged Nightjar (*Caprimulgus longirostris*) was abundant having been observed and heard

every day just before dawn. One morning, at predawn, I observed about eight individuals flying in a small grassy area surrounded by forest; another morning, after dawn, I found one individual resting on the ground in the middle of a trail.

### SPECIES ACCOUNTS

*Applomado Falcon* (*Falco femoralis*). This species is rare to locally uncommon in the paramos of the interandean slopes and valleys, and it has been suggested that Ecuadorian populations have diminished in recent decades (Ridgely & Greenfield 2001a). On 12 August, I saw an adult and a juvenile in paramo on the Santa Rosa de Totoras-Riobamba road (01°44'S, 78°52'W), at 3900 m. Both individuals were perched on a rock, in a small valley heavily grazed by sheep.

*Golden-plumed Parakeet* (*Leptosittaca branickii*). On 6 August at an altitude of 3000 m, I observed a group of 25–30 individuals flying and calling loudly because they were being attacked by an unidentified raptor. On 8 August, in a forest patch located at the same altitude, I observed what could have been the same group (about 30 individuals) in the forest canopy. I could see them probing in bromeliads over puma maqui trees (*Schefflera* sp., Araliaceae) for 0.5 h. The known distribution of the species in Ecuador includes the temperate zone of the east slope of the Andes, principally from Cañar and Morona Santiago southward; it has been recorded occasionally in forest on slopes above the interandean valleys and at eastern Carchi and Imbabura (Ridgely & Greenfield 2001a, 2001b). This species is considered as vulnerable by BirdLife International (2000) because of deforestation in many parts of its distribution range (from Colombia to Peru). It is also considered as endangered in Ecuador by Granizo *et al.* (2002), according to the IUCN criteria. Fur-

ther research needs to be conducted to determine if I observed part of a permanent population that inhabits Cashca Totoras and, if so, to assess its status.

*Ecuadorian Hillstar* (*Oreotrochilus chimborazo*). Two females were observed on 12 August near Laguna Patococha. One was perched on a dry branch about 40 cm over the ground next to a stream, and the other one was perched on a ridge next to the road. This species is thought to feed mainly, perhaps exclusively, on the orange-yellow flowers of the small shrub *Chuquiragua insignis*, which occurs widely on arid slopes above the treeline (Ridgely & Greenfield 2001a). I could not find *C. insignis* in this paramo and it was not possible to observe what species the hummingbirds were feeding on.

*Rainbow Starfrontlet* (*Coeligena iris*). I mist-netted 13 males (weight =  $7.23 \pm 0.39$  g; exposed culmen =  $28.40 \pm 1.06$  mm) and one female (weight = 6 g; exposed culmen = 30.5 mm); one male was collected as a voucher (QCAZ 1980). Previously, this species was known only from southwestern Chimborazo and Cañar south through Azuay to El Oro and Loja provinces. In Cashca Totoras, Rainbow Starfrontlet was common in open areas, forest borders, and forest between 2900 and 3200 m during the study period. However, as it was not observed in the area during September 1999 (J. F. Freile unpubl.), it might be a seasonal migrant. This record extends the northern limit of the species distribution by about 70 km.

*Purple-troated Sunangel* (*Heliangelus viola*). I observed two individuals, one in open field and the other in secondary forest. Additionally, I collected one individual (QCAZ 1977; weight = 5.5 g; exposed culmen = 13.8 mm) in primary forest at 3250 m. This species was rare in Cashca Totoras and previously, it had

been recorded only as far north as southern Chimborazo province. Ridgely & Greenfield (2001a) considered that early records of this species (1902) in Pichincha province are doubtful. The presence of this species in Cashca Totoras might indicate either that its historical range has retracted southward since the early 1900's, or simply, that the species is more widespread than was thought.

*Ocellated Tapaculo* (*Acropternis orthonyx*). I observed what seemed to be the same individual on two occasions, in the dense undergrowth of secondary forest at 2900 m. The first time (16 July), it was at about 1 m above the ground, moving between branches; after about 5 min of observation, it sang a series of six "queeu!" and repeated the series once after few seconds. The second time, I observed it probing the ground, but it did not sing. On the west slope, this species was recorded only in south to western Cotopaxi province above Pilaló (Ridgely & Greenfield 2001a), but now is known to be present at Salinas (01°21'S, 79°05'W; Poulsen & Krabbe 1998) and Cashca Totoras.

*Red-rumped Bush Tyrant* (*Cnemarchus erythropygius*). This species is rare to uncommon, but conspicuous in the temperate and paramo zones of both slopes of the Andes (Greenfield & Ridgely 2001a). On 12 August, I observed two individuals in the paramo, catching insects and perching on a powerline wire, 4 km from Santa Rosa de Totoras in the Santa Rosa de Totoras-Riobamba road at 3600 m.

## DISCUSSION

This inventory is clearly preliminary, because I kept finding new species, even on the last day of sampling. Although few complete lists for high-altitude Ecuadorian forests are available, the number of species found is at least

comparable with the 119 species recorded by King (1988) at Río Mazán, Azuay Province.

More recently, Poulsen & Krabbe (1998) reported a list of 88 species found in one or more of the following high altitude forest sites in the western slope of the Andes: Intag, Corazón, Salinas, Río Mazán, and Chaucha. Of those 88 species, 12 were not recorded in Cashca Totoras, probably because this site is not part of the geographic and/or altitudinal range of those species (Ridgely & Greenfield 2001a, 2001b). Another 13 species recorded by Poulsen & Krabbe (1998) [Andean Snipe (*Gallinago jamesoni*), Imperial Snipe (*G. imperialis*), Flammulated Treehunter (*Thripadectes flammulatus*), Moustached Antpitta (*Grallaria allenii*), Barred Fruiteater (*Pipreola arquata*), Black-capped Tyrannulet (*Phyllomyias nigrocapillus*), Brown-backed Chat Tyrant (*Ochthoeca fuscicolor*), Mountain Wren (*Troglodytes solstitialis*), Glossy-black Thrush (*Turdus serranus*), Blue-backed Conebill (*Conirostrum sitticolor*), Black-chested Mountain-Tanager (*Buthraupis eximia*), Buff-breasted Mountain-Tanager (*Dubusia taeniata*), and Black-capped Hemispingus (*Hemispingus atropileus*)] could be present in the area based on their ranges, but were not recorded during this work. The total number of species found for each specific forest site by Poulsen & Krabbe (1998) ranges from 42 to 58 species. But, these results are not comparable with the present work because the authors were not attempting to carry out complete avifaunal inventories, but instead testing a rapid ecological assessment method.

Overall, the species list of Cashca Totoras indicates that the area is a typical high Andean locality with respect to bird-species composition, including endemics of the interandean valleys and slopes and the southwestern highlands. Recent work (Krabbe *et al.* 1997; Krabbe *in* Ridgely & Greenfield 2001a) reveals that high-altitude forests in the western Andean slopes have been under-sampled

in spite of their easy access. It is possible that several species have larger distributional areas than it is currently appreciated. Some species first reported by N. Krabbe for the central-western Andean forests (Krabbe *et al.* 1997, Krabbe *vide* Ridgely & Greenfield 2001a) [e.g., Rufous-banded Owl, White-browed Spinetail (*Hellmayrea gularis*), Ash-colored Tapaculo (*Myornis senilis*), Ocellated Tapaculo (*Acropternis orthomyx*), Crowded Chat-Tyrant (*Ochthoeca frontalis*), and Roufus Wren (*Cinnycerthia unirufa*)] also have been recorded in my surveys. Year-round surveys at Cashca Totoras are needed to clarify the status of these and other species, especially the Golden-plumed Parakeet, the Giant Hummingbird, the Rainbow Starfrontlet, and the Purple-troated Sunangel.

It has been suggested that forests that remain in the interandean slopes and valleys Endemic center do not deserve additional conservation efforts, given the extreme degree of habitat destruction (Ridgely & Greenfield 2001a). This sounds reasonable in a time when conservation priorities of Ecuador should be focused in the southwestern dry forests and the humid forests on the Andean western slopes, both areas with either high endemism and deforestation rates. However, if serious efforts are not focused on preserving the small areas of temperate forests that remain, even tolerant species (including endemic species) will disappear; this concern is particularly acute given the uncertain status of these species in Colombia. Seasonally migratory species not resident in this endemic center also may suffer.

Conservation of only a few of the remnant forests is not a solution, because fragmentation and consequent reduction in gene flow may drive small populations to extinction. It is important to preserve most of the temperate forests that remain, and hope that future restoration efforts may reestablish connections among these forests. Such restora-

tion efforts must be coupled with plans to improve the current management of the agricultural lands and to incorporate adjacent communities in the conservation process.

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APPENDIX 1. Bird species registered at Bosque Protector Cashca Totoras, Bolívar Province, Ecuador, with their relative abundance, habitat, documentation, and participation in mixed flocks.

Species and status	Relative abundance <sup>a</sup>	Habitat <sup>b</sup>	Documentation <sup>c</sup>	Mixed flocks <sup>d</sup>
<i>Anas andium</i>	X	L	S	
<i>Buteo polyosoma</i>	R	A	S	
<i>Phalacrocorax carunculatus</i> <sup>e</sup>	X	P	S	
<i>Falco femoralis</i>	X	P	S	
<i>Falco sparverius</i>	X	A	S	
<i>Penelope montagnii</i>	U	F, FB	S, V	
<i>Vanellus resplendens</i>	X	L	S	
<i>Columba fasciata</i>	U	O, FB	S, V	
<i>Leptotila verreauxi</i> <sup>f</sup>	U	O, FB	S, V	
<i>Zenaida auriculata</i>	C	O, FB	S, V	
<i>Bolborhynchus lineola</i> <sup>f</sup>	X	F	S	
<i>Leptosittaca branickii</i> <sup>f</sup>	R	F, FB	S	
<i>Pionus sordidus</i>	R	A	S	
<i>Pionus seniloides</i>	R	A	S	
<i>Glaucidium jardinii</i>	X	F, FB	V	
<i>Otus albobularis</i>	X	FB	V, P	
<i>Strix albitarsis</i>	X	FB	V	
<i>Caprimulgus longirostris</i>	C	O, FB	S, V	



## APPENDIX 1. Continued.

Species and status	Relative abundance <sup>a</sup>	Habitat <sup>b</sup>	Documentation <sup>c</sup>	Mixed flocks <sup>d</sup>
<i>Streptoprocne zonaris</i> <sup>f</sup>	R	A	S	
<i>Adelomyia melanogenys</i>	R	FB	S	
<i>Chaetocercus mulsant</i>	X	O	S	
<i>Colibri coruscans</i>	R	O	S	
<i>Oreotrochilus chimborazo</i> <sup>g</sup>	X	P	S	
<i>Patagona gigas</i> <sup>f</sup>	X	O	S	
<i>Aglaeactis cupripennis</i>	C	O, FB	C	x
<i>Pterophanes cyanopterus</i>	X	O	S	
<i>Coeligena iris</i> <sup>e</sup>	C	O, FB, F	C	
<i>Lafresnaya lafresnayi</i>	C	O	C	
<i>Eriocnemis luciani</i>	C	O, FB	C	
<i>Lesbia nuna</i>	R	O	P	
<i>Metallura tyrianthina</i>	C	O	C	
<i>Helianthus violae</i> <sup>f</sup>	R	O, FB, F	C	
<i>Trogon personatus</i>	X	F	S	
<i>Aulacorhynchus haematopygus</i>	X	F	V	
<i>Piculus rivolii</i>	R	F, FB	S	
<i>Veniliornis nigriceps</i>	R	F	V	
<i>Xiphocolaptes promeropygus</i>	X	F	S	
<i>Synallaxis azarae</i>	U	FB	P, V	
<i>Hellmayrea gularis</i>	U	FB, CH	C	
<i>Margarornis squamiger</i>	U	FB, F	S	x
<i>Premnoplex brunnescens</i>	R	F	V	
<i>Cinclodes excelsior</i>	R	P	S	
<i>Cinclodes fuscus</i>	C	P	S	
<i>Pseudocolaptes boissonneantii</i>	U	F, FB	S	x
<i>Myornis senilis</i>	U	F, FB, CH	V	
<i>Scytalopus latrans</i>	C	CH	S, V	
<i>Grallaria squamiger</i> <sup>f</sup>	X	F	C, V	
<i>Grallaria ruficapilla</i>	U	F, FB	S	
<i>Grallaria rufula</i>	U	F, FB	S, V	
<i>Grallaria quitensis</i>	U	F, FB	P, V	
<i>Acropternis orthonyx</i>	R	FB	S, V	
<i>Elaenia albiceps</i>	U	FB	P	
<i>Elaenia pallatangae</i>	U	FB	P	
<i>Anairetes parulus</i>	U	FB	P	
<i>Mecocerculus leucophrys</i>	U	F	C	x
<i>Mecocerculus stictopterus</i>	C	F, FB	S, V	x
<i>Myiotheretes striaticollis</i>	R	O	S	
<i>Myiotheretes fumigatus</i>	R	FB	S	
<i>Cnemarchus erythropygius</i>	X	P	S	
<i>Ochthoeca rufipectoralis</i>	C	FB	S	
<i>Ochthoeca frontalis</i>	R	F	C	
<i>Ampelion rubrocristatus</i>	U	FB	S	
<i>Pipreola riefferii</i>	R	FB	S	

## APPENDIX 1. Continued.

Species and status	Relative abundance <sup>a</sup>	Habitat <sup>b</sup>	Documentation <sup>c</sup>	Mixed flocks <sup>d</sup>
<i>Cyanolyca turcosa</i>	U	F	S	
<i>Turdus fuscater</i>	C	O, FB	S, V	
<i>Cinclus leucocephalus</i> <sup>f</sup>	X	R	S	
<i>Notiochelidon murina</i>	R	A	S	
<i>Notiochelidon cyanoleuca</i>	C	A	S	
<i>Cinnyrbia unirufa</i>	R	FB, CH	S	
<i>Cistothorus platensis</i> <sup>f</sup>	X	O, P	S	
<i>Thryothorus euophrys</i>	C	CH	S, V	
<i>Myioborus melanocephalus</i>	C	FB, F	P	x
<i>Basileuterus nigrocristatus</i>	C	FB, F	P	x
<i>Basileuterus coronatus</i>	C	FB, F	S, V	x
<i>Conirostrum cinereum</i>	U	FB	S	
<i>Diglossopsis cyanea</i>	U	FB, F	S	
<i>Diglossa lafresnayii</i>	U	FB	P	
<i>Diglossa humeralis</i>	C	FB	P	
<i>Diglossa albilatera</i>	U	FB	P	
<i>Euphonia cyanocephala</i>	U	FB, F	S	x
<i>Tangara vassorii</i>	C	FB, F	S	x
<i>Anisognathus igniventris</i>	C	FB, F	C	x
<i>Anisognathus somptuosus</i>	U	FB	S	x
<i>Buthraupis montana</i>	R	FB	S	x
<i>Chlorornis riefferii</i>	R	FB	S	x
<i>Hemispingus superciliosus</i>	C	FB, F	S	x
<i>Phenacicus chrysogaster</i>	R	O	S	
<i>Catamenia inornata</i>	R	FB	P	
<i>Phrygilus unicolor</i>	C	P	S	
<i>Atlapetes latinuchus</i>	C	FB	P	x
<i>Atlapetes leucopterus</i> <sup>e</sup>	U	FB	S	
<i>Buarremon torquatus</i>	R	CH	S	
<i>Carduelis magellanica</i> <sup>f</sup>	X	O	S	
<i>Zonotrichia capensis</i>	R	O	C	

<sup>a</sup>Relative abundance criteria used in this work: C = common, recorded daily in large numbers when in appropriate habitat, > 10 individuals/day; R = rare, not recorded daily when in appropriate habitat, and only in small numbers when recorded; U = uncommon, recorded in small numbers daily when in appropriate habitat, 1–10 individuals/day; X = single observation or not enough information to assess relative abundance.

<sup>b</sup>Habitat: A = aerial; CH = chusquea bamboo; F = forest; FB = forest borders; L = lagoon; O = cleared, agricultural land, patches under regeneration; P = paramo; R = river.

<sup>c</sup>Documentation: C = collected; P = photographed, but not “C” or “V”; S = sight observation only; V = voice recorded.

<sup>d</sup>Species forming mixed flocks = x.

<sup>e</sup>Endemic to the interandean slopes and valleys or to the southern highlands of Ecuador (Ridgely & Greenfield 2001a).

<sup>f</sup>Vulnerable species (BirdLife International 2000).

<sup>g</sup>Species recorded during earlier work conducted in 6–8 September 1999 by Juan F. Freile.