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Ornithological inventory along an elevational gradient in the río Cotacajes Valley, dptos. La Paz and Cochabamba, Bolivia

Glenn F. Seeholzer, Miguel Aponte Justiniano, Michael G. Harvey and Brian Tilston Smith

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Se presenta los resultados de estudios y la colecta de muestras científicas desde el centro del valle de río Cotacajes, dptos. La Paz y Cochabamba, Bolivia. Se registró un total de 241 especies en cuatro sitios, en un gradiente altitudinal desde bosque caducifolio de temporada a bosque montano húmedo (1.300–2.900 m). Presentamos estimados de abundancia relativa para cada localidad y destacamos registros notables, nuevos registros departamentales y extensiones de rango altitudinal. Además discutimos actividad de reproducción.

In the Andes, arid intermontane valleys occur to the west of high mountains that block humid air rising from the Amazon Basin. This rainshadow effect creates a unique ecosystem dominated by arid montane scrub and tropical deciduous forest, hereafter dry forest⁹. Isolated by vast areas of humid montane forest, these arid inter-montane valleys host a distinctive yet heterogeneous avian community, often characterised by high endemism^{2,3,13}. Arid intermontane valleys also constitute important biogeographic barriers to species occupying humid montane forest and often mark the northern or southern range boundaries of taxa, or are the locations of turnover between closely related taxa occurring on opposite sides. In Bolivia, the Tunari highlands cast a rainshadow on the río Cotacajes, which constitutes the political boundary between dptos. La Paz, to the west, and Cochabamba, to the east. Rising in the Bolivian altiplano, the río Cotacajes flows north and cuts a deep canyon bordered to the east by the Cordillera Cocapata and to the west by a high, isolated massif. As we are not aware of an official name, we refer to it here as the Cordillera del Fraile (Cumbre Salto del Fraile is its highest peak).

In the late 1990s, exploration of the dry forests in the upper río Cotacajes drainage resulted in the description of two new avian taxa from the village of Inquisivi, Bolivian Spinetail *Cranioleuca henricae*⁷ and a subspecies of Green-cheeked Parakeet *Pyrrhura molinae flavoptera*⁸. In 1997–98, additional survey work was conducted lower in the valley by Herzog *et al.*⁵ on the Cochabamba side (right bank) of the middle río Cotacajes. Although Herzog *et al.*⁵ primarily surveyed humid montane forest and highland sites, they also visited the humid / dry forest transition zone and the upper elevations of dry forest as low as 1,600 m. Since their surveys, no additional collecting or survey work has been published from elsewhere in the río Cotacajes drainage. Herein, we present the results of collecting and survey work from additional sites

in the río Cotacajes dry forest (concentrating on the lowest elevations of the valley floor) and in the previously inaccessible humid montane forest on the slopes of the Cordillera del Fraile, above the left bank of the río Cotacajes. These sites represent an elevational and ecological transect from the dry forest of the valley floor (1,300 m) to humid montane forest and puna grassland (3,200 m). We compare our results to those of Herzog *et al.*⁵ to examine turnover between the humid montane forest avian communities either side of the Cotacajes.

Study sites and Methods

During 6–29 November 2013 we surveyed four sites within the upper Cotacajes drainage. On 6–13 November, we worked from a camp 1 km south-east of the village of Cotacajes, prov. Ayopaya, dpto. Cochabamba (Cotacajes; 16°74.3'S 66°73.6'W; 1,350 m; elevations covered 1,275–1,700 m) c.2.5 km north and 300 m below Herzog *et al.*⁵ dry-forest locality (also referred to as Cotacajes). Surveys were concentrated at the mouth of a valley in degraded dry forest and a matrix of fields at various stages of cultivation south-east of the village of Cotacajes itself (16°74.1'S 66°74.1'W). Epiphytic plants and ground bromeliads were especially numerous in the dry forest above the fields. Along rivers, *Gymnerium* sp. cane thickets were present. Weather during the survey period was clear and sunny, although short rain showers <15 minutes in duration interrupted two nights. Mornings began cool and calm, yet every day, from around 11h00 to 16h00, a very strong, gusty wind blew upslope, virtually eliminating bird activity.

While surveying near the town of Cotacajes as described above, on 7, 8, 10 and 12 November, at least one member of the team walked along a trail that ran east along the north side of the valley. After passing through the last of the agricultural fields, it ascended steeply and the habitat rapidly transitioned to taller (10–15 m), relatively undisturbed dry forest (16°74.5'S

66°72.5'W; c.1,600 m). Although cattle trails were common, human disturbance was minimal apart from one abandoned, overgrown farm with dilapidated stone foundations. Habitat appeared to be as described for the dry-forest locality in Herzog *et al.*⁵, i.e., dominated by *Acacia macracantha* and *Prosopis* sp., albeit more mesic and less disturbed. At the farm, the trail cut north-west, continued to ascend gradually, through mesic forest with a greater density of mosses and epiphytic plants. The trail passed a natural spring where *Cecropia* sp. was present and eventually reached open, arid grassland, at c.1,700 m, the furthest extent of our surveys at this site. Throughout the survey area near Cotacajes, the semi-deciduous forest appeared to be freshly leafed due to the recent austral spring rains.

Our second site was surveyed on 14–21 November at the transition from humid montane forest to puna grassland, 3 km north-west of the village of Chacopampa (Chacopampa; 16°65.6'S, 66°81.7'W; c.2,900 m; elevations covered c.2,700–3,200 m) in prov. Inquisivi, dpto. La Paz, on the west side of the río Cotacajes. The site was situated where the dirt road crossed a shallow pass and began to follow the south side of a shallow, braided river. A trail ran uphill north-east of camp through tall humid montane forest with an open understorey, heavily disturbed due to cattle grazing (especially in flatter areas at the top), with

steep, tussock grasslands on the western slopes. Stands of seeding *Chusquea* sp. bamboo were present in the steeper ravines. At the forest edge and along the road, trees were shorter in stature and the understorey was dominated by spiny shrubs, which were presumably unpalatable to cattle. South of the camp and road, we surveyed c.2 km from camp along a trail at the ecotone between humid montane forest and puna grassland. The matrix here was dominated by fields of tussock grass and short alder groves (*Alnus* sp.). The road continued west along the river, eventually crossing it c.1.8 km west of the camp, beyond which point we did not visit. The river margins and floodplain were dominated by tall, dense stands of alder, which were intensively surveyed one morning. Weather was intermittently cool and foggy, or warm and sunny, except on two days, which were rainy and overcast.

Our third site was surveyed on 21–25 November and was located at the transition between dry forest and humid montane forest near the community of Piedras Blancas, c.6 km west of Cotacajes (Piedras Blancas; 16°76.2'S, 66°78.9'W; 2,200 m; elevations covered c.2,100–2,500 m). We camped in a spacious level clearing beside the road, equidistant between two stream crossings along the south-facing slope of the mountain. In the ravines created by these streams, humid montane forest descended below the elevation of the campsite, whereas the intervening

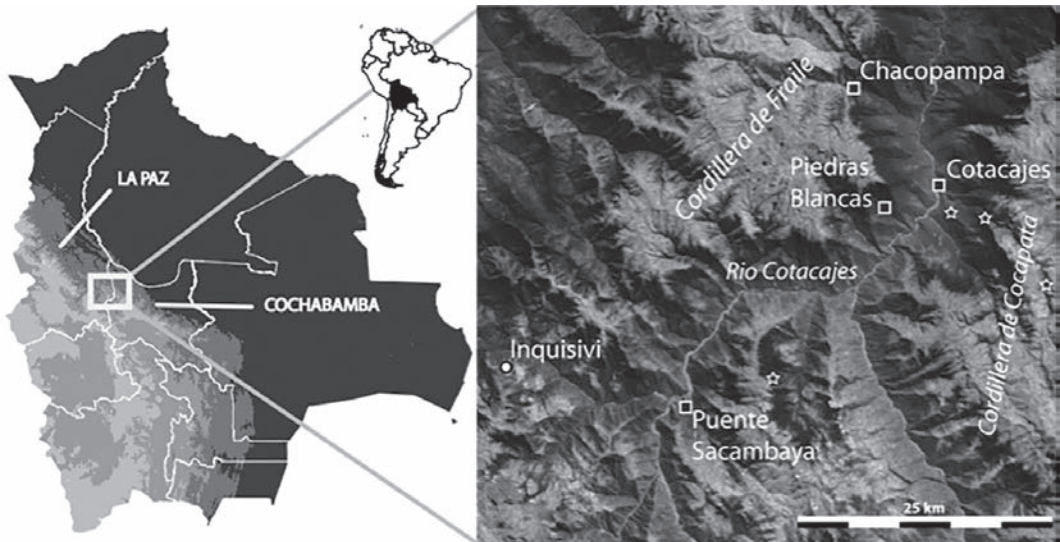


Figure 1. Left: the study area is circumscribed by the grey rectangle on the map of Bolivia straddling dptos. La Paz and Cochabamba. Right: Google Earth image (satellite image courtesy of Google Inc. All rights reserved © 2014 DigitalGlobe) of the study area, highlighting the major geographic features and sampling sites. Humid forest appears dark, transitioning to lighter dry forest closer to the Cotacajes Valley floor; puna grassland appears as the palest shading above the humid forest. Labelled boxes are the sites sampled during our surveys. Stars represent sites visited by Herzog *et al.*⁵. The town of Inquisivi, the type locality of Bolivian Spinetail *Cranioleuca henricae* and the *flavopectera* subspecies of Green-cheeked Parakeet *Pyrrhura molinae*, is also highlighted.

ridges were covered in dense stands of bracken fern and more xeric scrub, with the transition to humid montane forest at higher elevations. Below the camp was a very steep canyon where the vegetation rapidly transitioned to tall dry forest similar, although more mesic, to that surveyed in the Cotacajes upper dry forest. The road, along which we primarily surveyed, continued south, gradually climbing the opposite north-facing slope, where vegetation transitioned to arid montane scrub, and eventually reached a cluster of small farms and houses. We surveyed up to these farms on all days and, on 25 November, GFS walked past the house as far as c.4 km (by road) south of the camp.

Finally, to survey closer to Inquisivi, the type locality of *Cranioleuca henricae* and *Pyrrhura molinae flavoptera*, we returned to dpto. Cochabamba and entered the upper Cotacajes drainage 20 km east-southeast of Inquisivi along a road that terminated at Puente Sacambaya, an unfinished bridge over the río Cotacajes (Puente Sacambaya; 16°95.8'S 66°97.0'W; c.2,250 m; elevations covered 1,650–2,300 m). Habitat was similar in stature and overall composition to the Cotacajes upper dry forest, but was drier with more columnar and vine-like cacti, and fewer epiphytes. Here too, the forest appeared fresh green due to recent rains. We surveyed along 3 km of road at 17h30–19h00 on 28 November and 06h00–14h00 on 29 November. Weather was warm and sunny.

We conducted observational surveys along transects via roads, established footpaths and livestock trails at 06h00–11h00 and often again at 15h00–18h30. We tallied all birds seen or heard, and noted habitat associations and breeding activity. We documented as many species as possible with audio recordings, and voucher specimens obtained with shotguns or mist-nets. We used up to 14 mist-nets, 6–12 m in length, positioned at ground level, and opened at first light and closed in early evening. All observational data are deposited in the Avian Knowledge Network through the eBird portal, Cornell Lab of Ornithology, Ithaca, NY. Audio recordings are archived at the Macaulay Library (ML), Cornell Lab of Ornithology. Voucher specimens and tissue samples are deposited at the Museo de Historia Natural Noel Kempff Mercado (MNKM), Santa Cruz, Bolivia, and Louisiana State University Museum of Natural Science (LSUMNS), Baton Rouge, LA. We follow the taxonomy of the South American Classification Committee¹¹.

We compiled a list of species detected during our surveys considered, or suspected, to be austral migrants in Bolivia following Hennessey *et al.*¹ (Table 1). To assess if austral migrant taxa for which we obtained specimens were in breeding condition, we compared their gonadal data with specimens at LSUMNS collected inside and outside the breeding season.

Results

We report a total of 241 species from the four sites representing 47 families (Appendix). We documented 149 species with specimens or audio recordings. We recorded 121 species at Chacopampa, 118 species at Piedras Blancas, 108 species at Cotacajes and 47 species at Puente Sacambaya. Because Puente Sacambaya was surveyed for less than one day, its species list is less complete than those for other sites and estimates of relative abundance from this locality should be considered preliminary.

We obtained new low-elevation records in Bolivia for the following taxa: Grey-hooded Parakeet *Psilopsiagon aymara* (1,300 m), Puna Tapaculo *Scytalopus simonsi* (c.1,800 m—calling from a grassy hillside above the Cotacajes upper dry forest, no recordings obtained), *Cranioleuca henricae* (1,300 m) and Golden-collared Tanager *Iridosornis jelskii* (Piedras Blancas, 2,100 m). We obtained new high-elevation records for the following taxa: Large Elaenia *Elaenia spectabilis* (Cotacajes, 1,300 m), Tawny-crowned Pygmy Tyrant *Euscarthmus meloryphus* (above the Cotacajes upper dry forest, 1,800 m), White-lined Tanager *Tachyphonus rufus* and Bronze-green Euphonia *Euphonia mesochrysa* (both species at Piedras Blancas, 2,100 m). Additional high-elevation records were made at Chacopampa (2,900 m) for the following taxa: Grey-lined Hawk *Buteo nitidus*, Spotted Sandpiper *Actitis macularius*, Red-necked Woodpecker *Campephilus rubricollis*, Scaled Antpitta *Grallaria guatemalensis*, Black-banded Woodcreeper *Dendrocolaptes picumnus* and Round-tailed Manakin *Ceratopipra chloromeros*¹ (S. Herzog *in litt.* 2014).

We noted the presence of four species of Nearctic migrants. Swainson's Thrush *Catharus ustulatus* was among the commonest birds at Cotacajes (particularly in the upper dry forest) and, although presumably not breeding, were recorded giving almost complete songs typical of those on their breeding grounds in North America. We observed a single juvenile Broad-winged Hawk *Buteo platypterus* in the Cotacajes upper dry forest at 1,500 m. Alder Flycatcher *Empidonax alnorum* was fairly common at Cotacajes. Spotted Sandpiper *Actitis macularius* was recorded at Chacopampa and Puente Sacambaya.

We also report 26 species considered by Hennessey *et al.*¹ to be austral migrants (Table 1). We obtained specimens of 20 of these species. Males of 14 of the species had enlarged testes and females of four species had convoluted oviducts, consistent with reproductive activity at the time of our visit.

Table 1. Breeding evidence for species detected during our surveys considered or suspected to be austral migrants by Hennessey *et al.*¹. We indicate species not reported by Herzog *et al.*⁵ by *. The number of specimens examined appears in parentheses after the breeding evidence.

Species		Breeding Evidence	
		Male	Female
Turkey Vulture	<i>Cathartes aura</i>	–	–
Picui Ground Dove	<i>Columbina picui</i>	–	–
Rufous Nightjar	<i>Antrostomus rufus</i>	enlarged testes, territorial vocalisations (n=1)	–
Grey-hooded Parakeet	<i>Psilopsiagon aymara</i>	–	–
White-bellied Hummingbird	<i>Amazilia chionogaster</i>	testes minute (n=2)	ova minute (n=4)
Southern Beardless Tyrannulet	<i>Camptostoma obsoletum</i>	enlarged testes (n=1)	–
Greenish Elaenia	<i>Myiopagis viridicata</i> *	enlarged testes (n=2)	–
Large Elaenia	<i>Elaenia spectabilis</i> *	enlarged testes (n=1)	–
White-bellied Tyrannulet	<i>Serpophaga munda</i>	–	–
Tawny-crowned Pygmy Tyrant	<i>Euscarthmus meloryphus</i> *	enlarged testes, territorial vocalisations (n=1)	–
Bran-coloured Flycatcher	<i>Myiophobus fasciatus</i>	enlarged testes (n=1 of 3)	–
Euler's Flycatcher	<i>Lathrotricus euleri</i> *	enlarged testes (n=1)	–
White-winged Black Tyrant	<i>Knipolegus aterrimus</i>	enlarged testes (n=2)	–
Yellow-browed Tyrant	<i>Satrapa icterophrys</i> *	–	–
Rufous Casiornis	<i>Casiornis rufus</i>	enlarged testes (n=1)	convoluted oviduct (n=1)
Brown-crested Flycatcher	<i>Myiarchus tyrannulus</i> *	–	convoluted oviduct (n=1)
Streaked Flycatcher	<i>Myiodynastes maculatus</i> *	–	–
Variiegated Flycatcher	<i>Empidonomus varius</i> *	enlarged testes (n=2)	–
Crested Becard	<i>Pachyramphus validus</i>	enlarged testes (n=1)	–
Red-eyed Vireo	<i>Vireo olivaceus</i>	enlarged testes (n=4)	convoluted oviduct (n=2)
Creamy-bellied Thrush	<i>Turdus amaurochalinus</i>	enlarged testes (n=3)	convoluted oviduct (n=1)
Masked Yellowthroat	<i>Geothlypis aequinoctialis</i> *	–	ova minute (n=1)
White-lined Tanager	<i>Tachyphonus rufus</i> *	–	–
Double-collared Seedeater	<i>Sporophila caerulescens</i>	testes minute (n=3)	–
Dull-coloured Grassquit	<i>Tiaris obscurus</i> *	enlarged testes (n=2)	–
Hepatic Tanager	<i>Piranga flava</i> *	enlarged testes, territorial vocalisations (n=1)	–

Species accounts

White-eared Puffbird *Nystalus chacuru*

We mist-netted a male and female in non-breeding condition (testes 4 × 2 mm, ovary 8 × 5 mm) at Cotacajes. Fairly common at Cotacajes and Puente Sacabaya, being present in forested and disturbed habitats at both localities, but most frequently observed perched high in the tops of dead trees or bushes at the margins or in hedgerows around agricultural fields in Cotacajes. The nearest reports are from two dry-forest sites in the La Paz Valley, along the río Jucumarini, prov. Inquisivi, dpto. La

Paz, c.60 km north of the río Cotacajes Valley⁴. Our records augment unpublished reports from the Puente Sacabaya region (S. Herzog *in litt.* 2014) as the first records from the río Cotacajes drainage and dpto. Cochabamba¹ (S. Herzog *in litt.* 2014).

Red-necked Woodpecker *Campephilus rubicollis*

On 15 November, MGH & GFS observed a male and female at Chacopampa in humid montane forest at c.2,900 m. This is an exceptional altitudinal record for this primarily lowland species (<950 m), although in Bolivia it is known to reach c.2,700 m¹. At this elevation elsewhere in Andean humid

montane forest, Crimson-bellied Woodpecker *C. haematogaster* is the expected species of *Campephilus*. In Bolivia, where *C. haematogaster* is largely absent (except in humid montane forest near the Peruvian border), *C. rubricollis* appears to have expanded its elevational distribution upslope, perhaps due to reduced competition from its congener.

Green-cheeked Parakeet *Pyrrhura molinae*

Fairly common at all sites. At Puente Sacambaya, we collected a single individual we ascribe to *P. m. flavoptera* by virtue of its bright orange underwing-coverts and leading edge to the wing⁵. All other individuals we observed at Puente Sacambaya also appeared to be *P. m. flavoptera*. At Piedras Blancas, GFS observed a single *P. m. flavoptera*, initially in flight but subsequently perched, with an obvious bright yellow-orange leading edge to the wing among a flock of 14 nominate *P. molinae*. All specimens from Cotacajes ($n=3$) and Piedras Blancas ($n=1$), and all other individuals we observed at Cotacajes, Chacopampa and Piedras Blancas were nominate *P. molinae*. In their description of *P. m. flavoptera*, Majier *et al.*⁸ reported mixed flocks of nominate and *P. m. flavoptera* from three localities in the La Paz Valley to the north and at a single locality in the Cotacajes Valley. Our sightings at Puente Sacambaya add another locality for this range-restricted subspecies, and our sighting at Piedras Blancas extends the range of *P. m. flavoptera* further down the río Cotacajes Valley.

Barred Parakeet *Bolborhynchus lineola* and Slaty Finch *Haplospiza rustica*

We found both of these semi-nomadic *Chusquea* bamboo specialists at Chacopampa, yet only *H. rustica* at Piedras Blancas. *B. lineola* was common at Chacopampa, where it was predominantly detected by its vocalisations in flight, either just above the forest canopy or high overhead. On 15 November, GFS flushed a large flock of 30–50 *B. lineola* foraging in dead or dying *Chusquea* bamboo in disturbed humid montane forest. Two female *H. rustica* in non-breeding condition (for one, ovary 3×2 mm, ova minute, oviduct straight 4 mm long) were collected at Chacopampa. We observed *H. rustica* twice in humid montane forest at Chacopampa and once in heavily degraded humid montane forest at Piedras Blancas. All records were of 2–3 individuals of both sexes foraging in or near *Chusquea* bamboo. We did not note any vocalisations from *H. rustica*. Uncommon and nomadic throughout its range, there are just 12 previous records of *H. rustica* for Bolivia (S. Herzog *in litt.* 2014). Neither species was recorded by Herzog *et al.*⁵.

Light-crowned Spinetail *Cranioleuca albiceps*

Fairly common at Chacopampa, especially in alder groves and degraded edges of humid montane forest. Of the 11 individuals we collected, most had cream-colored crowns consistent with the southern subspecies *C. albiceps discolor* but a few had variable amounts of white and one was almost pure white, phenotypically closer to the nominate subspecies of the north. Similar intermediate crown colours were recorded by Herzog *et al.*⁵ in cloud forest on the eastern slope of the río Cotacajes Valley, as well as further north in dpto. La Paz¹⁰. Our observations provide additional data on the extent of the region where populations with variable and intermediate crown colour exist. Whether this represents subspecific intergradation or evolutionary change independent of gene flow is unknown¹⁰.

Bolivian Spinetail *Cranioleuca henricae*

Unexpectedly abundant at Puente Sacambaya, 20 km south-east of the species' type locality at Inquisivi, dpto. La Paz. Along the c.3 km of road we walked (from 16°95.8'S 66°97.1'W; 2200 m, to 16°93.5'S 66°97.6'W; 2,000 m) 3–5 individuals could be heard vocalising at any given moment during the most active hours of the morning (06h00–10h30). We conservatively estimate that we heard or saw c.60 individuals along this stretch of road. Unpublished surveys at the same locality recorded fewer total individuals (27), but were conducted later in the breeding season (S. Herzog *in litt.* 2014). We believe the high song activity we observed is associated with breeding, but it is unclear if the abundance we noted is stable year-round. Additionally, we observed a pair of *C. henricae* at Cotacajes on 10 and 13 November. MGH observed the presumed female follow the male, sometimes at a distance of 150+ m. MGH heard the presumed female singing a slightly weaker and higher pitched song than the loudsong of the male. The pair appeared to sing alternately, as if keeping track of each other. This Bolivian endemic is considered Endangered by BirdLife International due to its small, fragmented distribution and threatened habitat. Both records constitute new localities for *C. henricae* in Cochabamba, a new low elevation of 1,300 m, and the highest abundances yet reported for the species.

Azara's Spinetail *Synallaxis azarae* and Sooty-fronted Spinetail *S. frontalis*

Like Herzog *et al.*⁵, we found that *S. azarae* and *S. frontalis* segregate across the ecotone from humid to dry vegetation, respectively. Their songs were readily distinguishable as described in Herzog *et al.*⁵ and, at certain points along the road near Piedras Blancas, both species could be heard

simultaneously, calling from patches of humid and dry habitat. In all recordings we made of *S. azarae* and *S. frontalis* from the Cotacajes (e.g. ML 193125) we did not record any individuals with songs intermediate between the lower pitched *S. azarae* and higher pitched *S. frontalis*. However, specimens we collected of the two species (eight *S. azarae*, two *S. frontalis*) were virtually indistinguishable in plumage or morphometrics. Independent of locality and habitat, we could only identify individuals for which we had obtained voucher recordings prior to collection.

Tawny-crowned Pygmy Tyrant *Euscarthmus meloryphus*

A single male of the nominate migratory subspecies was collected in breeding condition (left testis 5 × 4 mm) at 1,800 m in a brushy ravine (16°73.44'W, 66°73.27'S) bisecting shrubby grassland above Cotacajes. It was very vocal (ML 193141) and responded territorially to playback of its own vocalisations; coupled with timing (the austral spring), this suggests breeding activity. This is the first record of *E. meloryphus* for Cochabamba and also one of the few records of this subspecies at an inter-Andean locality in the southern Andes, although non-migratory *E. m. fulviceps* is widespread in dry inter-Andean valleys in northern Peru. This represents a new upper elevation record for the species in Bolivia; the previous highest was at 1,200 m in Tarija (S. Herzog *in litt.* 2014).

Round-tailed Manakin *Ceratopira chloromeros*

We mist-netted a single *C. chloromeros* in degraded humid montane forest at 2,900 m. It was a subadult male in non-breeding condition (no bursa, left testis 6 × 3 mm) with a few red feathers on an otherwise olive crown. This is a new upper elevational record for this species in Bolivia and extends its elevational distribution by 1,200 m¹.

Drab Hemispingus *Hemispingus xanthophthalmus*

Fairly common at Chacopampa at the edge of humid montane forest. We collected a single female in breeding condition (ovary 4 × 3 mm, ova minute, oviduct 1.5 mm wide and convoluted). This represents the south-easternmost record of this species by c.120 km from the previous south-east range limit in the Chuspipata area, dpto. La Paz (c.16°24'S 67°83'W; S. Herzog *in litt.* 2014). The species was not recorded by Herzog *et al.*⁵ on the east bank of the río Cotacajes in Cochabamba, suggesting that the río Cotacajes represents the southern limit of this species' linear Andean distribution.

Seedeater sp. *Sporophila (schistacea?)*

On 7 November, GFS briefly observed a pale grey *Sporophila* with a small white wing speculum in

the village of Cotacajes. It showed little contrast between the upper- and underparts, but the wings were darker than the back, with an obvious dingy yellow bill. MGH made two more brief sightings of a *Sporophila* fitting this description while at Cotacajes, but we could not obtain a specimen. We ruled out Band-tailed Seedeater *Catamenia analis*, which was uncommon at this locality, due to the complete lack of streaking on the back and lack of dark feathers around the bill and lores, although we did not see the tail to confirm the absence of the white subterminal band of *C. analis*. The phenotypic characters we observed are consistent with *S. schistacea* or *S. plumbea*. Although the habitat at Cotacajes was closer to the preferences of *S. plumbea*, this species typically has a dark bill (although the newly described, migratory and presumed sister taxon, Tropeiro Seedeater *Sporophila beltoni*¹², has a yellow bill). Although all phenotypic characters match *S. schistacea*, this species almost always occurs in the presence of bamboo, typically in humid forest. Our documentation is too sparse for certainty, but either species would be noteworthy in the region and should be searched for on future trips to the río Cotacajes and other Bolivian dry valleys.

Discussion

Our surveys represent the first inventory of the arid valley bottom of the río Cotacajes as well as the first surveys of the cloud-forest avifauna of the Cordillera del Fraile, on the La Paz side of the río Cotacajes. Our results complement the work of Herzog *et al.*⁵ on the Cochabamba side of the río Cotacajes and, together, provide a detailed view of the diverse avian communities of the middle Cotacajes Valley.

Across our elevational transect, we recorded 241 species, 79 of which were not reported by Herzog *et al.*⁵ (after excluding species found only in puna) and represent new records for the valley (see Appendix). Likewise, Herzog *et al.*⁵ reported 80 species not found during our surveys. Most of these differences in species composition between the two surveys are the result of survey work in habitats not surveyed by the other party, i.e., *Polylepis* woodland by Herzog *et al.*⁵ and our work in the floor of the río Cotacajes Valley. Even accounting for these differences, we did not find any evidence from our surveys that closely related taxa replace each other across the río Cotacajes. However, we did find one species, *Hemispingus xanthophthalmus*, for which the río Cotacajes probably represents a range boundary. Additionally, the río Cotacajes drainage appears to delineate the range boundaries of the subspecies of Scaled Metaltail *Metallura a. aeneocauda* / *malagae*, Black-throated Thistletail *Asthenes h. harterti* / *bejaranoi* and possibly Rufous Antpitta *Grallaria rufula occabambae*

/ cochabambae, although these taxa were not detected during our surveys. The range limits of the partially migratory subspecies of White-winged Black-tyrant *Knipolegus a. aterrimus* and the northern resident subspecies *K. aterrimus anthracinus* likely meet in this region. We collected two males in breeding condition during our surveys, but did not observe or collect any females, on which best to base subspecific identification. Additional work in the region should target females to better delineate the range boundary of these taxa.

It is unclear if the range limits of these taxa are delimited by the Cotacajes, the La Paz dry valley system to the north, or both. These species occur at the transition from elfin forest to the treeline, a habitat not sampled by our surveys. Surveys of this habitat in the Cordillera de Fraile may help clarify the range limits of these taxa. Relative to other major biogeographic breaks formed by dry valleys in the Andes, such as the Marañón or Apurímac valleys, the Cotacajes does not appear to represent a formidable barrier to dispersal. This may be due to its north-east orientation, which may not produce as strong a rainshadow effect as other valleys. Or perhaps the smaller species pool of the southern Yungas cloud-forest community has yielded fewer chances for biogeographic breaks to occur in the region.

From the core cloud-forest community, which both teams surveyed extensively, there are conspicuous absences of certain species on one side of the valley that are present on the other. For instance, on the Cochabamba side, Herzog *et al.*⁵ recorded Rufous Antpitta *Grallaria rufula* and Undulated Antpitta *G. squamigera*, which were absent from our survey sites on the La Paz side. In contrast, we found Rufous-faced Antpitta *G. erythrotis* and White-throated Antpitta *G. albigula* to be common and to segregate elevationally (with *G. erythrotis* always above *G. albigula*), yet both were absent at Herzog *et al.*'s⁵ survey sites. These differences probably reflect differences in the elevations and microhabitats sampled between the surveys, in addition to the high beta diversity and stochasticity in the composition of cloud-forest bird communities.

We did not detect two potentially novel taxa reported by Herzog *et al.*⁵ from the dry / humid forest ecotone (*Cnemotriccus* sp.) and from cloud forest (*Diglossa* sp.). We may have missed the *Cnemotriccus* sp. because we did not intensively survey dry forest at 1,700–2,000 m or stunted ridgetop forest where Herzog *et al.*⁵ reported it to be commonest. The potentially new taxon of *Diglossa* was reported by Herzog *et al.*⁵ to be all black. They conjectured these sightings could represent a new subspecies in the Moustached Flowerpiercer *D. mystacalis* complex, a species that was otherwise absent at their survey sites and that exhibits a gap

in its distribution in this region. Although we did not find *Diglossa mystacalis* or any other all-dark *Diglossa*, our surveys at Chacopampa barely extended to the appropriate elevations for elfin forest, the preferred habitat of *D. mystacalis*. Even at appropriate elevations, we failed to detect most of the elfin-forest bird community, except White-browed Conebill *Conirostrum ferrugineiventre*, probably due to habitat degradation.

At all localities, we noted high levels of breeding activity presumably coinciding with the fresh foliage in the dry forest. Although we did not find much evidence of nestbuilding or attendance, vocal activity was very high, especially in the dry forest. For example, in the upper dry forest of Cotacajes, songs of Red-eyed Vireo *Vireo olivaceus* and Tropical Parula *Setophaga pitiaiyumi* were ubiquitous day-round. Amongst all species collected, most males (particularly in dry forest) had enlarged testes, yet females did not show signs of active or recent ovulation such as enlarged or ruptured follicles, or convoluted oviducts. In the cloud forest, and to a lesser extent dry forest, we observed and collected many individuals of various species in juvenile plumage (e.g. Chestnut-crested Cotinga *Ampelion rufaxilla*, Variable Antshrike *Thamnophilus caerulescens*, *Synallaxis azarae* and *Cranioleuca albiceps*). It appeared that breeding season activity was still mounting in the lower elevation dry forest, yet had waned in the cloud forest at higher elevations. Furthermore, it is possible that many species considered to be austral migrants in Bolivia were breeding in the valley and perhaps even resident, given that our surveys occurred during the austral breeding season (Table 1). Gonad evidence from most of these species is inconclusive, particularly for males, but suggestive that many of the taxa we collected were in breeding condition. Further sampling and mark-recapture studies in dry valleys across seasons will be required to determine if these putatively breeding populations of austral migrants represent the northern breeding limits or resident populations. Additionally, we observed large mobile flocks of Yellow-bellied Siskin *Sporagra xanthogastra*, and mixed-species flocks of Double-collared Seedeater *Sporophila caerulescens* and Band-tailed Seedeater *Catamenia analis* in the fields around Cotacajes, the latter probably representing downslope post-breeding movements.

We found all habitats in which we sampled across the elevational gradient to be affected to varying degrees by human activity. At all localities, human encroachment was evident in the clearing and burning of forest for pasture and farmland or, if not cleared, selective logging and, especially at Chacopampa, cattle grazing had heavily degraded the forest understorey. Human impact was greatest just below the cloud forest, at c.1,900–2,500 m,

resulting in a sharp delineation between the intact dry forest below and humid montane forest above, a common pattern in the Andes⁶. In comparison, adjacent slopes without roads or too steep for human settlement displayed a smooth, completely forested elevational transition from dry to humid forest. The least-impacted site was the upper dry forest above Cotacajes, where a large flock of Andean Guan *Penelope montagnii* was indicative of low hunting pressure and, to a lesser extent, forest quality.

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Glenn F. Seeholzer, Michael G. Harvey and Brian Tilston Smith*

*Dept. of Biological Sciences and Museum of Natural Science, 119 Foster Hall, Louisiana State University, Baton Rouge, LA 70803, USA. *Current address: Dept. of Ornithology, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024, USA. E-mails: seeholzer.glenn@gmail.com; mgh272@gmail.com; briantilstonsmith@gmail.com.*

Miguel Aponte Justiniano

Museo de Historia Natural Noel Kempff Mercado, Av. Irala 565, Casilla 2489, Santa Cruz, Bolivia. E-mail: miguel.aponte09@gmail.com.

Appendix. List of 241 species from four sites in the río Cotacajes drainage. Relative abundance was determined for each species based on the mean daily observational count and the number of days a species was recorded. Relative abundance criteria: C = common (>10 individuals / day); F = fairly common (mean 1–10 individuals / day); U = uncommon (mean 0.25–1 individuals / day); R = rare (mean <0.25 individuals / day), X = single record. Documentation: # = specimen collected, v = voice recorded. We indicate species not reported by Herzog et al.⁵ by *.

	Species	Cotacajes	Piedras Blancas	Chacopampa	Puente Sacabaya
TINAMIDAE					
Hooded Tinamou	<i>Nothocercus nigrocapillus</i> *			F, v	
Brown Tinamou	<i>Crypturellus obsoletus</i>	F	F, v	F	
Huayco Tinamou	<i>Rhynchotus maculicollis</i>	U, v	U	U, v	C
Ornate Tinamou	<i>Nothoprocta ornata</i>		R		
ANATIDAE					
Torrent Duck	<i>Merganetta armata</i> *	R		R	
Yellow-billed Pintail	<i>Anas georgica</i> *			U	
Yellow-billed Teal	<i>Anas flavirostris</i> *			U	
CRACIDAE					
Andean Guan	<i>Penelope montagnii</i>	F	F	F	
ODONTOPHORIDAE					
Stripe-faced Wood Quail	<i>Odontophorus balliviani</i>		F	F	
PHALACROCORACIDAE					
Neotropic Cormorant	<i>Phalacrocorax brasilianus</i> *	R			
ARDEIDAE					
Cattle Egret	<i>Bubulcus ibis</i> *	R			
THRESKIORNITHIDAE					
Black-faced Ibis	<i>Theristicus melanopis</i>			F, v	
CATHARTIDAE					
Turkey Vulture	<i>Cathartes aura</i>	F	U	F	F
Andean Condor	<i>Vultur gryphus</i>	R	U		
ACCIPITRIDAE					
Hook-billed Kite	<i>Chondrohierax uncinatus</i>	U			
Swallow-tailed Kite	<i>Elanoides forficatus</i> *		R	U	
Black-and-chestnut Eagle	<i>Spizaetus isidori</i> *			R	
Sharp-shinned Hawk	<i>Accipiter striatus</i>		R	R, #	
Roadside Hawk	<i>Rupornis magnirostris</i>	F		U	
Variable Hawk	<i>Geranoaetus polyosoma</i>			R	
Black-chested Buzzard-Eagle	<i>Geranoaetus melanoleucus</i>	U	R		
Broad-winged Hawk	<i>Buteo platypterus</i> *	U	U		
Grey-lined Hawk	<i>Buteo nitidus</i> *			R	
SCOLOPACIDAE					
Spotted Sandpiper	<i>Actitis macularius</i> *			U	U
LARIDAE					
Andean Gull	<i>Chroicocephalus serranus</i> *			R	
COLUMBIDAE					
Band-tailed Pigeon	<i>Patagioenas fasciata</i>	F	F, #	F	F
Eared Dove	<i>Zenaida auriculata</i>	F	U		F
Picui Ground Dove	<i>Columbina picui</i>	C, #	F	U	C
Large-tailed Dove	<i>Leptotila megalura</i>	F	F, #, v		C
White-throated Quail-Dove	<i>Geotrygon frenata</i>			F, #, v	
CUCULIDAE					
Squirrel Cuckoo	<i>Piaya cayana</i>	F			
Striped Cuckoo	<i>Tapera naevia</i> *	U			
Smooth-billed Ani	<i>Crotophaga ani</i> *	F, #			

	Species	Cotacajes	Piedras Blancas	Chacopampa	Puente Sacambaya
STRIGIDAE					
Tropical Screech Owl	<i>Megascops choliba</i>	R	U		U
White-throated Screech Owl	<i>Megascops albogularis</i>			R	
Yungas Pygmy Owl	<i>Glaucidium bolivianum</i>		U	R, v	
Rufous-banded Owl	<i>Ciccaba albitarsis</i>		R	F	
CAPRIMULGIDAE					
Swallow-tailed Nightjar	<i>Uropsalis segmentata</i>			R	
Lyre-tailed Nightjar	<i>Uropsalis lyra*</i>		U		
Rufous Nightjar	<i>Antrostomus rufus</i>	U, #, v			
APODIDAE					
Chestnut-collared Swift	<i>Streptoprocne rutila</i>	C	U		
White-collared Swift	<i>Streptoprocne zonaris</i>	F	F	C	
swift sp.	<i>Chaetura sp.*</i>	R			F, v
White-tipped Swift	<i>Aeronautes montivagus*</i>	U	U		
Andean Swift	<i>Aeronautes andecolus</i>		F		
TROCHILIDAE					
Green Violetear	<i>Colibri thalassinus</i>		X, #		
Sparkling Violetear	<i>Colibri coruscans</i>		R, #	X, #	
Long-tailed Sylph	<i>Agelaiocercus kingi</i>		F	F, #	
Rufous-capped Thornbill	<i>Chalcostigma ruficeps</i>			U, #	
Tyrian Metaltail	<i>Metallura tyrianthina</i>			C, #	
Collared Inca	<i>Coeligena torquata</i>		R	U, #	
Violet-throated Starfrontlet	<i>Coeligena violifer</i>			F, #	
Sword-billed Hummingbird	<i>Ensifera ensifera*</i>			R, #	
Blue-tailed Emerald	<i>Chlorostilbon mellisugus</i>	R, #	F		
White-bellied Hummingbird	<i>Amazilia chionogaster</i>	F, #	F		F
TROGONIDAE					
Golden-headed Quetzal	<i>Pharomachrus auriceps*</i>			U	
Crested Quetzal	<i>Pharomachrus antisianus*</i>			F	
Masked Trogon	<i>Trogon personatus</i>			F, #, v	
BUCCONIDAE					
White-eared Puffbird	<i>Nystalus chacuru*</i>	F, #			F, v
RAMPHASTIDAE					
Blue-banded Toucanet	<i>Aulacorhynchus coeruleicinctis</i>		F	F, #, v	
Hooded Mountain Toucan	<i>Andigena cucullata</i>			F, #, v	
PICIDAE					
Smoky-brown Woodpecker	<i>Picoides fumigatus</i>		R, #		
Striped Woodpecker	<i>Veniliornis lignarius</i>				F
Bar-bellied Woodpecker	<i>Veniliornis nigriceps</i>		U, #	U, #	
Golden-olive Woodpecker	<i>Colaptes rubiginosus</i>	U			
Crimson-mantled Woodpecker	<i>Colaptes rivolii</i>		U, #	U, #	
Green-barred Woodpecker	<i>Colaptes melanochloros</i>		F, #, v	U, v	F, #, v
Lineated Woodpecker	<i>Dryocopus lineatus*</i>	R			
Red-necked Woodpecker	<i>Campephilus rubricollis*</i>			U	
FALCONIDAE					
Barred Forest Falcon	<i>Micrastur ruficollis</i>			U, v	
Mountain Caracara	<i>Phalco boenus megalopterus</i>			U	
American Kestrel	<i>Falco sparverius</i>		R	U	
Aplomado Falcon	<i>Falco femoralis</i>			U	
PSITTACIDAE					
Green-cheeked Parakeet	<i>Pyrrhura molinae</i>	C, #	C, #	F	F, #, v
Grey-hooded Parakeet	<i>Psilopsiagon ayмара</i>	F, #	F		C
Mitred Parakeet	<i>Psittacara mitratus</i>	C	C	U	F

	Species	Cotacajes	Piedras Blancas	Chacopampa	Puente Sacambaya
Barred Parakeet	<i>Bolborhynchus lineola</i> *			C, v	
Yellow-chevroned Parakeet	<i>Brotogeris chiriri</i>				C
Black-winged Parrot	<i>Hapalopsittaca melanotis</i>		F	U, #	
Speckle-faced Parrot	<i>Pionus tumultuosus</i>		F	F	
Scaly-naped Parrot	<i>Amazona mercenarius</i>			C, v	
THAMNOPHILIDAE					
Barred Antshrike	<i>Thamnophilus doliaius</i> *	R			
Rufous-capped Antshrike	<i>Thamnophilus ruficapillus</i>		F, #, v		
Variable Antshrike	<i>Thamnophilus caerulescens</i>	U, #, v	F, #		F
MELANOPAREIIDAE					
Olive-crowned Crescentchest	<i>Melanopareia maximiliani</i>		F, #, v		
GRALLARIIDAE					
Scaled Antpitta	<i>Grallaria guatemalensis</i>		U, v	F, v	
White-throated Antpitta	<i>Grallaria albigula</i> *		F, #, v		
Rufous-faced Antpitta	<i>Grallaria erythrotis</i> *		R	F, #, v	
RHINOCRYPTIDAE					
Trilling Tapaculo	<i>Scytalopus parvirostris</i>			F, #	
Puna Tapaculo	<i>Scytalopus simonsi</i>	R		U, v	
FORMICARIIDAE					
Short-tailed Antthrush	<i>Chamaeza campanisona</i>	U, v	U		
Barred Antthrush	<i>Chamaeza mollissima</i>			F	
FURNARIIDAE					
Olivaceous Woodcreeper	<i>Sittasomus griseicapillus</i> *	F, #, v	F, #		
Black-banded Woodcreeper	<i>Dendrocolaptes picumnus</i>			U, #	
Strong-billed Woodcreeper	<i>Xiphocolaptes promeropirhynchus</i>	U, #	U	F	
Montane Woodcreeper	<i>Lepidocolaptes lacrymiger</i>		F	F, #	
Streaked Xenops	<i>Xenops rutilans</i> *	U, #, v			
Streaked Tuftedcheek	<i>Pseudocolaptes boissonneautii</i>			U, #	
Rufous Hornero	<i>Furnarius rufus</i> *	F, #			F
Cream-winged Cinclodes	<i>Cinclodes albigentris</i> *		R		
Buff-browed Foliage-gleaner	<i>Syndactyla rufosuperciliata</i>		U, #, v		
Pearled Treerunner	<i>Margarornis squamiger</i>			F, #	
Streak-fronted Thornbird	<i>Phacellodomus striaticeps</i>		R		C, #, v
Creamy-breasted Canastero	<i>Asthenes dorbignyi</i>				U
Light-crowned Spinetail	<i>Cranioleuca albiceps</i>			F, #	
Bolivian Spinetail	<i>Cranioleuca henricae</i>	F, v			C, v
Sooty-fronted Spinetail	<i>Synallaxis frontalis</i>	F, #, v	F, v		F, v
Azara's Spinetail	<i>Synallaxis azarae</i>		F, #, v	F, #, v	
TYRANNIDAE					
Southern Beardless Tyrannulet	<i>Camptostoma obsoletum</i>	U, #, v	R		F
White-banded Tyrannulet	<i>Mecocerculus stictopterus</i>			F	
White-throated Tyrannulet	<i>Mecocerculus leucophrys</i>		X, #	F, #	
Tufted Tit-Tyrant	<i>Anairetes parulus</i>		U	F	
Mouse-coloured Tyrannulet	<i>Phaenomyias murina</i> *	C, #, v			F, v
Greenish Elaenia	<i>Myiopagis viridicata</i> *	U, #			
Large Elaenia	<i>Elaenia spectabilis</i> *	X, #			
Highland Elaenia	<i>Elaenia obscura</i>	U	F, #, v		
Sierran Elaenia	<i>Elaenia pallatangae</i> *	U, #		F, #, v	
Torrent Tyrannulet	<i>Serpophaga cinerea</i> *	R			
White-bellied Tyrannulet	<i>Serpophaga munda</i>				F, v
Streak-necked Flycatcher	<i>Mionectes striaticollis</i>		X, #		
Slaty-capped Flycatcher	<i>Leptopogon supercilialis</i> *		U		
Mottle-cheeked Tyrannulet	<i>Phylloscartes ventralis</i>			U, v	
Sclater's Tyrannulet	<i>Phyllomyias sclateri</i>	U, #			U

	Species	Cotacajes	Piedras Blancas	Chacopampa	Puente Sacambaya
Tawny-rumped Tyrannulet	<i>Phyllomyias uropygialis</i>			F, #, v	
Bolivian Tyrannulet	<i>Zimmerius bolivianus</i>			U, #	
Southern Scrub Flycatcher	<i>Sublegatus modestus</i>				F
Tawny-crowned Pygmy Tyrant	<i>Euscarthmus meloryphus*</i>	U, #, v			
Pearly-vented Tody-Tyrant	<i>Hemitriccus margaritaceiventer</i>	F, #, v			
Ochre-faced Tody-Flycatcher	<i>Poecilatriccus plumbeiceps</i>		F, #, v		
Yellow-olive Flycatcher	<i>Tolmomyias sulphurescens*</i>	F, #, v			
Cinnamon Flycatcher	<i>Pyrrhomyias cinnamomeus</i>		F, #	F, #	
Cliff Flycatcher	<i>Hirundinea ferruginea</i>	F	F		
Bran-coloured Flycatcher	<i>Myiophobus fasciatus</i>	R, #	R, #		U
Euler's Flycatcher	<i>Lathrotriccus euleri*</i>	U, #, v			
Smoke-coloured Pewee	<i>Contopus fumigatus</i>		F, #, v	F	F
Alder Flycatcher	<i>Empidonax alnorum*</i>	F, #			
Black Phoebe	<i>Sayornis nigricans*</i>	U	R		
White-winged Black Tyrant	<i>Knipolegus aterrimus</i>	R	F	F, #	
Yellow-browed Tyrant	<i>Satrapa icterophrys*</i>	X, #			F
Streak-throated Bush Tyrant	<i>Myiotheretes striaticollis</i>			U	
Rufous-bellied Bush Tyrant	<i>Myiotheretes fusciorufus</i>			F, #, v	
Slaty-backed Chat-Tyrant	<i>Ochthoeca cinnamomeiventris</i>		F, #	X, #	
Rufous-breasted Chat-Tyrant	<i>Ochthoeca rufipectoralis</i>			F, v	
Rufous Casiornis	<i>Casiornis rufus</i>	U, #			
Brown-crested Flycatcher	<i>Myiarchus tyrannulus*</i>	U, #			
Golden-crowned Flycatcher	<i>Myiodynastes chrysocephalus</i>		F, #, v		
Streaked Flycatcher	<i>Myiodynastes maculatus*</i>	R			
Variiegated Flycatcher	<i>Empidonomus varius*</i>	U, #			
Tropical Kingbird	<i>Tyrannus melancholicus*</i>	F, #			
COTINGIDAE					
Band-tailed Fruiteater	<i>Pipreola intermedia</i>			U, #	
Barred Fruiteater	<i>Pipreola arcuata</i>			U, #	
White-tipped Plantcutter	<i>Phytotoma rutila</i>	U			
Red-crested Cotinga	<i>Ampelion rubrocristatus</i>			F	
Chestnut-crested Cotinga	<i>Ampelion rufaxilla*</i>			U, #, v	
PIPRIDAE					
Round-tailed Manakin	<i>Ceratopipra chloromeros*</i>			X, #	
TITYRIDAE					
Barred Becard	<i>Pachyrhamphus versicolor*</i>			U	
Crested Becard	<i>Pachyrhamphus validus</i>		X, #		
VIREONIDAE					
Red-eyed Vireo	<i>Vireo olivaceus</i>	C, #, v	F, v		C
Rufous-browed Peppershrike	<i>Cyclarhis gujanensis</i>	F, #	F		C
CORVIDAE					
White-collared Jay	<i>Cyanolyca viridicyanus</i>			F, #, v	
Purplish Jay	<i>Cyanocorax cyanomelas</i>	F, v			
HIRUNDINIDAE					
Blue-and-white Swallow	<i>Pygochelidon cyanoleuca</i>	F, #	C		
Pale-footed Swallow	<i>Orochelidon flavipes</i>			F	
Brown-bellied Swallow	<i>Orochelidon murina</i>		F	R	
TROGLODYTIDAE					
House Wren	<i>Troglodytes aedon</i>	F, #	F, v	C, v	C
Mountain Wren	<i>Troglodytes solstitialis</i>		U, #	F, #, v	
Sedge Wren	<i>Cistothorus platensis*</i>		U, #, v		
Moustached Wren	<i>Pheugopedius genibarbis*</i>	U, #			
Grey-breasted Wood Wren	<i>Henicorhina leucophrys</i>		F, #, v		

	Species	Cotacajes	Piedras Blancas	Chacopampa	Puente Sacambaya
TURDIDAE					
Andean Solitaire	<i>Myadestes rolloides</i>		R		
Swainson's Thrush	<i>Catharus ustulatus</i> *	C, #, v	F		C
White-eared Solitaire	<i>Entomodestes leucotis</i> *			F, #, v	
Pale-eyed Thrush	<i>Turdus leucops</i> *		R, #		
Creamy-bellied Thrush	<i>Turdus amaurochalinus</i>	C, #, v	R		C
Great Thrush	<i>Turdus fuscater</i>		U	F	
Chiguanco Thrush	<i>Turdus chiguanco</i>	X, #	F	F	
Glossy-black Thrush	<i>Turdus serranus</i>			F, #, v	
White-necked Thrush	<i>Turdus albicollis</i> *		R, #		
MIMIDAE					
Brown-backed Mockingbird	<i>Mimus dorsalis</i> *				U
PARULIDAE					
Masked Yellowthroat	<i>Geothlypis aequinoctialis</i> *	U, #	F		
Tropical Parula	<i>Setophaga pitiauyumi</i>	C, #, v			C
Three-striped Warbler	<i>Basileuterus tristriatus</i> *	U	F		
Two-banded Warbler	<i>Myiothlypis bivittata</i> *	F, #, v			
Slate-throated Redstart	<i>Myioborus miniatus</i> *		U		
Brown-capped Redstart	<i>Myioborus bruniceps</i>		F, #	U, #, v	C, v
Spectacled Redstart	<i>Myioborus melanocephalus</i>			F, #	
THRAUPIDAE					
Superciliaried Hemispingus	<i>Hemispingus superciliaris</i>		X, #	U	
Black-eared Hemispingus	<i>Hemispingus melanotis</i>		U		
Drab Hemispingus	<i>Hemispingus xanthophthalmus</i> *			F, #	
Rust-and-yellow Tanager	<i>Thlypopsis ruficeps</i>			F, #	
White-lined Tanager	<i>Tachyphonus rufus</i> *	U	X, #		
Silver-beaked Tanager	<i>Ramphocelus carbo</i> *	F, #	R		
Hooded Mountain Tanager	<i>Buthraupis montana</i>			F, #	
Grass-green Tanager	<i>Chlorornis riefferii</i> *			U, #	
Scarlet-bellied Mountain Tanager	<i>Anisognathus igniventris</i>			F, #	
Blue-winged Mountain Tanager	<i>Anisognathus somptuosus</i>			F, #, v	
Chestnut-bellied Mountain Tanager	<i>Dubusia castaneiventris</i>			U, #, v	
Golden-collared Tanager	<i>Iridosornis jelskii</i>		R	X, v	
Fawn-breasted Tanager	<i>Pipraeidea melanonota</i>		F, #, v	R, #	
Blue-and-yellow Tanager	<i>Pipraeidea bonariensis</i> *	U, #	F	F	F
Sayaca Tanager	<i>Thraupis sayaca</i>	F, #			
Blue-capped Tanager	<i>Thraupis cyanocephala</i>		U	F, #, v	
Blue-and-black Tanager	<i>Tangara vassorii</i>			F, #	
Saffron-crowned Tanager	<i>Tangara xanthocephala</i>		R		
Blue Dacnis	<i>Dacnis cayana</i> *	U			
Guira Tanager	<i>Hemithraupis guira</i> *	F, #, v			
Chestnut-vented Conebill	<i>Conirostrum speciosum</i> *	U			
Cinereous Conebill	<i>Conirostrum cinereum</i>			U	
Capped Conebill	<i>Conirostrum albifrons</i>			F, #	
White-browed Conebill	<i>Conirostrum ferrugineiventre</i>			R	
Grey-bellied Flowerpiercer	<i>Diglossa carbonaria</i>			U	
Masked Flowerpiercer	<i>Diglossa cyanea</i>			F, #, v	
Slaty Finch	<i>Haplospiza rustica</i> *		U	U, #	
Black-and-rufous Warbling Finch	<i>Poospiza nigrorufa</i>		F, #		F
Ringed Warbling Finch	<i>Poospiza torquata</i>	F, #	F, #		C
Saffron Finch	<i>Sicalis flaveola</i> *	C, #	U		C, v
Blue-black Grassquit	<i>Volatinia jacarina</i> *	F			
seed-eater sp.	<i>Sporophila plumbea/schistacea</i> *	R			
Double-collared Seed-eater	<i>Sporophila caeruleascens</i>	U, #			
Band-tailed Seed-eater	<i>Catamenia analis</i>	U, #	F, #	U	

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Red-crested Finch	<i>Coryphospingus cucullatus</i>	C, #			
Dull-coloured Grassquit	<i>Tiaris obscurus*</i>	U, #			
Greyish Saltator	<i>Saltator coerulescens*</i>	U			
Golden-billed Saltator	<i>Saltator aurantirostris</i>	R	C, #	F	C
EMBERIZIDAE					
Saffron-billed Sparrow	<i>Arremon flavirostris</i>	F, #	U		
White-browed Brush Finch	<i>Arremon torquatus</i>		X, #		
Bolivian Brush Finch	<i>Atlapetes rufinucha</i>		F	F, #, v	
Rufous-collared Sparrow	<i>Zonotrichia capensis</i>		C, #	C, #, v	
Common Chlorospingus	<i>Chlorospingus flavopectus</i>		F, v	C, #	
CARDINALIDAE					
Hepatic Tanager	<i>Piranga flava*</i>	U, #, v			
Black-backed Grosbeak	<i>Pheucticus aureoventris</i>	F, #	F, v	U, #	F
Ultramarine Grosbeak	<i>Cyanocompsa brissonii*</i>	F, #, v			
ICTERIDAE					
Mountain Cacique	<i>Cacicus chrysonotus</i>		R, v	U	
Russet-backed Oropendola	<i>Psarocolius angustifrons</i>	R			
Dusky-green Oropendola	<i>Psarocolius atrovirens</i>	U, v	U		
FRINGILLIDAE					
Golden-rumped Euphonia	<i>Euphonia cyanocephala</i>	U	F, #		U, v
Bronze-green Euphonia	<i>Euphonia mesochrysa*</i>		U		
Orange-bellied Euphonia	<i>Euphonia xanthogaster*</i>	U, #			
Yellow-bellied Siskin	<i>Sporagra xanthogastra*</i>	F, #	C		C
Hooded Siskin	<i>Sporagra magellanica</i>	U	U		
PASSERIDAE					
House Sparrow	<i>Passer domesticus</i>	C, #			