

## AVIFAUNA OF A CHACO LOCALITY IN BOLIVIA

ANDREW W. KRATTER,<sup>1,2</sup> T. SCOTT SILLETT,<sup>1,2</sup> R. TERRY CHESSEY,<sup>1,2</sup>  
JOHN P. O'NEILL,<sup>1</sup> THEODORE A. PARKER III,<sup>1,3</sup>  
AND ABEL CASTILLO<sup>4</sup>

**ABSTRACT.**—The avifauna of a locality in the Chaco region of Bolivia was studied during expeditions in 1990. Six species were found for the first time in Bolivia: Black-hooded Parakeet (*Nandayus nenday*), Rufous-legged Owl (*Strix rufipes*), Scimitar-billed Woodcreeper (*Drymornis bridgesii*), Chaco Earthcreeper (*Upucerthia certhioides*), Little Thornbird (*Phacelodonus sibilatrix*), and Stripe-capped Sparrow (*Aimophila strigiceps*). Another species, Crowned Eagle (*Harpyhaliaetus coronatus*), previously was known for Bolivia only by a specimen from an uncertain locality. A number of species not known to breed in the Chaco were found, including some presumed austral migrants. The community composition of the Chaco avifauna varies dramatically among sites, reflecting gradients in moisture and vegetation structure. Received 15 March 1992, accepted 5 Oct. 1992.

The Chaco is an extensive area of dry scrub and deciduous woodland in south-central South America. Centered in western Paraguay and northwestern Argentina, it extends north to southern Bolivia (dptos. Santa Cruz and Tarija), where it meets more humid forests. The Chaco avifauna has been summarized by Short (1975), but there are only a few (e.g., Capurro and Bucher 1988) single-site descriptions, such as those now available for several Andean and Amazonian forest localities. The avifauna of the Bolivian Chaco, especially the less dense, sandy-soil-based scrub characteristic of extreme southern Departamento de Santa Cruz, Bolivia, is largely undescribed.

The Chaco avifauna is composed of a distinct assemblage of species (Cracraft 1985) but has low endemism (Short 1975), because most species extend beyond the Chaco. Short (1975) described the species' limits, geographic variation, and biogeography of the Chaco avifauna, but few data are available on the habitat preferences, foraging ecology, or nesting biology for many Chaco species. Little information is available on seasonal use of the Chaco by migrants and winter visitors.

### STUDY AREA

The study site, Estancia Perforación, was in southern Provincia de Cordillera, Departamento de Santa Cruz, Bolivia (ca 19°45'S, 62°00'W), approximately 130 km east of the provincial capital of Charagua. The Estancia, about 80 km east of the Andean foothills, was flat to slightly rolling. The soil was sandy with little organic matter. The nearest major water

<sup>1</sup> Museum of Natural Science, Louisiana State Univ., Baton Rouge, Louisiana 70803.

<sup>2</sup> Dept. of Zoology and Physiology, Louisiana State Univ., Baton Rouge, Louisiana 70803.

<sup>3</sup> Conservation International, 1015 18th St. N.W., Washington, D.C. 20036

<sup>4</sup> Fundación Amigos de la Naturaleza, Av. Irala 421, P.O. Box 2241, Santa Cruz, Bolivia.

course, the Rio Parapetí, flows northeast about 40 km northwest of the Estancia. The vegetation at Estancia Perforación corresponded to Short's (1975) Dry Algorrobo Woodland, although the dominant vegetation was lower and more open than that described by Short. Most cover consisted of 1–2-m-tall shrubs, interspersed with small (2–7 m) trees (*Aspidosperma quebrachopalo*, *Chorisia* sp., *Prosopis* sp.) and columnar cacti (*Trichocereus* sp.) 4–8 m tall. The area south and northeast of the ranch buildings was the most open, with decreased cover and often with small (10 × 10 m) patches of bare sandy ground. Grasses were present only under dense scrub (perhaps as a result of grazing by cattle; see below). North and west of the ranch buildings, the cover was more extensive, often with extensive stands of palo verde (*Cercidium* sp.) and mesquite (*Prosopis* sp.). An area about 1 km west of the main site had not been grazed since the June rainfall, although old cattle trails were numerous. The ungrazed area, studied extensively 16–20 September, was similar to the more open scrub areas, except that dry, herbaceous grasses filled the open areas. Vegetation throughout tended to be clumped, with impenetrable thickets of terrestrial bromeliads (*Dyckia* sp.) under patches of tall trees and shrubs. One tree species (Bombacaceae: *Chorisia insignis*?) began leafing out about 10 September and was fully leafed by the 20th. Epiphytic bromeliads (*Tillandsia* sp.) were common on the larger trees, especially in species of Bombacaceae; in September the epiphytes were desiccated and drooped from the branches. Mistletoe, fruiting in June, was fairly common on the larger shrubs and trees. In September, flowering was restricted to palo verde, a few species of shrubs, and a common vine.

Large areas of the Chaco have been modified by human activity. The most prevalent disturbances have been cattle grazing, woodcutting, and fire suppression (Bucher and Nores 1988). These disturbances have resulted in a more xeromorphic, wooded aspect, with a decrease in the grassy areas that were interspersed among the patches of woodland and scrub (Short 1975, Bucher and Nores 1988).

Grazing has changed the vegetation at the Estancia. Before grazing, open grassy areas were most likely more common, occurring on the sites with poorer, more sandy soil that are now extensively covered with terrestrial bromeliads and other scrubby vegetation. The entire Estancia is presently subject to grazing, and cattle trails formed a network throughout the scrub. The most heavily grazed areas were closest to the ranch buildings, where there were a number of open, sandy corrals and large bare areas (approximately 20 ha).

Other human disturbances include a dirt runway for small aircraft, approximately 1 km long by 75 m wide. A number of jeep tracks also crossed the property. Two large cement tanks were kept full of water drawn from a well near the ranch buildings. Woodcutting appears to be limited currently to areas near (< 1 km) the ranch, although some larger trees were removed during our stay. One species of tree (*Aspidosperma quebrachopalo*) has been removed from large areas of the region. The ranch operators hunted daily, mainly for javelina (*Catagonus* and *Tayassu* spp.), gray brocket deer (*Mazama gouazoubira*), and armadillos (*Prionomys maximus*, *Dasypus* spp.). The ranch operators did not hunt for birds even though Chaco Chachalaca (*Ortalis canicollis*), the largest gamebird in the region, was plentiful.

## METHODS

In 1990, personnel of the Louisiana State Univ. Museum of Natural Science (LSUMNS) and the Museo de Historia Natural "Noel Kempff Mercado" (MHNNKM), Univ. Autónoma "Gabriel Rene Moreno," Santa Cruz, Bolivia, conducted an inventory of the Chaco avifauna at Estancia Perforación. A preliminary reconnaissance was conducted by Parker, Abel Castillo (AC), and Hermes Justiniano (HJ) from 16 to 18 June. A follow-up expedition, consisting of O'Neill, Chesser, Kratzer, Sillett, Castillo, and Maria Dolores Carreño, visited the same locality from 5 to 20 September.

Temperatures in June were fairly cool and coincided with the end of a period of unusually high rainfall for the region. Grasses and other herbaceous vegetation covered much of the open spaces between shrubs. Most shrubs and trees had luxuriant foliage. Weather in September was much warmer and drier (average high: 31°C, range: 19–38°C; average low: 19°C, range: 8–26°C; no rain recorded). The prevailing, often strong winds were from the north; however, on 12 and 18 September, winds switched to the south, and temperatures dropped sharply. These south winds (“surazos”) generally lasted for 24 h and were followed by a day or two of relatively calm weather conditions. In September, the vegetation was much drier with few leaves present on the dominant trees and shrubs.

The following species accounts include six species new for Bolivia and one species previously known from Bolivia only by a specimen from an uncertain locality (Remsens and Traylor 1989). Also included are accounts of those species not known to breed in the Chaco (see above), some notes on migratory movements, and natural history accounts of some poorly known species. A full list of species recorded is given in Appendix I, along with relative abundances and the breeding condition, fat content, and weights of collected specimens.

All specimens are housed at the LSUMNS and the MHNNKM. In addition, over 3 h of tape-recorded calls and songs are housed at the Library of Natural Sounds (LNS), Cornell Laboratory of Ornithology. Where noted, stomachs of the species below were examined under a dissecting microscope. Prey items were identified to order or family, when possible, and are listed in order of decreasing abundance in the stomachs. All stomach specimens are housed at the LSUMNS.

#### SPECIES ACCOUNTS

**Andean Condor (*Vultur gryphus*).**—This usually montane species was noted on one occasion, when five (4 ad., 1 imm.) were observed by AWK flying north on 10 September into strong north winds. Although this species is not known to breed in the Chaco (Short 1975), local residents reported that condors occurred in the area but were rare. Although only 100 km from the Andean foothills, this record indicates that condors at least occasionally descend into the Bolivian Chaco. The only other lowland record for Bolivia was outside the Chaco, in the Andean foothills of extreme northwest Dpto. Santa Cruz (Remsens et al. 1985).

**Crowned Eagle (*Harpyhaliaetus coronatus*).**—An adult was observed by TAP, AC and HJ in June. The only previous Bolivian record has no specific locality (Remsens and Traylor 1989). Short (1975) considered this species a woodland and forest or edge species; this record indicates that it may occasionally occur in scrub habitats far from woodlands.

**Spot-winged Falconet (*Spizapteryx circumcinctus*).**—This poorly known species was reported only recently from Bolivia, also in the Perforación area (Cabot et al. 1988). We observed scattered individuals nearly every day, flying low over the scrub in more open areas. Spot-winged Falconets have been reported to prey primarily on birds (Brown and Amadon 1968, Grossman and Hamlet 1964) or on insects and lizards (Pereya 1937). At Perforación, stomachs (N = 4) contained birds (including a Rufous Hor-

nero *Furnarius rufus*), large orthopterans, unidentified lizards, and beetles. In June, one individual was observed eating a female Barred Antshrike (*Thamnophilus doliatus* (TAP, AC, photos by HJ).

Black-hooded Parakeet (*Nandayus nenday*).—One group of six, seen and tape recorded (by TAP; to LNS) in June flying over the scrub, represents the first definite record of this species in Bolivia. This species was also observed and tape recorded in September flying high over the scrub in flocks of 5 and 7 birds. One previous record from Bolivia lacks documentation and may be from outside the country (Remsen and Traylor 1989). Short (1975) stated that this species frequents wooded pantanal but ranges into the drier Chaco during nonbreeding seasons. The nearest areas of pantanal are at least 300 km east of the site, suggesting that this species may occasionally make long-range movements into the dry Chaco.

Hoy's Screech-Owl (*Otus hoyi*).—This new form was previously known only from montane areas (1300–2600 m) in Argentina and Bolivia (König and Straneck 1989). *Otus hoyi* was recently described by König and Straneck (1989), and is considered (Marshall et al. 1991) closely related to Variable Screech-Owl (*O. atricapillus*). This species was heard by TAP in Chaco woodland at Isla Verde, ca 75 km northeast of Estancia Perforación. This is the first record for the Bolivian Chaco.

Rufous-legged Owl (*Strix rufipes*).—This species was formerly known north only into the central Paraguayan Chaco, 320 km south of Perforación (Steinbacher 1968); our records are the northernmost of the species and the first for Bolivia. We found two counter-singing 30 min before dawn on 17 June, and another was seen south of the ranch on 18 June. In September, a male and female, presumably a pair, were collected on consecutive evenings as they perched on fence posts along the dirt road just west of the ranch houses. Another individual was flushed from a thick clump of scrub by RTC on 15 September. Foraging and breeding behavior are known poorly (Mikkola 1973). Two stomachs of Perforación specimens contained scorpions, beetles, large spiders, centipedes, and a blind snake (*Leptotyphlops* sp.).

Checkered Woodpecker (*Picoides mixtus*).—Wary individuals and pairs of this poorly known species were observed in both open and denser scrub, often with mixed emberizid and furnariid flocks. They appeared to be most common in the ungrazed Chaco west of the ranch. The birds frequently gave short, rattled whinnies typical of the genus, and occasionally short, weak drumming was heard (tape recorded). Wetmore (1926) and Short (1982) described the general foraging behavior; here we include new information on foraging behavior and diet. Checkered Woodpeckers used a variety of substrates while foraging; they were observed from 0.2–6 m up in shrubs, columnar cacti, and branches and trunks of a variety

of trees. Five stomachs contained small beetle larvae (3–5 mm long) and other arthropod parts.

Scimitar-billed Woodcreeper (*Drymornis bridgesii*).—Although Short (1975) and Meyer de Schauensee (1982) listed this species as occurring in Bolivia, Remsen and Traylor (1989) found no specimens or documentation to support this record. The species was previously known north to western Paraguay, 320 km south of Perforación (Steinbacher 1968). A pair was observed in open scrub with scattered trees south of the ranch in June (TAP). A male was collected by AC in the same area on 9 September. The same day a single individual was flushed from the ground by RTC in the same area. The bird flew to a columnar cactus, where it pecked briefly and then flew to an area of clumped trees, where it was observed foraging on the trunk and main branches of a tree. In June a pair was observed perching horizontally on branches and cacti, probing *Tillandsia* bromeliads in trees, searching holes in dead branches, and probing in the sand. They were also observed searching the bases of terrestrial bromeliads and hopping on the ground. The single stomach contained large spiders, ant-lion larvae (Neuroptera: Myrmeleontidae), and centipedes. The extremely long bill (exposed culmen = 62.2 mm in our specimen) probably enables this species to prey on burrowing arthropods, such as ant-lion larvae, and to probe deeply into bromeliads and holes in trees and cacti.

Chaco Earthcreeper (*Upucerthia certhioides*).—This species was fairly common in dense stands of scrub with a thick terrestrial bromeliad layer below the scrub. The earthcreeper was most often detected by its song, a measured series of squeaky monotonic notes that increased in intensity (tape recordings to LNS). Birds usually sang from 2 to 4 m up in the dense central portion of small trees and larger shrubs. They foraged inconspicuously on or near the ground in terrestrial bromeliads. Stomachs (N = 8) contained beetles, orthopterans, and dipterans. These are the first definite records for Bolivia. Short (1975) listed a record from the Dpto. Tarija in Bolivia, on the basis of a sight record by Olrog (L. L. Short, in litt.), considered hypothetical by Remsen and Traylor (1989). The nearest records are from western Paraguay, 300 km south of Perforación (Steinbacher 1968). Vaurie (1980) considered the Chaco and Bolivian (*U. harterti*) earthcreepers conspecific, although all other authors have treated them as distinct species (e.g., Peters 1951, Short 1975, Sibley and Monroe 1990). *U. harterti* has been collected as close as 200 km west of the Estancia, in the foothills of the Andes. Like *U. certhioides*, *U. harterti* prefers thickets with terrestrial bromeliad undergrowth in xeromorphic scrub; however, it is restricted to steep rocky slopes above 1500 m (Remsen et al. 1988). A number of distinct morphological characters separate *certhioides* from

*harterti*. a series of nine *harterti* (8 skins, one skeleton) collected 275 km northwest of the Estancia in Prov. Caballero, Dpto. Santa Cruz (Remsen et al. 1988) was compared to 11 *certhioides* (8 skins, 3 skeletons) collected at Perforación; these are among the nearest populations of the two species. Males and females within species were pooled because mensural and plumage characters did not differ significantly. The major characters separating these two species are (*harterti* character followed by *certhioides* character in parentheses): distinct buff supercilium extending from bill over eye to end of auricular, bordered laterally by dark brown (weak rufous supercilium extending from eye to end of auricular, diffusing into crown); lore chocolate brown (lores chestnut); forehead and crown brown, the bases of forehead feathers dark brown and edged brown (no chestnut was evident in the crown feather bases as mentioned by Vaurie 1980) (forehead chestnut diffusing into brown nape); chest grayish buff diffusing to brown belly (chest and belly a uniform brown); inner web of rectrix #4 brown, outer web rufous (entire rectrix pale rufous). Body shape is also different: *certhioides* has a significantly shorter bill ( $21.34 \pm 1.09$  mm compared to  $22.57 \pm 0.76$  mm for *harterti*;  $t = 2.507$ ,  $P = 0.026$ ) but significantly longer wings ( $69.54 \pm 1.12$  mm compared to  $64.67 \pm 0.82$  mm for *harterti*;  $t = 9.988$ ,  $P < 0.001$ ); tail lengths do not significantly differ ( $t = 0.27$ ,  $P = 0.979$ ). Vaurie (1980, p. 26) stated that the characters separating the two taxa "do not differ by any character which seems to be of species importance in *Upucerthia*, and all the differences which distinguish them are relative and a matter of degree." What constitutes "important characters" is disputable; however, these plumage and morphological differences are certainly at least as distinct as the characters separating two other earthcreeper species (*U. albigula* and *U. jelskii*) that occur sympatrically (Schulenberg 1987). The songs (from tape recordings by TAP and AWK) of *harterti* and *certhioides* are similar, but *harterti* has, on average, more notes (7+) than *certhioides* (5–6 notes). The measurements of our specimens are consistent with *U. c. estebani* (Wetmore and Peters 1949); this is the expected subspecies based on range, because *estebani* has been recorded into the Chaco of Paraguay.

Short-billed Canastero (*Asthenes baeri*).—This species was discovered only recently in Dpto. Santa Cruz, in the Perforación area (Cabot 1990). We found these canasteros to be fairly common in more open scrub, where they gleaned from twigs and slender branches of low shrubs on the ground and in lower branches, but occasionally 4 m up in small trees. Stomachs (N = 9) contained primarily ants, with some orthopterans, dipterans, beetles, and dermapterans. This species often travelled with mixed emberizid and furnariid flocks. It was often observed hopping (running?) on the open ground with its tail cocked up. The frequently

given song was a few “springy” notes accelerating into a long-rapid, dry trill. The Pilcomayo and Bermejo Rivers of extreme southern Bolivia and central Paraguay apparently separate the nominate subspecies, south of the Bermejo, from *A. b. chacoensis*, north of the Pilcomayo (Nores 1992). *A. b. chacoensis* is represented at Perforación, which is north of the Pilcomayo, although prior Bolivian records (from Dpto. Tarija) are the nominate subspecies. Nores (1992) stated that extensive gallery forests in the Bermejo and Pilcomayo watersheds have also been historically important in separating subspecies of Red-billed Scythebill (*Campylorhamphus trochilirostris*), Variable Antshrike (*Thamnophilus caeruleus*), and Crested Gallito (*Rhinocrypta lanceolata*) and the allospecies Little/Plain Thornbirds and Brown/Rufous (*P. lophotes*/*P. cristata*) cacholotes. For the three taxa with subspecies separated by this area, the subspecies at Perforación is the expected subspecies north of the river, but for two allospecies pairs, the more southern species is found.

Little Thornbird (*Phacellodomus sibilatrix*).—This species, previously unrecorded from Bolivia, was most common south of the ranch (in June) and in the ungrazed scrub west of the Estancia (in September). Individuals, pairs, or small groups kept low in bushes and small trees or foraged on the ground. Stomachs (N = 4) contained beetles, spiders, orthopterans, and ants. This monotypic species was previously known from the southern Chaco north to southwestern Paraguay (Short 1975). Short (1975) and Nores (1992) considered the Plain and Little Thornbirds to form a superspecies that narrowly overlap in central Paraguay. These records greatly increase this zone of overlap, making superspecies status less likely.

Lark-like Brushrunner (*Coryphistera alaudina*).—The behavior of this species at Perforación was similar to that observed by others (e.g., Wetmore 1926, Friedmann 1927), but we report here on interesting roosting behavior, its migratory status, and its diet. As its English name suggests, this species is remarkably similar in plumage and habits to larks (Alaudidae). Brushrunners kept mainly to the most open areas of the scrub, running or walking on the ground in small loose flocks of 3–20 birds, often with Picui Ground-Doves (*Columbina picui*). A group of nine was observed entering the nest of a Brown Cacholote just before dusk in June. The group perched in a tree near the nest and withstood numerous attempts by the cacholote to drive them away. They entered the nest after the male cacholote departed to roost in another nest. This species may, on occasion, breed in cacholote nests. Stomachs (N = 9) contained almost entirely ants, including both larvae and newly emerged (white) individuals, a few spiders, and beetles. This species is not known to nest in Bolivia (Short 1975) and may migrate northward after breeding (Capurro and Bucher 1986). Birds at the Estancia, however, did not show signs of

being migrants, such as marked variation in numbers or deposits of subcutaneous fat. The published egg dates from Argentina are from late September through mid-November (de la Peña 1987), suggesting that this species should be migrating during August and September.

Brown Cacholote (*Pseudoseisura lophotes*).— This species has remarkably diverse foraging habits and is reminiscent of jays (Corvidae) in habits and appearance (see summary in Vaurie 1980); here we include information on foraging, display behavior, and diet. The noisy and conspicuous cacholotes were usually observed in groups of three or four, sometimes with mixed-species flocks. They were found in all areas, although less commonly in the thickest scrub. They were occasionally seen walking and foraging on the ground, but were more often seen in the denser central portions of trees, especially *Prosopis*. Foraging maneuvers included woodpecker-like hammering on the ground and in trees, and gleaning insects drawn to mammal hides drying at the ranch houses. They frequently participated in loud, raucous duets (Wetmore 1926) and displayed from the tops of trees, opening their wings and fanning their tails. Their large distinctive nests (see Wetmore 1926) were active in June. Pairs actively defended territories that seemed to be 2–3 ha in size. Stomachs (N = 8) contained beetles, fruits (5–7 mm), insect larvae, and large ants.

Giant Antshrike (*Batara cinerea*).— This poorly known species was previously unrecorded from the Bolivian Chaco. Wary individuals or pairs generally kept below one meter in dense, low thickets of terrestrial bromeliads and tangled branches of bushes. Stomachs (N = 3) contained large orthopterans (Acrididae) and large ants; a nearly whole lizard (*Tropidurus hispidus*) at least 4 cm long was in the stomach of one specimen. This locality is between the main ranges of subspecies represented in the humid montane valleys of western Dpto. Santa Cruz (*B. c. excubitor*) and the more likely Chaco subspecies (*B. c. argentina*) of Argentina and Dpto. Tarija, Bolivia. Bill size and tail barring suggest *argentina*; however, the crest of the female has less black than *excubitor*, and much less than *argentina* (M. L. Isler and P. R. Isler, pers. comm.). The only record from Paraguay is considered *argentina* (Steinbacher 1962), as is a female from northern Argentina, just east of extreme southern Dpto. Tarija in Bolivia (Camperi 1988).

Crested Gallito (*Rhinocrypta lanceolata*).— Peters (1923) and Wetmore (1926) described the behavior of this species in Argentina; here we present information on calls, foraging behavior, and diet. At Perforación, gallitos were wary and difficult to see, but were heard during all daylight hours. Two common calls were recorded: a ventriloquial, hollow, double note whistle, and two to four harsh “wraar-wraar” scolds (male and female, respectively?). Birds usually called either from the ground or low perches



in dense shrubs, but occasionally they called from as high as 4 m up in bushes and dense trees. Vocal activity appeared to increase when flocks of other species were nearby. Gallitos foraged by flicking sand with the bill or by rapidly scratching the surface with their legs. Stomachs (N = 10) contained mostly fruits, with some ants, beetles, insect larvae, and spiders.

White-crested Elaenia (*Elaenia albiceps*).—Although this species is usually montane in Bolivia (Traylor 1982), a female was collected by TSS on 12 September in scrub adjacent to the water tanks. The plumage and skin measurements of this specimen match those of the subspecies *E. a. chilensis*, of which there are apparently both migratory and sedentary populations (Traylor 1982). However, it lacks the elongated 10th primary of the migratory form (Zimmer 1941), and the sedentary population is evidently restricted to montane central Bolivia (Traylor 1982). Although the sedentary form of *E. a. chilensis* hybridizes with the lowland Small-billed Elaenia (*E. parvirostris*) along the eastern base of the Andes in Dpto. Chuquisaca, Bolivia (Traylor 1982), our freshly molted specimen does not appear to be intermediate in any characters. No hybrids were available for comparison. The stomach contained dipterans, insect larvae, heteropterans, small fruits, and a tiny (2 × 2 mm) flower.

Greater Wagtail-Tyrant (*Stigmatura budytoides*).—We report here on the breeding status of this interesting tyrannid and include new natural history notes. Short (1975) stated that northern records of *S. b. inzonata* may refer to wintering birds, although Traylor (1979) included southeastern Bolivia in the breeding range. Although our records do not definitively indicate that this species breeds in southern Bolivia, the pairs were obviously territorial. In addition, they showed no migratory characteristics in September (e.g., no heavy deposits of fat or marked variation in numbers from day to day). This was the most frequently netted bird and one of the most conspicuous species at the site. Duetting pairs were frequently heard, and the birds were easily observed as they foraged in pairs 1–3 m up in the outer branches of shrubs and small trees, most frequently in the more open scrub areas. The duet consisted of one bird giving a rapid three note “chur chur chur” (the second note higher and third note lower than the first) and the other giving a loud musical chatter. Family groups of 3–4 birds were noted in June; pairs were observed in September. They gleaned from and sallied to small leaves and twigs, often in the company of the behaviorally similar (Wetmore 1926) Masked Gnatcatcher (*Poliophtila dumicola*). Stomachs (N = 6) contained almost entirely ants, apparently of the same species, with a few beetles.

Cinnamon-bellied Ground-Tyrant (*Muscisaxicola capistrata*).—The single individual of this Andean species seen by RTC on 13 September represents the first Dpto. Santa Cruz record and the only lowland record for Bolivia. The bird was discovered on the second day of steady southerly

winds following a *surazo*, on the wide dirt road west of the ranch and the barren dirt airstrip adjacent to the road. The bird was roughly 18 cm in length and had a grayish-brown back with an ashy-gray breast and throat. The lower flanks and belly were light cinnamon and the face darkish, especially around the eyes. The most distinctive field mark, however, was a rufous crown patch, although this was only occasionally visible. The bird fed by picking food from the ground; it alternately paused and walked or ran along the ground. When searching, it stood rather upright, often pumping its tail, and it frequently ascended heaps of cattle dung, presumably for a better vantage point. When flushed, the bird flew low to the ground, swiftly and in a roughly zig-zag pattern. The bird was extremely wary, and attempts to collect it proved unsuccessful. This austral migrant normally occurs in Bolivia in puna grassland above 3400 m (Remsen and Traylor 1989).

Hudson's Black-Tyrant (*Knipolegus hudsoni*).—Several males were seen in June; two males and a female were collected in September. They generally perched low on outer branches of shrubs in rather open areas and sallied to the ground to capture insects. Stomachs (N = 2) contained beetles, orthopterans, isopterans (Termitidae), insect larvae, spiders, and dipterans. On 19 September, TSS observed two female-plumaged (one female collected) birds over a 15-min period performing a strange flight behavior (the "popcorn display") in an area of burned-over desert scrub. The birds flew from about a meter up in the dense, charred understory to 10–15 m in the air. At the apex of the flight, they gave a faint call, and then cocked their tails up and slowly fluttered to the ground. The intervals between these flights varied from 30 sec to 5 min. The birds were silent when in the understory. The species is known to breed only in Rio Negro and La Pampa, Argentina (Traylor 1979). The birds we observed were presumably winter residents.

Stripe-capped Sparrow (*Aimophila strigiceps*).—We report here on the first record for Bolivia and the northernmost record of this species. Groups of 2–8 birds were seen in open scrub, frequently with mixed emberizid and furnariid flocks. Occasionally flushed from the ground, they were more often seen perched 1–3 m up in dense shrubs and small trees near openings in the scrub. They frequently gave sharp "peenk" calls; no singing was heard during our visits. Stomachs (N = 10) contained fruits, seeds, tiny orthopterans, and spiders. The subspecies represented is the nominate *A. s. strigiceps*.

#### DISCUSSION

We recorded 110 species during the June and September expeditions (Appendix I); 24 species were recorded only in September, and 7 were recorded only in June. We recorded six species not mentioned by Short

(1975) as breeding in the Chaco. These were Cattle Egret (*Bubulcus ibis*), Andean Condor, Variable Screech-Owl, White-collared Swift (*Streptoprocne zonaris*), Hudson's Black-Tyrant, and Cinnamon-bellied Ground-Tyrant. Two of these are presumed austral migrants (the black-tyrant and ground-tyrant), and three are most likely wandering individuals that may occasionally use Chaco habitats during the nonbreeding season (Cattle Egret, Andean Condor, and White-collared Swift). The owl is presumably a permanent resident.

Mixed-species flocks of emberizids and furnariids were conspicuous at Perforación. The most common species in these flocks were emberizid finches, especially Red-crested Finches (*Coryphospingus cucullatus*: up to 25/flock) and Many-colored Chaco-Finches (*Saltatricula multicolor*: up to 10/flock). Smaller numbers of Ultramarine Grosbeaks (*Cyanocompsa cyanea*), Red-crested Cardinals (*Paroaria coronata*), and Stripe-capped Sparrows were often with these flocks. Many furnariid species also occurred with these flocks, especially Short-billed Canastero, Sooty-fronted Spinetail (*Synallaxis frontalis*), Little and Plain Thornbirds, and occasionally Brown Cacholote. Unlike the finches, only singles or pairs of furnariid species usually associated with flocks. Checkered Woodpeckers also occurred in many flocks.

The open corrals and heavily grazed areas seemed to be important habitat for some bird species, especially Picui Ground-Dove (*Columbina picui*), Lark-like Brushrunner, and Cattle Tyrant (*Machetornis rixosus*). Numerous species were drawn to the water tanks, most notably Picui Ground-Dove, White-tipped Dove (*Leptotila verreauxi*), and Hooded Siskin (*Carduelis magellanica*).

A few bird species were found only in the ungrazed area west of the Estancia, including Brushland Tinamou (*Nothoprocta cinerascens*), Plain Thornbird, and Wedge-tailed Grass-Finch (*Emberizoides herbicola*); the mixed emberizid and furnariid flocks (see above) were more common in the ungrazed areas than in the grazed areas.

Composition of the avifauna varies among different Chaco habitats (e.g., tall woodland vs desert scrub). At a Chaco woodland site (Proyecto Abapó-Izozog: ca 19°05'S, 63°05'W) 150 km northwest of Estancia Perforación, an LSUMNS expedition in 1984 recorded a much different avifauna (J. V. Remsen, unpubl. data): 59 species present at Perforación (54% of the Perforación avifauna) were absent at Proyecto Abapó-Izozog (Appendix II). Short (1976) described a collection of birds taken in the Paraguayan Chaco over a 14-year period in the vicinity of Lichtenau (22°49'S, 59°39'W), approximately 400 km southeast of Estancia Perforación. Lichtenau is just east of what Short described as the driest Paraguayan Chaco. Perforación is geographically nearest to the dry Chaco of

western Paraguay and therefore is probably more xeric than Lichtenau. The composition of the Lichtenau avifauna also reflects more mesic affinities than does Perforación: not only were more woodland species present at Lichtenau (Appendix II), but water-dependent species were also present (Appendix II). Although the avifauna described by Short did not include some elements (e.g., many large raptors such as Turkey Vulture [*Cathartes aura*] and Crested Caracara [*Polyborus plancus*]) that were most likely present but not collected, the collection is large (723 specimens) and probably represents most of the avifauna, especially the smaller species. It is thus surprising that 31 species present at Perforación (28% of the avifauna) were absent from Lichtenau (Appendix II), including such common or conspicuous species at Perforación as Spot-winged Falconet, Scissor-tailed Nightjar (*Hydropsalis brasiliensis*), Sooty-fronted Spinetail, and Crested Gallito.

Some turnover is evident even within the driest Chaco scrub at the northwestern periphery of the Chaco. Capurro and Bucher (1988) described the avifauna of a Chaco site in Dpto. Salta, Argentina (25°05'S, 64°10'W), 550 km SSE of Perforación; like Perforación, this site is at the base of the Andes and has similar scrub vegetation. The avifauna, however, was quite different: 27 of the species present at Perforación, or 25% of the avifauna, were not recorded at the Argentine site (Appendix II). Several of the species missing at the Argentina site were not only common at Perforación but widespread in Chaco habitats; these included White-barred Piculet (*Picumnus cirratus*), Stripe-backed Antbird (*Myrmorchilus strigilatus*), and Plush-crested Jay (*Cyanocorax chrysops*).

The avifaunal differences among these four sites indicate that there may be a high turnover of species along gradients of moisture and vegetation stature (i.e., desert scrub at Perforación to woodland at Lichtenau or Proyecto Abapó-Izozog) or even among microhabitats within xeric scrub habitats (Perforación to Salta, Argentina). Of the 218 total species (excluding water dependent species) combined from all four sites, only 14% are shared among all four (Appendix II).

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APPENDIX I  
ANNOTATED LIST OF AVIFAUNA AT ESTANCIA PERFORACIÓN<sup>a</sup>

	Relative abundance <sup>b</sup>	Breeding condition <sup>c</sup>	Fat <sup>d</sup>	Mean mass (g)	
				♂ (N: range)	♀ (N: range)
Rheidae					
Greater Rhea	R				
Tinamidae					
Tataupa Tinamou	FC	-			225 (1)
Small-billed Tinamou	NR, R	+		141 (1)	
Brushland Tinamou	R				
Ardeidae					
Cattle Egret	NR, V				
Cathartidae					
Black Vulture	C				
Turkey Vulture	FC				
Andean Condor	NR, V				
Accipitridae					
Bicolored Hawk	NR, R				300 (1)
Crane Hawk	NR, V				
Crowned Eagle	R, NR				
Roadside Hawk	R				
White-tailed Hawk	NR, R				
Falconidae					
Crested Caracara	FC				
Spot-winged Falconet	R, U	- (3), ± (1)		128.3 (4: 124-130)	
American Kestrel	NR, R	-			104 (1)

APPENDIX I  
CONTINUED

	Relative abundance <sup>b</sup>	Breeding condition <sup>c</sup>	Fat <sup>d</sup>	Mean mass (g)	
				♂♂ (N; range)	♀♀ (N; range)
Aplomado Falcon	R			229 (1)	
Cracidae					
Chaco Chachalaca	C				
Cariamidae					
Red-legged Seriema	R				
Black-legged Seriema	R, NR				
Columbidae					
Picui Ground-Dove	FC, C	-	- , +	42.7 (3: 40-47)	41 (1)
White-tipped Dove	C				
Psittacidae					
Blue-crowned Parakeet	U				
Black-hooded Parakeet	R				
Monk Parakeet	C	± (1 ♀), - (1 ♂)	-	98 (1)	84.6 (2: 75.5-94)
Blue-fronted Parrot	U				
Cuculidae					
Squirrel Cuckoo	NR, R				
Strigidae					
Tropical Screech-Owl	NR, U	-	-		62 (2: 59-65)
Ferruginous Pygmy-Owl	FC				
Rufous-legged Owl	U	±	-	350 (1)	375 (1)



APPENDIX I  
CONTINUED

	Relative abundance <sup>a</sup>	Breeding condition <sup>c</sup>	Fat <sup>d</sup>	Mean mass (g)	
				♂♂ (N; range)	♀♀ (N; range)
Caprimulgidae					
Little Nighthjar	NR, FC	- , ±	- , +	32.9 (2: 31-34.8)	
Scissor-tailed Nighthjar	U	+	-	47 (1)	
Apodidae					
White-collared Swift	V, NR				
Trochilidae					
Glittering-bellied Hummingbird	C	+ (2 ♂♂, 1 ♀) - (1 ♂)	+ , -	3.2 (3: 2.8-3.5)	2.8 (1) 2.8
Blue-tufted Starthroat	U	+	-	4.9 (1)	
Bucconidae					
Spot-backed Puffbird	U	-	-	34.7 (2: 32-37.3)	34 (1)
Picidae					
White-barred Piculet	U	-	- , ±	7.6 (3: 7-8.3)	7.4 (5: 6.7-8)
White Woodpecker	R	-	-	40 (1)	36.5 (1)
White-fronted Woodpecker	R	-	-	27.7 (2: 26-29.4)	25.2 (6: 22-27.5)
Checkered Woodpecker	FC	± (2 ♀♀, 1 ♂) - (2 ♀♀, 1 ♂)	-		
Green-barred Flicker	R	-	-	122 (1)	
Cream-backed Woodpecker	R	+ , -	-	211.5 (2: 210-213)	
Dendrocolaptidae					
Scimitar-billed Woodcreeper	R	+	-	76 (1)	
Great Rufous Woodcreeper	R				

APPENDIX I  
CONTINUED

	Relative abundance <sup>b</sup>	Breeding condition <sup>c</sup>	Fat <sup>d</sup>	Mean mass (g)	
				♂ (N: range)	♀ (N: range)
Narrow-billed Woodcreeper	FC	-	-	24.5 (1)	26.3 (5: 23.6-29.2)
Red-billed Scythebill	U	-	-	39 (1)	39.5 (2: 37.5-41.5)
Furnariidae					
Chaco Earthcreeper	FC	-	-	21.7 (7: 18-24)	22.5 (5: 20.9-24)
Rufous Hornero	U	-	-	38.8 (2: 36-41.5)	
Sooty-fronted Spinetail	FC	-	-	12.4 (4: 10.9-13.2)	
Stripe-crowned Spinetail	FC	- (3 ♀, 2 ♂)	-	10.5 (3: 10.2-10.9)	10.6 (3: 10.1-11.4)
		± (1 ♀, 1 ♂)			
		+ (2 ♀, 1 ♂)			
		± (2 ♀, 1 ♂)			
		- (1 ♀, 1 ♂)			
Short-billed Canastero	FC	-	-	14.3 (7: 13.3-15)	13 (5: 9.3-15.6)
Plain Thornbird					
	R	-	-	26.6 (1)	
Little Thornbird	U	- (3 ♂), ± (1 ♀)	-	15.6 (3: 14.9-16)	16 (1)
Lark-like Brushrunner	C	-	-	29.9 (7: 27-32)	30.1 (9: 27-32)
Brown Cacholote	FC	-	+	76 (5: 71-83)	68.6 (6: 63-77)
Formicariidae					
Giant Antshrike	R	-	-	97 (1)	103.5 (2: 97-110)
Great Antshrike	R	-	-		
Barred Antshrike	U	-	-	24.3 (2: 24-24.5)	23 (1)
Variable Antshrike	FC	-	-	15.7 (3: 14.7-16.9)	16.5 (4: 15-18.1)
Stripe-backed Antbird	C	- (3 ♀, 4 ♂)	-	22.4 (6: 21.3-23)	20.8 (3: 19.5-21.8)
		± (1 ♀)			

APPENDIX I  
CONTINUED

	Relative abundance <sup>b</sup>	Breeding condition <sup>c</sup>	Fat <sup>e</sup>	Mean mass (g)	
				♂♂ (N; range)	♀♀ (N; range)
<b>Rhinocryptidae</b>					
Crested Gallito	C	— (2 ♀♀, 2 ♂♂) ± (2 ♀♀, 2 ♂♂)	—	62.7 (8: 59–66.7)	59.7 (3: 54–64)
<b>Tyrannidae</b>					
Southern Beardless-Tyrannulet	U	—	—, ±	7.9 (2: 7.6–8.1)	
Southern Scrub-Flycatcher	U	—	+, —	11 (4: 10.1–12)	9.5 (2: 9–10.1)
Chaco Suiriri	FC	—	—	14.9 (2: 14.5–15.2)	12.4 (4: 11.2–13.3)
White-crested Elaenia	V	—	—		12.2 (1)
White-crested Tyrannulet	R	—	±		5.7 (1)
Plain Tyrannulet	C, NR	—	—		
Greater Wagtail-Tyrant	C	— (8 ♀♀, 5 ♂♂) ± (1 ♂)	—	9.7 (10: 9–10.5)	8.7 (8: 7.5–9.4)
Tawny-crowned Pygmy-Tyrant	R, NR	—	—		
Pearly-vented Tody-Tyrant	C	— (5 ♂♂, 1 ♀) ± (1 ♂)	—	7.3 (7: 6.6–8.3)	7.7 (2: 7.4–8)
Fuscous Flycatcher	NR, R	—	—		
Vermilion Flycatcher	U	—	+, ±	13.7 (2: 13.4–13.9)	
Cinnamon-bellied Ground-Tyrant	V	—	±		
Hudson's Black-Tyrant	R	—	±	14.3 (2: 12.1–16.5)	
White-winged Black-Tyrant	NR, U	—	—, ±	21.5 (2: 14.8–22)	15.5 (2: 15.1–16)
Cattle Tyrant	R	—	—		
Brown-crested Flycatcher	R	—	+	27.4 (1)	
Crowned Slaty-Flycatcher	NR, R	—	+	29.6 (1)	

APPENDIX I  
CONTINUED

	Relative abundance <sup>a</sup>	Breeding condition <sup>c</sup>	Fat <sup>d</sup>	Mean mass (g)	
				♂ (N: range)	♀ (N: range)
Phytotomidae					
White-tipped Plantcutter	U	±	-		40.5 (2: 40-41)
Hirundinidae					
Blue-and-white Swallow	V				
Corvidae					
Plush-crested Jay	FC	-	-	131.5 (2: 123-140)	130 (1)
Troglodytidae					
House Wren	NR, FC	-(2 ♂), ± (1 ♀)	-	10.0 (2: 10.0)	10 (1)
Sylviinae					
Masked Gnatcatcher	C	-	-	10.7 (2: 5.3-6.2)	5.9 (1)
Turdinae					
Creamy-bellied Thrush	U	-	±, -	54.3 (4: 46-62)	
Mimidae					
Chalk-browed Mockingbird	C	-	-, ±	55.3 (3: 54-56)	
White-banded Mockingbird	FC		-	45 (1)	46.0 (3: 43-49)
Vireonidae					
Rufous-browed Peppershrike	U	-	-	31.9 (2: 31.5-32.2)	
Emberizinae					
Rufous-collared Sparrow	FC	-	±	19.7 (4: 19-20.5)	
Stripe-capped Sparrow	FC	-	-	22.6 (6: 20.5-23.7)	21.7 (4: 20.7-23)

APPENDIX I  
CONTINUED

	Relative abundance <sup>b</sup>	Breeding condition <sup>c</sup>	Fat <sup>d</sup>	Mean mass (g)	
				♂♂ (N; range)	♀♀ (N; range)
Black-crested Finch	U	-	-	14.9 (9; 19-20.5)	14 (1)
Ringed Warbling-Finch	U, FC	-(1 ♀, 4 ♂♂) ± (1 ♂)	- , ±	9.7 (6; 9-10.6)	10.9 (1)
Black-capped Warbling-Finch	C	-	-	10.0 (5; 9.4-11)	9.7 (4; 9.4-10)
Wedge-tailed Grass-Finch	NR, R	-	-		8.9 (1)
Blue-black Grassquit	NR, V	-	-	22.3 (8; 20-25)	22.2 (10; 20.5-23.5)
Many-colored Chaco-Finch	C	-	-	13.7 (10; 12-15.8)	13.6 (3; 12.5-15)
Red-crested Finch	FC, C	-	-	36.8 (2; 34.6-39)	35.7 (2; 34.5-37)
Red-crested Cardinal	FC	-	-		
Cardinalinae					
Black-backed Grosbeak	U	-(♂), + (♀)	-	45 (1)	49 (1)
Golden-billed Saltator	C	-	- , ±	39.3 (9; 35-44)	42.2 (7; 39-45)
Ultramarine Grosbeak	FC	-	-	23.5 (6; 21.8-27)	23.1 (5; 19.3-29.6)
Thraupinae					
Hepatic Tanager	NR, R	-	-	30 (1)	i
Sayaca Tanager	NR, R	-	-		
Blue-and-yellow Tanager	R, NR	-	-		
Purple-throated Euphonia	NR, R	±	±	10.8 (1)	
Parulinae					
Tropical Parula	NR, U	-	- , +	7.4 (1)	6.6 (1)
Icteridae					
Epaulet Oriole	FC	-	± , -	29.9 (2; 28.8-29)	26.8 (1)

APPENDIX I  
CONTINUED

	Relative abundance <sup>a</sup>	Breeding condition <sup>b</sup>	Fat <sup>c</sup>	Mean mass (g)	
				♂♂ (N; range)	♀♀ (N; range)
Campo Oriole	FC	-	-	48 (1)	41.1 (2; 40.3-42)
Bay-winged Cowbird	U	-	-	40.3 (1)	
Shiny Cowbird	NR, R	±	+	48.5 (1)	
Fringillidae					
Hooded Siskin	FC	-	-	10.1 (3; 9.5-10.5)	10.1 (3; 9.8-10.5)

<sup>a</sup> Scientific names are given in Appendix II.  
<sup>b</sup> Relative abundance: If two codes, first is June abundance and second is September abundance; C = common (> 10/day); FC = fairly common (4-10/day); U = uncommon (1-3/day); R = rare (< 1/day); V = visitor; NR = not recorded.  
<sup>c</sup> Breeding condition: "++" = enlarged gonads (arbitrarily, testes ≥ 2 × 2 for birds < 8 g; > 7 × 4 mm for birds < 50 g, or > 10 × 5 for birds > 50 g; largest ova > 1 mm for birds < 50 g or > 2 mm for birds > 50 g; "-" = nonreproductive gonads (arbitrarily, testes < 2 × 2 for birds < 8 g, < 4 × 3 mm for birds < 50 g or < 7 × 4 for birds > 50 g; largest ova < 1 mm); "±" = intermediate testes size or for largest ovum = 1 mm for females < 50 g, or = 2 for females > 50 g. Numbers in parentheses refer to number of specimens from each sex in the given condition. All data from September specimens.  
<sup>d</sup> Fat: "+" = heavy or very heavy fat (deep fat in feather tracts, furcula area, and throughout intestinal tract), "++" = moderate fat (furcula area almost filled with fat, fat present in feather tracts); "-" = trace or light fat. If more than one condition is noted, the most frequent condition is given first. All data from September specimens.

APPENDIX II  
REGIONAL AVIFAUNA AT FOUR CHACO SITES<sup>a</sup>

Species	EP	L	P	S	Species	EP	L	P	S
Greater Rhea ( <i>Rhea americana</i> )	+	-	-	+	Crane Hawk ( <i>Geranoospiza caerulescens</i> )	+	-	-	-
Tataupa Tinamou ( <i>Crypturellus tataupa</i> )	+	+	+	+	Harris' Hawk ( <i>Parabuteo unicinctus</i> )	-	-	+	+
Small-billed Tinamou ( <i>C. parvirostris</i> )	+	-	-	-	Great Black-Hawk ( <i>Buteogallus urubitinga</i> )	-	+	-	+
Brushland Tinamou ( <i>Nothoprocta cinerascens</i> )	+	+	-	+	Savanna Hawk ( <i>B. meridionalis</i> )	-	-	-	+
Spotted Nothura ( <i>Nothura maculosa</i> )	-	+	-	-	Black-chested Buzzard-Eagle ( <i>Geranoaetus melanoleucus</i> )	-	-	+	+
White-bellied Nothura ( <i>N. borinquira</i> )	-	+	-	-	Crowned Eagle ( <i>Harpyhaliaetus coronatus</i> )	+	-	-	+
Quebracho Crested-Tinamou ( <i>Eudromia femorata</i> )	-	+	-	+	Roadside Hawk ( <i>Buteo magnirostris</i> )	+	-	+	+
Least Grebe ( <i>Podiceps dominicus</i> )	-	+	-	-	White-tailed Hawk ( <i>B. albicaudatus</i> )	+	+	-	+
White-tufted Grebe ( <i>P. rolland</i> )	-	+	-	-	Red-backed Hawk ( <i>B. polyosoma</i> )	-	-	-	+
Pied-billed Grebe ( <i>Podilymbus podiceps</i> )	-	+	-	-	Crested Caracara ( <i>Polyborus plancus</i> )	+	-	+	+
Green-backed Heron ( <i>Butorides striatus</i> )	-	+	-	-	Chimango Caracara ( <i>Milvago chimango</i> )	-	-	-	+
Snowy Egret ( <i>Egretta thula</i> )	-	+	-	-	Spot-winged Falconet ( <i>Spizopteryx circumcinctus</i> )	+	-	-	+
Cattle Egret ( <i>Bubulcus ibis</i> )	+	-	-	-	American Kestrel ( <i>Falco sparverius</i> )	+	-	+	+
Ringed Teal ( <i>Callonetta leucophrys</i> )	-	+	-	-	Aplomado Falcon ( <i>F. femoralis</i> )	+	+	+	+
Masked Duck ( <i>Oxyura dominica</i> )	-	+	-	-	Bat Falcon ( <i>F. rufigularis</i> )	-	+	-	-
Black Vulture ( <i>Coragyps atratus</i> )	+	-	+	-	Peregrine Falcon ( <i>F. peregrinus</i> )	-	-	-	+
Turkey Vulture ( <i>Cathartes aura</i> )	+	+	+	-	Chaco Chachalaca ( <i>Orientalis canicollis</i> )	+	+	+	+
Andean Condor ( <i>Vultur gryphus</i> )	+	-	-	-	Spotted Rail ( <i>Pardirallus maculatus</i> )	-	+	-	-
Hook-billed Kite ( <i>Chondrohierax uncinatus</i> )	-	+	-	-	Paint-billed Crane ( <i>Neocrex erythrops</i> )	-	+	-	-
Pearl Kite ( <i>Gampsonyx swainsonii</i> )	-	+	-	+	Spot-flanked Gallinule ( <i>Porphyriops melanops</i> )	-	+	-	-
Black-shouldered Kite ( <i>Elanus caeruleus</i> )	-	+	-	+	Common Moorhen ( <i>Gallinula chloropus</i> )	-	+	-	-
Mississippi Kite ( <i>Ictinia mississippiensis</i> )	-	+	-	-	Purple Gallinule ( <i>Porphyryla martinica</i> )	-	+	-	-
Sharp-shinned Hawk ( <i>Accipiter striatus</i> )	-	+	+	+	White-winged Coot ( <i>Fulica leucopetra</i> )	-	+	+	-
Bicolored Hawk ( <i>A. bicolor</i> )	+	+	-	-	Red-legged Seriema ( <i>Cariama cristata</i> )	+	-	-	-
Cinereous Harrier ( <i>Circus cinereus</i> )	-	-	-	+					

APPENDIX II  
CONTINUED

Species	EP	L	P	S	Species	EP	L	P	S
Black-legged Seriema ( <i>Chunga burmeisteri</i> )	+	-	-	+	Black-billed Cuckoo ( <i>C. erythrophthalmus</i> )	-	+	-	-
Limpkin ( <i>Aramus guarana</i> )	-	+	-	-	Yellow-billed Cuckoo ( <i>C. americanus</i> )	-	+	-	-
Wattled Jacana ( <i>Jacana jacana</i> )	-	+	-	-	Dark-billed Cuckoo ( <i>C. melacoryphus</i> )	-	+	-	+
American Painted-Snipe ( <i>Rostratula semicollaris</i> )	-	+	-	-	Squirrel Cuckoo ( <i>Piaya cayana</i> )	+	-	+	-
Black-necked Stilt ( <i>Himantopus mexicanus</i> )	-	+	-	-	Smooth-billed Ani ( <i>Crotophaga ani</i> )	-	+	+	+
Collared Plover ( <i>Charadrius collaris</i> )	-	+	-	-	Guira Cuckoo ( <i>Guira guira</i> )	-	+	+	+
White-rumped Sandpiper ( <i>Calidris fuscicollis</i> )	-	+	-	-	Striped Cuckoo ( <i>Tapera naevia</i> )	-	+	+	+
Pectoral Sandpiper ( <i>C. melanotos</i> )	-	+	-	-	Barn Owl ( <i>Tyto alba</i> )	-	+	-	+
Solitary Sandpiper ( <i>Tringa solitaria</i> )	-	+	-	-	Tropical Screech-Owl ( <i>Otus choliba</i> )	-	+	+	+
Picazuro Pigeon ( <i>Columba picazuro</i> )	-	+	-	-	Great Horned Owl ( <i>Bubo virginianus</i> )	-	-	-	-
Spot-winged Pigeon ( <i>C. maculosa</i> )	-	-	-	+	Ferruginous Pygmy-Owl ( <i>Glaucidium brasilianum</i> )	+	+	+	+
Pale-vented Pigeon ( <i>C. cayennensis</i> )	-	+	-	-	Burrowing Owl ( <i>Speotyto cunicularia</i> )	-	+	-	-
Eared Dove ( <i>Zenaida auriculata</i> )	-	+	+	+	Rufous-legged Owl ( <i>Sirix rufipes</i> )	+	+	-	-
Scaled Dove ( <i>Columbina squammata</i> )	-	+	-	-	Short-eared Owl ( <i>Asio flammeus</i> )	-	+	+	+
Ruddy Ground-Dove ( <i>C. talpacoti</i> )	-	+	-	-	Buff-fronted Owl ( <i>Aegolius harrisi</i> )	-	+	+	+
Picui Ground-Dove ( <i>C. picui</i> )	+	+	+	+	Gray Potoo ( <i>Nyctibius griseus</i> )	-	+	-	-
White-tipped Dove ( <i>Leptotila verreauxi</i> )	+	+	+	+	Common Nighthawk ( <i>Chordeiles minor</i> )	-	+	-	-
Yellow-collared Macaw ( <i>Ara auricollis</i> )	-	+	+	-	Nacunda Nighthawk ( <i>Podager nacunda</i> )	-	+	-	+
Blue-crowned Parakeet ( <i>Aratinga acuticauda</i> )	+	+	+	+	Band-winged Nightjar ( <i>Caprimulgus longirostris</i> )	-	-	-	+
Black-hooded Parakeet ( <i>Nandayus nenday</i> )	+	+	+	+	Little Nightjar ( <i>C. parvulus</i> )	+	+	-	+
Green-cheeked Parakeet ( <i>Pyrrhura molinae</i> )	-	-	+	-	Scissor-tailed Nightjar ( <i>Hydropsalis brasiliana</i> )	+	-	-	+
Monk Parakeet ( <i>Myiopsitta monachus</i> )	+	+	-	+	White-collared Swift ( <i>Streptoprocne zonaris</i> )	+	-	-	-
Blue-fronted Parrot ( <i>Amazona aestiva</i> )	+	+	+	+	Glittering-bellied Hummingbird	+	-	-	-
Ash-colored Cuckoo ( <i>Coccyzus cinereus</i> )	-	+	-	+					



APPENDIX II  
CONTINUED

Species	EP	L	P	S	Species	EP	L	P	S
( <i>Chlorostilbon aureoventris</i> )	+	+	+	+	Red-billed Scythebill ( <i>Campylorhamphus trochilrostris</i> )	+	+	+	+
Gilded Hummingbird ( <i>Hylacharis chrysurus</i> )	-	+	+	-	Chaco Earthcreeper ( <i>Upucerthia certhioides</i> )	+	+	-	+
Blue-tufted Starthroat ( <i>Heliomaster furcifer</i> )	+	+	+	+	Rufous Hornero ( <i>Furnarius rufus</i> )	+	+	-	+
Blue-crowned Trogon ( <i>Trogon curucui</i> )	-	+	+	-	Crested Hornero ( <i>F. cristatus</i> )	-	+	-	+
Spot-backed Puffbird ( <i>Nystalus maculatus</i> )	+	+	+	+	Tufted Tit-Spinetail ( <i>Leptasthenura platensis</i> )	-	+	-	+
Toco Toucan ( <i>Ramphastos toco</i> )	-	-	+	-	Chotoy Spinetail ( <i>Schoeniophylax phryganophila</i> )	-	+	-	-
White-barred Piculet ( <i>Picumnus cirratus</i> )	+	+	+	-	Pale-breasted Spinetail ( <i>Synallaxis albescens</i> )	-	+	+	+
White Woodpecker ( <i>Melanerpes candidus</i> )	+	+	+	+	Sooty-fronted Spinetail ( <i>S. frontalis</i> )	-	+	+	+
White-fronted Woodpecker ( <i>M. cactorum</i> )	+	+	+	+	Stripe-crowned Spinetail ( <i>Cranioleuca pyrrhophia</i> )	+	+	-	+
Checkered Woodpecker ( <i>Picoides mixtus</i> )	+	+	+	+	Short-billed Canastero ( <i>Asithenes baeri</i> )	+	+	-	+
Golden-green Woodpecker ( <i>Piculus chrysochloros</i> )	-	+	-	-	Plain Thornbird ( <i>Phacelodomus rufifrons</i> )	+	+	-	-
Green-barred Woodpecker ( <i>Colaptes melanochloros</i> )	-	+	-	-	Little Thornbird ( <i>P. sibilatrix</i> )	+	+	-	+
Campo Flicker ( <i>C. campestris</i> )	+	+	+	+	Lark-like Brushrunner ( <i>Coryphistera alaudina</i> )	+	+	-	+
Black-bodied Woodpecker ( <i>Dryocopus schulzi</i> )	-	+	-	-	Brown Chacholote ( <i>Pseudoseisura lophotes</i> )	+	+	-	+
Cream-backed Woodpecker ( <i>Phloeocoastes leucopogon</i> )	+	+	+	+	Giant Antshrike ( <i>Batara cinerea</i> )	+	+	-	-
Olivaceous Woodcreeper ( <i>Sittasomus griseicapillus</i> )	-	+	+	-	Great Antshrike ( <i>Thamnophilus major</i> )	+	+	+	+
Scimitar-billed Woodcreeper ( <i>Drymornis bridgesi</i> )	+	+	-	+	Barré Antshrike ( <i>Thamnophilus doliatus</i> )	+	+	+	-
Black-banded Woodcreeper ( <i>Dendrocolaptes picumnus</i> )	-	-	+	-	Variable Antshrike ( <i>T. caerulescens</i> )	+	+	+	+
Great Rufous Woodcreeper ( <i>Xiphocolaptes major</i> )	+	+	+	+	Stripe-backed Antbird ( <i>Myrmorchilus strigilatus</i> )	+	+	+	-
Narrow-billed Woodcreeper ( <i>Lepidocolaptes angustirostris</i> )	+	+	+	+	Black-bellied Antwren ( <i>Formicivora melanogaster</i> )	-	+	+	-
	+	+	+	+	Crested Gallito ( <i>Rhinocrypta lanceolata</i> )	+	-	+	+

APPENDIX II  
CONTINUED

Species	EP	L	P	S	Species	EP	L	P	S
Olive-crowned Crescent-chest ( <i>Melanopareia maxmilliani</i> )	-	+	-	-	Euler's Flycatcher ( <i>Lathrotriccus euleri</i> )	-	+	-	-
Southern Beardless-Flycatcher ( <i>Campostoma obsoletum</i> )	+	-	+	+	Vermilion Flycatcher ( <i>Pyrocephalus rubinus</i> )	+	+	-	+
Southern Scrub-Flycatcher ( <i>Sublegatus modestus</i> )	+	+	+	+	Lesser Shrike-Tyrant ( <i>Agrionis murina</i> )	-	+	-	+
Chaco Suiriri ( <i>Suiriri suiriri</i> )	+	+	+	+	Gray-bellied Shrike-Tyrant ( <i>Agrionis microptera</i> )	-	+	-	-
White-crested Elaenia ( <i>Elaenia albiceps</i> )	+	+	+	+	White Monjita ( <i>Xolmis irupero</i> )	-	+	-	+
Small-billed Elaenia ( <i>E. parvirostris</i> )	+	-	-	+	Black-crowned Monjita ( <i>X. coronata</i> )	-	+	-	+
Large Elaenia ( <i>E. spectabilis</i> )	-	-	-	+	Gray Monjita ( <i>X. cinerea</i> )	-	+	-	-
White-crested Tyrannulet ( <i>Serpophaga subcristata</i> )	-	+	-	-	Cinnamon-bellied Ground-Tyrant ( <i>Muscisaxicola capistrata</i> )	+	-	-	-
White-bellied Tyrannulet ( <i>S. munda</i> )	+	+	+	+	Hudson's Black-Tyrant ( <i>Knipolegus hudsoni</i> )	+	+	-	-
Plain Tyrannulet ( <i>Mezia inornata</i> )	-	-	+	-	White-winged Black-Tyrant ( <i>K. aterrimus</i> )	+	+	-	+
Greater Wagtail-Tyrant ( <i>Stignatura budytoides</i> )	+	-	-	-	Cinereous Tyrant ( <i>K. striaticeps</i> )	-	+	+	-
Bearded Tachuri ( <i>Polystictus pectoralis</i> )	+	+	-	+	Pied Water-Tyrant ( <i>Fluvicola pica</i> )	-	+	-	+
Subtropical Doradito ( <i>Pseudocolopteryx acutipennis</i> )	-	+	-	-	Spectacled Tyrant ( <i>Hymenops perspicillata</i> )	-	+	-	-
Tawny-crowned Pygmy-Tyrant ( <i>Euscarthmus meloryphus</i> )	+	+	+	+	Yellow-browed Tyrant ( <i>Sairapa icterophrys</i> )	-	+	-	-
Pearly-vented Pygmy-Tyrant ( <i>Hemitriccus margaritaceiventer</i> )	+	+	+	+	Cattle Tyrant ( <i>Machetornis rixosus</i> )	+	+	-	+
Bran-colored Flycatcher ( <i>Myiophobus fasciatus</i> )	-	-	-	+	Rufous Casiornis ( <i>Casiornis rufa</i> )	-	+	-	-
Fuscous Flycatcher ( <i>Cnemotriccus fuscatus</i> )	+	+	+	-	Swainson's Flycatcher ( <i>Myiarchus swainsoni</i> )	-	+	+	+
					Brown-crested Flycatcher ( <i>M. tyrannulus</i> )	+	+	+	+
					Great Kiskadee ( <i>Pitangus sulphuratus</i> )	-	+	+	-
					Boat-billed Flycatcher ( <i>Megarynchus pitangua</i> )	-	+	-	-
					Streaked Flycatcher ( <i>Myiodynastes maculatus</i> )	-	+	-	+
					Crowned Slaty Flycatcher ( <i>Griseotyrannus aurantioocristatus</i> )	+	+	-	+
					Fork-tailed Flycatcher ( <i>Tyrannus savana</i> )	-	+	-	+

APPENDIX II  
CONTINUED

Species	EP	L	P	S	Species	EP	L	P	S
Tropical Kingbird ( <i>T. melancholicus</i> )	-	+	-	+	Yellowish Pipit ( <i>Anthus lutescens</i> )	-	+	-	-
Green-backed Becard ( <i>Pachyrhamphus viridis</i> )	-	+	-	-	Rufous-browed Peppershrike ( <i>Cyclarhis gujanensis</i> )	+	+	+	+
White-winged Becard ( <i>P. polychroterus</i> )	-	+	-	-	Red-eyed Vireo ( <i>Vireo olivaceus</i> )	-	+	-	-
White-naped Xenopsaris ( <i>Xenopsaris albinucha</i> )	-	+	-	+	Rufous-collared Sparrow ( <i>Zonotrichia capensis</i> )	+	+	-	+
White-tipped Plantcutter ( <i>Phytotoma rutila</i> )	+	-	-	+	Grassland Sparrow ( <i>Ammodramus humeralis</i> )	-	+	-	+
Brown-chested Martin ( <i>Phaeoprogne tapera</i> )	-	-	-	+	Stripe-capped Sparrow ( <i>Aimophila strigiceps</i> )	+	+	-	+
Southern Martin ( <i>Progne modesta</i> )	-	-	-	+	Black-crested Finch ( <i>Lophospingus pusillus</i> )	-	+	-	+
White-rumped Swallow ( <i>Tachycineta leucorrhoa</i> )	-	+	-	-	Cinnamon Warbling-Finch ( <i>Pooospiza ornata</i> )	+	+	-	+
Chilean Swallow ( <i>T. meyeri</i> )	-	-	-	+	Ringed Warbling-Finch ( <i>P. torquata</i> )	-	-	-	+
Blue-and-white Swallow ( <i>Notiochelidon cyanoleuca</i> )	-	-	-	+	Black-capped Warbling-Finch ( <i>P. melanoleuca</i> )	+	+	-	+
Tawny-headed Swallow ( <i>Stelgidopteryx fucata</i> )	+	-	-	-	Saffron Finch ( <i>Sicalis flaveola</i> )	-	+	-	+
Plush-crested Jay ( <i>Cyanocorax chrysops</i> )	-	+	+	+	Grassland Yellow-Finch ( <i>S. luteola</i> )	-	+	-	-
House Wren ( <i>Troglodytes aedon</i> )	+	+	+	-	Wedge-tailed Grass-Finch ( <i>Emberizoides herbicola</i> )	+	-	-	-
Fawn-breasted Wren ( <i>Thryothorus guarayanus</i> )	+	+	+	-	Great Pampa-Finch ( <i>Embernagra platensis</i> )	-	+	-	+
Chalk-browed Mockingbird ( <i>Mimus saturninus</i> )	-	-	+	-	Blue-black Grassquit ( <i>Volatinia jacarina</i> )	+	+	+	-
White-banded Mockingbird ( <i>M. trirurus</i> )	+	+	-	+	Double-collared Seedeater ( <i>Sporophila caerulea</i> )	-	+	-	+
Creamy-bellied Thrush ( <i>Turdus amaurochalinus</i> )	+	+	-	+	Lined Seedeater ( <i>S. lineola</i> )	-	+	-	+
Masked Gnatcatcher ( <i>Polioptila dumicola</i> )	+	+	+	+					

APPENDIX II  
CONTINUED

Species	EP	L	P	S	Species	EP	L	P	S
Tawny-bellied Seedeater ( <i>S. hypoxantha</i> )	-	+	-	-	Golden-winged Cacique ( <i>Cacicus chrysopterus</i> )	-	+	-	-
Many-colored Chaco-Finch ( <i>Saltairicula multicolor</i> )	+	+	-	+	Solitary Cacique ( <i>C. solitarius</i> )	-	+	-	-
Red-crested Finch ( <i>Coryphospingus cucullatus</i> )	+	+	+	+	Epaulet Oriole ( <i>Icterus cayanensis</i> )	+	+	-	+
Red-crested Cardinal ( <i>Paroaria coronata</i> )	+	+	-	+	Campo Oriole ( <i>I. jamacaii</i> )	+	+	+	+
Black-backed Grosbeak ( <i>Pheucticus aureoventris</i> )	+	+	+	-	White-browed Blackbird ( <i>Leistes superciliosus</i> )	-	+	-	-
Grayish Saltator ( <i>Saltator coerulescens</i> )	-	+	+	+	Chestnut-capped Blackbird ( <i>Agelaius ruficapillus</i> )	-	+	-	-
Golden-billed Saltator ( <i>S. aurantirostris</i> )	+	+	+	+	Chopi Blackbird ( <i>Gnorimopsar chopi</i> )	-	+	-	-
Ultramarine Grosbeak ( <i>Cyanocompsa brissonii</i> )	+	+	-	+	Bay-winged Cowbird ( <i>Molothrus badius</i> )	+	+	-	+
Swallow Tanager ( <i>Tersina viridis</i> )	-	+	-	-	Screaming Cowbird ( <i>M. rufoaxillaris</i> )	-	+	-	+
Hepatic Tanager ( <i>Piranga flava</i> )	+	+	+	+	Shiny Cowbird ( <i>M. bonariensis</i> )	+	+	-	+
Sayaca Tanager ( <i>Thraupis sayaca</i> )	+	+	-	+	Bobolink ( <i>Dolichonyx oryzivorus</i> )	-	+	-	-
Blue-and-yellow Tanager ( <i>T. bonariensis</i> )	+	-	-	+	Hooded Siskin ( <i>Carduelis magellanica</i> )	+	+	-	+
Purple-throated Euphonia ( <i>Euphonia chlorotica</i> )	+	+	+	-	House Sparrow ( <i>Passer domesticus</i> )	-	+	-	-
Tropical Parula ( <i>Parula pitiayumi</i> )	+	+	+	+	Total	110	181	73	136
Masked Yellowthroat ( <i>Geothlypis aequinoctialis</i> )	-	+	-	+					

\* EP = Estancia Perforación; L = Lichenau, Short 1976; P = Proyecto Abapó-Izozog, J. V. Remsen, unpubl. data; S = Salta, Capurro and Bucher 1988. A "+," indicates present, "-" indicates not recorded.