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SEASONAL DISTRIBUTION OF BIRDS AT A CLOUD-FOREST LOCALITY, THE ANCHICAYÁ VALLEY, IN WESTERN COLOMBIA

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ABSTRACT.—This study presents information on the seasonal status of a cloud-forest avifauna on Colombia's Pacific Andean slope at 950–1050 m elevation. Two hundred seventy-one species were recorded at the 70–80 ha site. About 64% of these were year-round residents. The remainder (36%) were vagrants and species showing varying degrees of seasonal movements; 22% were short-distance (elevational or local) migrants, 8% were long-distance migrants from North America. Short-distance migrants were predominantly frugivores and nectarivores; over half (58%) of all nectarivores were elevational migrants. Seasonal movements were recorded in all months, but short-distance migrants were most numerous March-June and November-January, periods when migrants from both the highlands and lowlands were present. The abundance of flowers and fruits also showed two small peaks. About twice as many short-distance migrant nectarivores came from high elevations as low elevations. A majority of short-distance migrant frugivores also were from the highlands. Eight *Tangara* tanagers, although resident, showed significant expansions and contractions of foraging range, diversity of fruit eaten, and amount of fruit included in their diet, an indication that these birds track resource levels, and that variation in fruit abundance affects the dynamics of frugivore populations.

RESUMEN.—Este estudio muestra una informaci6n preliminar de cambios estacionales de la avifauna de un bosque nublado en la vertiente pacifica de los Andes colombianos. Se registr6 un total de 271 especies en un área entre 70–80 ha. Alrededor de un 36% de las especies mostraron evidencias de movimientos estacionales; 22% presentaban movimientos altitudinales o locales y 8% eran aves migratorias de larga distancia que se reproducen en Norte América. Las aves migratorias de corta distancia eran principalmente nectivoros y frugíforos; 58% de los nectivoros eran aves migratorios que se presentaban movimientos altitudinales o locales. Los movimientos estacionales fueron complejas y distribuidos a lo largo del año, pero más aves migratorias de corta distancia estuvieron presente durante los períodos de marzo a junio y de noviembre a enero, epocas cuando provenía especias de elevaci6nes mayores y menores. La abundancia de flores y fruitas tambien mostraron evidencias de cambios estacionales. Los nectivoros migratorios provenía predominantemente de elevaci6nes mayores; tambien la majoría de frugíforos estacionales provenía de regiones altas. Ocho especies de *Tangara* no mostran evidencias de movimientos altitudinales pero mostraron aumentos y reducci6nes de sus rangos de alimentaciones, equalmente en la diversidad y cantidad de frutas consumidos.

It is generally acknowledged that populations of many tropical latitude-breeding birds vary seasonally in abundance (Karr 1977; Smythe 1982; Karr and Freemark 1983; Stiles 1983; Levy 1988). Variations in abundance over time may be a result of local movements within a habitat, or between habitats at similar elevations, or between habitats at different elevations (Feinsinger 1978; Stiles 1980; Karr et al. 1982; Levy 1988; Loiselle 1988, 1991; Stiles 1988; Loiselle and Blake 1990, 1991). In southern Central America long-term studies by Skutch (1954, 1967), Karr (1971), Feinsinger (1976), Stiles (1983, 1985a, 1988), Martin and Karr (1986), Levy (1988), and Loiselle and Blake (1990, 1991) have documented extensive local and elevational migration within avian communities. Movements have been broadly linked to temporal and spatial variation in food, especially of fruit and nectar (Stiles 1988; Levy and Stiles 1992; Loiselle and Blake 1991).

No work comparable to that in Costa Rica exists on seasonal movements of birds in the Andes, and the extent of movements within Andean avifaunas is largely unknown. Nevertheless, an understanding of migratory movements within the Andes is of interest because: (1) many migrant birds are nectarivores or frugivores that play important roles in pollination and seed dispersal; and (2) increasingly intensive land use in the Andes makes information on seasonal migratory movements important for conservation-planning and long-term preservation of biotic communities.

Several short-term surveys of avian diversity have been conducted in the Andes (i.e., Terborgh 1971; Ridgely and Gaulin 1980; Parker and Parker 1982; Remsen 1985; Davis 1986; Robbins and Ridgely 1990; Willis and Schuchmann 1993), but none has lasted longer than a few weeks, and these studies are of insufficient duration to detect seasonal movements or seasonal abundances of birds. The present study is the first documention of seasonal bird distribution throughout a full annual cycle in an Andean avifauna. Because comparable work in montane avifaunas exists mainly for sites in the mountains of southern Central America, this study addresses the question: are there differences in seasonal occurrences of bird species at comparable elevations between western Colombia (3°N) and Costa Rica (10°N)? Relationships between food resources, habitats, and short-distance migratory movements in birds in western Colombia also are compared with studies in Costa Rica. The data were gathered as part of a larger study aimed at identifying seasonal patterns in foraging and breeding behavior of frugivores (Hilty 1977, 1980a, b).

STUDY SITE

Field work was carried out in the upper Anchicayá Valley, depto. de Valle, Colombia, from April 1972 through June 1973, at a locality known as Alto Yunda (3°32″N, 76°48″W). The study site, at 950–1050 m elevation was about 70–80 ha in extent on a long ridge that forms part of the watershed divide separating the eastern side of the upper Anchicayá Valley from the Río Mono Valley to the east.

The area also was visited from 9–18 June 1975. Alto Yunda was originally an overnight waystation for mule trains carrying supplies to the construction site of the Alto Anchicayá hydropower plant. Later, a road at lower elevation alleviated the need for mule trains, and the building was occupied for a number of years by a forest guard employed by the Corporación Autónoma Regional del Cauca (C.V.C.) to prevent settlers from illegally entering and destroying forest in the watershed around the dam. Most trails are now overgrown and completely closed, or have been destroyed by landslides, so fewer guards are required today. The building at Alto Yunda no longer exists, and there is no ready access to the study site.

Alto Yunda lies within a belt of very heavy rainfall that characterizes most of the Pacific slope of the Western Andes southward to the Ecuador boundary. Rainfall at four sites in or near the Anchicayá Valley was slightly biseasonal and averaged 4,000–5,000 mm a year, but data for most years were incomplete. At Danubio (3°38″N, 76°56″W), which is nearby but lower in elevation, rainfall averaged about 5,600 mm (C.V.C., unpublished data; Fig. 1). Mean monthly temperate was 21.5 degrees C. Fog occurred almost daily at Alto Yunda, averaging more than 5 hrs. per day from September–November and in March. The least foggy months, January–February and July–August, average 2–3 hrs. per day.

The vegetation at Alto Yunda is Premontane Rain Forest (Holdridge 1967). In a popular sense it would be called cloud forest. The forest is evergreen, and trees in the understory and the canopy are covered to varying degrees with epiphytes. Large trees generally support heavy loads of herbaceous and woody epiphytes. Because the terrain is steep, numerous small streams, landslides, and treefalls create many light gaps, and the canopy is discontinuous and broken. A dense understory of herbaceous and woody plants makes movement away from established trails difficult.

By 1973, subsistence farmers and squatters to the east of Alto Yunda, in the valley of the Río Mono, had cleared or disturbed perhaps 35–40% of the forest at elevations below 850 m. At higher elevations there were few clearings. The entire upper Anchicayá Valley was undisturbed rainforest except for a small area around the hydroelectric plant, a construction site, housing site, and one road (all located at about 500 m). The Anchicayá Valley remains protected today, and access to the valley is strictly controlled. The construction site and most of the housing area is now closed, and today this wilderness is less disturbed than 20 years ago. At Alto Yunda one large pasture surrounded the house and extended eastward down the valley a distance of approximately 350 m. Except for the rather wide entrance trail (10 m wide in places) from La Cascada to Alto Yunda and continuing on to the dam site, there were no other man-made disturbances to the natural forest vegetation. Use of the trail from Alto Yunda to the dam was discontinued about two years prior to my arrival, and this portion of the trail was already so overgrown and closed by successional plants that it was impassable without use of a machete.

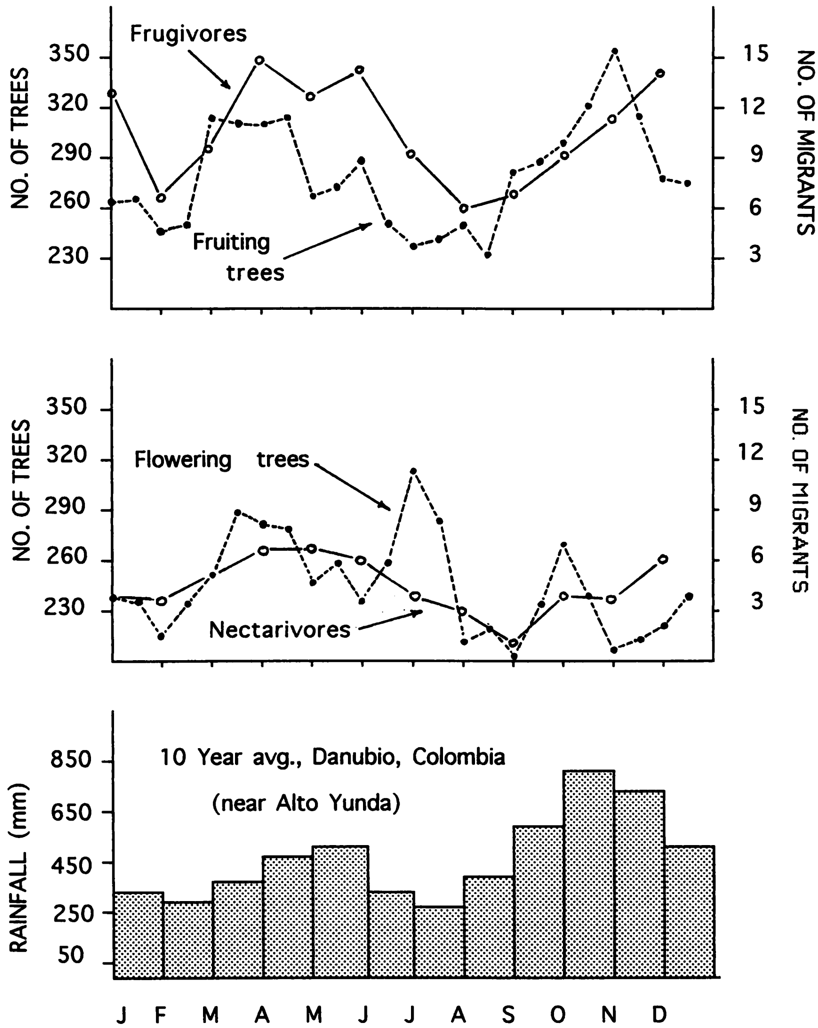

FIG. 1. Number of individual fruiting trees and number of species of short-distance migrant frugivores (top); number of individual flowering trees and number of species of short-distance migrant nectarivores (middle); and 10 year average annual rainfall at Danubio (near Alto Yunda), Colombia, 1963–73.

Because of generally pristine conditions in the Anchicayá Valley, mammals and birds were present in natural numbers, although illegal hunting occurred occasionally. One cracid, the Sickle-winged Guan (*Chamaepetes goudotii*), was common at Alto Yunda, but no others occurred there. The Baudo Guan *(Penelope ortoni)*, although collected at lower elevation in the Anchicayá Valley (Meyer de Schauensee, 1948–1952), was never seen at Alto Yunda. Forest guards and residents of the Río Mono Valley never indicated others occurred here, although they mentioned the presence of a "pajuí" (*Crax rubra*) at lower elevations.

METHODS

Plants.—A total of 621 trees (164 species) greater than 3 m height were marked along a 1 km trail where birds were captured in nets. All tagged trees were examined twice monthly for evidence of flowering and fruiting (see details in Hilty 1980a). Variations in the number of species and individuals flowering and fruiting were taken as broad indications of seasonal change in nectar and fruit resources.

Birds.—An average of 12 mist nets (approx. 3 × 10 m) were operated for 2–4 mornings each month (except September and January) from May 1972 through June 1973, for a total of 1,784 net hours and 1,394 net captures. From this sample, 436 birds, mostly frugivores, and nectarivores, were marked with unique combinations of color bands for later recognition. Net captures, field observations of marked birds, censusing, and other field techniques (below) provided a fairly complete picture of the diversity and seasonal movements of birds at Alto Yunda. Five mornings each month (for a total of 30 hrs each month throughout the study) were spent recording all birds and their activities at a group of 19 *Cecropia reticulata* trees growing in an old regenerating landslide scar inside the forest. Several other species of fruiting trees (*Miconia* sp., *Cecropia burriada, Coussapoa oligoneura*) were kept under observation for shorter periods of time during the study. Seven to 10 mornings each month were spent walking trails to record foraging behavior of frugivorous birds. I kept records of the variety of fruit eaten by all frugivores, and I kept detailed foraging observations for many common tanagers including all the *Tangara* tanagers. The locations of all sightings and recaptures of color-marked tanagers were recorded and compared to original capture sites. These combined techniques provide a relatively complete inventory of the avifauna and one that is comparable from month to month.

Species were assigned to diet, movement (migratory, etc.), and habitat categories based on field observations and occasionally also by information from published sources (i.e., Stiles and Skutch 1989; Remsen et al. 1993). The seasonal movements, diets, and habitats of each species are not as rigid and simplistic as categorized here. Diets vary seasonally (Leck 1972; Morton 1980; Loiselle and Blake 1990), habitat preferences vary geographically (Hilty, pers. obs.), and seasonal movements are complex and poorly understood (Levy 1988). Despite these limitations, the categories permit broad-based comparisons within this avifauna, and with studies elsewhere.

Diets.—Bird species were assigned to one of the following diet categories: (1) carrion and scavenging, (2) raptorial species that eat mainly vertebrates, (3) arthropods, (4) fruit, (5) fruit and arthropods, (6) fruit and seeds (for parrots and parakeets) and, (7) nectar. Species were assigned to the category deemed a "best fit" despite the fact that most species consume foods in more than one of these categories. In species in some genera (i.e., *Attila, Pachyramphus, Cacicus, Atlapetes*, and *Arremon*) in which the diet consisted of almost equal proportions of fruit and insects, species were split and assigned to each of the categories. For the analysis some ecologically similar categories (e.g., all categories in which fruit was a major component of the diet) were merged.

Habitats.—Species were assigned to one of three habitats: (1) forest interior, which includes species found primarily inside shady understory of forest, (2) forest canopy and edge, which includes species found primarily in the upper levels of old growth forest, older regrowth forest, or along forest borders, and (3) early successional vegetation and semi-open, which includes birds typically found in pastures or bushy overgrown areas. A single aquatic species was recorded flying over the area, although no aquatic habitats existed at Alto Yundo.

Seasonal status.—All species at Alto Yundo are classified into one or more of five categories. These categories are artifically rigid, and many species may eventually be shown to fit into combinations of these categories. (1) Residents include all species that show no evidence of seasonal movement beyond normal post-breeding dispersal of juveniles. (2) Elevational migrants include species that show some seasonal patterns of abundance, e.g., between higher and lower elevations. Movements are mainly short-distances and may involve all, or only a portion of the species' population. Some elevational migrants may breed at Alto Yunda and then move to higher or lower elevation, although breeding data are insufficient for analysis. (3) Local migrants move seasonally, but mostly within the same elevational zone and region. Some species classified as local migrants may prove only to be post-breeding dispersers, wandering immatures, and unmated individuals of resident species that are searching for appropriate habitat, mates, etc. (4) Long-distance migrants (Nearctic/austral breeding migrants) include those that return, for part of each year, to tropical latitudes. (5) A final category, *vagrants*, comprise a few rare or accidental species observed on only one or a few days (in most cases only a single individual was observed or captured in nets during the 15-month study) and whose movement patterns, if any, are unclear. Additional work may show that a few species breeding in or near Alto Yunda undertake longer-distance intratropical migrations that take them out of Colombia. *Elanoides forficatus* and *Ictinia plumbea* are examples.

To estimate the proportion of migrants at Alto Yunda from highland and lowland areas, I examined the overall geographic distribution of each species (using Hilty and Brown 1986). If a species was found primarily higher than 1,000 m (the elevation of Alto Yunda), then it was considered to belong to a highland community; if it was primarily lower, then it was considered to belong to the lowland community. A local species was one whose center of distribution was close to the elevation of Alto Yunda. For example, *Pharomachrus antisianus* occurs primarily in cloud forest at elevations above 1,400 m but was recorded at Alto Yunda during the months of June through August, suggesting a downslope movement during this time of the year. The reverse was true for lowland and foothill species like *Amazona farinosa* and *Columba goodsoni*, which were common in the Pacific lowland plain but also were present for several months (both at broadly similar times of the year) at Alto Yunda. The general direction of movement of short-distance migrants, therefore, was based on an examination of their broader elevational distributions in Colombia.

Guilds.—The guild categories are similar to those used by other researchers in South America. Assignments are based largely on personal data.

RESULTS

Community composition.—I recorded 271 species of birds at Alto Yunda. This is one of the largest lists reported for a single lower montane wet forest locality in the Neotropics. The number of "core" species (Remsen 1994) at Alto Yunda is higher than ones reported at similar elevations elsewhere in the Andes (e.g., Miller 1963; Remsen 1985; Davis 1986; Parker and Parker 1982). Subtracting vagrants, the core Alto Yunda avifauna is 256; removing vagrants, and all species of the early successional vegetation in the pasture, reduces the core total to 217 species, still substantially above the 152 (which includes some early succession species) reported by Davis (1986). Davis' (1986) lists are some of the highest reported totals in Andean wet forest localities at elevations similar to Alto Yunda.

Several additional species occurred at the same elevation in other parts of the Anchicayá Valley or in adjacent river systems. For example, *Merganetta armata, Sayornis nigricans, Serpophaga cinerea* and *Cinclus leucocephalus* were not recorded because Alto Yunda lacks a permanent stream. *Rupicola peruviana* was virtually absent at Alto Yunda (two vagrant immatures seen in 15 months) because there were no cliffs suitable for nest sites. *Semnornis ramphastinus* and *Tangara parzudakii* occurred on a ridge only 100 m higher and a little over 1 km away, but were never found at Alto Yunda, and *Pipreola jucunda*, common on this same ridge, was recorded only once in 15 months at Alto Yunda. A curious example of a patchy distribution is illustrated by *Boissonneaua jardini*. Fairly common at 500–600 m in the Anchicayá Valley, and as high as 1,200–1,600 m further south in the Colombian Andes of Nariño, it was never recorded at Alto Yunda.

Residents.—About 64% (174 of 271) of the Alto Yunda avifauna is resident. This 271 species total includes vagrants and species of early successional habitat (15 and 39 species respectively), which are not part of the core forest avifauna and may show more seasonal movement than the core avifauna. When these species are removed, the percentage of residents in the core avifauna increases to 71% (154 residents out of 217 core species). When species of the forest interior are considered, the change is even more dramatic; 81 of 94 forest-interior species (86%) are sedentary. The 13 nonsedentary species of the forest interior include four vagrants, a long-distance migrant (*Wilsonia canadensis*) and eight short-distance migrants. The taxonomic composition of these eight short-distance forest migrant species spans six families. They are united, however, by diet—all eight are either nectarivores or frugivores—and include a quail-dove, oilbird, two hummingbirds (which also feed at forest edges), a fruiteater, two thrushes, and a tanager.

Resident species were predominantly insectivores, but also include most raptors and some nectar- and fruit-feeding species. Resident frugivores of the forest interior were mostly small-bodied species, i.e., manakins and tanagers, that ate small fruits and berries, or a mixed diet of fruit and insects. Two species, *Tinamus major* and *Chamaepetes goudotii*, were exceptions, in that they were large-bodied resident frugivores. Other large-bodied forest frugivores—among them a quetzal, fruitcrow, cock-of-the-rock, and umbrellabird—were elevational migrants.

Most resident species probably bred in or near Alto Yunda. For resident species in which part of the population is migratory, e.g., *Elanoides forficatus, Ictinia plumbea* and *Chlorophonia flavirostris*, local breeding was suspected but not proved.

Migrants: community patterns.—In a broad context, migrants should not be viewed as distinct entities but as a continuum of species whose behaviors range from virtually sedentary to intercontinental, and from occasional to regular in occurrence (Lack 1944; Keast and Morton 1980; Levey and Stiles 1992). Species at Alto Yunda displayed this entire spectrum of migratory behavior, including species that (1) transited an area but did not forage, (2) migrated in or out of the region one or more times during the year (ranging from local to intercontinental in distance), and (3) resident species whose populations were augmented or depleted during part of the year by migratory populations.

TABLE 1

NUMBER OF SHORT-DISTANCE MIGRANT (ELEVATIONAL AND LOCAL) BIRD SPECIES BY MONTH AT ALTO YUNDA, ANCHICAYÁ VALLEY, COLOMBIA, APRIL 1972 TO JUNE 1973

Category[1]	J	F	M	A	M	J	J	A	S	O	N	D
Highlands												
Frugivores[2]	5	1	4	4	7	5	3	1	2	3	5	5
Nectarivores	3	1	3	5	4	3	2	1	1	1	3	6
Lowlands												
Frugivores	7	5	5	10	5	8	4	4	4	4	4	8
Nectarivores	1	3	2	2	3	3	2	2	0	3	1	0
Mid-El. (local)												
Frugivores	1	1	1	1	1	1	2	1	1	2	2	1
Summary												
All frugivores	13	7	10	15	13	14	9	6	7	9	11	14
All nectarivores	4	4	5	7	7	6	4	3	1	4	4	6
Total	17	11	15	22	20	20	13	9	8	13	15	20

[1] Highlands = distribution of species mostly above 1,000 m; lowlands = range mostly below 1,000 m; mid-elevation = range centered at about 1,000 m. Includes all species for which fruit is an important component of the diet. Most also consume insects and/or arthropods.
[2] Includes all psittacines (both frugivores and seed predators/granivores).

Two psittacines, *Aratinga wagleri* and *Bolborhynchus lineola,* were seen flying over the area on several occasions but were not observed foraging. In other areas these species are known to move seasonally or erratically as fruit crops vary, but the extent and timing of these migrations are not documented. Sightings of lone individuals of *Pandion haliaetus* in November and December could represent long-distance migrants or individuals wandering from one river system to another.

About 36 percent (97 of 271) of all Alto Yunda species showed some type of seasonal or irregular movement other than normal post-breeding dispersal of young and unmated adults. When vagrants are removed the figure drops to 30%; when both vagrants (6%) and long-distance migrants (8%) are removed the figure drops to 22%. These short-distance migrants (22% of total avifauna) were mostly elevational migrants and were recorded in all months (Table 1). Nearly twice as many were present during March-June and November-January as during February and August-September.

Elevational migrants at Alto Yunda are more likely to depend wholly or partly on fruit or nectar than on any other food resource (Table 2). As a group, nectarivores were the most highly migratory. Fifty-eight percent of all nectarivores were migratory, compared with 44% of the frugivores. Frugivores, however, were numerically the most important group of migrants (58% of all short-distance migrant species were frugivores). Most insectivorous species, on the other hand, were residents (72%) or long-distance migrants (13%). Short-distance migrants (elevational and local) accounted for a mere 7% of all insectivore species (Table 2).

Nectarivores.—Nectar-feeders showed three main patterns. First, the number of elevational migrants reaching Alto Yunda from the highlands was twice that of the lowlands (8 species versus 4). Secondly, the highest number of species of migrant nectarivores was recorded during two periods of the year—March-June and December (Table 1). The first peak generally overlaps an early-year increase in the number of woody plants (individuals and species) in flower (Fig. 1); a small late-year flowering spike in October was accompanied by only a small increase in migrant nectar-feeders. The number of migrant nectarivores was positively, but not significantly, correlated with the number of individual trees and shrubs in flower (Spearman's rank correlation, $z = 1.81$, $P < 0.10$). The lowest number of migrant nectarivores was recorded in August-September when only a single highland hummingbird, *Aglaiocercus coelestis*, was present. The fewest number of individual plants flowered in September, and this also was at or near the time when the fewest species were flowering (Hilty 1980a).

Thirdly, well over half the nectar-feeding community was migratory, and most of these migrants (12 of 15) were hummingbirds. The dominance of the migrant nectar-feeding category by hummingbirds, however, was strongly correlated with the habitat in which these birds spent most of their time. Ten of the 12 migrant hummingbirds inhabited canopy, forest edge, and early successional vegetation; only two were associated with the forest interior (Table 3 and Appendix).

TABLE 2

ASSOCIATION BETWEEN MOVEMENT STATUS AND DIET OF BIRDS AT ALTO YUNDA, COLOMBIA, APRIL 1972 TO JUNE 1973

Diet class	Frugivore[1]	Nectarivore	Insectivore	Granivore	Raptor[2]
Status					
Short-distance migrants					
Elevational[3]	32	15	9	1	
Local	2				
Vagrant	4		9		2
Long-distance migrants[4]	5		16		2
Resident	55	11	87	7	14
Total[5]	98	26	121	8	18

[1] Includes species for which fruit is an important, but not exclusive, component of the diet, i.e., tinamous, parakeets, parrots, trogons, thrushes, dacnises, tanagers, emberizine finches. *Attila, Pachyramphus, Cacicus, Atlapetes,* and *Arremon* are split between frugivore and insectivore categories.

[2] Includes only those whose prey is principally small vertebrates or carrion.

[3] *Cotinga nattererii, Pipreola jacunda,* and *Cephalopterus penduliger,* considered as elevational migrant frugivores, may be only vagrants to Alto Yunda.

[4] All but one species are from north temperate latitudes.

[5] *Elanoides forficatus, Ictinia plumbea, Chlorophonia flavirostris,* and *Heterospingus xanthopygius* were each split into both resident and migrant categories. *Pionopsitta pulchra* was counted only as an elevational migrant, and *Diglossa indigota* as a resident and migrant.

By contrast six of 10 resident hummingbirds fed primarily inside mature forest. Only one resident, *Amazilia tzacatl,* occurred largely in early successional vegetation.

Frugivores.—More short-distance migrant frugivores at Alto Yunda were from the highlands than the lowlands. A total of 19 frugivores was classed as migrants from higher elevations to Alto Yunda, and 13 from lower elevations (Table 4). Migrant frugivores from the lowlands remained at Alto Yunda longer, respectively, than highland species (mean of 4.6 months vs. 2.6 months).

The greatest number of migrant frugivores were present March-June and November-January, periods of time broadly overlapping the migrant nectar-feeding community. These two peaks of frugivore numbers broadly track a twice annual increase in fruit abundance (Hilty 1980a), although they appear to lag it slightly (Fig. 1). Correlation between the number of individual trees in fruit (fruit abundance), and the number of elevational migrants present was positive but not significant (Spearman's Rank Correlation, $z = 1.360$, $P < 0.10$).

Some short-distance movements may overlap resident populations. Populations of *Elanoides forficatus* and *Chlorophonia flavirostris* included both resident and migrant individuals. Individuals of *Elanoides forficatus* were recorded almost daily during every month of the year at Alto Yunda. However, large flocks moving along a forested ridge in August and September (maximum of 31 individuals on 8 September 1972), greatly augmented the small numbers of birds usually present. *Chlorophonia flavirostris* was present all year in small numbers, but during January and February flocks of 18–20 fed in *Miconia* sp. trees at Alto Yunda, and in June, at elevations of 100–300 m in the lower Anchicayá Valley, I encountered flocks of over 80 birds. Groups of up to a dozen also have been seen at 1,800 m, and the origins and seasonal movement of this species remain unclear.

About 23 percent (22 of 97) of the migrant species at Alto Yunda breed in north-temperate latitudes (Table 2). Only one (*Myiopagis caniceps*) may be an austral migrant. Six species were recorded only on one or a few days of the year, i.e., *Buteo platypterus, Chaetura pelagica*

TABLE 3

HUMMINGBIRD COMMUNITIES AT ALTO YUNDA, COLOMBIA AND LA MONTURA, COSTA RICA

Category	Alto Yunda	La Montura
Resident	10	10
Regular seasonal migrants[1]	7	4
Rare/accidental migrants	5	8

[1] Regular elevational migrants at Alto Yunda include *Doryfera ludoviciae, Androdon aequatorialis, Threnetes ruckeri, Colibri delphinae, Florisuga mellivora, Aglaiocercus coelestis,* and *Philodice mitchellii.*

TABLE 4

NUMBER OF SHORT DISTANCE MIGRANTS REACHING ALTO YUNDA FROM HIGHER, LOWER, AND LOCAL (OR UNKNOWN) SOURCES

	Number of species	Mean number months present
Elevational migrants		
Highland species	19	2.6
Lowland species	13	4.6[1]
Local migrants[2]	2	?

[1] Mean based on 11 species; *Pionopsitta pulchra* and *Heterospingus xanthopygius* not included in calculations because suspected resident and migratory population could not be distinguished.
[2] Origin (highlands or lowlands) unknown.

(identification not certain), *Myiarchus crinitus*, *Riparia riparia*, *Hirundo rustica*, and *Piranga olivacea*, whereas the remainder were resident for 5–9 months of the year. The highest number of individuals and species of north-temperate migrants was recorded in October, many arriving around the middle of the month (Hilty 1980b). Most remained only a few days, but one *Dendroica fusca* that I color-marked was with a mixed-species flock until its northward migration the following spring.

Short-distance migrants at Alto Yunda were primarily frugivores and nectarivores (Table 2). Insectivorous elevational migrants were mainly aerial-feeders—four swifts, two swallows and two insectivorous raptors. The remainder consisted of an icterid and a flycatcher. The two raptors, *Elanoides forficatus* and *Ictinia plumbea*, capture large, flying insects (among other things) by snatching them from canopy foliage or grabbing them in the air. *Elanoides forficatus* was present year-round, but its numbers greatly increased in August and early September, suggesting a migratory movement. *Ictinia plumbea* was not present all year but several large migrating groups were noted in August and September. Both species are migratory in parts (all?) of their range (Stiles and Skutch 1989), and southbound flocks have been noted in July and August in Costa Rica (Stiles, pers. comm.).

Four species of swifts, all aerial insectivores, displayed a seasonal distribution that suggests they were elevational migrants. During 1972 and 1973, three species, *Streptoprocne rutila*, *Chaetura cinereiventris* and *C. spinicauda*, were present mainly during February–May and October–December. *Chaetura cinereiventris* was also recorded during June 1975. *Streptoprocne rutila* was probably present continually from November through May (Appendix) despite the fact that I failed to record it in December or April. This highland species was seen nearby at elevations even lower than Alto Yunda during December. *Panyptila cayennensis* was recorded in August and November–December, thus overlapping in part the pattern shown by the others. Except for *S. rutila*, all of these swifts are believed to be lowland and foothill breeding species, and their occurrence at elevations as high as Alto Yunda during most of the rainiest months of the year may be related to wet season increases in small aerial insects at this elevation or, alternatively, to depressed aerial insect populations at lower elevations. This is the first report of presumed seasonal elevational migration in Neotropical swifts. Marin (1993) summarized patterns of elevational distribution of swifts in the Andes of Ecuador, but did not document or discuss the possibility of seasonal movement.

The late-year, down-slope movement of highland species included several, i.e., *Entomodestes coracinus*, *Platycichla leucops*, *Pipraeidea melanonota*, and *Bangsia edwardsi*, that had not previously been in the area, and stayed only a few weeks or a month or two. Lowland species stayed longer—some were present more than half the year—i.e., *Capito maculicoronatus*, *Pteroglossus sanguineus*, and *Tangara lavinia*—and could have bred there (no breeding evidence was noted). *Columba goodsoni* (from lowlands) and *Ampelioides tschudii* (from highlands) were noted singing for several weeks upon arrival. Except for *Ampelioides tschudii*, whose loud whistles were heard for several months early in the year, it is unlikely that any highland species bred there. The short residency, absence of song, and unpaired behavior of most elevational migrants, such as *Geotrygon frenata* and *Entomodestes coracinus*, suggest that they did not breed at Alto Yunda.

On the other hand *Amazona farinosa* was recorded on the study site in eight different months, but was still not known to breed there (it was known to breed at sites about 500 m lower in elevation). Late in the year it was present in large flocks for several months, but in other months

TABLE 5

KENDALL'S RANK CORRELATION OF NUMBER OF SPECIES OF FRUIT TAKEN EACH MONTH BY EIGHT SPECIES OF *Tangara* WITH THE NUMBER OF TREE SPECIES IN FRUIT EACH MONTH AND KENDALL'S RANK CORRELATION OF NUMBER OF SPECIES OF FRUIT TAKEN EACH MONTH BY 26 SPECIES OF TANAGERS WITH THE NUMBER OF TREE SPECIES IN FRUIT EACH MONTH, AT ALTO YUNDA, COLOMBIA

	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
Number of fruiting species	47	45	55	60	61	63	52	53	53	58	66	51
Tangara[1]	22	18	25	29	30	29	25	29	22	34	33	21
26 Tanagers[2]	27	23	33	36	41	36	33	40	33	46	44	30

[1] Kendall's coefficient of rank correlation with ties, $r_s = 0.76$, $P < 0.05$.
[2] Kendall's coefficient of rank correlation with ties, $r = 0.71$, $P < 0.05$.

it was noted only sporadically and in scattered pairs or small groups that flew over the study area but rarely stopped. Records for some presumed elevational migrants, e.g., *Dacnis cayana* and *Carduelis xanthogastra,* were so scattered or spotty that elevational movements or breeding status were unknown.

Vagrants.—I list 15 species as vagrants (Table 2). A little over one-half (nine of 15) were insect-eating species, and the majority (12 of 15) were species of forest canopy or early successional growth. Two raptorial species, *Milvago chimachima* and *Falco sparverius,* are typical of open or partially deforested regions and probably represent wandering individuals from deforested pastureland at lower elevation. Partial clearing and opening of forest habitats at lower elevation probably also opened an avenue of upward expansion for *Synallaxis brachyura* and *Tolmomyias sulphurescens*. Another recent invader from open habitats, *Molothrus bonariensis,* was already established in the single clearing at Alto Yunda, and *Zonotrichia capensis,* although not recorded every month, was classed as a resident.

A pair of antbirds, *Cecromacra tyrannina,* were considered vagrants, although they were heard and seen frequently during a three week period from late November to mid-December. They were never seen thereafter. This species was not found near Alto Yunda—the nearest resident pair known to me was several kilometers away and at least 250 m lower in elevation—and this pair's temporary presence probably represented wandering behavior in search of a suitable territory.

Some insectivores were recorded only irregularly during the study, e.g., several woodpeckers, foliage-gleaners, a motmot, a puffbird, and two flycatchers (*Rhynchocyclus brevirostris* and *Myiobius barbatus*). A combination of foraging areas that lay largely outside the study area, and in some cases low population densities, may account for the inconsistent records of these species.

Without records from many years it is impossible to distinguish some short-distance migrants responding to environmental perturbations from vagrants or normal non-breeding dispersal of immatures and unmated or mated adults. *Pipra pipra* provides an example. It foraged mostly for small berries and fruit in the lower story of the forest and was easily captured in mist nets but infrequently observed. I captured it during six widely scattered months of the year. All were adult females or female-plumaged immatures. The broad scatter of records throughout the year could point to post-breeding dispersal or to diet-related seasonal movement. The nearest lek known to me, apparently occupied more or less year-round, was nearly 1 km away, at 660 m elevation.

Seasonality of foraging and diet.—The number of kinds of fruit eaten each month by eight species of *Tangara* tanagers, and by the entire tanager community (26 species), was positively and significantly correlated with the number of species of trees bearing fruit (Kendall's Rank Correlation, $r_s = 0.76$, and $r_s = 0.71$ respectively, $P < 0.05$, Table 5). Thus, the greatest range of fruits was taken during months when the greatest diversity was available. The amount of fruit in their diets also reached an annual high of 86.3% ± 1.3 S.E. in October and dropped to an annual low of 66% ± 6.4 S.E. in August (n = 3,849 foraging records). These months are at or close to the annual highs and lows respectively of general fruit abundance in the community (Hilty 1980a).

None of the eight common *Tangara* was a local or elevational migrant (all were present in approximately the same numbers in all months) but, as a group, they showed significant foraging

TABLE 6

RANKING OF FRUIT ABUNDANCE (CANOPY SURFACE AREA) WITH MEAN MONTHLY FORAGING DISTANCE (N = 1,340) OF 11 SPECIES OF TANAGERS[1]

Parameters[2]	J	F	M	A	M	J	J	A	S	O	N	D
Forag. dist. (m)	121	136	146	143	125	112	110	113	127	129	123	119
Fruit abund. (%)	40.4	40.8	32.3	34.2	35.8	49.5	48.0	41.2	37.3	45.9	49.5	38.3

[1] *Tangara cyanicollis, T. arthus, T. nigroviridis, T. palmeri, T. rufigula, T. icterocephala, T. gyrola, T. florida, Euphonia xanthogaster, Chlorospingus flavigularis, Chlorothraupis stolzmanni.*

[2] Kendall's coefficient of rank correlation with ties, $r_s = -0.61$, $P < 0.05$.

responses to seasonally varying fruit resources. The average foraging distance (distance of recapture or sighting away from original capture location) varied from a maximum of 146 and 136 m in July and August to 110 and 112 m in November and December, respectively (Table 6). The greater foraging distances in July and August, compared to later in the year, coincided with a general decrease in the amount of fruit at this time of year (Hilty 1980a); conversely, foraging distances were smallest when fruit spiked to one of its highest levels of the year in November. The foraging distance of eight *Tangara*, and three additional species with sufficient data, are inversely and significantly correlated with fruit abundance (Kendall's Rank Correlation with ties, $r_s = -0.61$, $P < 0.05$). Foraging distances did not contract as markedly during the early year fruiting peak of March-April, a period when many species were breeding (Hilty 1977).

DISCUSSION

Community composition and comparisons.—The Alto Yunda avifauna represents one of the largest single-site, montane avifaunas reported. Aside from possible historical factors, the avifauna at Alto Yunda is not believed to be inherently richer than other Andean montane sites. Rather, it represents the addition of some vagrants, rare or uncommon species, and especially, many short-distance migrants that were recorded over a full annual cycle. Many of these species would not be recorded during the relatively brief visits that have characterized work at other Andean sites.

Few comparable studies exist of seasonal distribution patterns in Andean regions. Miller's (1963) year long survey at San Antonio, Colombia (2,100 m), less than 40 km away, provides a comparison, although his conclusions differ from those of the present study. San Antonio, a region of mixed "cloud forest," disturbed areas, and pasture land, had fewer species (167) than Alto Yunda. Moreover, Miller reported that apart from 15 species that migrate to North America to breed, the avifauna is permanently resident, with only one species (*Elaenia obscura*) [*sic* = *frantzii*] showing regular seasonal movement.

Despite Miller's (1963) results, dynamic avifaunas similar to Alto Yunda's may characterize much of the Andes, perhaps even more so than the avifauna of my study area. Alto Yunda is an unusually wet mountain region close to the equator, where rainfall is not strongly seasonal. Thus, at Alto Yunda, seasonal variation is minimized.

The large proportion of tropical breeding species that showed evidence of seasonal or irregular movement at Alto Yunda (22%) is comparable to studies by Stiles (1983, 1985b, 1988), Levy (1988), and Loiselle and Blake (1991) in Costa Rica. These studies have demonstrated that both local and migratory movements are characteristic of montane avifaunas in southern Central America. Stiles (1985b) reported that up to half of the avifauna in Costa Rica shows evidence of migratory movement, and that 26% of the species on Costa Rica's wet Caribbean slope show seasonal changes in elevation of at least 500 m. More than 75 species of birds in Parque Nacional Braulio Carrillo, a montane park in Costa Rica, undergo seasonal elevational movements (Stiles 1985b); at Alto Yunda 57 species were classified as elevational migrants.

Most local and elevational migrants are frugivores (ca. 58%) or nectarivores (ca. 25%), proportions similar to those found in Costa Rica (Loiselle and Blake 1991) but higher than the representation of these groups in the avifauna. The high proportion of short-distant migrants that are frugivores and nectarivores in Costa Rica suggests that their movements are related to varying abundances of food (Loiselle and Blake 1991; Levy and Stiles 1992).

The two seasonal increases in numbers of migrant frugivores and nectarivores are of interest because species from both the highlands and lowlands were present. Contributions from species of both higher and lower elevation account for a doubling of the number of short-distance migrants during April–June and November–January (only April–June and December for nectarivores). These movements differ in timing from those reported in Costa Rica, and they also appear more complex. Stiles (1985b) reported that migration in both nectar-/and fruit-eating birds was correlated with flower and fruit production, but the respective elevational movements differed in timing—frugivores moved downslope during the latter part of the year, at about the same time that nectar-feeders moved upslope. The seasonal movement of elevational migrant nectarivores at Alto Yunda is similar to that in Costa Rica, in that more species apparently moved downslope during the first (drier) part of the year, and left (presumably moving back upslope) during the rainiest latter months of the year.

The pattern in fruit-eating birds suggests more complex movements than those reported in Costa Rica. In Costa Rica a major downslope movement of fruit-eating birds characterizes the wet season (last half of year), and a major upslope movement occurs in the dry season (early months of the year) (Stiles 1988; Loiselle and Blake 1991), whereas at Alto Yunda two peaks of elevational migrants were apparent, both approximately coincident with the highest levels of fruit in the environment. Fruit and flower production was not strongly seasonal at Alto Yunda (probably less so than in Costa Rica which lies seven degrees of latitude northward), and some measures of flower and fruit abundance at Alto Yunda showed no significant seasonality. Consequently, elevational migration at Alto Yunda may not be so rigorously constrained by climate and food supply as in Costa Rica, thus permitting a greater variety of seasonal movements to occur.

Another difference between Alto Yunda and the Costa Rican localities is the elevational origin of the species. At Alto Yunda the seasonal increases of elevational migrant frugivores and nectarivores contain species from both high and low elevations. However, at present it is impossible to know the true sources and origins of the species contributing to these seasonal patterns.

Nectarivores.—Proportionately more nectarivores are migrants than any other dietary group of birds at Alto Yunda. Nectar dependence, however, does not necessitate migratory behavior. Stiles (1988), Feinsinger and Colwell (1978) and Levy and Stiles (1992) found for hummingbirds in Costa Rica a positive correlation between seasonal migratory movements and use of canopy and edge habitats. The results of this study are similar to those at La Montura in Parque Nacional Braulio Carillo, Costa Rica (Stiles 1988). The sites are at similar elevations, have similar rainfall, and similar hummingbird communities, each with 10 residents in a community of 22 species (Table 3). However, Alto Yunda hosted more regular seasonal migrants, with fewer migrant species classified as rare or accidental, than La Montura. Most regular migrants at La Montura were immatures that moved downslope during the early- to mid-rainy season, with only one species, *Thalurania furcata*, moving upslope. Alto Yunda's regular migrant hummingbirds were drawn about equally from the highlands and lowlands, although almost all of the rare species (except an immature *Amazilia amabilis*) were from the highlands. Of seven regular migrant hummingbirds at Alto Yunda, five (*Doryfera ludoviciae*, *Androdon aequatorialis*, *Threnetes ruckeri*, *Florisuga mellivora* and *Aglaiocercus coelestis*) were present for 5–9 consecutive months and may have bred, but each was absent for at least two consecutive months. The two remaining species, *Colibri delphinae* and *Philodice mitchellii,* were present only for about three months during the year. The latter's two brief visits coincided with the flowering of several *Hamelia* sp. shrubs.

At La Montura, Stiles (1988) correlated the seasonal presence of several hummingbirds with definite elevational shifts of their populations. At Alto Yunda the seasonal visits of several species of hummingbirds also represent elevational shifts because their populations were derived from elevational zones primarily above or below Alto Yunda. *Threnetes ruckeri* and *Florisuga mellivora*, for example, breed mainly below 900 m, *Aglaiocercus coelestis* mostly from 900–2,000 m, and *Colibri delphinae*, *Haplophaedia aureliae*, and *Ocreatus underwoodi* even higher still. The movements of a few hummingbird species may represent primarily nonelevational shifts to habitats adjacent to, but outside of, the study area. Brief absences, for example, of *Phaethornis syrmatophorus*, *Amazilia tzacatl*, and *Urostice benjamini*, and fluctuating numbers of *Popelairia conversii*, may have been due to local changes in the abundance of food plants. Each of the four latter species was relatively numerous at Alto Yunda, and, although all breed at higher or lower elevations, their relatively brief absences suggest local, rather than longer, elevational movements.

Seasonal foraging behavior and resource abundance.—One response to adverse changes in food resources is to alter the diet and, consequently, foraging behavior. Another response is a local, elevational, or long-distance migration. This study lacks direct evidence linking food supply to migratory movements, but it demonstrates that small tanagers track resources and respond by adjustments in diet and expansion and contraction of foraging range. It suggests that food resources may be limited at some times for some species.

All avifaunas are composed of a variety of species with different life-history strategies, habitat requirements, foods, migratory tendencies, and foraging techniques, but seasonal limitations of food are an important factor in migratory movements (Stiles 1985b, 1988; Loiselle and Blake 1991; Levy and Stiles 1992). The eight species of *Tangara* represent corroborating evidence relating resource abundance to seasonal movements of the Alto Yunda avifauna. Most *Tangara* are not territorial in the strict sense of defending exclusive, rigid territories (pers. obs.). The size of their foraging areas can easily expand or contract as resource abundance varies. Such a response to variation in diversity and abundance of food resources could be a precursor to the evolution of local or elevational migration.

Conservation.—The extent of short-distance migration reported here has important implications for conservation planning. About a third of the avifauna at Alto Yunda showed evidence of seasonal movement. To protect these species, and migratory species like them elsewhere, future research and land planning must focus not only on communities at specific sites, but also on maintaining corridors of habitat to accommodate species' movements within and between communities.

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APPENDIX

BIRDS OF ALTO YUNDA, ANCHICAYÁ VALLEY, COLOMBIA WITH MONTHS OF OCCURRENCE, SEASONAL STATUS, HABITAT, ELEVATIONAL DISTRIBUTION, AND GUILD. APRIL 1972 THROUGH JUNE 1973; ● (BULLET) INDICATES 1 OR MORE REC(S). FOR THE MONTH

Species	J	F	M	A	M	J	J	A	S	O	N	D*	Status[1]	Habitat[2]	Distrib. elev.[3]	Guild[4]
TINAMIDAE																
Tinamus major	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	L	Fr(Gran?), T
Crypturellus soui	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	L	Fr(Gran?), T
CATHARTIDAE																
Coragyps atratus	●	●	●	●	●	●	●	●	●	●	●	●	R	A	W	Car
Cathartes aura	●	●	●	●	●	●	●	●	●	●	●	●	R	A	W	Car
ACCIPITRIDAE																
Elanoides forficatus	●	●	●	●	●	●	●	●	●	●	●	●	R & SDM	A	L	Ins, Aer/Cnpy
Harpagus bidentatus	●	●	?	●	●	●	?	?	?	?	●	●	R	FI	L	R, D
Ictinia plumbea	●			●				●	●	●	●		R & SDM	A	L	Ins, Aer/Cnpy
Accipiter superciliosus			●	●								●	R	CN/ES	L	R, D
Buteo platypterus										●			LDM	CN	H	R, D
Buteo magnirostris	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	L	R, D
Leucopternis princeps	●	●	●	●	●	●	●			●	●	●	R	FI	C	R, D
Harpia harpyja		●											R	FI	L	R, D
Spizastur melanoleucus												●	R	FI	L	R, D
Spizaetus ornatus		●		●	●	●	●	●	●	●	●		R	FI	L	R, D
PANDIONIDAE																
Pandion haliaetus											●	●	LDM?/V?	A	W	R, D
FALCONIDAE																
Herpetotheres cachinnans	●	●	●	●	●	●	●	●	●	●	●	●	R	CN/ES	L	R, D
Micrastur ruficollis	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	L	R, D
Milvago chimachima		●						●					V	ES	L	Car
Falco rufigularis						●†							R	CN/A	L	R, D
Falco sparverius										●			V	ES	W	R, D
CRACIDAE																
Chamaepetes goudotii	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	C	Fr, A
ODONTOPHORIDAE																
Odontophorus erythrops	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	C	Gran, T

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Species	J	F	M	A	M	J	J	A	S	O	N	D*	Status[1]	Habitat[2]	Distrib. elev.[3]	Guild[4]
RALLIDAE																
Laterallus melanophaius	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	L	Ins, T
COLUMBIDAE																
Columba goodsoni	●	●	?	●	●						●	●	SDM	CN	L	Fr, A
Columba plumbea	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	L	Fr, A
Columba subvinacea	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	C	Fr, A
Geotrygon saphirina	?	●	?	●	●					●			R	FI	C	Fr, T
Geotrygon frenata							●	?	●				SDM	FI	H	Fr, T
PSITTACIDAE																
Aratinga wagleri	●												SDM	CN	H	Fr/Gran, A
Bolborhynchus lineola				●									SDM	CN	H	Fr/Gran, A
Touit dilectissima	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	C	Fr/Gran, A
Pionopsitta pulchra			●	●		●		●	●			●	R & SDM	CN	L	Fr/Gran, A
Pionus menstruus	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	L	Fr/Gran, A
Amazona farinosa	●	●	●	●		●				●	●	●	SDM	CN	L	Fr/Gran, A
CUCULIDAE																
Piaya cayana	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	L	Ins, A, G
Crotophaga ani	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	W	Ins, A, G
STRIGIDAE																
Ciccaba virgata	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	L	R
Otus columbianus	●					●				●	●	●	R	FI	C	R
STEATORNITHIDAE																
Steatornis caripensis							●			●	●		SDM	FI	W	Fr, A
NYCTIBIIDAE																
Nyctibius griseus	●						●						R	CN	L	Ins, A, Sal
APODIDAE																
Streptoprocne zonaris	●	●	●	●	●	●	●	●	●	●	●	●	R	A	L	Ins, Aer
Streptoprocne rutila		●	●		●							●	SDM?	A	H	Ins, Aer
*Chaetura pelagica**										●			LDM	A	L?	Ins, Aer
Chaetura cinereiventris		●		●		●†					●	●	SDM?	A	L	Ins, Aer
Chaetura spinicauda				●	●					●	●		SDM?	A	L	Ins, Aer
Panyptila cayennensis								●			●	●	SDM?	A	L	Ins, Aer

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Species	J	F	M	A	M	J	J	A	S	O	N	D*	Status[1]	Habitat[2]	Distrib. elev.[3]	Guild[4]
TROCHILIDAE																
Doryfera ludoviciae		•	•	•	•	•	•			•	•	•	SDM	CN	H	N
Androdon aequatorialis	•	•			•	•	•			•	•		SDM	CN	L	N
Threnetes ruckeri		•	•	•	•	•	?	•					SDM	ES	L	N
Phaethornis yaruqui	•	•	•	•	•	•	•	•	•	•	•	•	R	FI	L	N
Phaethornis syrmatophorus	•	•	•	•	•	•	•	•	•	•	?	?	R	FI	H	N
Phaethornis longuemareus	•	•	•	•	•	•	•	•	•	•	•	•	R	FI	L	N
Eutoxeres aquila	•	•	•	•	•	•	•	•	•	•	•	•	R	FI	L	N
Florisuga mellivora		•	•	•	•	•	•	•	?	•			SDM	CN	L	N
Colibri delphinae				•	•	•							SDM	CN	H	N
Popelairia conversii	•	•	•	•	•	•	•	•	•	•	•	•	R	CN	C	N
Thalurania furcata	•	•	•	•	•	•	•	•	•	•	•	•	R	FI	L	N
Amazilia amabilis										•			SDM	ES	L	N
Amazilia franciae	•	?	•									•	SDM	CN	H	N
Amazilia tzacatl	?	•	•	•	•	•	•	•	?	•	•	•	R	ES	L	N
Urosticte benjamini	•	•	•	•	•	•	•	•	?	•	•	•	R	CN	C	N
Helidoxa imperatrix	•	•	•	•	•	•	•	•	•	•	•	•	R	FI	C	N
Coeligena wilsoni	•			•		•	•				•		SDM	FI	H	N
Haplophaedia aureliae												•	SDM	CN	H	N
Ocreatus underwoodi					•							•	SDM	CN	H	N
Aglaiocercus coelestis	•	?	•	•				•	•	?	•	•	SDM	FI	H	N
Heliothryx barroti	•	•	•	•	•	•	•	•	•	•	•	•	R	CN	L	N
Philodice mitchellii				•	•							•	SDM	ES	H	N
TROGONIDAE																
Pharomachrus antisianus						•†	•	•					SDM	CN	H	Fr, A
Trogon massena	•	•	?	•	•	?	•					•	R	FI/CN	L	FR/A, A, Sal
Trogon collaris	•	•	•	•	•	•	•	•	•	•	•	•	R	FI	C	Fr/A, A, Sal
MOMOTIDAE																
Electron platyrhynchum			•	•		•	•		•		•		R	FI	L	Ins, A, Sal
Baryphthengus martii	•	•	•	•	•	•		•				•	R	FI	L	Fr/A, A, Sal
BUCCONIDAE																
Malacoptila mystacalis	•	•	•			•		•		•		•	R	FI	C	Ins, A, Sal
Micromonacha lanceolata										•			R	FI	C	Ins, A, Sal

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Species	J	F	M	A	M	J	J	A	S	O	N	D*	Status[1]	Habitat[2]	Distrib. elev.[3]	Guild[4]
CAPITONIDAE																
Capito maculicoronatus						●	●	?	●	●			SDM	CN	L	Fr, A
Eubucco bourcierii	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	H	Fr/A, A, G, DL
RAMPHASTIDAE																
Aulacorhynchus haematopygus	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	H	Fr, A
Pteroglossus sanguineus	●	●	?	●	●	●	?	●				●	SDM	CN	L	Fr, A
Ramphastos ambiguus	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	L	Fr, A
PICIDAE																
Picumnus olivaceus	●				●	●		●	●				R	CN	L	Ins, B, I
Piculus rubiginosus	●	●	●	●	●	●	●	●	●	●	●	●	R	CN/ES	H	Ins, B, I
Piculus leucolaemus	●	●					●			●	●	●	R	CN	C	Ins, B, I
Celeus loricatus			●	●		●	●	●	●				R	FI/CN	L	Ins, B, I
Dryocopus lineatus							●					●	R	CN/ES	L	Ins, B, I
Veniliornis fumigatus	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	H	Ins, B, I
Veniliornis cassinii						●†			●			●	R?	CN	L	Ins, B, I
Campephilus melanoleucos	●	●	●	●	●	●	●	●	●	●	●	●	R	CN/ES	L	Ins, B, I
Campephilus haematogaster				●		●					●		R	FI	C	Ins, B, I
DENCROCOLAPTIDAE																
Dendrocincla fuliginosa	●	●		●		●	●	●		●	●		R	FI	L	Ins, B, S
Glyphorynchus spirurus	●	●	●	●	●	●	●	●	●	●	●	●	R	FI/ES	L	Ins, B, S
Dendrocolaptes sanctithomae								●					V	FI	L	Ins, B, S
Xiphorhynchus erythropygius	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	L	Ins, B, S
Xiphorhynchus triangularis	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	C	Ins, B, S
Campylorhamphus pusillus	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	C	Ins, B, S
FURNARIIDAE																
Synallaxis brachyura				●									V	ES	L	Ins, A, G
Cranioleuca erythrops	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	C	Ins, A, G
Premnoplex brunnescens	●			●	●							●	R	FI	H	Ins, B, S
Pseudocolaptes lawrencii				●	?	●	●	●	?	●			R?	CN	H	Ins, A, G
Syndactyla subalaris	●			●				●					R	FI	C	Ins, A, G
Anabacerthia variegaticeps							●			●	●		R/V?	FI	C	Ins, A, G
Anabacerthia striaticollis	●	●				●				●		●	R	FI	C	Ins, A, G
Philydor rufus	●				●	●		●					R	CN	H	Ins, A, DL
Automolus rubiginosus	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	H	Ins, A, G(?)

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Species	J	F	M	A	M	J	J	A	S	O	N	D*	Status[1]	Habitat[2]	Distrib. elev.[3]	Guild[4]
Thripadectes ignobilis	●	●	●				●			●	●	●	R	FI	C	Ins, A, DL
Xenops minutus	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	L	Ins, B, S
Sclerurus mexicanus	●	●						●		●		●	R	FI	L	Ins, T, G
FORMICARIIDAE																
Taraba major	●	●		●		●	●	●	●	●		●	R	ES	L	Ins, A, G
Thamnophilus unicolor	●			●		●		●	●	●	●		R	FI	H	Ins, A, G
Thamnistes anabatinus	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	C	Ins, A, G
Dysithamnus puncticeps	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	C	Ins, A, G
Myrmotherula brachyura					●								V	CN	L	Ins, A, G
Myrmotherula surinamensis	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	L	Ins, A, G
Myrmotherula fulviventris			●		●								V	FI	L	Ins, A, DL
Myrmotherula schisticolor	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	C	Ins, A, G(DL?)
Herpsilochmus axillaris	●						●		●	●	●		R	CN	H	Ins, A, G
Microrhopias quixensis		●	●	●			●	●	●				R	CN/ES	L	Ins, A, G
Terenura callinota	●				●	●					●		R	CN	H	Ins, A, G
Cercomacra tyrannina								●	●				V	ES	L	Ins, A, G
Myrmeciza immaculata	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	L	Ins, A, G
Myrmeciza nigricauda	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	L	Ins, A, G
Gymnopithys leucaspis					●				●				V	FI	L	Ins, AF
Conopophaga castaneiceps	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	C	Ins, A, G(?)
RHINOCRYPTIDAE																
Scytalopus chocoensis[5]	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	C	Ins, T, G
COTINGIDAE																
Cotinga nattererii						●							SDM/V?	CN	L	Fr, A
Pipreola jacunda					●								SDM/V?	FI	H	Fr, A
Ampelioides tschudii	●	?	●	●	●					●	?	●	SDM	CN	H	Fr, A
Pachyramphus cinnamomeus	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	L	Fr/A, A
Pachyramphus polychopterus	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	L	Fr/A, A
Tityra semifasciata	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	L	Fr, A
Querula purpurata	●	?	●	●	●	●	?	●					SDM/R?	CN	L	Fr, A
Cephalopterus penduliger	●			●									SDM/V?	CN	C	Fr, A
Rupicola peruviana				●									V	FI	C	Fr, A

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Species	J	F	M	A	M	J	J	A	S	O	N	D*	Status[1]	Habitat[2]	Distrib. elev.[3]	Guild[4]
PIPRIDAE																
Pipra pipra		●	●		●	●		●		●			R/V?	FI	C	Fr, A
Masius chrysopterus	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	C	Fr, A
Manacus vitellinus	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	L	Fr, A
Machaeropterus deliciosus	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	C	Fr, A
Schiffornis turdinus	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	L	Fr/A, A
TYRANNIDAE																
Zimmerius viridiflavus	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	C	Fr, A
Ornithion brunneicapillum	●												V	CN	L	Fr/A, A
Camptostoma obsoletum	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	L	Ins, A, G
Myiopagis caniceps					●					●		●	SDM/V?	CN	?	Ins(?), A, G
Elaenia flavogaster		●										●	SDM	ES	W	Fr/A, A, G
Mionetes olivaceus	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	C	Fr, A
Leptopogon superciliaris	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	C	Ins, A, Sal
Pseudotriccus pelzelni	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	H	Ins, A, Sal
Myiornis ecaudatus								●					V	CN	L	Ins, A, Sal
Lophotriccus pileatus	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	C	Ins, A, Sal
Todirostrum nigriceps				●	●						●		R	CN	L	Ins, A, Sal
Todirostrum cinereum	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	L	Ins, A, Sal
Rhynchocyclus brevirostris		●				●	●		●		●		R	FI	L	Ins, A, Sal
Tolmomyias sulphurescens							●		●				V	ES	L	Ins, A, Sal
Platyrinchus mystaceus	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	C	Ins, A, Sal
Myiotriccus ornatus	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	C	Ins, A, Sal
Myiobius barbatus			●	●			●	●	●		●	●	R	FI	L	Ins, A, Sal
Mitrephanes phaeocercus	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	C	Ins, A, Sal
Contopus cooperi	●	●	●	●							●	●	LDM	CN	C?	Ins, A, Sal
Contopus sordidulus (or *virens*)	●	●	●						●	●	●	●	LDM	CN	C?	Ins, A, Sal
Contopus fumigatus	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	C	Ins, A, Sal
Empidonax virescens	●	●	●	●				●	?	?	●	●	LDM	ES	L	Ins, A, Sal
Colonia colonus	●	●	●	●	●	●	●	●	●	●	●	●	R	CN/ES	L	Ins, A, Sal
Attila spadiceus	●	●	●	●	●	?	?	?	?	●	●	●	R	CN	L	Fr/A, A, Sal
Myiarchus crinitus										●			LDM	ES	L?	Fr/A, A, Sal
Myiarchus tuberculifer	●	●	●			●	●						R?	CN	L	Ins(?), A, Sal
Myiozetetes cayanensis	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	L	Ins, A

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Species	J	F	M	A	M	J	J	A	S	O	N	D*	Status[1]	Habitat[2]	Distrib. elev.[3]	Guild[4]
Conopias cinchoneti	●	●	●	●		●	●	●		●	●	●	R	CN	C	Ins, A, G
Myiodynastes chrysocephalus	●	●	●	●	●			●	●	●	●	●	R	CN	C	Ins, A, Sal
Tyrannus melancholicus	●	●	●	●	●	●	●	●	●	●	●	●	R	CN/ES	W	Ins, A, Sal
Tyrannus tyrannus			●										LDM	CN/ES	?	Fr, A, Sal
HIRUNDINIDAE																
Notiochelidon cyanoleuca				●		●				●			SDM	A	H	Ins, Aer
Neochelidon tibialis				●	?	●	●	●	●	●	●		SDM	A	L	Ins, Aer
Stelgidopteryx ruficollis	●	●	●	●	●	●	?	●	●	●	●	●	R	A	W	Ins, Aer
Riparia riparia										●			LDM	A	?	Ins, Aer
Hirundo rustica										●	●		LDM	A	L	Ins, Aer
CORVIDAE																
Cyanolyca pulchra		●											V	CN	H	Fr/A, A
TROGLODYTIDAE																
Campylorhynchus albobrunneus	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	C	Ins, A, G
Odontorchilus branickii	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	C	Ins, A, G
Thryothorus spadix	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	C	Ins, A, G/DL?
Thryothorus nigricapillus	●	●	●	●	●	●	●	●	●	●	●	●	R	CN/ES	L	Ins, A, G
Troglodytes aedon	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	W	Ins, A, G
Henicorhina leucophrys	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	H	Ins, A, G
Microcerculus marginatus	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	L	Ins, T, G
POLIOPTILINAE																
Microbates cinereiventris	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	L	Ins, A, G
TURDINAE																
Myadestes ralloides	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	C	Fr, A
Entomodestes coracinus					●					●	●	●	SDM	FI	H	Fr, A
Catharus ustulatus	●	●	●	●						●	●	●	LDM	CN/ES	C?/W	Fr, A
Platycichla leucops	●				●	●						●	SDM	FI	H	Fr, A
Turdus serranus										●	●		SDM	CN	H	Fr, A
Turdus ignobilis				●	●	●	●						SDM	CN/ES	H	Fr, A
Turdus obsoletus	●				●	●		●			●		R	FI	H	Fr, A
VIREONIDAE																
Vireolanius leucotis	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	L	Ins, A, G
Vireo olivaceus (incl. *flavoviridis*)				●					●	●		●	SDM?/V?	CN/ES	L	Fr/A, A
Hylophilus semibrunneus				●	●							●	R?	CN	C	Ins, A, G

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Species	J	F	M	A	M	J	J	A	S	O	N	D*	Status[1]	Habitat[2]	Distrib. elev.[3]	Guild[4]
PARULINAE																
Parula pitiayumi	●	●	●	●	●	●	●	●	●	●	●	●	R	CN/ES	L	Ins, A, G
Vermivora chrysoptera	●	●	●							●	●	●	LDM	CN	C	Ins, A, DL
Vermivora peregrina				●						●			LDM	CN	C	Fr/A, A
Dendroica castanea											●		LDM	CN	L	Ins, A, G
Dendroica cerulea										●			LDM	CN	C	Ins, A, G
Dendroica fusca	●	●	●	●	●				●	●	●	●	LDM	CN	H	Ins, A, G
Mniotilta varia	●	●	●	●					●	●	●	●	LDM	CN	H	Ins, B, S
Setophaga ruticilla										●			LDM	CN/ES	W	Ins, A, S
Wilsonia canadensis	●	●	●	●					●	●	●	●	LDM	FI	H	Ins, A, G
Oporornis philadelphia	●	●	●	●							●	?	LDM	ES	C	Ins, A, G
Myioborus miniatus	●	●	●	●	●	●	●	●	●	●	●	●	R	FI/CN	C	Ins, A, G
Geothlypis semiflava	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	L	Ins, A, G
Basileuterus tristriatus	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	H	Ins, A, G
Basileuterus culicivorus	●	●	●	●	●	●	●	●	●	●	●	●	R	CN/ES	C	Ins, A, G
Basileuterus fulvicauda	●	●	●	●	●	●	●	●	●	●	●	●	R	FI/AQ	L	Ins, T, G
THRAUPINAE																
Diglossa indigotica	●	●	●	?	●	●	?	●	●	●	●	●	R & SDM	CN	C	N
Dacnis venusta												●	SDM	CN	L	Fr/A, A
Dacnis cayana	●			●			●					●	SDM?	CN	L	Fr/A, A
Cyanerpes caeruleus				●									SDM?	CN	L	N
Cyanerpes cyaneus						●							SDM?	CN	L	N
Chlorophanes spiza	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	L	Fr/A, A
Iridophanes pulcherrima						●							SDM	CN	H	Fr/A, A
Coereba flaveola	●	●	●	●	●	●	●	●	●	●	●	●	R	CN/ES	W	N
Chrysothlypis salmoni	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	C	Fr/A, A
Chlorochrysa phoenicotis	●		●		●	●		●	●	●	●		R?/V?	FI/CN	H	Fr/A, A
Tangara cyanicollis	●	●	●	●	●	●	●	●	●	●	●	●	R	CN/ES	C	Fr/A, A
Tangara arthus	●	●	●	●	●	●	●	●	●	●	●	●	R	FI/CN	C	Fr/A, A
Tangara nigroviridis					●								SDM/V?	CN	H	Fr/A, A
Tangara palmeri	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	L	Fr/A, A
Tangara rufigula	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	C	Fr/A, A
Tangara icterocephala	●	●	●	●	●	●	●	●	●	●	●	●	R	FI/CN	C	Fr/A, A
Tangara vitriolina				●	●								V	ES	C	Fr/A, A
Tangara gyrola	●	●	●	●	●	●	●	●	●	●	●	●	R	CN/ES	C	Fr/A, A
Tangara lavinia	●	●	●	●	●						●	●	SDM	CN	L	Fr/A, A

APPENDIX
CONTINUED

Species	J	F	M	A	M	J	J	A	S	O	N	D*	Status[1]	Habitat[2]	Distrib. elev.[3]	Guild[4]
Tangara florida	●	●	●	●	●	●	●	●	●	●	●	●	R	FI/CN	C	Fr/A, A
Tangara larvata	●	●	●	●	●	●	●	●	●	●	●	●	R	CN/ES	L	Fr/A, A
Euphonia minuta					●	●	●						SDM	CN	L	Fr, A
Euphonia xanthogaster	●	●	●	●	●	●	●	●	●	●	●	●	R	FI/CN	C	Fr, A
Euphonia saturata		●	●										SDM	CN/ES	C	Fr, A
Euphonia fulvicrissa		●											V	CN?	L	Fr, A
Chlorophonia flavirostris	●	●	●	●	●	●	●	●	●	●	●	●	R & SDM	CN	C	Fr, A
Chlorospingus flavigularis	●	●	●	●	●	●	●	●	●	●	●	●	R	FI/CN	C	Fr/A, A
Chlorospingus flavovirens	●	●	●	●	●	●	●	●	●	●	●	●	R	FI/CN	C	Fr/A, A
Pipraeidea melanonota	●	?	●	●	●						●	●	SDM	CN/ES	H	Fr/A, A
Bangsia rothschildi	●	?	●	●	●	●	●	●	●	●	●	●	R	FI/CN	C	Fr/A, A
Bangsia edwardsi			●								●		DM	FI	H	Fr/A, A
Thraupis palmarum	●	●	●	●	●	●	●	●	●	●	●	●	R	CN/ES	W	Fr/A, A
Thraupis episcopus	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	W	Fr/A, A
Piranga rubra	●	●	●	●						●	●	●	LDM	CN/ES	H	Fr/A, A
Piranga olivacea			●							●			LDM	CN	?	Fr/A, A
Ramphocelus flammigerus	●										●	●	SDM	CN/ES	H	Fr/A, A
Ramphocelus icteronotus	●	●	●	●	●	●	●	●	●	●	●	●	R	CN/ES	L	Fr/A, A
Chlorothraupis stolzmanni	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	C	Fr/A, A
Mitrospingus cassinii	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	L	Fr/A, A
Heterospingus xanthopygius	●	●	●	●		●	●	●	●	●	●	●	R & SDM	CN	L	Fr/A, A
Tachyphonus rufus	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	W	Fr/A, A
ICTERIDAE																
Molothrus bonariensis	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	L	Ins, T
Icterus chrysater		●						●	●	●			SDM?	ES	H	N (Fr/A)
Amblycercus holosericeus			●	●				●					SDM?	ES	W	Ins, A
Cacicus uropygialis	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	L	Fr/A, A
Psarocolius angustifrons				●									V	CN	L	Fr/A, A
CARDINALINAE																
Saltator grossus	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	L	Fr/A, A
Saltator maximus	●	●	●	●	●	●	●	●	●	●	●	●	R	CN/ES	L	Fr, A
Saltator atripennis	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	C	Fr, A
Pheucticus ludovicianus	●	●	●	●							●	●	LDM	CN/ES	C	Fr/A, A
Cyanocompsa cyanoides	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	L	Fr/A, A

APPENDIX
CONTINUED

Species	J	F	M	A	M	J	J	A	S	O	N	D*	Status[1]	Habitat[2]	Distrib. elev.[3]	Guild[4]
EMBERIZINAE																
Oryzoborus angolensis	●	●		●				●				●	R?	ES	L	Gran
Volatinia jacarina	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	L	Gran
Tiaris olivacea	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	C	Gran
Sporophila americana	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	L	Gran
Sporophila nigricollis	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	W	Gran
Sporophila intermedia	●	●	●	●	●	●	●	●	●	●	●	●	R	ES	W	Gran
Atlapetes tricolor	●	●	●	●	●	●	●	●	●	●	●	●	R	CN	C	Fr/A, A
Buarremon brunneinucha	●	●	●	●	●	●	●	●	●	●	●	●	R	FI	H	Fr/A, A & T
Buarremon (torquatus) atricapillus	●	●		●	●			●	●		●		R	FI	C	Fr/A, A & T
Arremon aurantirostris			●					●	●	●		●	R	FI	L	Fr/A, T
Zonotrichia capensis	●		●	●			●				●		R	ES	H	Gran, T
FRINGILLIDAE																
Carduelis xanthogastera	●				●	●			●		●	●	SDM/R?		H	Gran, A

* Month abbrev. J (Jan.) through D (Dec.); ? indicates status uncertain.

† Recorded only in June of 1975.

[1] Key to status: LDM = Long-distance migrants from north temperate zone. SDM = short-distant migrant from within tropical latitudes. All short-distance migrants are elevational migrants except *Elaenia flavogaster* and *Tangara vitriolina*, which are classified as local migrants. R = resident throughout year. V = vagrant, including juveniles, immatures, and adults (unmated or mated birds). Some represent normal non-breeding dispersal in search of suitable habitat; others are probably expansions of edge and open terrain birds into newly deforested zones.

[2] Key to habitats: FI = interior of mature forest, mainly shaded lower and middle levels. C*n* = canopy and old second growth, principally edge species. ES = early succession, young second growth, open pasture with scattered trees. A = aerial.

[3] Key to elevational distribution: L = species distributed largely below 1,000 m in western Colombian Andes. H = species distributed largely above 1,000 m in western Colombian Andes. C = species distribution centered at about the 1,000 m contour. W = widespread from lowlands through highlands.

[4] Key to guilds: *n* = Nectar (hummingbirds). Fr, T = Fruit, Terrestrial. Fr, A = Fruit, Arboreal. Fr/A, T = Fruit/Arthropods, Terrestrial. Fr/A, A = Fruit/Arthropods, Arboreal. Fr/Gra*n* = Fruit/Granivore (applied to parrots and parakeets). Gran, T = Granivore, Terrestrial. Gran, A = Granivore, Arboreal. Ins, A, G = Insectivore, Arboreal, Gleaning. Ins, A, Sal = Insectivore, Arboreal, Sallying (sally here includes any wing-powered maneuver). Ins, AF = Insectivore, Ant-Following. Ins, DL = Insectivore, Dead Leaf. Ins, Aer = Insectivore, Aerial (swifts, swallows). Ins, Aer/Cnpy = Insectivore, Aerial/Canopy (2 species of kites). Ins, B, S = Insectivore, Bark, Surface (mostly woodcreepers). Ins, B, I = Insectivore, Bark, Interior (woodcreepers, some furnariids). Ins, T = Insectivore, Terrestrial. R, *n* = Raptorial, Nocturnal (owls). R, D = Raptorial, Diurnal. Car = Carrion/scavenging.

[5] See Krabbe and Schulenberg (1997).