

AVIAN DIVERSITY AT EL IMPOSIBLE NATIONAL PARK AND SAN MARCELINO WILDLIFE REFUGE, EL SALVADOR

Diversidad de avifauna en el Parque Nacional El Imposible y el
Refugio de Vida Silvestre Complejo San Marcelino, El Salvador

Oliver Komar

Ohio Wesleyan University, Delaware, Ohio 43015, USA.

Nestor Herrera

Servicio de Parques Nacionales y Vida Silvestre. Soyapango, El Salvador.

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Avian diversity at El Imposible National Park and Complejo
San Marcelino Wildlife Refuge, El Salvador

*Diversidad de avifauna en el Parque Nacional El Imposible y el Refugio de Vida
Silvestre Complejo San Marcelino,
El Salvador*

OLIVER KOMAR

Ohio Wesleyan University, Delaware OH 43015

NESTOR HERRERA

Servicio de Parques Nacionales y Vida Silvestre, Soyapango, El Salvador

Wildlife Conservation Society
Bronx, NY
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STUDY OF AVIAN BIODIVERSITY AND HABITAT USE IN EL SALVADOR

PREFACE

The five articles contained in this report are the result of three months' field research on bird populations at selected conservation areas. While many species of Salvadoran birds have been called "endangered," there are virtually no data available on actual populations or relative abundance of any bird species in El Salvador, nor much of northern Central America. The 1994 field work reported here is the beginning of what will be a long-term effort to determine which species are truly rare, and which natural areas provide important refuges for these species. Such an effort, when complete, also will reflect long-term or medium-term changes in bird populations.

Biogeographically, the lowland Pacific slope of northern Central America and southern Mexico has been considered a separate region from the Central American highlands and Atlantic/Caribbean slope lowland regions (for example, see Bibby et al., *Putting Biodiversity on the Map*, ICBP, 1992). El Salvador, except for a tiny section of cordillera along its northern border and several isolated volcanic peaks, falls entirely within the lowland Pacific slope region. While El Salvador's natural areas are small and disturbed, they must not be abandoned by the international wildlife conservation community. No other nation in the region has as much reason to care about the welfare of its Pacific slope wildlife as does El Salvador, since it has neither a Caribbean slope nor any largely uninhabited areas where wildlife abounds. The country is currently struggling to protect approximately 64 natural areas. El Salvador has abundant young people who could be trained in conservation and wildlife management.

Our study collected the first standardized data on relative abundances of forest birds in El Salvador. We conducted an inventory of the bird community in the eastern third of El Imposible National Park (Chapter 1), and collected equivalent data at the Las Lajas forest on the inner slope of the Coatepeque Caldera (Chapter 2). Standardized data are useful because they permit comparisons that demonstrate the relative importance of different natural areas (Chapter 3). Our census methods relied heavily on the detection of singing birds, and we present observations of variation in song behavior over time for many species of forest birds (Chapter 4). Inventories of tropical forest birds are still rarely done, and so we provide critique of the methods and suggestions for future workers in Chapters 1, 3, and 4. Finally, we present a review of the forest habitat and birds of a third site, the San Diego y La Barra natural area on the shores of Lake

Güija (Chapter 5), which we visited while searching for appropriate study sites.

One of the most useful applications of the data we present is the evaluation of conservation status for Salvadoran bird species. Given the paucity of forest sites in El Salvador, species rare at El Imposible and Las Lajas are almost certainly threatened with extinction at the national level. A review of protected or unprotected forest sites on the entire Pacific slope of northern Central America will undoubtedly place these species in danger at the regional level.

The current study has just touched upon the critical issues of habitat use and abundance of birds. No aspect of the study is complete, and more data could enhance results significantly. Especially needed are data on song behavior of forest birds, which can be used to convert standardized census data into estimates of density, or at least to provide more accurate estimates of relative abundance. We also need more complete data on breeding status, as some of the birds we are censusing may not actually be breeding residents of the forest habitats. For example, the Barred Woodcreeper (*Dendrocolaptes certhia*) is rare in the El Imposible forest, which may signify that the forest is a valuable refugia for the species. But if it is not breeding there, the forest may be a secondary habitat that attracts wanderers from source populations elsewhere. Therefore documentation of breeding is necessary to understand the importance of the habitat.

This study will continue in 1995 with similar field work at new sites on the San Salvador and Santa Ana volcano complexes. We also wish to return to the El Imposible and Las Lajas study areas in a future year to gather additional breeding and song behavior data. Of course there are other important forest sites in El Salvador that should be surveyed, such as Bosque San Diego y La Barra, Bosque Montecristo, Bosque Nancuchiname, Bosque Santa Clara, extensive pine forests in the foothills of the northern cordillera, cloud forest patches on isolated volcanoes, and also coffee plantations that provide breeding habitat for some resident birds and wintering habitat for northern migratory passerine birds.

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OLIVER KOMAR

Department of Zoology, Ohio Wesleyan University
95 Elizabeth St. #411
Delaware OH 43015 USA
Tel: 614-369-0175, Fax: 614-363-6749
e-mail: ookomar@cc.owu.edu

Address in El Salvador:

Residencial Metrópolis Norte, Polígono A
Senda 1 Pte., Casa N° 89
Zacamil, San Salvador, El Salvador
Tel: 503-284-1878

NÉSTOR OMAR HERRERA SERRANO

Licenciado en Biología
Servicio de Parques Nacionales y Vida Silvestre
Colonia Atlacatl
Edificio M N° 33
San Salvador, El Salvador
Tel: 503-276-4904

SCHEDULE OF FIELD WORK 1993-1994

4,11 Dec Exploration of El Picacho, Volcán de San Salvador
6-9 Dec Exploration of Parque Nacional El Imposible
13-16 Dec Exploration of Bosque San Diego y La Barra
27-30 Dec Exploration of Bosque Las Lajas
2-4 Jan Exploration of Parque Nacional W. T. Deininger
22-27 May Point Counts at Bosque Las Lajas
6-9 Jun Point Counts at Bosque Las Lajas
14-24 Jun Point Counts at Parque Nacional El Imposible
29 Jun-10 Jul Bird Monitoring Training at Bosque Las Lajas
11-24 Aug Mist-netting and Point Counts at P.N. El Imposible
30 Aug-9 Sep Mist-netting and Point Counts at Bosque Las Lajas

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Servicio de Parques Nacionales y Vida Silvestre

Servicio de Parques Nacionales y Vida Silvestre
Ministerio de Agricultura y Ganadería
Dirección de Recursos Naturales Renovables
Apartado Postal 2265
Cantón El Matasano
Soyapango, El Salvador
Tel: 503-277-0622; Fax: 503-277-0490

Parque Nacional El Imposible.

Fundación SalvaNatura
Colonia Escalón
77 Avenida Norte, N° 422
San Salvador, El Salvador
Tel: 503-298-0348; Fax: 503-223-3620

Complejo San Marcelino wildlife refuge (Bosque Las Lajas).

Asociación Salvadoreña de Conservación de Medio Ambiente
1ª Calle Pte., N° 2904
Condominio Monte María
Edificio D, Cuarta Planta, Local N° 5
San Salvador, El Salvador
Tel: 503-298-4035; Fax: 503-298-4035

CHAPTER 1: AVIAN INVENTORY OF EL IMPOSIBLE NATIONAL PARK, SAN BENITO AND RIO GUAYAPA SECTORS

Oliver Komar and Néstor Herrera

INTRODUCTION

In 1975, El Imposible forest was "discovered" as a potential wildlife refuge by the recently-created El Salvador Service of Wildlife and National Parks. Although once heavily disturbed by coffee farming, subsistence agriculture, selective logging, and hunting, the area was abandoned for political reasons in the late 1960s and early 1970s. The 5000-ha park encompasses three deep river valleys that have cut huge ravines in the western end and south-facing slope of the low cordillera that runs westward from the flanks of Cerro Grande de Apaneca, an 1800 m volcano in the Santa Ana volcano complex. These large ravines contain gallery forest, including along the Río Guayapa. The steep walls of the huge ravines are mostly impassable and often have eroded into cliffs, some with spectacular proportions. The steeper slopes support only shrubby vegetation. Compared with the Las Lajas forest (see Chapter 2), El Imposible's forests appear wetter in the rainy season and drier in the dry season. The humidity may be responsible for the surprising discovery of tree ferns along the Río Guayapa at only 420 m elevation (they were not found anywhere else during this study). Especially near San Benito, the soil is red clay, unlike the rich soils of Las Lajas.

The park's biodiversity has been scantily studied, except for investigations of cracids (Sermeño 1986) and raptors (West 1988). Alfonso Sermeño, a technician in the park service, spent three years living in the eastern portion of the park in the late 1970s and early 1980s. He prepared his undergraduate thesis on the feeding habits and reproduction of the Great Currawong (*Crax rubra*) at El Imposible. Sermeño returned in 1989-1990 to prepare his master's thesis on habitat use and population density of *Crax rubra*. In 1979-1980, a North American, Jane West, spent nearly one year at the western portion of the park studying the nesting habits of raptors, in preparation for her master's thesis (1988). The El Salvador mission of the U.S. Agency of International Development (A.I.D.) sponsored studies of the park in the mid 1980s and again in 1993. Their reports provide general information on the climate, hydrology, and socio-economics of the park, as well as preliminary species lists for vertebrates and trees (Serrano 1993).

The purpose of the present study is to provide the first data on the relative abundances of birds and their use of habitat in the park. In so doing, we aim to identify bird species which may be of special conservation concern. We also examined variation in the park's forest communities, and provide preliminary data on relative abundance of tree species.

STUDY AREA

We conducted bird and tree censuses within 2 km of the eastern park entrance at Hacienda San Benito (a former coffee plantation) and in the adjacent Río Guayapa valley from 200 m south of the intersection of the Venado and Guayapa rivers, north to the head of the Río Escaleras tributary (a distance of 3.5 km). In all, we studied an area of about 475 ha (Figure 1.1). The elevational range of the study area was 420 - 1050 m above sea level. The adjacent forest runs continuously up to 1380 m above sea level. In June 1994, we spent 10 days in the study area: three days in the upland forest near the old San Benito coffee hacienda, and seven days in the adjacent Río Guayapa valley, including the deep ravine cut by the Río Escaleras tributary. We were accompanied each day by one or the other of the park guards Francisco Chinchilla and Heriberto Rivera. We returned in August 1994 with mist-netting assistants Alicia Díaz and Fabricio Pérez, and spent six days at San Benito, and eight at Río Guayapa. The same park guards continued to assist us, and were especially invaluable during our vegetation sampling, as they identified over 1000 trees. Komar also explored the study area during 6-9 December 1993, accompanied by Wilfredo Rodríguez, Lorena Rosales, and Emilio Sánchez.

The largest forest habitat in the study area, especially near San Benito, is a regenerated forest situated on an abandoned coffee plantation, with most trees about 25 years old, and some older trees that provided shade for the coffee. Canopy height is 15 to 20 m, except where an old milpa (corn or bean field) has been allowed to grow into forest, or where fires have restricted growth, especially on the steeper hillsides. The canopy height in these younger forests is 8 to 12 m. In the Río Guayapa valley, we surveyed gallery forest. Canopy height averages around 25 m and the tallest trees reach 35 or 40 m. There may be no virgin forest in the valley, but much of the gallery forest is mature, and resembles a primary forest.

However, patches of younger secondary forest were easily recognized where pastures, milpas, and coffee groves were abandoned as recently as 25 years earlier, according to park personnel.

METHODS

Relative abundance of birds.--We determined the frequency of detection of birds at a series of independent points, to serve as a preliminary estimation of relative abundance. We censused birds at 32 points during 16-22 June 1994 in the Río Guayapa gallery forests, and 16 points on 23 and 24 June in the San Benito upland forest (48 points in total). Each census was a ten minute count of all birds seen and heard from a point within forest of varying stages of advanced (>25 yr) second growth. Points were selected at 200 m intervals, usually along existing trails. If the trail curved or doubled back between points, we added either 50 or 100 m to the measurement, being sure to keep a straight line distance of at least 200 m between study points. We counted birds at all distances, but deleted the most distant birds from the census if they were subsequently or previously recorded at a neighboring point. We omitted uncertain species identifications.

We conducted the censuses between 05:45 and 08:30 h, CST, on days with good weather (no or low wind, no precipitation). Most days had clear skies. Temperature was constant, in the 22-25°C range. Two people participated in the censuses but only one (Komar) counted and identified birds. The other (Herrera) collected data on the forest structure and topography at each point (data not presented in this report). Each observer recorded his own data. We tape recorded most censuses to provide corroboration of the song identifications.

We define our use of relative abundance terms as follows. "Abundant" species were present at more than 50% of the census points. Species found at 20% to 49% of the points we classify as "common or locally abundant." The species found at 10% to 19% of the points we call "common." We consider "uncommon or locally common" those species recorded at 5 to 9% of the points. Species not recorded at sampling points but nonetheless present we classify as either rare, uncommon, or difficult to detect.

Forest structure and tree abundance.--We selected a representative series of plots of 0.1 ha each in which we identified and measured every tree with a diameter at breast height (DBH) of 10 cm or more. The plots were located along 100-m segments of trails, and included 5 m on each side of the trail (1000 m²). We marked the beginning and endpoints of each plot with flags, and recorded their positions in our notes. We located plots completely within one of the three major forest types that we recognized, and arbitrarily selected

the start points along trails. We conducted more tree censuses in the principal habitats; thus at Río Guayapa, we placed six plots in mature gallery forest and four in the less-extensive abandoned pastures and milpas.

Trees were identified with local names in the field, and their heights estimated, by park personnel Francisco Chinchilla Jr. and Heriberto Rivera Davila. We later cross-referenced local names with available information to determine the appropriate scientific names. Our sources were the El Imposible collection notes of the Jardín Botánico La Laguna (unpublished, available from the JBLL office in Antigua Cuscatlán, San Salvador, El Salvador); and Reyna de Aguilar (in Serrano 1993). The local tree names vary in different parts of El Salvador, and their scientific names are not always possible to determine without collecting samples of the plant material. However, the Jardín Botánico La Laguna has been collecting such samples on a large scale in El Imposible National Park, and identifying the trees with common names used by the same park personnel who assisted us. We caution that we have not made an independent effort to confirm the identifications of the trees. We present tree identifications with the goal of demonstrating the principal differences between major forest types. We do not present an inventory of the trees of our study area.

Bird capture with mist nets.-- The mist nets used were standard 12 m x 2.6 m, with 36 mm black nylon mesh, provided by the Association of Field Ornithologists. For net poles, we used 3-m green bamboo shoots. We always used nine double-nets, spaced approximately 50 m apart. Net sites were labeled permanently with numbered metal tags on trees near the central post, and maps of the net trails were prepared in our field notes. We operated nets for 6.5 h from 06:00 to 12:30 each day, on seven days. Nets were opened 14-15 August in the San Benito area ("Mirador del Mulo" station), and five days along the Río Guayapa in both gallery forest and 25-year second growth (18-19 August at the "Piedra Sellada" station, 20-22 August at the "Cashal" station). We began operating mist-netting stations for just two days because three-day sessions at Las Lajas in July had proven unproductive (low third-day capture rates). However, the third day at the Cashal station was nearly as productive as the first two days. Most birds captured in August were banded with a numbered yellow plastic ring on the tarsus. Hummingbirds were not banded, but were marked by clipping a tail feather. Birds were marked in order to identify recaptured individuals.

Statistical methods.-- We used chi-square to test differences in detection frequency. We considered the 5% level of probability (chi-square >3.840) to be significant, but included non-significant differences in

the tables if $P < .25$ (chi-square > 1.320) and non-standardized observations corroborated the difference. The detection frequency percentages in the tables were determined from the raw data by dividing the number of points where each species was present by the total number of points at the study site, and then multiplying by 100. The average number of individuals per point has not been presented, given that we can not distinguish vocalizing family groups from multiple territorial males (as in the Blue-crowned Motmot and Elegant Trogon, which were usually counted several times at each point). We also thereby avoid overcounting some loud singers (tinamous for example calling at once from distant territories) relative to soft singers which are likely to be heard only from the nearest territory.

RESULTS

RELATIVE ABUNDANCE OF BIRDS

Table 1.1 provides a list of 82 species recorded during the early rainy season at San Benito and Río Guayapa (separate and combined). Comments on how to interpret the data in this and other tables are in the Discussion. The complete list of species, in taxonomic order, and with additional species observed in December 1993 or August 1994, may be found in the appendix. We recorded eight abundant species, 10 common or locally abundant species, 11 common species, and 19 uncommon or locally common species. The remaining 33 species are either uncommon, rare, or difficult to detect; only 20 of these were recorded on censuses. One species, the Ruddy Woodcreeper (*Dendrocincla homochroa*), seemed to be much more common than expected when we set up mist nets and caught five in August. We never heard a Ruddy Woodcreeper sing, nor saw one while walking through the forest in June, and therefore it is not included in Table 1.1. One of the birds captured in August had a brood patch indicating local breeding.

Differences between gallery and upland forest in El Imposible.--The 28 species showing marked changes in abundance from one forest type to the other are presented in Table 1.2. Fifteen species were more abundant in upland forest while 13 species preferred the gallery forest. A fourteenth, Ruddy Woodcreeper, showed a noticeable preference for the gallery forest in mist-netting data. Two other species, the Barred Woodcreeper and Stub-tailed Spadebill, were rarely encountered during standardized data collection, but during casual observations were only found in the gallery forests in the deeper ravines.

FOREST STRUCTURE AND TREE ABUNDANCE

We identified three principal forest types in the study area. These were secondary upland forest (principally around the San Benito hacienda), mature gallery forest, and young (25 year old) gallery forest. In the mature gallery forest, nearly 13% of all trees are higher than 20 m, and 11% have the DBH greater than 80 cm, whereas in the young gallery forest, no trees surpass 20 m, and only 3.6% surpass 15 m; the DBH in the young forest surpasses 80 cm in only 1.4% of the trees (Table 1.3). The young forest occurs as patches smaller than 25 ha within the mature forest, and we suspect that much of the avifauna pass indiscriminately among the habitats, due to the patchiness. However, our census data were insufficient to discern differences in the use of these habitats by avifauna. The secondary upland forest was a shade coffee plantation 25 years ago. Like the secondary gallery forest, more than 70% of the trees are less than 10 m tall. However, perhaps because the former coffee plantation maintained a canopy of shade trees, we found three times as many trees larger than 15 m than in the young gallery forest. The diversity of trees at the upland site (77 species in the sampling) was almost as high as the mature gallery forest (81 species) and much higher than the secondary gallery forest (40 species). Smaller sampling area at the latter forest type may be responsible for the apparently lower diversity (Table 1.3).

The density and identifications of trees in each of the three forest types is presented in Table 1.4. At the secondary upland forest, three species each form more than 5% of the tree population: *Cecropia obtusifolia* (5.4%), *Piptadenia constricta* (5.4%), and *Muntingia calabura* (5.2%). At the secondary gallery forest, four species combined formed 45.6% of all trees: *Guazuma ulmifolia* (22.3%), *Psidium guajava* (11.2%), *Aphelandra* sp. (6.3%), and *Enterolobium cyclocarpum* (5.8%). At the mature gallery forest, the four dominant species are *Brosimum alicastrum* (11.8%), *Terminalia oblonga* (6.5%), *Faramea occidentalis* (6.5%), and *Licania retifolia* (6.0%). Since there is a large variation in size and age classes within these species, an analysis of basal area may provide a better measure of species dominance.

BIRD CAPTURE WITH MIST NETS

We captured 178 birds of 28 species (Table 1.5). Two of these species were not detected otherwise, the Ruddy Woodcreeper (five captured) and the Red-legged Honeycreeper (probably a migrant). Capture data confirmed local breeding status for 19 species. One second-year male Long-tailed Manakin was captured at Mirador del Mulo and recaptured eight days later at Piedra Sellada, a distance of 800 m and a vertical drop of 200 m. Six species comprised 69% of all captures. Listed in order of capture frequency, they were: Long-tailed Manakin (40), Fan-tailed Warbler

(26), Rufous-capped Warbler (20), Blue Bunting (14), Yellow-green Vireo (12), and Rufous-and-white Wren (11).

ORNITHOLOGICAL CONTRIBUTIONS

The following species accounts include notes on the occurrence and behavior of 20 species at El Imposible National Park, seven of which have been reported only rarely in El Salvador. These are the Gray-headed Kite (*Leptodon cayanensis*), Rufous-necked Wood-Rail (*Aramides axillaris*), Barred Woodcreeper, Stub-tailed Spadebill, Black Phoebe (*Sayornis nigricans*), Louisiana Waterthrush (*Seiurus motacilla*), and Bar-winged Oriole (*Icterus maculialatus*).

Species accounts

Gray-headed Kite *Leptodon cayanensis*. On at least two occasions in June 94 and on 23 August 94, we heard a hawk call regularly in a ravine about 700 m up the valley from the Piedra Sellada. Heriberto Rivera Davila had seen the bird earlier in the year, and from his description we strongly suspect it to be the Grey-headed Kite. This species has previously been reported in the park by West (1988).

White Hawk *Leucopternis albicollis*. A pair of these hawks could usually be found in the uppermost part of the Izcanal River valley (at the Recibidero Cerro León), on the southern slopes of Cerro León. We saw them on 23 June 94 and again on 12 August 94, when we heard one calling (a pig-like squealing) during flight.

Rufous-necked Wood-Rail *Aramides axillaris*. We first heard this species, locally known as *tamborcito* ("little drum") because of its calls, on 15 August 94, near Mirador El Mulo. On 16 August 94 Komar heard two more, one about 400 m downhill from Mirador El Mulo. On 19 August 94, we heard one near the "Potrero Redondo," at an elevation of about 500 m. A local resident described finding the nest a year earlier in a "*Santa Maria*" bush (Piperaceae), near the Corral de Pajuiles (an enclosure where several captive Great Curasows are kept). That nest produced eight young.

Pacific Parakeet *Aratinga strenua*. Park guards said that this species does not nest in the park. Nevertheless, in August 94 we encountered several flocks near Cerro León, possibly attracted to the duraznillo (*Aphananthe monoica*), which we observed the birds eating. Park guards had told us that both these parakeets and toucans eat the duraznillo. In a group of six *strenua* that Komar observed at close range, at least one had two small orange (not red) spots, one on the throat and one on the neck.

Berylline Hummingbird *Amazilia beryllina*. This species is probably abundant throughout the forest, given that one sees it often, yet it rarely is recorded on point counts given its reluctance to sing. The flight

call, a descending series of rapid twittering notes, may be distinctive. If so, most unidentified hummingbirds on the point counts should be reclassified as this species. We never heard the song until our last day in the park, on 24 August 94. The singing bird was perched on a bare twig in an opening in the forest near Mirador El Mulo, about 8 m above the ground. The song was distinctive, and we had never heard it before. It was a long, dry trill, reminiscent of the Chipping Sparrow (*Spizella passerina*) but weaker. Like most other singing hummingbirds, it remained at its singing perch for several hours, constantly repeating its song.

Elegant Trogon *Trogon elegans*. Park guards told us that both male and female trogons sing, perhaps explaining the high frequency with which one detects this species on point counts in June. On 18 June 94 we were very close to a singing trogon, and when we located the bird it was a female. However, we never saw the bird sing. Nonetheless, H. W. Brandt observed a female singing in Arizona (quoted in Bent 1940).

Emerald Toucanet *Aulacorhynchus prasinus*. Herrera heard this species on 12 August 94 near Cerro León, and saw one eating flowers of *Cecropia* on the north slope of Cerro León on 23 August 94.

Collared Araçari *Pteroglossus torquatus*. Two were calling near Cerro León (Point 48) on 12 August 94. The altitude of approximately 1000 m may be unusually high for this species. van Rossem apparently found the species always below 850 m (Dickey and van Rossem 1938).

Barred Woodcreeper *Dendrocolaptes certhia*. On various occasions in the gallery forests of the Río Guayapa and Río Escaleras, we heard the distinctive rising whistles of this species but were not convinced of their identification. We occasionally glimpsed the birds by imitating their calls, but the responding birds stayed too high up (>15 m) to be seen well. We heard the calls in three or four of the larger ravines, in both June and August 94. On 17 August 94 we observed three together, but again the birds were too high in the trees to be identified. The Strong-billed Woodcreeper (*Xiphocolaptes promeropirhynchus*) has been reported from El Imposible (Thurber et al. 1987) but the song we heard always sounded like the Barred Woodcreeper, a species never before reported from western El Salvador. On our last day of mistnetting, 22 August 94, we captured a Barred Woodcreeper, confirming the species' presence.

Stub-tailed Spadebill *Platyrinchus cancrominus*. This species is more common than the census data indicate, because it does not sing frequently, and its song is weak and does not carry a long distance (perhaps only 50 m). While only one was recorded on point count censuses, we saw or heard at least half a dozen individuals. During mist-netting in August 94, family groups sometimes foraged alongside the nets while only one flew into them.

Least Flycatcher *Empidonax minimus*. Two birds that probably were this species were part of a mixed foraging flock on 12 August 94, thus being among the earliest arriving migrants noted. Another, seen in the same area, gave the characteristic (?) "wip" call note on 24 August 94.

Yellow-bellied Flycatcher *Empidonax flaviventris*. Komar heard three giving the "che-bunk" call along the ridge southeast of Cerro León (La Lechera trail) on 12 August 94, marking the return of this northern migrant.

Black Phoebe *Sayornis nigricans*. Two birds were found along the Río Guayapa near the Piedra Sellada, on 18 and 19 August 94. Park guards described finding this species' nest, which they said was a half cup glued to an overhanging rock.

Long-tailed Manakin *Chiroxiphia linearis*. We observed a lek near Mirador El Mulo, San Benito area, on 12 August 94, with at least four adult males and three second or third year males. Three adults perched very closely together on a small branch less than 1 m from the ground. They were dancing, one at a time jumping up and making a strange sound like winding up a toy. Komar also observed two males perched next to each other, simultaneously singing their distinctive "toledo" song, giving the song a ringing, stereo quality. The younger males observed had green bodies but their heads were blackish with the brilliant red crown. These birds also had the long tail plumes and sang the "toledo" song. On 14 August 94 we set up mist nets within 15 m of the lek, and caught three manakins in the nearest net. On 15 August, with the nets still set up, the lek was silent. On 16 August, the nets gone, at least three males had returned to the lek.

Cliff Swallow *Hirundo pyrrhonota*. Two were flying over Mirador el Mulo on 15 August 94.

Rufous-and-white Wren *Thryothorus rufalbus*. This abundant species is usually associated with the lower strata of the forest, skulking secretly in bushes and tangles of the understory. However, on 18 June 94, Komar observed one singing from the lower branches of a tree, 15 m above the ground.

Yellow-green Vireo *Vireo flavoviridis*. This abundant species was one of the most visible in several feeding flocks we observed in August. On 12 August 94, near San Benito, a flock of 15 was eating fruits of *Trichospermum* sp. ("capulín blanco"), and one bird fed another. On 16 August 94, they were eating fruits of *Ardisia paschalis* ("cerezo") and *Trema micrantha* ("capulín macho"). The species is abundant throughout our study area, but we suspect that it is mostly associated with the smaller trees in second growth forest. We found several nests (identified as of this species, locally called *camaronero*, by the park guards) in second growth dominated by *Psidium guajava* ("guayabo") and *Caecaria commersoniana* ("camarón rojo") trees only about 5 m tall. The nests were open cups, sometimes hanging right above the

trail 2.5 m from the ground (in the Potrero de la Sellada).

Louisiana Waterthrush *Seiurus motacilla*. This species has rarely been reported in El Salvador. The only other recent record we know of is one Komar photographed at Parque Deininger on 2 January 94. We heard call notes and saw this species three or four times, both along the Quebradona tributary and along the Río Guayapa, on 19 and 20 August 94.

Red-legged Honeycreeper *Cyanerpes cyaneus*. This species was seen several times in December 93, including a flock of 30 in one tree (at Las Escaleras). We saw it again on 12 August 94, when two birds had joined a mixed feeding flock near San Benito. We also captured an immature on 15 August 94 near Mirador El Mulo. This species may be a migrant visitor, potentially migrating from Cuba or the Yucatán peninsula.

Bar-winged Oriole *Icterus maculialatus*. This northern Central American endemic was encountered just once at El Imposible, on 12 August 94 when Komar heard its song at Point 46 on the La Lechera trail (southern flank of Cerro León).

DISCUSSION

Standardized census data (Table 1.1) are valuable because they permit statistical comparisons of populations from one site to another (Table 1.2). Not all the observed differences in populations are significant, which is to say that the method of collecting data allows for some variation in results due to chance. Using the frequency of detection of birds at sample points as an indicator of relative abundance assumes that we can detect all birds present at a sample point in just 10 minutes. This assumption, which is not always true, is discussed in detail in Chapter 4. The international scientific community generally recognizes that observed differences are significant (true) if the probability of the difference being the result of randomness is less than 5%. In Table 1.2, we tested the detection frequency of birds at Río Guayapa and San Benito for statistically significant differences, and found that 12 of 28 differences were significant (the chance that the differences were due to random variation was less than 5%). With larger sample sizes, the differences observed in the other 16 species may prove to be significant.

Conservation priorities.--El Imposible is famous in El Salvador for providing the last remaining habitat for many birds and other wildlife and plants. It has not been reported, however, which species find their last Salvadoran homes at the park. We encountered 10 species not known to occur recently in any other El Salvador location. These are: White Hawk (*Leucopternis albicollis*), Crested Guan (*Penelope*

purpurascens), Great Curassow (*Crax rubra*), Ruddy Quail-Dove (*Geotrygon montana*), Olivaceous Woodcreeper (*Sittasomus griseicapillus*), Ruddy Woodcreeper (*Dendrocincla homochroa*), Barred Woodcreeper (*Dendrocolaptes certhia*), Ochre-bellied Flycatcher (*Mionectes oleagineus*), Stub-tailed Spadebill (*Platyrinchus cancrinus*), and Northern Bentbill (*Oncostoma cinereigulare*). Two other species collected from the eastern section of El Imposible National Park in the 1970s, and not recorded anywhere else in El Salvador according to Thurber et al. (1987), are the Tody Motmot (*Hylomanes momotula*) and Green Shrike-Vireo (*Vireolanius pulchellus*). West (1988) also reported nesting of the Ornate Hawk-Eagle (*Spizaetus ornatus*). Therefore, 13 species of birds seem to be restricted at the national level to El Imposible National Park.

While all of the other species at El Imposible have been recorded elsewhere in El Salvador in recent years, some species maintain extraordinarily important populations at El Imposible. In the absence of data from other locations, we must assume that the El Imposible populations for certain species may be the only viable populations in El Salvador. There are at least 10 species in this category, which have sizeable populations at El Imposible. We discuss their statuses outside the park briefly in this paragraph. The King Vulture (*Sarcoramphus papa*) occurs occasionally at Montecristo National Park on the Honduras and Guatemala borders (Karla Pérez obtained a clear photograph in 1994). The Common Black-Hawk (*Buteogallus anthracinus*) may still occur widely but its status outside the park is uncertain; Komar has seen it at San Diego y La Barra, and in the Río Lempa valley. The Black Hawk-Eagle (*Spizaetus tyrannus*) was discovered outside the park for the first time in 1995 at Volcán de Santa Ana (O. Komar and J. P. Domínguez, personal communication, documented with photographs and audio recordings). The Spectacled Owl (*Pulsatrix perspicillata*) may still persist at Bosque Santa Clara, where Komar photographed one in January 1993. The Pale-billed Woodpecker (*Campephilus guatemalensis*) apparently occurs near the outlet of the Río Guayapa on the coastal plain, as Komar heard the distinctive double rap of this species in mangroves at Colegio de las Aves, Barra de Santiago wildlife refuge, in September 1994. This woodpecker was also seen regularly at Parque Deininger until 1979 (Thurber et al. 1987) and may persist there. Komar et al. (in press) recorded the Streak-headed Woodcreeper (*Lepidocolaptes souleyetii*) in mangroves at Bahía de La Unión on the opposite frontier of El Salvador; Komar and Rodríguez also reported one at Bosque San Diego (see Chapter 5). The Banded Wren (*Thryothorus pleurostictus*) has recently only been recorded at Bosque San Diego (Chapter 5), although future field work may rediscover the species in eastern El Salvador where van Rossem

found it common in the 1920s (Dickey and van Rossem 1938). The Bright-rumped Attila (*Attila spadiceus*) appears to have a distribution like that of the Pale-billed Woodpecker: Herrera has heard it in the mangroves of Barra de Santiago (there are also records from the 1970s at Volcán de San Salvador and Walter T. Deininger National Park, according to Thurber et al., 1987). The Black Phoebe (*Sayornis nigricans*) has been sparsely reported outside of El Imposible: Komar photographed one at Walter T. Deininger National Park in January 1994. J. P. Domínguez and F. A. Pérez (personal communication) have separately reported the species from the Department of Santa Ana. The tenth species is the Golden-crowned Warbler (*Basileuterus culicivorus*), which has been reported recently only from El Imposible and the forests on the San Salvador Volcano (Komar, personal observation and audio recordings).

Five other species at El Imposible are worth mentioning because they were not present at Las Lajas (Chapter 2). All five have small populations at El Imposible, and probably have larger populations elsewhere in El Salvador. These species are White-collared Swift (*Streptoprocne zonaris*), Green Kingfisher (*Chloroceryle americana*), Emerald Toucanet (*Aulacorhynchus prasinus*), Northern Beardless-Tyrannulet (*Camptostoma imberbe*), and Louisiana Waterthrush (*Seiurus motacilla*). The swift and kingfisher occur widely in the lowlands. The Emerald Toucanet occurs widely above 1000 m. The beardless-tyrannulet is discussed in Chapter 5. The waterthrush is a migratory, non-breeding visitor, and is discussed in the species accounts above.

Mist-netting.--We planned to sample bird populations with mist nets because we expected that a number of species could not be sampled well with point counts. This assumption appeared to be false, with a few minor exceptions. However, it may still hold true if point counts and mist-netting are conducted during the dry season (October to April). Most species captured in mist nets were well represented on the point counts, and therefore the mist netting provided little new information on relative abundance. Capture rates were also lower than predicted, reducing the productivity of mist-netting. However, by mist-netting we learned much about molt stages, local breeding, and demographics for some species. We made extensive measurements, including extent of molt, for each bird handled, all of which has been entered into a computerized database. Such baseline data are scarce and may be useful for future life history and/or morphological studies.

The point count method.--Perhaps the best method for monitoring bird populations in forest habitats is the point count census of singing birds, since most species in the avian community can be detected quickly and

easily. By comparing the frequency of detection at various points among years, one can determine if the population is changing. At the same time, the data provide relative abundance information. The present study encompasses only one breeding season, but we used the point-count method to 1) quantify the avian communities at three forest habitats, and 2) detect differences in forest ecosystems by comparing the frequency of detection for birds. A third potential use of our results is as baseline data for a long-term bird-population monitoring program.

There are pitfalls with each of these three research goals, yet all are worthwhile. If one is to compare relative abundance from one year to the next, one must repeat the method of the previous year exactly. The time of day, weather, and date must be the same. A change in the observer can cause a bias since one observer hears differently than another. Even with all variables kept constant, one must census many points to obtain sufficient data, especially for those species that do not sing often.

The problems with point count data for comparing sites or habitats, and for describing avian communities, are more important to the current study. First, we know too little about the singing behavior of the birds we are counting. Since we cannot see most birds by standing still in a dense tropical forest, we rely on counting singing birds, but species may sing more frequently in one part of the year. Thus, unless both sites in a comparison are censused during the period of peak singing frequency, the data will be biased by the singing behavior of the species. Differences in the singing frequency *among species* also cause bias in the point count data. Some species sing so often that any territory within earshot of the censuser will be noted, while other species sing so rarely that most territories or individuals will not be noted. The Yellow-green Vireo (*Vireo flavoviridis*) sings non-stop, while the Squirrel Cuckoo (*Piaya cayana*) may sing once every 15 or 30 minutes, and the Rufous-necked Wood-Rail (*Aramides axillaris*) may sing only two or three times a day. Similarly, woodpeckers (Picidae) and woodcreepers (Dendrocolaptidae) sing relatively infrequently. A study of the singing frequency of each species could provide a correction factor such that the census results represent a true relative abundance index.

Such a study may need to be conducted at each census area, because the singing behavior of a given species may vary from one site to another (more singing would be expected where density is higher). Differences in habitat among sites may also influence the detectability of a bird's song. Some species can be heard far away (at Las Lajas we heard chachalacas two kilometers away!) while others, such as hummingbirds, barely can be heard at 50 m. The chachalacas are much less abundant than hummingbirds, yet are detected singing more

frequently. This problem can be corrected by calculations of distance and subsequent adjusting, but the solution will not be easy. Distance of song in a forest (especially when there is a steep slope) can be misleading. Thus, among some groups, comparisons of relative abundance estimates derived from point counts may be meaningless; however comparisons within species (among sites or among years) are still valid.

In terms of the avian community, we must acknowledge that non-singing birds are poorly represented in the point count census data. A non-singing bird may include a species whose density is sufficiently low that territorial song behavior is unnecessary, a nocturnal singer that is not detected by daytime point counts, or a bird whose singing frequency is near its lowest during the season in which the censusing is conducted. Some examples of non-singers in El Salvador forests include hummingbirds (they sing in the late rainy season and dry season after most song birds have decreased their song activity) and swifts (Apodiformes), most birds of prey (Falconiformes and Strigiformes), nightjars (Caprimulgiformes), and many migrant species. Some species get "double" counted if both males and females sing. This factor may be responsible for the relatively high detection frequencies for Long-tailed Manakin (*Chiroxiphia linearis*) and Elegant Trogon (*Trogon elegans*). Species in which male and female populations are not equal cannot be accurately represented in the census results, unless we can consult a demographical study with which to correct the results. While such studies exist, we have not yet attempted to correct the results presented herein. Unfortunately, we could not distinguish between singing males and females in *Chiroxiphia linearis*, although this may be possible.

Despite the problems described above, our point count data has provided an important perspective on bird populations at El Imposible with relatively little field work. If time and resources are limited, there is no better way of inventorying an avian community. We have provided this lengthy discussion with the aim of aiding the interpretation of our data, as well as the planning of future avian demography studies.

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Figure 1.1 Map of study area, San Benito and Río Guayapa sectors, El Imposible National Park, El Salvador

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Table 1.1 Frequency of detection for birds in June at El Imposible National Park (San Benito and Río Guayapa sectors), El Salvador

Species	Scientific name	(48 points)	% Frequency All Points ^a (32 points)	% Frequency Río Guayapa (16 points)	% Frequency San Benito
Blue-crowned Motmot	<i>Momotus momota</i>		92	91	94
Yellow-green Vireo	<i>Vireo flavoviridis</i>		92	97	81
Elegant Trogon	<i>Trogon elegans</i>		81	78	88
Long-tailed Manakin	<i>Chiroxiphia linearis</i>		75	81	63
Yellow-olive Flycatcher	<i>Tolmomyias sulphureus</i>		67	91	19
Rufous-and-white Wren	<i>Thryothorus rufalbus</i>		58	66	44
Thicket Tinamou	<i>Crypturellus cinnamomeus</i>		56	53	63
Ivory-billed Woodcreeper	<i>Xiphorhynchus flavigaster</i>		54	47	69
Banded Wren	<i>Thryothorus pleurostictus</i>		46	34	69
White-tipped Dove	<i>Leptotila verreauxi</i>		44	38	56
Greenish Elaenia	<i>Myiopagis viridicata</i>		44	59	13
Rufous-capped Warbler	<i>Basileuterus rufifrons</i>		40	22	75
Lesser Greenlet	<i>Hylophilus decurtatus</i>		40	47	25
Fan-tailed Warbler	<i>Euthlypis lachrymosa</i>		38	41	31
Blue Bunting	<i>Cyanocopsa parellina</i>		31	22	50
Hummingbird spp. (Unidentified)	<i>Trochilidae spp. (No-identificado)</i>		31	28	38
Squirrel Cuckoo	<i>Piaya cayana</i>		27	13	56
Clay-colored Robin	<i>Turdus grayi</i>		27	25	31
Lesser Ground-Cuckoo	<i>Morococcyx erythropygus</i>		19	19	19
Scrub Euphonia	<i>Euphonia affinis</i>		19	19	19
Social Flycatcher	<i>Myiozetetes similis</i>		19	25	6
Plain Wren	<i>Thryothorus modestus</i>		17	9	31
Rufous-browed Peppershrike	<i>Cyclarhis gujanensis</i>		17	19	13
Sulphur-bellied Flycatcher	<i>Myiodynastes luteiventris</i>		15	22	0
Bright-rumped Attila	<i>Attila spadiceus</i>		15	19	6
Northern Bentbill	<i>Oncostoma cinereigulare</i>		15	6	31
Dusky-capped Flycatcher	<i>Myiarchus tuberculifer</i>		13	13	13
Spot-breasted Wren	<i>Thryothorus maculipectus</i>		10	6	19
White-throated Robin	<i>Turdus assimilis</i>		10	9	13
Red-billed Pigeon	<i>Columba flavirostris</i>		10	3	25
Pale-billed Woodpecker	<i>Campephilus guatemalensis</i>		8	13	0
Golden-fronted Woodpecker	<i>Melanerpes aurifrons</i>		8	13	0
Great Curassow	<i>Crax rubra</i>		8	13	0
Collared Araçari	<i>Pteroglossus torquatus</i>		8	13	0
Ruddy Quail-Dove	<i>Geotrygon montana</i>		6	0	19
Singing Quail	<i>Dactylortyx thoracicus</i>		6	0	19
Turquoise-browed Motmot	<i>Eumomota superciliosa</i>		6	0	19
Bushy-crested Jay	<i>Cyanocorax melanocyanus</i>		6	6	6
Rufous-naped Wren	<i>Campylorhynchus rufinucha</i>		6	3	13
Olivaceous Woodcreeper	<i>Sittasomus griseicapillus</i>		6	9	0
Barred Antshrike	<i>Thamnophilus doliatus</i>		6	6	6
Violaceous Trogon	<i>Trogon violaceus</i>		6	6	6
Streak-headed Woodcreeper	<i>Lepidocolaptes souleyetii</i>		6	9	0
Golden-olive Woodpecker	<i>Piculus rubiginosus</i>		6	6	6
White-bellied Chachalaca	<i>Ortalis leucogastra</i>		4	6	0
Buffy-crowned Wood-Partridge	<i>Dendrortyx leucophrys</i>		4	0	13
Vaux' Swift	<i>Chaetura vauxi</i>		4	3	6

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Table 1.1 Continued

Species	Scientific name	(48 points)	% Frequency All Points (32 points)	% Frequency Río Guayapa (16 points)	% Frequency San Benito
Ochre-bellied Flycatcher	<i>Mionectes oleagineus</i>		4	6	0
Paltry Tyrannulet	<i>Zimmerius vilissimus</i>		4	6	0
Striped Cuckoo	<i>Tapera naevia</i>		4	0	13
Yellow-throated Euphonia	<i>Euphonia hirundinacea</i>		4	3	6
Golden-crowned Warbler	<i>Basileuterus culicivorus</i>		4	6	0
Orange-fronted Parakeet	<i>Aratinga canicularis</i>		4	0	13
Altamira Oriole	<i>Icterus gularis</i>		4	6	0
Orange-chinned Parakeet	<i>Brotogeris jugularis</i>		2	3	0
Pacific Parakeet	<i>Aratinga strenua</i>		2	3	0
Red-crowned Ant-Tanager	<i>Habia rubica</i>		2	3	0
Orange-billed Nightingale-thrush	<i>Catharus aurantiirostris</i>		2	3	0
Streak-backed Oriole	<i>Icterus pustulatus</i>		2	3	0
Red-throated Ant-Tanager	<i>Habia fuscicauda</i>		2	3	0
Northern Beardless Tyrannulet	<i>Camptostoma imberbe</i>		2	3	0
Stub-tailed Spadebill	<i>Platyrinchus cancrominus</i>		2	3	0
Barred Woodcreeper	<i>Dendrocolaptes certhia</i>		2	3	0
Turkey Vulture	<i>Cathartes aura</i>		2	0	6
Black Vulture	<i>Coragyps atratus</i>		2	0	6
Collared Forest-Falcon	<i>Micrastur semitorquatus</i>		2	0	6
Laughing Falcon	<i>Herpetotheres cachinnans</i>		2	0	6
Emerald Toucanet	<i>Aulacorhynchus prasinus</i>		2	0	6
Boat-billed Flycatcher	<i>Megarynchus pitangua</i>		2	0	6
White-collared Swift	<i>Streptoprocne zonaris</i>		0	10	0
White Hawk	<i>Leucopternis albicollis</i>		0	0	2
Crested Guan	<i>Penelope purpurascens</i>		0	2	0
Mottled Owl	<i>Ciccaba virgata</i>		0	0	2
King Vulture	<i>Sarcoramphus papa</i>		0	1	0
Red-tailed Hawk	<i>Buteo jamaicensis</i>		0	1	0
Common Black-Hawk	<i>Buteogallus anthracinus</i>		0	1	0
Black Hawk-Eagle	<i>Spizaetus tyrannus</i>		0	0	1
Spectacled Owl	<i>Pulsatrix perspicillata</i>		0	1	0
Violet Sabrewing	<i>Campylopterus hemileucurus</i>		0	1	0
Blue-throated Goldentail	<i>Hylocharis eliciae</i>		0	1	0
Berylline Hummingbird	<i>Amazilia beryllina</i>		0	1	0
Green Kingfisher	<i>Chloroceryle americana</i>		0	1	0
Tropical Pewee	<i>Contopus cinereus</i>		0	1	0
Ferruginous Pygmy-Owl	<i>Glaucidium brasilianum</i>		0	0	0
Masked Tityra	<i>Tityra semifasciata</i>		0	0	0
SPECIES:	82				

^a Species with 0% frequency were recorded outside of point counts. Two species for which we have no field notes (in June) are listed at the end with zeroes in all columns: our failure to note them may have been an error (we definitely recorded these species in August). The species total excludes these two species in order to permit comparisons with other sites inventoried in June.

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Table 1.2 Differences in the frequency of detection of birds between upland forest (San Benito) and gallery forest (Río Guayapa), El Imposible National Park, El Salvador

Species	% Freq. Upland (16 points)	% Freq. Gallery (32 points)	Ratio	chi-square	P ^a
Singing Quail <i>Dactylortyx thoracicus</i>	19	0		6.400	<.025 x
Turquoise-browed Motmot <i>Eumomota superciliosa</i>	19	0		6.400	<.025 x
Ruddy Quail-Dove <i>Geotrygon montana</i>	19	0		6.400	<.025 x
Buffy-crowned Wood-Partridge <i>Dendrortyx leucophrys</i>	12	0		Too small	
Striped Cuckoo <i>Tapera naevia</i>	12	0		Too small	
Red-billed Pigeon <i>Columba flavirostris</i>	25	3	8:1	5.470	<.025 x
Northern Bentbill <i>Oncostoma cinereigulare</i>	31	6	5:1	5.352	<.025 x
Squirrel Cuckoo <i>Piaya cayana</i>	56	13	4:1	10.338	<.005
Plain Wren <i>Thryothorus modestus</i>	31	9	3:1	3.675	<.100 x NS
Rufous-capped Warbler <i>Basileuterus rufifrons</i>	75	22	3:1	12.588	<.001
Spot-breasted Wren <i>Thryothorus maculipectus</i>	19	6	3:1	1.786	<.250 x NS
Blue Bunting <i>Cyanocompsa parrellina</i>	50	22	2:1	3.927	<.050
Banded Wren <i>Thryothorus pleurostictus</i>	69	34	2:1	5.077	<.025
White-tipped Dove <i>Leptotila verreauxi</i>	56	38	1.5:1	1.524	<.250 NS
Ivory-billed Woodcreeper <i>Xiphorhynchus flavigaster</i>	69	47	1.5:1	2.056	<.250 NS
Rufous-and-white Wren <i>Thryothorus rufalbus</i>	44	66	1:1.5	2.100	<.250 NS
Lesser Greenlet <i>Hylophilus decurtatus</i>	25	47	1:2	2.134	<.250 NS
Bright-rumped Attila <i>Attila spadiceus</i>	6	19	1:3	1.338	<.250 x NS
Social Flycatcher <i>Myiozetetes similis</i>	6	25	1:4	2.462	<.250 x NS
Greenish Elaenia <i>Myiopagis viridicata</i>	13	59	1:5	9.524	<.005
Yellow-olive Flycatcher <i>Tolmomyias sulphurescens</i>	19	91	1:5	24.797	<.001
Olivaceous Woodcreeper <i>Sittasomus griseicapillus</i>	0	9		1.600	<.250 x NS
Streak-headed Woodcreeper <i>Lepidocolaptes souleyetii</i>	0	9		1.600	<.250 x NS
Collared Araçari <i>Pteroglossus torquatus</i>	0	13		2.182	<.250 x NS
Great Curassow <i>Crax rubra</i>	0	13		2.182	<.250 x NS
Pale-billed Woodpecker <i>Campephilus guatemalensis</i>	0	13		2.182	<.250 x NS
Golden-fronted Woodpecker <i>Melanerpes aurifrons</i>	0	13		2.182	<.250 x NS
Sulphur-bellied Flycatcher <i>Myiodynastes luteiventris</i>	0	22		4.098	<.050 x

^a NS = Not significant ($P > .05$). Species with non-significant differences were included in the table if observations outside of the censuses corroborated the difference. No analysis could be performed for samples marked "too small." x = may have been skewed by one or two chi-square cells with expected values less than 5.

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Table 1.3 Forest structure of three habitats at El Imposible National Park, San Benito and Río Guayapa sectors, El Salvador

		San Benito Secondary Upland Forest	Río Guayapa Mature Young Gallery Forest	Río Guayapa Gallery Forest
No. of plots		7	6	4
No. of trees counted		419	394	223
No. of trees per ha		599	657	558
<u>Height classes (trees/ha)</u>				
< 7 m		40	56	133
7 - 10 m		411	254	320
11 - 15 m		97	147	85
16 - 20 m		60	117	20
21 - 35 m		0	83	0
Median Height (STD)		10.3 (3.67)	13.6 (6.53)	9.0 (3.21)
<u>DBH classes (trees/ha)</u>				
10 - 19 cm		240	275	340
20 - 39 cm		157	153	80
40 - 79 cm		150	155	80
80 - 159 cm		46	52	8
>159 cm		6	22	0
Median DBH (STD)		36.2 (32.1)	40.8 (42.1)	24.2 (18.3)

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Table 1.4 Trees per hectare at three forest habitats, El Imposible National Park (San Benito and Río Guayapa sectors), El Salvador

Tree species	Local name	San Benito Secondary Upland	Río Guayapa	
			Mature Gallery	Young Gallery
<i>Abutilon andrieuxii</i>	Papelillo de Río			3
<i>Acacia glomerosa</i>	Zarzo		7	10
<i>Acacia hindsii</i>	Is canal			5
<i>Acalypha macrostachya</i>	Chichicaste Macho		2	
<i>Agonandra racemosa</i>	Cipres Silvestre	3		
<i>Albizia adinosephala</i>	Polvo De Queso	17	2	3
<i>Alchornea latifolia</i>	Tambor	1	30	5
<i>Alstonia longifolia</i>	Chilindrón	24		
<i>Andira inermis</i>	Almendo De Río		2	
<i>Apeiba toboubou</i>	Peine De Mico		2	
<i>Aphananthe monoica</i>	Duraznillo	1	2	
<i>Aphelandra sp.</i>	Camarón Blanco		10	35
<i>Aspidosperma megalocarpon</i>	Molleja De Pato	7		
<i>Astronium graveolens</i>	Ron-ron		2	
<i>Bauhinia cf. divaricata</i>	Pata De Cabro		13	
<i>Bocconia arborea</i>	Sangre De Perro	3	8	20
<i>Brosimum alicastrum</i>	Ojushte De Verano	3	45	13
<i>Calophilum brasiliense</i>	Barío	13	5	8
<i>Calycophyllum candidissimum</i>	Salamo		17	
<i>Capparis hexandra</i>	Repollo Negro		2	
<i>Capparis pringlei</i>	Repollo		2	
<i>Casearia aculeata</i>	Tinterillo	1	2	18
<i>Casearia commersoniana</i>	Camarón Rojo	3	7	
<i>Casearia sylvestris</i>	Sombra De Armado		3	
<i>Casimiroa edulis</i>	Matasano		2	
<i>Cecropia obtusifolia</i>	Guarumo	33	13	18
<i>Cecropia peltata</i>	Guarumo De Hoja Pequeña		7	3
<i>Cedrela odorata</i>	Cedro		2	
<i>Cestrum sp.</i>	Huele De Noche	1	2	
<i>Chamaedorea sp.</i>	Cuiliote	1		
<i>Chlorophora tinctoria</i>	Mora		2	
<i>Chrysophyllum mexicanum</i>	Caimito Rojo	27	2	13
<i>Chrysophyllum oliviforme</i>	Caimito Blanco	3		
<i>Citharexylum donnell-smithii</i>	Chorrillo	6		
<i>Clusia guatemalensis</i>	Mangle De Tierra	1		
<i>Cnidocolus multilobus</i>	Chichicaste De Altura		2	
<i>Coccoloba montana</i>	Papaturro De Tierra Fría		3	
<i>Coccoloba sp.</i>	Papaturro	1		
<i>Coix lacryma-jobi</i>	Lagrimas De San Pedro		2	
<i>Cordia alliodora</i>	Laurel	20		10
<i>Cornutia pyramidata</i>	Cangrejo		3	
<i>Cupressus lusitanica</i>	Ciprés	1		
<i>Dalbergia sp.</i>	Cagalero			10
<i>Dendropanax arboreus</i>	Mano De León	4	12	8
<i>Dichapetalum donnell-smithii</i>	Cacagüillo		2	
<i>Diphysa robinoides</i>	Guachipilín			5

Table 1.4 Continued

KOMAR & HERRERA • AVIAN INVENTORY OF EL IMPOSIBLE

Tree species	Local name	San Benito Secondary Upland	Río Guayapa	
			Mature Gallery	Young Gallery
<i>Drypetes lateriflora</i>	Aluminio	6	17	
<i>Dussia cuscatlanica</i>	Cashal		2	
<i>Enterolobium cyclocarpum</i>	Conacaste Negro			33
<i>Erythroxylum</i> sp.	Pergamino	1		
<i>Eugenia lindeniana</i>	Escobo Negro	13		
<i>Exostema mexicanum</i>	Quina	3	3	
<i>Faramea occidentalis</i>	Cafecillo		43	
<i>Ficus obtusifolia</i>	Matapalo Del Grande			3
<i>Ficus pertusa</i>	Capulamate	1		
<i>Ficus</i> sp.	Amate	3		
<i>Gliricidia sepium</i>	Madrecacao	11		
<i>Guaiacum sanctum</i>	Guayacán	4		
<i>Guazuma ulmifolia</i>	Caulote		5	125
<i>Gymnanthes riparia</i>	Pata De Paloma	1		
<i>Gyrocarpus americanus</i>	Chichicaste Rojo		10	5
<i>Heliocarpus</i> sp.	Calagua	7	2	
<i>Hirtella racemosa</i>	Aceitunillo	1	7	
<i>Hymenaea courbaril</i>	Copinol		2	10
<i>Ilex discolor</i>	Rodeo	11		
<i>Inga calderonii</i>	Zapato De Mico	4		
<i>Inga fagifolia</i>	Caspirol	9	12	15
<i>Inga</i> cf. <i>pavonia</i>	Guamito			8
<i>Inga punctata</i>	Pepeto Guamito	10		5
<i>Ipomoea arborescens</i>	Siete Camisas	1		
<i>Ixora floribunda</i>	Palo De Melón		5	
<i>Licania retifolia</i>	Mulo	19	40	
<i>Lonchocarpus atropurpureus</i>	Funera Blanco	6		
<i>Lonchocarpus guatemalensis</i>	Chaperno	3	3	
<i>Lonchocarpus purpureus</i>	Chaperno Blanco	3		
<i>Luehea speciosa</i>	Tepecaulote	11		
<i>Lysiloma divaricatum</i>	Quebracho	4	2	
<i>Machaerium biovulatum</i>	Cedazo	9		
<i>Mangifera indica</i>	Mango	3		
<i>Manilkara chicle</i>	Níspero	9	32	
<i>Mastichodendron capiri</i>	Tempisque	1		
<i>Matayba glaberrima</i>	Palo De Yegua	7		
<i>Maytenus chiapensis</i>	Escobo Blanco	13		
<i>Mouriri myrtilloides</i>	Fierrito		2	
<i>Muntingia calabura</i>	Capulín	31		
<i>Myroxylon balsamun</i>	Bálsamo		8	
<i>Ocotea sinuata</i>	Cashulaguácate		2	
<i>Ocotea veraguensis</i>	Pimiento	7	2	
<i>Omphalea oleifera</i>	Tambor Rojo		2	
<i>Perymenium grande</i>	Tatascamite De Tierra Fría	27		
<i>Phoebe acuminatissima</i>	Pimiento Negro	3	2	
<i>Pilocarpus racemosus</i>	Matasanillo	3	2	
<i>Piper tuberculatum</i>	Cordoncillo		3	

Table 1.4 Continued

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Tree species	Local name	San Benito Secondary Upland	Río Guayapa	
			Mature Gallery	Young Gallery
<i>Piptadenia constricta</i>	Hormiguillo	33		
<i>Plumeria rubra</i>	Flor De Mayo Blanco		2	
<i>Pogonopus speciosus</i>	Chorcha De Pava		3	
<i>Prunus brachybotrya</i>	Sapuyulo	7		
<i>Psidium guajava</i>	Guayaba			63
<i>Quercus sp.</i>	Roble		2	
<i>Randia armata</i>	Crucito Amarillo	1		
<i>Randia chiapensis</i>	Crucito	4	3	3
<i>Rheedia edulis</i>	Chaparrón	30	18	3
<i>Rollinia rensioniana</i>	Churumuyo		2	
<i>Roupala glaberrima</i>	Zorrillo	9		
<i>Salix humboldtiana</i>	Sauce			3
<i>Sambucus mexicana</i>	Saúco	6		
<i>Sapium sp.</i>	Chilamate		3	8
<i>Saurauia kegeliana</i>	Alais	6	2	
<i>Sideroxylon persimile</i>	Huistempisque	6		
<i>Simarouba glauca</i>	Aceituna De Castilla	1		
<i>Sloanea terniflora</i>	Terciopelo		15	
<i>Spondias cirouella</i>	Jocote De Pava	3	3	5
<i>Spondias mombin</i>	Jocote Jobo		7	
<i>Stemmadenia donnell-smithii</i>	Cojón	1	22	15
<i>Styrax argenteus</i>	Estoraque	17	3	3
<i>Swartzia simplex</i>	Naranjillo		20	
<i>Tabebuia rosea</i>	Maquilishuat		5	5
<i>Tecoma stans</i>	San Andrés			8
<i>Terminalia oblonga</i>	Volador		43	15
<i>Thouinidium decandrum</i>	Zorrillo			23
<i>Trema micrantha</i>	Capulín Macho	4	2	
<i>Trichilia martiana</i>	Cola De Pava		13	8
<i>Trichospermum sp.</i>	Capulin Blanco		8	5
<i>Triumfetta lappula</i>	Mozote De Caballo	6		
<i>Urera baccifera</i>	Chichicastón		3	
<i>Xylosma sp.</i>	Aguja De Arra	4		
<i>Zanthoxylum mayanum</i>	Pochote		3	5
<i>Zinowiewia cuneifolia</i>	Barreto Rojo	3		
<i>Zinowiewia integerrima</i>	Barreto	7		
<i>Zinowiewia tacanensis</i>	Barreto De Tierra Fría	1		
Not determined	Mora De Danta		5	
	Porocho	1		
	Istatén		12	
Jocote Macho		2		
	Limpia Vientre		5	
	Tachulatapa (Chapulaltapa?)	26		
TOTAL SPECIES:		77	80	40

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Table 1.5 Birds captured in mist nets (data from both El Imposible and Las Lajas are presented for reference).^a

Species	Las Lajas 521 net-hrs July 1994	El Imposible 819 net-hrs August 1994	Las Lajas 684 net-hrs Sept. 1994	2024 net-h Tot.
Singing Quail <i>Dactylortyx thoracicus</i>			1	1
White-tipped Dove <i>Leptotila verreauxi</i>		1	1	2
Violet Sabrewing <i>Campylopterus hemileucurus</i>	1	4 (B)		5
Berylline Hummingbird <i>Amazilia beryllina</i>	1	4	1	6
Cinnamon Hummingbird <i>Amazilia rutila</i>	1		3	4
Fork-tailed Emerald <i>Chlorostilbon canivetii</i>	1			1
Turquoise-browed Motmot <i>Eumomota superciliosa</i>	2 (B)	1		3
Blue-crowned Motmot <i>Momotus momota</i>		3	2	5
Elegant Trogon <i>Trogon elegans</i>		5 (B)	1	6
Golden-olive Woodpecker <i>Piculus rubiginosus</i>		1 (B)		1
Barred Antshrike <i>Thamnophilus doliatus</i>			1	1
Streak-headed Woodcreeper <i>Lepidocolaptes souleyetii</i>		1 (B)		1
Ruddy Woodcreeper <i>Dendrocincla homochroa</i>		5 (B)		5
Ivory-billed Woodcreeper <i>Xiphorhynchus flavigaster</i>		7 (B)		7
Olivaceous Woodcreeper <i>Sittasoma griseicapillus</i>		1		1
Barred Woodcreeper <i>Dendrocolaptes certhia</i>		1		1
Northern Bentbill <i>Oncostoma cinereigulare</i>		4 (B)		4
Greenish Elaenia <i>Myiopagis viridicata</i>		3 (B)		3
Ochre-bellied Flycatcher <i>Mionectes oleaginea</i>		3 (B)		3
Stub-tailed Spadebill <i>Platyrinchus cancrominus</i>		1 (B)		1
Yellow-olive Flycatcher <i>Tolmomyias sulphurescens</i>	1 (B)	4 (B)	1	6
Yellow-bellied (?) Flycatcher <i>Empidonax flaviventris</i> (?)			1	1
Long-tailed Manakin <i>Chiroxiphia linearis</i>	4 (B)	40 (B)	6	50
Bushy-crested Jay <i>Cyanocorax melanocyaneus</i>	1 (B)			1
Banded Wren <i>Thryothorus pleurostictus</i>		1 (B)		1
Spot-breasted Wren <i>Thryothorus maculipectus</i>	1 (B)	2 (B)	5 (B)	8
Plain Wren <i>Thryothorus modestus</i>	8 (B)	1	8 (B)	17
Rufous-and-white Wren <i>Thryothorus rufalbus</i>	1 (B)	11 (B)	11 (B)	23
Rufous-naped Wren <i>Campylorhynchus rufinucha</i>			3 (B)	3
Orange-billed Nightingale-Thrush <i>Catharus aurantiirostris</i>	1 (B)		6 (B)	7
Clay-colored Robin <i>Turdus grayi</i>	2 (B)		1	3
Rufous-browed Peppershrike <i>Cyclarhis gujanensis</i>			1	1
Yellow-green Vireo <i>Vireo flavoviridis</i>		12		12
Black-and-white Warbler <i>Mniotilta varia</i>			1	1
Worm-eating Warbler <i>Helmitheros vermivora</i>			1	1
Canada Warbler <i>Wilsonia canadensis</i>			4	4
Kentucky Warbler <i>Oporornis formosus</i>			1	1
Rufous-capped Warbler <i>Basileuterus rufifrons</i>	19 (B)	20 (B)	21	60
Fan-tailed Warbler <i>Euthlypis lachrymosa</i>		26 (B)	8 (B)	34
Red-legged Honeycreeper <i>Cyanerpes cyaneus</i>		1		1
Red-throated Ant-Tanager <i>Habia fuscicauda</i>		1 (B)	3 (B)	4
Red-crowned Ant-Tanager <i>Habia rubica</i>	1 (B)			1
Blue Bunting <i>Cyanocompsa parrellina</i>		14 (B)	3	17
Black-headed Saltator <i>Saltator atriceps</i>	1		1	2
Bar-winged Oriole <i>Icterus maculialatus</i>	1 (B)		2 (B)	3
Rusty Sparrow <i>Aimophila rufescens</i>	1		3 (B)	4
TOTAL SPECIES (INDIVIDUALS)	18 (48)	28 (178)	28 (107)	46 (333)

^a (B) indicates that some birds had brood patches or were juveniles, proving that local breeding takes place.

LISTA DE AVES PARA VISITANTES AL SECTOR SAN BENITO Y RIO GUAYAPA, PARQUE NACIONAL
EL IMPOSIBLE.

Deseábamos proporcionar un listado de las aves del Parque Nacional El Imposible, pero no teníamos suficiente información de la mayor parte del parque para poder lograr tal objetivo. Nuestras observaciones están limitadas a la parte este del parque. Nosotros tendríamos que conocer tres regiones más para preparar un listado completo; estas áreas son Cerro Campana, Río Mashtapula, y el lado de San Francisco Menéndez. Otros autores han recolectado información de esas áreas pero no nos proporcionan suficiente detalle en su forma existente para determinar los estados de las especies.

La lista principal incorpora 155 especies que han sido reportadas desde las áreas de San Benito y Río Guayapa (incluyendo el Río Las Escaleras) dentro del Parque Nacional El Imposible. Hemos incluido algunas especies reportadas por otros observadores (comunicación personal de Alfonso Sermeño, Alvaro Moises, Heriberto Rivera, Francisco Chinchilla), que son citados cuando la especie no fue observada por nosotros. Presentamos al final de nuestra lista las 87 especies adicionales reportadas por Francisco Serrano, Jane West, y Oliver Komar de trabajos en el área de San Francisco Menéndez.

Existe un listado preliminar de las aves del parque, preparado por Francisco Serrano de parte de Fundación SalvaNatura, pero solo incluye los nombres de las especies. La mayoría de la información proviene de observaciones casuales entre de 1975 y 1983 en el lado de San Francisco Menéndez. Las especies adicionales reportadas por Serrano se listan al final de nuestra lista principal. El sector de Cerro Campana contiene bosque más húmedo de otros sectores del parque, y es la fuente de algunas de las especies de bosque montano húmedo reportado por Serrano, que probablemente no se presentan en el área de San Benito y Río Guayapa. Se requieren más estudios en Cerro Campana; una visita en mayo de 1995 a este sector por Alvaro Moises descubrió dos especies adicionales para el parque: *Aramides cajanea* y *Euphonia elegantissima*. Cerca de este área, pero fuera del parque actual, el Sr. Jose Angel Campos observó visitas ocasionales de *Corvus corax*, a principio de los 60s (F. Serrano, comunicación personal).

Dado las condiciones del parque hace 25 años, cuando existían varias milpas y cafetales donde ahora hay bosque secundario, podemos presumir que las especies que hoy se presentan en las fincas y milpas alrededor del bosque El Imposible, antes se presentaban dentro del parque. Estas especies sin duda visitarán los límites o aún sitios dentro del parque en el futuro, cuando partes del bosque se abran por causas naturales tal como derrumbes, caídas de árboles, y fuego. Debido a que no hemos incluido muchas de estas especies, será factible agregar más especies a la lista por continuar investigaciones ornitológicas en el futuro.

Los nombres comunes han sido proporcionados por guardaparques del Servicio de Parques Nacionales y Vida Silvestre, en particular por Heriberto Rivera y Francisco Chinchilla (padre). Ambos trabajan en el sector de San Benito, y nos agregan que la gente de San Francisco Menéndez ocupan diferentes nombres.

Nuestro estudio de aves en el parque nacional El Imposible abarcó un total de cinco semanas: en el Río Guayapa y San Benito cuatro semanas durante junio y agosto 1994, además 4 días en diciembre 1993. La mayor parte de nuestro estudio fue en la estación lluviosa, cuando no se presentaban aves visitantes del norte.

ESTADO: Bajo de la columna "Est." se encuentran letras que indican residente (R), visitante o migrante (V), hipotético (H), y de prioridad de conservación (P). Especies de prioridad de conservación pueden ser amenazadas o en peligro de extinción a nivel nacional. Un asterisco (*) indica que hay fuerte evidencia que la especie anida en el parque. Hay dos especies marcadas "V*," indicando que visitan por temporadas para anidar en el parque; estas especies luego migran a Suramérica. Para especies hipotéticas, se requieren más observaciones seguras o documentación para confirmar su presencia en el parque; el nombre del observador sigue el reporte.

ABUNDANCIA: Nuestro estudio proporcionó datos sobre la abundancia relativa de aves en los bosques de la cuenca del Río Guayapa y cerca de San Benito. Basado rústicamente en nuestro índice de abundancia, hemos dado clasificaciones de abundante, común, poco común, y raro. Para especies no registradas por nosotros, presentamos los nombres de las personas que las han registrado.

Oliver Komar y Néstor Herrera

LAS AVES DE SAN BENITO Y RÍO GUAYAPA, PARQUE NACIONAL EL IMPOSIBLE

FAMILIA/ Nombre Común	Nombre Científico	Nombre Inglés	Est.	Abundancia
TINAMIDAE				
Mona; Tinamú	<i>Crypturellus cinnamomeus</i>	Thicket Tinamou	R*	Común
ARDEIDAE				
Jorjora	<i>Tigrisoma mexicanum</i>	Bare-throated Tiger-Heron	V H	F. Chinchilla
Garcita	<i>Butorides virescens</i>	Green Heron	V H	H. Rivera
CATHARTIDAE				
Zope	<i>Coragyps atratus</i>	Black Vulture	R*	Poco Común
Suncha; Gusma	<i>Cathartes aura</i>	Turkey Vulture	R	Poco Común
Rey Zope	<i>Sarcoramphus papa</i>	King Vulture	R* P	Poco Común
ACCIPITRIDAE				
?	<i>Leptodon cayanensis</i>	Gray-headed Kite	R P	J. West &
H. Rivera				
?	<i>Harpagus bidentatus</i>	Double-toothed Kite	V	A. Moises (foto)
?	<i>Accipiter striatus</i>	Sharp-shinned Hawk	V	Poco Común
Gavilán blanco	<i>Leucopternis albicollis</i>	White Hawk	R P	Poco Común
Gavilán riyero	<i>Buteogallus anthracinus</i>	Common Black-Hawk	R P	Poco Común
?	<i>Buteo brachyurus</i>	Short-tailed Hawk	R P	Fuera del
Parque				
Gavilán cola dorada	<i>Buteo jamaicensis</i>	Red-tailed Hawk	R P	Poco Común
Aguila crestada	<i>Spizaetus tyrannus</i>	Black Hawk-Eagle	R P	Poco Común
FALCONIDAE				
Guatze	<i>Herpetotheres cachinnans</i>	Laughing Falcon	R P	Poco Común
Corta cabezas	<i>Micrastur semitorquatus</i>	Collared Forest-Falcon	R P	Poco Común
CRACIDAE				
Chacha	<i>Ortalis leucogastra</i>	White-bellied Chachalaca	R*	Poco Común
Pava	<i>Penelope purpurascens</i>	Crested Guan	R* P	Poco Común
Pahuil, Pajuil	<i>Crax rubra</i>	Great Curassow	R* P	Poco Común
PHASIANIDAE				
Guachoca	<i>Dendrortyx leucophrys</i>	Buffy-crowned Wood-Partridge	R	Poco Común
Godorníz	<i>Dactylortyx thoracicus</i>	Singing Quail	R P	Poco Común
RALLIDAE				
Tamborcito	<i>Aramides axillaris</i>	Rufous-necked Wood-Rail	R* P	Poco Común
COLUMBIDAE				
Petacona, paloma azul	<i>Columba flavirostris</i>	Red-billed Pigeon	R*	Poco Común
Paloma guatalera	<i>Zenaida asiatica</i>	White-winged Dove	R*	A. Sermeño
Izcomuna	<i>Leptotila verreauxi</i>	White-tipped Dove	R*	Común
?	<i>Geotrygon albifacies</i>	White-faced Quail-Dove	R	A. Sermeño
Paloma burgadora	<i>Geotrygon montana</i>	Ruddy Quail-Dove	R*	Poco Común
PSITTACIDAE				
Pericón, Chocoyo	<i>Aratinga strenua</i>	Pacific Parakeet	V	Poco Común
Perico	<i>Aratinga canicularis</i>	Orange-fronted Parakeet	R*	Poco Común
Catalnica	<i>Brotogeris jugularis</i>	Orange-chinned Parakeet	R*	Poco Común
Lora nuca amarilla	<i>Amazona auropalliata</i>	Yellow-naped Parrot	V	H. Rivera
CUCULIDAE				
Piscoy, Platano asado, Chicolatero	<i>Piaya cayana</i>	Squirrel Cuckoo	R	Poco Común
Tres pesos pido	<i>Tapera naevia</i>	Striped Cuckoo	R	Poco Común
Chonte piñalero, Chonte bobo, Pajaro bobo	<i>Morococcyx erythropygus</i>	Lesser Ground-Cuckoo	R	Poco Común
Siguamonta	<i>Geococcyx velox</i>	Lesser Roadrunner	R	H. Rivera
STRIGIDAE				
Buho de anteojos	<i>Pulsatrix perspicillata</i>	Spectacled Owl	R P	Raro

LAS AVES DE SAN BENITO Y RÍO GUAYAPA, PARQUE NACIONAL EL IMPOSIBLE

FAMILIA/ Nombre Común	Nombre Científico	Nombre Inglés	Est.	Abundancia
Aurorita	<i>Glaucidium brasilianum</i>	Ferruginous Pygmy-Owl	R	Poco Común
Pajaro león	<i>Ciccaba virgata</i>	Mottled Owl	R	Común
Buho blanco y negro	<i>Ciccaba nigrolineata</i>	Black-and-white Owl	R P	J. West
CAPRIMULGIDAE				
Pucuyo	<i>Nyctidromus albicollis</i>	Pauraque	R	H. Rivera
NYCTIBIIDAE				
Pajaro troncón	<i>Nyctibius griseus</i>	Common Potoo	R P	F. Chinchilla
APODIDAE				
Vencejo	<i>Streptoprocne rutila</i>	Chestnut-collared Swift	V H	O. Komar
Vencejo	<i>Streptoprocne zonaris</i>	White-collared Swift	R	Común
Vencejo	<i>Chaetura vauxi</i>	Vaux' Swift	R	Común
TROCHILIDAE				
?	<i>Campylopterus rufus</i>	Rufous Sabrewing	V	A. Sermeño
Gorrión, Colibrí	<i>Campylopterus hemileucurus</i>	Violet Sabrewing	R	Poco Común
?	<i>Abeillia abeillei</i>	Emerald-chinned Hummingbird	R H	A. Sermeño
Gorrión, Colibrí	<i>Chlorostilbon canivetii</i>	Fork-tailed Emerald	R	Poco Común
Gorrión, Colibrí	<i>Hylocharis eliciae</i>	Blue-throated Goldentail	R*	Poco Común
Gorrión, Colibrí	<i>Amazilia beryllina</i>	Berylline Hummingbird	R	Común
Gorrión, Colibrí	<i>Amazilia rutila</i>	Cinnamon Hummingbird	R	Poco Común
Gorrión, Colibrí	<i>Archilochus colubris</i>	Ruby-throated Hummingbird	V	Poco Común
TROGONIDAE				
Coa, Agrora	<i>Trogon violaceus</i>	Violaceous Trogon	R	Poco Común
Coa, Agrora	<i>Trogon elegans</i>	Elegant Trogon	R*	Abundante
MOMOTIDAE				
Pavilla	<i>Hylomanes momotula</i>	Tody Motmot	R	A. Sermeño
Talapo, Dragón	<i>Momotus momota</i>	Blue-crowned Motmot	R*	Abundante
Torogoz, Dragón	<i>Eumomota superciliosa</i>	Turquoise-browed Motmot	R*	Común
ALCEDINIDAE				
Martín pescador	<i>Ceryle alcyon</i>	Belted Kingfisher	V	H. Rivera
Martín pescador	<i>Chloroceryle americana</i>	Green Kingfisher	R	Poco Común
RAMPHASTIDAE				
Tucan verde	<i>Aulacorhynchus prasinus</i>	Emerald Toucanet	R	Poco Común
Navajón, Pico navaja	<i>Pteroglossus torquatus</i>	Collared Araçari	R	Poco Común
PICIDAE				
Cheje	<i>Melanerpes aurifrons</i>	Golden-fronted Woodpecker	R*	Poco Común
Cheje Avado	<i>Sphyrapicus varius</i>	Yellow-bellied Sapsucker	V	F. Chinchilla
Carpintero verde	<i>Piculus rubiginosus</i>	Golden-olive Woodpecker	R	Poco Común
Cheje carpintero	<i>Campephilus guatemalensis</i>	Pale-billed Woodpecker	R P	Poco Común
DENDROCOLAPTIDAE				
Chejilla canela	<i>Dendrocincla homochroa</i>	Ruddy Woodcreeper	R*	Poco Común
Chejilla canela	<i>Sittasomus griseicapillus</i>	Olivaceous Woodcreeper	R	Poco Común
Chejilla canela	<i>Xiphocolaptes promeropirhyncus</i>	Strong-billed Woodcreeper	H	A. Sermeño
Chejilla canela	<i>Dendrocolaptes certhia</i>	Barred Woodcreeper	R	Poco Común
Chejilla canela	<i>Xiphorhynchus flavigaster</i>	Ivory-billed Woodcreeper	R*	Común
Chejilla canela	<i>Lepidocolaptes souleyetii</i>	Streak-headed Woodcreeper	R	Poco Común
FORMICARIIDAE				
?	<i>Thamnophilus doliatus</i>	Barred Antshrike	R	Raro
? Grallaria guatimalensis	Scaled Antpitta	R		A. Sermeño &
F. Chinchilla				

FAMILIA/ Nombre Común	Nombre Científico	Nombre Inglés	Est.	Abundancia
TYRANNIDAE				
Copetoncito ceja blanca	<i>Zimmerius vilissimus</i>	Paltry Tyrannulet	R	Raro
Copetoncito pequeñito	<i>Camptostoma imberbe</i>	Northern Beardless Tyrannulet	R	Poco Común
Copetoncito verdusco	<i>Myiopagis viridicata</i>	Greenish Elaenia	R	Común
Copetoncito pico curvado	<i>Oncostoma cinereigulare</i>	Northern Bentbill	R	Poco Común
Copetoncito ojo claro	<i>Tolmomyias sulphureus</i>	Yellow-olive Flycatcher	R	Abundante
?	<i>Platyrinchus cancrinus</i>	Stub-tailed Spadebill	R	Poco Común
Copetoncito de la vega	<i>Contopus cinereus</i>	Tropical Pewee	R	Poco Común
Copetoncito volvedor amarillento	<i>Empidonax flaviventris</i>	Yellow-bellied Flycatcher	V	Poco Común
Copetoncito volvedor gris	<i>Empidonax minimus</i>	Least Flycatcher	V	Poco Común
? <i>Empidonax hammondi</i>	Hammond's Flycatcher	V H	A. Moises	
Pajaro riero (Riyero),	<i>Sayornis nigricans</i>	Black Phoebe	R*	Poco Común
Papamoscas negro				
?	<i>Attila spadiceus</i>	Bright-rumped Attila	R	Poco Común
Copetón triste	<i>Myiarchus tuberculifer</i>	Dusky-capped Flycatcher	R	Poco Común
Copetón	<i>Myiarchus tyrannulus</i>	Brown-crested Flycatcher	V	Común
Copetón enojado	<i>Myiarchus crinitus</i>	Great Crested Flycatcher	V	Poco Común
Chepito fue, Cierito fue	<i>Pitangus sulphuratus</i>	Great Kiskadee	R	A. Sermeño
Chilipillo grande	<i>Megarynchus pitangua</i>	Boat-billed Flycatcher	R	Poco Común
Chilipillo	<i>Myiozetetes similis</i>	Social Flycatcher	R	Común
Chilipillo rayado	<i>Myiodynastes luteiventris</i>	Sulphur-bellied Flycatcher	V*	Común
COTINGIDAE				
Torreja, Toreco, Pedreco	<i>Tityra semifasciata</i>	Masked Tityra	R	Poco Común
PIPRIDAE				
Toledo	<i>Chiroxiphia linearis</i>	Long-tailed Manakin	R*	Abundante
HIRUNDINIDAE				
Golondrina	<i>Progne chalybea</i>	Gray-breasted Martin	V	Poco Común
Golondrina	<i>Hirundo pyrrhonota</i>	Cliff Swallow	V	Poco Común
Golondrina de granja	<i>Hirundo rustica</i>	Barn Swallow	V	Poco Común
CORVIDAE				
Urraca	<i>Calocitta formosa</i>	White-throated Magpie-Jay	R	Raro
Chara, Chechera	<i>Cyanocorax melanocyaneus</i>	Bushy-crested Jay	R	Poco Común
TROGLODYTIDAE				
Guacalchia	<i>Campylorhynchus rufinucha</i>	Rufous-naped Wren	R*	Poco Común
Arriero pecho puntiado	<i>Thryothorus maculipectus</i>	Spot-breasted Wren	R*	Poco Común
Arriero flautista	<i>Thryothorus rufalbus</i>	Rufous-and-white Wren	R*	Abundante
Arriero bandado	<i>Thryothorus pleurostictus</i>	Banded Wren	R*	Común
Arriero chichiguatero	<i>Thryothorus modestus</i>	Plain Wren	R*	Común
MUSCICAPIDAE				
? <i>Poliophtila caerulea</i>	Blue-gray Gnatcatcher	V		Poco Común
Guardabarranco	<i>Myadestes occidentalis</i>	Brown-backed Solitaire	R	F. Chinchilla
Chontillo	<i>Catharus aurantirostris</i>	Orange-billed Nightingale-thrush	R	Raro
Cotuzero, Mañanero	<i>Catharus ustulatus</i>	Swainson's Thrush	V	Común
?	<i>Hylocichla mustelina</i>	Wood Thrush	V	A. Sermeño
Chonte, Sensontle	<i>Turdus grayi</i>	Clay-colored Robin	R	Poco Común
Sensontle mexicano	<i>Turdus assimilis</i>	White-throated Robin	R	Poco Común
BOMBYCILLIDAE				
?	<i>Bombycilla cedrorum</i>	Cedar Waxwing	V	A. Moises (foto)

LAS AVES DE SAN BENITO Y RÍO GUAYAPA, PARQUE NACIONAL EL IMPOSIBLE

FAMILIA/ Nombre Común	Nombre Científico	Nombre Inglés	Est.	Abundancia
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VIREONIDAE

?	<i>Vireo solitarius</i>	Solitary Vireo	V	Poco Común
?	<i>Vireo flavifrons</i>	Yellow-throated Vireo	V	Poco Común
?	<i>Vireo gilvus</i>	Warbling Vireo	V	Poco Común
Camaronero	<i>Vireo flavoviridis</i>	Yellow-green Vireo	V*	Abundante
Camaronero pequeño	<i>Hylophilus decurtatus</i>	Lesser Greenlet	R	Común
El Invisible	<i>Vireolanius pulchellus</i>	Green Shrike-Vireo	R	A. Sermeño
Copetón Ceja Roja	<i>Cyclarhis gujanensis</i>	Rufous-browed Peppershrike	R	Poco Común
EMBERIZIDAE				
?	<i>Vermivora peregrina</i>	Tennessee Warbler	V	Abundante
?	<i>Dendroica petechia</i>	Yellow Warbler	V	Poco Común
?	<i>Dendroica magnolia</i>	Magnolia Warbler	V	Poco Común
?	<i>Dendroica townsendi</i>	Townsend's Warbler	V	Poco Común
?	<i>Dendroica virens</i>	Black-throated Green Warbler	V	Poco Común
Miquero, Hormiguero	<i>Mniotilta varia</i>	Black-and-white Warbler	V	Poco Común
?	<i>Helmitheros vermivorus</i>	Worm-eating Warbler	V	Poco Común
?	<i>Seiurus aurocapillus</i>	Ovenbird	V	Poco Común
?	<i>Seiurus motacilla</i>	Louisiana Waterthrush	V	Poco Común
?	<i>Oporornis philadelphia</i>	Mourning Warbler	V H	A. Sermeño
?	<i>Geothlypis poliocephala</i>	Gray-crowned Yellowthroat	R H	O. Komar
?	<i>Wilsonia pusilla</i>	Wilson's Warbler	V	Poco Común
?	<i>Wilsonia canadensis</i>	Canada Warbler	V	A. Sermeño
?	<i>Myioborus miniatus</i>	Slate-throated Redstart	R	A. Sermeño
Pajuilito, Alzaculito	<i>Euthlypis lachrymosa</i>	Fan-tailed Warbler	R*	Común
?	<i>Basileuterus culicivorus</i>	Golden-crowned Warbler	R	Poco Común
Chichiguitero, Chapero	<i>Basileuterus rufifrons</i>	Rufous-capped Warbler	R*	Común
?	<i>Cyanerpes cyaneus</i>	Red-legged Honeycreeper	V	Poco Común
Capulinero	<i>Euphonia affinis</i>	Scrub Euphonia	R	Poco Común
Capulinero	<i>Euphonia hirundinacea</i>	Yellow-throated Euphonia	R	Poco Común
Ruidazo corona roja	<i>Habia rubica</i>	Red-crowned Ant-Tanager	R	Poco Común
Ruidazo ronco	<i>Habia fuscicauda</i>	Red-throated Ant-Tanager	R	Poco Común
Cojonero	<i>Piranga ludoviciana</i>	Western Tanager	V	Poco Común
Calandria ala blanquinegra	<i>Piranga leucoptera</i>	White-winged Tanager	R	A. Sermeño &
A. Moises				
Chinchangara	<i>Saltator atriceps</i>	Black-headed Saltator	R	A. Sermeño
Azulejo de Montaña	<i>Cyanocopsa parrellina</i>	Blue Bunting	R*	Común
Cuatro Ojos	<i>Melospiza leucotis</i>	White-eared Ground-Sparrow	R	A. Sermeño &
H. Rivera				
?	<i>Sporophila torqueola</i>	White-collared Seedeater	R	A. Moises
Chiguitero	<i>Aimophila ruficauda</i>	Stripe-headed Sparrow	R	A. Sermeño &
A. Moises				
?	<i>Aimophila rufescens</i>	Rusty Sparrow	R	A. Sermeño
?	<i>Dives dives</i>	Melodious Blackbird	R	A. Sermeño
Tordo	<i>Molothrus aeneus</i>	Bronzed Cowbird	R	A. Sermeño
Chiltota	<i>Icterus maculialatus</i>	Bar-winged Oriole	R	Raro
Chiltota	<i>Icterus pustulatus</i>	Streak-backed Oriole	R	Poco Común
Chiltota	<i>Icterus gularis</i>	Altamira Oriole	R	Poco Común
FRINGILLIDAE				
?	<i>Carduelis psaltria</i>	Lesser Goldfinch	R	A. Sermeño

CONTEO:

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Aves adicionales reportadas por Serrano.--En 1993, la Fundación SalvaNatura y U.S.A.I.D. publicaron un inventario de flora y fauna (F. Serrano, ed., Biodiversidad y Ecología de la Cuenca de la Barra de Santiago/El Imposible) que lista 214 especies de aves registradas por Francisco Serrano, principalmente en bosque de galería en el occidente del parque, entre 1975 y 1983. La lista incluyó 10 especies por accidente (F. Serrano, comunicación personal), las cuales son *Automolus rubiginosus*, *Empidonax flavescens*, *Corvus corax*, *Catharus dryas*, *Anthus spinoletta*, *Piranga flava*, *Saltator maximus*, *Amaurospiza concolor*, *Haplospiza rustica*, e *Icterus wagleri*. Estas 10 especies no han sido registradas en el parque, pero las listamos para hacer posible el futuro uso de la lista publicada por SalvaNatura. Para las especies observadas por Serrano en el parque, listadas a continuación, no tenemos información directa sobre sus estados en El Imposible; sin embargo los migrantes de Norte América están señalados con un "V." Las 65 especies que no encontramos durante nuestro estudio en San Benito y Río Guayapa se presentan a continuación; seis indicadas con "Campana" fueron registradas únicamente en el sector de Cerro Campana (F. Serrano, comunicación personal).

FAMILIA/ Nombre Común	Nombre Científico	Nombre Inglés	Est.	Notas
ARDEIDAE				
Garcita blanca	<i>Egretta thula</i>	Snowy Egret	V	
Garcita azul	<i>Egretta caerulea</i>	Little Blue Heron	V	
Garza garrapatera	<i>Bubulcus ibis</i>	Cattle Egret		
CATHARTIDAE				
Zunche cabeza amarilla	<i>Cathartes burrovianus</i>	Lesser Yellow-headed Vulture		Hipotético
ACCIPITRIDAE				
Milano de cola blanca	<i>Elanus leucurus</i>	White-tailed Kite		
FALCONIDAE				
Querque	<i>Caracara plancus</i>	Crested Caracara		
PHASIANIDAE				
Codorníz	<i>Colinus leucopogon</i>	Spot-bellied Bobwhite		
COLUMBIDAE				
Tortolita rojiza	<i>Columbina talpacoti</i>	Ruddy Ground-Dove		
CUCULIDAE				
Cuclillo de pico amarillo	<i>Coccyzus americanus</i>	Yellow-billed Cuckoo	V	
Tres pesos pido	<i>Dromococcyx phasianellus</i>	Pheasant Cuckoo		
Pijuyo	<i>Crotophaga sulcirostris</i>	Groove-billed Ani		
CAPRIMULGIDAE				
Pucuyo	<i>Chordeiles acutipennis</i>	Lesser Nighthawk	V	
Pucuyo	<i>Caprimulgus carolinensis</i>	Chuck-will's-widow	V	
Pucuyo	<i>Caprimulgus vociferus</i>	Whip-poor-will	V	
APODIDAE				
Vencejo de garganta blanca	<i>Aeronautes saxatalis</i>	White-throated Swift	V	
TROCHILIDAE				
Mango de pecho verde	<i>Anthracothorax prevostii</i>	Green-breasted Mango		
Gorrión, Colibri	<i>Heliomaster constantii</i>	Plain-capped Starthroat		
TROGONIDAE				
Coa	<i>Trogon melanocephalus</i>	Black-headed Trogon		
PICIDAE				
Carpinterito del bosque	<i>Veniliornis fumigatus</i>	Smoky-brown Woodpecker		
Montañero de pelusilla	<i>Dryocopus lineatus</i>	Lineated Woodpecker		
FURNARIIDAE				
?	<i>Synallaxis erythrothorax</i>	Rufous-breasted Spinetail		
DENDROCOLAPTIDAE				
?	<i>Xiphorhynchus erythropygius</i>	Spotted Woodcreeper		Campana
TYRANNIDAE				
?	<i>Elaenia flavogaster</i>	Yellow-bellied Elaenia		

FAMILIA/ Nombre Común	Nombre Científico	Nombre Inglés	Est.	Notas
?	<i>Todirostrum cinereum</i>	Common Tody-Flycatcher		
?	<i>Mitrephanes phaeocercus</i>	Tufted Flycatcher		Campana;
			V	hipotético
?	<i>Contopus virens</i>	Eastern Wood-Pewee	V	
?	<i>Empidonax traillii</i>	Willow Flycatcher	V	
?	<i>Empidonax albigularis</i>	White-throated Flycatcher		
?	<i>Myiarchus cinerascens</i>	Ash-throated Flycatcher	V	
?	<i>Tyrannus melancholicus</i>	Tropical Kingbird		
Tijereta	<i>Tyrannus forficatus</i>	Scissor-tailed Flycatcher	V	
COTINGIDAE				
?	<i>Pachyramphus major</i>	Gray-collared Becard		Campana
?	<i>Pachyramphus aglaiae</i>	Rose-throated Becard		
HIRUNDINIDAE				
Golondrina de manglar	<i>Tachycineta albilinea</i>	Mangrove Swallow		
TROGLODYTIDAE				
Reyezuelo de casa	<i>Troglodytes aedon</i>	House Wren		
MUSCICAPIDAE				
Azulejo	<i>Sialia sialis</i>	Eastern Bluebird		Campana
VIREONIDAE				
?	<i>Vireo bellii</i>	Bell's Vireo	V	
EMBERIZIDAE				
?	<i>Vermivora pinus</i>	Blue-winged Warbler	V	
?	<i>Vermivora chrysoptera</i>	Golden-winged Warbler	V	
?	<i>Vermivora celata</i>	Orange-crowned Warbler	V	
?	<i>Vermivora ruficapilla</i>	Nashville Warbler	V	
?	<i>Dendroica pensylvanica</i>	Chestnut-sided Warbler	V	
?	<i>Dendroica tigrina</i>	Cape May Warbler	V	
?	<i>Dendroica fusca</i>	Blackburnian Warbler	V	
?	<i>Dendroica graciae</i>	Grace's Warbler	V	Campana
?	<i>Dendroica discolor</i>	Prairie Warbler	V	
?	<i>Setophaga ruticilla</i>	American Redstart	V	
?	<i>Seiurus noveboracensis</i>	Northern Waterthrush	V	
?	<i>Oporornis tolmiei</i>	MacGillivray's Warbler	V	
?	<i>Geothlypis trichas</i>	Common Yellowthroat	V	
?	<i>Cardellina rubrifrons</i>	Red-faced Warbler	V	Campana
?	<i>Icteria virens</i>	Yellow-breasted Chat	V	
Azulejo	<i>Thraupis episcopus</i>	Blue-gray Tanager		
?	<i>Thraupis abbas</i>	Yellow-winged Tanager		
Calandria	<i>Piranga rubra</i>	Summer Tanager	V	
Dichoso Fui	<i>Saltator coerulescens</i>	Grayish Saltator		
Calandria	<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak	V	
Azulejo	<i>Guiraca caerulea</i>	Blue Grosbeak	V	
Zacatero	<i>Passerina cyanea</i>	Indigo Bunting	V	
Canario	<i>Passerina ciris</i>	Painted Bunting	V	
?	<i>Melospiza bicarunculata</i>	Prevost's Ground-Sparrow		
Clarinerero	<i>Quiscalus mexicanus</i>	Great-tailed Grackle		
Chiltota	<i>Icterus spurius</i>	Orchard Oriole	V	
Chiltota	<i>Icterus pectoralis</i>	Spot-breasted Oriole		
Pico blanco	<i>Amblycercus holosericeus</i>	Yellow-billed Cacique		

Especies adicionales observadas en sectores occidentes del parque.--Jane Noll West estudió la nidificación de rapaces en el parque en 1979 y 1980, principalmente cerca de San Francisco Menéndez. Encontramos registros de 17 especies adicionales en su tesis de maestría (J. N. West, Central Washington University, 1988). Oliver Komar observó otras cinco especies cerca de San Francisco Menéndez en enero 1993. Algunas de éstas fueron también reportadas por Serrano (1993). Las especies adicionales se presentan a continuación:

FAMILIA/ Nombre Común	Nombre Científico	Nombre Inglés	Est.	Observador
ACCIPITRIDAE				
? <i>Spizaetus ornatus</i>	Ornate Hawk-Eagle	R P		J. West
? <i>Pandion haliaetus</i>	Osprey	V		J. West
? <i>Ictinia mississippiensis</i>	Mississippi Kite	V H		J. West
? <i>Circus cyaneus</i>	Northern Harrier	V		J. West
? <i>Accipiter cooperi</i>	Cooper's Hawk	V H		J. West
Gavilán cangrejero	<i>Buteogallus urubitinga</i>	Great Black-Hawk	R P	J. West
Gavilán pollero O. Komar	<i>Buteo nitidus</i>	Gray Hawk	R	J. West,
Gavilán zarado	<i>Buteo magnirostris</i>	Roadside Hawk	R	J. West
? O. Komar	<i>Buteo platypterus</i>	Broad-winged Hawk	V	J. West,
?	<i>Buteo swainsoni</i>	Swainson's Hawk	V P	J. West
?	<i>Buteo albonotatus</i>	Zone-tailed Hawk	R P	J. West
FALCONIDAE				
Halcón de cola rayada	<i>Micrastur ruficollis</i>	Barred Forest-Falcon	R P	J. West
Klis-Klis	<i>Falco sparverius</i>	American Kestrel	V P	J. West
?	<i>Falco columbarius</i>	Merlin	V H	O. Komar
Halcón caza murciélagos	<i>Falco ruficularis</i>	Bat Falcon	V P	J. West
?	<i>Falco peregrinus</i>	Peregrine Falcon	V P	J. West
COLUMBIDAE				
Tortolita inca	<i>Columbina inca</i>	Inca Dove	R	O. Komar
TYTONIDAE				
Lechuza	<i>Tyto alba</i>	Common Barn-Owl	R P	J. West
STRIGIDAE				
Tecolote del Pacifico	<i>Otus cooperi</i>	Pacific Screech-Owl	R H	J. West
APODIDAE				
Vencejo	<i>Panyptila cayennensis</i>	Lesser Swallow-tailed Swift	R	O. Komar
TYRANNIDAE				
?	<i>Tyrannus verticalis</i>	Western Kingbird	V	O. Komar
MUSCICAPIDAE				
?	<i>Catharus guttatus</i>	Hermit Thrush	V H	O. Komar
CONTEO:	22			

RESUMEN EN ESPAÑOL (CAPITULO 1)

INVENTARIO AVIFAUNISTICO DE LOS SECTORES SAN BENITO Y RIO GUAYAPA DEL PARQUE NACIONAL EL IMPOSIBLE.

Oliver Komar y Néstor Herrera

Se realizó un inventario básico de aves en el bosque de galería de la cuenca del Río Guayapa, y el bosque secundario cerca de la antigua hacienda San Benito, durante junio y agosto de 1994. En este informe, presentamos índices de abundancia relativa de las especies de aves encontradas, descripciones de tres clases de hábitat boscoso, y una lista de aves para visitantes del parque, especialmente a los sectores de San Benito y Río Guayapa (Apendice).

Area de estudio.--El trabajo de campo comprendió aproximadamente 475 ha (Figura 1.1). La mayoría del área estuvo muy perturbada por el cultivo de café y cultivos de granos básicos antes de 1970. La topografía es difícil, con valles profundos interceptando una cordillera baja. Las paredes inclinadas de estos valles se han desgastado hasta formar farallones en algunos lugares. La altura del área de estudio es entre 420 y 1050 msnm. La mayoría de bosque se encuentra recuperándose sobre antiguos cafetales, con altura de docel entre 15 y 20 m. Porciones de árboles más densos y menores de 12 m de altura se presentan en las milpas que han sido abandonadas, donde las quemadas han restringido el crecimiento de la vegetación, o sobre acantilados. Franjas angostas de bosque galería se encuentran en los barrancos mayores, por ejemplo, al lado del Río Guayapa; la altura promedio del docel es aproximadamente 25 m y los árboles más altos alcanzan 35 o 40 m.

Abundancia relativa de aves de bosque.--La frecuencia de detección para cada especie se determinó haciendo 48 conteos de punto, cada uno de los cuales es un censo de 10 minutos. La Tabla 1.1 es una lista de 82 especies registradas durante junio (temprano en la estación lluviosa). Ocho especies se presentaban en más de 50% de los puntos de

muestreo, considerándose "abundante." Se consideran "común o localmente abundante" 10 especies registradas en 20-49% de los puntos. Las 11 especies registradas en 10-19% se consideran como "común." Otras 19 especies encontradas en 5-9% de los puntos están clasificadas como "poco común." Las 33 especies adicionales son poco común, rara, o difícil de detectar. Las especies encontradas en Río Guayapa y San Benito fueron similares, pero 28 mostraron índices de abundancia bastante diferentes entre los dos sitios (Tabla 1.2). Habían 15 especies más abundantes en el bosque secundario de San Benito mientras 13 especies preferían el bosque de galería. Otras tres especies mostraban preferencias para el bosque de galería, pero las diferencias no se demostraron en los datos estandarizados: son *Dendrocincla homochroa*, *Dendrocolaptes certhia*, y *Platyrinchus cancrominus*, ninguna de las cuales fueron detectadas en San Benito.

El método de conteos de punto proporcionó una manera eficaz para determinar la abundancia relativa, medida como la frecuencia de detección, en la mayoría de las especies comunes y poco comunes. La estandarización del método permite la fácil comparación de una población de un área con la de otra. No obstante, las comparaciones solamente valen cuando las dos áreas han sido muestreadas durante períodos de mayor frecuencia de cantos para las especies bajo estudio. Se necesita más información sobre el comportamiento de cantos (por ejemplo, la probabilidad de detectar un ave por escuchar su canto) para mejorar el valor de los datos obtenidos de los conteos de punto. Algunos grupos de especies no fueron bien representados en los resultados del presente estudio, por su comportamiento de cantar con poca frecuencia. Tales grupos incluyen las rapaces (Cathartidae, Accipitridae, Falconidae,

Strigidae), los rálidos de bosque (*Aramides sp.*), los colibríes (Trochilidae), los vencejos (Apodidae), y los tapacaminos (Caprimulgidae). Las especies migratorias también vocalizan infrecuentemente en sus territorios invernales.

Estructura de bosque y abundancia de árboles.--Las tres clases de bosque en el área de estudio son (1) bosque maduro de galería, (2) bosque joven de galería (menos de 25 años), y (3) bosque secundario mesetario (principalmente alrededor del casco San Benito). En la clase 1, 13% de los árboles sobrepasan los 20 m, mientras en el bosque de la clase 2, solamente 3.6% sobrepasan los 15 m, y ninguno alcanza los 20 m (Tabla 1.3). El bosque clase 2 ocurre en parches de menos de 25 ha dentro de la clase 1. El bosque clase 3, como la clase 2, tienen más de 70% de sus árboles menos de 10 m de altura, pero tiene tres veces más árboles con altura mayor de 15 m, debido a su anterior uso para cafetal de sombra. La densidad e identificaciones de los árboles en cada clase de bosque se presentan en la Tabla 1.4. Las especies más abundantes en el bosque maduro de galería son *Brosimum alicastrum*, *Terminalia oblonga*, *Faramea occidentalis*, y *Licania retifolia*. Las especies más abundantes en el bosque joven de galería son *Guazuma ulmifolia*, *Psidium guajava*, *Aphelandra sp.*, y *Enterolobium cyclocarpum*. En el bosque secundario mesetario, las especies dominantes son *Cecropia obtusifolia*, *Piptedenia constricta*, y *Muntingia calabura*.

Captura de aves con redes de neblina.--Capturamos 178 aves de 28 especies durante siete días en agosto, permitiendo la confirmación de reproducción local en 19 especies. Seis especies formaban 69% de todas las capturas (Tabla 1.5), siendo en orden de abundancia, *Chiroxiphia linearis*, *Euthlypis lachrymosa*, *Basileuterus rufifrons*, *Cyanocompsa parcellina*, *Vireo flavoviridis*, y *Thryothorus rufalbus*. La captura con redes no proporcionó muchos datos nuevos en cuanto a la abundancia relativa de aves reproductoras del bosque, pero sí proporcionó información muy valiosa sobre la reproducción, demografía, y el período de

muda en las especies capturadas. El método puede ser más importante para estudios de las poblaciones avifaunísticas de la estación seca, cuando se presentan muchas especies migratorias y pocas especies cantan frecuentemente.

Contribuciones ornitológicas y prioridades de conservación.--Se presentan observaciones interesantes de 20 especies de aves, incluyendo siete que se han reportado raras veces en El Salvador. Estas son *Leptodon cayanensis*, *Aramides axillaris*, *Dendrocolaptes certhia*, *Platyrrinchus cancrorninus*, *Sayornis nigricans*, *Seiurus motacilla*, e *Icterus maculialatus*. Entre las especies más importantes del punto de vista de las prioridades de conservación, son dos especies de rapaces grandes que tienen pocos refugios en El Salvador, *Sarcoramphus papa* ("rey zope") y *Spizaetus tyrannus* ("águila crestada"), además *Campephilus guatemalensis* ("cheje carpintero"), y 13 especies conocidas del parque y de ningún otro lugar en El Salvador desde 1980, presentadas a continuación: *Leucopternis albicollis*,* *Spizaetus ornatus*, *Penelope purpurascens*, *Crax rubra*, *Geotrygon montana*,* *Hylomanes momotula*,* *Sittasomus griseicapillus*, *Dendrocincla homochroa*,* *Dendrocolaptes certhia*, *Oncostoma cinereigulare*, *Mionectes oleaginea*, *Platyrrinchus cancrorninus*, y *Vireolanius pulchellus*.* Dentro de estas especies, cinco (indicadas con un asterisco) nunca han sido registradas en El Salvador fuera del parque.

COMPLEJO SAN MARCELINO
WILDLIFE REFUGE.CHAPTER 2: AVIAN INVENTORY
OF BOSQUE LAS LAJAS,

Oliver Komar and Néstor Herrera

INTRODUCTION

Las Lajas forest is one of three principal sections in the Complejo San Marcelino wildlife refuge. It is the only section that has never been studied by biologists of any kind. Las Lajas is a broadleaf, part evergreen, mostly undisturbed forest growing on the rich soil of the inner slopes of the Coatepeque collapse basin (caldera). The highest trees reach 40 m, although the majority of the canopy is formed by trees 20 to 25 m tall. It is a very different habitat, and much older, than the other sections of the refuge, La Presa and San Isidro. La Presa is a dry deciduous forest growing over a relatively recent (<300 years) lava flow from the San Marcelino volcano (Williams & Meyer-Abich 1954), where the lava spread across the western end of the Zapotitán basin. San Isidro is evidently mostly grassland, also over an old lava flow (W. Rodríguez, personal communication). Separating the three sections of the refuge are coffee plantations, and the villages of Las Lajas and San Isidro, as well as scattered milpas or pastures.

Jose Maria Rossa, the forest vigilante for the Las Lajas Cooperative and caretaker of the cooperative's retreat on the shore of Lake Coatepeque (the "Casa del Lago") which is adjacent to the forest, provided us with many details about hunting at the forest. People who live in the area have been known to eat a wide variety of the forest's fauna and avifauna. However, wildlife provides only an occasional supplement to the local diet. All hunting is in fact illegal, but there has been no enforcement at Las Lajas. Sport hunting is greatest from October to January, focusing on white-tailed deer (*Odocoileus virginianus*) and armadillos (*Dasybus novemcinctus*), but any animal is fair game. While we stayed at the Casa del Lago, residents there ate squirrel (*Sciurus variegatoides*), rabbit (*Sylvilagus floridanus*), and even an anteater (*Tamandua tetradactyla*).

Since the agrarian reform act in 1980 the forest has been part of the Las Lajas Cooperative, a coffee growing consortium of some 1000 or more families. Most of these families and all of the coffee plantations are on the outer slopes of the Coatepeque caldera, whereas the natural forest lies on the steeper inner slope. The cooperative provides vigilance against illegal logging in the forest, and maintains the road by which one can drive a vehicle through the middle of the forest, climbing out of the caldera. Locked gates at each end of the road restrict traffic. Several years ago,

the cooperative took advantage of a national program to reduce its debt by "selling" back to the government unfarmed land. The Las Lajas forest, as well as adjacent lakeshore forest that belonged to the Los Pinos Cooperative, was then given back to the government. In June of 1994, the Salvadoran Association for the Conservation of the Environment ("ASACMA"), a non-profit organization in San Salvador, signed an agreement with the El Salvador Service of National Parks and Wildlife to manage the forest together with nearby partially forested lava fields of the San Marcelino volcano, in what is now known as the Refugio de Vida Silvestre Complejo San Marcelino. In January 1995, ASACMA employed a staff person to prepare a management plan for the area.

The purpose of the present study is to provide the first data on the relative abundances of birds in the forest. In so doing, we aim to identify bird species which may be of special conservation concern. We also provide preliminary data on relative abundance of tree species.

STUDY AREA

Las Lajas forest, elevation 745-1100 m, consists of about 300 ha of primary broadleaf mostly-evergreen forest, and about 100 ha of a highly-disturbed 12-year-old secondary forest along its edges, including 12 year old plantations of pine (Figure 2.1). In addition, a narrow strip (100 m wide) of primary forest extends about five km to the northeast along the edge of Lake Coatepeque. Adjacent to this strip are coffee plantations (Cooperativa Los Pinos) covering the inner slope of the caldera. There is also about 50 ha of primary forest on Isla Teopán, a private retreat owned by Antonio Cabrales, the former Minister of Agriculture and Livestock.

Our studies took place in the forest itself, including the strip of lake-side forest up to about 2.5 km from the Casa del Lago (see map in Figure 2.1), and the pine plantation on the south border of the forest. We did not collect data from the surrounding coffee plantations, nor from Isla Teopán or Cerro Pacho.

Between 10 July and 31 August, some natural change occurred in the forest. We observed four new tree falls, and heard a large branch fall on 31 August. Evidently the steepness of the caldera walls (about 35° average) and loose soil lend instability to the forest.

We were warned against working in the forest during September afternoons, when "hurricanes" crossing the lake can fell trees and branches.

METHODS

We observed birds on 27-30 December 1993 (Komar, with assistance from Wilfredo Rodríguez and Juan Pablo Domínguez), 22-27 May 1994, 6-9 June 1994, 29 June-9 July 1994, and 30 August-9 September 1994. Accommodations at the Casa del Lago were provided by the Cooperativa Las Lajas, and the house's gracious caretakers, Jose María Rossa and his family. The July visit was a training workshop in methods for monitoring bird populations, sponsored by the Point Reyes Bird Observatory, United States Forest Service, and Wildlife Conservation Society (Komar and Borja Milá, instructors), involving 16 biologists. On 9 July 1994, these observers split into five teams to conduct an intensive morning survey of the birds throughout Las Lajas forest. The results of this one-day survey are reported separately in Table 2.1.

Relative abundance of birds.--We determined frequency of detection of birds at a series of independent points, as an approximate estimation of relative abundance. Only point counts conducted in the early rainy season (late May and June) have been included in the results. We censused 32 points, visiting eight on 24 May 1994, six on 25 May, seven on 26 May, one on 27 May, seven on 7 June, and three on 8 June. Each census was a ten minute count of all birds seen and heard from a point within the forest, and at least 50 m from the edge of the study area. We selected points at 200 m intervals along existing or former trails which we reopened. If the trail curved or doubled back between points, we added either 50 or 100 m to the measurement, being sure to keep a straight line distance of at least 200 m between study points. We counted birds at all distances, but deleted the most distant birds from the census if they were subsequently or previously recorded at a neighboring point. We omitted uncertain species identifications.

We conducted the censuses between 05:45 and 08:30 h, CST, on days with good weather (no or low wind, no precipitation). Most days had clear skies. Temperature was constant, in the 22-25°C range. Two people participated in the censuses but only one (Komar) counted and identified birds. The other (Herrera) collected data on the forest structure and topography at each point (these data are not presented in this report). Each observer recorded his own data. We tape recorded most censuses to provide corroboration of the song identifications.

We define our use of relative abundance terms as follows. "Abundant" species were present at more than 50% of the census points. Species found at 20% to 49% of the points we classify as "common or locally

abundant." The species found at 10% to 19% of the points we call "common." We consider "uncommon or locally common" those species recorded at 5 to 9% of the points. Species not recorded at sampling points but nonetheless present we classify as either rare, uncommon, or difficult to detect.

Forest structure and tree abundance.--We selected a representative series of plots of 0.1 ha each in which we identified and measured every tree with a diameter at breast height (DBH) of 10 cm or more. The plots were located along 100-m segments of trails, and included 5 m on each side of the trail (1000 m²). We marked the beginning and endpoints of each plot with flags, and recorded their positions in our notes. The start points along trails were selected randomly. We purposely conducted more tree censuses in the principal habitats; thus three-fourths of the plots were in primary forest, and one-fourth in secondary forest, roughly equivalent to the actual ratio of primary to secondary forest in the study area.

Trees were identified with local names in the field, and their heights estimated, by Jose María Rossa and Raul Villacorta. The latter collected samples when possible, for confirmation at the Jardín Botánico La Laguna. We later cross-referenced local names with available information to determine the appropriate scientific names. Apart from unpublished information provided by the botanical garden (via Raul Villacorta), our sources were limited to a list of tree species and local names from the El Imposible region (Reyna de Aguilar 1993).

The local tree names vary in different parts of El Salvador, and are not always possible to determine without collecting samples of the plant material. We caution that we have not made an independent effort to confirm the identification of the trees. We present tree identifications with the goal of demonstrating the principal differences between major forest types. We by no means intend to present an inventory of the trees of our study area.

Bird capture with mist nets.--The mist nets used were standard 12 m x 2.6 m, with 36 mm black nylon mesh, provided by the Association of Field Ornithologists. For net poles, we used 3-m stems from young trees. In July (during training sessions) we used eight to ten single nets usually placed at intervals of 50 m. We operated nets at four separate stations, each for two to three days in the morning, but also occasionally in the late afternoon. Methods in July were not standardized, but rather designed to maximize capture rate, since training was the main objective. During the standardized sampling for this study, we always used nine double-nets, spaced approximately 50 m apart. Net sites were labeled permanently with numbered metal tags on trees near the central post, and maps of the net trails were prepared in our field notes. We

operated nine double-nets for 6.5 h from 06:00 to 12:30 each day, on three mornings each at two stations ("El Pinar" 2-4 September, and "Las Tumbas" 7-9 September). Most birds captured in July and September were banded with a numbered yellow plastic ring on the tarsus. Hummingbirds were not banded, but were marked by clipping a tail feather. Birds were marked in order to identify recaptured individuals.

Statistical methods.--We used statistical table analysis to test differences in detection frequency. We considered the 5% level of probability (chi-square > 3.840) to be significant, but included non-significant differences in the tables if $P < 0.25$ (chi-square > 1.320) and non-standardized observations corroborated the difference. The detection frequency percentages in the tables were determined from the raw data by dividing the number of points where each species was present by the total number of points at the study site, and then multiplying by 100 to obtain a percentage. The average number of individuals per point has not been presented, given that we can not distinguish vocalizing family groups from multiple territorial males (as in the Blue-crowned Motmot and Elegant Trogon, which were usually counted several times at each point). We also thereby avoid overcounting some loud singers (tinamous for example calling at once from distant territories) relative to soft singers which are likely to be heard only from the nearest territory.

RESULTS

RELATIVE ABUNDANCE OF BIRDS

We recorded 86 species during the early rainy season (Table 2.1). A complete list of species, including migratory species observed in December and additional species observed in August and September, presented in taxonomic order and with status, may be found in the Appendix. In addition to the detection frequencies, Table 2.1 includes the total number of individuals recorded during the point counts and the results of an intensive one-day, five-team survey over the same terrain. Some of the differences between the point count results and the one-day, multi-observer survey, are undoubtedly due to observer bias: most of the July surveyors were not as experienced at bird-song identification as the point-count censuser.

We recorded 12 abundant species, 16 common or locally abundant species, 10 common species, and 14 uncommon or locally common species. Of the remaining 34 species, 31 are either uncommon, rare, or difficult to detect; only 17 of these were recorded on point counts. Three species are aquatic and should not be considered part of the Las Lajas forest avifauna (none was recorded on a point count census).

FOREST STRUCTURE AND TREE ABUNDANCE

We identified three principal forest types in the study area: primary upland forest, secondary upland forest, and 12- year-old pine (*Pinus oocarpa*) plantation. In the primary upland forest, there is an even distribution of trees among five size classes, including many large trees (15.5% of trees surpass 20 m height, 20.8% have DBH greater than 40 cm), while in the secondary upland forest, only 3.9% of the trees surpass 20 m (Table 2.2). These large trees are either at the edge of the primary forest or were left standing when the area had last been cleared. The DBH in the younger forest surpasses 40 cm in only 6.8% of the trees. The secondary upland forest also has a much more open canopy, and abundant grasses in the lowest strata. We were unable to determine if any of the primary forest birds avoided the secondary forest, but we suspect not. The pine plantation only has one species of tree, all of which were about 7 m tall, and has a highly disturbed understory of shrubs and grass. We found two species of bird, the Rusty Sparrow (*Aimophila rufescens*) and Barred Antshrike (*Thamnophilus doliatus*), virtually restricted to this habitat (within the study area), but some of the typical forest birds wandered into the pines.

The density and identifications of trees in the two principal forest types is presented in Table 2.3. At the primary upland forest, just two of the 58 species recorded form more than 5% each of the tree community. They are *Bursera simaruba* (6.4%) and *Sapium sp.* ("Chilamate," 5.2%). In stark contrast, the secondary forest plots, in which we identified only 32 species (the species list may be larger if the sample size were increased to equal to that of primary forest), five species form 54.5% of the tree community. These are *Heliocarpus sp.* ("Calagua," 27.2%), *Cordia alliodora* (8.7%), *Eugenia aeruginea* (7.0%), *Lysiloma divaricatum* (5.8%), and *Trichilia americana* (5.8%). Since there is a large variation in size and age classes within these species, an analysis of basal area may provide a better measure of species dominance.

The primary forest at Las Lajas does not reach the shores of Lake Coatepeque, except to the east of the reserve. The narrow plane along the lake has been cleared for milpas. The tree community in the lakeshore forest may be different from the primary upland forest community we sampled; however, bird censusing in the lakeshore forest did not detect any species of birds that were not also detected in equal or greater numbers in the upland forest of the reserve.

BIRD CAPTURE WITH MIST NETS

During July and September we captured 155 birds of 33 species (Table 2.4), of which eight birds of five species were North American migrants. Local

breeding was confirmed for 16 species by the presence of brood patches and local juveniles. Six species comprised 60% of all captures. In order of abundance they were (number following species is the actual number captured): Rufous-capped Warbler 40; Plain Wren 16; Rufous-and-white Wren 12; Long-tailed Manakin 10; Fan-tailed Warbler 8; and Orange-billed Nightingale-Thrush 7. All of the Plain Wrens were captured in secondary forest.

ORNITHOLOGICAL CONTRIBUTIONS

The geographical location of Las Lajas, on a steep slope facing opposite a small mountain, the Isla Teopán volcano, creates an acoustic phenomenon that allows the loudest singers to be heard quite clearly as they sing from the island more than 900 m across the lake. We often heard the Laughing Falcon, White-bellied Chachalaca, and Mottled Owl singing from the island. Another geographical feature influencing the observation of birds is the partially underground permanent stream that flows through the La Vertiente quebrada. This is the only open water in the forest except immediately after rain storms. Here on 9 June 94 we were able to observe numerous hummingbirds visiting the pools to bathe and/or drink. Generally hummingbirds were difficult to observe as they zipped through the forest. At the springs we saw at least three Berylline Hummingbirds, a male Fork-tailed Emerald, and a male Violet Sabrewing. An oddly plumaged hummingbird, probably a Long-billed Starthroat (described below), also visited the stream.

Many northern migrant species occupied the forest in December but not during May through September. On 31 August 94, after a seven week absence, we returned to find several migrant species present or passing through. The resident species had formed roving feeding flocks which were not observed earlier in the rainy season (which began in May). The most noteworthy observations of birds during the entire study period are presented below in the form of species accounts. Nest or nesting observations are provided for the Collared Araçari, Tropical Pewee, Long-tailed Manakin, Bushy-crested Jay, Yellow-throated Euphonia, Bar-winged Oriole, and Streak-backed Oriole. Additional species showed evidence of breeding, such as brood patches and recently fledged birds in their juvenal plumage. These species are noted in Table 2.4.

Species accounts

Magnificent Frigatebird *Fregata magnificens*. On 7 June 94, a frigatebird swooped down to the surface of Lake Coatepeque about 300 m from the Casa del Lago, and then flew towards the center of the lake, disappearing behind Isla Teopán. The lake is some 40 km inland; frigatebirds or other coastal birds must

cross an 1100 m high ridge in order to discover the lake, which is at 745 m above sea level. Local residents claim to see "pelicans" from time to time, usually in November. On 7 August 94, Komar observed three frigatebirds at Lake Olomega (with W. Rodríguez and C. Dueñas), also inland (12 km) but at a much lower elevation (the lake is below 200 m).

Turkey Vulture *Cathartes aura*. Every evening in early September a group of about 60 Turkey Vultures roosted inside or on the rim of the forested summit crater of the small volcano on Isla Teopán.

Red-tailed Hawk *Buteo jamaicensis*. Only one seen, on 9 June 94. It was mostly white below.

Short-tailed Hawk *Buteo brachyurus*. On 4 September 94, we observed two soaring high over the forest, giving a one-note high clear whistle call. Early in the morning (05:40 h) Herrera observed a Short-tailed Hawk, perhaps one of the same individuals, dive at a flock of Pacific Parakeets (*Aratinga strenua*). On another occasion Komar saw flying parakeets react to the presence of a Short-tailed Hawk by changing course and diving into the forest.

Osprey *Pandion haliaetus*. Fabricio Pérez and Karla Pérez called our attention to an Osprey on 2 July 94. The bird was flying and perching near the shore of Isla Teopán.

Collared Forest-Falcon *Micrastur semitorquatus*. Herrera first heard this bird on 1 September 94. We heard it again on 2 September and 7 September, always from virtually the same location (Cedro Real trail). It sang at sunset and well before sunrise. On each occasion it repeated its distinctive cries (it sounds like it is sad and is in great anguish) several times. We never saw the bird.

Rufous-necked Wood-Rail *Aramides axillaris*. We did not see or hear this species with certainty until September, however two unidentified songs in May may have been this species (a loud "tidik, tidik, tidik..." heard on 24 May 94, and a "dik dik dik..." heard on 26 May). When we arrived on 30 August 94, Sr. Rossa and his son told us they had recently seen "tambores," and their description matched this species. In El Imposible, local people call this bird the *tamborcito*. Alicia Díaz saw one 1 September 94 in scrubby undergrowth in the 12-year-old *Pinus oocarpa* plantation, about 25 m from the edge of the primary forest at about 1000 m above sea level. About 100 m further into the primary forest from that point, Komar saw one on 4 September 94 high in a tree. Despite being a rail (generally ground-dwelling), the bird was calling from a hidden perch about 12 m up. It flew with slow wingbeats to another perch about 15 m above the ground. The call, unlike other calls we heard from this species, was a soft series, like laughing. The quality of the call suggested either a raptor or an aquatic bird. On 6 September 94, dogs flushed two wood-rails very near the Casa del Lago, but in the forest at an elevation of about 760 m above sea level.

KOMAR & HERRERA • AVIAN INVENTORY OF BOSQUE LAS LAJAS

The birds gave a loud harsh alarm, and then hid in dense tangles 1-2 m above the ground. We flushed them again, observing that the two birds flew in opposite directions. Following one we eventually relocated it (thanks again to a dog) and Komar observed it clearly as it perched 3 m above the ground on a bare branch 15 m away. Sr. Rossa says that this species is common throughout the forest, but it only becomes vocal after July. We never heard one calling regularly or often.

White-bellied Chachalaca *Ortalis leucogastra*. At least seven pairs of chachalacas occupied the Las Lajas forest during our studies, while another pair called regularly from Cerro Pacho about 500 m across a small coffee finca from the Casa del Lago. At least four pairs occupy the south side of Isla Teopán, about 900 m across the lake. Calling is infrequent, so counting is difficult. However, the loud calls carry more than 1000 m across the valley. Birds singing on the island can occasionally be heard near the rim of the caldera (south side of Las Lajas forest), about 2 km away. On 24 May 94, Herrera flushed a chachalaca from a nest in the crown of an *Acacia hindsii* along the Chara trail. At mid-day on 6 Jul 94, Komar heard four pairs each duetting from a different direction, as if singing a round.

Buffy-crowned Wood-Partridge *Dendrortyx leucophrys*. We never heard the distinctive "gualchoca" call of this species in May, June, or July, but when we arrived on 30 Aug 94, at least four birds were calling near the lakeshore at 18:30 h, well past sunset. As they finished the chorus ten minutes later, the Mottled Owls (*Ciccaba virgata*) began their own chorus. We would hear the wood-partridges periodically, at various times of day and at all elevations, during our 10-day stay. Komar once saw one that was flushed by a dog and then perched in a tree.

Singing Quail *Dactylortyx thoracicus*. We found the species common on the upper slopes of the forest. Twenty-one birds, mostly or all singing, were counted during a survey on 9 July 94. In early September, singing continues although less urgently. At this time one hears shorter and weaker songs, perhaps made by young birds. A daily maximum of five birds were heard singing during late December 93 (without conducting a comprehensive survey). The skin of a juvenile male was preserved and donated to the collection of the El Salvador Museum of Natural History. The young male, collected on 3 September 94, had less than one-third ossification on its skull. The bird was heavily molting both body and flight feathers, and the older juvenile feathers are noticeably thin (fewer barbs).

The Singing Quail has a very spotty distribution in Central America, and in fact each isolated population has been described as a separate subspecies, with three populations reported from El Salvador, two from

Honduras, and several others from Guatemala and Chiapas (Warner & Harrell 1957). The three reported populations in El Salvador are from the San Miguel volcano complex, Cerro Cacaguatique, and the third from Cerro El Aguila, a volcanic cone about 12 km northwest of Las Lajas. The presence of this species at Las Lajas and in El Imposible National Park, some 50 km to the west, suggests this local population is more extensive than previously known.

Northern Jacana *Jacana spinosa*. Only seen once, at 17:38 h on 24 May 94. Two adults flew past the Casa del Lago then crossed the lake and settled on the shore of Isla Teopán.

Spotted Sandpiper *Actitis macularia*. Two were on the lakeshore on 31 August 94.

White-tipped Dove *Leptotila verreauxi*. On 5 July 94, an active nest was found by Borja Milá and other observers. The nest contained two young.

Pacific Parakeet *Aratinga strenua*. Small bands of these parakeets are constantly crossing and occupying the forest. They roosted on Isla Teopán, and were seen flying across the caldera rim towards the coffee plantations on the caldera's outer slopes. The bands usually contain less than 20 birds (on 5 September one flock had 32). Sr. Rossa described three nesting colonies, each in a different canyon. Local people rob young parakeets from the nests, although access is apparently difficult. Few such nesting colonies have been reported in the literature (possibly only three) for all of El Salvador. Evidently no colony in El Salvador receives protection or is guarded against thievery. Sr. Rossa said that nesting takes place in August and September. We noted bands consisting of some paired birds in early September but didn't try to locate the nests. It is difficult to observe the birds well, but we never were able to see the red-throated Green Parakeet (*Aratinga holochlora*) which may only be a non-breeder visitor to El Salvador (Thurber et al. 1987). On 5 July 94, B. Milá and other observers reported a group of 16 *strenua* eating fruits of a *Ficus* tree.

Mottled Owl *Ciccaba virgata*. On 26 May 94, between 04:00 h and 05:10 h, we heard five different Mottled Owls calling as we walked from the Casa del Lago more than 1 km up the Calle del Pacún (passing through the forest). The owls were calling from both the woods and the surrounding areas, including 1000 m away from Isla Teopán. We heard five again in the early morning of 2 September 94. In December we heard Mottled Owls in the coffee plantations on the outside of the Coatepeque caldera.

Barn Owl *Tyto alba*. Herrera saw and heard one in the milpa near the Casa del Lago on 8 July 94.

Lesser Swallow-tailed Swift *Panyptila cayannensis*. On 9 Jun 94 we observed two pairs of swifts, possibly this species, flying incredibly fast with one bird chasing another, over La Vertiente quebrada. They were emitting rapid notes with an electric and buzzy quality, reminding me of a distant Eastern

Kingbird (*Tyrannus tyrannus*). Herrera saw a swift that may have been one of the same individuals on 6 July 94.

Great Swallow-tailed Swift *Panyptila sanctihieronymi*. Komar carefully observed two of these large swifts as they foraged over the forest, and then flew out over the lake to the north on 9 July 94. We only know of one prior report for El Salvador, in August 1992 near the Honduran frontier (also by Komar).

Violet Sabrewing *Campylopterus hemileucurus*. Probably not as rare as our few sightings would suggest. We caught two females in nets (December 93 and July 94), and we saw a male at La Vertiente on 9 June 94. However, on 7-9 September 94 we heard three males singing near our mist nets. Evidently the males do not sing in May, June, and July, as we had passed near these same song perches many times during those months. The male sings (incessantly) "chip chip chip cheep chip chip cheep...." from a position less than 2 m above the ground, among the dense understory of a tree fall or well-lit space in the forest.

Fork-tailed Emerald *Chlorostilbon canivetii*. We have records from December 93, and June, July, and 31 Aug (1994).

Blue-throated Goldentail *Hylocharis eliciae*. This species was commonly found singing in December 93 and between 31 August 94 and 9 September 94; in May, June, and July 1994 it was seen at least once but never heard. It could easily have been missed during those months. The song is a five or six-note phrase, "ti-tseet-de-de-deet," repeated incessantly. Often two or more males are singing within 50 m of each other. The call, unlike other hummingbirds we observed in this forest, is a double note repeated, "tsi-tsi, tsi-tsi." Generally the call is given while in flight, and the song is given while perched on a small bare branch in a small clearing beneath the canopy. We found at least six males singing at three locations on 31 August 94.

Berylline Hummingbird *Amazilia beryllina*. We suspect that most unidentified hummingbirds on the censuses are this species, since most gave a flight call (a slightly descending trill) that we traced to the Berylline Hummingbird, but unfamiliarity with all of the hummingbirds' flight calls prevented a secure identification. Although we caught several in mist nets, hummingbirds generally see the nets and avoid them, so the capture rate is not a good measure of relative abundance. Despite little standardized data, the Berylline was the most commonly observed hummingbird. We often identified five or six in one day (31 August 94 for example), whereas the other hummingbird species were not even seen daily (except for Cinnamon Hummingbird [*A. rutila*] at the forest edges).

Cinnamon Hummingbird *Amazilia rutila*. On 3 September 94 we found two or more of these

hummingbirds singing in a tree-fall clearing just inside the forest, at 1000 m above sea level. Although this species is common in open areas and cities, we had never before heard the song, an incessant "zeeu zeeu zeeu zeeu ..." On 7 September 94, Herrera saw one bathing itself in Lake Coatepeque.

Long-billed Starthroat *Heliomaster longirostris*. At 07:25 h on 6 September 94, Komar briefly observed one within 10 m at the Casa del Lago. It was emitting a soft chip note, similar to that of the Cinnamon Hummingbird but hoarser. The field marks were carefully noted, but light conditions precluded seeing the shiny metallic colors of the forehead and throat. There would be no reason to doubt that it was a Long-billed Starthroat except for a very similar bird Komar observed on 9 June 94 at the La Vertiente pools, that had all the same characteristics except, due to better light, it showed a green throat. The Long-billed Starthroat has always been described with a red throat. The original field description (translated from the Spanish description written in Komar's field notebook) is as follows:

"It had a metallic green throat, but very restricted, with white borders on the sides of the throat. The throat was less brilliant green than a Berylline Hummingbird, but I did not observe any white spots or flecks in the throat. It had dark olive flanks, contrasting with the whitish belly. Its head and back/wings were very dark, except for a very evident white spot behind the eye, and its forehead was metallic blue."

The bird was observed for just a few seconds as it hovered over the water, but the description was immediately noted as the species was not recognized. The Green-throated Mountaingem (*Lampornis viridipallens*) was ruled out because of its white-flecked green throat; the local subspecies has whitish flanks (Dickey & van Rossem 1938). Could there be a green-throated morph or plumage of the Long-billed Starthroat? At any rate, we have only these two observations, so if the bird is resident at Las Lajas it seems quite rare.

Plain-capped Starthroat *Heliomaster constantii*. While not registered during censuses, we encountered this species three times in the forest in late May and early June 1994, and Komar found two along the edge of the forest near the lakeshore about 2 km to the northeast of the Casa del Lago on 9 July 94. Rarely reported in El Salvador (Thurber et al. 1987).

Collared Araçari *Pteroglossus torquatus*. At 13:16 h on 25 May 94, Komar observed an araçari enter a small hole in a 35 m high White Conacaste (*Enterolobium cyclocarpum*) tree, and heard young begging for food. The tree was 80 m south of the Casa del Lago, 20 m from the edge of the undisturbed forest. The nest hole was in a major branch of the central trunk, about 25 m above the ground but below the canopy, about 2 m from the center of the tree, and

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15-20 m from the edges of the huge canopy. The hole faced west, was roughly square, and just large enough for the toucan to enter. The branch was about 60 cm wide at the nest hole. The tree's DBH was 247 cm, circumference 7.77 m.

Paltry Tyrannulet *Zimmerius vilissimus*. This species is uncommon yet seemingly territorial, given that calling birds were repeatedly found in certain trees or groups of trees at scattered points in the forest. One favorite tree was a *Terminalia oblonga* ("volador"). The birds were only occasionally glimpsed high in the upper canopy, but often sang. The most frequent song (or call) was a simple, rich and clear, "dooo-dee," the second note higher and shorter. Also heard was "dooo-dee-dee," or just "dew" or "tew," sometimes often repeated. On 31 August 94, Komar heard at least four different birds. On 9 September 94, a tyrannulet gave a rapid dry trill, "di-di-di-di-di-di," reminiscent of the song of the Yellow-winged Tanager (*Thraupis abbas*).

Sulphur-bellied Flycatcher *Myiodynastes luteiventris*. The latest date we recorded this breeding visitor to El Salvador was 6 September 94. At Las Lajas it is found almost exclusively along the lakeshore.

Least Flycatcher *Empidonax minimus*. Two of this migrant visitor were seen and heard (the "wip" call note) on 31 August 94.

Tropical Pewee *Contopus cinereus*. In late May we found an active nest in a 25 m cedar tree (*Cedrela odorata*) at the edge of a corn field some 50 m from the Casa del Lago. The tree had not yet grown out its leaves. The nest was a small cup about a third of the distance from the outermost branches toward the trunk, and roughly 12 m above the ground. It was placed at the intersection of two small branches. By July the nest was concealed by foliage.

Olive-sided Flycatcher *Contopus borealis*. On 1 September 94, and again on 2 September, we observed this species hunting insects from a perch atop an 18-m dead tree, at an elevation of approx. 1000 m above sea level. The bird used the perch for at least 10 min at one time and allowed us to pass nearly directly underneath.

Masked Tityra *Tityra semifasciata*. Komar observed a female eating fruit of *Bursera simaruba* on 8 June 94.

Rose-throated Becard *Pachyramphus aglaiae*. Evidently a rare bird in this area. One was reported to me by birders on 3 July 94. Two were reported during a five-team survey on 9 July 94. W. Rodríguez and Komar saw one in December 93.

Long-tailed Manakin *Chiroxiphia linearis*. On 26 May 1994, we encountered a female manakin carrying nesting material, near the head of the La Vertiente quebrada, about 400 m above the Las Tumbas trail. Here a small stream passes through a canyon about 20 m wide with steep cliff-like walls about 75 m high.

The nest was 0.5 m from the ground on a tiny bush or sapling that was growing nearly horizontally from the steep (40°) slope. The nest contained fern roots and dead leaves. The nest was just a few meters from the main stream bed, although at the time there was just a trickle above ground. This is the only stream in the Las Lajas forest, but being near water can not be a prerequisite for the species as it is common in many areas with no stream. The female emitted a short two-note call, the first note higher in pitch than the second, a call frequently heard on censuses.

Northern Rough-winged Swallow *Stelgidopteryx serripennis*. Komar noted a pair at the lakeshore 24 May 94 and in subsequent days, but the species was not noted later in the year.

Bushy-crested Jay *Cyanocorax melanocyaneus*. Borja Milá and other observers found a nest with young in the La Vertiente quebrada on 6 July 94. They observed abundant snail shells of two types below the nest suggesting an important food source for the jays. Juan Pablo Domínguez found the nest abandoned on 9 July. Herrera saw adults and immatures eating the fruits of the *Trema micrantha* ("capulín macho") tree on 31 August 94.

Blue-gray Gnatcatcher *Poliptila caerulea*. Komar found up to four in one day during the short December 1993 visit. He heard two calling (cat-like, high "mew") on 31 August 94, and encountered the species daily thereafter (until leaving on 9 September 94). Las Lajas seems to be near the southern limit of the winter range of this gnatcatcher, only recently reported in El Salvador (O. Komar, in prep.).

Swainson's Thrush *Catharus ustulatus*. Eight were caught in mist nets and two were seen in December, indicating that this migratory visitor is abundant in the forest's lower strata during the northern winter.

Rufous-browed Peppershrike *Cyclarhis gujanensis*. The songs of this species can cause much confusion. They have two distinctly different song types, each of which can be given with considerable variation, and it is hard to believe that they come from the same species. The most common song, at least during May through July, is a bubbly burst of loud sweet, alternating high and low notes, resembling the gobbling of a turkey but slower, sometimes slowed down so much as to say "wichee wichee wichee wich," and occasionally resembling the "wicity wicity wicity" of a Common Yellowthroat (*Geothlypis trichas*). The pace usually speeds up near the end of the song, except for a lengthy last note. Some local bird observers know this song as the *Pavito* (or "little turkey"). The second song was heard occasionally in May and July, but was much more prevalent in August and September, and also in December. It is a series of downward moving slurred-up notes, reminiscent of a Barred Woodcreeper (*Dendrocolaptes certhia*), but generally given faster and with more notes. Since the

song goes down the scale, it could be called the "scale" song type. We had heard this song some fifty times, in various locations (including in and near San Salvador) before Komar finally saw a peppershrike give it on 31 August 94. In Las Lajas we noted that the song was almost always given near a peppershrike singing the *pavito* song type. Skutch (1967) described similar song types, and theorized that the "scale" type is the female, and the "*pavito*" type the male, although this remains to be confirmed.

Yellow Warbler *Dendroica petechia*. We first noted the arrival of this migrant species on 5 September 94.

Blackburnian Warbler *Dendroica fusca*. We saw one at the lakeshore on 7 September 94.

Kentucky Warbler *Oporornis formosus*. Komar saw one in December 93 in lake-side forest a few km east but contiguous with Las Lajas forest proper. Mist nets caught another on 7 September 94. This species has been reported rarely in El Salvador (Thurber et al. 1987).

Rufous-capped Warbler *Basileuterus rufifrons*. The earliest sign of fledging was on 7 June 94. A parent brought food to a fledged juvenile less than 50 m from the lakeshore.

Yellow-throated Euphonia *Euphonia hirundinacea*. On 23 May 94, we observed a pair building a nest by the Cedro Real trail, at 925 m above sea level. Both parents visited the nest two times during a 3-min period, carrying fern roots and moss, building the structure in a bromeliad perched on a heavy horizontal branch about 10 m above the ground. The short sharp, partly buzzy, song of this species often resembles a call of the Carolina Chickadee (*Parus carolinensis*) and can be confused with the longer and more complex song of the Orange-billed Nightingale-Thrush (*Catharus aurantiirostris*). Apart from the buzzy chickadee-like song, we often heard a short clear one-note call "*kip*" in early September which we suspect is uttered by this species, although we couldn't rule out the possibility that it is a call of the Paltry Tyrannulet (whose calls had a similar quality), or a winter call note of an *Empidonax* flycatcher.

Blue-crowned Chlorophonia *Chlorophonia occipitalis*. Two chlorophonias feeding in a fig tree at 980 m above sea level in December 93 may indicate a seasonal drop from higher altitudes. Chlorophonias are rare and generally are found in cloud forests or wet montane forest (Dickey & van Rossem 1938). In El Salvador they have been reported in literature only above 1800 m, although there are unpublished reports from El Imposible National Park below 1400 m (A. Sermeño, personal communication).

Blue-gray Tanager *Thraupis episcopus*. Notable for its absence. Seen just one day, 7 July 94, when a group of three flew into the yard of the Casa del Lago.

The species is common in San Salvador, at a similar altitude.

White-eared Ground Sparrow *Melospiza leucotis*. One of the most significant bird residents at Las Lajas, photographed in December, tape recorded singing in May and June, and seen in July and September. Singing continues into September. This species is common in the upper two thirds of the forest. It seems to be rare near the lake shore. The northern subspecies is spottily distributed in Chiapas, Guatemala, and El Salvador. It has never before been reported as common. In El Salvador it seems to be known from just four sites: El Imposible (where we did not encounter it), Cerro Verde (Komar saw one in February 1991 but Thurber (unpublished manuscript) never saw it there), Las Lajas, and San Salvador volcano (Dickey & van Rossem (1938) had three records in 1912 at 1500 m but it has not been reported since). A Costa Rican subspecies is morphologically different, and has sometimes been classified as a separate species.

Rusty Sparrow *Aimophila rufescens*. This species is common in the 12-year-old *Pinus oocarpa* plantation above the natural forest. The understory of the plantation is occasionally burned or cut back, and is mostly tall grass and small shrubs. The trees are uniformly spaced and about 7 m tall. On 1 September 94 there were five or six sparrows singing there, and they were also heard in May. They were never seen or heard at Las Lajas outside the plantation. On 10 September 94 one was singing in open grassy habitat on the steep inner slopes of the Coatepeque caldera on the opposite side of the lake from Las Lajas.

Streak-backed Oriole *Icterus pustulatus*. At 13:20 h on 25 May 94, we observed an adult feeding a fledged juvenile, which had a completely yellow head and underparts with no black throat, and darker wings and tail. Except for size it looks identical (in the field) to the juvenile Altamira Oriole. On 7 June 94 Komar photographed an adult entering a nest with a large green butterfly larva. The gourd-like nest was hanging from a bull-horn acacia (*Acacia hindsii*) at the edge of the lake.

Bar-winged Oriole *Icterus maculialatus*. This species has a story similar to the White-eared Ground Sparrow, except that it is strictly a northern Central America endemic. Evidently rare in Chiapas, Guatemala, and El Salvador, it may be restricted to the volcanic chain (it has not been reported from the Honduran highlands). It is distinctly common at Las Lajas, and possible nowhere else. We saw several in December (max. 3 in one day, which were in the forest near the lakeshore a few km east of the Las Lajas reserve). In May 94 we found various singing males; one was feeding on white Chichicaste (*Ureca baccifera*) berries, also edible by man. A female was carrying nest material on 25 May 94. On 8 July 94 we mistnetted and photographed a female with brood

patch. On 8 September 94 we mistnetted and photographed two juveniles, who lacked the black throat patch. Singing had virtually stopped, although one sang briefly on 5 September.

HUMAN USE AND DISTURBANCE

There is moderate foot traffic through some parts of the forest, mainly following three paths: Los Lombrices trail, the "tubería," and the limited access road called "Calle el Pacún." Villagers from the Las Lajas cooperative pass down this road in order to fish or swim in the lake. They usually return in the afternoon. On Wednesday, 7 September, we counted all persons walking down the Calle el Pacún between 05:30 and 14:00. Twenty-six persons walked down, while five different persons climbed up the road; six of the first group also climbed back up the road before our survey ended. On Friday, 9 September we counted exactly six persons walking down the Calle el Pacún between 05:00 h and 13:00 h.

Twice a year (June and September) the Las Lajas Cooperative sends a team of four or five workers to clear vegetation growing along the sides of the Calle el Pacún, and also to keep open the "tubería," a 4-m wide straight path over a buried water pipe. Also, a power line cut through a tiny portion of the forest was cleared of extensive growth in June, but we don't know the frequency of this activity. We were told that the pine plantation above the forest is periodically cleared of undergrowth.

The caretaker of the Casa del Lago, Jose María Rossa, informs us that he has resided on the edge of Las Lajas forest for the last 24 years, farming several small milpas on the narrow plain between the forest and the lake. The last nine years he has been the Las Lajas Cooperative's vigilante at the forest, and has kept a register of every visit or observed human activity in the forest.

Direct observation of hunting was rare. On 1 September, we came across some men plucking the feathers of a Violaceous Trogon (*Trogon violaceus*) which they had killed with a sling shot. A boy told us that he shoots every bird he can, even warbler-sized birds, to take home for dinner (he lives on the edge of the forest). Several families send their children to school through the forest and most carry sling shots (although only once did we observe one use his sling shot, to kill a lizard in a corn field). We also found the head of an Emerald Toucanet (*Aulacorhynchus prasinus*) decorating a shelf near the kitchen at the Casa del Lago. They said they had recently eaten the bird, and that it was killed in the forest. We never observed this species in the forest, but it may occasionally wander down from Cerro Verde only about 6 km away. Mammals were rarely observed, due in part to shyness typical of a hunted area, and possibly to true scarcity. During July when we had a

team of 14 observers for 11 days, there was only one report of a deer *Odocoileus virginianus* (we occasionally found deer tracks). Squirrels (*Sciurus variegatoides*) were the mammal most often seen, but we also encountered Ring-tailed Cats *Bassariscus sumichrasti* (nocturnal cries identified by local residents), bats, a tree rat and a rabbit (*Sylvilagus floridanus*). In September 94, Raul Villacorta observed a fox (*Urocyon cinereoargenteus*).

According to Sr. Rossa, bird species considered game and regularly hunted for food include almost all birds larger than a warbler. Especially prized are the Thicket Tinamou (*Crypturellus cinnamomeus*), White-bellied Chachalaca (*Ortalis leucogastra*), Singing Quail (*Dactylortyx thoracicus*), Buffy-crowned Wood-Partridge (*Dendrortyx leucophrys*), White-tipped Dove (*Leptotila verreauxi*), and Elegant and Violaceous Trogons (*Trogon elegans* and *T. violaceus*). Other groups are also taken, including toucans, hawks, owls, waterbirds, orioles, motmots, Clay-colored Robin (*Turdus grayi*), Bushy-crested Jay (*Cyanocorax melanocyaneus*), and White-throated Magpie-Jay (*Calocitta formosa*).

DISCUSSION

Conservation priorities.--About 300 ha of Las Lajas forest remains intact and little disturbed from its natural state. Given the scarcity of natural forest at middle elevations in El Salvador, Bosque Las Lajas is probably one of the most important wildlife refuges in El Salvador for preserving and maintaining biodiversity. We recorded 32 species at the forest or along its edges which we were either unable to locate at our El Imposible National Park study area, or located in much lower numbers (Table 3.2 in Chapter 3). Yet El Imposible contains the largest similar forest in El Salvador. Of the 32 species, nine species may be of special conservation concern, as we know of no other forest in El Salvador providing better or more extensive habitat for these species. They are:

Singing Quail *Dactylortyx thoracicus*
 Pacific Parakeet *Aratinga strenua*
 Plain-capped Starthroat *Heliomaster constantii*
 Violaceous Trogon *Trogon violaceus*
 Bushy-crested Jay *Cyanocorax melanocyaneus*
 Spot-breasted Wren *Thryothorus maculipectus*
 Orange-billed Nightingale-Thrush
Catharus aurantiirostris
 White-eared Ground-Sparrow *Melospiza leucotis*
 Bar-winged Oriole *Icterus maculialatus*

Of course, numerous other species find refuge at Las Lajas while their habitat has been nearly exterminated from El Salvador; they can also be found commonly at El Imposible National Park or other areas in El Salvador.

Mist-netting and point count methods.--The reader will find a general discussion about the usefulness and problems of each bird sampling method in Chapter 1.

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Figure 2.1. Map of study area, Bosque Las Lajas, Complejo San Marcelino wildlife refuge, El Salvador

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Table 2.1 Frequency of detection for birds at Bosque Las Lajas, El Salvador, in 1994

Species	% Frequency 32 points May-June ^a	No. at Census Points	No. on Survey 9July94
Elegant Trogon <i>Trogon elegans</i>	88	44	42
Blue-crowned Motmot <i>Momotus momota</i>	81	61	57
White-tipped Dove <i>Leptotila verreauxi</i>	78	43	49
Rufous-capped Warbler <i>Basileuterus rufifrons</i>	72	41	35
Hummingbird sp. <i>Trochilidae sp.</i>	72	29	
Rufous-and-white Wren <i>Thryothorus rufalbus</i>	66	29	25
Clay-colored Robin <i>Turdus grayi</i>	63	39	64
Rufous-browed Peppershrike <i>Cyclarhis gujanensis</i>	56	19	12
Bushy-crested Jay <i>Cyanocorax melanocyanus</i>	53	27	41
Singing Quail <i>Dactylortyx thoracicus</i>	53	26	21
Spot-breasted Wren <i>Thryothorus maculipectus</i>	53	20	18
Black-headed Saltator <i>Saltator atriceps</i>	50	26	54
Rufous-naped Wren <i>Campylorhynchus rufinucha</i>	50	23	23
Altamira Oriole <i>Icterus gularis</i>	44	19	31
Dusky-capped Flycatcher <i>Myiarchus tuberculifer</i>	44	18	12
Violaceous Trogon <i>Trogon violaceus</i>	44	17	16
Ivory-billed Woodcreeper <i>Xiphorhynchus flavigaster</i>	44	14	8
Long-tailed Manakin <i>Chiroxiphia linearis</i>	41	18	27
Yellow-olive Flycatcher <i>Tolmomyias sulphurescens</i>	38	13	11
Bar-winged Oriole <i>Icterus maculialatus</i>	31	11	5
Orange-billed Nightingale-thrush <i>Catharus aurantiirostris</i>	28	12	4
Fan-tailed Warbler <i>Euthlypis lachrymosa</i>	28	11	13
Pacific Parakeet <i>Aratinga strenua</i>	28	10	28
Melodious Blackbird <i>Dives dives</i>	25	11	33
Red-billed Pigeon <i>Columba flavirostris</i>	25	10	19
Golden-fronted Woodpecker <i>Melanerpes aurifrons</i>	22	9	11
Squirrel Cuckoo <i>Piaya cayana</i>	22	9	9
White-eared Ground-Sparrow <i>Melozona leucotis</i>	22	8	10
Golden-olive Woodpecker <i>Piculus rubiginosus</i>	22	7	7
Social Flycatcher <i>Myiozetetes similis</i>	19	7	6
Boat-billed Flycatcher <i>Megarynchus pitangua</i>	19	6	4
Lesser Greenlet <i>Hylophilus decurtatus</i>	19	6	5
White-bellied Chachalaca <i>Ortalis leucogastra</i>	16	12	11
Plain Wren <i>Thryothorus modestus</i>	16	7	33
Collared Araçari <i>Pteroglossus torquatus</i>	16	6	10
Streak-backed Oriole <i>Icterus pustulatus</i>	16	6	18
Yellow-green Vireo <i>Vireo flavoviridis</i>	16	5	9
Laughing Falcon <i>Herpetotheres cachinnans</i>	13	4	
Blue Bunting <i>Cyanocompsa parcellina</i>	13	4	
Great-tailed Grackle <i>Quiscalus mexicanus</i>	9	6	16
Masked Tityra <i>Tityra semifasciata</i>	9	4	14
Orange-fronted Parakeet <i>Aratinga canicularis</i>	9	3	
Barred Antshrike <i>Thamnophilus doliatus</i>	9	3	4
Berylline Hummingbird <i>Amazilia beryllina</i>	9	3	6
Scrub Euphonia <i>Euphonia affinis</i>	9	3	2
Grayish Saltator <i>Saltator coerulescens</i>	9	3	9
Orange-chinned Parakeet <i>Brotogeris jugularis</i>	6	4	
Thicket Tinamou <i>Crypturellus cinnamomeus</i>	6	4	4

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Table 2.1 Continued

Species	% Frequency 32 points May-June	No. at Census Points	No. on Survey 9July94
Yellow-bellied Flycatcher <i>Empidonax flaviventris</i>	6	2	
Black Vulture <i>Coragyps atratus</i>	6	2	16
Greenish Elaenia <i>Myiopagis viridicata</i>	6	2	2
Yellow-throated Euphonia <i>Euphonia hirundinacea</i>	6	2	12
Striped Cuckoo <i>Tapera naevia</i>	6	2	
Red-crowned Ant-Tanager <i>Habia rubica</i>	3	2	1
Yellow-winged Tanager <i>Thraupis abbas</i>	3	2	6
Sulphur-bellied Flycatcher <i>Myiodynastes luteiventris</i>	3	1	3
Paltry Tyrannulet <i>Zimmerius vilissimus</i>	3	1	
Fork-tailed Emerald <i>Chlorostilbon canivetii</i>	3	1	1
Blue-throated Goldentail <i>Hylocharis eliciae</i>	3	1	
Turquoise-browed Motmot <i>Eumomota superciliosa</i>	3	1	9
Inca Dove <i>Columbina inca</i>	3	1	1
White-winged Dove <i>Zenaida asiatica</i>	3	1	18
Yellow-billed Cacique <i>Amblycercus holosericeus</i>	3	1	1
Ferruginous Pygmy-Owl <i>Glaucidium brasilianum</i>	3	1	
Groove-billed Ani <i>Crotophaga sulcirostris</i>	3	1	2
Vaux' Swift <i>Chaetura vauxi</i>	3	1	4
Turkey Vulture <i>Cathartes aura</i>	3	1	26
Rusty Sparrow <i>Aimophila rufescens</i>	3	1	
White-collared Seedeater <i>Sporophila torqueola</i>	3	1	6
Mottled Owl <i>Ciccaba virgata</i>	0	5	
White-throated Magpie-Jay <i>Calocitta formosa</i>	0	4	7
Gray-breasted Martin <i>Progne chalybea</i>	0	4	9
Plain-capped Starthroat <i>Heliomaster constantii</i>	0	3	2
Tropical Pewee <i>Contopus cinereus</i>	0	3	5
Cinnamon Hummingbird <i>Amazilia rutila</i>	0	2	4
Northern Rough-winged Swallow <i>Stelgidopteryx serripennis</i>	0	2	
Northern Jacana <i>Jacana spinosa</i>	0	2	
Spot-bellied Bobwhite <i>Colinus leucopogon</i>	0	2	5
Least Grebe <i>Tachybaptus dominicus</i>	0	2	
Short-tailed Hawk <i>Buteo brachyurus</i>	0	2	1
Great Kiskadee <i>Pitangus sulphuratus</i>	0	2	3
Bronzed Cowbird <i>Molothrus aeneus</i>	0	2	1
Blue Grosbeak <i>Guiraca caerulea</i>	0	1	
Magnificent Frigatebird <i>Fregata magnificens</i>	0	1	
Red-tailed Hawk <i>Buteo jamaicensis</i>	0	1	
Lesser Ground-Cuckoo <i>Morococcyx erythropygus</i>	0	1	1
Violet Sabrewing <i>Campylopterus hemileucurus</i>	0	1	
Lesser Goldfinch <i>Carduelis psaltria</i>			3
Great Swallow-tailed Swift <i>Panyptila sanctihieronymi</i>			2
Rose-throated Becard <i>Pachyramphus aglaiae</i>			2
Red-throated Ant-Tanager <i>Habia fuscicauda</i>			1
TOTAL (SPECIES):		788 (86)	990 (72)

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^a Species with 0% frequency were only registered outside of point counts. The total number registered is presented under the column "No. at census points."

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Table 2.2 Forest structure of three habitats within Las Lajas forest

	Primary Upland Forest	Secondary Upland Forest	Pine Plantation
No. of plots	6	2	1
No. of trees counted	251	103	52
No. of trees per ha	418	515	520
Estimated total area (ha)	300	40	60
<u>Height classes (trees/ha)</u>			
< 7 m	65	125	10
7 - 10 m	102	180	510
11 - 15 m	100	135	0
16 - 20 m	87	55	0
21 - 35 m	65	20	0
Median Height (STD)	14.1 (6.99)	10.7 (5.43)	6.8 (0.25)
<u>DBH classes (trees/ha)</u>			
10 - 19 cm	179	335	180
20 - 39 cm	152	145	340
40 - 79 cm	75	35	0
80 - 159 cm	12	0	0
>159 cm	0	0	0
Median DBH (STD)	28.3 (19.1)	19.9 (9.7)	21.6 (4.0)

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Table 2.3 Trees per hectare at two forest habitats, Bosque Las Lajas, Complejo San Marcelino wildlife refuge, El Salvador

Tree species	Local name	Primary Upland Forest	Secondary Upland Forest
<i>Acacia glomerosa</i>	Zarzo	10	
<i>Acacia hindsii</i>	Iscanal	3	10
<i>Achatocarpus nigricans</i>	Cuenta De Agua	5	
<i>Albizia adinosephala</i>	Polvo De Queso	2	
<i>Alstonia longifolia</i>	Chilindrón	3	
<i>Aphananthes mexicana</i>	Sisimite	3	
<i>Astronium graveolens</i>	Ron-ron	20	
<i>Bocconia arborea</i>	Sangre De Perro		5
<i>Brosimum alicastrum</i>	Ojushte De Verano	13	
<i>Bunchosia sp.</i>	Manzanito	13	
<i>Bursera simaruba</i>	Jiote	27	5
<i>Caesalpinia eriostachys</i>	Iguano	8	
<i>Capparis sp.</i>	Polvorín	2	
<i>Casearia corymbosa</i>	Canjurillo	7	
<i>Cecropia obtusifolia</i>	Guarumo		5
<i>Cedrela mexicana</i>	Cedro Real	10	5
<i>Cedrela odorata</i>	Cedro	5	5
<i>Ceiba pentandra</i>	Ceiba	3	
<i>Chlorophora tinctoria</i>	Mora	12	
<i>Citharexylum donnell-smithii</i>	Chorrito	5	5
<i>Clethra mexicana</i>	Sapotillo	2	20
<i>Coccoloba sp.</i>	Torcuatro	8	
<i>Coccoloba sp.</i>	Papaturro	5	
<i>Conostegia xalapensis</i>	Círín		5
<i>Cordia alliodora</i>	Laurel	20	45
<i>Cornutia pyramidata</i>	Cangrejo	2	15
<i>Enterolobium cyclocarpum?</i>	Conacaste Negro	8	5
<i>Erythrina berterioana</i>	Pito	2	
<i>Eugenia aeruginea</i>	Guacoco	7	35
<i>Exostema mexicanum</i>	Quina	17	
<i>Eysenhardtia adenostylis</i>	Taray		5
<i>Ficus obtusifolia</i>	Matapalo Del Grande	2	
<i>Guazuma ulmifolia</i>	Caulote	5	
<i>Heliocarpus sp.</i>	Calagua	2	140
<i>Inga paterno</i>	Guama	2	
<i>Lonchocarpus minimiflorus</i>	Chaperno Negro	12	
<i>Lonchocarpus purpureus</i>	Chaperno Blanco	10	
<i>Lysiloma divaricatum</i>	Quebracho	10	30
<i>Mouriri myrtilloides</i>	Cantarillo	8	
<i>Myroxylon balsamun</i>	Bálsamo	2	
<i>Ocotea veraguensis</i>	Pimiento	2	5
<i>Perymenium grande</i>	Tatascamite		5
<i>Piptadenia oblicua</i>	Plumajillo	2	
<i>Pisonia sp.</i>	Mozote De Tunco	3	10
<i>Pisonia aculeata</i>	Rompe Caite	2	

Table 2.3 Continued

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Tree species	Local name	Primary Upland Forest	Secondary Upland Forest
<i>Poeppigia procera</i>	Memble	3	
<i>Pogonopus speciosus</i>	Chorcha De Pava	3	5
<i>Randia armata</i>	Crucito Amarillo	5	
<i>Rollinia rensioniana</i>	Churumuyo		10
<i>Sapium sp.</i>	Chilamate	22	15
<i>Sapranthus microcarpus</i>	Arbol Asta De Bajío	2	
<i>Sciadodendron excelsum</i>	Palo De Lagarto	3	
<i>Spondias radlkoferi</i>	Jocote Jobo	8	
<i>Stemmadenia donnell-smithii</i>	Cojón	17	
<i>Styrax argenteus</i>	Estoraque		5
<i>Tabebuia rosea</i>	Maquilishuat		25
<i>Tecoma stans</i>	San Andrés		15
<i>Terminalia oblonga</i>	Volador	2	
<i>Thouinidium decandrum</i>	Zorrillo	8	
<i>Trichilia americana</i>	Jocotillo	8	30
<i>Trichilia martiana</i>	Cola De Pava	8	5
<i>Triplaris melanodendrum</i>	Mulato		5
<i>Urera baccifera</i>	Chichicaste	12	
<i>Zanthoxylum mayanum</i>	Pochote		15
Not determined	Hoja Fina	2	
	Barretero		5
	Chicharro	2	
	Mecacao	13	10
	Manzano	13	10
	Bálsamo De Montaña	5	
TOTAL SPECIES:		58	32

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Table 2.4 Birds captured in mist nets at Las Lajas (Data from El Imposible included for reference)^a

Species	Las Lajas 521 net-hrs July 1994	El Imposible 819 net-hrs August 1994	Las Lajas 684 net-hrs Sept. 1994	2024 n-h Tot.
Singing Quail <i>Dactylortyx thoracicus</i>			1	1
White-tipped Dove <i>Leptotila verreauxi</i>		1	1	2
Violet Sabrewing <i>Campylopterus hemileucurus</i>	1	4 (B)		5
Berylline Hummingbird <i>Amazilia beryllina</i>	1	4	1	6
Cinnamon Hummingbird <i>Amazilia rutila</i>	1		3	4
Fork-tailed Emerald <i>Chlorostilbon canivetii</i>	1			1
Turquoise-browed Motmot <i>Eumomota superciliosa</i>	2 (B)	1		3
Blue-crowned Motmot <i>Momotus momota</i>		3	2	5
Elegant Trogon <i>Trogon elegans</i>		5 (B)	1	6
Golden-olive Woodpecker <i>Piculus rubiginosus</i>		1 (B)		1
Barred Antshrike <i>Thamnophilus doliatus</i>			1	1
Streak-headed Woodcreeper <i>Lepidocolaptes souleyetii</i>		1 (B)		1
Ruddy Woodcreeper <i>Dendrocincla homochroa</i>		5 (B)		5
Ivory-billed Woodcreeper <i>Xiphorhynchus flavigaster</i>		7 (B)		7
Olivaceous Woodcreeper <i>Sittasoma griseicapillus</i>		1		1
Barred Woodcreeper <i>Dendrocolaptes certhia</i>		1		1
Northern Bentbill <i>Oncostoma cinereigulare</i>		4 (B)		4
Greenish Elaenia <i>Myiopagis viridicata</i>		3 (B)		3
Ochre-bellied Flycatcher <i>Mionectes oleaginea</i>		3 (B)		3
Stub-tailed Spadebill <i>Platyrinchus cancrominus</i>		1 (B)		1
Yellow-olive Flycatcher <i>Tolmomyias sulphurescens</i>	1 (B)	4 (B)	1	6
Yellow-bellied (?) Flycatcher <i>Empidonax flaviventris</i> (?)			1	1
Long-tailed Manakin <i>Chiroxiphia linearis</i>	4 (B)	40 (B)	6	50
Bushy-crested Jay <i>Cyanocorax melanocyaneus</i>	1 (B)			1
Banded Wren <i>Thryothorus pleurostictus</i>		1 (B)		1
Spot-breasted Wren <i>Thryothorus maculipectus</i>	1 (B)	2 (B)	5 (B)	8
Plain Wren <i>Thryothorus modestus</i>	8 (B)	1	8 (B)	17
Rufous-and-white Wren <i>Thryothorus rufalbus</i>	1 (B)	11 (B)	11 (B)	23
Rufous-naped Wren <i>Campylorhynchus rufinucha</i>			3 (B)	3
Orange-billed Nightingale-Thrush <i>Catharus aurantiirostris</i>	1 (B)		6 (B)	7
Clay-colored Robin <i>Turdus grayi</i>	2 (B)		1	3
Rufous-browed Peppershrike <i>Cyclarhis gujanensis</i>			1	1
Yellow-green Vireo <i>Vireo flavoviridis</i>		12		12
Black-and-white Warbler <i>Mniotilta varia</i>			1	1
Worm-eating Warbler <i>Helmitheros vermivora</i>			1	1
Canada Warbler <i>Wilsonia canadensis</i>			4	4
Kentucky Warbler <i>Oporornis formosus</i>			1	1
Rufous-capped Warbler <i>Basileuterus rufifrons</i>	19 (B)	20 (B)	21	60
Fan-tailed Warbler <i>Euthlypis lachrymosa</i>		26 (B)	8 (B)	34
Red-legged Honeycreeper <i>Cyanerpes cyaneus</i>		1		1
Red-throated Ant-Tanager <i>Habia fuscicauda</i>		1 (B)	3 (B)	4
Red-crowned Ant-Tanager <i>Habia rubica</i>	1 (B)			1
Blue Bunting <i>Cyanocompsa parellina</i>		14 (B)	3	17
Black-headed Saltator <i>Saltator atriceps</i>	1		1	2
Bar-winged Oriole <i>Icterus maculialatus</i>	1 (B)		2 (B)	3
Rusty Sparrow <i>Aimophila rufescens</i>	1		3 (B)	4
TOTAL SPECIES (INDIVIDUALS)	18 (48)	28 (178)	28 (107)	46 (333)

^a (B) indicates that some birds had brood patches or were juveniles, proving that local breeding takes place.

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 BIRD LIST (APPENDIX)

LISTA DE AVES PARA VISITANTES AL COMPLEJO SAN MARCELINO, SECTOR BOSQUE LAS LAJAS

El listado de 129 especies presentado a continuación incorpora observaciones de diciembre 1993 (tres días), mayo 1994 (seis días), junio 1994 (seis días), julio 1994 (nueve días), agosto 1994 (dos días), y septiembre 1994 (nueve días). Hay relativamente pocas observaciones de la estación seca, cuando se presentan muchas especies visitantes o migrantes. Aún se requiere trabajo adicional para obtener un listado completo de aves. No hemos encontrado ninguna información previa sobre aves de este bosque. No incluimos en la lista especies descritas por la gente local a menos que pudieramos confirmar la especie por observación directa. Nos contaron que el "Tucán verde" (*Aulacorhynchus prasinus*) es un visitante de la estación seca; y también que "pelícanos" (*Pelecanus sp.?*) visitan el lago al principio del verano (noviembre).

ESTADO: Bajo la columna "Estado" se encuentra letras que indican residente (R), visitante o migrante (V), hipotético (H), y de prioridad de conservación (P). Especies de prioridad de conservación pueden ser amenazadas o en peligro de extinción a nivel nacional. Un asterisco (*) indica que hay fuerte evidencia que la especie anida en el parque. Hay dos especies marcadas "V*," indicando que visitan por temporadas para anidar en el bosque; estas especies luego migran a Suramérica. Para las especies hipotéticas, se requiere más observaciones seguras o documentación para confirmar sus presencias en el bosque. Las especies residentes con un "?" fueron registradas en junio o julio pero no en diciembre; se requieren confirmaciones de su presencia durante la estación seca.

ABUNDANCIA: Determinamos frecuencia de detección en una serie de 32 puntos en el bosque Las Lajas. Generalmente, especies que fueron encontradas en mayor de 50% de los puntos recibieron la etiqueta de "abundante." Especies "comunes" fueron encontradas en 10-49% de los puntos. Especies "poco comunes" fueron detectadas en 0-9% de los puntos. Especies "raras" fueron observadas solamente una vez.

Oliver Komar y Néstor Herrera

FAMILIA/Nombre Inglés	Nombre Científico	Estado	Abundancia
TINAMIDAE			
Thicket Tinamou	<i>Crypturellus cinnamomeus</i>	R?	Poco Común
PODICIPEDIDAE			
Least Grebe	<i>Tachybaptus dominicus</i>	?	Poco Común
FREGATIDAE			
Magnificent Frigatebird	<i>Fregata magnificens</i>	V	Raro
CATHARTIDAE			
Black Vulture	<i>Coragyps atratus</i>	R	Común
Turkey Vulture	<i>Cathartes aura</i>	R	Común
ACCIPITRIDAE			
Short-tailed Hawk	<i>Buteo brachyurus</i>	R	Poco Común
Red-tailed Hawk	<i>Buteo jamaicensis</i>	R	Raro
FALCONIDAE			
Laughing Falcon	<i>Herpetotheres cachinnans</i>	R	Común
Collared Forest-Falcon	<i>Micrastur semitorquatus</i>	V	Raro
American Kestrel	<i>Falco sparverius</i>	V	Raro
CRACIDAE			
White-bellied Chachalaca	<i>Ortalis leucogastra</i>	R*	Común
PHASIANIDAE			
Buffy-crowned Wood-Partridge	<i>Dendrortyx leucophrys</i>	R?	Poco Común
Singing Quail	<i>Dactylortyx thoracicus</i>	R P	Abundante

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FAMILIA/Nombre Inglés	Nombre Científico	Estado	Abundancia
Spot-bellied Bobwhite	<i>Colinus leucopogon</i>	R?	Poco Común
RALLIDAE			
Rufous-necked Wood-Rail	<i>Aramides axillaris</i>	R?	Poco Común
American Coot	<i>Fulica americana</i>	V	Raro
SCOLOPACIDAE			
Northern Jacana	<i>Jacana spinosa</i>	V	Raro
Spotted Sandpiper	<i>Actitis macularia</i>	V	Poco Común
COLUMBIDAE			
Red-billed Pigeon	<i>Columba flavirostris</i>	R	Común
White-winged Dove	<i>Zenaida asiatica</i>	R	Común
Inca Dove	<i>Columbina inca</i>	R	Poco Común
White-tipped Dove	<i>Leptotila verreauxi</i>	R*	Abundante
PSITTACIDAE			
Pacific Parakeet	<i>Aratinga strenua</i>	R*	Común
Orange-fronted Parakeet	<i>Aratinga canicularis</i>	R	Poco Común
Orange-chinned Parakeet	<i>Brotogeris jugularis</i>	R	Poco Común
CUCULIDAE			
Squirrel Cuckoo	<i>Piaya cayana</i>	R	Común
Striped Cuckoo	<i>Tapera naevia</i>	R?	Poco Común
Lesser Ground-Cuckoo	<i>Morococcyx erythropygus</i>	R	Poco Común
Groove-billed Ani	<i>Crotophaga sulcirostris</i>	R	Poco Común
TYTONIDAE			
Common Barn-Owl	<i>Tyto alba</i>	R	Raro
STRIGIDAE			
Ferruginous Pygmy-Owl	<i>Glaucidium brasilianum</i>	R	Poco Común
Mottled Owl	<i>Ciccaba virgata</i>	R	Poco Común
APODIDAE			
Vaux' Swift	<i>Chaetura vauxi</i>	R	Poco Común
Lesser Swallow-tailed Swift	<i>Panyptila cayennensis</i>	V H	Raro
Great Swallow-tailed Swift	<i>Panyptila sanctihieronymi</i>	V	Raro
TROCHILIDAE			
Violet Sabrewing	<i>Campylopterus hemileucurus</i>	R	Poco Común
Fork-tailed Emerald	<i>Chlorostilbon canivetii</i>	R	Poco Común
Blue-throated Goldentail	<i>Hylocharis eliciae</i>	R	Común
Berylline Hummingbird	<i>Amazilia beryllina</i>	R	Común
Cinnamon Hummingbird	<i>Amazilia rutila</i>	R	Común
Long-billed Starthroat	<i>Heliomaster longirostris</i>	R?	Raro
Plain-capped Starthroat	<i>Heliomaster constantii</i>	R?	Poco Común
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	V	Común
TROGONIDAE			
Violaceous Trogon	<i>Trogon violaceus</i>	R	Común
Elegant Trogon	<i>Trogon elegans</i>	R	Abundante
MOMOTIDAE			
Blue-crowned Motmot	<i>Momotus momota</i>	R	Abundante
Turquoise-browed Motmot	<i>Eumomota superciliosa</i>	R*	Poco Común
ALCEDINIDAE			
Belted Kingfisher	<i>Ceryle alcyon</i>	V	Poco Común
RAMPHASTIDAE			
Collared Araçari	<i>Pteroglossus torquatus</i>	R*	Común

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FAMILIA/Nombre Inglés	Nombre Científico	Estado	Abundancia
<hr/>			
PICIDAE			
Golden-fronted Woodpecker	<i>Melanerpes aurifrons</i>	R	Común
Golden-olive Woodpecker	<i>Piculus rubiginosus</i>	R	Común
DENDROCOLAPTIDAE			
Ivory-billed Woodcreeper	<i>Xiphorhynchus flavigaster</i>	R?	Común
FORMICARIIDAE			
Barred Antshrike	<i>Thamnophilus doliatus</i>	R?	Poco Común
TYRANNIDAE			
Paltry Tyrannulet	<i>Zimmerius vilissimus</i>	R?	Poco Común
Greenish Elaenia	<i>Myiopagis viridicata</i>	R?	Poco Común
Yellow-olive Flycatcher	<i>Tolmomyias sulphurescens</i>	R	Común
Olive-sided Flycatcher	<i>Contopus borealis</i>	V	Raro
Tropical Pewee	<i>Contopus cinereus</i>	R*	Poco Común
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	V	Poco Común
Least Flycatcher	<i>Empidonax minimus</i>	V	Poco Común
Dusky-capped Flycatcher	<i>Myiarchus tuberculifer</i>	R	Común
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	V	Poco Común
Brown-crested Flycatcher	<i>Myiarchus tyrannulus</i>	V	Poco Común
Great Kiskadee	<i>Pitangus sulphuratus</i>	R	Poco Común
Boat-billed Flycatcher	<i>Megarynchus pitangua</i>	R	Común
Social Flycatcher	<i>Myiozetetes similis</i>	R	Común
Sulphur-bellied Flycatcher	<i>Myiodynastes luteiventris</i>	V*	Común
Rose-throated Becard	<i>Pachyramphus aglaiae</i>	R	Raro
COTINGIDAE			
Masked Tityra	<i>Tityra semifasciata</i>	R	Poco Común
PIPRIDAE			
Long-tailed Manakin	<i>Chiroxiphia linearis</i>	R*	Común
HIRUNDINIDAE			
Gray-breasted Martin	<i>Progne chalybea</i>	R	Común
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	R?	Poco Común
Barn Swallow	<i>Hirundo rustica</i>	V	Poco Común
CORVIDAE			
White-throated Magpie-Jay	<i>Calocitta formosa</i>	R	Poco Común
Bushy-crested Jay	<i>Cyanocorax melanocyaneus</i>	R*	Abundante
TROGLODYTIDAE			
Rufous-naped Wren	<i>Campylorhynchus rufinucha</i>	R*	Abundante
Spot-breasted Wren	<i>Thryothorus maculipectus</i>	R*	Abundante
Rufous-and-white Wren	<i>Thryothorus rufalbus</i>	R*	Abundante
Plain Wren	<i>Thryothorus modestus</i>	R*	Común
MUSCICAPIDAE			
Blue-gray Gnatcatcher	<i>Poliophtila caerulea</i>	V	Común
Orange-billed Nightingale-thrush	<i>Catharus aurantirostris</i>	R*	Común
Swainson's Thrush	<i>Catharus ustulatus</i>	V	Común
Clay-colored Robin	<i>Turdus grayi</i>	R*	Abundante
White-throated Robin	<i>Turdus assimilis</i>	V	Raro
VIREONIDAE			
Yellow-throated Vireo	<i>Vireo flavifrons</i>	V	Poco Común
Warbling Vireo	<i>Vireo gilvus</i>	V	Poco Común
Yellow-green Vireo	<i>Vireo flavoviridis</i>	V*	Común
Lesser Greenlet	<i>Hylophilus decurtatus</i>	R	Común

FAMILIA/Nombre Inglés	Nombre Científico	Estado	Abundancia
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Rufous-browed Peppershrike	<i>Cyclarhis gujanensis</i>	R	Abundante
EMBERIZIDAE			
Tennessee Warbler	<i>Vermivora peregrina</i>	V	Común
Yellow Warbler	<i>Dendroica petechia</i>	V	Poco Común
Magnolia Warbler	<i>Dendroica magnolia</i>	V	Poco Común
Black-throated Green Warbler	<i>Dendroica virens</i>	V	Común
Blackburnian Warbler	<i>Dendroica fusca</i>	V	Raro
Black-and-white Warbler	<i>Mniotilta varia</i>	V	Común
Worm-eating Warbler	<i>Helmitheros vermivorus</i>	V	Poco Común
Kentucky Warbler	<i>Oporornis formosus</i>	V	Raro
MacGillivray's Warbler	<i>Oporornis tolmiei</i>	V	Poco Común
Wilson's Warbler	<i>Wilsonia pusilla</i>	V	Abundante
Canada Warbler	<i>Wilsonia canadensis</i>	V	Común
Fan-tailed Warbler	<i>Euthlypis lachrymosa</i>	R*	Común
Rufous-capped Warbler	<i>Basileuterus rufifrons</i>	R*	Abundante
Red-legged Honeycreeper	<i>Cyanerpes cyaneus</i>	V	Raro
Blue-crowned Chlorophonia	<i>Chlorophonia occipitalis</i>	V	Raro
Scrub Euphonia	<i>Euphonia affinis</i>	R	Poco Común
Yellow-throated Euphonia	<i>Euphonia hirundinacea</i>	R*	Poco Común
Blue-gray Tanager	<i>Thraupis episcopus</i>	V	Raro
Yellow-winged Tanager	<i>Thraupis abbas</i>	R*	Poco Común
Red-crowned Ant-Tanager	<i>Habia rubica</i>	R	Poco Común
Red-throated Ant-Tanager	<i>Habia fuscicauda</i>	R?	Raro
Summer Tanager	<i>Piranga rubra</i>	V	Poco Común
Western Tanager	<i>Piranga ludoviciana</i>	V	Poco Común
Grayish Saltator	<i>Saltator coerulescens</i>	R	Poco Común
Black-headed Saltator	<i>Saltator atriceps</i>	R	Abundante
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	V	Poco Común
Blue Bunting	<i>Cyanocompsa parcellina</i>	R?	Común
Blue Grosbeak	<i>Guiraca caerulea</i>	V	Raro
White-eared Ground-Sparrow	<i>Melospiza leucotis</i>	R P	Común
White-collared Seedeater	<i>Sporophila torqueola</i>	R?	Poco Común
Rusty Sparrow	<i>Aimophila rufescens</i>	R?	Poco Común
Melodious Blackbird	<i>Dives dives</i>	R	Común
Great-tailed Grackle	<i>Quiscalus mexicanus</i>	R?	Poco Común
Bronzed Cowbird	<i>Molothrus aeneus</i>	R?	Poco Común
Bar-winged Oriole	<i>Icterus maculialatus</i>	R* P	Común
Streak-backed Oriole	<i>Icterus pustulatus</i>	R*	Común
Spot-breasted Oriole	<i>Icterus pectoralis</i>	V	Raro
Altamira Oriole	<i>Icterus gularis</i>	R*	Común
Yellow-billed Caticue	<i>Amblycercus holosericeus</i>	R	Poco Común
FRINGILLIDAE			
Lesser Goldfinch	<i>Carduelis psaltria</i>	R	Poco Común
COUNT:	129		

RESUMEN EN ESPAÑOL (CAPITULO 2)

INVENTARIO AVIFAUNISTICO DEL BOSQUE LAS LAJAS,
AREA NATURAL COMPLEJO SAN MARCELINO.

Oliver Komar y Néstor Herrera

Durante la estación lluviosa de 1994, se realizó una investigación de aves en el sector Las Lajas del refugio de vida silvestre Complejo San Marcelino. Este sector, uno de tres en el complejo, nunca antes había sido estudiado por biólogos, por lo cual creemos que no existe ningún otra información sobre su fauna y flora. Este informe incluye un índice de abundancia para las aves del bosque, una descripción de tres clases de bosques en el área, y una lista completa de aves para visitantes al área, dando información para cada especie sobre estado de reproducción, migración, y abundancia relativa.

Area de estudio.--El bosque es principalmente latifoliado-perennifolio, creciendo entre 745 y 1100 msnm, sobre el fértil suelo de las faldas interiores de la caldera de Coatepeque. El bosque tiene rasgos de un bosque climax o primario, y posiblemente ha sido relativamente poco perturbado durante miles de años. El docel varía entre 20 y 25 m, y los árboles más grandes alcanzan 40 m de altura. El área de estudio mide aproximadamente 400 ha, de los cuales 300 ha son de bosque primario, y el resto comprende bosque secundario de 12 años (con algunos árboles mayores) y plantación de pino. La extensión del área protegida, según el "Sistema Salvadoreño de Areas Protegidas" (Ministerio de Agricultura y Ganadería, mayo de 1994), es 515.5 ha. Una franja angosta (100 m de ancho) de bosque primario extiende 5 km al noreste por la margen del Lago de Coatepeque. Adyacente a esta franja existen plantaciones de café de la Cooperativa Los Pinos, sobre las faldas interiores de la caldera.

Abundancia relativa de aves.--La frecuencia de detección para cada especie se determinó por realizar 32 conteos de puntos, cada uno de 10 minutos, durante la primera parte de la estación lluviosa (mayo y junio).

Las Lajas contiene 38 especies que son comunes o abundantes (detectadas en 10% o más de los puntos). Las especies detectadas en los puntos de muestreos se presentan en la Tabla 2.1, en orden de su frecuencia de detección. Las cinco especies más frecuentemente detectadas fueron *Trogon elegans*, *Momotus momota*, *Leptotila verreauxi*, *Basileuterus rufifrons*, y *Thryothorus rufalbus*. Los colibríes también fueron abundantes, y la mayoría probablemente son *Amazilia beryllina*. Una lista de todas las especies de aves registradas en Las Lajas se presente en el apéndice. Comentarios sobre la utilidad y limitaciones del método de conteos de punto se presentan al final del capítulo 1.

Estructura del bosque y abundancia de árboles.--Identificamos tres clases de bosque en el área de estudio: bosque primario, bosque secundario, y plantación de *Pinus oocarpa* de 12 años. En el bosque primario, el tamaño de los árboles está distribuido normalmente, con 15% de árboles más alto que los 20 m, mientras en el bosque secundario solamente 4% sobrepasan los 20 m (Tabla 2.2). La plantación de pinos contiene árboles con altura de 7 m. La densidad e identificaciones de los árboles en los dos bosques naturales se presentan en la Tabla 2.3. En el bosque primario, las especies dominantes son *Bursera simaruba* (6.4%) y *Sapium sp.* ("Chilamate," 5.2%). El bosque secundario comprende cinco especies dominantes, formando 55% de la comunidad arbolescente: *Heliocarpus sp.* ("Calagua," 27.2%), *Cordia alliodora* (8.7%), *Eugenia aeruginosa* (7.0%), *Lysiloma divaricatum* (5.8%), y *Trichilia americana* (5.8%).

Captura de aves con redes de neblina.--Durante seis días en septiembre y nueve días en julio, capturamos 155 aves de 33 especies,

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de las cuales cinco fueron migrantes de norteamérica (Tabla 2.4). Se confirmó reproducción local en 16 especies capturadas. Seis especies comprendieron 60% de los individuos capturados, siendo en orden de abundancia, *Basileuterus rufifrons*, *Thryothorus modestus*, *T. rufalbus*, *Chiroxiphia linearis*, *Euthlypis lachrymosa*, y *Catharus aurantiirostris*. Comentarios sobre la utilidad y limitaciones del método de captura con redes se presentan al final del capítulo 1.

Contribuciones ornitológicas.-- Observaciones importantes de la anidación, alimentación, o comportamiento de cantos se recolectaron para 50 especies. Las observaciones más interesantes incluyen: una *Fregata magnificens* visitando al Lago de Coatepeque; un *Aramides axillaris* vocalizando de una percha 15 m sobre el suelo; el segundo registro de *Panyptila sanctihieronymi* para El Salvador; las descripciones de cantos para *Campylopterus hemileucurus*, *Hylocharis eliciae*, *Amazilia beryllina*, *A. rutila*, y *Zimmerius vilissimus*; y *Chlorophonia occipitalis* muy abajo de su rango altitudinal normal.

Uso y perturbación humano.--La gente local consume una variedad amplia de la fauna del bosque. No obstante, la caza de subsistencia no es regular. Las leyes contra la caza de vida silvestre no se aplican en Las Lajas. Cualquier ave de mayor tamaño de un chipe (o sylvia) es cazada para alimentación humana. Más apreciadas son *Crypturellus cinnamomeus*, *Ortalis leucogastra*, *Dactylortyx thoracicus*, *Dendrortyx leucophrys*, *Leptotila verreauxi*, *Trogon elegans*, y *Trogon violaceus*.

Prioridades de conservación.--Aparte de las especies más aprovechadas por los cazadores, hay nueve especies de aves en Las Lajas que se deben considerar como prioridades para la conservación. Estas especies, la mayoría comunes en Las Lajas, posiblemente no encuentran hábitat más extenso o mejor en otras partes de El Salvador (ninguna fue común en nuestra área de estudio en Parque Nacional El Imposible). Las nueve

especies son *Dactylortyx thoracicus*, *Aratinga strenua*, *Heliomaster constantii*, *Trogon violaceus*, *Cyanocorax melanocyaneus*, *Thryothorus maculipectus*, *Catharus aurantiirostris*, *Melozone leucotis*, e *Icterus maculialatus*. Las últimas dos, *Melozone leucotis* e *Icterus maculialatus*, tienen distribuciones restringidas a bosques de alta o mediana elevación en Chiapas, Guatemala, y El Salvador. Ambas especies son raras por la mayoría de su distribución, y refugios importantes para ellos, tal como Las Lajas, no se ha identificado anteriormente. El bosque Las Lajas también proporciona un santuario importante para una población aislada de *Dactylortyx thoracicus*, y sitios de anidación para tres colonias de *Aratinga strenua*.

CHAPTER 3: COMPARISON OF BIRD COMMUNITIES AT EL IMPOSIBLE NATIONAL PARK AND LAS LAJAS FOREST, EL SALVADOR.

Oliver Komar

INTRODUCTION

Despite superficial similarities between the humid, broadleaf, partly evergreen forests of El Imposible National Park and Las Lajas (Complejo San Marcelino natural area), there are large differences in the bird communities. Understanding these differences will help us understand how each forest is unique, and which of its avian residents make it so. To determine the differences, I compared the frequency of detection of birds at 48 study points in El Imposible park with 32 study points at Las Lajas. The censusing methods I used are described in Chapters 1 and 2.

RESULTS AND DISCUSSION

The similarity and differences in the resident bird communities at El Imposible and Las Lajas during the early rainy season are summarized in Table 3.1. Las Lajas has more common or abundant species, but El Imposible has more uncommon species. Both forests have several common forest species that do not occur at the other. Tables 3.2 and 3.3 contain the species of birds that are notably more common at one of the study sites when compared with the other. Las Lajas and El Imposible, respectively, contained 32 and 29 species that were at least twice as frequently detected compared to the other site. Not all of the species described as only at one or the other study site (in Table 3.1) are included in tables 3.2 and 3.3, because many were encountered so rarely at one site that I cannot be sure that they weren't also present at the other site but too scarce to be detected. Only 10 of the 25 species found only at Las Lajas are included in table 3.2. The other 15 species are excluded for one of two reasons: nine have been reported from El Imposible either before or after the June study period, and six were found on the margins of the Las Lajas study site. For similar reasons, only 19 of the species found only at El Imposible are included in Table 3.3.

Previous researchers (Jane West, 1988, M. of Sc. thesis, Central Washington University; A. Sermeño, personal communication) have observed several other species at El Imposible that are evidently rare, and also were not recorded at Las Lajas. They include Gray-headed Kite (*Leptodon cayannensis*), Ornate Hawk- Eagle (*Spizaetus ornatus*), Black-and-white Owl (*Ciccaba nigrolineata*), Tody Motmot (*Hylomanes momotula*), and Green Shrike-Vireo

(*Vireolanius pulchellus*). These species have not been included in the analyses because their current status is uncertain. Also not included in the tables are two species absent at Las Lajas and resident at El Imposible, but not detected in June due to secretive behavior or local distribution; they are Ruddy Woodcreeper (*Dendrocincla homochroa*) and Black Phoebe (*Sayornis nigricans*).

Except for certain aquatic families that are represented on Lake Coatepeque (Las Lajas), the number of families of birds that occupy Las Lajas and El Imposible appear to be the same, but there are some curious differences in the members of some of the families. Below I mention some of the differences, but not the abundant similarities.

As might be expected because of its greater area, a greater diversity of raptors (hawks and owls) have been recorded at El Imposible. Notable are the Common Black-Hawk (*Buteogallus anthracinus*) and Spectacled Owl (*Pulsatrix perspicillata*), the former attracted to the major rivers in the park where it hunts freshwater crabs. Also quite visible at El Imposible are the White Hawk (*Leucopternis albicollis*) and the Black Hawk- Eagle (*Spizaetus tyrannus*). At Las Lajas the Laughing Falcon (*Herpetotheres cachinnans*) and Ferruginous Pygmy-Owl (*Glaucidium brasilianum*) are more evident.

The Thicket Tinamou (*Crypturellus cinnamomeus*), the only tinamou in El Salvador, is much more abundant at El Imposible than at Las Lajas. Guans (Cracidae) are more diverse at El Imposible (three species to one at Las Lajas), while quail (Phasianidae) are more dominant at Las Lajas (three species to two at El Imposible). Parakeets (Psittacidae) are much more notable at Las Lajas than in El Imposible, mainly because of the nesting colonies of Pacific Parakeets (*Aratinga strenua*). But El Imposible supports greater diversity and overall numbers of woodpeckers (Picidae) and woodcreepers (Dendrocolaptidae), eight species vs. three. Interestingly, the Golden-fronted Woodpecker (*Melanerpes aurifrons*) and Olive-green Woodpecker (*Piculus rubiginosus*) are more abundant at Las Lajas, perhaps because of competition with other species of woodpecker and woodcreeper at El Imposible. Another hole-nesting group, the trogons, were abundant at both forests. But while the Elegant Trogon (*Trogon elegans*) was one of the most abundant species at each

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site, the Violaceous Trogon (*T. violaceus*) was common at Las Lajas and rare at El Imposible.

More evident at El Imposible although also well represented at Las Lajas are the flycatchers (Tyrannidae) and manakins (Pipridae). But Corvidae, represented by the Bushy-crested Jay (*Cyanocorax melanocyaneus*), are more abundant at Las Lajas. Wrens (Troglodytidae) are abundant at both forests. In the genus *Thryothorus*, the Spot-breasted Wrens (*T. maculipectus*) of Las Lajas seem to be replaced by Banded Wrens (*T. pleurostictus*) at El Imposible, while the Rufous-and-White Wren (*T. rufalbus*) and Plain Wren (*T. modestus*) are common at both sites (the latter in grassy and shrubby habitat at the edges of the forest).

The thrushes (Muscicapidae, Turdinae) are much more abundant at Las Lajas, due to the Clay-colored Robin (*Turdus grayi*) and the Orange-billed Nightingale-Thrush (*Catharus aurantiirostris*), although the White-throated Robin (*Turdus assimilis*), probably a non-breeding visitor to Las Lajas, adds diversity to El Imposible. The vireos (Vireonidae) are represented by the same three species at both forests, but the Rufous-browed Peppershrike (*Cyclarhis gujanensis*) is dominant at Las Lajas, while the Yellow-green Vireo (*Vireo flavoviridis*) dominates at El Imposible. At Las Lajas, the latter is only found at the edge of the lake, while it is abundant throughout the forest at both San Benito and Río Guayapa, possibly a reflection of the younger age of the El Imposible forest.

A striking difference is found in the diverse Emberizidae family, particularly in the Cardinalinae and Icterinae subfamilies. Combining these two groups, I noted just three species at El Imposible but 13 species, including seven common ones, at Las Lajas.

Geographically and faunistically, Las Lajas appears more similar to San Benito than to Río Guayapa, particularly in the numbers of common and abundant species (Table 3.1). The forest at Río Guayapa contains many uncommon species not found at Las Lajas (some may not be found anywhere else in El Salvador). The elevation is comparable (Las Lajas is 750 m to 1100 m; San Benito is 650 m to 1000 m) and neither site contains a permanent stream. The forest at Las Lajas is more similar to the upland forest at San Benito. However, the forest at Las Lajas is noticeably less disturbed, containing more large economically-valuable tree species such as Cedrela. One should thus expect that more of the differences in the avifaunas of Las Lajas and El Imposible are caused by Río Guayapa than by San Benito. Table 3.2 listed 32 species that were more abundant at Las Lajas than at El Imposible (probability levels less than 0.05 for 25 species). When these same species are compared only to San Benito, six no longer present notable differences ("notable" defined as $P < 0.250$). These are

Laughing Falcon, Red-billed Pigeon, White-tipped Dove, Golden-olive Woodpecker, Boat-billed Flycatcher, and Rufous-capped Warbler. Three species would have been added, although their probability levels are not significant at a desirable level. These are the Collared Araçari, *Pteroglossus torquatus* (16% detection rate at Las Lajas vs. 0 at San Benito, chi-square 2.791, $P < 0.100$), Yellow-olive Flycatcher, *Tolmomyias sulphurescens* (38% at Las Lajas vs. 19% at San Benito, chi-square 1.745, $P < 0.250$), and Rufous-and-white Wren (66% at Las Lajas vs. 44% at San Benito, chi-square 2.100, $P < 0.250$). If the table were presented as a comparison between Las Lajas and San Benito, it would contain 29 species that are more abundant at Las Lajas, of which 21 have probability levels less than 0.05. Thus, the avifauna at Las Lajas appears more similar to the avifauna of San Benito than to the combined avifauna of San Benito and Río Guayapa.

Seeking the source of the majority of differences presented in Table 3.3 confirms the greater similarity of Las Lajas to San Benito, rather than Río Guayapa. In Table 3.3, we saw that El Imposible has 29 species that are at least twice as abundant than at Las Lajas (only 10 of these test at probability levels less than 0.05, but general observations outside of censuses confirm, albeit inconclusively, that many uncommon or rare species at El Imposible are not present at Las Lajas). Taking out the Río Guayapa component, the table gains two species and loses 18 species, leaving just 13 species (Table 3.4).

The differences between the avifaunas of El Imposible and Las Lajas are probably due to several factors. Specific relationships of birds with certain trees may play a role in bird distribution. Many more trees have been identified at El Imposible than at Las Lajas, but complete tree inventories are not available from both sites. Historical, geographical, and climatic factors may also influence biodiversity. Las Lajas has a much older, less-disturbed forest, but recent hunting pressure is probably higher than at El Imposible. The smaller area of Las Lajas makes the amount of forest edge, relative to its area, much greater at Las Lajas. El Imposible's birds benefit from a larger continuous forest area, a likely factor in the greater diversity of woodcreepers and woodpeckers. Elevational range is often a factor in diversity, with greater range indicating greater biodiversity. El Imposible has a greater elevational range than Las Lajas.

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Table 3.1 Differences in bird diversity, Las Lajas vs. El Imposible (May and June 1994)^a

	Las Lajas	El Imposible (Combined)	Río Guayapa ^b	San Benito ^b
Abundant species	12	8	8	11
Common species	26	21	20	22
Uncommon species	43	53	36	19
Total species	81	82	64	52
Species found only at this site	25	26		
Common species found only at this site	4	5		
Species more than twice as abundant compared to other site	32	29		

^a In this analysis, abundant species were detected at more than 50% of sampling points, common species at 10 to 49%, and uncommon species at 0 to 9%. Three aquatic species and two swallows associated with Lake Coatepeque have been excluded from the Las Lajas species count.

^b At Río Guayapa and San Benito (sectors of El Imposible National Park), the number of uncommon species (and total species) is sparse in part due to less time in each of these areas compared to the main study sites as a whole, and also because not all species encountered outside of censuses were recorded.

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Table 3.2 Birds detected at least twice as frequently at Las Lajas than at El Imposible (aquatic birds at Lake Cotepeque excluded), June 1994

Species	% Frequency Las Lajas ^a (32 points)	% Frequency El Imposible (48 points)	Ratio	Chi-square	P ^b
Black-headed Saltator <i>Saltator atriceps</i>	50	0		30.000	<.001
Bar-winged Oriole <i>Icterus maculialatus</i>	31	0		17.143	<.001
Melodious Blackbird <i>Dives dives</i>	25	0		13.333	<.001 x
White-eared Ground-Sparrow <i>Melospiza leucotis</i>	22	0		11.507	<.001 x
Masked Tityra <i>Tityra semifasciata</i>	9	0		4.675	<.050 x
Grayish Saltator <i>Saltator coerulescens</i>	9	0		4.675	<.050 x
Berylline Hummingbird <i>Amazilia beryllina</i>	9	+		4.675	<.050 x
Great-tailed Grackle <i>Quiscalus mexicanus</i>	9	0		4.675	<.050 x
Yellow-billed Cacique <i>Amblycercus holosericeus</i>	3	0		Too small	
Rusty Sparrow <i>Aimophila rufescens</i>	3	0		Too small	
Plain-capped Starthroat <i>Heliomaster constantii</i>	+	0			
Orange-billed Nightingale-thrush <i>Catharus aurantiirostris</i>	28	2	14:1	11.905	<.001 x
Pacific Parakeet <i>Aratinga strenua</i>	28	2	14:1	11.905	<.001 x
Altamira Oriole <i>Icterus gularis</i>	44	4	11:1	18.802	<.001
Boat-billed Flycatcher <i>Megarynchus pitangua</i>	19	2	9.5:1	6.680	<.010 x
Singing Quail <i>Dactylortyx thoracicus</i>	53	6	9:1	22.500	<.001
Bushy-crested Jay <i>Cyanocorax melanocyaneus</i>	53	6	9:1	22.500	<.001
Rufous-naped Wren <i>Campylorhynchus rufinucha</i>	50	6	8:1	20.293	<.001
Streak-backed Oriole <i>Icterus pustulatus</i>	16	2	8:1	5.075	<.025 x
Violaceous Trogon <i>Trogon violaceus</i>	44	6	7:1	16.134	<.001
Laughing Falcon <i>Herpetotheres cachinnans</i>	13	2	6.5:1	3.556	<.100 x NS
Spot-breasted Wren <i>Thryothorus maculipectus</i>	53	10	5.5:1	17.565	<.001
White-bellied Chachalaca <i>Oryzopsis leucogastra</i>	16	4	4:1	3.157	<.100 x NS
Dusky-capped Flycatcher <i>Myiarchus tuberculifer</i>	44	13	3.5:1	10.000	<.005
Golden-olive Woodpecker <i>Piculus rubiginosus</i>	22	6	3.5:1	4.286	<.050 x
Rufous-browed Peppershrike <i>Cyclarhis gujanensis</i>	56	17	3.5:1	13.713	<.001
Golden-fronted Woodpecker <i>Melanerpes aurifrons</i>	22	8	3:1	2.969	<.100 x NS
Red-billed Pigeon <i>Columba flavirostris</i>	25	10	2.5:1	3.000	<.100 NS
Clay-colored Robin <i>Turdus grayi</i>	63	27	2.5:1	9.938	<.005
Hummingbird sp. <i>Trochilidae</i> sp. (unidentified)	72	31	2.5:1	12.707	<.001
Rufous-capped Warbler <i>Basileuterus rufifrons</i>	72	40	2:1	8.028	<.005
White-tipped Dove <i>Leptotila verreauxi</i>	78	44	2:1	9.284	<.005

^a + indicates not recorded on point counts, usually due to rarity or secretive behavior, but nonetheless present.
two chi-square cells with expected values less than 5.

^b NS

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Table 3.3 Birds detected at least twice as frequently at El Imposible than at Las Lajas, June 1994

Species	% Frequency Las Lajas (32 points)	% Frequency El Imposible ^a (48 points)	Ratio	Chi-square	P ^b
Banded Wren <i>Thryothorus pleurostictus</i>	0	46		20.230	<.001
Lesser Ground-Cuckoo <i>Morococcyx erythropygus</i>	+	19		6.761	<.010 x
Bright-rumped Attila <i>Attila spadiceus</i>	0	15		5.114	<.025 x
Northern Bentbill <i>Oncostoma cinereigulare</i>	0	15		5.114	<.025 x
White-throated Robin <i>Turdus assimilis</i>	0	10		3.207	<.100 x NS
Pale-billed Woodpecker <i>Campephilus guatemalensis</i>	0	8		2.807	<.100 x NS
Great Curassow <i>Crax rubra</i>	0	8		2.807	<.100 x NS
Olivaceous Woodcreeper <i>Sittasomus griseicapillus</i>	0	6		Too small	
Streak-headed Woodcreeper <i>Lepidocolaptes souleyetii</i>	0	6		Too small	
Ruddy Quail-Dove <i>Geotrygon montana</i>	0	6		Too small	
Golden-crowned Warbler <i>Basileuterus culicivorus</i>	0	4		Too small	
Ochre-bellied Flycatcher <i>Mionectes oleagineus</i>	0	4		Too small	
Stub-tailed Spadebill <i>Platyrinchus cancrominus</i>	0	2		Too small	
Barred Woodcreeper <i>Dendrocolaptes certhia</i>	0	2		Too small	
King Vulture <i>Sarcoramphus papa</i>	0	+			
White Hawk <i>Leucopternis albicollis</i>	0	+			
Black Hawk-Eagle <i>Spizaetus tyrannus</i>	0	+			
Crested Guan <i>Penelope purpurascens</i>	0	+			
Spectacled Owl <i>Pulsatrix perspicillata</i>	0	+			
Green Kingfisher <i>Chloroceryle americana</i>	0	+			
Thicket Tinamou <i>Crypturellus cinnamomeus</i>	6	56	1:9	20.771	<.001
Greenish Elaenia <i>Myiopagis viridicata</i>	6	44	1:7	13.181	<.001
Yellow-green Vireo <i>Vireo flavoviridis</i>	16	92	1:6	46.776	<.001
Sulphur-bellied Flycatcher <i>Myiodynastes luteiventris</i>	3	15	1:5	2.801	<.100 x NS
Blue Bunting <i>Cyanocompsa parellina</i>	13	31	1:2.5	3.727	<.100 NS
Lesser Greenlet <i>Hylophilus decurtatus</i>	19	40	1:2	3.879	<.050
Scrub Euphonia <i>Euphonia affinis</i>	9	19	1:2	1.324	<.250 x NS
Long-tailed Manakin <i>Chiroxiphia linearis</i>	41	75	1:2	9.559	<.005
Yellow-olive Flycatcher <i>Tolmomyias sulphurescens</i>	38	67	1:2	6.599	<.025

^a + indicates not recorded on point counts, usually due to rarity or secretive behavior, but nonetheless present. or two chi-square cells with expected values less than 5.

^b NS

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Table 3.4 Bird species detected at least twice as frequently at San Benito than at Las Lajas, June 1994.

Species	% Frequency Las Lajas (32 points)	% Frequency San Benito ^a (16 points)	Ratio	Chi-square	P ^b
Banded Wren <i>Thryothorus pleurostictus</i>	0	69		28.541	<.001
Lesser Ground-Cuckoo <i>Morococcyx erythropygus</i>	0	19		4.479	<.050
Ruddy Quail-Dove <i>Geotrygon montana</i>	0	19		4.479	<.050
Northern Bentbill <i>Oncostoma cinereigulare</i>	0	31		11.163	<.001
White-throated Robin <i>Turdus assimilis</i>	0	13		too small	
King Vulture <i>Sarcoramphus papa</i>	0	+			
White Hawk <i>Leucopternis albicollis</i>	0	+			
Black Hawk-Eagle <i>Spizaetus tyrannus</i>	0	+			
Thicket Tinamou <i>Crypturellus cinnamomeus</i>	6	63	1:10	18.000	<.001
Yellow-green Vireo <i>Vireo flavoviridis</i>	16	81	1:5	19.600	<.001
Blue Bunting <i>Cyanocompsa parellina</i>	13	50	1:4	8.000	<.005
Squirrel Cuckoo <i>Piaya cayana</i>	22	56	1:2.5	5.672	<.025
Turquoise-browed Motmot <i>Eumomota superciliosa</i>	3	19	1:6	3.409	<.100 NS

^a + indicates not recorded on point counts, usually due to rarity or secretive behavior, but nonetheless present.

^b NS = Not significant ($P > .05$). Species with non-significant differences were included in the table if observations outside the censuses corroborated the difference. No analysis could be performed for samples marked "too small."

COMPARACION DE LAS COMUNIDADES AVIFAUNISTICAS EN EL PARQUE NACIONAL EL IMPOSIBLE Y EL BOSQUE LAS LAJAS, EL SALVADOR.

Oliver Komar

A pesar de lo parecido de los bosques en el Parque Nacional El Imposible (Sectores San Benito y Río Guayapa) y Las Lajas (sector del Refugio de Vida Silvestre Complejo San Marcelino), hay diferencias significativas entre las comunidades de aves. Para determinar estas diferencias, se comparó la frecuencia de detección de aves en 48 puntos de muestreo en El Imposible con 32 puntos de muestreo en Las Lajas.

Las similitudes y diferencias de las dos comunidades de aves residentes están resumidas en la Tabla 3.1. Las Lajas tiene más especies comunes y abundantes, pero El Imposible tiene más especies poco comunes. Las Tablas 3.2 y 3.3 contienen las especies de aves que están más comunes en uno u otro sitio de estudio. Las Lajas contenía 32 especies, y El Imposible 29, que fueron por lo menos dos veces más frecuentemente detectadas en comparación al otro sitio. Diez especies en Las Lajas, incluyendo cuatro especies comunes, no fueron encontradas en El Imposible en junio, mientras que 19 especies de El Imposible, incluyendo cinco comunes, no fueron encontradas en Las Lajas en mayo o junio. En El Imposible, investigadores anteriores (J. West, 1988, M. de Sc. tesis, Central Washington University; A. Sermeño, comunicación personal) han observado cinco especies adicionales que no se registraron en Las Lajas, incluyendo *Leptodon cayannensis*, *Spizaetus ornatus*, *Ciccaba nigrolineata*, *Hylomanes momotula*, y *Vireo lanius pulchellus*. Estas especies no se han incluido en el análisis presente ya que su situación actual no se conoce. También se dejó fuera del análisis dos especies residentes en El Imposible que se encontraron en Agosto y nunca se han registrado en Las Lajas, las cuales son *Dendrocincla homochroa* y *Sayornis nigricans*.

Las familias de aves que ocupan los bosques de El Imposible y Las Lajas son iguales, pero ciertas familias son más diversas en un sitio u otro. *Crypturellus cinnamomeus* (Tinamidae) es mucho más abundante en El Imposible. Una diversidad mayor de rapaces (Accipitridae, Falconidae, y Strigidae) se han registrado en El Imposible, incluyendo *Leucopternis albicollis*, *Spizaetus tyrannus*, y *Pulsatrix perspicillata*. En Las Lajas, *Herpetotheres cachinnans* y *Glaucidium brasilianum* son más evidentes. La familia Cracidae es más diversa en El Imposible (tres especies vs. una en Las Lajas), mientras Phasianidae es más dominante en Las Lajas (tres especies vs. dos en El Imposible). Se nota mayor presencia de Psittacidae en Las Lajas que en El Imposible, debido

principalmente a las colonias de anidación de *Aratinga strenua*. El Imposible soporta mayor riqueza de especies y poblaciones más altas de Picidae y Dendrocolaptidae, ocho especies vs. tres. *Trogon elegans* se encontró abundante en ambos bosques, pero *Trogon violaceus* fue común en Las Lajas y raro en El Imposible.

Más evidente en El Imposible son las familias Tyrannidae y Pipridae. Pero Corvidae, representado por *Cyanocorax melanocyaneus*, es más abundante en Las Lajas. Troglodytidae es abundante en ambos bosques; en el género *Thryothorus*, *T. maculipectus* de Las Lajas se reemplaza por *T. pleurostictus* en El Imposible, mientras que *T. rufalbus* y *T. modestus* son comunes en ambos sitios. Miembros de Turdinae (Muscicapidae) son mucho más abundante en Las Lajas, por *Turdus grayi* y *Catharus aurantirostris*, aunque *Turdus assimilis* proporciona diversidad en El Imposible. La Vireonidae está representado por las mismas tres especies en los dos bosques, pero *Cyclarhis gujanensis* es dominante en Las Lajas, mientras que *Vireo flavoviridis* domina en El Imposible. Una diferencia notable se encuentra dentro de las subfamilias diversas Cardinalinae e Icterinae (Emberizidae). Al combinar estos dos grupos, se nota solamente tres especies en El Imposible pero 13 especies, incluyendo siete que son comunes, en Las Lajas.

En ambos su fauna y su geografía, Las Lajas se parece más a San Benito que al Río Guayapa. El bosque en Río Guayapa tiene muchas especies poco comunes que no se encuentran en Las Lajas, ni en San Benito. San Benito y Las Lajas tienen alturas semejantes, y no tienen ríos o riachuelos permanentes. Sin embargo, el bosque en Las Lajas parece menos perturbado, comprendiendo mayor densidad de árboles grandes de valor económico, tal como *Cedrela*. A comparar Las Lajas con San Benito, hay 28 especies de aves más abundante en Las Lajas, y 13 especies más abundante en San Benito (Tabla 3.4).

Los bosques de Las Lajas y El Imposible parecen similares pero la diferencia en la avifauna fue mayor que lo que se esperaba. Las diferencias son resultado de factores históricos, geográficos, botánicos, y climáticos. El área de estudio en El Imposible comprende un rango altitudinal mayor, tiene mayor extensión de bosque con menos área de bordes, mayor diversidad de árboles, y un clima más severo. El bosque de Las Lajas es más maduro, pero tiene mayor presión de cacería, y relativamente más bordes de

bosque.

THE RAINY SEASON IN EL SALVADOR.

Oliver Komar

CHAPTER 4: VARIATION IN BIRD SONG DETECTION WITHIN

INTRODUCTION

The data in this chapter present evidence that the detectability of many resident bird species varies over time within the rainy season. Most of the variation is due to either decreased or increased singing, depending on the species. Most species in which detectability changed were non-migratory residents, and are not known to congregate in wandering flocks, supporting the hypothesis that changes were due primarily to song behavior.

METHODS

At Las Lajas forest, I censused 32 points early in the rainy season, visiting 22 points on 24-27 May 1994, and 10 on 7-8 June. In the late rainy season, I returned to 16 of the points, censusing 10 on 31 August-1 September, and six on 7-8 September. At El Imposible forest, Río Guayapa section, I censused 32 points during 16-22 June 1994, and revisited 13 of these points on 18, 22, and 23 August. At the San Benito section, I censused 16 points on 23 and 24 June, returning to 13 of these points on 12, 13, and 16 August. In total, I censused 48 points in June and 26 points in August at El Imposible forest. At each census point, I recorded all birds vocalizing and any birds seen during 10 min, always in the first 3 h of the morning. I conducted the second census later in the season within one hour of the starting time of the first.

RESULTS

Changes noted at El Imposible.--Fourteen species exhibited a notable decrease in detection rates between June and August (Table 4.1). Eight of these were statistically significant ($P < 0.05$). For the other six species the lack of a significant chi-square value may be due to small sample sizes, and non-standardized observations corroborated the observed variation. Ten of the 14 species that declined are non-migratory and non-gregarious; their declines are presumably due to decreased singing. The reason for the declines of the other species, Red-billed Pigeon, Clay-colored and White-throated Robins, and Yellow-green Vireo, are not clear. All four species probably formed flocks and decreased singing. These species may also migrate from the area.

Thirteen species, and unidentified hummingbirds, were detected more frequently in August, although the differences were statistically significant for only three,

the Plain Wren, Berylline Hummingbird, and Yellow-bellied Flycatcher (Table 4.1). The Berylline Hummingbird was identified more often in August, but not because of singing; however the only time one of these hummingbirds was found singing was on 24 August. The Yellow-bellied Flycatcher was a recently-arrived migrant in August that was detected by its "che-bunk" call/song. I believe increased singing frequency is the reason for increased detection of Plain Wren, and probably explains the increases noted in the other ten species included in the table, since all are resident in the area. Possible exceptions are the Orange-chinned Parakeet and White-throated Magpie-Jay, which may have moved into the study areas in August from surrounding areas.

Changes noted at Las Lajas.--Fifteen species showed a notable decline in detection frequency (Table 4.2), although the decrease was significant for only three species (Ivory-billed Woodcreeper, Elegant Trogon, and Clay-colored Robin) and unidentified hummingbirds. At least 11 species are non-migratory, non-flocking residents; the decline in detection is due to reduced singing. The decline in the other four species and unidentified hummingbirds are less easily explained. The Yellow-green Vireo decline is almost certainly due to reduced singing, but since none were recorded in late August/early September, the birds may have emigrated from the study site. The species reportedly migrates to South America, and is a breeding visitor to El Salvador. For Red-billed Pigeon, Clay-colored Robin, and Great-tailed Grackle, decline in singing is likely, but an alternate explanation may be that the birds have formed wandering flocks (possibly emigrating from the area) and the likelihood of encountering the species at any given point in the forest has therefore declined dramatically. However, I did not encounter flocks of any of these species in August. The grackle is not a regular member of the forest avian community, although in June birds calling near the forest periphery were detected.

Ten species at Las Lajas showed notable increases (Table 4.2), statistically significant in three, the Plain Wren, Ferruginous Pygmy-Owl, and Turquoise-browed Motmot. The increases can be attributed to increased singing in at least eight of the 10 species. The other two, Altamira Oriole and White-throated Magpie-Jay, may be more detectable in August/September due to post-breeding immigration from coffee plantations (the magpie-jay was not noted in May/June in the forest). The Plain Wren data set is small enough to cause error

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in the statistical test, but the increase mirrors a statistically-significant increase observed at El Imposible. This species sings year-round, and breeds during the May-June census period (we observed fledglings in early July and again in September). Perhaps the presence of juveniles during the later census period induces more frequent singing.

DISCUSSION

Variation in detection rates over time were mostly due to changes in song behavior and not actual population changes. However, some increases in detectability in August/September are due to the influx of migrants, post-breeding wanderers from outside the forests, and also the addition of newly-fledged birds to the population, especially in species that form noisy family groups, such as Bushy-crested Jay and Altamira Oriole. Species that form feeding flocks may also become less frequently detected, because the population becomes patchily distributed. A few species may move altitudinally on a small scale, resulting in an apparent increase or decrease at certain elevations. In El Imposible, four species decreased notably at the upland forest in August, and concurrently increased at the lower elevation gallery forest, suggesting an altitudinal or partially altitudinal migration (Table 4.3). These species are Banded Wren, Yellow-green Vireo, Rufous-capped Warbler, and Scrub Euphonia. The vireo is a long-distance migrant, therefore the observed change in detection rate may merely represent a difference in late season song behavior among the upland and gallery forest birds, or potentially a post-breeding shift towards the gallery forest before migration gets underway.

Changes in song behavior during the rainy season were consistent for avifauna at both study sites. The differences between Las Lajas and El Imposible, in terms of which species showed notable changes in song behavior, were generally due to differences in the avian communities. Three species, however, showed variation at one site but not at the other. In August, the abundant Blue-crowned Motmot was detected less frequently at El Imposible, but was encountered at 81% of points in Las Lajas both early and late in the season (into September). During the dry season, this species is rarely heard except before dawn (personal observation), so the singing will presumably eventually subside at Las Lajas. Why did it subside so much earlier at El Imposible? The detection frequency for Ivory-billed Woodcreeper increased at El Imposible between June (54%) and August (69%), while there was a statistically significant decrease at Las Lajas. The difference between sites may be explained by timing of the censuses: the August censuses at El Imposible were two weeks earlier than at Las Lajas. The Rufous-and-white Wren decreased significantly at El Imposible, but only slightly at Las Lajas (66% in

May/June vs. 56% in August/September, chi-square 0.400, $P > 0.50$).

Two other cases where the results from El Imposible differed from Las Lajas may be due to randomness, in the case of the Long-tailed Manakin, or an inadequate census method, in the case of unidentified hummingbirds. The Long-tailed Manakin showed an 18% decline at El Imposible (detection rates of 75% in June and 62% in August), and a 37% increase at Las Lajas (41% detection rate in May/June and 56% rate in August/September). Generally, I was able to identify more hummingbirds on the point counts later in the season, due to increased singing in some species. Since hummingbirds did not sing regularly during the study, and are otherwise very difficult to detect on point counts, the point count method probably is not adequate for determining relative abundance in hummingbirds, and the data therefore should not be analyzed.

One of the most interesting results of this study is the contrast between the two common trogon species (at Las Lajas). While the Elegant Trogon showed a significant and large decline in song activity, the Violaceous Trogon showed no change in song behavior (44% detection rate at Las Lajas in both May/June and August/September).

A potential flaw in the study design is that not all the June census points were revisited later in the rainy season. The revisited points were chosen arbitrarily but not randomly. Some of the observed differences in detection rates may thus be a function of non-random distribution of birds among the census points. Nonetheless, all census points were in reasonably uniform forest habitat.

If we knew how detectability varied over time for each resident species, then relative abundance data could be collected by the point count method over a greater part of the year. Each data set could then be corrected to make it equivalent to a data set collected at the peak singing period for each species. If we also knew the probability that one will detect the species singing if one is within hearing distance of its territory, we could correct the census results to provide a much truer relative abundance estimate. For example, if we knew that the Elegant Trogon sings or calls once every minute during June, but only once every 50 minutes during August, then we could assume a probability of detection during a 10-minute point count of 100% in June and 20% in August. We could compare relative abundance data from June and August by correcting the August point-count census data up five times. If we had similar information for another species, let us say Violaceous Trogon, that called once every 20 minutes in June and August (probability of detection = 50%), we could compare the abundance of the two species by doubling the June and August census data for the Violaceous Trogon. Again, the August Elegant Trogon data would need to

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be corrected by a factor of 5. We would then have a much more accurate estimation of the two trogons' abundance relative to each other. The importance of such a correction would be greater for species who sing relatively infrequently, such as the Squirrel Cuckoo (*Piaya cayana*) or Rufous-necked Wood-Rail (*Aramides axillaris*). In summary, to determine relative abundance of birds, two types of data are useful: the probability of hearing a bird that is present during a 10-minute point count, and the frequency of detection on the point counts. By determining the temporal variation for these data, one can correct data collected at different times of year so that comparisons of true relative abundance are possible. The present study illustrates temporal variation in the frequency of detection, and suggests that these changes are often due to variation in the probability of detection. To determine actual changes in relative abundance, information is needed on the temporal variation of probability of detection.

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Table 4.1 Changes in detection frequency of birds at El Imposible National Park, comparison of June 1994 (48 points) and August 1994 (26 points)

Species	% Frequency			Chi-square	P ^a
	June	August	Change		
Red-billed Pigeon <i>Columba flavirostris</i>	10	0	-100	2.905	<.100 x NS
White-throated Robin <i>Turdus assimilis</i>	10	0	-100	2.905	<.100 x NS
Golden-fronted Woodpecker <i>Melanerpes aurifrons</i>	8	0	-100	2.290	<.250 x NS
Great Curassow <i>Crax rubra</i>	8	0	-100	2.290	<.250 x NS
Clay-colored Robin <i>Turdus grayi</i>	27	4	-86	5.937	<.025
Elegant Trogon <i>Trogon elegans</i>	81	15	-81	30.056	<.001
Rufous-and-white Wren <i>Thryothorus rufalbus</i>	58	19	-67	10.437	<.001
Thicket Tinamou <i>Crypturellus cinnamomeus</i>	56	19	-66	9.417	<.005
White-tipped Dove <i>Leptotila verreauxi</i>	44	15	-65	6.066	<.025
Greenish Elaenia <i>Myiopagis viridicata</i>	44	15	-65	6.066	<.025
Blue-crowned Motmot <i>Momotus momota</i>	92	38	-58	24.206	<.001
Lesser Greenlet <i>Hylophilus decurtatus</i>	40	23	-42	2.054	<.250 NS
Yellow-green Vireo <i>Vireo flavoviridis</i>	92	73	-20	4.605	<.050 x
Long-tailed Manakin <i>Chiroxiphia linearis</i>	75	62	-18	1.463	<.250 NS
Ivory-billed Woodcreeper <i>Xiphorhynchus flavigaster</i>	54	69	28	1.588	<.250 NS
Hummingbird sp.	31	54	72	3.613	<.100 NS
Buffy-crowned Wood-Partridge <i>Dendrortyx leucophrys</i>	4	8	85	Too small	
Lesser Ground-Cuckoo <i>Morococcyx erythropygus</i>	19	35	85	2.306	<.250 NS
Plain Wren <i>Thryothorus modestus</i>	17	38	131	4.352	<.050
Streak-headed Woodcreeper <i>Lepidocolaptes souleyetii</i>	6	15	146	1.643	<.250 x NS
Turquoise-browed Motmot <i>Eumomota superciliosa</i>	6	15	146	1.643	<.250 x NS
Rufous-naped Wren <i>Campylorhynchus rufinucha</i>	6	15	146	1.643	<.250 x NS
Orange-chinned Parakeet <i>Brotogeris jugularis</i>	2	12	454	2.949	<.100 x NS
Rufous-necked Wood-Rail <i>Aramides axillaris</i>	0	4		Too small	
Blue-throated Goldentail <i>Hylocharis eliciae</i>	0	4		Too small	
White-throated Magpie-Jay <i>Calocitta formosa</i>	0	4		Too small	
Berylline Hummingbird <i>Amazilia beryllina</i>	0	12		5.772	<.025 x
Yellow-bellied Flycatcher <i>Empidonax flaviventris</i>	0	15		7.807	<.010

^a NS = Not significant (P>.05). Species with non-significant differences were included in the table if observations outside of the censuses corroborated the difference. No analysis could be performed for samples marked "too small." x = may have been skewed by one or two chi-square cells with expected values less than 5.

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Table 4.2 Changes in detection frequency of birds at Las Lajas forest, comparison of May/June 1994 (32 census points) to August/September 1994 (16 census points)

Species	% Frequency			Chi-square	P ^a
	June	August	Change		
Social Flycatcher <i>Myiozetetes similis</i>	19	0	-100	3.429	<.100 NS
Yellow-green Vireo <i>Vireo flavoviridis</i>	16	0	-100	2.791	<.100 NS
Collared Araçari <i>Pteroglossus torquatus</i>	16	0	-100	2.791	<.100 NS
Blue Bunting <i>Cyanocompsa parcellina</i>	13	0	-100	2.182	<.250 NS
Great-tailed Grackle <i>Quiscalus mexicanus</i>	9	0	-100	1.600	<.250 NS
Grayish Saltator <i>Saltator coerulescens</i>	9	0	-100	1.600	<.250 NS
Ivory-billed Woodcreeper <i>Xiphorhynchus flavigaster</i>	44	6	-86	6.982	<.010
Red-billed Pigeon <i>Columba flavirostris</i>	25	6	-75	2.462	<.250 NS
Hummingbird sp.	72	19	-74	12.126	<.001
Clay-colored Robin <i>Turdus grayi</i>	63	19	-70	8.181	<.005
Lesser Greenlet <i>Hylophilus decurtatus</i>	19	6	-67	1.338	<.250 NS
Elegant Trogon <i>Trogon elegans</i>	88	31	-64	15.709	<.001
Bar-winged Oriole <i>Icterus maculialatus</i>	31	13	-60	2.000	<.250 NS
Dusky-capped Flycatcher <i>Myiarchus tuberculifer</i>	44	25	-43	1.600	<.250 NS
Singing Quail <i>Dactylortyx thoracicus</i>	53	31	-41	2.056	<.250 NS
White-tipped Dove <i>Leptotila verreauxi</i>	78	56	-28	2.471	<.250 NS
Bushy-crested Jay <i>Cyanocorax melanocyaneus</i>	53	75	41	2.134	<.250 NS
Altamira Oriole <i>Icterus gularis</i>	44	69	57	2.671	<.250 NS
Plain Wren <i>Thryothorus modestus</i>	16	44	180	4.500	<.050 x
Blue-throated Goldentail <i>Hylocharis eliciae</i>	3	13	300	1.600	<.250 NS
Paltry Tyrannulet <i>Zimmerius vilissimus</i>	3	19	500	3.409	<.100 NS
Yellow-billed Cacique <i>Amblycercus holosericeus</i>	3	19	500	3.409	<.100 NS
Ferruginous Pygmy-Owl <i>Glaucidium brasilianum</i>	3	25	700	5.470	<.025
Turquoise-browed Motmot <i>Eumomota superciliosa</i>	3	31	900	7.714	<.010
Lesser Ground-Cuckoo <i>Morococcyx erythropygus</i>	0	13		Too small	
White-throated Magpie-Jay <i>Calocitta formosa</i>	0	13		Too small	

^a See footnote for Table 4.1.

Table 4.3 Evidence for altitudinal migration at San Benito (upland forest) and Río Guayapa (gallery forest), El Imposible National Park, El Salvador. June detection rate is compared to August detection rate in each cell.

	San Benito avg. 839 m	Río Guayapa avg. 578 m
Scrub Euphonia <i>Euphonia affinis</i>	19:0	19:46
Banded Wren <i>Thryothorus pleurostictus</i>	69:46	34:69
Rufous-capped Warbler <i>Basileuterus ruficapillus</i>	75:46	22:38

VARIACION EN LA DETECCION DE CANTOS DE AVES DENTRO DE
LA ESTACION LLUVIOSA EN EL SALVADOR.

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Se compararon los resultados de conteos de aves realizados a principios de la estación lluviosa, con resultados de conteos en los mismos áreas de estudio realizados nueve a 13 semanas más tarde. Ya que la mayoría de aves registrados en los conteos fueron detectadas por escuchar sus cantos, muchas de las diferencias en los resultados se deben a cambios en la frecuencias de cantos.

En el Parque Nacional El Imposible, 14 especies fueron detectadas con menos frecuencia en agosto que en junio (Tabla 4.1). Diez de las 14 especies son residentes que no migran y no forman bandadas; solamente se puede explicar sus disminuciones por variación en la frecuencia de cantos. Las otras especies, *Columba flavirostris*, *Turdus grayi*, *Turdus assimilis*, y *Vireo flavoviridis*, posiblemente forman grupos para alimentarse después de junio, o pueden emigrar fuera del área de estudio. Probablemente también cantan con menos frecuencia en agosto. De las 13 especies detectadas más frecuentemente en agosto (Tabla 4.1), nueve son residentes que probablemente cantan más frecuentemente en agosto, pero solamente *Thryothorus modestus* presentaba datos que fueron estadísticamente significantes.

En el Bosque Las Lajas, 15 especies fueron detectadas menos frecuentemente en agosto (Tabla 4.2). Cuatro de ellas podrían haber emigrado del área o formado bandadas, resultando en menos probabilidad de detección; éstas son *Columba flavirostris*, *Turdus grayi*, *Vireo flavoviridis*, y *Quiscalus mexicanus*. Sin embargo, no se observaron bandadas de estas en agosto, y es más probable que para *Columba* y *Turdus*, la diferencia en la detección fue debido a un cambio en frecuencia de cantos. *Vireo* y *Quiscalus* posiblemente habían emigrado del área. Las otras 11 especies son residentes que no forman bandadas, y el descenso en detección se debía a menos actividad de cantar. En Las Lajas, 10 especies fueron detectadas más frecuentemente en agosto (Tabla 4.2). Los incrementos en ocho especies probablemente se deben a actividad más alta de cantar; en otros dos especies, *Icterus gularis* y *Calocitta formosa*, se sugiere que son más evidentes debido a inmigración de cafetales aledaños.

La mayoría de la variación en tasas de detección se debía a cambios en comportamiento de canto, y no a cambios poblacionales. Sin embargo, especies que forman bandadas para buscar alimentación después de la época de anidación resultan distribuidas en parches, y serán menos frecuentemente registradas en conteos estandarizados. Algunos incrementos en detectabilidad en agosto se debían a inmigración desde otros áreas, y a la adición de juveniles a la población, especialmente en especies que forman grupos familiares ruidosos, como *Cyanocorax melanocyaneus* e *Icterus gularis*. En El Imposible, se detectaron variaciones causadas por movimientos altitudinales entre cuatro especies residentes (Tabla 4.3).

Tres especies mostraban variación en un sitio, pero no en el otro. El abundante *Momotus momota* se detectó menos en agosto en El Imposible, pero se encontró en 81% de puntos en Las Lajas ambos en junio y agosto. La frecuencia de detección de *Xiphorhynchus flavigaster* subió en El Imposible entre junio (54%) y agosto (69%), mientras el descenso en Las Lajas fue estadísticamente significativo. *Thryothorus rufalbus* se detectó significadamente menos en El Imposible en agosto, pero en Las Lajas no se detectó una variación.

Para determinar la abundancia relativa de aves, suelen ser útiles dos tipos de datos: la frecuencia de detección en conteos de punto, y la probabilidad de detectar un ave presente en el punto de muestreo durante un conteo de 10 minutos. Por determinar la variación temporal de estos datos, se puede corregir datos colectados en diferentes épocas del año para permitir comparaciones de las verdaderas abundancias relativas. El presente estudio muestra que la frecuencia de detección varía con la época del año, y sugiere que los cambios observados se deben a variaciones en la probabilidad de detección. Para determinar cambios verdaderos en abundancia relativa, se requiere información sobre la variación temporal de la probabilidad de detección para cada especie de ave.

CHAPTER 5: EVALUACIÓN PRELIMINAR DEL HÁBITAT Y LAS AVES DEL ÁREA NATURAL SAN DIEGO Y LA BARRA, EL SALVADOR.

Oliver Komar

Ohio Wesleyan University, Delaware OH 43015

Wilfredo Rodríguez

Universidad de El Salvador, Escuela de Biología, San Salvador, El Salvador

ENGLISH ABSTRACT.--During a three-day visit to the proposed San Diego y La Barra protected area, we identified six zones of forest, five within the conservation area measuring an estimated 1700 ha, and one outside. The forest outside, located north of La Barra, contains approximately 1000 ha and is contiguous with thousands of hectares of forest in Guatemala. The majority of forest is dry, deciduous, growing on lava, but in La Barra a small forest (6 ha) is evergreen, growing on a flood plain. We identified 103 species of birds in the forest, cultivated areas, and marshes of Lake Güija. Eleven species encountered represent significant records. The most important are White-fronted Parrot (*Amazona albifrons*), Yellow-naped Parrot (*Amazona auropalliata*), Blue-gray Gnatcatcher (*Poliophtila caerulea*), and Eastern Meadowlark (*Sturnella magna*), the latter a new species for El Salvador.

RESUMEN

Este informe incluye un mapa y descripciones de las zonas boscosas del área natural San Diego y La Barra. Identificamos seis zonas boscosas, cinco dentro del área protegida que estimamos miden 1700 ha, y una separada, al norte de la Barra, con aproximadamente 1000 ha que comunican con miles de hectareas de bosque en Guatemala. La mayoría de bosque es seco, caducifolio, creciendo sobre roca volcánica, pero en la Barra hay un bosque de galería perennifolio (6 ha). Identificamos 103 especies de aves en el bosque, áreas de cultivo, y humedales del Lago de Güija. Reportamos registros significativos de 11 especies, siendo las más importantes *Amazona albifrons*, *Amazona auropalliata*, *Poliophtila caerulea*, y *Sturnella magna*, esta última un nuevo registro para El Salvador.

INTRODUCCIÓN

No conocemos ningún estudio intensivo de la fauna o vegetación del área natural San Diego y La Barra. El ornitólogo A. J. van Rossem visitó el lago de Güija entre el 22 y 31 de mayo de 1927. Colectó algunos especímenes, que describió en su libro de las aves de El Salvador (Dickey & van Rossem 1938). Observaciones adicionales de las aves de la región están siendo recolectadas por un miembro del Cuerpo de Paz de los Estados Unidos, Christine Turnbull, quien está trabajando desde 1994 con la Asociación Pro Humedales de El Salvador. En 1994, esta asociación firmó un convenio con el gobierno para coadministrar el área San Diego y La Barra.

Dado el vacío en la información publicada sobre la fauna y el hábitat de San Diego y la Barra, deseamos hacer disponible la presente información relacionada a los tamaños y ubicaciones de bosques naturales en esta área protegida; además se presenta una lista de aves observadas.

MÉTODOS

Realizamos una visita de cuatro días, del 13 al 16 de diciembre de 1993. Nuestro campamento lo ubicamos en el antiguo casco de la hacienda San Diego, el cual no ofreció condiciones higiénicas adecuadas. Definimos seis zonas distintas de bosque (Figura 5.1). Los recorridos realizados por tierra sólo comprendieron las zonas 2, 4, y 5 del bosque. Nuestras estimaciones de la extensión de bosque están basadas en hojas cartográficas (Instituto Geográfico Nacional "Ingeniero Pablo Arnoldo Guzman" 1985 y 1986) y por observación directa, pero no se cuentan con un nivel de precisión muy adecuado.

El 13 de diciembre, por la tarde, visitamos la zona de amortiguamiento entre las zonas boscosas 2 y 4, ascendiendo por el cono del volcán (lado norte) hasta la mitad. Descendimos hasta cerca de las márgenes del Lago

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de Güija y exploramos el sector suroeste del cerro la Vega de la Caña, tratando de encontrar acceso a la zona 4. No encontramos ese acceso hasta el día siguiente.

El 14 de diciembre, por la mañana, exploramos la zona 2 del bosque, próxima a la línea del ferrocarril. Nos introdujimos unos 200 m por un sendero en dirección del volcán, rumbo suroeste. Luego nos dividimos en dos equipos. Uno buscó un acceso al bosque por el Cerro de las Iguanas (zona 4) y otro recorrió la línea del ferrocarril en rumbo sur para buscar senderos de acceso a la zona 1. Por la tarde, visitamos La Barra, desplazándonos en carro por Metapán, cruzando al oeste por la carretera que conduce a la Cementera Maya y el pueblo de Ostúa. Descubrimos que el acceso al bosque es por la hacienda La Bonanza. Para llegar a este lugar es recomendable usar un vehículo de doble tracción para poder cruzar el Río Angue. Hay otro acceso del lado norte por el puente de la carretera, pero se requiere llave, y quizás un permiso escrito.

El 15 de diciembre llegamos al bosque de galería de la Barra a las 07:45, acompañados por un guía local proporcionado por la hacienda La Bonanza. Realizamos un recorrido por el bosque y una pequeña porción de las márgenes del Lago de Güija. El propietario de La Bonanza, el Ing. Guillermo Valiente, nos prestó su avioneta para realizar una evaluación aérea de los bosques de toda la región. El recorrido en avioneta duró sólo 15 minutos, pero fue suficiente para sobrevolar la mayor parte de las zonas boscosas 1, 2, 4, 5, y 6. Sobrepasamos una porción de Guatemala, donde hay una gran extensión de bosque seco que es continuo con la zona 6. Desde la avioneta, pudimos observar algunos senderos bastante largos dentro del Bosque San Diego (zona 1) y tratamos de encontrar la conexión de senderos entre los lados norte y sur del Bosque de las Iguanas (zona 4), pero no fue visible. Tomamos 24 fotografías de las áreas sobrevoladas. Por la tarde fuimos a la Hacienda Santa Fé acompañados por Christine Turnbull, miembro del Cuerpo de Paz (USA), para conocer el lado norte de la zona 4 del bosque. Invertimos 1 hora y 45 minutos en recorrer a pie y en carro por una calle en malas condiciones. Regresamos al bosque cercano al casco de la hacienda San Diego, para colocar tres redes de neblina antes del anochecer.

El 16 de diciembre, en vez de explorar más el área, abrimos tres redes de neblina (12 m x 2.5 m, malla 36 mm) de las 06:00 h hasta las 11:00 h. Fue difícil colocar redes debido a que la roca volcánica está a diferentes niveles del suelo, y por la gran cantidad de vegetación arbustiva y herbácea.

El tiempo total invertido en la observación de aves fue restringido a 3.5 horas el primer día, 6 horas el segundo día, 4 horas el tercer día, y 4.5 horas el cuarto día.

RESULTADOS

ZONAS DEL BOSQUE

Según nuestras observaciones, los bosques del área natural San Diego y La Barra están hoy en día constituidos por aproximadamente 1700 ha, divididos en seis zonas distintas (Figura 5.1). La mayoría del bosque es seco, creciendo sobre lava volcánica. Alrededor del volcán San Diego hay cuatro zonas de bosque. Al oeste, sur, y sureste se encuentra un bosque cerrado pero no muy denso (zona 1); al este y noreste se encuentra un bosque abierto (zona 2); al este de las faldas del volcán, en las colinas al otro lado de la carretera panamericana, hay una zona de bosque y matorral denso (zona 3); al norte, separado de las otras zonas boscosas por campos de maicillo, se encuentra el Bosque de las Iguanas, un bosque más desarrollado y denso siempre sobre lava (zona 4). El bosque de La Barra es completamente diferente, siendo bosque de galería sobre una planicie aluvial (zona 5). Al norte de la Barra se presenta el bosque de Ostúa, siempre abierto y sobre lava (zona 6).

El bosque de la zona 1 incorpora aproximadamente 600 ha. Tiene dos accesos: la línea del ferrocarril, y una calle de aproximadamente 1.5 km. Desafortunadamente, no tuvimos oportunidad de visitar el interior de este bosque.

El bosque de la zona 2 incluye 150 ha contiguas a la zona 1. Se distingue por extensas áreas abiertas. Se observan zacatales, arbustos, y algunos árboles aislados, los cuales en su mayoría no sobrepasan los 15 metros. Sin embargo, la vegetación es densa. Los árboles predominantes son árbol de la cruz (*Bursera simaruba*), ceiba (*Ceiba pentandra*), y flor de mayo (*Plumeria rubra*, forma acutifolia). La gran mayoría de las especies vegetales que se encuentran en este bosque son caducifolias a excepción de algunos arbustos y otras especies del estrato herbáceo que permanecen siempre verdes.

Algunas 300 ha de bosque y matorral de la zona 3 se presentan sobre colinas rocosas de pendiente fuerte. No tuvimos oportunidad de explorarlo.

Entre las zonas boscosas 2 y 4 hay cultivos extensivos que miden más de 700 ha. En las zonas de amortiguamiento, entre los cultivos y el bosque, se encuentra algunas áreas totalmente deforestadas donde predominan las gramíneas, que durante nuestra visita (diciembre) estaban secas. Estos constituyen un buen hábitat para algunas especies ya que pudimos observar una gran cantidad de saltamontes y bastantes aves migratorias, incluyendo *Polioptila caerulea* y *Ammodramus savannarum*. A la orilla del camino que provee acceso a los

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cultivos, atrás (oeste) de la hacienda San Diego, encontramos alguna vegetación siempre verde parecida a un bosque de galería. La extensión de estos parches no sobrepasa 6 ha.

La zona 4, el Bosque de Las Iguanas, tiene una extensión aproximada de 650 ha. Al lado sur, se ven algunos árboles de hasta 20 m, pero en esta zona la lava tiene una topografía muy difícil y no encontramos un acceso adecuado. Donde encontramos un sendero, los árboles son mucho más pequeños. En el lado norte, por el sector de la hacienda Santa Fé, los lugareños informaron que hay tres calles de acceso, de las cuales visitamos una, adentrandonos sólo un kilómetro hasta su termino, donde encontramos muchos pantes de leña. El camino pasa a través de un bosque joven alcanzando alturas de menos de 12 m. No notamos evidencia de extracción de leña o madera excepto al final de la calle. El suelo siempre está formado por roca volcánica.

La zona 5, conocida como La Barra, se encuentra aislada del bosque seco y cercana a la frontera con Guatemala, con una extensión muy restringida de aproximadamente 6 ha. Otra parcela de bosque del mismo tamaño se encuentra a 200 m, pero al otro lado de la frontera. El bosque se presenta en el área aluvial del Río Ostúa y del Lago de Güija, dándole un aspecto de bosque de galería. Contiene árboles de hasta 30 m de altura y en su estrato herbáceo predominan las *Heliconias sp.* El 100 por ciento de la vegetación es perennifolia y en la estación lluviosa una parte se inunda. El bosque constituye un área de alimentación para cotorras (*Amazona albifrons*) y loras (*Amazona auropalliata*). Un caserío pequeño fue construido hace pocos años (como parte de un proyecto de desarrollo social) justo a la par del bosque.

La zona 6, Ostúa, es un área extensa de más de 1000 ha, siempre bosque seco y abierto sobre roca volcánica. Se sitúa fuera del área natural que pertenece al gobierno. Durante un sobrevuelo, observamos muchos rastros de jeeps que sugieren que el acceso es fácil. El bosque es continuo con miles de hectáreas de hábitat similar en Guatemala, al lado norte y oeste del Lago de Güija.

OBSERVACIONES DE AVES

En tres días de exploración, la lista de aves observadas creció de 38 especies después del primer día, a 72 especies en el segundo día, y hasta 103 especies al final del tercer día (Tabla 5.1). La prueba con redes de neblina durante la mañana del cuarto día resultó en la captura de sólo dos aves (en 15 horas/red), un *Campylorhynchus rufinucha* y un *Empidonax minimus*. Consideramos que los siguientes registros son los más importantes:

Circus cyaneus. Se observó un macho volando alto sobre los pastizales de la planicie de la Barra. Thurber et al. (1987) reportaron sólo cuatro registros de este gavilán migratorio para todo El Salvador entre 1970 y 1980.

Buteo albicaudatus. Desde la avioneta lo observamos volando entre la frontera de El Salvador y Guatemala, sobre el Río Ostúa.

Aramus guarana. Lo escuchamos en la desembocadura del Río Ostúa, cercano al bosque de la Barra. Thurber et al. (1987) reportaron sólo un registro reciente, de Laguna El Jocotal en 1977.

Columbina passerina. Pudimos observar esta tortolita en los caminos junto a los campos de cultivo de maíz y maicillo. Su distribución en El Salvador parece ser restringida a una franja angosta en los valles centrales del país, del Lago de Güija hasta la Unión (Dickey & van Rossem 1938).

Amazona albifrons. Encontramos la cotorra frente blanca en los bosques secos y cultivos de maicillo, en ambos sectores San Diego y La Barra. Observamos 73 individuos volando hacía un dormidero después de las 17:00 h, al este de la Hacienda San Diego.

Amazona auropalliata. Las poblaciones de la lora nuca amarilla están bastante disminuidas a través del todo el país. Encontramos la especie en La Barra.

Coccyzus minor. Las observaciones de esta especie, el "cuckoo del manglar," han sido muy pocas en El Salvador. Observamos un solo individuo en las copas de árboles del bosque de la Barra.

Camptostoma imberbe. Este papamoscas pequeño fue considerado raro en El Salvador por Thurber et al. (1987), debido a que no tenían registros y presumieron que ahora existe poco hábitat para la especie. Dado a la frecuencia en que observamos la especie en los bosques secos de San Diego, sospechamos que es común allí.

Empidonax traillii. Escuchamos el canto de esta especie migratoria en la orilla del Bosque la Barra, en la vegetación arbustiva del río. Dado la dificultad para identificarlo sin oír el canto, y la poca frecuencia en que se escucha durante la estación no reproductora, hay pocos registros de esta especie migratoria en El Salvador.

Thryothorus pleurostictus. Esta especie es conocida de solamente tres lugares en la mitad occidental del país; se ha registrado más comunmente en el oriente (Dickey & van Rossem 1938). Van Rossem tomó especímenes del Lago de Güija en mayo de 1927. Logramos ver y escuchar uno cerca de la Hacienda San Diego.

Poliptila caerulea. Esta "perlita" fue recién agregada a la lista de avifauna del país (Komar, en prep.). Se encontró comúnmente en todas partes del bosque y zonas de amortiguamiento. Se identifica más fácilmente por su llamado que por vista.

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Passerculus sandwichensis. Hay pocos registros de Centroamérica, y el único registro en El Salvador fue en abril de 1926 en la Laguna de Olomega (Dickey & van Rossem 1938). Lo encontramos en un cultivo de maicillo en la Hacienda La Bonanza.

Ammodramus savannarum. Esta especie es raramente encontrada, y se conoce por registros entre enero y mayo (Thurber et al. 1987). Observamos una el 13 de diciembre de 1993 en el zacate seco de la falda del Volcán de San Diego.

Sturnella magna. Un nuevo registro para El Salvador. Se observaron en los campos de cultivo y la pista de aterrizaje de la Hacienda Bonanza, donde encontramos 13 individuos el 14 de diciembre de 1993 y uno el siguiente día. Lo documentamos con fotografías.

DISCUSIÓN

La edad de la lava y los bosques mayores es considerable, porque ninguna erupción es conocida de tiempos históricos (Simkin et al. 1981), lo que nos sugiere que una explicación para la edad joven de porciones de bosque, en la zona 4 especialmente, es la tala de troncos o quemas, ya que pobladores locales causan incendios cada año en toda las zonas boscosas (Christine Turnbull, comunicación personal). Las mayores presiones humanas en las áreas boscosas parecen ser quemas artificiales, la extracción de leña, y la tala de árboles para limpiar espacio para cultivos.

La lista de aves está lejos de ser completa, sin embargo aprendimos muchas cosas en cuatro días. Dado que durante cada día de exploración la lista de especies aumentaba, se puede predecir que dos días más de búsqueda intensiva producirán algunas 30 a 50 especies más. No disponíamos de mucho tiempo para buscar las aves, por lo que no visitamos algunos de los sectores menos perturbados, ni el lago (más que unos minutos).

Sería recomendable estudiar las abundancias relativas y densidades de la flora y fauna que ocupan los distintos hábitats del área natural San Diego y La Barra. Tales estudios deben seguir métodos estandarizados (Ralph et al. 1994, por ejemplo, copia en la biblioteca de la Escuela de Biología de la Universidad de El Salvador), para que se pueda seguir con monitoreos de esta fauna cada año. Un método sencillo para registrar abundancia relativa de las aves es conteos de punto. Se cuenta las aves vistas y oídas durante diez minutos en por lo menos 30 puntos distribuidos a través de varias zonas boscosas. El método requiere un alto conocimiento de los cantos de las aves.

En cuanto a la vegetación, se puede cuantificar hábitats por los tamaños y densidades de árboles. Recomendamos identificar y medir alturas, diámetros a la altura del pecho de los árboles dentro de varias cuadrículas de 0.1 ha (100 m x 10 m, por ejemplo), para poder hacer comparaciones con otros bosques donde se han realizado estudios. Con estos datos se puede determinar cuáles son las especies más amenazadas por las actividades humanas que afectan el área natural.

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Tabla 5.1 Aves observadas en San Diego y La Barra, Dpto. de Santa Ana, El Salvador, 13-16 de dic. de 1993.

Especies (nombre inglés)	Especies (nombre científico)	13dic.	14dic.	15dic.	16dic.	Máximo	Sumatoria
Pied-billed Grebe	<i>Podilymbus podiceps</i>				2	2	2
Neotropic Cormorant	<i>Phalacrocorax brasilianus</i>				3	3	3
Great Blue Heron	<i>Ardea herodias</i>		1			1	1
Great Egret	<i>Casmerodius albus</i>				2	2	2
Snowy Egret	<i>Egretta thula</i>				3	3	3
Little Blue Heron	<i>Egretta caerulea</i>				1	1	1
Cattle Egret	<i>Bubulcus ibis</i>	300				300	300
Green Heron	<i>Butorides virescens</i>				1	1	1
Black Vulture	<i>Coragyps atratus</i>	2	15	3	3	15	23
Turkey Vulture	<i>Cathartes aura</i>	6	17	1	1	17	25
Osprey	<i>Pandion haliaetus</i>	2	3	2	1	3	8
Northern Harrier	<i>Circus cyaneus</i>				1	1	1
Common Black-Hawk	<i>Buteogallus anthracinus</i>		2			2	2
Gray Hawk	<i>Buteo nitidus</i>		1		2	2	3
Roadside Hawk	<i>Buteo magnirostris</i>				1	1	1
White-tailed Hawk	<i>Buteo albicaudatus</i>				1	1	1
Crested Caracara	<i>Caracara plancus</i>				1	1	1
Laughing Falcon	<i>Herpetotheres cachinnans</i>	2			1	2	3
American Kestrel	<i>Falco sparverius</i>	2			1	2	3
Spot-bellied Bobwhite	<i>Colinus leucopogon</i>		6			6	6
Common Moorhen	<i>Gallinula chloropus</i>				2	2	2
American Coot	<i>Fulica americana</i>				3	3	3
Limpkin	<i>Aramus guarauna</i>				1	1	1
Northern Jacana	<i>Jacana spinosa</i>				17	17	17
Ruddy Turnstone	<i>Arenaria interpres</i>				1	1	1
Caspian Tern	<i>Sterna caspia</i>				3	3	3
Rock Dove	<i>Columba livia</i>		3			3	3
Red-billed Pigeon	<i>Columba flavirostris</i>				1	1	1
White-winged Dove	<i>Zenaida asiatica</i>	20				20	20
Mourning Dove	<i>Zenaida macroura</i>	3				3	3
Inca Dove	<i>Columbina inca</i>	7	3	2	2	7	14
Common Ground-Dove	<i>Columbina passerina</i>	5				5	5
Ruddy Ground-Dove	<i>Columbina talpacoti</i>		2	2		2	4
Orange-fronted Parakeet	<i>Aratinga canicularis</i>	4			2	4	6
Orange-chinned Parakeet	<i>Brotogeris jugularis</i>	8	2		2	8	12
White-fronted Parrot	<i>Amazona albifrons</i>	24	20	111	40	111	195
Yellow-naped Parrot	<i>Amazona auropalliata</i>		5	1		5	6

Tabla 5.1 Continuación

KOMAR & RODRÍGUEZ • EVALUACION DEL AREA NATURAL SAN DIEGO Y LA BARRA

Especies (nombre inglés)	Especies (nombre científico)	13dic.	14dic.	15dic.	16dic.	Máximo	Sumatoria
Mangrove Cuckoo	<i>Coccyzus minor</i>				1	1	1
Squirrel Cuckoo	<i>Piaya cayana</i>		3		1	3	4
Lesser Ground-Cuckoo	<i>Morococcyx erythropygus</i>	2			3	3	5
Groove-billed Ani	<i>Crotophaga sulcirostris</i>		4	4		4	8
Ferruginous Pygmy-Owl	<i>Glaucidium brasilianum</i>		1		1	1	2
Green-breasted Mango	<i>Anthracothorax prevostii</i>		4		1	4	5
Cinnamon Hummingbird	<i>Amazilia rutila</i>			2		2	2
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	2	8		3	8	13
Belted Kingfisher	<i>Ceryle alcyon</i>			1		1	1
Green Kingfisher	<i>Chloroceryle americana</i>		1			1	1
Golden-fronted Woodpecker	<i>Melanerpes aurifrons</i>	2	1	2		2	5
Lineated Woodpecker	<i>Dryocopus lineatus</i>	1			2	2	3
Ivory-billed Woodcreeper	<i>Xiphorhynchus flavigaster</i>		2			2	2
Streak-headed Woodcreeper	<i>Lepidocolaptes souleyetii</i>			1		1	1
Northern Beardless Tyrannulet	<i>Camptostoma imberbe</i>		3	1	1	3	5
Yellow-bellied Elaenia	<i>Elaenia flavogaster</i>	3				3	3
Yellow-olive Flycatcher	<i>Tolmomyias sulphurescens</i>	1				1	1
Tropical Pewee	<i>Contopus cinereus</i>			1		1	1
Willow Flycatcher	<i>Empidonax traillii</i>			3		3	3
Least Flycatcher	<i>Empidonax minimus</i>				1	1	1
Empidonax sp.	<i>Empidonax sp.</i>	4				4	4
Dusky-capped Flycatcher	<i>Myiarchus tuberculifer</i>		1	1		1	2
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	2	3	1		3	6
Brown-crested Flycatcher	<i>Myiarchus tyrannulus</i>	6	2		3	6	11
Great Kiskadee	<i>Pitangus sulphuratus</i>	2	3	1		3	6
Boat-billed Flycatcher	<i>Megarynchus pitangua</i>	2	1			2	3
Social Flycatcher	<i>Myiozetetes similis</i>	1	4	2		4	7
Tropical Kingbird	<i>Tyrannus melancholicus</i>			1		1	1
Western Kingbird	<i>Tyrannus verticalis</i>	20	61	10	10	61	101
Scissor-tailed Flycatcher	<i>Tyrannus forficatus</i>	30	5	1		30	36
Masked Tityra	<i>Tityra semifasciata</i>		8			8	8
Violet-green Swallow	<i>Tachycineta thalassina</i>			20	10	20	30
Barn Swallow	<i>Hirundo rustica</i>			2		2	2
White-throated Magpie-Jay	<i>Calocitta formosa</i>	5				5	5
Rufous-naped Wren	<i>Campylorhynchus rufinucha</i>		2	2	3	3	7
Banded Wren	<i>Thryothorus pleurostictus</i>		1		1	1	2
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>	1	3	2	2	3	8
Clay-colored Robin	<i>Turdus grayi</i>		4	3		4	7
Yellow-throated Vireo	<i>Vireo flavifrons</i>		4		1	4	5
Warbling Vireo	<i>Vireo gilvus</i>		4		1	4	5
Yellow Warbler	<i>Dendroica petechia</i>	2	4	4		4	10
Magnolia Warbler	<i>Dendroica magnolia</i>			1	1	1	2
Common Yellowthroat	<i>Geothlypis trichas</i>			3		3	3
Rufous-capped Warbler	<i>Basileuterus rufifrons</i>		2			2	2
Yellow-breasted Chat	<i>Icteria virens</i>		1			1	1
Scrub Euphonia	<i>Euphonia affinis</i>		2	1		2	3
Summer Tanager	<i>Piranga rubra</i>		1			1	1
Western Tanager	<i>Piranga ludoviciana</i>		6		1	6	7
Black-headed Saltator	<i>Saltator atriceps</i>	3	2			3	5

Tabla 5.1 Continuación

KOMAR & RODRÍGUEZ • EVALUACION DEL AREA NATURAL SAN DIEGO Y LA BARRA

Especies (nombre inglés)	Especies (nombre científico)	13dic.	14dic.	15dic.	16dic.	Máximo	Sumatoria
Blue Grosbeak	<i>Guiraca caerulea</i>	1				1	1
Indigo Bunting	<i>Passerina cyanea</i>	20	2	1		20	23
Painted Bunting	<i>Passerina ciris</i>		5	2		5	7
Blue-black Grassquit	<i>Volatinia jacarina</i>			2		2	2
White-collared Seedeater	<i>Sporophila torqueola</i>			4		4	4
Stripe-headed Sparrow	<i>Aimophila ruficauda</i>	3	3			3	6
Savannah Sparrow	<i>Passerculus sandwichensis</i>		1			1	1
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	1				1	1
Eastern Meadowlark	<i>Sturnella magna</i>		13	1		13	14
Melodious Blackbird	<i>Dives dives</i>		3	2		3	5
Great-tailed Grackle	<i>Quiscalus mexicanus</i>		6	1		6	7
Orchard Oriole	<i>Icterus spurius</i>	1				1	1
Streak-backed Oriole	<i>Icterus pustulatus</i>		1	1	1	1	3
Spot-breasted Oriole	<i>Icterus pectoralis</i>			1		1	1
Altamira Oriole	<i>Icterus gularis</i>		5	2		5	7
Northern Oriole	<i>Icterus galbula</i>	1	2	2		2	5
House Sparrow	<i>Passer domesticus</i>		1	1		1	2
TOTALS	TOTALES	501	273	257	102	871	1133
SPECIES COUNTS	CONTEOS DE ESPECIES	37	55	61	29	103	

