# BIRD SURVEYS IN THE MOGOTE VEGETATIONAL COMPLEX IN THE SIERRA DEL INFIERNO, PINAR DEL RÍO, CUBA, JUNE 2000

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*Abstract*.—We conducted surveys of birds using point counts in the limestone karst of the Sierra del Infierno, Cordillera de Guaniguanico, Pinar del Río province, of western Cuba, from 17 to 25 June 2000. In total, 49 species were detected at 83 stations among four habitat types. Among the most common of these species were Cuban Tody (*Todus multicolor*), Cuban Solitaire (*Myadestes elisabeth*), Cuban Trogon (*Priotelus temnurus*), Turkey Vulture (*Cathartes aura*), Yellow-headed Warbler (*Teretistris fernandinae*), and Scaly-naped Pigeon (*Columba squamosa*). An additional 19 species were encountered in the study area but not during the point counts. Several species are of special interest, including Mangrove Cuckoo (*Coccyzus minor*), Bee Hummingbird (*Mellisuga helenae*), Plain Pigeon (*Columba inornata*), and Black-crowned Night-Heron (*Nycticorax nycticorax*) because the observations represent extended distributions. A Gray Catbird (*Dumetella carolinensis*) was recorded, representing a rare summer observation of this winter resident and transient. A substantial proportion of species (22%) and subspecies (25%) recorded in the study area was endemic. The high levels of endemism and diversity revealed in our preliminary surveys support the need to increase the level of protection for the Sierra del Infierno.

*Key words: bird populations, Cordillera de Guaniguanico, Cuba, endemic, habitat association, karst, mogote, point count, Sierra del Infierno, survey*

*Resumen*.—CENSOS DE AVES EN EL COMPLEJO VEGETAL CÁRSICO EN LA SIERRA DEL INFIERNO, PINAR DEL RÍO, CUBA, JUNIO DE 2000. Realizamos conteos de aves usando el método de parcela circular ("point counts") en los mogotes calizos de la sierra del Infierno, cordillera de Guaniguanico, provincia de Pinar del Río, en el occidente de Cuba, del 17 al 25 de junio de 2000. Un total de 49 especies se detectaron en las 83 estaciones repartidas por cuatro tipos de hábitat. Entre las especies más comunes se encontraron la Cartacuba (*Todos multicolor*), el Ruiseñor (*Myadestes elisabeth*), el Tocororo (*Priotelus temnurus*), el Aura Tiñosa (*Cathartes aura*), la Chillina (*Teretistris fernandinae*) y la Torcaza Cuelllimorada (*Columba squamosa*). En el área de estudio se detectaron 19 especies adicionales fuera de los conteos. De las especies registradas, algunas son de interés especial, incluyendo el Arrierito (*Coccyzus minor*), el Zunzuncito (*Mellisuga helenae*), la Paloma Boba (*Columba inornata*) y el Guanabá de la Florida (*Nycticorax nycticorax*), ya que las observaciones representan extensiones en su distribución. Se registró un Zorzal Gato (*Dumetella carolinensis*), lo que representa una rara observación de verano para esta ave que en Cuba es residente invernal y transeúnte. Una proporción sustancial de especies (22%) y subespecies (25%) endémicas se registraron en el área de estudio. Los altos niveles de endemismo y diversidad encontrados en nuestro estudio preliminar apoyan la necesidad de incrementar el nivel de protección para la sierra del Infierno.

*Palabras clave: poblaciones de aves, cordillera de Guaniguanico, Cuba, endémico, asociaciones de hábitat, carso, mogote, parcela circular, sierra del Infierno, conteo*

THE SIERRA DEL INFIERNO, Cordillera de Guaniguanico, Pinar del Río province, is a little-studied region of western Cuba. Although some surveys of bird populations have been conducted in the Cordillera de Guaniguanico (González Bermúdez and del Risco Rodríguez 1981, Wallace *et al*. 1996, González *et al*. 1999, Hernández Suárez *et al*. 1999, Blanco 2000), we are unaware of intensive surveys of biodiversity in the Sierra del Infierno. In June 2000, we began a long-term survey of the plants and animals of the Sierra, concentrating first on the plant and bird communities. The initial studies will be followed by additional expeditions to examine bird populations during all seasons over a three-year period. The results of our June surveys of the plant communities have been summarized (Ruiz *et al*. 2001). Here we report the results of our bird surveys in the Sierra del Infierno, conducted during the

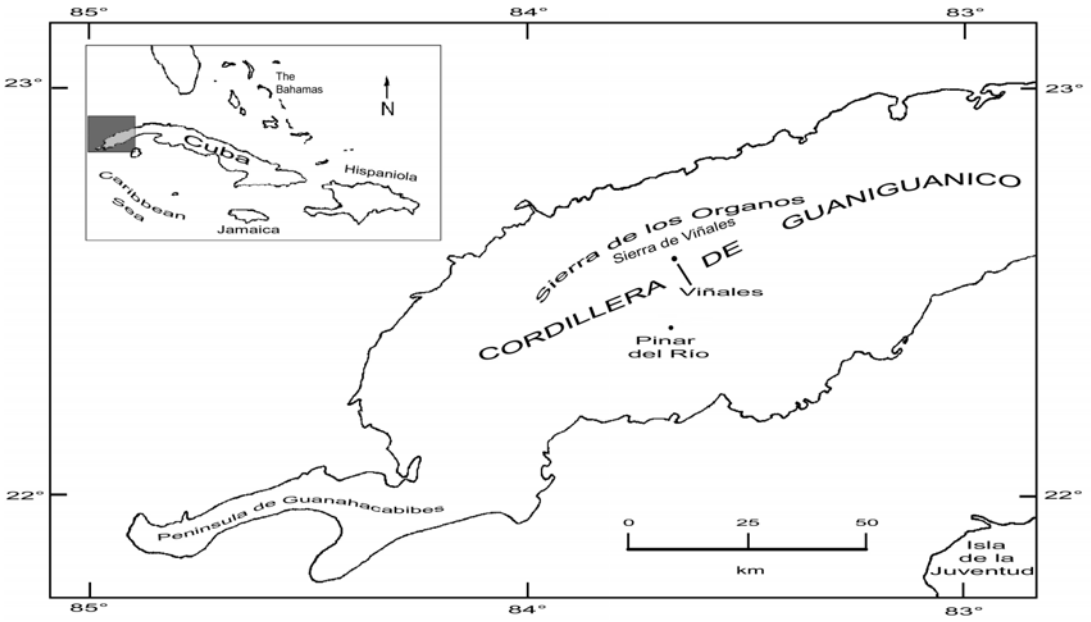


Fig. 1. Western Cuba, showing Sierra de Viñales and Sierra de los Organos, Cordillera de Guaniguanico. The Sierra del Infierno is a part of the Sierra de los Organos, northeast of Viñales. Shaded part of insert shows position of larger map.

breeding seasons of most species.

## STUDY AREA

The Sierra del Infierno, a part of the Sierra de los Organos, is Jurassic limestone deposited on slaty sandstone in the west, formed by a series of mountains of calcareous rock, eroded to leave vertical hillsides (Fig. 1). The karst formation of the region is characterized by steeply inclined, tower-like karstic hills or "mogotes," with narrow and deep gorges, hidden cave systems, and a long valley separating the mountains in a SW–NE direction. The surface of the mountains is usually bare rock or eroded skeletal soils. Still, many of the perpendicular walls are densely covered by vegetation; e.g., the sun-exposed cliffs support *Agave* scrub. The mogote tops are characterized by eroded exposed karst, with a bromeliad-rich open scrub. In the gorges, deep humic-carbonated rendzina soils are deposited, whereas in the intercolline valleys, tropical brown and red soils predominate. The rubble sides and ravines of the mogotes are dominated by closed forest, whereas the intercolline valley, formerly covered by seasonal evergreen forests, is cultivated, with fragments of a *Roystonea*-*Ceiba* secondary savanna. Our study site was centered at 22°37'05"N, 83°46'38"W.

Because of several factors, including geographical isolation of the Sierra and ecological extremes, the Sierra is a center of endemism. On the tops of the mogotes an ancient and highly specialized flora has developed, preserving several taxonomically isolated relicts, conditioned by the decreased competition in the extremely unfavorable habitats. With the rugged terrain of the karst hills, the upland area has been little developed, although slopes and valleys have a long history of agricultural use. This pattern of human use of the land, coupled with the antiquity of the karst formation and isolation of mogotes, has resulted in the paleoendemism (Samek 1973, Borhidi 1996). The karst forests are species-rich, consisting mostly of deciduous trees, 5–8 m high, on the steep slopes and tops of the karstic mountains. With a mean of 1600–2000 mm of precipitation per year, the vegetation falls within the subtropical humid forest in the Holdridge life-zone scheme (Borhidi 1996). Borhidi (op. cit.) distinguished seven types of vegetation within the mogote complex of the Sierra, including a herbaceous community rich in succulents in the sun-exposed southern hillsides and, in shady cracks, a mogote brush zone dominated by bromeliads on interior walls of the northern hillside, mogote forest or semideciuous forest over rocks and at the foot of the hills, and seasonal rainforest or relict rainforest. Deeper soils in the bowls between mogotes and on the slopes below the karst hills permit the development of tall forest. Whereas the slope forests have, for the most part, been cut to make way for

Table 1. Descriptions of bird survey points, Sierra del Infierno, Cordillera de Guaniguanico, Pinar del Río province, Cuba, 17–25 June 2000.

| Description | Station nos. |
|---|---|
| UPPER MOGOTE (8 subclasses; 15 stations) | |
| Upper mogote slope interface with large woodlot and small agriculture field | 48–53 |
| Above canyon, steep mogote side with low vegetative growth | W4, W5 |
| Upper canyon forest in mogote | W8 |
| Upper mogote forested canyon | W20 |
| Above canyon on steep mogote side – low vegetation | W9, W10 |
| Uppermost forested mogote canyon | W21 |
| Top of canyon wall – forest on additional level | W22 |
| Upper slope of mogote top, low vegetation | W23 |
| MOGOTE FOREST (14 subclasses; 35 stations) | |
| Forested plateau/sink in arroyo of mogote | 1–7 |
| Mogote side; open sun | 8–10 |
| Mogote top, with few trees | 11,12 |
| Sink forest | 13–22 |
| Camp cliff edge | 23 |
| Mogote canyon forest | 45–47 |
| Base of cliff–canyon forest | W1 |
| Mid-level canyon forest in mogote | W2 |
| Upper-level canyon – tall forest in mogote | W3 |
| Lower canyon forest in mogote | W6 |
| Mid-level forest in mogote canyon | W7 |
| Canyon mouth – dense forest | W11 |
| Wooded arroyo between steep mogote walls | 41, 42 |
| Wooded high arroyo between steep mogote walls | 43 |
| MOGOTE SLOPE (14 subclasses; 27 stations) | |
| Mogote edge, slope, forest with royal palm | 27 |
| Wooded mogote lower slope, surrounded on 2 sides by agriculture/pasture | 30–33 |
| Small stream with woods, on mogote slope | 34 |
| Forest (mogote slope)/pasture interface | 35 |
| Mid-slope, stream woodlot | 37 |
| Mid-slope forest/plantation | 38 |
| Lower slope, forest | 39 |
| Bottom of slope, stream/riparian/edge | 40 |
| Second growth woods on slope below mogote cliff | W27 |
| Mid-slope below cliff of mogote: woodlot/agriculture interface | W28, W29, W30 |
| Base of mogote cliff/interface with conuco | W12–W17 |
| Upper slope, below mogote cliffs: pasture/woodlots | W18, W19 |
| Upper slope, below cliff of mogote: woodlot/agriculture interface | W24, W25, W26 |
| Bottomland-valley woodlot with stream | 44 |
| MIXED AGRICULTURE (6 subclasses; 6 stations) | |
| Agriculture and woodlot | 24 |
| Banana plantation, surrounded by forest (base of mogote cliff) | 25 |
| Agriculture conuco surrounded by forest at edge of mogote cliff | 26 |
| Agriculture slope below mogote, with forest edge | 28 |
| Pasture (hillside) and woodlots/palm on mogote slope | 29 |
| Agriculture slope/woodlots | 36 |

agriculture, most trees within the mogote sinks and bowls remain. The trees form closed canopy forests maintaining high humidity.

## METHODS

Our surveys were conducted from 17 to 25 June 2000. Bird populations were sampled using point counts, following methods standardized by Wunderle (1994) and Bibby *et al*. (2000). Bird presence was determined by visual and auditory cues. Stations were a minimum of 75 m apart, but no standard distance could be established because of the nature of the terrain; i.e., the rugged mogote landscape dictated position of stations, although we attempted to place the stations evenly at 100 m. All birds detected within 25 m were recorded at each station for 5 min. Thereafter, the observer moved to the next station

with a slow walk. Data collection was performed in two periods: 15 min before sunrise through 09:30 h, and 16:00 h through 15 min after sunset. Bird populations were sampled at a total of 83 stations.

Vegetative and physical characteristics of the sites were noted after sampling periods. Those descriptions resulted in 42 distinct habitat classifications (Table 1). These were collapsed into the four general categories: Upper Mogote (upper cliff walls and summits; 8 subcategories, 15 stations), Mogote Forest (dense forest of lower walls, sinks, and elevated bowls between karst hills; 14 subcategories, 35 stations), Mogote Slope (steep upper slopes below mogote cliffs; 14 subcategories, 27 stations), and Mixed Agriculture (lower shallow slopes above valleys; 6 subcategories, 6 stations) (Table 1).

## RESULTS AND DISCUSSION

In total, 49 avian species were detected during the point counts (Table 2). Among the most frequently detected species were Cuban Tody (*Todus multicolor*; mean = 1.23 detected per station, detected at 80% of stations, mean = 1.55 individuals detected at stations with todies), Cuban Solitaire (*Myadestes elisabeth*; 1.20, 72%, 1.67), Cuban Trogon (*Priotelus temnurus*; 1.14, 76%, 1.51), Turkey Vulture (*Cathartes aura*; 1.06, 36%, 2.93), Yellow-headed Warbler (*Teretistris fernandinae*; 1.06, 57%, 1.87), and Scaly-naped Pigeon (*Columba squamosa*; 0.96, 49%, 1.95) (Table 2). Although less numerous overall, several species showed a higher mean incidence at stations where the species was detected, indicating a clumped distribution or flocking behavior; e. g., Greater Antillean Grackle (*Quiscalus niger*; mean = 0.69 detected per station, detected at 21% of stations, 3.35 individuals detected at stations with this species), Cuban Pewee (*Contopus caribaeus*; 0.49, 19%, 2.56), Cuban Martin (*Progne cryptoleuca*; 0.41, 15%, 2.83), Smooth-billed Ani (*Crotophaga ani*; 0.31, 11%, 2.89), Cave Swallow (*Petrochelidon fulva*; 0.23, 10%, 2.38), and Cuban Grassquit (*Tiaris canora*; 0.22, 8%, 2.57) (Table 2).

Among the birds detected in the surveys, of particular interest is Mangrove Cuckoo (*Coccyzus minor*), a species not mapped as occurring within the Cordillera de Guaniguanico by Garrido and Kirkconnell (2000). The cuckoo is a locally common resident on several of Cuba's larger cays, but is less common and occurs in few localities in Cuba. One Bee Hummingbird (*Mellisuga helenae*), a species Garrido and Kirkconnell (op. cit.) consider a rare local resident in Cuba, was observed among the 83 stations. Although depicted in the nearby Sierra de Anafe and Guanahacabibes peninsula, Garrido and Kirkconnell (op. cit.) did not map it as occurring within the mogote area of western Cuba. Wallace *et al*. (1996), however, recorded the hummingbird during intensive surveys at Mil Cumbres, some 36 km ENE of our study area. Also of interest is Red-legged Honeycreeper (*Cyanerpes cyaneus*), which Garrido and Kirkconnell (2000) characterize as a rare local resident, including in the Sierra de los Organos. We found the honeycreeper to be uncommon, detecting it at only two stations, with a total of three individuals (Table 2). Although considered a rare local resident by Garrido and Kirkconnell (op. cit.), we found Scaly-naped Pigeon in high numbers (0.96 individuals detected per station) and widely distributed among stations in appropriate (forest) habitats (detected at 41 [49%]of 83 stations) (Table 2). Several active nests (with eggs and chicks) were found in Mogote Forest. Key West Quail-Dove (*Geotrygon chrysia*) was detected at seven stations, for an average of 0.08 individuals per station, and 1.17 individuals per positive station (Table 2). Garrido and Kirkconnell (op. cit.) considered the quail-dove to be uncommon or locally common island-wide. Although Wallace *et al*. (1996) found Cuban Grassquit only in pine habitat, we encountered this species in Mogote Slope and Mixed Agriculture habitats in our study area.

In addition to species detected during the point counts, we observed and heard 19 species incidental to other work, including several species of special interest (Table 3). Two accipiters, Sharp-shinned Hawk (*Accipiter striatus*) and Gundlach's Hawk (*A. gundlachi*), were seen and heard twice each in the dense mogote forest. Wallace *et al*. (1996) also recorded Gundlach's Hawk from the region, which encompasses one of three populations noted by Wotzkow (1985). Garrido and Kirkconnell (2000) considered the sharpshin as endangered and Gundlach's Hawk vulnerable. Limpkin (*Aramus guarauna*) was infrequently heard within the mogote forest. Although considered common in Cuba (Garrido and Kirkconnell op. cit.), the Limpkin has been greatly reduced in numbers and distribution (e. g., Hispaniola; Wiley, pers. obs.) or extirpated (Puerto Rico; Raffaele 1989, Raffaele *et al*. 1998) in the West Indies. Stygian Owl (*Asio stygius*) was also heard infrequently; it is listed as uncommon, local, and vulnerable in Cuba (Garrido and Kirkconnell 2000). We saw a pair of Plain Pigeons (*Columba inornata*), considered endangered in Cuba (Garrido and Kirkconnell, op. cit.), on several occasions in the lower Mogote Slope and Mixed Agriculture interface. Garrido and Kirkconnell (op. cit.) did not include the mogote region of western Cuba as part of

Table 2. Species of birds detected at 83 point stations, with status and incidence of individuals at stations, Sierra del Infierno, Cordillera de Guaniguanico, Pinar del Río, Cuba, 17–25 June 2000. Arranged by rank, most-often encountered to least-often encountered.

| Species | Status in Cuba[1] | Total individuals detected | Mean number detected per station | Total number of stations in which detected | Percent of stations in which detected | Mean number detected per positive station[2] |
|---|---|---|---|---|---|---|
| Cuban Tody *Todus multicolor* | ESp CR/IW | 102 | 1.23 | 66 | 80 | 1.55 |
| Cuban Solitaire *Myadestes elisabeth* | ESp CR/L | 100 | 1.20 | 60 | 72 | 1.67 |
| Cuban Trogon *Priotelus temnurus* | ESp CR/IW | 95 | 1.14 | 63 | 76 | 1.51 |
| Turkey Vulture *Cathartes aura* | AR/IW | 88 | 1.06 | 30 | 36 | 2.93 |
| Yellow-headed Warbler *Teretistris fernandinae* | ESp CR/Re | 88 | 1.06 | 47 | 57 | 1.87 |
| Scaly-naped Pigeon *Columba squamosa* | RaR/L | 80 | 0.96 | 41 | 49 | 1.95 |
| Red-legged Thrush *Turdus plumbeus* | CR/IW | 69 | 0.83 | 49 | 59 | 1.41 |
| Black-whiskered Vireo *Vireo altiloquus* | CSuR/IW | 61 | 0.73 | 41 | 49 | 1.49 |
| La Sagra's Flycatcher *Myiarchus sagrae* | CR/IW | 58 | 0.70 | 42 | 51 | 1.38 |
| Greater Antillean Grackle *Quiscalus niger* | ESsp AR/IW | 57 | 0.69 | 17 | 21 | 3.35 |
| Cuban Bullfinch *Melopyrrha nigra* | ESsp CR/IW | 56 | 0.67 | 32 | 39 | 1.75 |
| West Indian Woodpecker *Melanerpes superciliaris* | ESsp CR/IW | 53 | 0.64 | 35 | 42 | 1.51 |
| Yellow-faced Grassquit *Tiaris olivacea* | CR/IW | 44 | 0.53 | 20 | 24 | 2.20 |
| Cuban Pewee *Contopus caribaeus* | ESsp CR/IW | 41 | 0.49 | 16 | 19 | 2.56 |
| Cuban Green Woodpecker *Xiphidiopicus percussus* | ESp CR/IW | 40 | 0.48 | 26 | 31 | 1.54 |
| Western Stripe-headed Tanager *Spindalis zena* | CR/IW | 39 | 0.47 | 26 | 31 | 1.50 |
| Cuban Martin *Progne cryptoleuca* | CSuR/IW | 34 | 0.41 | 12 | 15 | 2.83 |
| Great Lizard-Cuckoo *Saurothera merlini* | ESsp CR/IW | 31 | 0.37 | 27 | 33 | 1.15 |
| Loggerhead Kingbird *Tyrannus caudifasciatus* | ESsp CR/IW | 28 | 0.34 | 19 | 23 | 1.47 |
| Cuban Blackbird *Dives atroviolacea* | ESp CR/IW | 27 | 0.33 | 18 | 22 | 1.50 |
| Smooth-billed Ani *Crotophaga ani* | AR/IW | 26 | 0.31 | 9 | 11 | 2.89 |
| Gray Kingbird *Tyrannus dominicensis* | CSuR/IW | 22 | 0.27 | 13 | 16 | 1.69 |
| Zenaida Dove *Zenaida aurita* | CR/IW | 22 | 0.27 | 18 | 22 | 1.22 |
| Cave Swallow *Petrochelidon fulva* | ESsp CSuR/IW | 19 | 0.23 | 8 | 10 | 2.38 |
| Greater Antillean Oriole *Icterus dominicensis* | ESsp CR/IW | 19 | 0.23 | 13 | 16 | 1.46 |
| Cuban Grassquit *Tiaris canora* | ESp CR/almost IW | 18 | 0.22 | 7 | 8 | 2.57 |
| Cuban Emerald *Chlorostilbon ricordii* | ESsp CR/IW | 15 | 0.18 | 14 | 17 | 1.07 |
| Cuban Vireo *Vireo gundlachii* | ESp CR/IW | 15 | 0.18 | 14 | 17 | 1.07 |
| Tawny-shouldered Blackbird *Agelaius humeralis* | ESsp CR/IW | 15 | 0.18 | 7 | 8 | 2.14 |
| Northern Mockingbird *Mimus polyglottos* | CR/IW | 13 | 0.16 | 13 | 16 | 1.00 |
| Mourning Dove *Zenaida macroura* | AR/IW | 12 | 0.14 | 9 | 11 | 1.33 |
| Ruddy Quail-Dove *Geotrygon montana* | CR/IW | 10 | 0.12 | 10 | 12 | 1.00 |
| American Kestrel *Falco sparverius* | ESsp CR/IW | 8 | 0.10 | 6 | 7 | 1.33 |
| Key West Quail-Dove *Geotrygon chrysia* | U or LoC/IW | 7 | 0.08 | 6 | 7 | 1.17 |
| White-winged Dove *Zenaida asiatica* | CR/IW | 7 | 0.08 | 6 | 7 | 1.17 |
| Antillean Nighthawk *Chordeiles gundlachii* | CSuR/IW | 4 | 0.05 | 4 | 5 | 1.00 |
| Antillean Palm Swift *Tachornis phoenicobia* | ESsp CR/IW | 4 | 0.05 | 2 | 2 | 2.00 |
| Cuban Pygmy-Owl *Glaucidium siju* | ESp CR/IW | 3 | 0.04 | 3 | 4 | 1.00 |
| Red-legged Honeycreeper *Cyanerpes cyaneus* | RaR/L | 3 | 0.04 | 2 | 2 | 1.50 |
| Rock Dove *Columba livia* | CR/IW | 3 | 0.04 | 1 | 1 | 3.00 |
| Yellow-billed Cuckoo *Coccyzus americanus* | USuR/IW | 3 | 0.04 | 3 | 4 | 1.00 |
| Cuban Screech-Owl *Otus lawrencii* | ESp CR/IW | 2 | 0.02 | 1 | 1 | 2.00 |
| Green Heron *Butorides virescens* | CR/IW | 2 | 0.02 | 2 | 2 | 1.00 |
| Olive-capped Warbler *Dendroica pityophila* | CR/L | 2 | 0.02 | 1 | 1 | 2.00 |
| Bee Hummingbird *Mellisuga helenae* | ESp Ra R/L | 1 | 0.01 | 1 | 1 | 1.00 |
| Killdeer *Charadrius vociferus* | CR/IW | 1 | 0.01 | 1 | 1 | 1.00 |
| Mangrove Cuckoo *Coccyzus minor* | Less C in Cuba than larger cays R | 1 | 0.01 | 1 | 1 | 1.00 |
| Red-tailed Hawk *Buteo jamaicensis* | CR/IW | 1 | 0.01 | 1 | 1 | 1.00 |
| Shiny Cowbird *Molothrus bonariensis* | CR/IW | 1 | 0.01 | 1 | 1 | 1.00 |

[1]Status: ESp = endemic species, ESsp = endemic subspecies, A = abundant, C = common, U = uncommon, Ra = rare, LocC = locally common, R = resident year-round, SuR = summer resident, L = local, Re = restricted, IW = islandwide; from Garrido and Kirkconnell (2000).
[2]Positive station = Point station where the species was detected.

Table 3. Bird species detected, but not recorded during point count surveys, in the Sierra del Infierno, Cordillera de Guaniguanico, Pinar del Río province, western Cuba, 17–25 June 2000.

| Species | Status[1] | Detection[2] | Habitat type |
|---|---|---|---|
| Snowy Egret *Egretta thula* | CR/IW | O | Mixed Agriculture |
| Little Blue Heron *Egretta caerulea* | CR/IW | O | Mixed Agriculture |
| Cattle Egret *Bubulcus ibis* | AR/IW | O | Mixed Agriculture |
| Black-crowned Night-Heron *Nycticorax nycticorax* | CR/near IW | O/H | Mogote Slope |
| West Indian Whistling-Duck *Dendrocygna arborea* | CR/IW | H | Mogote Slope |
| Sharp-shinned Hawk *Accipiter striatus* | ESsp End R/L | O/H | Mogote Forest |
| Gundlach's Hawk *Accipiter gundlachi* | ESp Vu RaR/L | O/H | Mogote Forest |
| Broad-winged Hawk *Buteo platypterus* | ESsp CR/IW | O/H | Mogote Forest |
| Northern Bobwhite *Colinus virginianus* | ESsp CR/near IW | O/H | Mixed Agriculture |
| Limpkin *Aramus guarauna* | CR/IW | H | Mogote Forest |
| Plain Pigeon *Columba inornata* | End R/L | O/H | Mogote Slope/Mixed Agriculture |
| Common Ground-Dove *Columbina passerina* | CR/IW | O/H | Mixed Agriculture |
| Gray-headed Quail-Dove *Geotrygon caniceps* | ESsp Vu RaR/L | O/H | Mogote Forest |
| Barn Owl *Tyto alba* | CR/IW | H | Mogote Forest |
| Stygian Owl *Asio stygius* | ESsp UR/L | H | Mogote Forest |
| Greater Antillean Nightjar *Caprimulgus cubanensis* | ESsp CR/IW | H | Mogote Slope |
| Northern Flicker *Colaptes auratus* | ESsp CR/Re | O/H | Mogote Slope |
| Gray Catbird *Dumetella carolinensis* | CWR & T (19 Sep–25 May)/IW | O/H | Mogote Slope |
| Eastern Meadowlark *Sturnella magna* | ESsp CR/IW | O/H | Mixed Agriculture |

[1]Status: ESp = endemic species, ESsp = endemic subspecies, A = abundant, C = common, U = uncommon, Vu = vulnerable, Ra = rare, End = endangered, R = resident year-round, SuR = Su resident, WR = winter resident, T = transient, L = local, Re = restricted distribution, IW = islandwide; from Garrido and Kirkconnell (2000).
[2]Detection: O = observed, H = heard.

the pigeon's known range, although Wallace *et al*. (1996) observed one at Mil Cumbres in 1994. In other parts of its range (Jamaica, Hispaniola, and Puerto Rico), the species occurs in the wet limestone karst forests similar to that in the Sierra del Infierno (Wiley, pers. obs.). Another rare species (Garrido and Kirkconnell 2000), Gray-headed Quail-Dove (*Geotrygon caniceps*), was seen twice within the Mogote Forest. Wallace *et al*. (1996) recorded the quail-dove from Mil Cumbres. Although recorded from Mil Cumbres (Wallace *et al*., op. cit.) and Sierra de Organos (Blanco, unpubl. data), we did not detect Blue-headed Quail-Dove (*Starnoenas cyanocephala*) in our surveys. Garrido and Kirkconnell (2000) did not map Black-crowned Night-Heron (*Nycticorax nycticorax*) as occurring within the limestone karst of western Cuba, but we saw and heard it several times on the Mogote Slope. Northern Bobwhite (*Colinus virginianus*) was observed and heard in open areas in Mogote Slope, whereas Garrido and Kirkconnell (2000) restricted its range to the lowlands below the limestone karst of western Cuba.

We heard and observed a single Gray Catbird (*Dumetella carolinensis*) in a thick brushy area on the mogote slope on two occasions on 20 and 21 June 2000. The catbird is among the most commonly encountered winter residents and transients in Cuba (Wallace *et al*. 1996), but the late June date is extraordinary; Garrido and Kirkconnell (2000) confine its presence to 19 September through 25 May.

Hernández Suárez *et al*. (1999), conducted surveys of birds in the Sierra de los Organos in summer and winter, finding a total of 57 species, including 11 species we did not observe during our studies. All but three of the 11 species were winter residents, including six Neotropical migrant warblers, Belted Kingfisher (*Ceryle alcyon*), and Yellow-bellied Sapsucker (*Sphyrapicus varius*). Hernández Suárez *et al*. (op. cit.) also reported Great Blue Heron (*Ardea herodias*; common in the valley below our study area), White-crowned Pigeon (*Columba leucocephala*), and House Sparrow (*Passer domesticus*). Our list of species recorded (point counts and incidental) totaled 68, including 22 species not reported by Hernández Suárez *et al*. (op. cit.).

Blanco (2000) listed a total of 62 species for the Sierra de los Órganos, 18 of which were not detected in our surveys. These included 11 migrants (Yellow-throated Vireo *Vireo flavifrons*, Palm Warbler *Dendroica palmarum*, Magnolia Warbler *D. magnolia*,

Table 4. Bird species detected during point counts at 83 stations classed in four habitat categories, Sierra del Infierno, Cordillera de Guaniguanico, Pinar del Río province, Cuba, 17–5 June 2000.

| Species[1] | Presence in habitat category – Number (%) of individuals | | | | Total |
|---|---|---|---|---|---|
| | Upper Mogote | Mogote Forests | Mogote Slope | Mixed Agriculture | |
| Green Heron | | 1 (50) | 1 (50) | | 2 |
| Turkey Vulture | 25 (28.4) | 9 (10.2) | 51 (58) | 3 (3.4) | 88 |
| Red-tailed Hawk | | 1 (100) | | | 1 |
| American Kestrel | 1 (12.5) | | 6 (75) | 1 (12.5) | 8 |
| Killdeer | | | 1 (100) | | 1 |
| Rock Dove | | | | 3 (100) | 3 |
| Scaly-naped Pigeon | 18 (22.5) | 39 (48.8) | 19 (23.8) | 4 (5) | 80 |
| White-winged Dove | | | 3 (42.9) | 4 (57.1) | 7 |
| Zenaida Dove | 7 (31.8) | 3 (13.6) | 10 (45.5) | 2 (9.1) | 22 |
| Mourning Dove | 2 (16.7) | 2 (16.7) | 7 (58.3) | 1 (8.3) | 12 |
| Key West Quail-Dove | 2 (28.6) | 5 (71.4) | | | 7 |
| Ruddy Quail-Dove | 3 (30) | 5 (50) | 2 (20) | | 10 |
| Yellow-billed Cuckoo | 1 (33.3) | 1 (33.3) | 1 (33.3) | | 3 |
| Mangrove Cuckoo | | | 1 (100) | | 1 |
| Great Lizard-Cuckoo | 13 (41.9) | 10 (32.3) | 6 (19.4) | 2 (6.5) | 31 |
| Smooth-billed Ani | 2 (7.7) | | 23 (88.5) | 1 (3.9) | 26 |
| Cuban Screech-Owl | | 2 (100) | | | 2 |
| Cuban Pygmy-Owl | 2 (66.7) | 1 (33.3) | | | 3 |
| Antillean Nighthawk | 3 (75) | 1 (25) | | | 4 |
| Antillean Palm Swift | | | 4 (100) | | 4 |
| Cuban Emerald | 2 (13.3) | 10 (66.7) | 3 (20) | | 15 |
| Bee Hummingbird | | | 1 (100) | | 1 |
| Cuban Trogon | 13 (13.7) | 41 (43.2) | 32 (33.7) | 9 (9.5) | 95 |
| Cuban Tody | 12 (11.8) | 49 (48) | 39 (38.2) | 2 (2) | 102 |
| West Indian Woodpecker | 9 (17) | 24 (45.3) | 18 (34) | 2 (3.8) | 53 |
| Cuban Green Woodpecker | 6 (15) | 17 (42.5) | 17 (42.5) | | 40 |
| Cuban Pewee | 1 (2.4) | | 29 (70.7) | 11 (26.8) | 41 |
| La Sagra's Flycatcher | 15 (25.9) | 19 (32.8) | 20 (34.5) | 4 (6.9) | 58 |
| Gray Kingbird | 7 (31.8) | 3 (13.6) | 9 (40.9) | 3 (13.6) | 22 |
| Loggerhead Kingbird | | 2 (7.1) | 24 (85.7) | 2 (7.1) | 28 |
| Cuban Vireo | 2 (13.3) | | 10 (66.7) | 3 (20) | 15 |
| Black-whiskered Vireo | 5 (8.2) | 32 (52.5) | 21 (34.4) | 3 (4.9) | 61 |
| Cuban Martin | 8 (23.5) | 10 (29.4) | 6 (17.6) | 10 (29.4) | 34 |
| Cave Swallow | | 14 (73.7) | 1 (5.3) | 4 (21.1) | 19 |
| Cuban Solitaire | 15 (15) | 52 (52) | 29 (29) | 4 (4) | 100 |
| Red-legged Thrush | 12 (17.4) | 32 (46.4) | 21 (30.4) | 4 (5.8) | 69 |
| Northern Mockingbird | 1 (7.7) | | 10 (76.9) | 2 (15.4) | 13 |
| Olive-capped Warbler | | | 2 (100) | | 2 |
| Yellow-headed Warbler | 13 (14.8) | 55 (62.5) | 18 (20.5) | 2 (2.3) | 88 |
| Western Stripe-headed Tanager | 11 (28.2) | 13 (33.3) | 11 (28.2) | 4 (10.3) | 39 |
| Red-legged Honeycreeper | | 1 (33.3) | 2 (66.7) | | 3 |
| Cuban Bullfinch | 14 (25) | 19 (33.9) | 23 (41.1) | | 56 |
| Cuban Grassquit | | | 15 (83.3) | 3 (16.7) | 18 |
| Yellow-faced Grassquit | 6 (13.6) | 3 (6.8) | 30 (68.2) | 5 (11.4) | 44 |
| Tawny-shouldered Blackbird | 3 (20) | | 11 (73.3) | 1 (6.7) | 15 |
| Cuban Blackbird | 2 (7.4) | 6 (22.2) | 17 (63) | 2 (7.4) | 27 |
| Greater Antillean Grackle | 31 (54.4) | | 20 (35.1) | 6 (10.5) | 57 |
| Shiny Cowbird | 1 (100) | | | | 1 |
| Greater Antillean Oriole | 5 (26.3) | | 11 (57.9) | 3 (15.8) | 19 |
| Totals (%) of all species | 35 (71.4) | 32 (65.3) | 42 (85.7) | 31 (63.3) | 49 |

[1]See Tables 2 and 3 for scientific names.

Black-and-white Warbler *Mniotilta varia*, Worm-eating Warbler *Helmitheros vermivorus*, Swainson's Warbler *Limnothlpis swainsonii*, Ovenbird *Seiurus aurocapillus*, Hooded Warbler *Wilsonia citrina*, Summer Tanager *Piranga rubra*, Indigo Bunting *Passerina cyanea*, and Yellow-bellied Sapsucker), three lowland waterbirds (Neotropic Cormorant *Phalacrocorax brasilanus*, Common Moorhen *Gallinula*

*chloropus*, and Black-necked Stilt *Himantopus mexicanus*), Crested Caracara (*Caracara plancus*), White-crowned Pigeon, Cuban Gnatcatcher (*Polioptila caerulea*), and Helmeted Guineafowl (*Numida meleagris*). More recently, Blanco (unpubl. ms.) expanded his list to 73 species for the Sierra, including an additional six not encountered by us: Brown Pelican (*Pelecanus occidentalis*), Blue-headed Quail-Dove, White-eyed Vireo (*Vireo griseus*), Northern Parula (*Parula americana*), Black-throated Blue Warbler (*Dendroica caerulescens*), and House Sparrow.

Of the 49 species detected during point counts, nine were restricted to one of the four habitat types: Upper Mogote – 1 species, Mogote Forest – 2 species, Mogote Slope – 5 species, and Mixed Agriculture – 1 species. Almost all of these species represent sample sizes of a single individual and thus cannot be interpreted as habitat specialists. Most other species, however, were found in three or all four of the habitats; more species (N = 18; 37%) were found in four habitat types than were detected in only three (N = 15; 31%) or two (N = 7; 14%) types. Wallace *et al*. (1996) regarded Cuban Pewee, Cuban Vireo (*Vireo gundlachii*), Loggerhead Kingbird (*Tyrannus caudifasciatus*), Cuban Tody, and Cuban Green Woodpecker (*Xiphidiopicus percussus*) as a group of ubiquitous resident species found in a wide variety of habitats. This agrees with our observations, in which each of these species occupied at least three of the four habitat types examined. Several species (e.g., American Kestrel *Falco sparverius*, Smooth-billed Ani, Cuban Pewee, Northern Mockingbird *Mimus polyglottos*, Cuban Vireo, Tawny-shouldered Blackbird *Agelaius humeralis*, Greater Antillean Grackle, and Greater Antillean Oriole *Icterus dominicensis*) not found in the intervening dense Mogote Forest were detected in the open vegetation of the mogote tops (Upper Mogote) as well as Mogote Slope habitat. Among the forest species, the most restricted were Key West Quail-Dove, Cuban Screech-Owl (*Otus lawrencii*), Cuban Pygmy-Owl (*Glaucidium siju*), and Antillean Nighthawk (*Chordeiles gundlachii*), all of which were detected only in the Upper Mogote and Mogote Forest (screech-owl only in Mogote Forest). Wallace *et al*. (1996) considered Cuban Emerald (*Chlorostilbon ricordii*), Cuban Solitaire, Yellow-headed Warbler, and Yellow-faced Grassquit (*Tiaris olivacea*) as specialized in their use of mature, high canopy, montane forest, particularly pine. Our data agree with such an assignment of the emerald, solitaire, and warbler, but we found the great majority of grassquits in Mogote Slope habitat. No substantial difference was found in numbers of species detected among the habitat types, although we found the greatest diversity in Mogote Slope (N = 42 of 49 [86%] species) and least diversity (N = 31 [63%] species) in Mixed Agriculture habitat (Table 4).

Although none of the species detected during our counts is restricted to the Sierra de los Organos or Sierra del Infierno, we found a high proportion were Cuban endemic species (N = 11; 22%) or subspecies (N = 12; 25%) (Table 2). An additional endemic species and eight subspecies were recorded on the study area but not during the point counts (Table 3).

No corvids were detected, although both Palm Crow (*Corvus palmarum*) and Cuban Crow (*C. nasicus*) occur in nearby areas (Garrido and Kirkconnell 2000). Local residents were questioned, but all responded that crows had not been seen in the Sierra del Infierno for more than 30 years. We also inquired among locals about the status of other species of concern in Cuba. No long-time residents had seen Cuban Parrot (*Amazona leucocephala*) nor Cuban Parakeet (*Aratinga euops*) in at least 30 years, although both species were within the memories of several old-timers. One 91-year-old resident, who moved to the area in 1943, noted that parrots were hunted out some 40 years ago, with parakeets disappearing about the same time.

Our surveys were restricted to the summer, when almost all migrants and winter residents were absent from the area. Further surveys will be made year-round and for a period of several years to determine the diversity of avian species using the area. Furthermore, the status of several species detected for the first time in the mogote region will be examined in greater detail. The nearby area of Viñales is a popular tourist location and the geography of the region is spectacular enough to attract further development for tourism. The ruggedness of the mogotes has served to protect them from the kinds of extensive habitat alteration that has vastly changed the valleys and slopes. Still, these lower areas are apparently important for almost all avian species that occur in the less damaged karst forest and mogote tops, because few species restricted their activities to the more remote and secure of the habitats. The high levels of endemism and diversity revealed in our preliminary surveys support ensuring the Sierra de los Organos and Sierra del Infierno with greater protection.

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