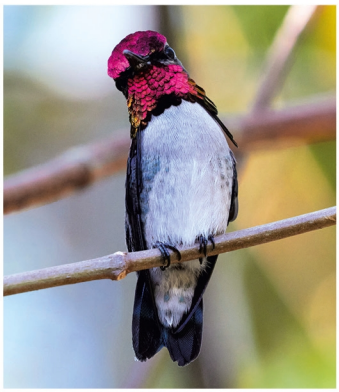
BIRDS OF CUBA

A PHOTOGRAPHIC GUIDE




ARTURO KIRKCONNELL, PATRICIA E. BRADLEY
& YVES-JACQUES REY-MILLET

BIRDS OF CUBA

A PHOTOGRAPHIC GUIDE

Arturo Kirkconnell, Patricia E. Bradley and
Yves-Jacques Rey-Millet

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For Yves-Jacques Rey-Millet (1946–2016)

A lifetime of photographing birds
throughout the West Indies
has contributed to our understanding
of this precious resource.

AK: To my wonderful grandchildren
Adam and Alexa Kirkconnell,
whom I love.

PEB: To my beloved grandson
Alexander Michael Bradley.

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PREFACE

The preparation of this guide has not been easy due to the death in June 2016 of the third author and principal photographer, Yves-Jacques Rey-Millet, after a brief but devastating illness. It was a terrible shock and work on the book ground to a halt. His ambition had been to complete a trio of West Indian photographic field guides: Cayman Islands, Jamaica and Cuba. Yves-Jacques and Patricia had worked together on many projects since 1983 and the loss of his friendship and professional collaboration has been profound. Arturo, too, had developed a special bond with Yves-Jacques since they began working on the Cuban book in 2013. In late 2017, we returned to completing the text and the daunting task of reviewing over 400,000 of Yves-Jacques's unsorted photographs. Despite this vast body of work, he had not had sufficient time to complete the Cuban portfolio.

This is the first photographic field guide for the birds of Cuba, with a total of 384 recorded species, of which 29 are endemic species. Among these are outstanding birds such as the Bee Hummingbird (the smallest bird in the world), the charming and enigmatic Blue-headed Quail-Dove, the Cuban Trogon with its unique tail, the very colourful Cuban Tody and two beautiful picids, Cuban Green Woodpecker and Fernandina's Flicker. A total of 156 species breed on Cuba, 138 Nearctic migrants are regular winter visitors, 44 species are exclusively passage migrants, 74 are currently considered to be vagrants or accidental visitors, and 16 are summer residents that come to Cuba to breed and spend our winters in the south. Eight well-established species are confirmed as introduced and another two were possibly introduced. The entries for three species use illustrations of birds for which we were unable to obtain photographs because of their rarity.

Arturo Kirkconnell and Patricia E. Bradley
Cuba and the Cayman Islands
August 2020

Blue-headed Quail-Dove.

ACKNOWLEDGMENTS

We are especially grateful to those who have come to our rescue by sharing their images to fill the empty spaces; in particular, we would like to thank Nancy Norman, Arturo Kirkconnell Jr and Bruce Hallett. And for the task of preparing the digital images for publication we thank the extraordinary and extensive work of Esteban Gutiérrez, Nancy Norman and Arturo Kirkconnell Jr. We could not have completed the field guide without the generosity of these four friends giving their time and expertise. Thanks to Glen Tepke and Yves Aubry for sharing last-minute images. We would like to thank our Publisher, Jim Martin, for his patience and understanding throughout this project, our Editor, Jenny Campbell, for her patience and wise judgement in producing the book amid our deluge of changes, and to Rod Teasdale for his design skills.

We also wish to thank Alexandra Günther-Calhoun for giving permission to use the Rey-Millet photographs; Eldon and Pat Kirkconnell for their support during Arturo's visits to the Cayman Islands; Jim Wiley for reviewing parts of the Introduction; and artist Alvaro de Jesús for his wonderful illustrations. We would also like to thank Carlos Mancina who kindly cooperated with the production of very accurate maps; and Ramona Oviedo, Manuel Iturralde-Vinent and Jesús Pajón who provided important information for the Introduction.

Thanks, too, to KBC and Alvaro's Adventures for supporting some of the field expeditions providing data and images; the American Museum of Natural History, New York, for permission to review bird collections, with special thanks to Paul Sweet; Dan Thompson at Vireo Resources for Ornithology, Drexel University; Rosita M. Posada for all her support, and Roberto Posada, who assisted with some of the field expeditions; and Marlene Concepción for facilitating communication.

Female Fernandina's Flicker.

INTRODUCTION TO THE CUBAN ARCHIPELAGO

GEOGRAPHICAL POSITION

Cuba is the largest country in the Caribbean Sea and represents more than half of the total land mass of the West Indies. It is bordered to the north by the Straits of Florida, to the north-east by the Nicholas Channel and the Old Bahama Channel, to the south by the Windward Passage and the Cayman Trench, while to the south-west lies the Caribbean Sea. To the west, it reaches to the Yucatán Channel and the north-west is open to the Gulf of Mexico.

The Cuban archipelago comprises a main island (Cuba), the Isle of Pines (or Isle of Youth) and more than 3,000 small islands and cays (generally small, low-elevation islands on the surface of reefs) comprising four archipelagos. Off the southern coast lie the archipelagos of Jardines de la Reina and Los Canarreos. Off the north-eastern shore lies the Sabana-Camagüey archipelago or Jardines del Rey, which is composed of approximately 2,517 cays and islands, including Cayo Coco, Cayo Romano and Cayo Paredón Grande. The Colorados archipelago lies off the north-western coast.

Map of the Cuban archipelago.

Geographical statistics of the Cuban archipelago:
Main island: 104,553km².
Isle of Pines (or Isle of Youth): 2,204km².
Cays: 3,126km².
Total area: 109,883km².

Geographical limits:
Northern limit: Cayo Cruz del Padre, 23° 17′ 09″ N.
Southern limit: Punta del Inglés, 19° 49′ 36″ N.
Eastern limit: Punta del Quemado, 74° 07′ 52″ E.
Western limit: Cabo de San Antonio, 84° 57′ 54″ W.

Neighbouring countries:
Haiti: 77km to the east, across the Windward Passage.
Jamaica: 140km to the south, across the Strait of Columbus.
United States: 180km to the north, across the Straits of Florida.
Mexico: 210km to the west, across the Yucatán Channel.

Length and breadth of the main island:
Longitudinal axis: 1,250km.
Widest part: 191km.
Narrowest: 31km.

Highest elevations:
Western provinces: Pan de Guajaibón; 699m, Cordillera de Guaniguanico.
Central provinces: Pico de San Juan, 1,140m, Massif of Guamuhaya.
Eastern provinces: Pico Turquino, 1,972m, in the Sierra Maestra.

Length of the main rivers:
Flowing north: Sagua la Grande, 144km; Caonao, 132km; Toa, 118km.
Flowing south: Cauto, 343km; Zaza, 145km; Agabama, 118km.

ABOUT CUBA

The total Cuban population was *c.* 11.5 million in 2017. The first Spanish settlement, in Baracoa, was founded by Diego Velázquez in 1511. There were two major population waves from Spain, of *c.* 0.5 million in 1820–98, and 1.2 million in 1899–1930, although many returned. During 1842–73, 221,000 Africans were brought to Cuba as slaves. In 1959, a revolutionary government took power, and by 1961 a socialist system had been established. The present constitution ascribes the role of the Communist Party of Cuba to be the 'leading force of the society and the state' and as such has the capability of setting national policy. The language spoken is Spanish.

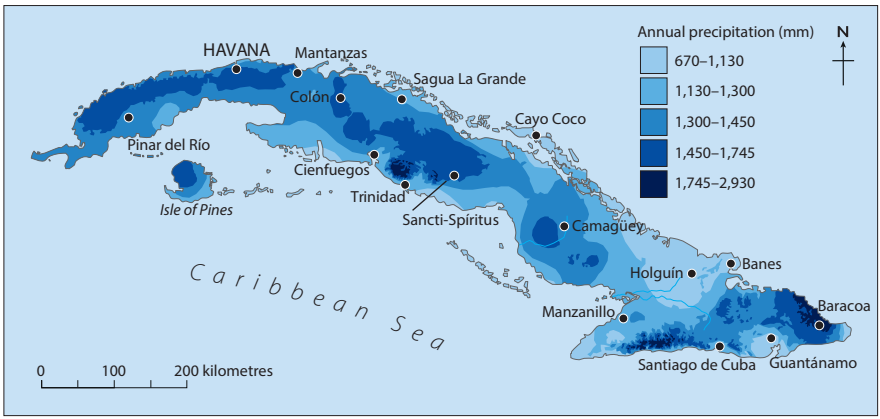
CLIMATE

The Cuban climate is tropical but varies considerably, due to the geographical location of the island and seasonal variations. The dry period extends generally from November–April. The driest regions are on the south coast: the south-eastern province of Guantánamo and east of Cienfuegos, where annual rainfall is less than 200mm. The annual mean temperature on the island is 25.2°C, mean humidity 80 per cent and mean annual rainfall 1,374mm. The Sierra Maestra mountain range receives an average of 1,600mm. The maximum recorded annual rainfall is in the eastern mountain range (Nipe–Sagua–Baracoa), with mean rainfall exceeding 3,400mm. Wind direction varies with locality. Along the north coast and inland, prevailing winds are from the north and the east-north-east. Along the south coast, winds are mostly from the north-east to south-east.

The winter is marked by the arrival of cold fronts from the north. These usually affect the western two-thirds of the archipelago and occur from September–March. From February–April, southerly winds predominate.

The Caribbean experiences a strong tropical storm season from June–November. In the last 168 years, Cuba has averaged slightly more than one tropical storm per year, with approximately 196 storms crossing the territory in that period. Of these, 37 were classified as high intensity, or hurricanes, with winds reaching more than 210km per hour. Storms are more frequent in the western third of the island.

Annual precipitation across the Cuban archipelago.



GEOLOGY

Origin of the Cuban land mass

The islands of the Greater Antilles (Cuba, Hispaniola, Puerto Rico and Jamaica) have complex geological histories, and the geological foundation of Cuba is an amalgam of rocks of various origins. The general trend on Cuba's tectonic evolution has been the rising of the land surface and an increase in its area; this process commenced *c.* 40–45 million years ago (MYA). Around 3–4 MYA, the Cuban archipelago was part of a large promontory in the north-western Caribbean. From about 20,000 years ago to the present, glacial and interglacial periods alternated, with corresponding falls in sea level (creating more land) followed by sea level rises (which flooded many land areas). It is estimated that the average speed of uplift of the Cuban land mass during this period ranged from 1–3mm per year, while the mean rise in sea level was 4.8 mm. Since *c.* 8,000–10,000 years ago, sea level rise first accelerated, then subsequently declined, redrawing the coastline to some extent and adjusting the position of inshore coral reefs.

ORIGINS OF THE AVIFAUNA

The oldest bird fossil recorded in the West Indies is a feather found preserved in amber on Hispaniola and estimated to date from 15–20 MYA; it belonged to a woodpecker closely related to Antillean Piculet. The oldest mammal fossils found on Cuba (a rodent, a sloth and a monkey) date from 20–30 MYA. If mammals, which are much less able to disperse across physical barriers than birds, were present in the Greater Antilles, it is logical that an indigenous avifauna was present, too.

During the late Oligocene (*c.* 25 MYA), the eastern part of Cuba was connected to Hispaniola and this connection lasted *c.* 10 million years. Later, *c.* 16–14 MYA, tectonic activity led to the separation of land blocks to form the Greater Antillean islands of today; Cuba and Hispaniola separated, and the Paso de los Vientos formed. Since the separation of the Greater Antilles, faunal fragmentation, or vicariance, among islands has given a new biogeographical panorama to the region, as evidenced by fossil remains shared among islands and by the present distribution of some species, including Cuban and Hispaniolan Trogons, and the nightjar genus *Siphonorhis*.

During the Pliocene (2.6–5.0 MYA), birds reached their maximum diversity. New genera appeared, and most of those present-day species evolved. In the early Pliocene, sea level was *c.* 80m higher than it is at present and most of Cuba was submerged. Yet, there is no doubt that birds were part of the terrestrial fauna, and would have found refuge in the highest mountains, as they did in Jamaica, Hispaniola and Puerto Rico. At some point during the last 3–4 million years, the three islands were reunited to form a single island. The faunas of the reunited islands dispersed throughout Cuba although during interglacial periods, isolation and fragmentation of populations continued. Such vicariance could also probably explain the modern distribution of the genus *Teretistris*.

In the mid- to late Pliocene (2.6–3.0 MYA), a pattern of alternating glacial and interglacial cycles commenced and continued during the Pleistocene (2.6 MYA to 11,000 years ago). During glacial stages, a cold, dry climate with arid conditions predominated in the Greater Antilles, while during interglacial periods, a warm, humid climate was dominant. Rising and falling sea level also affected ecosystems and habitats throughout the region and consequently modified the flora and fauna.

Avian colonisers

The ancestors of the present Greater Antilles endemic avifauna have spread from west to east and from north to south. The most accepted biogeographic theory is that over-water dispersal from Middle and North America was responsible for the ancestral taxa of present Greater Antillean avifauna. Glaciation and falling sea levels caused island land masses to increase in area, reducing the distances between the islands and the continent. Thus, many species colonised the Caribbean from Middle America via Jamaica (believed to be the first Greater Antillean island to be colonised) and via Yucatán to western Cuba. During Pleistocene glaciations (*c.* 17,000–20,000 years ago), sea level was 100–120m below the present level,

resulting in Caribbean islands being larger than at present. For example, Puerto Rico and the Virgin Islands were connected, and many of the Bahamian islands were united. When sea levels were 40m below present levels, *c.* 10,000–12,000 years ago, the Great Bahama Bank was only 20km from Cuba (currently *c.* 180km separates Cuba from the Great Bahama Bank) and had a land area of 102,231–103,670km^2, nearly the same size as Cuba today (109,833km^2). Consequently, several taxa, such as Northern Mockingbird and Northern Flicker, entered the West Indies from North America via Florida to Cuba and the Bahamas.

Over-water dispersal from the Middle and North America continent was likely in response to global climate changes in tropical and temperate regions, and to the availability of food resources in the breeding and wintering grounds. It acted as a selective filter, preventing the colonisation of distant sites by groups of birds with weak flight capabilities and allowing taxa with advantageous ecological characteristics to colonise successfully. Ancestral migratory movements throughout the Greater Antilles were probably also achieved via regular migrations or by post-breeding dispersal during these glacial epochs. The existence of natural corridors in or near the distribution range of a particular species may facilitate its dispersal. For example, since the mid-Pleistocene, a corridor of thorn-scrub habitat along the North American Gulf coast has facilitated interchange between eastern Mexico and Texas and south-east to the Florida Peninsula; it persists today.

Endemism

During glacial and interglacial events earlier in the Pleistocene, the distribution of West Indian vertebrates was affected by alternating emergence and submergence of land. This cycle resulted in repeated faunal isolation, speciation and extinction. Once resident populations were established, endemic taxa evolved over time by a process that probably accelerated due to greater isolation during interglacial periods, when sea level was higher and there were more isolated land masses. During periods when islands were more isolated, avian colonisers faced new selective pressures, new habitats and niches, leading to the evolution of island endemics, a process that probably took longer in some groups than in others.

On Cuba, a unique endemic family (Teretistridae) and eight endemic genera occur: *Cyanolimnas* (rail), *Starnoenas* (quail-dove), *Margarobyas* (owl), *Xiphidiopicus* (woodpecker), *Ferminia* (wren), *Teretistris* (Cuban warblers), *Torreornis* (sparrow), and *Ptiloxena* (blackbird), with a total of 29 endemic species suggesting a long isolation from continental lineages.

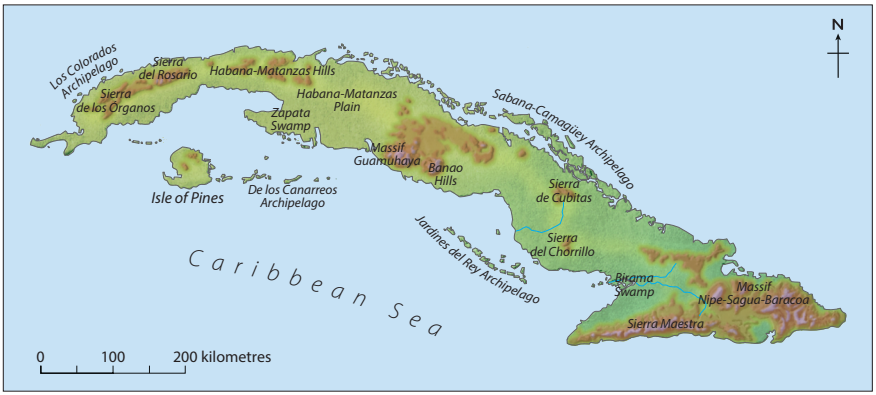
VEGETATION AND HABITATS

Knowledge of Cuba's habitat types can assist greatly in finding its birds. The diversity of Cuban vegetation is indicated by the existence of about 30 types of habitat, making the Cuban archipelago a conservation hotspot. There is a total of 7,020 species of vascular plants, of which some 6,000 are flowering plants and about 50 per cent are endemic to the island. Among the endemic species, 15 per cent are found mainly at low elevations, with approximately 75 per cent found in highland regions. The Nipe–Sagua–Baracoa mountain system has the highest percentage of endemics. Generally speaking, semi-deciduous forests account for about 43 per cent of all forested areas, mangroves 31 per cent, and pine forests, relicts from past ice ages, 12 per cent. The vegetative diversity of the Cuban archipelago has been impoverished: 500 years ago, forest accounted for 95 per cent, but today the figure is just 14–16 per cent.

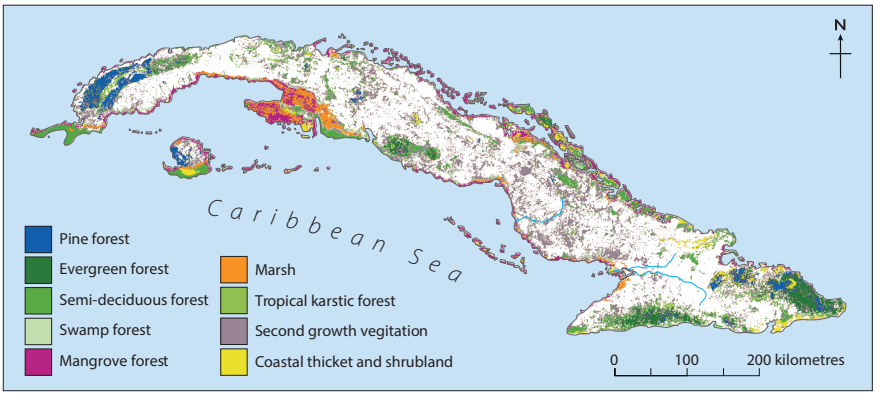
Extensive rainforests cover the eastern mountains, whereas the south-eastern coastal ranges from Guantánamo to Maisí are extremely arid. Savannas altered by agriculture are often extensive, and biologically quite distinct. Noteworthy are the sandy savannas of the Isle of Pines and Pinar del Río and those on the large stretches of flat terrain scattered between the Havana region and the easternmost mountain ranges with their many Royal Palms, *Roystonea regia*. Swampy vegetation is abundant on the Zapata Peninsula.

The following is a summary of some important bird habitats shown on the map (the vernacular name is shown in parenthesis), we highlight major examples in the Cuban archipelago, including several important habitat sub-types.

Topographic map of Cuba.



Vegetation on the Cuban archipelago.



Cloud forest, Pico Turquino.

TERRESTRIAL HABITATS

Cloud forest typically occurs from 1,600–1,900m above sea level, although this formation is sometimes found at lower elevations. Annual precipitation range is 170–300cm. Cloud forest has no deciduous elements and the tree height averages 12m. Vegetation is almost continuously shrouded in mist from the near-constant cloud cover, and the high humidity supports luxuriant growths of arboreal and terrestrial ferns, mosses, liverworts and orchids, as well as a grass strata. Examples of cloud forest occur in the highest mountains of Sierra Maestra, Sierra de Imías, Sierra del Purial and other eastern mountain ranges, most notably at Pico Turquino. Indicator plant species found in cloud forest are *Magnolia* spp., *Cyrilla silvae*, *Graffenrieda rufescens*, *Ilex macfadyenii*, *Brunellia comocladifolia*, *Tabebuia shaferi*, *Garrya fadyenii*, *Torralbasia cuneifolia* and *Weinmannia pinnata*.

Rainforest is characterised by emergent deciduous trees, an annual precipitation of 120–300cm, and no dry season. Epiphytes and arboreal ferns are abundant. Three sub-types of rainforest are recognised on Cuba:

Rainforest, Humboldt National Park, Guantánamo.

a) **Lowland rainforest** extends from the coast to as high as 400m above sea level, with three arboreal strata, the tallest of which attains 35m. Annual rainfall is 160–300cm. In some localities of Moaëse phytogeographic district, rainfall may reach 500cm. Examples of lowland rainforest are found at Moa and Toa (e.g. the mouths of the rivers Jaguaní, Moa and Toa; Mal Nombre, a locality in Guantánamo province). In Guantánamo province, lowland rainforest is present at Meseta Mina Iberia and El Yunque near Baracoa. Indicator species are: *Carapa guianensis*, *Calophyllum utile*, *Oxandra laurifolia*, *Bactris cubensis*, *Tabebuia dubia*, *T. hypoleuca* and *Protium fragrans*.

b) **Submontane seasonal tropical rainforest** is found at elevations of 200–800m in mountains throughout Cuba, with rainfall of 80–300cm. It is similar to semi-deciduous forest, but with a greater proportion of evergreen species. Examples include: in Pinar del Río province, on the north-eastern slope of Pan de Guajaibón, some areas of Sierra del Rangel and Sierra del Rosario; in Cienfuegos province, near Pico San Juan; and in Sancti-Spíritus province, in some areas of Banao and Pico Potrerillo. Indicator species include *Andira inermis*, *Bursera simaruba*, *Sideroxylon foetidissimum*, *S. salicifolium*, *Cupania* spp., *Clusia rosea*, *Roystonea regia* and *Chionanthus ligustrinus*.

c) **Montane tropical rainforest** occurs at elevations of 800–1,600m in areas with rainfall of 160–230cm. It is characterised by two strata, the tallest of which attains 25m. Examples can be observed in Cuchillas del Toa and Moa, as well as at several localities in Sierra Maestra, including Gran Piedra and Pico Mogote, Meseta de Mina Iberia, part of Meseta del Toldo and some wooded areas around La Melba. Typically, trees are covered with epiphytes (orchids and bromeliads) and arboreal ferns (e.g. *Byrsonima crassifolia* and *B. bucherae*). Indicator species include *Beilschmiedia pendula*, *Clethra cubensis*, *Guatteria blainii*, *G. moralesi*, *Matayba domingensis*, *Micropholis polita* and *Bonnetia cubensis*.

Semi-deciduous woodland originally covered the majority of the island, in flat and rolling regions, the lower slopes of mountains and other seasonally humid areas. Annual rainfall is 100–120cm. It is a broadleaf woodland habitat, with 40–65 per cent of the upper stratum comprising of deciduous trees, and an understorey that includes bushes, grasses, some epiphytes and abundant lianas (woody vines). Two sub-types of semi-deciduous woodland are recognised on Cuba. Below are the characteristics of both sub-types:

a) **Semi-deciduous mesophyllous woodland** occurs in savanna, with two strata of trees no more than 15–25m in height, with individual trees and palms emergent above the highest stratum. Tree leaves are typically longer than 13cm. This is the most extensive woodland on Cuba, but such habitats are mostly relicts of formerly more extensive areas and now mostly consist of fragmented and degraded areas. Annual rainfall is 120–160cm. Examples include: in Pinar del Río province, Guanahacabibes Peninsula, the lower parts of the limestone karst hills of Viñales, Mil Cumbres; Isle of Pines, the southern peninsula; most of the karstic region of Península de Zapata; typical of the lower parts of the Guamuhaya mountain range in three of the central provinces; in Ciego de Ávila province, parts of Sierra de Cunagua; and in Camagüey province, small areas of Sierra Cubitas and Najasa. Indicator species are *Cordia gerascanthus*, *Zanthoxylum martinicense*, *Z. fagara*, *Cordia collococca*, *Nectandra coriacea*, *Cedrela odorata*, *Ceiba pentandra*, *Trichilia hirta* and *Oxandra lanceolata*.

Burrowing Owl habitat on sandy savanna, San Ubaldo, Pinar del Río province.

b) **Semi-deciduous microphyllous woodland** occurs in savannas and hills, and is characterised by two strata of trees of no more than 4–10m and 12–15m tall, respectively, and by having leaves less than 6cm in length. Annual rainfall is 80–120cm. Examples include: Isle of Pines, the southern region; in Matanzas province, La Barranca forest, Martí; Villa Clara province, small areas of Monte Ramonal in Santo Domingo; and part of Birama-Monte Cabaniguán; in Granma province, north of the mouth of The Río Cauto; in Santiago de Cuba province, areas of Siboney-Justicí, Daiquirí-Verraco to near Laguna de Baconao; and in Guantánamo province, small areas of scrubby coastal and subcoastal vegetation from Tortuguilla to near Maisí terrace. Indicator trees are generally thorny and typically include *Brya ebenus*, *Bucida* spp., *Erythroxylum rotundifolium*, *Copernicia* spp., *Cameraria* spp., *Hypelate trifoliata*, *Guettarda elliptica*, *Peltophorum adnatum*, *Coccothrinax* spp. and *Guaiacum officinale*.

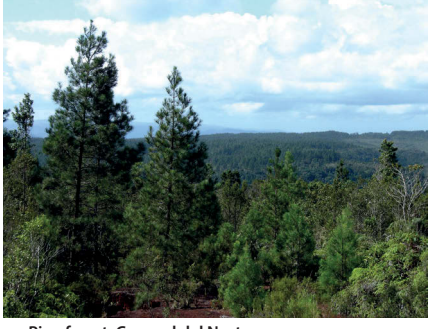
Evergreen forest has broadleaf tree species making up less than 30 per cent of vegetation. It is characterised by an understorey of brush and grass strata, almost no epiphytes and an increasing number of lianas, depending on the conservation state. Two sub-types are recognised on Cuba:

a) **Evergreen mesophyllous forest** (local name, *manacal*, mainly in eastern Cuba) is typically found at 300–800m; rainfall is 120–230cm. The majority of trees are evergreen, with deciduous species comprising less than 30 per cent in the highest strata (usually no more than 25m high, but with

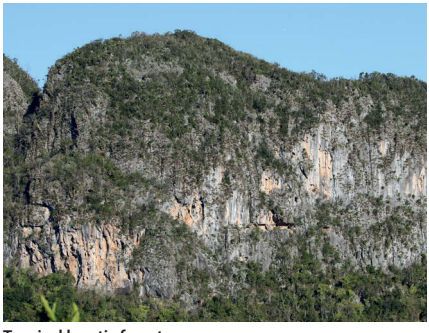
some emergents reaching 30m) and with leaves characteristically more than 13cm in length. Examples include: in Pinar del Río province, lower slopes of Pan de Guajaibón, Sierra Chiquita and other localities between Mil Cumbres and Sabanilla; in Matanzas province, some areas within Sierra de Bibanasí and south of Santo Tomás, Caleta Buena in Zapata Swamp; in the central provinces, some zones within the Guamuhaya mountain range; in Ciego de Ávila province, parts of Sierra de Cunagua; in Camagüey province, some zones within Sierra de Cubitas and Najasa; and in Santiago de Cuba province, several lowland and mid-elevation localities in Sierra Maestra, including La Bayamesa National Park to the zones of La Gran Piedra–Pico Mogote, among other areas. Indicator species are *Alchornea latifolia*, *Sapium laurifolium*, *Dendropanax arboreus*, *Calophyllum antillanum*, *Trophis racemose* and *Pseudolmedia spuria*.

b) **Evergreen microphyllous forest** (dry forest) generally occurs in lowlands and hills near dry coasts. Annual rainfall is 70–120cm. It is characterised by evergreen and deciduous trees with leaves 1–6cm in length, an upper stratum reaching 12–15m and a lower stratum of 5–10m. Vegetation characteristically includes thorny bushes, dry epiphytes and columnar cacti. Examples include: in Pinar del Río province, some areas on Guanahacabibes Peninsula; in Matanzas province, relict patches from Punta Guanos to Punta Rubalcaba, and near Playa Girón to Punta Mangles; in Cienfuegos province, a small area between Punta Gavilanes and Trinidad; in Villa Clara province, part of Cayo Santa María; in Ciego de Ávila–Camagüey provinces, restricted areas in Cayo Coco; and in Granma-Santiago de Cuba–Guantánamo provinces, throughout the dry ecosystems of the southern coast of the Oriente region, including from Cabo Cruz to Maisí. Indicator plant species are *Colubrina elliptica*, *Bourreria suculenta*, *Exostema caribaeum*, *Coccothrinax* spp., *Ocotea nemodaphne*, *Cynophalla flexuosa*, *Cordia sebestena* and *Coccoloba diversifolia*.

Pine forest (*pinar*) is needle-leaved evergreen woodland, with the tree strata dominated by species of the genus *Pinus*, reaching 25m. The shrub and herbaceous strata are well developed, with some epiphytes and climbing plants. Pine forests occur in eastern and western Cuba, as well as the Isle of Pines. In the west, the annual rainfall is 100–160cm. Examples include: in Pinar del Río province, at lower levels of the base of Sierra de la Güira, Cajálbana, Mil Cumbres, Matahambre; and Isle of Pines, Los Indios, Santa Bárbara. In the east, the annual rainfall is 120–300cm. Examples include: in Santiago de Cuba province, La Gran Piedra, La Bayamesa; in Holguín province, Mayarí, Sierra de Nipe, Moa, Meseta del Toldo; and in Guantánamo province, Ojito de Agua, Cupeyal del Norte, Nibujón and Baracoa. Among indicator species in western Cuba and the Isle of Pines are *Pinus caribaea*, *Pinus tropicalis*, *Matayba oppositifolia*, *Abarema obovalis*, *Amaioua corymbosa*, *Eugenia rigidifolia*, *Colpothrinax wrightii*, *Coccoloba* spp. and *Curatella americana*. Characteristic species in eastern Cuba are *Pinus cubensis*, *Jacaranda arborea*, *Eugenia pinetorum*, *Baccharis scoparioides*, *Abarema nipensis*, *Anemia coriacea*, *Pteridium caudatum*, *Suberanthus canellifolius* and *Pinus maestrensis*.



Pine forest, Cupeyal del Norte.



Tropical karstic forest.

Viñales Valley.

Tropical karstic forest (*mogote* vegetation complex) occurs in karst mountains and is primarily mesophyllic semi-deciduous forest. The complex is characterised by bushy vegetation, with succulent plants, epiphytes and lianas, and an arboreal stratum (palms) reaching 10m high. Annual rainfall is 150–220cm (Sierra de Los Órganos–Viñalense district). This vegetation formation occurs in western Cuba but also in the central and eastern parts of the island. A typical locality is the Viñales Valley of Pinar del Río province. Indicator species in western Cuba are *Agave* spp., *Actinostemon brachypodus*, *Pachira cubensis*, *Celtis iguanaea*, *Cuervea integrifolia*, *Erythrina cubensis*, *Gaussia princeps*, *Lantana strigosa*, *Plumeria sericifolia* and *Leucothrinax morrisii*. The common species in central and eastern Cuba are *Coccothrinax* spp., *Picrasma tetramera*, *Grisebachianthus carsticola*, *Garrya fadyenii*, *Gesneria cubensis*, *Hemithrinax compacta* and *Neobracea howardii*.

Montane serpentine shrubwood (*charrascal*) occurs in savannas, hills and mountains in eastern Cuba. Annual rainfall is 120–300cm depending on the phytogeographic district. The scrubby vegetation can reach 6m high, with emergent palms attaining 10m. Vegetative elements are mesophyllous and sclerophyllous, with thorny elements less abundant than in lowland serpentine shrubwoods, and with some herbs, climbing plants and dispersed epiphytes. The richest diversity of endemic species (35–40 per cent) is found this habitat. Examples include: Moa–Baracoa; in Sierra de Nipe, La Bandera, La Caridad and La Cueva; and Sierra Cristal. Among indicator plants are *Dracaena cubensis*, *Adenoa cubensis*, *Annona sclerophylla*, *Erythroxylum pedicellare*, *Mazaea shaferi*, *Byrsonima biflora* and *Coccoloba* spp.

Lowland serpentine shrubwood.

Lowland serpentine shrubwood (*cuabal*) occurs in savanna areas with low hills. It features dense scrubby vegetation reaching no more than 4m, with emergents no taller than 6m. Vegetation is thorny, sclerophyllous, nanophyllous and herbaceous, with dispersed epiphytes on ultramafic soils derived from serpentine metamorphic rocks. Annual rainfall is 80–160cm. Examples include: in Pinar del Río province, Cajálbana; in Havana province, Barreras, La Coca; in Matanzas province, Tres Ceibas de Clavellinas, Loma el Jacán and San Miguel de los Baños; in Villa Clara province, Motembo, around Los Caneyes, Cubanacán and Agabama; in Sancti-Spíritus and Ciego de Ávila provinces, Jatibonico–San Felipe; in Camagüey province, Sabanas de Cromo; and Holguín province. Among the indicator species are *Phyllanthus orbicularis*, *Neobracea valenzuelana*, *Mesechites roseus*, *Bursera angustata*, *Coccothrinax* spp. and *Erythroxylum alaternifolium*.

Coastal thicket comprises scrubby vegetation in coastal areas, and is characterised by stunted shrubs and emergent trees, with palms reaching up to 6m. Vegetation has deciduous elements, including sclerophyllous, microphyllous and nanophyllous, with leaf types less than 3mm in length. Succulents and thorny elements are abundant, and some palms, grass and vines occur. Annual rainfall is 100–140cm. Examples include: in Pinar del Río province, Guanahacabibes; in Matanzas province, Zapata Peninsula (near Playa Girón, near Guasasa); Cayo Santa María, on some rocky coasts; in Ciego de Ávila and Camagüey provinces, areas on the northern cays in the Sabana–Camagüey archipelago; in Holguín province, some coastal points of Guardalavaca and Caletones in Gibara; and in Guantánamo province, southern coast

from Tortuguilla to Maisí, Baracoa (average rainfall 38–60cm) and Bahía de Taco. Indicator species include *Erythroxylum rotundifolium*, *Quadrella cynophallophora*, *Capparis grisebachii*, *Diospyros* spp., *Coccothrinax* spp., *Caesalpinia* spp., *Guettarda* spp. and *Maytenus buxifolia*. In some regions, particularly the southern coast of the eastern provinces, there are many species of succulents and spiny brush, notably *magueyes* and cacti, including *Harrisia eriophora*, *Dendrocereus nudiflorus*, *Pilosocereus* spp., *Consolea macracantha*, *Opuntia dillenii* and *Melocactus* spp.

Coastal thicket, Baitiquirí.

Riparian forest occurs along river and stream edges, in all provinces where natural vegetation and/or second growth is found along rivers, streams, springs and canals. It has a tree stratum of 15–20m, is composed of more sun-loving plant species, including palms and an understorey of shrubs, grasses, climbing plants and epiphytes. Annual rainfall is 70–120cm. Indicator species are *Calophyllum brasiliense*, *Lonchocarpus seriseus*, *Tabebuia angustata*, *T. leptoneura* and *Calophyllum rivulare*.

Lowland riparian forest, Zapata Peninsula.

Montane riparian forest, La Melba, Humboldt National Park.

WETLAND HABITATS

These are well represented on Cuba. There are the several natural wetlands, which include sandy coast and coral reefs ecosystems comprising 5,746km^2 and also inland ecosystems.

Swamp forest is characterised by broadleaf woodland, with deciduous elements, occupying zones flooded periodically or permanently in coastal regions. Annual rainfall is 120–170cm. The tree stratum is 8–15m, with a maximum of 20m. This habitat includes mangrove, epiphyte and fern elements, with

Thatch palms in sandy coast vegetation, Cayo Paredón Grande, Ciego de Ávila province.

Shorebird habitat on tidal sand bank, Cayo Coco, Ciego de Ávila province.

grasses and herbaceous growth on soils rich in organic material. Example localities include: in Pinar del Río province, northern Guanahacabibes Peninsula; southern Mayabeque near Surgidero de Batabanó; in Matanzas province, Zapata Peninsula, Ciénaga de Majaguillar; southern Isle of Pines; in Villa Clara province, Ciénaga de Jumagua (Sagua la Grande); in Ciego de Ávila province, wetlands of northern Ciego de Ávila–Ciénaga de Cunagua; and in Granma province, Ciénaga de Birama–Monte Cabaniguán. Indicator species are *Bucida palustris*, *B. buceras*, *Annona glabra*, *Tabebuia angustata*, *Hibiscus elatus*, *Morella cerifera*, *Sabal maritima* and *Copernicia* spp.

Rocky coast vegetation complex includes communities in open areas on high rocky coasts, with small to large succulents, small bushes up to 2m high and grasses. Annual rainfall is 100–140cm. Example localities include: in Pinar del Río province, Guanahacabibes Peninsula; southern part of Isle of Pines; north-east of Havana; in Matanzas province, Zapata Peninsula, Archipelago de los Canarreos; in Camagüey and Ciego de Ávila provinces, northern and southern cays; and in Granma, Santiago de Cuba and Guantánamo provinces, Cabo Cruz to Maisí. This complex is characterised by *Borrichia arborescens*, *B. cubana*, *Euphorbia mesembryanthemifolia*, *Erithalis fruticosa*, *Flaveria linearis* and *Strumpfia maritima*.

Sandy coast vegetation complex comprises open communities on sandy areas. Annual rainfall is 100–140cm. It includes grassy plants, palms and dispersed trees; mangroves or sea grape (*Coccoloba uvifera*) are the usual arboreal species. Example localities include: in Pinar del Río province, Guanahacabibes Peninsula; southern part of Isle of Pines; north-east of Havana; in Matanzas province, Zapata Peninsula, Archipelago de los Canarreos; and in Camagüey and Ciego de Ávila provinces, northern and southern cays. Among the indicator species are *Canavalia rosea*, *Cenchrus tribuliodes*, *Diodia serrulata*, *Erithalis fruticosa*, *Ernodea littoralis*, *Ipomea pes-caprae*, *Scaevola plumieri*, *Stemodia maritima* and *Uniola virgata*.

Coastal areas include fringing reefs and the coastline of sandy beaches with no terrestrial vegetation.

Sandy coast vegetation complex, Maisí, eastern Cuba.

SALT AND BRACKISH WATER COMMUNITIES

Mangrove forest is broadleaf evergreen woodland alongside low muddy coastal or estuarine areas with a high level of salinity. Mangrove forest covers 4.8 per cent of the entire area of the Cuban archipelago and represents 26 per cent of forested land. Annual rainfall is 120–170cm in the Zapatensis phytogegraphic district. Trees can reach 15–25m, are adapted to submersion and have specialised roots (prop roots and pneumatophores). No bush stratum is present, but grasses with succulent leaves, ferns and climbing plants (creepers) are well represented. Mangrove forest is best developed in the following areas: the southern coast of the Isle of Pines and its cays; in Pinar del Río province, along the northern coast from Las Pozas to Pretiles, and small areas in northern Guanahacabibes; in Mayabeque, all along the southern coast from Ensenada de la Broa; in Matanzas province, on the Zapata Peninsula and Hicacos Peninsula; in Villa Clara province, at Carahatas in Sagua la Grande, northern cays; in Ciego de Ávila province, some parts of the northern and southern cays; in Camagüey province, some parts of the northern and southern cays; and in Granma province, the delta of the Cauto River and Monte Cabaniguán. Indicator species are *Rhizophora mangle*, *Avicennia germinans*, *Laguncularia racemosa*, *Conocarpus erectus*, *Acrostichum aureum*, *Dalbergia ecastaphyllum*, *Batis maritima* and *Rhabdadenia biflora*.

Mangrove forest, La Salina, Zapata Peninsula.

Salt ponds are coastal wetlands periodically infused with saltwater during very high tides or storms. Most vegetation consists of herbaceous species and succulent plants that are highly tolerant of salt. Indicator species include *Batis maritima*, *Chloris sagrana*, *Distichlis spicata*, *Fimbristylis spathacea* and *Sarcocornia perennis*.

FRESHWATER COMMUNITIES

Marsh (*herbazal de ciénaga*) consists of seasonally flooded grassland, and typically remains waterlogged at all times. Annual rainfall is 120–170cm in the Zapatensis phytogegraphic district. The grassland can reach 1.5–2.0m high. This habitat is typically found on Zapata Peninsula, in Birama Swamp and Lanier Swamp. Indicator species include *Cyperus* spp., *Echinodorus* spp., *Eleocharis cellulosa*, *E. interstincta*, *Panicum dichotomiflorum* and *P. lacustre*. In areas that are permanently flooded and have an accumulation of peat in the soil, the following species may be present: *Centella erecta*, *Cladium jamaicense*, *Thelypteris confluens*, *Typha domingensis*, *Erianthus giganteus* and *Cyperus giganteus*.

Zapata marsh (eastern).

Zapata marsh (western); Zapata Wren habitat.

Freshwater wetland, San Ubaldo, Pinar del Río province.

Marshlands besides rivers are lowland habitats, including those along the largest rivers, the Cauto and Toa, in eastern Cuba. Among the plant species present are *Arundo donax, Bambusa vulgaris*, *Cyperis heterophyllus, C. surinamemnsis* and *Gynerium sagittatum*.

Freshwater lagoons are characterised by floating and rooted species of plants. Among the floating species are *Azolla caroliniana*, *Eichhornia* spp., *Lemma minuta*, *Pistia stratiotes*, *Salvinia auriculata* and *Utricularia* spp. Among the rooted species are *Brasenia schreberi*, *Cabomba furcata*, *Hydrocotyle umbellata*, *Nymphaea* spp. and *Potamogeton* spp.

Anthropic wetlands are freshwater habitats, including rice fields and reservoirs, that are artificially created and maintained. The plant communities include many species that occur in natural freshwater aquatic habitats.

Second-growth vegetation occurs where the original natural vegetation has been altered by human activity or natural events (e.g. hurricanes). The original vegetation has been replaced by other species and associations, with the structural complexity related to the levels of successional development in three categories of associations:

a) **Second-growth forest** has arboreal, brush and grass strata, with an abundance of creeping vines and widely dispersed trees.
b) **Bushland** is characterised by an abundance of shrubs, grass and creeping vines, with widely dispersed trees.
c) **Grasslands** have a well-developed herbaceous stratum; there are dispersed trees, palms, bushes, vines and climbing plants.

Sandhill Crane habitat in second-growth vegetation, Zapata Peninsula.

Agricultural lands include all those areas cleared for agriculture, whether for large-scale farming or for subsistence agriculture, at high or low elevation.

Urban areas are extensively human-modified habitats, where primary habitats are mainly replaced with exotic plants in parks and gardens, artificial constructions and any other type of human activity.

HISTORY OF ORNITHOLOGY IN CUBA

The earliest descriptions of endemic species, Blue-headed Quail-Dove and Cuban Bullfinch, were by Linnaeus in 1752, and of Cuban Grassquit by Johann Friedrich Gmelin in 1789. Serious ornithological studies began in the first half of the 19th century. In 1827, Temminck described and illustrated some species from Cuba in a catalogue in 1825. Pablo Guillermo de Würtenberg collected birds and published *Viaje a América septentrional* in 1835. In 1839, an ornithological section was included in a compendium, *Historia física, política y natural de la Isla de Cuba,* by Alcide d'Orbigny, published by Don Ramón de la Sagra. In 1847, he also published a dissertation, *Ornitología de la India Occidental*. In 1848, Andrés Poey y Aloy, published a catalogue of Cuban birds numbering 208 species *in Memorias de la Real Sociedad Económica de la Habana*. In 1850, Juan Lembeye produced *Aves de la Isla de Cuba*.

Johannes Gundlach arrived in Cuba in 1838, becoming one of its most distinguished naturalists and ornithologists. He discovered several Cuban endemics, including Gundlach's Hawk, Gray-fronted Quail-Dove, Bee Hummingbird, Cuban Vireo, Cuban Gnatcatcher and Oriente Warbler, and also discovered other Antillean endemics such as Antillean Nighthawk, La Sagra's Flycatcher, Bahama Mockingbird and Olive-capped Warbler; he described some of these species. Gundlach wrote two major treatises on Cuban birds, *Contribución a la Ornitología Cubana* (1876*,* 1893). The majority of endemics were described between 1811–60, though Giant Kingbird (a *de facto* endemic) was not described until 1887. The last endemic species to be found were Zapata Wren, Zapata Sparrow and Zapata Rail in 1926–27 by the Spanish entomologist, Fermin Cervera; the first of this trio was described by Thomas Barbour and the other two by Barbour and Peters.

In the first half of the 20th century, important ornithological contributions were made by W. E. Clyde Todd, who wrote *The Birds of the Isle of Pines* (1916); Thomas Barbour, a zoologist from the Museum of Comparative Zoology, Harvard University, who wrote *Birds of Cuba* (1923) and *A naturalist in Cuba* (1946); and James Bond, Curator at the Academy of Natural Science, Philadelphia, who published *Birds of the West Indies* (1936, with several later editions and supplements to 1987).

Many people have contributed to Cuban ornithology, including the North American entomologist, Stephen Bruner, and Charles Ramsden in Santiago de Cuba studied birds in the eastern part of the country, collecting several species that are almost extinct today. Amateurs played major roles, including the collectors Gastón Villalba, Cleto Sánchez and José Hernández Bauzá, an excellent taxidermist who prepared specimens of mounted birds, and eggs, for two important collections. Pastor Alayo Dalmau and Abelardo Moreno Bonilla also made significant contributions. Important researchers have included Robert Ridgway, Wells W. Cooke, Outram Bangs, Walter R. Zappey, Pelegrin Franganillo, Storrs Olson, Kenneth C. Parkes, George Watson, Alexander Wetmore, Peters Friedman, William Suárez, George Wallace, José Morales, Pedro Blanco, Alejandro Llanes, Martín Acosta, Lourdes Mujica, Orlando Torres, the late Denis Dennis, Ariam Jiménez, Hiram González, Barbara Sánchez, Daisy Rodríguez and Freddy Santana, among others.

Cuban zoologists Orlando H. Garrido and Florentino Garcia Montaña produced *Catálogo de las Aves de Cuba* (1975) for the Felipe Poey museum. Garrido and Arturo Kirkconnell wrote *A Field Guide to the Birds of Cuba* (2000, 2011). Other important contributions have included *Aves Acuáticas en los humedales de Cuba* (Mujica *et al.* 2006); *Important Bird Areas (IBAs) in Cuba* (2010); and the multi-author *Libro rojo de los Vertebrados de Cuba* (2012). However, in the last three decades the most important and long-term contribution to the natural history of Cuban endemic birds was by James W. Wiley (1943–2018).

Bee Hummingbird.

THE AVIFAUNA

BREEDING BIRDS

A total of 156 species are known to have bred regularly on Cuba. The breeding season is generally March–July, but a number of species breed outside this period and some appear to nest year-round. Changes in the breeding season of several species have been noted, beginning earlier in late January or prolonged until August. The breeding season appears to be related to the onset of the wet season (rain cycles can also change in relation to the altitude and region) and is interconnected with food availability (abundance of insects, blooming and fruiting of certain trees), required to provide the energy levels for adults and chicks during the breeding period.

LANDBIRDS

A total of 96 species (61 per cent) of native (indigenous) species are landbirds and 44 of these (46 per cent) breed in forest. Among the 29 endemic species, a total of 24 breed in forest regularly; the exceptions are Zapata Rail, Zapata Wren, Cuban Gnatcatcher and Red-shouldered Blackbird. In the case of Cuban Grassquit, Zapata Sparrow and Cuban Vireo, the breeding range can expand into bushes or scrub.

Nests constructed by forest birds vary from simple to more elaborate and complex structures, and are usually attached to or suspended from trees. Many passerines (such as warblers and vireos) build cup-shaped nests, others (e.g. quail-doves, pigeons, kingbirds and mockingbirds) build very simple stick platforms, and others (e.g. Cuban Oriole, Zapata Wren, Cuban Bullfinch and Cuban Grassquit) construct complex globular nests.

Primary cavity nesters, including all woodpeckers, expend substantial energy excavating their nest hole. Despite this initial investment, these sites can be reused by woodpeckers over several years, requiring only cleaning and enlargement of the interior dimensions. Importantly, American Kestrel, Cuban Trogon, Cuban Parrot, Cuban Parakeet, Cuban Martin, Cuban Pygmy-Owl and Bare-legged Owl reuse the cavities built by woodpeckers. In addition to woodpeckers, other species, such as Cuban Tody, excavate their own cavities in soft substrates such as mud, sand, rotten wood in dead or living trees, or use existing natural holes. Other species add material to natural cavities, e.g. Red-legged Thrush and Cuban Blackbird (the latter also uses woodpecker cavities). Endemic Cuban Solitaire, Cuban Green Woodpecker, Cuban Tody and Cuban Parakeet may also breed in natural cavities in limestone cliffs, as do Barn Owl, White-collared Swift and Black Swift.

Red-legged Thrush, western subspecies.

Only one forest species, the cryptic Cuban Nightjar, breeds on the ground in litter on the forest floor. Antillean Nighthawk, another ground-nesting member of this family, nests in open terrain with pale (often stony or sandy) ground. Three endemic species are confined to marsh vegetation: Zapata Wren (globular nest), Zapata Rail (unknown) and Red-shouldered Blackbird (cup-shaped nest). Nesting materials also vary, with a broad spectrum of items used, such as sticks, grasses, leaves and hair. Species such as Cave Swallow construct their nests with mud and saliva. The Bee Hummingbird's nest is the smallest and possibly the most complex among Cuban birds. This species uses grass, lichen and spider webs; only the female builds and tends the nest, as is typical of the hummingbird family.

A total of 16 species visit Cuba to breed, mostly from southern regions: Yellow-billed Cuckoo, Antillean Nighthawk, Wilson's Plover, Snowy Plover, Sooty Tern, Bridled Tern, Least Tern, Roseate Tern, Common Tern, Sandwich Tern, White-tailed Tropicbird, Audubon's Shearwater, Gray Kingbird, Black-whiskered Vireo, Cuban Martin and Cave Swallow.

WATERBIRDS

A total of 59 (39 per cent) species breed in wetlands, of which 21 breed along Cuban coasts. The only endemic waterbird is the Zapata Rail. All the breeding plovers (Killdeer, Wilson's Plover and Snowy Plover) nest on the ground in open habitats. Many seabirds select their nest-site based on factors such as substrate and vegetation cover, temperature, distance from feeding areas and presence of predators.

Only ten seabirds breed in the Cuban archipelago, nesting on the rocky or sandy substrate of cays, cliffs and beaches, mainly from May–July: Laughing Gull, Brown Noddy, Sooty Tern, Bridled Tern, Least Tern, Gull-billed Tern, Common Tern, Roseate Tern, Royal Tern and Sandwich Tern. Six species of ducks breed on Cuba, from April/May through the summer and possibly year-round: West Indian Whistling-Duck, Fulvous Whistling-Duck, Wood Duck, White-cheeked Pintail, Masked Duck and Ruddy Duck.

Mangroves are important coastal wetland ecosystems for bird reproduction because of their abundant food sources, secure nesting sites and relative protection against land predators. Among the most important Cuban mangrove species is the American Flamingo, with around 130,000 individuals. A colonial breeder, its largest colony is at the mouth of The Río Máximo in Camagüey province, with *c.* 45,000 pairs. Clapper Rail also breeds in this habitat, as do Pied-billed Grebe and Least Grebe, which breed almost year-round (and also in freshwater wetlands).

Both members of the family Recurvirostridae breed: Black-necked Stilt and American Avocet, though the latter has only been found to nest very recently. Of the 26 species of wader on Cuba, only Snowy Plover, Wilson's Plover, Killdeer and Willet breed. Nesting only on offshore cays, mostly from

Least Tern, non-breeding.

Matanzas to Camagüey province, are Magnificent Frigatebird almost year-round (few breeding data are available from Cuba), and two species of cormorants, Double-crested and Neotropic. Brown Booby also breeds in small numbers on some offshore cays, as do Anhinga and Brown Pelican.

As might be expected given the abundance of wetlands on Cuba, there are 11 breeding members of the heron family. Egret breeding seasons are generally the longest of any in this family, ranging from 6–11 months. Little Blue Heron and Reddish Egret have very long breeding seasons, while Least Bittern, Great Blue Heron and Cattle Egret are among those with the shortest. The most important heron breeding colonies are in Matanzas province east to Birama in Granma province, including the cays.

Seven species of rail breed in freshwater wetlands on Cuba. The Zapata marshland is the only site for the Critically Endangered Zapata Rail; breeding data unknown. It also holds the most important breeding populations of Spotted Rail and Yellow-breasted Crake, King Rail, Purple Gallinule, Common Gallinule, American Coot and Limpkin. Northern Jacana is an uncommon resident breeder, its population decline throughout the island possibly being due to the introduction of exotic catfish. Two hawks breed exclusively in freshwater wetlands: Snail Kite and Osprey.

THREATENED AND RESTRICTED ENDEMIC SPECIES AND SUBSPECIES

The majority of Cuban endemics have a fragmented breeding distribution throughout the main island; fewer breed on the Isle of Pines (Isle of Youth) and the northern and southern cays. The most restricted species are Zapata Rail and Zapata Wren, both relict populations restricted to western Zapata Peninsula. Zapata Rail and Cuban Kite are the most threatened species on Cuba. Cuban Kite is found in the Nipe–Sagua–Baracoa mountain range. Another locally restricted species is Cuban Palm Crow, currently found near Trinidad, central and southern Camagüey. Zapata Sparrow occurs as three subspecies restricted to Zapata Peninsula, Cayo Coco, Cayo Romano and south-east Guantánamo. Other species, such as Fernandina's Flicker, are widespread but locally distributed. The flicker is a locally threatened species with the main populations from eastern Pinar del Río province to Las Tunas and Birama Swamp, although most individuals occur in Zapata Peninsula. Another restricted species is Red-shouldered Blackbird, found in the central and western section of the main island and the Isle of Pines. Some endemic subspecies are confined to the Isle of Pines: Cuban Green Woodpecker, West Indian Woodpecker and Cuban Trogon.

Snail Kites in flight.

Giant Kingbird is widespread throughout the island although very local, with most individuals located in southern Camagüey province. Cuban Gnatcatcher is mostly restricted to coastal areas in the central provinces and eastern Cuba, rarely inland. Cuban Solitaire breeds in the mountains of western and eastern Cuba; it is absent from the central mountain ranges. Cuban Parakeet is found mostly from Zapata Peninsula to the eastern mountain ranges of Cuba. The most important breeding populations of Blue-headed Quail-Dove are on Guanahacabibes Peninsula, Sierra de los Órganos, Sierra del Rosario and Zapata Peninsula.

The breeding areas of Sandhill Crane are very localised: Isle of Pines, Zapata Peninsula and scattered locations in Camagüey province. Sharp-shinned Hawk is very local, with the majority breeding in the mountains of the eastern and western provinces. If it is still extant, Ivory-billed Woodpecker is restricted to Humboldt National Park, Guantánamo province, but it may be extinct. Thick-billed Vireo is located in some northern cays; this species is highly threatened due to the impact of Hurricane Irma in September 2017 and new development. Red-legged Thrush has two very distinct subspecies: one widespread population in the western and central part of Cuba and the cays, and the second restricted to eastern Cuba.

MOULTS

Feathers undergo changes throughout the year, from worn and faded to bright and new following a full moult. Many species assume these changes gradually. Others have completely different plumages in the non-breeding and breeding seasons and may also show intermediate stages while in transition between the two, e.g. Black-bellied Plover and Rose-breasted Grosbeak. A full or partial moult to replace worn feathers usually occurs twice a year including the post-breeding moult, which may take place before migration, at migration stops or on arrival in the wintering grounds. The moult from immature to adult can result in a brighter but similar plumage, e.g. Ovenbird, or one distinct from the immature phase, e.g. Little Blue Heron.

Most juveniles have similar but duller plumages than adults, with paler feather tips and fringes, as in doves and many shorebirds, while others have distinctive field marks, e.g. Western and Least Sandpipers have short-lived bright cinnamon feathers on the face and scapulars, an important identification tool in early autumn. In most passerines, juvenile plumage lasts until late summer; the first-winter plumage follows and remains until the first spring when it is replaced by the first-summer plumage, which is often similar to the adult breeding plumage. The first adult non-breeding plumage is assumed through the second autumn and winter and is then replaced by adult breeding plumage the following spring. In some species, replacement occurs within a shorter period. In some seabirds, e.g. gulls, there are juvenile, first-, second-, third- and sometimes fourth-year plumages before adulthood. Other species assume adult plumage gradually, e.g. Red-footed Booby over three years.

Red-breasted Grosbeak, breeding male.

Thus, between autumn and spring different individuals of a single species may exhibit juvenile, immature, male, female, breeding and non-breeding plumages as well as transitional plumages. It takes many years of expertise to distinguish between the dull autumn plumages of non-breeding and immature birds. In autumn and winter, the majority of migrants are in non-breeding and immature plumage, which is dramatically different from the summer breeding plumage, especially in some shorebirds and warblers.

MIGRATION

The geographical position of the Cuban archipelago between the Florida Peninsula and the other Antillean islands and Central and South America makes Cuba an important wintering ground and stopover site for hundreds of thousands of birds migrating from North America to latitudes south of their breeding grounds. Cuba's land mass (with about 50 per cent of the total land area in the Caribbean), topography, habitat diversity and the fact that it is part of a chain of islands (Greater and Lesser Antilles) have all contributed to its importance for migrating birds. Migration studies have identified several different migration routes in North America. Two have a direct impact on the Cuban archipelago: the Atlantic coast corridor by which most birds arrive from Florida, and the Mississippi corridor across the Gulf of Mexico to the Yucatán Peninsula and then onward through Central and South America. The Atlantic coast corridor has the greatest influence, taking birds over the Bahamas and Cuba.

Autumn migration Between mid-July and May bird diversity is greatly enriched by Nearctic migrants, with 138 species overwintering on Cuba for 7–10 months and 44 passage migrants remaining only for a brief stopover and wintering farther south, e.g. Wilson 's Warbler and Prothonotary Warbler. Autumn migration extends from early July to late November, with several peaks in September, October and November depending on weather conditions en route and the timings when leaving the breeding grounds. Warblers, vireos, ducks, waders and herons migrate across the island, with a tendency for some to migrate to certain regions. The largest waves of mixed flocks of nocturnal migrants arrive along northern-western and central coasts of Cuba. Among the first species to arrive are Louisiana Waterthrush, Northern Waterthrush and Least Sandpiper; next are Prairie Warbler, Yellow-throated Warbler and Black-and-white Warbler. A steady flow of birds continues into November with a few later arrivals occurring into early December.

Spring migration Nearctic species from the south arrive along the entire southern coast, with the greatest numbers in the central and western part of the Cuban archipelago, i.e. from Las Tunas and Holguín provinces west to central Pinar de Río province. Migration begins as early as late January, intensifying in March and the first two weeks of April. In May and June it is rare to see wintering migratory birds and most are late passage migrants from further south. Most summer visitors are Neotropical species that arrive on Cuba from southern regions to breed; some are abundant and evenly distributed throughout the country (Antillean Nighthawk, Gray Kingbird, Black-whiskered Vireo), though Cuban Martin seems to be restricted by the availability of nesting sites. For some of the migratory species, e.g. warblers, Cuba was or is the only major wintering ground. Bachman's Warbler winters nowhere else. For others, such as Palm Warbler and Black-throated Blue Warbler, Cuba is simply the most important wintering site in the West Indies. Two migratory species, although widely distributed, show a strong preference for mountain habitats, e.g. Black-throated Blue Warbler in the highest

Black-whiskered Vireo.

mountains of the Sierra Maestra and surrounding mountain ranges (Nipe–Sagua–Baracoa). It occurs from sea level to at least 1,300m, where it is very common. Bicknell's Thrush only winters in the West Indies on Cuba, Hispaniola and Puerto Rico; on Cuba, it is a very rare winter visitor to the highest mountains in the eastern part of the island, Pico Turquino, Pico Suecia, Pico Cuba and La Bayamesa.

REGULAR MIGRATORY LANDBIRDS

The most important sites for overwintering landbirds are those places with the greatest diversity of native species and are usually in areas of conservation importance such as the Zapata Peninsula, Guanahacabibes Peninsula, Sierra de Guaniguanico, surrounding cays and the major mountain ranges of Nipe–Sagua–Baracoa.

Three species of falcon are regular migrants and overwinter: American Kestrel, Peregrine Falcon and Merlin. Sharp-shinned Hawk is a regular winter migrant and an uncommon migrant through North America to the West Indies. Other regular wintering migrant raptors include Broad-winged Hawk and Northern Harrier; the former migrates mostly through western Cuba, while the latter winters mostly in central and western Cuba. Swallow-tailed Kite usually arrives in the same areas of Cuba, before continuing on passage to the Yucatán Peninsula.

In the cuckoo family, Yellow-billed Cuckoo is both a summer breeding visitor and passage migrant. In the nightjar family, Common Nighthawk is a regular passage migrant. Antillean Nighthawk is a common summer breeder and passage migrant, and is thought to winter in South America. Among the swifts, only Chimney Swift is an uncommon passage migrant. There are eight migratory swallows. Tree Swallow is the most common winter visitor and passage migrant. Purple Martin migrate, through the Bahamas, Cuba and Cayman Islands; on Cuba it is a common passage migrant. Cave Swallow is a summer breeding visitor. Northern Rough-winged Swallow is mainly a passage migrant but possibly also a winter visitor. Barn Swallow is a common passage migrant. Cuban Martin is a common summer breeding visitor. Yellow-bellied Sapsucker, the only migratory woodpecker on Cuba, is a common winter visitor and passage migrant.

A total of 13 migratory tyrant flycatchers occur. One, Gray Kingbird, is a common summer breeding visitor, whose autumn migration is along the southern coast through the eastern part of the island. Eastern Wood Pewee is a regular visitor in winter. The migrant Gray Catbird is one of the most common winter visitors and passage migrants, and Cuba is the most important wintering ground for this species in the Greater Antilles. Nine migratory thrushes are recorded, eight being mostly rare passage migrants. Seven migratory vireos occur. Black-whiskered Vireo winters in Amazonia; on Cuba, it is a very common summer breeding visitor in the western mountains. White-eyed Vireo and Yellow-throated Vireo are common winter visitors and passage migrants, mainly in western and central Cuba. Red-eyed Vireo is a common passage migrant. Blue-gray Gnatcatcher is a common winter visitor.

The warbler family, from which 40 species have been recorded, is the most conspicuous group of migratory landbirds arriving on Cuba. Sixteen species are regular in winter. Among the most common are Palm Warbler, American Redstart, Black-and-white Warbler, Northern Parula, Black-throated Blue Warbler, Prairie Warbler, Common Yellowthroat, Cape May Warbler, Yellow-throated Warbler, Northern Waterthrush and Ovenbird. Some of the warblers arrive in mid-July, but peak arrivals are from mid-September to October. A total of 12 species of warbler are mainly passage migrants, although some individuals may winter: Prothonotary Warbler, Tennessee Warbler, Hooded Warbler, Yellow Warbler, Chestnut-sided Warbler and Blackpoll Warbler are regular passage migrants.

Chestnut-sided Warbler, breeding male.

Among the cardinals, only two species are regular visitors: Summer Tanager, a winter resident and passage migrant, and Scarlet Tanager, a passage migrant. A total of eight sparrows occur, of which five are regular winter visitors: Savannah Sparrow, Grasshopper Sparrow, Clay-coloured Sparrow, White-crowned Sparrow and Lincoln Sparrow. Most migrate through the western section of the island. Other regular visitors are Blue Grosbeak, Indigo Bunting, Rose-breasted Grosbeak and Painting Bunting. Among the blackbird family there are six migratory species, of which three are regular passage migrants with Baltimore Oriole and Bobolink the most common.

REGULAR MIGRATORY WATERBIRDS

Waterfowl and shorebirds migrate by both day and night, partly depending on weather conditions. Sandpipers, herons and ducks make up the largest percentage in aquatic ecosystems, visiting beaches, mangroves, marshes, marshy plains, lakes, dams and agro-ecosystems such as rice. On Cuba, most waders are observed on mudflats and shallow lagoons of brackish water in mangrove habitats or on remote sandy beaches and on rice fields. Most mudflats are located in the southern part of the Cuban archipelago: Zapata Swamp (Matanzas province), Lanier Swamp (Isle of Pines), Birama Swamp (Granma province) and Bahia de Guadiana (Guanahacabibes) in Pinar de Río province.

THE MOST COMMON VISITORS IN WINTER AND/OR ON PASSAGE

Among the duck species are Blue-winged Teal, Northern Shoveler, American Wigeon, Ring-necked Duck, Lesser Scaup, Red-breasted Merganser and Ruddy Duck. Among the rails are American Coot (which also has a resident breeding population) and Sora.

Shorebirds occur in suitable habitats throughout most of the island. The most common winter visitors are Black-necked Stilt (also a breeder), Black-bellied Plover, Wilson's Plover (a summer breeding resident and passage migrant), Semipalmated Plover, Killdeer, Ruddy Turnstone, Least Sandpiper, Semipalmated Sandpiper, Short-billed Dowitcher, Wilson's Snipe, Spotted Sandpiper, and both Greater and Lesser Yellowlegs (which are recorded year-round). Willet is a summer-breeding resident, winter visitor and passage migrant. Stilt Sandpiper is a passage migrant. Among the family Laridae, Ring-billed Gull and Caspian Tern are common winter visitors and passage migrants. Laughing Gull and Royal Tern occur in winter and on passage, and both species are found commonly year-round and breed on Cuba.

Killdeer.

VAGRANTS AND RARE VISITORS

A total of 67 species are currently considered to be vagrant, accidental or occasional visitors. The most recently recorded is White-faced Ibis (see Appendix A).

INTRODUCED AND COLONISING SPECIES

Six species are confirmed as introduced and another two were possibly introduced (see Appendix B).

CONSERVATION

CONSERVATION LAW ON CUBA

Environmental considerations were largely ignored on Cuba for almost 200 years. Only in the last few decades, with the enactment of Law 33 (the Law on Environmental Protection and the Rational Use of Natural Resources) on 10 January 1981, have environmental laws and regulations begun to play a very small role in guiding the development of natural resources exploitation and the ecology of the island. Law 33 was passed in order to 'establish the basic principles to conserve, protect, improve and transform the environment and the rational use of natural resources, in accordance with integral development policies' of the Cuban government, and 'with the objective of the best utilisation of the national productive potential'. Law 33 is divided into four main chapters: chapter one covers the main concepts of the Law; chapter two covers specific areas of the Law and the fundamentals for the use, protection and rehabilitation of water, soil, mineral resources, etc.; chapter three covers the organisation of the government entity responsible for the Law – the Comisión Nacional de Protección del Medio Ambiente y Conservación de los Recursos Naturales; and chapter four is an attempt to legislate a system of fines for violating the Law, including a mechanism to insure that it is obeyed.

PROTECTED AREAS

The Sistema Nacional de Áreas Protegidas de Cuba (SNAP) cover approximately 20.2 per cent of the country, including the marine insular platform to a depth of 200m, with 17.2 per cent of the land and 25.0 per cent of the marine platform administered by the Sistema Nacional.

Currently 211 protected areas have been recognised for their value for conservation purposes under one of the management categories established for Cuba; 77 areas have been identified as of national significance and 112 of local significance. Coordinated by SNAP as part of BirdLife International's Caribbean Programme, 28 Important Bird Areas (IBAs) were identified, mapped and documented for Cuba.

Map of protected areas on Cuba.

ADVERSE IMPACTS ON THE ENVIRONMENT

1. **Habitat destruction** There has been extensive land alteration due to agriculture, cattle ranching, urban development and timber production. Logging is common, even within protected areas, to provide firewood and charcoal. Intervals between cuts usually range in the decades but it is often too short a time to allow adequate regeneration. At present, the northern cays (Coco, Romano, Cruz and Paredón Grande) are among the most disturbed areas, mainly as a result of development for tourism. In these cays some species occur only in small numbers and are therefore highly

threatened; examples include Bahama Mockingbird, Thick-billed Vireo and Zapata Sparrow. Habitat disturbance is threatening Piping Plover on the northern cays. In Río Máximo, the most important breeding colony of American Flamingo in the West Indies is also highly threatened, due to anthropic habitat disturbance.

2. **Hunting** Two forms may be recognised: sport hunting, purportedly within the law, and illegal poaching. For sport hunting, there are official regulations regarding species, seasons, places and limits on numbers hunted, but these are frequently disregarded by both hunters and wardens. Birds are regularly killed in numbers exceeding the legal limits and protected species, such as Ruddy Duck and Masked Duck, are sometimes hunted as well. Poachers, on the other hand, persistently violate official restrictions, and use not only guns but also several kinds of traps. The only penalties are confiscation of prey and confiscation of the guns, which happens rarely.

3. **Introduction of exotic species** Both accidental and intentional introductions plague Cuba and other islands in the Antilles. Rats, as well as feral pigs, cats and, more rarely, dogs are now found even in the most remote and virgin forests. These animals, along with Small Indian Mongoose (*Herpestes javanicus*), have undoubtedly had a considerable adverse effect on native bird species, although this has never been documented. Less direct, though perhaps more insidious, has been the impact on habitats of White-tailed Deer (*Odocoileus virginianus*), which has maintained wild populations in many areas for the past 170 years. In addition, over the past two or three decades, Cuba has received more than its share of exotic species (African and Asian bovids and monkeys), along with Wild Boar (*Sus scrofa*). Three different species of monkey have been released on several cays off both the northern and southern coasts, with fragile ecosystems that support several unique bird and reptile subspecies. In the early 1990s catfish (*Clarias* sp.) were introduced with a very negative ecological impact on the indigenous fauna. Several invasive plants have been introduced, including Sicklebush (*Dichrostachys cinerea*), Sweet Acacia (*Vachellia farnesiana*), Australian Pine (*Casuarina equisetifolia*) and Broad-leaved Paperbark (*Melaluca quinquenervia*). The last has had a most detrimental effect on the survival of two relict endemic species: Zapata Rail and Zapata Wren.

4. **Illegal commerce** The species most affected by illegal commerce is Cuban Parrot. Chicks of this species are obtained in the wild by felling nesting trees and rearing them by hand until fully developed. No doubt, hundreds have been smuggled out of the country in a drugged state, simply inside the pockets or luggage of travellers. Other species have recently been detected by Cuban customs, such as Cuban Trogon, Blue-headed Quail-Dove, Cuba Grassquit, Cuban Bullfinch and other native and migratory species. An unfortunate side-effect of tree-felling to obtain parrot chicks is that cavities and trees suitable for cavity excavation by other birds are becoming rare; this is the case for Cuban Screech-Owl, Cuban Pygmy-Owl, Cuban Parakeet, Fernandina's Flicker and other woodpeckers. The illegal trade of bird species also affects Neartic migrants; the most affected species are Painted Bunting, Indigo Bunting and Rose-breasted Grosbeak.

5. **Chemical pollution** Until the late 1980s, industries on Cuba were developing at a considerable pace. Not surprisingly, sugar refineries and electrical generating plants released a wide range of pollutants that lowered the quality of the air, soil and water. This pollution would have adversely impacted populations of some bird species.

WHERE TO WATCH BIRDS ON CUBA

The best time to observe winter migrants is between October and March when diversity is highest. Summer residents start to arrive in the spring, and for the best photo opportunities we suggest from mid-April to mid-May.

Map of birding sites on Cuba.

PINAR DEL RÍO PROVINCE

Guanahacabibes Peninsula

Located 380km west of Havana, the peninsula has several vegetation formations dominated by semi-deciduous woodlands. Blue-headed Quail-Dove, Bee Hummingbird, Cuban Parrot, Giant Kingbird and Yellow-headed Warbler can be observed. A total of 16 endemics have been recorded here. Many migratory passerines can also be seen in this area.

Site 1. Las Tumbas

The westernmost tip of the peninsula, with a lighthouse, 59km west of La Bajada. There are woods along the road approaching this site. Birds such as Bee Hummingbird, Cuban Trogon and Cuban Parrot are found in the area. ` Excellent for migratory birds.

Site 2. El Verraco

This area is 18km west of La Bajada. There are woods with open areas where Bee Hummingbird and Cuban Parrot can be observed.

Site 3. El Veral

This area is 6km west of La Bajada. There are woods with open areas where Gundlach's Hawk and Cuban Green Woodpecker can be seen. This area is about 12km west of La Bajada.

Site 4. María La Gorda

This beach and resort are about 14km from La Bajada. There are woods in the area and about 16 endemics have been recorded, including Blue-headed Quail-Dove, Bee Hummingbird and Cuban Vireo.

Site 5. La Bajada

Ducks and shorebirds can be seen on and around small ponds with mangrove vegetation by the road 800m from the village of La Bajada.

VIÑALES

A beautiful valley with amazing karstic formations called *mogotes* ('haystacks') in the Sierra de los Órganos. It is 26km north of Pinar del Río and 212km west of Havana. A total of 17 endemic species have been recorded here, including Cuban Solitaire and Cuban Grassquit.

Site 6. Sendero Maravillas de Viñales

About 14km west of Viñales town, this area can be good for Gundlach's Hawk, Cuban Tody, Cuban Solitaire, Cuban Grassquit and Cuban Bullfinch.

Site 7. Sierra Ancón

This site is 7km north-west of Rancho San Vicente. Cuban Solitaire and other endemics are present in the area.

Site 8. La Ermita

Approaching La Ermita Hotel, there is a fork between the paved road and a dirt road 200m before reaching the resort. Take the dirt road for 1km to reach a good area for Olive-capped Warbler.

Site 9. Cueva de los Portales, La Güira

Located in Sierra de los Órganos, 150km west of Havana. A total of 18 endemics have been recorded here; among the target species are Scaly-naped Pigeon, Gundlach's Hawk, Giant Kingbird, Cuban Solitaire, Olive-capped Warbler and Cuban Grassquit.

Site 10. Sierra La Güira

About 145km west of Havana. Scaly-naped Pigeon, Gundlach's Hawk, Fernandina's Flicker, Giant Kingbird, Cuban Solitaire and Olive-capped Warbler can be found here.

Site 11. Hacienda Cortina

About 5km from San Diego de los Baños, this site is a garden surrounded by woods. Birds such as Gundlach's Hawk, Fernandina's Flicker and Giant Kingbird can be seen.

Site 12. Soroa

About 87km west of Havana. Sixteen endemics occur here, including Blue-headed Quail-Dove, Grey-fronted Quail-Dove, Cuban Green Woodpecker, Fernandina's Flicker, Cuban Solitaire and Cuban Grassquit.

Site 13. Las Terrazas

Located about 60km west of Havana, 18 endemics are found here. Among the most important are Stygian Owl (a Cuban subspecies), Cuban Trogon, Cuban Green Woodpecker, Fernandina's Flicker and Cuban Grassquit.

ISLE OF PINES
About 100km south of the mainland (Havana). The island has an area of 2,204km². It is mostly flat with a hilly central area that reaches 310m at Sierra de Caballos and Sierra de Casas. Nineteen endemics are recorded here, including Bee Hummingbird and Giant Kingbird.

Site 14. Los Indios
A sandy savanna-like area with many cabbage palms and open vegetation, 34km west of La Fé. Sandhill Crane, Burrowing Owl and Cuban Parrot breed in the area.

Site 15. South of the island
About 20km south of La Fé, the area includes Ciénaga de Lanier (Lanier Swamp) and wooded areas south of Cayo Piedra. Fourteen endemic birds are recorded here.

Male Cuban Bullfinch.

Site 16. Cayo Largo del Sur
An island 26km long and less than 2km wide, 177km south-east of Havana, from where there are daily flights. Several important species are found here, including Cuban Black Hawk, and Sooty and Bridled Terns can also be seen in summer.

MATANZAS PROVINCE

Site 17. Hato de Jicarita–Río Hatiguanico
This locality lies south of the highway, at the km 101 marker, which is actually 103km from Havana. Drive along the road to Hatibonico River on the right for 7km until it ends at a forest guard station, where you may rent small boats along the Hatiguanico River. Gundlach's Hawk, Zapata Wren, Zapata Sparrow and Red-shouldered Blackbird can be seen, among the 18 endemics recorded.

SITE 18. SANTO TOMÁS
This marsh area was the type locality of Cuba's endemic Zapata Rail, Zapata Wren and Zapata Sparrow. It is about 34km west of Playa Larga. About 112 species have been recorded, including 19 endemics.

Site 19. Peralta
Beside the highway between Havana and Santa Clara, Peralta is located at the km 122 marker. The trail runs *c.* 2.5km alongside swamp woodland, ending in marsh. Fifteen endemics have been recorded here, including Fernandina's Flicker, Zapata Wren, Zapata Sparrow and Red-shouldered Blackbird.

Site 20. La Turba
North of Guamá is an often-productive area of marsh known as La Turba. If coming from the south it is *c.* 5km beyond Guamá. Zapata Wren, Zapata Sparrow and Red-shouldered Blackbird are among 17 endemics recorded.

Site 21. La Boca
This location is about 12km north of Playa Larga (or 18km south of Jagüey-Grande). It is a tourist centre with scattered trees; several notable species can be observed here, including Bee Hummingbird, Cuban Parakeet, Cuban Parrot, Fernandina's Flicker, Cuban Crow and Cuban Blackbird.

Site 22. Pálpite
Several notable bird species can be observed here, including Bee Hummingbird, Cuban Parrot, Fernandina's Flicker, Cuban Crow, Cuban Oriole, Cuban Blackbird and many migrants. It is 19km south of Jagüey Grande, at the edge of Laguna del Tesoro.

Site 23. Soplillar
This is a small village 5km north-east of Playa Larga. Birds to look for are Bee Hummingbird, Bare-legged Owl, Cuban Pygmy-Owl, Fernandina's Flicker, Cuban Parakeet and Cuban Parrot.

Site 24. Mera
A swamp forest site 1km south-east of Soplillar, Mera has about 16 endemics, including Gray-fronted Quail-Dove, Cuban Nightjar, Bee Hummingbird, Bare-legged Owl and Fernandina's Flicker.

Site 25. La Salina
These abandoned saltpans are about 26km south of Buena Ventura, a small village just 3km west of Playa Larga. This area is covered by mangroves with brackish ponds. American Flamingo, Roseate Spoonbill, shorebirds, egrets and ducks can be seen.

Site 26. El Cenote (Cueva de los Peces)
This limestone-based semi-deciduous forest area is *c.* 18km south-east of Playa Larga on the left-hand side of the road. It is well signposted, 'Cueva de los Peces'. A total of 13 endemics have been recorded, including Blue-headed Quail-Dove and Cuban Trogon.

Site 27 Bermejas
An open area with royal and cabbage palms, bushes and shrubbery 12km north of Playa Girón. The 19 endemics recorded include Cuban Nightjar, Bee Hummingbird, Bare-legged Owl, Cuban Pygmy-Owl, Cuban Trogon, Cuban Tody, Cuban Parakeet, Fernandina's Flicker, Cuban Vireo and Yellow-headed Warbler. More than 100 species have been noted.

Site 28. San Blas
This open area with scattered trees is 14km north of Girón. Fernandina's Flicker and Cuban Parakeet are found here.

Site 29 La Cuchilla
A marshland about 25km north of Girón on the road to Yaguaramas. About 12 endemic species can be observed, including Gundlach's Hawk, Cuban Pygmy-Owl, Cuban Trogon, Cuban Green Woodpecker and Red-shouldered Blackbird. Limpkin and Crested Caracara are also recorded here.

CIENFUEGOS PROVINCE
Site 30. Laguna Guanaroca
This brackish water lagoon of about 2.2km^2 is located 9km south-east of Cienfuegos city. Several species can be seen, including American Flamingo, ducks and pelicans.

Site 31. Jardin Botánico de Cienfuegos
A 4.5ha botanical garden 23km east of Cienfuegos city. Several endemic birds can be seen, including Cuban Pygmy-Owl, Cuban Tody and Cuban Green Woodpecker.

Site 32. Sierra de Trinidad.
This mountain range is 15km north of Trinidad city. More than 80 species have been recorded, including Black Swift, White-collared Swift, Gundlach's Hawk, Cuban Parrot, Giant Kingbird and Cuban Palm Crow.

VILLA CLARA PROVINCE
Site 33. Cayo Santa María
A cay 39km east-north-east of the town of Yaguajay. It covers 20km^2 and has a sandy beach 15km long. Several endemic species are present here, including Cuban Black Hawk and Cuban Green Woodpecker, as well as many migrants.

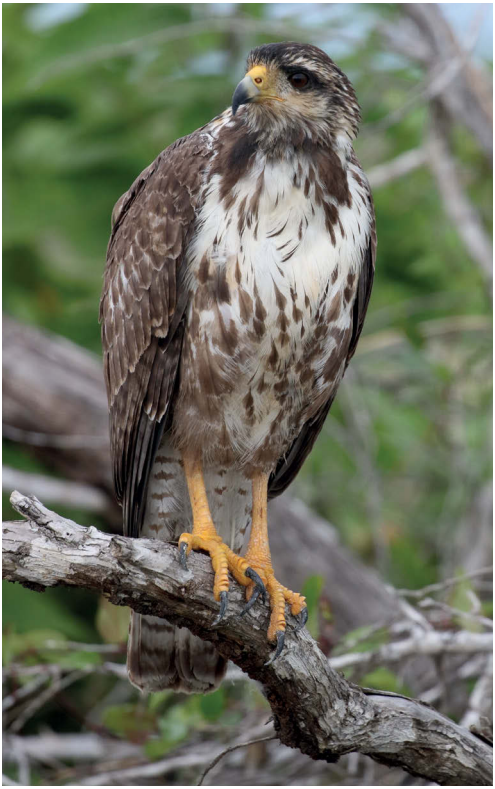
NORTHERN CAYS, CIEGO DE ÁVILA PROVINCE
Site 34. Cayo Guillermo
Situated 34km north-west of Cayo Coco, this is a sandy cay with coastal thickets and lots of *Coccothrinax* sp. palms. Bahama Mockingbird, Mangrove Cuckoo, West Indian Whistling-Duck and American Flamingo occur here.

Site 35. Cayo Coco
This, the second-largest cay on Cuba, is 508km east of Havana and 70km north-west of Morón. It is connected to the mainland by a causeway.

Woodland and wetland habitats cover most of the cay. Over 220 species, including 13 endemics, have been reported. This is an excellent area to find West Indian Whistling-Duck, Key West Quail-Dove, Piping Plover, Thick-billed Vireo, Cuban Gnatcatcher, Oriente Warbler and a subspecies of Zapata Sparrow. There are many waders and large groups of American Flamingo.

Site 36. Cayo Paredón Grande
About 45km east of the Cayo Coco hotel complex, the black-and-yellow lighthouse of Cayo Paredón Grande is recognisable in the distance. The habitat of the cay is coastal thickets and wetlands. More than 100 species have been recorded, including Piping Plover, Cuban Black Hawk, Thick-billed Vireo, Cuban Gnatcatcher, Bahama Mockingbird and Oriente Warbler. Tourist developments have almost totally eliminated the xerophytic habitat.

Site 37. Cayo Romano
The largest of the Cuban cays (connected to the mainland by a rock-filled causeway). Vegetation is similar to that found on Cayo Coco. More than 130 species have been recorded, including 15 endemics, for example Zapata Sparrow and Oriente Warbler.


Juvenile Cuban Black Hawk.

CAMAGÜEY PROVINCE

Site 38. Sierra de Cubitas
The sierra is about 50km north-east of the city of Camagüey. Many birds can be found here, with about 15 endemics including Cuban Pygmy-Owl, Cuban Trogon, Cuban Tody, Cuban Green Woodpecker and Oriente Warbler.

Site 39. Sierra de Najasa
Located about 70km south-east of Camagüey city, this is a protected area of open country with many palm groves and a mixture of semi-deciduous woodland in hill country. About 124 species, including 18 endemics; among the target species are Plain Pigeon, Cuban Parakeet, Giant Kingbird and Cuban Palm Crow.

GRANMA PROVINCE

Site 40. Ciénaga de Birama
A swampy area of around 22km^2 located in the south-east coastal region near the Guacanabayabo Gulf. This swamp is 90km north-west of Manzanillo and south of Jobabo. The Cauto Delta hosts up to 100,000 waterbirds. More than 100 species include Gundlach's Hawk, Fernandina's Flicker, Cuban Parakeet and many migratory ducks.

GUANTÁNAMO PROVINCE

Site 41. Baitiquirí
Located 50km east of the south-coast city of Guantánamo, this xerophytic area is the driest in all of Cuba and is particularly notable for the local subspecies of Zapata Sparrow (*sigmani*). Fewer than 100 species are recorded here, but Cuban Gnatcatcher and Cuban Grassquit are both very common.

INFORMATION FOR VISITING BIRDERS

Planning your trip There are international flights from Europe and America to Havana and Camagüey. Hire cars are available, as well as organised tours, such as KConnell Birds (www.kirkconnellbirds.com). Cuba is a very safe country with friendly, approachable people.

Due to the large number of migrant birds in the avifauna, the optimum time to see the greatest number of species is in autumn, from September to November, or spring, from March to mid-April. The best time to see endemics is from mid-March to May. All the recommended birding sites have wide, well-maintained trails, so walking is easy. We always recommend you have a local guide as the distances are large and specialist knowledge of the birds in the area prevents time lost to searching.

Lodging In some cases it is better to stay in hotels (such as Cayo Coco, Guanahacabibes Peninsula) while in some areas, such Viñales, Zapata Peninsula and Trinidad, we recommend staying in B&Bs.

Transportation Comfortable buses are provided by Cuban travel agencies, as well as a good taxi service and car rentals (best done in advance from overseas).

Clothing and equipment Off-road birding calls for boots, long trousers, a long-sleeved shirt and hat for protection against the rough bush and the sun. Pack a plastic bag to protect equipment in the rainy months. Always carry water and, if without a guide, a map, compass, GPS tracker and mobile phone.

Water and food Always drink water from bottles and avoid consuming tap water. Many restaurants serve excellent local food.

Security Always lock your car and hide valuable items. Carry cash with you or keep it in a safe box. Never trespass or take photos in military areas or proscribed industrial areas.

Hazards Mosquitoes can be a problem in the rainy season, especially a few weeks after its onset. At this time, adequate repellent must be used when walking through woods near the coast, or on the cays, since mosquitoes are, at times, unbearable even during the day. We recommend wearing long-sleeved shirts and long trousers. During the colder dry season, most of the island is almost a bug-free paradise. Ticks are a problem in pastures with grazing livestock in late winter and spring when the grass is dry. Trousers should be tucked into socks to avoid being infested by small ticks. Spray insect repellant on boots, socks and around the waist. If attacked, undress and wash clothing and remove ticks with tweezers or cover the area with an antihistamine cream. Take care when standing still – if the ground is loosened and grainy, it may be a biting ants' nest. Horse flies are rarely a nuisance, and then only at a few remote beaches. There are several mildly poisonous plants on Cuba, but if you stay on the paths, you should not have any problems. The most common of these noxious plants belongs to the genus *Comocladia* – easily recognisable by its compound, bright green saw-like leaves.

Male Western Spindalis.