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THE AVIFAUNA OF THE SOLOMA REGION IN HUEHUETENANGO, GUATEMALA

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# THE AVIFAUNA OF THE SOLOMA REGION IN HUEHUETENANGO, GUATEMALA

## CHAPTER I

## INTRODUCTION

Guatemala, the northernmost of the Central American republics, has a total area of about 48,250 square miles. The northern third of the country, the Petén, is a lowland plain which is densely forested and sparsely inhabited. The central portion of the country is mountainous and has an exceedingly complex topography. Much of the land in the high central region lies above 9,000 feet. The coastal regions are tropical lowlands. A chain of fourteen volcanoes parallels the Pacific slope. Of these Tajumulco, rising to a height of 13,600 feet, is the highest point in middle America.

The department of Huehuetenango lies in the northwestern corner of Guatemala. To the north and west it is bounded by Chiapas, Mexico; to the south by the departments of San Marcos and Quezaltenango; to the east by the department of El Quiché; and to the southeast by the department of Totonicapan. The department is largely mountainous. Tropical lowlands are found near the Chiapas border. The precise location of the department of Huehuetenango is between latitudes 15 degrees 8 minutes and 16 degrees 4 minutes 32 seconds north; and between 15 degrees 3 minutes and 92 degrees 8 minutes longitude west.

The total area of Huehuetenango is 7,500 square kilometers. The department is one of the more densely populated areas of Guatemala, having a population of 205,110 inhabitants according to the 1950 census (Recinos, 1954: 10).

The principal mountain range in the department is the Sierra de los Cuchumatanes. Vast regions of this range reach elevations in excess of 9,500 feet. The Cuchumatanes are the highest and most extensive mountain range in the country. Recinos (1954: 17) says, "Las alturas más importantes de Guatemala y de toda la América Central se hallen estrechamente agrupadas en este cordillera de montañas..." While this may be an overstatement of fact, the mountain mass is formidable in appearance, especially when viewed from the south.

Many small streams originate in the mountains and constitute the headwaters of several well known rivers. Many of the smaller streams contain water only in the rainy season and are dry arroyos in the dry season.

The Río Chixoy originates as the Río Negro near Santa Ana Malacatán. Throughout its course the river receives many tributaries and, as is the case with all rivers and streams in Guatemala, it is known by many different names in different places. The river flows in a northwest direction toward the city of Huehuetenango.

The Río Lacantún flows from the region around San Juan Ixcoy toward Barillas. This river receives many tributaries from the San Pedro Soloma region.

The Río Chiapas is the largest river in the department and has many tributaries. It flows to the northwest into the Mexican state of

Chiapas.

Typically the mountains in Huehuetenango are of limestone with granite outcroppings. In this respect the northern altos differ from the southern, the latter being of volcanic origin.

The amount and distribution of rainfall varies from place to place. In general, the lowlands receive much rain, the interior at moderate elevations is somewhat dryer, and the highlands are very wet. The nature of the country can be better understood by an analysis of the crops raised in the department. In the low country the principal crops are bananas and coffee. This agricultural belt is referred to by the natives as the tierra caliente, or hot country.

At an elevation of about 2,500 feet, but differing from place to place, is the tierra templada, the region of intermediate climate. In this region coffee and corn are the principal crops although some cattle are raised.

The tierra fria, or cold country, is generally above 6,000 feet. That portion of the cold country which extends above 10,000 feet is referred to as the Región Andina. In the cold country the principal crops are corn and wheat. Sheep are raised by every Indian family. Above 10,000 feet sheep are the principal means of livelihood although some potatoes are grown.

The town of San Pedro Soloma lies within the tierra fria. When I arrived at this locality in February, 1958, the general appearance of the land was brown and dry. The nights were very cold and frost was not unusual. The temperature rose to a pleasant 60 degrees in the daytime. The climate gradually warmed through the spring months. However,

in the warmest month of the year, July, nighttime temperatures were often in the 50 degree range and the daytime temperatures seldom became as high as 80 degrees. Higher in the mountains the temperatures were lower for both days and nights.

No records of rainfall are available for the area in which I worked. Any record for such an area unless taken at a great variety of elevations would be very misleading. In the dry season, from November to May, rains are not infrequent and occur about once a week. The rainy season begins in May and ends in October. There is not an abrupt transition between the two seasons. Rather, the weekly rains lead gradually into semi-weekly rains and finally into daily rains. During May and June the rains are largely confined to the afternoons and come at regular hours every day. By July the rains fall every afternoon and continue to fall throughout the night. Occasionally there are rainy mornings. The heaviest rains come in August and September. This condition persists until mid-October when a gentle decrease in the rain is apparent. By November the rains are once again on a weekly basis and the dry season has begun.

It was surprising to note the differences in the rainfall at different localities. On many mornings it would not be raining in Soloma, but it would be raining heavily on the higher mountains around town. In ascending the mountains I often passed through the cloud mass to find the mountain bathed in bright sunlight. From such a vantage point I could look back toward town and note that the lower elevations were receiving heavy rains.

The character of the land changed greatly with the coming of

the rainy season. The planting of corn coincided with the coming of the rains. Fields that formerly were brown and which had been burned to rid them of their weeds now began to appear green. Pastures which were heavily overgrazed and which were brown in appearance also became covered with a lush green growth.

The altitude of San Pedro Soloma, the locality where I did my collecting, is 7,300 feet. The township covers a considerable territory and is composed of one pueblo, 12 aldeas (Indian villages), and numerous caseríos (small groups of houses; Indian hamlets). The limits of the township are: Santa Eulalia to the north; Chajul, in the Department of El Quiché, to the east; San Juan Ixcoy to the south; and San Rafael la Independencia to the west.

Surrounding the town of Soloma are several mountains of 9,000 feet or more. These mountains all have well established names and all were investigated for birds. The principal mountains where birds were taken were Sajcaguá, Pajaltac, Ixtichacán, Cantel, Chival, and Chumajté. Chival was a favorite mountain for the natives in the fall months when they harvested large numbers of migrating birds at night with the aid of small fires.

The principal streams in the Soloma region are the Ixtiapoc and the Soloma. The Ixtiapoc rises as a spring near the aldea of Jolumcú and it joins the Río San Juan Ixcoy near the aldea of Ixtiapoc. It flows to the east through Soloma, turns north and is joined by the Río Soloma, which flows north toward Santa Eulalia.

Several tributaries to the principal rivers are arroyos which are dry for part of the year, but which are swift flowing streams in

the rainy season. These tributaries had a lush growth of shrubs and were some of the most important collecting areas around Soloma. The most important arroyos were San Antonio, Quisisí, Pueblo Nuevo, and Ixlacuitz. To the northeast of town is a small salt flat, known as El Salitre, where flocks of band-tailed pigeons assembled daily.

Much of my collecting was done near the aldeas. When I asked natives for directions to certain habitats, they usually referred me to a specific aldea. Several of the aldeas are so heavily built up that collecting near them was not feasible. However, many birds were collected near the following aldeas: Chival, Ixlacuitz, Ixtichacán, Ixtenam, Ixtiapoc, Jolumcú, Pajaltac, Jacxap, and Yasanlac. The names are Indian names of the Chuj dialect. It is the practice in Guatemala to retain Indian names unless a village prospers commercially, whereupon a Spanish name is bestowed on it. At a great distance from the pueblo are the caseríos which are isolated aggregations of houses. It was near the caseríos that much of my work was done as there the human population was at its lowest density. The principal caseríos were: Bacau, Chochcap, San Francisco, Ixtiquix, Ixnamconop, Pueblo Nuevo, and Yulichal.

The town of San Pedro Soloma is the center of the Indian population of the Chuj language. The town is ancient, the written records extending (with interuptions) back to 1565 A.D. The population of the town is about 3,000 Indians and about 800 Ladinos. The latter, a people of mixed blood, are the Spanish speaking element in the country.

Because of agricultural practices it was difficult to find areas that were not subject to human disturbance. There was not a

single collecting location that I visited that was not also used by the natives for farming, grazing, or wood cutting. I often found myself in an area inhabited by a good bird, but collecting the specimen was out of the question because of the proximity of Indian houses or livestock.

Conservation in this region is poorly understood and little practiced. Vast regions have been deforested and have not been replanted. Some slopes cleared for corn-growing are incredibly steep. In these areas erosion is bad and the crop almost nonexistent. Nevertheless, steep slopes are cleared every year. Burning of fields throughout the dry season, February or March principally, is a common practice.

In general the people are very poor and they exist on substandard diets. The effect of this condition is that birds are hunted for meat throughout the year with slingshots. The hunting is not limited to game birds, but includes even the small warblers and sparrows. This practice must contribute to the general scarcity of birds in the region. Very few species of birds can be called abundant or common.

Mammals were even scarcer than birds. No mammal was common in the area although I saw several species and the natives regularly hunted mammals for food. Those which I saw were (names from Recinos, 1954): Vampyrus spectrum, a vampire bat, one of which regularly fed on my horse every night; Canis latrans, a coyote, which was mostly heard in the dry season; Vulpes virginianus, a fox which was seen on two occasions, once at 12,000 feet in open country and once at 7,000 feet in brush; Cariacus virginianus, a deer, commonly heard in the

forested regions and occasionally shot for meat; Sciurus carolinensis, a squirrel, the only small mammal seen more or less regularly; Mus musculus, a mouse, common in town; and Lepus palustris, a rabbit, occasionally seen in the area, but rare. The mouse is, of course, an introduced species. One other mammal, Sorex sp., a shrew, was seen once in the cloud forest where a mountain robin (Turdus plebejus) dropped the animal at my feet. This specimen is now in the collection at the University of Michigan. In spite of the fact that corn and wheat were grown in the area, there was a scarcity of small rodents in the cultivated fields. This scarcity of small mammals probably accounts, to some extent, for the scarcity of avian predators.

With the exception of two species of lizards, reptiles were very scarce in the area. Only once did I see a snake in the high country near Soloma. The two species of lizards were abundant throughout the open pastures and fields. There are no turtles in the entire mountain range.

A toad belonging to the genus Bufo was common in the rainy season on cultivated land near town. The toads bred in June and July.

I saw no fish in the streams near Soloma, and the natives informed me that fish were to be found only in the streams of the low country. I saw no ponds or lakes anywhere in the Sierra de los Cuchumatanes.

## CHAPTER II

## HISTORY OF ORNITHOLOGY IN GUATEMALA

The history of ornithology in Guatemala is marked by periods of intense activity followed by periods when little was done. Much of the early knowledge regarding birdlife was derived from trade skins which were shipped to various European museums. The early collectors trained the natives in preparation techniques, but data accompanying the skins were usually very poor. Often the locality at which the skin was collected could not be determined and most of the skins were assumed to have come from the Cobán area. However, the old trade skins served a vital function in bringing to light several species new for Guatemala, some of which were new to science.

Prior to 1842 several people made brief trips through Guatemala and published brief accounts of the birds they recorded. Serious work on the birds of Guatemala began in 1842 when M. A. Delattre worked in Cobán in Alta Vera Paz for nearly a year. Delattre collected many specimens and trained many natives in the preparation of trade skins. Several species were described as a result of this expedition.

The next important expedition was that of George Ure Skinner, who collected birds in several different localities. The majority of his specimens came from the general vicinity of Cobán. This area, which was formerly called Vera Paz, is now divided into the departments

of Alta Vera Paz and Baja Vera Paz.

The results of the two expeditions mentioned above, as well as those of several minor expeditions are summarized by Sclater and Salvin (1859: 1-22, 117-138, 213-234).

Much of what is known regarding the ornithology of Guatemala is a result of extensive investigations by Osbert Salvin and Frederick Godman. A report of their travels can be pieced together from an examination of the "Biologia Centrali-Americana" (Introduction) and from their various separate publications in The Ibis (1860: 28-45, 272-278, 396-402, 259-272, 248-253) (1861: 58-69, 138-149, 351-357) (1864: 372-387) (1865: 187-199) (1866: 188-206) (1871: 86-100).

Between 1857 and 1874 Osbert Salvin made four expeditions to Guatemala. He was accompanied by Frederick Godman on the third and longest expedition. Many areas in Guatemala were visited, but the following were worked most intensively: Dueñas, Volcán de Agua, Lake Atitlán, Cobán, Lake Yzabal, the Motagua Valley, and Vera Paz. Salvin and Godman did not visit the department of Huehuetenango. However, they did collect in the highlands of Quezaltenango, in country similar to that of the Sierra de los Cuchumatanes.

In 1889, W. B. Richardson collected birds in various parts of Guatemala for a little more than a year. His most important areas were the altos of San Marcos and Quezaltenango, Volcán de Santa Maria, and Lake Atitlán. His work was done under the auspices of Salvin and Godman and was the last of the explorations sponsored by these two men.

Adolphe Boucard collected birds in Guatemala during the entire month of June, 1877. His most important localities were Escuintla,

Antigua, Guatemala City, and the volcanoes Agua and Fuego. Most of the skins were prepared by native collectors and are without locality designations or data of any kind.

N. S. Goss collected in Guatemala for several months in 1882, 1885, and 1887. He collected on the Pacific and Atlantic slopes, the highlands near Guatemala City, and made a brief trip into the Petén.

The first ornithologists to venture into the department of Huehuetenango were Nelson and Goldman, who collected specimens in various parts of Guatemala from December 14, 1895, to January 29, 1896. Their work was largely confined to the departments of San Marcos, Quezaltenango, and Huehuetenango. No separate report of this expedition was ever published, but several new forms were described by Nelson and the localities at which he took specimens are recorded in Ridgway's "The Birds of North and Middle America."

Ned Dearborn spent nearly four months in Guatemala, from January through April, in 1906. His work was centered in the southeastern part of the republic in the Caribbean lowlands, in the Motagua Valley, and at a few localities on the Pacific coast and in the central highlands near lakes Atitlán and Amatitlán.

S. N. Rhoads and E. L. Poole spent two months in the spring of 1915 collecting birds on the Caribbean slope. They obtained many specimens in the arid Motagua Valley and in the tropical rain forest near the coast.

Austin P. Smith collected in Guatemala from October, 1919, to February, 1920. He worked near Quezaltenango, at Lake Atitlán, at various points in the Pacific coastal region, and near Retalhuleu.

A. W. Anthony spent four and a half years collecting specimens in Guatemala. The localities he visited are too numerous to mention here; however, he did not visit the Petén, he did not collect in the southern portion of the country near El Salvador and Honduras, and in the Cuchumatanes he collected at only a few scattered localities for brief periods of time. The Anthony expedition stands as a major landmark in the history of Guatemalan ornithology. Griscom (1932) reported in full on the Anthony expedition, including a list of all specimens collected and of all localities visited. This publication is the only definitive work on the bird-life of Guatemala.

The northern third of the country, the Petén, has largely been unexplored by ornithologists. The climate is wet, hot, and unhealthful. Most of what we know today regarding the bird-life of the Petén is a result of Josselyn Van Tyne's work in 1931. Van Tyne's expedition lasted about two months and his principal collecting locality was Uaxactún. There are still vast regions in the Petén which have not been visited by ornithologists.

Alexander Wetmore spent a little over a month collecting birds in the central highlands of Guatemala in 1936. He worked near Dueñas, at Antigua, near Volcan de Agua, at Chimaltenango, at Volcan de Fuego, at Panajachel on the shores of Lake Atitlán, and near Tecpam.

Richard E. Tashian collected in southeastern Guatemala during the fall and winter of 1950-51. His work was confined to the departments of Santa Rosa, Jutiapa, Jalapa, and Zacapa. He collected a total of 150 forms.

A recent publication edited by Saunders, Holloway and Handley

concerns a U. S. Fish and Wildlife Department report on a survey made in Guatemala. This report deals with the fish and game of the country and contains a great deal of information on game birds. Various parts of the country were visited to secure this information, but much of the section on game birds is taken from the earlier literature resulting from the above-mentioned expeditions.

A review of the above-mentioned expeditions reveals that certain areas in Guatemala (Caribbean coast, Motagua Valley, Pacific coastal plain, central highlands) have been worked by many ornithologists, but that other areas have been neglected (southern lowlands, the Petén, and the northern altos). In addition, the several collectors moved about the country a great deal and seldom stayed at any one locality for more than one season of the year. In general, the object of the expeditions was to obtain many different kinds of birds from a great variety of habitats and localities. Prior to the present report, not one publication on Guatemalan birds has concerned itself with observations made throughout the year in any one restricted area.

## CHAPTER III

## THE 1958 EXPEDITION

I arrived in Guatemala City on February 7, 1958, and spent several days clearing my equipment through customs. I proceeded to the town of Huehuetenango on February 11. The next few days were spent in exploring the department of Huehuetenango for suitable headquarters.

Through the kindness of Father Joseph Rickert I was able to make San Pedro Soloma my headquarters. Father Rickert furnished me with room and board at the rectory. The Maryknoll Fathers were very helpful to me in many ways, especially in furnishing me room and board in any pueblo I visited.

I started field work in the Soloma region on February 17. Field work continued until mid-October when I returned to the United States. The majority of the work was done near San Pedro Soloma, but two short trips, in July and August, were made to nearby Santa Eulalia. The purpose of these trips was to examine the large pine forest near Santa Eulalia.

From June 2 to 10 I visited a coffee finca on the Pacific coast in the department of San Marcos. In July I traveled to Guatemala City for three days to obtain an extension of my visa.

A primary goal of my expedition was to follow the birdlife of

a restricted area during the four seasons of the year. In February and March I was able to study the wintering populations, from March to May the spring migration, and from mid-August to mid-October the fall migration.

By restricting myself to one locality I was able to obtain notes on the fluctuations in numbers of species throughout the various months as some forms moved into the area while others moved out.

I arrived in the Soloma region before the start of the spring nesting season, and I left the area in fall after the fall nesting season was completed.

A secondary goal of my expedition was a collection of birds. The Soloma area had not been previously explored by ornithologists. I tried to obtain specimens of every form inhabiting this area, and I paid particular attention to those groups whose racial affinities might be difficult to work out.

## CHAPTER IV

## HABITATS

The temperate zone in the vicinity of Soloma can be divided into the following six habitats: cloud forest, oak forest, scrub oak thicket, oak-pine forest, pine forest, and cultivated land including pasture. The distribution of these habitats is more dependent on soil type, rainfall, and slope than on altitude. Griscom (1932: 65) indicated that the life-zones in the mountains of Guatemala are too slightly developed to permit of formal separation or description. Thus, on a steep slope at 8,500 feet, where there is a rapid run-off of any rainfall, or where the soil is poor, pine forest grows. On a gentle slope at the same altitude oak forest may thrive. A progression up the side of a valley from 5,000 to 10,000 feet can involve the following habitats: cultivated land, scrub oak thicket, pine forest, oak-pine forest, oak forest, cloud forest. The slope on the opposite side of the valley might have the following habitats: cultivated land, pine forest, oak forest, pasture, pine forest, cloud forest.

Pine makes an appearance whenever the rainfall is locally reduced or wherever the soil is poor. Scrub oak appears in cultivated fields that have been abandoned. Oak is found on good soil with abundant rainfall. Cloud forest is restricted to a high elevation and demands good soil and abundant rainfall. Cultivated land is found

chiefly below 8,000 feet except for pastures which have been cleared at almost any altitude. Most of the land below 8,000 feet has been cleared for cultivation. The exceptions are slopes too steep for planting or areas that are extremely rocky and difficult to cultivate. Level land is almost nonexistent.

## Cloud Forest

The cloud forest crowns the higher ridges. In the Soloma region is occurs chiefly between 8,700 and 9,600 feet. During my sojourn it was characterized by cypress (Cupressus lusitanica) and by large oaks (Quercus spp.). The trees were often five feet or more in diameter and many were as much as 150 feet high. The forest was usually above or in the clouds during the rainy season. Even in the dry season a moderate amount of rain fell in the cloud forest and the habitat was never dry. In the rainy season water dripped from the trees both night and day. The tree trunks were covered with moss and there was little undergrowth except in open places where trees had been cut.

There is not much cloud forest left in the altos of Huehuetenango as the natives lumber or clear the land almost continuously for pasture. In the Soloma region there are only two remnants, both of them at some distance from town. I hesitate to state that the cloud forest represents virgin timber, since in the center of one forest I found the remains of an ancient pyramid. Only the top was exposed, the rest of the structure having been covered long ago with soil in which large cypresses and oaks were growing. These trees appeared no different in size from the rest of the forest.

Because of the poor light, the numerous epiphytes, and the

height of the trees, birds were difficult to observe and collect in this habitat. Nests were almost impossible to locate. Many specimens were shot that were never recovered. Often birds lodged in epiphytes 40-50 feet above the ground, and sometimes specimens were lost because of the poor light and the lush vegetation covering the forest floor.

The following breeding species were confined to the cloud forest and to mature oak forest chiefly above 8,500 feet: Penelopina nigra, Oreophasis derbianus, Lampornis amethystinus, Eugenes fulgens, Aulacorhynchus prasinus, Cyanolyca pumilo, Henicorhina leucophrys, Turdus infuscatus, and Chlorospingus ophthalmicus.

The following breeding birds were characteristic of the cloud forest, but were collected in at least one other habitat: Dendrortyx leucophrys, Lamprolaima rhami, Trogon mexicanus, Colaptes cafer, Lepidocolaptes affinis, Empidonax flavescens, Mitrephanes phaeocercus, Aphelocoma unicolor, Troglodytes rufociliatus, Turdus plebejus, Myadestes obscurus, Catharus occidentalis, Vermivora superciliosa, Myioborus miniatus, Ergaticus versicolor, Basileuterus belli, and Atlapetes brunnei-nucha.

The following non-breeding birds were taken in the cloud forest: Empidonax hammondi, Sphyrapicus varius, Dendroica fusca, Dendroica townsendi, and Wilsonia pusilla.

In terms of numbers of individual birds, the cloud forest was a poor habitat. Perhaps no other habitat, with the exception of the pine forest, contained as few birds per acre. Even during migration the forest was relatively quiet. The bulk of the activity was confined to the edge of the forest adjacent to pastures.

## Oak Forest

Mature oak forest was found in widely scattered areas from 4,200 to 9,000 feet. At 9,000 feet and higher, rainfall increased, cypress invaded the oaks, and the habitat became cloud forest. In most places, pines invaded the oaks. Unless pines were co-dominants, I considered the habitat as oak forest. The following oaks have been recorded from the region (Recinos, 1954: 93): Quercus reticulata, Q. polymorpha, Q. tomentosa, Q. mexicana, and Q. robur. Madroño (Arbutus donnellsmithi) was usually found with oaks. It contributed to the understory, being much taller than the shrubs on the floor of the forest, but not nearly as massive as the oaks. The oak forest was not as dense as the cloud forest. In areas where sheep grazed there was no understory. In most places the oaks were being cut and open areas, covered with shrubs, appeared in the forest. According to the natives, the oak forest near Soloma was all second growth.

Breeding birds restricted to this habitat were: Caprimulgus vociferus, Aspatha gularis, and Cyanolyca cucullata. Breeding in oak forest, but also elsewhere were: Dactylortyx thoracicus, Hylocharis leucotis, Lamprolaima rhami, Trogon mexicanus, Colaptes cafer, Dendrocopos villosus, Lepidocolaptes affinis, Contopus pertinax, Empidonax flavescens, Empidonax fulvifrons, Mitrephanes phaeocercus, Cyanolyca pumilo, Cyanocitta stelleri, Certhia familiaris, Troglodytes rufociliatus, Turdus rufitorques, Myadestes obscurus, Catharus occidentalis, Vireo huttoni, Diglossa baritula, Vermivora superciliosa, Myioborus miniatus, Ergaticus versicolor, Basileuterus belli, and Atlapetes brunnei-nucha.

The oak forest was especially rich in transient and wintering forms. The following were recorded in oaks: Contopus virens, Bombycilla cedrorum, Ptilogonys cinereus, Vireo solitarius, Vireo gilvus, Mniotilta varia, Dendroica audubоni, Dendroica townsendi, Dendroica occidentalis, Oporornis tolmiei, Wilsonia pusilla, Icterus galbula, Icterus chrysater, Piranga rubra, Passerina cyanea, and Empidonax hammondi.

## Scrub Oak Thicket

This habitat occurred between 6,700 and 8,800 feet in abandoned fields and in places where oak forest or pine forest had been cut. In areas where pine forest has been cut, the pine invades the scrub oak and eventually takes over to form another pine forest. Where oak forest has been cut the shrubs and scrub oak take over the field and eventually the oaks mature to form a forest. In abandoned fields, shrubs and oaks spring up, but seldom do they attain a height of greater than 10 to 15 feet, since in most cases they are cut for fire wood. The field, after lying idle for 10 to 20 years, is usually reclamed for agricultural purposes. The scrub oak habitat shifts gradually from one area to another. It is found in isolated spots and seldom does an individual stand of scrub oak thicket cover much area.

Colibri thalassinus and Atthis ellioti were restricted to scrub oak thickets in the fall breeding season, but were not found in the Soloma region in any other part of the year. Melanotis hypoleucus and Atlapetes gutturalis were restricted to scrub oak thickets during the entire year. The following birds were characteristic of scrub oak thickets, but were also found in at least one other habitat: Geococcyx

velox, Hylocharis leucotis, Dendrocopos villosus, Contopus pertinax, Empidonax fulvifrons, Cyanocitta stelleri, Psaltiparus melanotis, Turdus rufitorques, Catharus occidentalis, Vireo huttoni, Vermivora superciliosa, Ergaticus versicolor, Tanagra musica, and Pipilo erythrophthalmus.

The following eight species were found in the scrub oak as transient or wintering birds: Contopus sordidulus, Empidonax hammondi, Empidonax wrightii, Dendroica coronata, Dendroica townsendi, Basileuterus rufifrons, Passerina cyanea, and Melospiza lincolni.

## Oak-pine Forest

This habitat occurred in two widely separated areas. The largest stand of oak-pine forest was between 5,300 and 6,300 feet. Another stand was between 7,800 and 8,900 feet. There were a few additional areas which can be referred to this habitat. Typically these were small restricted localities in oak forest where pine occurred, or small areas of pine forest invaded by oaks. These local oak-pine habitats occurred as low as 4,200 feet. The oak-pine habitat at the lower elevation was much dryer than that at the higher elevation. The lower stand was rather open, the trees being far apart and the understory slight. At higher elevations the trees were very close together and it was difficult to walk through the area except by following trails cut by natives.

Most of the characteristic birds of oak-pine forest were also found in pure stands of either oak or pine. Only Melanerpes formicivorus was restricted to oak-pine forest. It was found only at the lower elevation. Breeding birds characteristic of oak-pine forest

were: Lamprolaima rhami, Trogon mexicanus, Colaptes cafer, Aphelocoma unicolor, Cyanocitta stelleri, Psaltriparus melanotis, Certhia familiaris, Campylorhynchus zonatus, Turdus rufitorques, Turdus plebejus, Myioborus miniatus, Ergaticus versicolor, and Basileuterus belli.

Transient and wintering birds found in oak-pine forest were: Nuttallornis borealis, Bombycilla cedrorum, Ptilogonys cinereus, Mniotilta varia, Dendroica auduboni, Dendroica townsendi, Dendroica occidentalis, Wilsonia pusilla, and Cardellina rubrifrons.

## Pine Forest

There were very few pure stands of pine forest in the Soloma region. The lowest stand I visited was at 4,200 feet, the highest at 9,000 feet. Near Santa Eulalia there were large stands of pine forest which I visited on two occasions. Recinos (1954: 102) listed the following pines from the region: Pinus ayacahuite, P. oocarpa, P. strobiliformis. The last-named was common at high elevations and was cut extensively for fire wood. The other two species occurred throughout the entire area and were cut for timber which was used for building purposes.

Most of the pine forest near Soloma was second growth and the trees were seldom higher than 75 feet. Near Santa Eulalia there were remnants of a much older pine growth, some of the trees being well over 100 feet high and as much as four feet in diameter. In both types of forest there was very little understory, as pine needles covered the ground to a depth of several inches. Only in places where trees had been cut were there any shrubs.

The pine forest had fewer species of birds than any other habi-

tat. No species was restricted to this habitat. Breeding birds found in the pine forest were: Hylocharis leucotis, Lepidocolaptes affinis, Empidonax fulvifrons, Mitrephanes phaeocercus, Cyanocitta stelleri, Certhia familiaris, Campylorhynchus zonatus, Myadestes obscurus, and Ergaticus versicolor.

Three transients were taken in pine: Nuttallornis borealis, Dendroica townsendi, and Dendroica occidentalis.

## Cultivated Land

The land under 8,000 feet was cultivated extensively. Above 8,000 feet were large areas which were once forest, but which had been converted into pasture. Below 8,000 feet the land was used for corn, wheat, and pasture. The character of the cultivated areas changed markedly with the coming of the rainy season in April. From February to April the fields were brown and dry. In April the wheat matured and the corn sprouted. When the rains started the fields turned green and the entire countryside took on a fresh spring-like appearance. Throughout the rainy season the fields became progressively greener and, as the corn matured, many birds invaded the cultivated land. After the rainy season the corn was harvested and the fields were burned. Several creeks ran through the cultivated areas and pastures and many shrubs grew along the creek banks. These shrubs provided a suitable habitat for migrating birds and for several nesting forms.

Between Soloma and the town of Huehuetenango, near the village of Paquix, there was a grassy area, several miles in extent, where spruce (Abies guatemalensis) grew in small stands. The elevation was from 11,500 to 12,500 feet. This grassy plain was used for sheep

pasture, and I found no evidence that it had ever been a solid forest. Sturnella magna was seen in this area.

The following birds were restricted to cultivated land, pasture, abandoned fields, and streams flowing through these habitats: Sayornis nigricans, Notiochelidon pileata, Troglodytes musculus, Sialia sialis, Cassidix mexicanus, Spinus atriceps, Aimophila rufescens, Junco alticola, and Zonotrichia capensis.

Recorded in cultivated areas, but also seen elsewhere were: Dactylortyx thoracicus, Columba fasciata, Geococcyx velox, Hylocharis leucotis, Contopus pertinax, Cyanocitta stelleri, Cinclus mexicanus, Turdus rufitorques, Diglossa baritula, and Pipilo erythrophthalmus.

Transient and wintering birds of cultivated areas were: Falco sparverius, Charadrius vociferus, Actitis macularia, Tachycineta thalassina, Bombycilla cedrorum, Oporornis tolmiei, Wilsonia pusilla, Guiraca caerulea, and Melospiza lincolni.

Not all birds can be assigned to any one habitat or set of habitats. Two species of vultures, the red-tailed hawk, and the raven I saw in every habitat. The collared swift, Streptoprocne zonaris, I saw on several occasions, but only at one waterfall. Seven species (see p. 29) were taken at a fire at night, but were never seen in the daytime. An owl provisionally identified as Aegolius ridgwayi was seen only once in an attic in town.

An analysis of the species listed under the various habitats reveals that the oak forest contained more different kinds of birds than any other habitat. In it were found 28 breeding forms and 16 migrant or wintering forms. The pine forest was the poorest habitat

for birds, having only nine breeding forms and three transients. No habitat was as restricted in total area as was the cloud forest; however, this habitat contained 26 breeding forms and five transients. It was second only to oak forest in the total number of species found in it. Most of the total area in the Soloma region was cultivated land and pasture. This habitat, which covered more ground than all the other habitats combined, contained 19 breeding forms and ten migrants.

Both the cloud forest and oak forest could be subdivided into smaller ecological habitats by splitting them horizontally into strata. In each habitat were certain birds which lived near or on the ground, others that lived in the understory, some that lived only in the upper levels of the trees, and others that seemed to live at any level. The pine forest, on the other hand, had little or no undergrowth, the ground was usually covered with dead needles, and the trees were not as high as the oaks or cypresses. The birds did not arrange themselves into strata in this habitat.

The cultivated land was constantly changing. It presented a great many ecological niches for birds and was larger than any other habitat. It was not surprising to find a large number of species in this habitat as well as a large number of individual birds.

The oak-pine forest, containing 17 breeding forms and 9 migrants, presented a more varied appearance than the pine forest. The presence of the understory accounts, to some extent, for the greater number of forms inhabiting it.

The scrub oak thicket was also more varied than the pine forest

as it had many shrubs and open areas in it. It contained 18 breeding forms and eight transients.

The number of species found in any given habitat was dependent not on its total area, but on the number of ecological niches it contained. Any habitat in the high country of Guatemala is subject to disturbance by man. A large percentage of the human population lives away from the towns and many people wander freely through even the most remote cloud forests in search of game or wood. Presumably this condition has existed for centuries as the Maya civilization is an ancient one.

## CHAPTER V

## SEASONAL CYCLES

There was a marked change in the number of birds in the Soloma region from season to season. By far the greatest number of individuals was present in September. During this month the fall migration was underway, several forms had returned to the high country to breed, and several wintering forms had returned from their northern breeding grounds.

The mountain mass formed by the Sierra de los Cuchumatanes presents a barrier to migration. The range extends in an east-west direction and has an elevation in excess of 12,000 feet. To the east and the west there are lowlands which swarm with migrants in both spring and fall. To the north lies Mexico, whose Pacific lowlands and Atlantic lowlands are separated by the Sierra Madre. The Sierra Madre is not continuous with the mountains of Guatemala. It is possible for birds to migrate through Mexico and Guatemala and to stay in the lowlands or at only moderately high elevations for their entire journey. It is possible for birds to migrate through the Sierra Madre of Mexico and, by descending to the lowlands at the southern limit of the Sierra Madre, to avoid the Cuchumatanes by migrating along the Pacific cordillera of Guatemala or through the altos of Alta Vera Paz.

From my Soloma experiences, which included a study of the en-

tire spring migration and much of the fall migration, I conclude that most species avoid crossing the Cuchumatanes. Migration in both spring and fall in this sierra was unimpressive and disappointing. When I arrived in February, the wintering forms constituted a small percentage of the total number of birds in the area. Gradually, as spring advanced, there were fewer and fewer of these birds as the various species left for their northern breeding grounds. Several new species arrived as migrants from more southern areas or from lower elevations, but in general the spring months were marked by a decrease, rather than an increase, of both individuals and species.

The fewest species were found in June and July. During this period only resident forms were present. Some of the species were no longer singing and some were molting and were very secretive. The area seemed to be remarkably devoid of birdlife during these months.

Migrant species seen in both spring and fall included Contopus virens, Contopus sordidulus, and Vireo solitarius. None of these were common in either season.

The following migrants appeared and were collected only in the spring: Vireo gilvus, Dendroica fusca, Seiurus noveboracensis, Guiraca caerulea, and Melospiza melodia. It is possible that some of these passed through the area after I left in mid-October.

Species which were taken only in the fall were: Bartramia longicauda, Coccyzus erythropthalmus, Nuttallornis borealis, Empidonax flaviventris, Empidonax minimus, Vireo flavoviridis, Mniotilta varia, Dendroica occidentalis, Oporornis formosus, Wilsonia canadensis, Cardellina rubrifrons, and Piranga rubra. Many of these forms winter in

Guatemala, but at lower elevations.

A local custom of killing birds at night as they migrate through the area permitted me to examine several thousand fall migrants. In so doing, I added seven species that I never saw in the daytime (Bartramia longicauda, Coccyzus erthropthalmus, Empidonax flaviventris, Empidonax minimus, Vireo flavoviridis, Oporornis formosus, and Wilsonia canadensis).

The Indians in the high country of the Cuchumatanes have many favorite spots, usually on the mountain tops, at which they kill fall migrants for food. One such area, which I visited on several occasions, was situated at an altitude of 9,600 feet near Soloma. It was a small grassy plain near the top of a mountain and was surrounded by open oak forest. From mid-August to mid-October the Indians made nightly excursions to this place.

I was first made aware of this custom when in mid-August an Indian approached me with a sack containing about 50 small flycatchers of the genus Empidonax. He explained the local custom of capturing birds, and I accompanied him that night to see the operation.

We reached the grassy plain at 9:00 p.m. to find about 45 Indians assembled there. Each Indian carried a small racquet made of slender twigs tied together. About 11:00 p.m. the Indians built small fires. A light rain, which had started early in the afternoon, continued throughout the night. The wind, which was from the south, blew directly against the birds as they approached from the north. The birds flew into the light of the fire, hovered for a few seconds, appeared to become confused, and fell to the ground. Even while falling

they beat their wings vigorously. They never flew directly into the fire. When a bird fell to the ground an Indian hit it with his racquet. I noted that if the bird was not seen by an Indian, it recovered in a matter of seconds and flew off. On occasion a bird would fly past the fire and circle the area in a confused manner. Characteristically, upon falling to the ground, the small warblers and flycatchers remained motionless with their wings outspread, lying on their bellies. The black-billed cuckoos and the upland plovers usually kept their wings against the body and stood erect on their feet.

I visited the area about twice a week from mid-August to mid-October. Until mid-September the only birds taken in any numbers were small flycatchers (Empidonax). By the end of September several other species were being taken nightly. Commonest of those killed in September were Wilsonia canadensis, Wilsonia pusilla, Bartramia longicauda, and Coccyzus erthropthalmus. The peak of migration occurred shortly after midnight, but it was not unusual for large flocks of birds to appear at three or four o'clock in the morning. The birds came in waves. For twenty minutes there might be many birds, usually all of the same species, milling about the fires. This was usually followed by a short period of relatively little activity, whereupon another flock would come into the light of the numerous small fires. The fact that there were many people walking about the fires did not seem to deter the oncoming birds.

If the weather was clear, or if the wind was not from the south, no birds came to the fires. On such a night one could hear the birds calling as they flew over the area. At these times the birds seemed to

be high overhead. In the fall, however, a clear night was a rarity and the prevailing wind was from the south. When south wind or drizzle prevailed, the migrating birds seemed to fly at a very low elevation, just missing the top of the mountain.

On some nights, even when the wind was from the south or the fog was heavy, few birds were taken. On other nights it was possible for one man to kill several hundred birds. Evidently conditions vary from year to year. The natives complained that 1958 was a poor year for birds.

Near Soloma there were several of these areas at which birds could be taken at night. Other towns in the area also had favorite areas for this sport. On the trail from San Miguel to Santa Eulalia, at about 10,000 feet, there is a large grassy plain several miles in extent. Here the natives had constructed large blinds made of straw. The fires were placed in front of the blinds which were used as reflectors. In some places the fires were placed in front of large, light-colored rocks. Near Soloma the fires were placed in the open.

Birds taken at night were primarily eastern species which did not winter in the high country, but which have been recorded as wintering in the low country of Guatemala. Species which were abundant as wintering or as migrating species in the vicinity of Soloma were seldom taken at night. Thus Empidonax hammondi, the common wintering Empidonax, was not taken at night while E. minimus and E. flaviventris, both of which winter in the low country and were never seen by me in the vicinity of Soloma in the daytime, were commonly taken at night. Dendroica townsendi was a common bird in fall and winter, yet rarely

was it killed at night. Wilsonia canadensis was the species most often taken at night. On certain nights several hundred individuals were taken by each of several natives. I never saw this species in the daytime.

The following species wintered in the high country: Falco sparverius, Charadrius vociferus, Actitis macularia, Sphyrapicus varius, Empidonax hammondi, E. wrighti, Tachycineta thalassina, Bombycilla cedrorum, Dendroica coronata, D. auduboni, D. townsendi, Oporornis tolmiei, Wilsonia pusilla, Icterus galbula, and Passerina cyanea. These species often mixed in small flocks with resident species. For example, it was not uncommon to see small flocks containing Ergaticus versicolor, Vermivora superciliosa, Dendroica townsendi, and Wilsonia pusilla. This situation did not prevail in late spring when the resident forms started nesting.

A final group which accounted for fluctuations in the bird populations were those hummingbirds which returned to the high country in the fall to nest. Only four species were involved in this type of activity, but so many individuals were involved that the whole area seemed to come alive with hummingbirds in the fall months. The four species were: Colibri thalassinus, Lamprolaima rhami, Eugenes fulgens, and Atthis ellioti. The major factor affecting the arrival of these species was the abundance of flowers in bloom during the fall months. Not the least important of these were beans which were planted in the corn fields and which grew, much like a vine, up the corn plants to a height of three or four feet. In August and September the bean plants were covered with brilliant red flowers.

The number of resident individuals was also subject to seasonal cycles. At certain times of the year certain species seemed to be common and at other times rare. Thus, Diglossa baritula could be found near Soloma in any month of the year, but it was abundant in the fall months. Vermivora superciliosa all but disappeared in the summer, but it was abundant as a nesting species in spring. Much of the fluctuations in numbers of the resident forms may have been more apparent than real. It is possible that in the nesting season, when the birds were singing, the species appeared to be common. During the non-breeding season, or while the birds were molting, they may have been secretive and difficult to observe.

Several generalizations concerning seasonal fluctuations in Guatemalan bird populations appear to be valid. Of species which winter in Guatemala, those which breed in eastern North America tend to winter in the lowlands of Guatemala, but can be taken almost anywhere in Guatemala in migration; species which breed in western North America tend to migrate through, and generally winter in, the high country of Guatemala. Species which occur in Guatemala only as transients, and which winter in countries to the south, either are rare in Guatemala or are easily overlooked there. Many forms which winter regularly in Guatemala intermingle freely with resident forms until the resident forms start to breed.

## CHAPTER VI

## NESTING CYCLES

The nesting birds of the Soloma region can be divided into three groups: a large number of species that nest in the spring, a few that nest in the fall, and a few that nest in both spring and fall. In terms of numbers of species, the spring nesting season was the largest of the three. However, in the fall nests were much easier to find, and the fall nesting season was more impressive than the spring season.

I have not been able to assign each of the breeding species to one only of the above mentioned categories. I did not find the nests of many of the resident forms. I have assigned the birds to nesting seasons according to the condition of gonads in specimens collected, the presence or absence of brood-patches, the condition of the molt, the time of appearance of young birds, the months in which the various species were singing, observations on courtship displays, and the actual discovery of nests with eggs or young.

Spring nesting started toward the end of the dry season, in March, and continued into June. The greatest activity was observed in April and May, the start of the rainy season. A considerable number of the spring nesting species had at least one brood out of the nest by the time the heavy rains started in June. Birds which nested in spring

and did not, as far as I observed, nest in fall were: Dendrortyx leucophrys, Dactylortyx thoracicus, Geococcyx velox, Caprimulgus vociferus, Trogon mexicanus, Aulacorhynchus prasinus, Empidonax flavescens, Notiochelidon pileata, Corvus corax, Cyanolyca pumilo, Aphelocoma unicolor, Cyanocitta stelleri, Psaltriparus melanotis, Certhia familiaris, Cinclus mexicanus, Turdus infuscatus, Myadestes obscurus, Catharus occidentalis, Turdus plebejus, Sialia sialis, Vermivora superciliosa, Myioborus miniatus, Ergaticus versicolor, Basileuterus belli, Cassidix mexicanus, Chlorospingus ophthalmicus, Atlapetes brunnei-nucha, Pipilo erythrophthalmus, and Junco alticola.

Birds which nested only in the fall were five hummingbirds--Colibri thalassinus, Hylocharis leucotis, Lamprolaima rhami, Eugenes fulgens, Atthis ellioti, and the honey creeper Diglossa baritula. The height of the fall nesting season was in August and September. During these months heavy rains fell daily. Perhaps the most important factor determining the fall nesting season for the above mentioned forms was the abundance of flowers. At least two species, Hylocharis leucotis and Diglossa baritula, were dependent on the maturing of the corn for nesting sites.

Species which nested in both the spring and the fall were: Melanotis hypoleucus, Turdus rufitorques, and Zonotrichia capensis. For the latter two forms the fall nesting season was more important than the spring nesting season.

There seemed to be no overlap between spring and fall nesting seasons. Even in those forms which nested in both spring and fall there seemed to be a definite break between the two seasons. There is

slight evidence to suggest that in species which nest in both spring and fall not all individuals nest in both seasons. Some individuals of certain species were not in breeding condition while other individuals of the same species were incubating eggs (Zonotrichia capensis, Turdus rufitorques). Some birds collected in July were in the midst of the postnuptial molt while individuals of the same species were known to be nesting in August and September (Zonotrichia capensis).

Although several nests were found with three eggs or three young, the common clutch-size was two eggs. Psaltriparus melanotis had consistently more than three eggs. Nest predation was at a minimum. Never did I leave a nest to return in a few days and find it destroyed. Perhaps this can be explained because of the extreme rarity of snakes. Small rodents which might eat eggs or young birds were very rare in the area except in town where they lived in stored corn.

Birds which bred in the spring were present in the area throughout the entire year. Some of the species which nested in the fall were found in the area only during the fall nesting season. Presumably these species lived at lower elevations during the non-breeding season as none of them are considered to be migratory.

Most of the species having close affinities with the avifauna of North America were found breeding only in the spring--an exception being Zonotrichia capensis, which had a fall nesting season. It is interesting to note that Z. capensis is the only southern species of the genus Zonotrichia. The wintering ranges of the other species in the genus do not touch the breeding range of Z. capensis. The race found in Guatemala, Z. c. septentrionalis, is the northern representa-

tive of this essentially South American species. On the basis of ecology, behavior, and distribution, I seriously question the advisability of linking this southern species with what is, otherwise, a well-defined, exclusively North American genus.

Many forms nested in the spring while wintering birds were still in the area. Fall-nesting started at about the time the first fall migrants arrived.

Several questions can be raised concerning the nesting cycles of birds in Central America. Perhaps the most important facet of the problem concerns the stimulus for nesting. How is it that some species nest in the spring and others nest in the fall? If conditions are such that certain species are stimulated in the spring why are not all species so stimulated? It has been shown repeatedly that changes in day-length affect the size of the testes in male birds. This change in day-length, with its concomitant enlargement of gonads, is thought to induce breeding in birds. However, in tropical countries, there is little or no variation in day-length throughout the year. It is, therefore, not possible to postulate that change in day-length is the principal factor determining inception of the nesting cycle in tropical birds.

Perhaps the greatest stimulus comes from the changing of the seasons from wet to dry and from dry to wet. In the altos of Guatemala there is as much difference between the dry season and wet season as there is between winter and summer in Oklahoma.

Miller (1958: 295) believes that birds have an inherent rhythm which determines their nesting cycles. Thus, in birds which live near

the equator and which breed throughout the year, not all individuals breed throughout the entire year. Rather, while some breed in every month, and the species thus appears to breed continuously, no individual bird has a nesting season of more than two or three months.

Inherent rhythm, then, is probably the major factor determining when a species breeds. The little change in day-length and the changing of the wet and dry seasons may be secondary factors. Perhaps the same stimulus which induces wintering birds to return to their breeding grounds is responsible for initiating the spring nesting season in tropical countries.

In the tropical and subtropical zones of Guatemala there are species which nest throughout the entire year. In the high country near Soloma, however, I know of no species that fall into this category.

## CHAPTER VII

## AFFINITIES OF TEMPERATE ZONE BIRDS

Geologically and geographically Middle America is a part neither of North America nor of South America. During the Cretaceous, Guatemala and all of Middle America were probably connected to both North and South America much as they are now. The connection with South America may have been broader than it is now. During the Eocene and the Oligocene the Isthmus of Panama and other parts of Middle America were submerged, Guatemala being separated from Mexico by water.

Evidence points to the strong probability that North and South America have been connected since the Pliocene. Prior to this period, however, water gaps appeared between the two continents. The gaps were sufficiently wide to prohibit the passage of mammals from one continent to the other, but at no time were they wide enough to prohibit the free passage of birds.

With these facts in mind, the student may examine the birdlife of the temperate zone of northern Guatemala with an eye to determining the affinities of this avifauna with that of North and South America. In considering such affinities, I have consulted Mayr (1946: 3-41) and, to a lesser extent, Griscom (1932: 67-72; 1950: 341-382).

An analysis of the birdlife near the town of Soloma furnishes some evidence that the affinities of that region are mostly with North

America. These affinities are clearly demonstrated by an analysis of the origins of the various families represented in this temperate zone of northern Guatemala. When so analyzed, the families can be arranged in five categories, as follows:

1. Families of North American origin: Cathartidae, Momotidae (Griscom points out the possibility of the origin of this family in Middle America proper), Cinclidae, Troglodytidae, Mimidae, Bombycillidae, Ptilogonatidae, Vireonidae, Parulidae, and the subfamily Emberizinae of the Fringillidae.

2. Families of South American origin: Rhamphastidae, Dendrocolaptidae, Coerebidae, and the subfamily Richmondeninae of the Fringillidae.

3. Families of Pan-American origin, apparently from the north: Cracidae; apparently from the south: Trochilidae, Tyrannidae, Thraupidae, and Icteridae.

4. Families which originated in the Old World, which crossed into North America via the land bridge (what is now the Bering Straits), and which consequently reached Guatemala from North America: Phasianidae, Columbidae, Cuculidae, Strigidae, Hirundinidae, Corvidae, Paridae, Certhiidae, Turdidae, and the subfamily Carduelinae of the Fringillidae.

5. Lastly, there are a number of families whose origins are uncertain. These include: Accipitridae, Falconidae, Scolopacidae, and Apodidae. It seems probable that the Caprimulgidae and the Picidae originated in the New World.

An analysis of the affinities of the avifauna with either con-

tinent at the genus- or species-level tends to obscure the issue. For example, Zonotrichia capensis septentrionalis is the northernmost race of a wide ranging species, the only species of Zonotrichia found in South America. As such, it furnishes evidence of close affinity between a Guatemalan bird and a South American bird. On the other hand, the genus Zonotrichia is more North American than South American, since at least four species inhabit North America exclusively. So, viewed at the genus-level, the affinities of Z. capensis would seem to be with North America, the species being the southernmost representative of a northern genus. The question can be resolved by decision as to the origin of the subfamily Emberizinae, the subfamily to which Zonotrichia unquestionably belongs. The Emberizinae are widely believed to be North American in origin. So, even if the species capensis be referred to the monotypic genus Brachyspiza, as some taxonomists insist it should be, the affinities of the form are still with North America.

An analysis of the forms inhabiting the temperate zone indicates that there have been at least two major invasions of birds from North America and that these two invasions have been separated from each other by a vast amount of time. On the one hand we have in Guatemala a large number of resident forms only racially distinct from their North American relatives. These are the result of a rather recent invasion. On the other hand, there is an element in the avifauna of the temperate zone which is either specifically or generically different from their North American relatives. These forms are the result of a much older invasion of Guatemala from the north.

Examples of forms which belong to well-defined North American

species, but which are racially distinct are: Dendrocopos villosus sanctorum, Cinclus mexicanus anthonyi, Caprimulgus vociferus chiapensis, Colaptes cafer mexicanoides, Cyanocitta stelleri ridgwayi, Certhia familiaris pernigra, Sialia sialis guatemalae, and Pipilo erythrophthalmus repetens.

Examples of forms resulting from a much older invasion are: Aphelocoma unicolor, Troglodytes rufociliatus, Melanotis hypoleucus, Turdus rufitorques, Ergaticus versicolor, Spinus atriceps, Junco alticola, and Zonotrichia capensis. Although all of these forms are of North American origin, none of the species extends as far north as the United States and some of the genera (Aphelocoma, Melanotis, Ergaticus) are southern representatives of northern families.

The invasion of Middle America from South America was ancient. It also was not a large invasion, since there are comparatively few species found in the temperate zone of Guatemala whose origins are clearly South American. Many Guatemalan birds of South American origin are specifically distinct from their South American relatives; some are generically distinct. These relationships point to the antiquity of the South American invasion.

Guatemala, then, has served as a buffer zone between two continents. While much of Middle America was submerged the high areas of Guatemala were islands of refuge for land birds from either continent. Evidence suggests that at least three major invasions of birds occurred in Guatemala. At least one invasion, prompted, perhaps, by an early ice age of North America, was sufficiently ancient to permit the formation of endemic species and genera in Guatemala.

An analysis of the forms now inhabiting the temperate zone around Soloma demonstrates that the avifauna of this region originated, for the most part, in North America or in the Old World via North America; that the South American element is almost negligible.

The present day relationship existing between the avifaunas of Guatemala and of North America is very close. The great seasonal fluctuations in the numbers of birds in the temperate zone is due to the arrival in the fall and the departure in the spring of many migrants from North America. This annual invasion of birds from North America tends to emphasize the close affinities between the avifaunas of North and Middle America. There is no corresponding annual invasion from South America.

## CHAPTER VIII

## SPECIES RECORDED FROM THE DEPARTMENT OF HUEHUETENANGO, GUATEMALA

A limited amount of collecting has been done in the department of Huehuetenango. In the species accounts which follow, I have attempted to list all specimens that have been collected in the department. The several collecting localities represent a wide range in altitudes and serve as a basis for comparison between the tropical and temperate zones. Unfortunately, previous workers collected in Huehuetenango for very short periods of time and obviously missed many species.

Unless otherwise noted, the specimens listed and the sight observations discussed are my own and refer to the San Pedro Soloma region and to Santa Eulalia. I have followed the nomenclature of the "Distributional Check-List of the Birds of Mexico" (1950, 1957) except for the genus Contopus where I have followed the fifth edition of the American Ornithologists' Union's "Check-List of North American Birds" (1957). References to the older literature, where they might be misleading, are given in their original form, as many of them precede the use of trinomials.

Ornithologists have collected in the following localities in the Department of Huehuetenango: 1. Barrillos (the spelling now in

usage is Barillas), a town in the northeastern quarter of the department, at an altitude of 5,000 feet. A. W. Anthony collected in this vicinity from February 28 to March 22, 1927.

2. Chanquejelve, a ranch near Nenton where Anthony collected from January 21 to February 5, 1927. Chanquejelve has an altitude of 5,000 feet and is close to the Chiapas border.

3. Huehuetenango, capitol of the department, is located near the southern border not far from the Department of Totonicapan. The altitude is 6,800 feet. Anthony collected near Huehuetenango from December 14-30, 1926.

4. San Mateo, at an altitude of 9,000 feet, is a town in the northcentral part of the department. Anthony collected near San Mateo from February 10-24, 1927.

5. Hacienda Chancol, at an altitude of 11,000 feet, is a ranch in the high central part of the department. Nelson and Goldman collected near Hacienda Chancol from January 2-10, 1896 (Goldman, 1951: 292).

6. Nenton is a village in the northwest quarter of the department at an altitude of 3,000 feet. Nelson and Goldman collected near Nenton from December 13-18, 1895.

7. Todos Santos is a village in the central part of the Sierra de los Cuchumatanes at an altitude of 10,000 feet. Nelson and Goldman collected near this town from December 25, 1895, to January 2, 1896.

8. Jacaltenango is a village on the northern side of the Cuchumatanes at an altitude of 5,400 feet. Nelson and Goldman collected near Jacaltenango from December 18-24, 1895.

9. El Rincon is an area near Chiapas, Mexico where the Rio Rincon flows into Chiapas. The general region is in the subtropical zone. W. B. Richardson collected in this area, but no report of his expedition was ever published. We do not know how long he remained in the area. The Biologia Centrali-Americana, from 1891 on, contains a listing of his specimens, but the section dealing with the Passeriformes was published prior to 1891.

In the species accounts which follow, the Griscom references pertain to the collection made by A. W. Anthony, the Ridgway references to Nelson's and Goldman's specimens, and the Salvin and Godman references are based on the work of W. B. Richardson.

## Order Falconiformes

### Family Cathartidae

Coragyps atratus (Bechstein). The common vulture in every town I visited. It far outnumbered Cathartes aura. In Soloma the birds often sat on the ground in the market place eating garbage. I recorded the species as high as 11,500 feet in the vicinity of Chancol, above Chiantla.

Cathartes aura (Linneaus). This species was usually seen either singly or in pairs, away from town. The local name viuda relates to the solitary habits of this species. These birds were usually seen as they flew over cultivated areas and were often seen with Coragyps atratus away from town.

### Family Accipitridae

Buteo jamaicensis (Gmelin). This species was occasionally seen between 5,800 and 9,200 feet near Soloma. I recorded one adult near Santa Eulalia on July 23. Two immature birds were seen August 2 near Soloma.

A male in breeding condition taken March 3 at 9,000 feet, on the edge of the cloud forest, represents the race B. j. costaricensis. The wing measured 385 mm., the tail, 205 mm. I did not see any melanistic birds in the Cuchumatanes.

Buteo platypterus (Vieillot). Anthony collected a male at Barillas. Griscom (1932: 155) found that the specimen represents the nominate race. I did not record this species near Soloma.

Family Falconidae

Falco sparverius Linnaeus. This species was present in cultivated areas from September 15 to March 24. I recorded this species as high as 9,500 feet in the Soloma region. A male, collected February 18 at 7,200 feet near Soloma, is referable to the nominate race (wing 184 mm., tail 122 mm.). Anthony collected a female near Barillas which Griscom (1932: 165) referred to this same race.

I recorded sparrow hawks near the town of Huehuetenango in June and July. These birds lacked the chestnut crown patch and probably are referable to the race tropicalis. However, no specimens representing this race have been taken in the Department of Huehuetenango.

Order Galliformes

Family Cracidae

Penelopina nigra (Fraser). During March, April, and May this species called in the cloud forest from 9,000 to 9,600 feet. The birds were secretive and wary. On two occasions males were seen perched in trees about 25 feet from the ground. A female was taken in humid oak forest at 8,400 feet on May 7. The ovary was slightly enlarged; there was no brood-patch.

My specimen is referable to the nominate race. However, the black barring on the tail of my specimen is somewhat narrower than in any specimens of P. n. nigra in the Chicago or the Sutton collection. The measurements are: wing 252 mm.; tail 283 mm.

Salvin and Godman (III: 278) recorded a specimen collected by Richardson at El Rincón.

Oreophasis derbianus Gray. I observed this bird on the edge of the cloud forest at 9,000 feet on February 24 and caught a glimpse of one on March 17 at the same locality. The species was not common, though it was well known to the natives. The birds were exceptionally wary and no specimens were obtained.

## Family Phasianidae

Dendrortyx leucophrys (Gould). These birds were calling from dense oak forest and cloud forest during every month of my stay in Soloma. They seemed to be quite numerous in the region. I recorded them from 5,200 to 9,500 feet. Although often heard, they were seen on only two occasions. A female, taken March 3, was with a second bird, but had no brood-patch. The ovary was slightly enlarged. A female, taken May 7, had a distinct brood-patch. Both tails measured

135 mm.; the wings, 155 and 149.

My two specimens have the "sooty gray" auriculars ascribed to D. l. nicaraguae, described from Jalapa, Nicaragua (4,000 ft.), but I have examined the series of D. leucophrys in the Chicago Museum of Natural History and agree with Hellmayr and Conover (1942: 227) that nicaraguae is not a valid race. Certainly none of the alleged characters of nicaragua held among 17 adults (four from Guatemala, eight from Honduras, five from Nicaragua) which I examined. I, therefore, refer my specimens to the nominate race.

Colinus virginianus (Linnaeus). Nelson and Goldman collected a female at Nenton on December 16. Nelson considered insignis a full species and identified this specimen accordingly (1897: 46).

Dactylortyx thoracicus (Gambel). I heard this species singing in dense oak thickets in April and May. The crop of a female collected at 8,500 feet in dense oaks on April 7 contained isopods, millepedes, snails, seeds, and two small grasshoppers. There was no brood-patch. A juvenal was taken July 30 at 7,700 feet in a corn field bordering an oak woods near Soloma. The adult female is referable to the race D. t. chiapensis.

## Order Charadriiformes

## Family Charadriidae

Charadrius vociferus Linnaeus. In February and March I saw flocks of eight to ten birds near town in pastures where sheep were grazing.

## Family Scolopacidae

Bartramia longicauda (Bechstein). I collected an immature female on September 7 at 9,600 feet by a fire at night. Perhaps as many as 30 upland plovers were taken by the natives on the night of September 7. This species is a regular transient in Guatemala, but in the past only two specimens have been taken in the country. I neither saw nor heard this species in the daytime.

Actitis macularia (Linnaeus). On February 15 a pair of these birds was located at a marshy area near Soloma. One of the pair, a female, was collected February 18. The remaining bird stayed in the area until May 10. On August 9 a single bird was seen in this same location. It remained in the area until I left Soloma in October.

## Order Columbiformes

## Family Columbidae

Columba fasciata Say. A flock of 30-40 birds was seen regularly near a salt flat near the edge of Soloma. The birds drank water at this location, but were not seen eating salt. I did not learn where the birds nested.

Scardafella inca (Lesson). Anthony collected a male at Huehuetenango (Griscom, 1932: 113). I did not see the species.

## Order Psittaciformes

## Family Psittacidae

Aratinga holochlora (Sclater). Richardson collected this species

at El Rincón. Salvin and Godman (II: 572) recorded the species as Conurus holochlorus.

Order Cuculiformes

Family Cuculidae

Coccyzus erthropthalmus (Wilson). An immature male was taken by a fire at night on September 7 at 9,600 feet. None was ever seen in the daytime, but many were killed by the natives at night. I saw about 15-20 killed on the night of September 7.

Crotophaga sulcirostris Swainson. Anthony collected 1 male and 4 females from Chanquejelve and 2 males and 2 females from Barillas. Griscom (1932: 220) referred these specimens to the nominate race. I did not see the species near Soloma.

Geococcyx velox (Wagner). This species was found from 6,000 to 8,800 feet in scrub oak thickets and on rocky hillsides. A female with a slightly enlarged ovary was taken March 24. The crop contained 4 lizards and 14 grasshoppers. An immature male was taken June 16. These specimens are referable to the race G. v. affinis. A female, collected near Chanquejelve by Anthony, was referred to this race by Griscom (1932: 218).

Order Strigiformes

Family Strigidae

Speotyto cunicularia (Molina). Anthony collected a female at Huehuetenango. Griscom (1932: 171) identified the specimen as S. c.

hypugaea. I did not see this species near Soloma.

Ciccaba virgata (Cassin). Anthony collected a male at Barillas. This specimen was identified by Griscom (1932: 171) as C. v. centralis. I did not record this species near Soloma.

Aegolius ridgwayi (Alfaro). I collected a male on July 18 in Soloma. The bird was roosting in the attic of a thatched hut where corn was stored. Briggs (1954: 179) pointed out that this species is divided into three races, each known only from the type specimen. Each is in the so-called "immature" plumage although a male taken in Chiapas had slightly enlarged gonads and was taken in the breeding season. My specimen is an adult male (the skull appeared to be ossified) in the postnuptial molt (body feathers, heavy on throat and breast, plus wing and tail). However, it is also in the unspotted "immature" plumage.

I refer my specimen to the race A. r. tacanensis on the basis of the close proximity of Soloma to Volcan Tacaná, the type locality of this race (about 50 miles from Soloma). However, more material is needed to ascertain the validity of any of the three races described for this species.

## Order Caprimulgiformes

### Family Caprimulgidae

Caprimulgus vociferus Wilson. I heard these birds calling in the oak forest (7,000 to 9,000 feet) from February 16 to May 4 and from September 25 until I left the area in October, but not from May 4 to September 25. A female was collected from a nest on April 3. The

two creamy white, unmarked eggs, which were near hatching, were in a slight depression on the floor of an oak forest on a steep hillside at 8,100 feet. My specimen is referable to the race C. v. chiapensis as is a female taken by Anthony at San Mateo (Griscom, 1932: 191).

Order Apodiformes

Family Apodidae

Streptoprocne zonaris (Shaw). Several of these birds were seen flying about a large waterfall at 6,800 feet in April, August, and September. Anthony collected a male at Barillas which was identified by Griscom (1932: 193) as S. z. mexicana.

Family Trochilidae

Colibri thalassinus (Swainson). This species was not found in the Soloma region as a permanent resident, and Wagner (1945: 166) believed the species to be partly migratory in the northern part of its range. The species was first recorded at Soloma on August 2 and was confined to scrub oak thickets between 6,800 and 8,600 feet. In August and September, when it was nesting, it was very abundant. I collected six males, all in breeding condition, between August 2 and October 8.

Chlorostilbon canivete (Lesson). Anthony collected a female at Chanquejelve which was referred by Griscom (1932: 205) to the nominate race. I did not record this species.

Hylocharis leucotis (Vieillot). This species was the common hummingbird in the Soloma region all year around. I found it from 5,800

to 9,500 feet in scrub oak thickets, in pine forests, and along the edges of the oak and cloud forests. From February to the end of July it was usually seen in small flocks. Nesting occurred in August and September when the corn was six to eight feet high. Nests were placed on corn leaves close to the stalk. Adults taken in August had enlarged gonads. Several nests were found in September, all in corn fields, and one female was captured by hand on her nest. Males of this species seemed to be aware of the location of the nest, as, on several occasions, males were observed singing from within a foot of the nest. However, this species was so abundant in the corn fields that pair relationships were difficult to work out. No male was ever seen on the nest.

My six specimens, four males and two females, are referable to the nominate race. Griscom (1932: 204) assigned two males and two females taken by Anthony at Barillas to this race.

Amazilia cyanocephala (Lesson). Anthony collected a male and a female at Chanquejelve, and six males, one female, and one bird of undetermined sex at Barillas. Griscom (1932: 203) referred these specimens to the nominate race.

A male, taken by Anthony at Huehuetenango, was identified by Griscom as A. c. guatemalensis. I did not record this species.

Lampornis amethystinus Swainson. This species was restricted to the cloud forest and humid oaks above 8,600 feet. I found it as high as 9,800 feet. Adults taken in March and April were not in breeding condition. This species was not common in the above-mentioned

habitats, but it was present during the entire year.

My specimens, a male and a female, are referable to the race L. a. salvini. Specimens collected at El Rincón by Richardson were recorded by Salvin and Godman (II: 335) as Delattria henrici.

Lamprolaima rhami (Lesson). From February to the end of July this species did not inhabit the Soloma area. From July 28 to mid-October the species was common in oak forest, oak-pine forest, and cloud forest from 8,100 to 9,700 feet. During these months courtship displays were frequently seen.

Richardson collected this species at El Rincón (Salvin and Godman, II: 338). My specimens, two males from Soloma and one female from Santa Eulalia, are referable to the nominate race.

Eugenes fulgens (Swainson). This species was seen from the latter part of July until I left the area in October. It was not common in any habitat, but preferred humid oak forest and cloud forest above 8,500 feet. Courtship displays were observed in August.

Richardson collected this species at El Rincón (Salvin and Godman, II: 328). My specimen, a male, is referable to the race E. f. viridiceps (exposed culmen 29.4 mm.).

Doricha enicura (Vieillot). Anthony collected an immature male at Chanquejelve (Griscom, 1932: 221).

Tilmatura duponti (Lesson). Anthony collected a male at Barillas (Griscom, 1932: 211). I did not record this species.

Atthis ellioti Ridgway. This species was common after July 29

in scrub oak thickets from 7,000 to 8,700 feet. It was very pugnacious and was often seen chasing larger hummingbirds from feeding areas. A nest with two young was found August 12 in a scrub oak thicket. The nest was in a slender oak, four feet from the ground, towards the end of a branch.

A male taken July 29 shows only a few flecks of red on the throat. A male taken July 30 has a solid red throat, but lacks the streamers on the gorget. Males taken in the latter half of August were in full breeding plumage. Evidently there is a prenuptial molt which involves the feathers of the chin, throat, and upper breast.

Richardson collected this species at El Rincón (Salvin and Godman, II: 361). My specimens, four males, are referable to the nominate race.

Selasphorus platycercus (Swainson). A female, collected at Barillas by Anthony, was assigned by Griscom (1932: 212) to the race S. p. guatemalae. I did not record this species.

## Order Trogoniformes

## Family Trogonidae

Trogon mexicanus Swainson. This species was heard and seen in oak forest, oak-pine forest, and cloud forest from 7,800 to 9,500 feet. Anthony (Griscom, 1932: 214) described the call-note as resembling the yelping of a young puppy. I would describe it as a short "coo coo". In quality this cooing is not at all unlike that of Geococcyx californianus, and I was under the impression for the first month that I was in the area that the call of this bird was coming from Geococcyx velox.

Trogon mexicanus breeds in April and May. A female with a brood patch was taken in April, a juvenal was seen in May. Adults undergoing the postnuptial molt were seen in September and October.

Three male specimens show an interesting variation in plumage color. One bird (October 6) had just completed the postnuptial molt. The tail is black with a terminal white bar on each of the three outer feathers. The red of the chest and belly is a brilliant scarlet. A second male (March 5) is almost in breeding condition. The tail, however, is much like the adult female's tail, having white barring along the inner and outer web of the three outer tail feathers. The red of the chest and belly is not as brilliant as in the fully adult male and several feathers on the breast are barred with black. The skull of the third male (September 12) was ossified, and the pattern is identical to that of the March bird. The plumage of these latter two birds is subadult. It is probable, however, that the bird breeds in this subadult plumage. From my meager material I would conclude that at least two years must pass before the true adult plumage is acquired.

My specimens, three males and one female, are referable to the nominate race (racial determination being dependent, in part, on the large wing measurements; adult male 140 mm., female, 135 mm.). Anthony collected a male at Chanquejelve and a male and a female at San Mateo. Griscom (1932: 214) referred these specimens to the nominate race.

Order Coraciiformes

Family Alcedinidae

Chloroceryle americana (Gmelin). Anthony collected a male at

Barillas. Griscom (1932: 181) referred specimens from Guatemala to the race C. a. isthmica, but pointed out that they do not differ significantly from C. a. septentrionalis and might well be referred to that race.

Family Momotidae

Aspatha gularis (Lafresnaye). I saw this species only three times during my stay at Soloma. On April 19 a bird was seen in a dense oak thicket at 4,200 feet. In September a bird was seen at 8,200 feet on the edge of an oak forest. A male, in postnuptial molt, was collected September 13 at 8,600 feet in an oak thicket.

Momotus momota (Linnaeus). Anthony collected a male at Barillas. Griscom (1932: 182) identified the specimen as an intermediate between M. m. lessoni and M. m. goldmani. I did not record this species.

Family Rhamphastidae

Aulacorhynchus prasinus (Gould). This species was restricted to cloud forest from 8,700 to 9,500 feet. In Mexico the species is found at much lower elevations. The breeding season was in the spring. A May bird had slightly enlarged gonads and an immature bird was taken June 24. By mid-August the postnuptial molt was completed and the birds were in fresh fall plumage. The birds were always seen in flocks, usually of eight to ten birds, even in the breeding season.

My series of five adults, four males and one female, are intermediate between A. p. prasinus and A. p. stenorhabdus. The black edging of the maxillary tomia is slightly broader than that of typical stenor-

habdus, and the embossed ridge at the base of the bill is not as broad as in typical prasinus. The distribution and intensity of the chestnut tipping on the tail is variable in the series of stenorhabdus and prasinus which I examined at the Chicago Museum of Natural History. In my specimens this color and pattern is uniform. The yellow on the flanks and sides, which appears to be highly variable in both races, is uniform in my specimens. Griscom (1932: 221) identified a male and two females, collected at Barillas by Anthony, as A. p. stenorhabdus.

Order Piciformes

Family Picidae

Colaptes cafer (Gmelin). These birds were found in oak-pine forest, oak forest, and cloud forest from 6,000 to 9,200 feet. I heard birds calling during every month of my stay in Soloma. Birds taken in February and March were not in breeding condition, and birds taken in August were undergoing the postnuptial molt.

My series of four males is referable to the very distinct race C. c. mexicanoides. The crown and nape are chestnut and the feathers of the upper back are barred with black and chestnut. Anthony collected a female at Chanquejelve and two males and two females at San Mateo. Griscom (1932: 223) referred these specimens to C. mexicanoides. Specimens collected at El Rincon by Richardson were also referred to C. mexicanoides by Salvin and Godman (II: 404).

Piculus rubiginosus (Swainson). Anthony collected a male and a female at Chanquejelve. Griscom (1932: 224) referred these specimens to P. r. maximus.

Melanerpes formicivorus (Swainson). This species was restricted to oak-pine forest from 5,300 to 6,300 feet. In this habitat it was frequently seen in small flocks with Campylorhynchus zonatus. Neither species inhabited oak-pine forest at higher elevations, although the higher habitat seemed identical with the lower. Males of M. formicivorus were in breeding condition in mid-April. By September 10 the birds were in fresh fall plumage.

My specimens, two males and one female, are referable to the race M. f. lineatus. Anthony collected seven males and five females at Chanquejelve, and three males at Huehuetenango. Griscom (1932: 224) referred these specimens to Balanosphyra f. lineata.

Sphyrapicus varius (Linnaeus). Two birds collected in March above 9,000 feet in the cloud forest were undergoing slight body molt. The two specimens, a male and a female, show no trace of red on the nape. I assign them to the nominate race on the basis of size (male, wing 127 mm., tail 78; female, wing 129 mm., tail 76).

Dendrocopos villosus (Linnaeus). This species was uncommon in the Soloma region. It was found in oak forest between 6,800 and 8,600 feet. One was seen in scrub oak at 7,200 feet. A female in breeding condition was taken March 28. A male taken February 19 was molting on the nape.

My specimens are very dark below and I assign them to the race D. v. sanctorum. The type locality of this race, Todos Santos, is about 25 miles from Soloma. Richardson collected specimens at El Rincón. Salvin and Godman referred these to Dendrocopus jardini. Specimens col-

lected by Nelson and Goldman (Nelson, 1897: 50) at Todos Santos were referred to Dryobates sanctorum. Griscom (1932: 230) referred a female, collected at San Mateo by Anthony, to Dryobates villosus sanctorum.

## Order Passeriformes

### Family Dendrocolaptidae

Lepidocolaptes affinis (Lafresnaye). This species ranged from 8,200 to 9,500 feet in cloud forest and in oak forest. One bird was taken in pine forest. Adults taken from February through April had slightly enlarged gonads. Immature birds were taken July 19, August 6, September 12, and October 4.

I assign my specimens (two males, two females, and two immature males from Soloma and one immature male from Santa Eulalia) to the nominate race because of the rich reddish brown of the upperparts. Also assigned to this race were specimens taken by Nelson and Goldman at Todos Santos (Ridgway, 1911: 262).

Xiphorhynchus erythropygius (Sclater). Richardson collected this species at El Rincón. Salvin and Godman (II: 181) referred these specimens to Dendrornis erythropygia.

### Family Formicariidae

Thamnophilus doliatus (Linnaeus). Anthony, who collected a male at Chanquejelve, had this to say of the species: "Ant-shrikes were rare at Chanquejelve, the highest record I have being 5,000 feet" (Griscom, 1932: 234). Griscom identified Anthony's specimen as T. d. intermedius. I did not record this species.

Family Tyrannidae

Sayornis nigricans (Swainson). This species was resident along the Río San Juan Ixcoy and its tributaries, from 6,400 to 7,000 feet. It was usually seen perching in small trees and shrubs, and usually was very wary and difficult to approach.

I assign my three specimens (three males, one of them immature) to the race S. n. aquatica on the basis of the very dark upper parts and the reduced amount of white on the belly. Anthony collected a female at Barillas and three males at San Mateo. Griscom (1932: 246) referred these specimens to the same race.

Tyrannus melancholicus Vieillot. A female, collected by Anthony at Barillas, was identified by Griscom (1932: 249) as T. m. chloronotus. I did not record this species.

Myiarchus nuttingi Ridgway. Specimens collected at Nenton by Nelson and Goldman were referred to the nominate race by Ridgway (1907: 630). I did not record this species.

Myiarchus tuberculifer (D'Orbigny and Lafresnaye). A male, collected by Anthony at Huehuetenango, was identified by Griscom (1932: 255) as M. t. lawrencei. I did not record this species.

Nuttallornis borealis (Swainson). Two adult females were taken respectively on September 4 at 6,100 feet in an open pine forest and on September 20 at 6,300 feet in an oak-pine forest. I have no spring records.

Contopus virens (Linnaeus). Three specimens collected by me are

referable to this species. The altitude range is from 6,200 to 8,800 feet. Two birds were taken in pine forest, one in April (immature male), the second in September (female), and one was taken in oak forest in September (female).

Contopus sordidulus Sclater. I collected an adult female on October 2 at 8,600 feet in an apple tree which was in an open pasture. I assign this specimen to the nominate race because of the brown back with a contrastingly darker crown and because of its small size: wing, 83 mm.; tail, 64 mm. It compared favorably with the material representing this race in the Chicago Museum of Natural History.

A male, which I collected September 8 at 8,600 feet in a scrub oak thicket, is referable to the race C. s. veliei. The bill is large and dark below, the underparts are gray without any trace of yellow, and the back is olive-brown. The measurements are: wing, 88 mm.; tail, 65 mm.

Contopus pertinax Cabanis and Heine. These birds were found in oak forest, scrub oak thickets, and in trees on cultivated land from 5,600 to 8,200 feet. They were always seen singly or in pairs, and usually were seen perching near the top of a tree.

My specimens, four males, one of them immature, are referable to the nominate race because of their dark upperparts. Also referred to the nominate race were specimens taken by Nelson and Goldman at Hacienda Chancol (Ridgway, 1907: 514).

Empidonax flaviventris (Baird and Baird). One specimen, a male, was taken by me on August 21 by a fire at night on a 9,600 foot ridge.

The species did not winter in the Soloma region. Nelson and Goldman collected this species at Nenton (Ridgway, 1907: 550).

Empidonax minimus (Baird and Baird). This species was never collected in the daytime. Wintering records from Guatemala have usually been from elevations much lower than Soloma. However, many flycatchers of the genus Empidonax were killed in the fall by the natives at night on a 9,600 foot ridge by the use of small fires. Many of these were E. minimus. On the night of August 21 I collected six birds of this species (two males, four females). All had fully ossified skulls. Nelson and Goldman collected this species at Nenton (Ridgway, 1907: 563).

Empidonax hammondi (Xantus). Abundant in the Soloma area when I arrived in February, it was the only member of the genus Empidonax common in the winter months. I collected specimens between 7,000 and 8,600 feet in scrub oak thickets, oak forest, cloud forest, and shrubs bordering streams. The latest date in spring was March 27, the first fall date was September 25.

Anthony collected four males and two females at Chanquejelve, three males at Barillas, one male at San Mateo, and three males, one female and one bird of undetermined sex at Huehuetenango (Griscom, 1932: 261).

Empidonax wrighti Baird. I collected a male at 7,600 feet on February 19 in a scrub oak thicket. This species is called E. oberholseri in the fifth edition of the American Ornithologists' Union Check-List (1957: 345). Anthony collected a male and a female at Chan-

quejelve (Griscom, 1932: 262).

Empidonax affinis (Swainson). A male Empidonax taken by Anthony at San Mateo was identified by Griscom (1932: 262) as E. fulvipectus pulverius. At Hacienda Chancol Nelson (1901: 47) took specimens of Empidonax which he believed to be of a new species and named E. trepidus. E. fulvipectus is now believed to be a synonym of E. affinis, and trepidus a race of affinis (Miller, et al., 1957: 89,90). I did not record this species.

Empidonax flavescens Lawrence. On April 2 I collected a female in an oak forest at 7,900 feet. The oviduct held an egg ready to be laid. On April 10 I collected a male in breeding condition in the cloud forest at 9,000 feet.

I assign these specimens to E. f. dwighti on the basis of their incomplete eye-rings. This condition is more pronounced in the male than in the female. The characters used by van Rossem (1928: 359) to separate E. f. dwighti from E. difficilis salvini are: incomplete eye-ring versus complete eye-ring; general coloration of upperparts brighter and greener; wing bars yellowish green instead of buffy. Van Rossem had ample material of dwighti, but only the type of salvini. In examining the material at Chicago, I found that the characters used by van Rossem to separate the two forms are variable within each group. They are, to some extent, variable in individual birds. For example, specimen 93, 804, collected by E. R. Blake in Guatemala, has a complete eye-ring on the left side and an incomplete eye-ring on the right side.

The two forms would be assigned to the same species (Hellmayr,

1927: 214) except that their breeding ranges overlap in Chiapas and Guatemala. A series of seven males marked dwighti at Chicago averaged: wing 69.5 mm.; tail, 58 mm. A series of eight males marked salvini averaged: wing, 69.6 mm.; tail, 59 mm. I suspect that several of these individuals are hybrids. Information concerning the call notes, nests, behavior, etc., of the two forms appears to be lacking. I suspect that eventually the two forms will be merged, but I reserve opinion until such time when the call notes and behavior have been described.

Empidonax fulvifrons (Giraud). This species was recorded from 6,950 to 8,600 feet in oak forest, scrub oak thickets, pine forest, and in shrubs bordering streams. The male of a pair collected April 17 was in breeding condition. Singing was common in April and May. An immature male was collected August 7.

My specimens, two males and two females from Soloma and an immature male from Santa Eulalia, are referable to the race E. f. fusciceps on the basis of the prominent buffy chest-band.

Mitrephanes phaeocercus (Sclater). This species was not common in the region, and I doubt if it bred near Soloma. I saw it only in August and September from 8,200 to 9,400 feet in pine forest, oak forest, and cloud forest, and took an immature bird from what seemed to be a family group on September 19.

My specimens, two males (one of them immature) and a female, represent the race M. p. quercinus because of their brightly colored underparts. A male and a female taken at Chanquejelve by Anthony are referred to this race by Griscom (1932: 267).

Tyranniscus vilissimus (Sclater and Salvin). A male, collected by Anthony at Barillas, was referred by Griscom (1932: 274) to the nominate race. I did not record this species.

Pipromorpha oleaginea (Lichtenstein). A female, collected by Anthony at Barillas, was referred by Griscom (1932: 275) to the race P. o. assimilis. I did not record this species.

Family Hirundinidae

Stelgidopteryx ruficollis (Vieillot). Griscom considered the race S. r. salvini to be the breeding form in Guatemala. Anthony secured a female at Huehuetenango (Griscom, 1932: 285). I did not record this species.

Notiochelidon pileata Gould. This species bred from about mid-May to early July in a large rock sink in cultivated land and pasture at 8,700 feet. Nesting was at its peak in mid-June. The only other possible breeding site was a steep road-cut at the edge of town where birds were seen entering and leaving holes. About 15 pairs nested at the rock sink. The nests were placed in crevices in the rocks about 20 to 35 feet above the floor of the sink. Mud and small twigs were used in building the nests, and at least one nest had feathers in the lining. Both parents fed the young in the nest and both carried away fecal sacs. Often both birds arrived at the nest at the same time. One pair made 36 trips to the nest in one hour. About every half hour the entire flock assembled at the sink, and, after perching for a few minutes, swirled up together in a flock and left the area. In this

respect their behavior seemed to be identical to that of Petrochelidon pyrrhonota. They often sang when perched. A few perched on dead twigs sticking out of the face of the rock wall, but many birds clung, swift-fashion, against the face of the rock. Most of the foraging was done within 200 years of the sink, in pastures and in cultivated land near houses. By the first of September they deserted the nesting area and were seen only occasionally over fields and pastures.

I collected two specimens: a male, taken June 19, in breeding condition; a female, collected February 22, not in breeding condition. Neither specimen was molting.

Tachycineta thalassina (Swainson). I saw several flying over pastures between 6,800 and 8,800 feet from February to March 22 and from September 10 until I left the area in October.

Anthony collected a male at San Mateo and four males at Chanquejelve. Griscom (1932: 282) referred these specimens to the race T. t. lepida. Specimens collected by Nelson and Goldman at Hacienda Chancol were referred to the same race by Ridgway (1904: 96).

## Family Corvidae

Corvus corax Linnaeus. This species was common above 8,000 feet. I recorded it as low as 4,200 feet near Soloma and at 2,000 feet near the Pacific coast. I often saw it in small flocks near Paquix at 11,500 feet. Throughout the year natives complained that it fed on young chickens and turkeys. On March 10 I found a nest (two eggs) on a rock ledge at 8,700 feet. On March 24 there were two young in the nest. On April 5 the young were about ready to leave the nest, and I

collected the adult female. The bird was in good plumage, showing no sign of wear on either the wings or tail. The specimen is referable to the race C. c. sinuatus on the basis of its small bill, but it is much larger than would be expected from the southern edge of the range of this race. The measurements are: wing, 443 mm.; tail, 252 mm. The largest of 14 adult female C. c. principalis listed in Ridgway (1904: 259) is: wing, 440.5 mm.; tail, 246.5 mm.

Cyanolyca cucullata (Ridgway). I found two birds in humid oak forest at 4,800 feet on April 19. A female with a distinct brood-patch was collected. The birds were wary and density of the underbrush made approach difficult. Both birds uttered a nasal one-note call. The second bird, presumably a male, was not heard after the female was taken. Soloma is the third locality at which this species has been taken in Guatemala.

I assign my specimen to the race C. c. guatemalae because of the purplish occipital patch and because of the dark rump and crissum. Three males and one female, taken by Anthony at Barillas, were identified by Griscom (1932: 405) as C. mitrata.

Cyanolyca pumilo Strickland. This species was restricted to cloud forest and to humid oak forest above 7,900 feet. In these areas it replaced C. cucullata which was restricted to a similar habitat at lower elevations. A male, taken April 10, was in breeding condition. A female with a brood-patch was taken April 2. An immature female was collected July 28. Adults were molting in both May and October.

My four adult specimens (one male, three females) are referable

to the nominate race because of the restricted amount of black on the throat. A male from Barillas and a male and two females from San Mateo, collected by Anthony, were referred by Griscom (1932: 405) to the same race.

Aphelocoma unicolor (du Bus). I saw this species principally in the cloud forest above 9,000 feet. However, on February 28, I found a nest among oaks and pines at 8,200 feet; it was in a slender oak about 40 feet from the ground; in it were three unmarked, pale blue eggs. By September the birds were in fresh fall plumage.

My four adult specimens, three males and one female, are referable to the nominate race on the basis of their comparatively light blue upperparts.

Cyanocitta stelleri (Gmelin). This, the common jay of the high country, was found in every habitat from 5,800 to 11,000 feet, but it was not common in the cloud forest and in dense oak forest. In February and March it usually went about in small flocks of eight to ten birds, but by April pairs had formed. On April 12, two nests were found in oak-pine forest, one (two eggs) at 8,400 feet about 20 feet from the ground in an oak, the other (one egg) at 6,400 feet in an oak about 15 feet up. The eggs were bluish, slightly speckled with brown. By June the birds, once again in small flocks, were very destructive to the growing corn. The natives considered them pests. The birds continued to flock as long as I was in the area. Birds taken in August were undergoing the postnuptial molt. There was no evidence of fall nesting.

My series of eight specimens, seven males (one of them immature) and one female, represents the race C. s. ridgwayi because of their light blue crowns. Specimens collected by Anthony, seven males and three females at Huehuetenango and three males and one female at San Mateo, were referred by Griscom (1932: 402) to the same race.

Cyanocorax yncas (Boddaert). Ridgway (1904: 309) recorded specimens from Nenton (collected by Nelson and Goldman) as Xanthoura luxuosa vivida.

## Family Paridae

Psaltriparus melanotis (Hartlaub). These birds inhabited scrub oak thickets and shrubbery bordering streams (occasionally open oak-pine forest or oak forest) from 5,800 to 8,600 feet. They went about in small flocks except in the nesting season. Nesting was at its peak in April and May. A nest found April 21 in a scrub oak thicket at 8,100 feet, contained three newly hatched, naked young and one immaculate white egg. The nest was lined with feathers. Four juvenals were collected May 4 as they left a nest at 8,200 feet in a scrub oak thicket. There was no evidence of fall nesting. Adults were molting in July. Male and female juvenals resemble the adult male in having black masks and brown eyes. Adult females lack the black mask and have yellow eyes.

My 11 specimens (two males, three females, two immature males, three juvenal males, one juvenal female) have olive-brown upperparts and dark underparts. They are referable to the nominate race. Also referred to the nominate race were specimens collected at Hacienda

Chancol by Nelson and Goldman (Ridgway, 1904: 426) and specimens collected by Anthony (Griscom, 1932: 323) at Huehuetenango (three males, one female) and San Mateo (three males, two females).

Family Certhiidae

Certhia familiaris Linnaeus. This species was not common in the Soloma region, but in nearby Santa Eulalia it was abundant in a pine forest at 8,000 feet. Specimens were taken in pine forest, oak-pine forest, and oak forest between 5,800 and 8,800 feet. Adults molted in August, and were in fresh fall plumage in September. Immature birds were taken in July, August, and October.

My specimens (three males, one female, one immature male, one immature female from Soloma and a male and a female, both immature, from Santa Eulalia) have very dark crowns and are referable to the race C. f. pernigra. Ridgway (1904: 471) recorded specimens taken at Hacienda Chancol by Nelson and Goldman as C. f. alticola. Also referred to this race was a female collected by Anthony at San Mateo (Griscom, 1932: 323).

Family Cinclidae

Cinclus mexicanus Swainson. Resident along mountain streams between 4,900 and 7,000 feet. Above 7,000 feet there was no suitable habitat. It was seen throughout the year, but difficult to collect after April because of the rain-swollen streams. A male in breeding condition was taken March 22. An immature bird was collected June 18.

My specimens, four males (one of them immature) and a female,

are referable to the race C. m. anthonyi. The type locality of this race, San Mateo, is about 20 miles from Soloma. Specimens, collected by Anthony at Barillas (one male) and San Mateo (three males, three females), were referred by Griscom (1932: 299) to this race.

## Family Troglodytidae

Campylorhynchus zonatus (Lesson). This species was common in pine forest and in oak-pine forest from 5,300 to 6,300 feet, but it was not found in identical habitats at higher elevations. However, the lower stands of pine and oak-pine were not continuous with the pine and oak-pine forests of the higher elevations. Birds invariably went about in flocks, even during the nesting season. Melanerpes formicivorus also inhabited stands of pine and oak-pine from 5,300 to 6,300 feet and was often found in flocks with C. zonatus. A pair of wrens taken April 17 was in breeding condition. An immature female was collected September 15.

My specimens, a male and three females (one of them immature), are referable to the race C. z. vulcanius because of their pale underparts with an absence of markings on the crissum.

Thryothorus modestus Cabanis. A male, collected at Barillas by Anthony, is referred to the race T. m. pullus by Griscom (1932: 292). I did not record this species.

Troglodytes musculus Naumann. This species was often heard in town, both in Soloma and in Santa Eulalia. It also was found in cultivated areas on the edges of town. In dense vegetation at higher ele-

vations it was replaced by T. rufociliatus. Singing was heard from February to July 26 and was resumed September 28. Two males with slightly enlarged testes were taken in March. Two birds were seen entering and leaving a hole in a large rock in Soloma almost daily from August 27 to September 11. I could not determine if a nest was in the rock. The birds were never seen carrying any food into the hole.

My specimens, two males, are referable to the race T. m. intermedius (wings, 49 and 51 mm.; tails, 39 and 41 mm.).

Troglodytes rufociliatus Sharpe. This species was restricted to the dense cloud forest and humid oak forest from 7,400 to 9,100 feet. It was a ground inhabiting form seldom seen above five feet from the ground, although Blake (1953: 407,-8) and Griscom (1932: 294,-5) both referred to the birds' preference for living in epiphytes above the ground. Adults taken in March and April were in near breeding condition. Singing was often heard in these two months. One male is abnormal in having white on the sides of the neck and on part of the crown.

My series of five males and one female are referable to the nominate race because of the comparatively light upperparts.

Henicorhina leucophrys (Tschudi). This species was found only in humid oak forest and cloud forest above 8,000 feet. It was extremely secretive and difficult to secure. A pair was taken in the cloud forest on March 24. The male was singing, but the birds were not in breeding condition. An adult female, taken September 13 in a humid oak forest, was undergoing the postnuptial molt.

My specimens, a male and two females, are referable to the race

H. l. capitalis because of their dark gray crowns.

Salpinctes obsoletus (Say). Nelson (1897: 70) collected specimens at Hacienda Chancol and named them S. o. neglectus. Griscom (1932: 297) referred two females collected at Huehuetenango by Anthony to this race. I did not record this species.

Family Mimidae

Dumetella carolinensis (Linnaeus). Anthony collected a male at Barillas and a male and a female at Chanquejelve (Griscom, 1932: 301). I did not record this species.

Melanotis hypoleucus Hartlaub. Restricted to scrub oak thickets and shrubby hillsides from 6,700 to 8,100 feet. Singing was most intense in March, April, and May, but scattered bits of song were heard throughout the summer and fall. I suspect that this species had a fall nesting as courtship was observed in August, and during this month singing almost reached the intensity he had in spring. A female, taken March 27, had a brood-patch. A juvenal female, dark below with some white feathers on the lower belly, was taken July 30. A bird taken October 9 was undergoing the postnuptial molt. Specimens: one male, three females, one juvenal female.

Mimus gilvus (Vieillot). Anthony collected a male at Huehuetenango. Griscom (1932: 300) recorded this specimen as M. g. lawrencei, but suggests that this race is not separable from gracilis. I did not record this species.

Family Turdidae

Turdus rufitorques Hartlaub. This species was resident between 5,200 and 10,500 feet, but was more abundant above 7,000 feet. It was found at the edge of town, in cloud forest, oak forest, oak-pine forest and scrub oak thickets, and on grassy fields. Birds taken in March were in breeding condition. Nests: April 9 in a scrub oak thicket, female building a nest in a small oak, about six feet from the ground; April 30 on a stump in a deserted field, about seven feet from the ground, two eggs; August 19 on the edge of an oak forest about 18 feet up in a large oak, two young; September 10, about 12 feet up in an oak tree in a pasture, three young. Singing was not heard in the latter part of June and July, but it was resumed in August and September. By the end of September flocks of 10 to 15 birds were commonly seen flying about the area or feeding in pastures.

I collected four males, three females, one juvenal male, and one juvenal female. Anthony collected a female at Huehuetenango, four males and one female at Barillas, and two males and three females at San Mateo (Griscom, 1932: 307). Nelson and Goldman collected specimens at Jacaltenango and Hacienda Chancol (Ridgway, 1907: 97).

Turdus plebejus Cabanis. This species was uncommon. It inhabited cloud forest and oak forest above 8,600 feet. Two females, taken March 24 and 26 respectively, had brood patches; a male taken March 26 was singing and had enlarged testes.

My specimens, one male and four females, are referable to the race T. p. differens as they are brownish above (rather than grayish-

brown as in the nominate race).

Turdus infuscatus (Lafresnaye). This species was restricted to cloud forest and humid oak forest above 8,600 feet. I collected specimens as high as 9,500 feet. A female taken April 28 had a brood-patch. Males taken in July had enlarged tests.

My series of specimens (four males, one female) reveals some interesting color variations heretofore not recorded in the literature. Two males are solid black. One breeding male is essentially black, but has patches of brownish, female-like chest, flank and side feathers on the right side. Another breeding male is olive-gray above, olive-brown below, paler on the belly, with a lightly streaked throat. All of the above-mentioned specimens have yellow bills and feet. A breeding female is brown, darker above than below, with a streaked throat. The legs are yellow, the bill black.

Catharus mexicanus (Bonaparte). A female, taken at Barillas by Anthony, was referred by Griscom (1932: 312) to the race C. m. cantator. I did not record this species.

Catharus occidentalis Sclater. This species was heard singing its beautiful song daily from March to July. Specimens were collected from 6,800 to 9,500 feet in oak forest, cloud forest, and in scrub oak thickets. Males taken from March to July had enlarged testes. A nest, about 5 feet from the ground in a shrub on the edge of an oak forest, with two eggs was found on April 7. The eggs were light blue, splotched with lavender. Two adult females taken April 17 and 21 respectively were not in breeding condition. The species was undergoing the post-

nuptial molt in September. A juvenal male was collected August 2 in an oak forest. Although somewhat mottled below, this specimen is unmarked on the crown and back. Fall singing was not common.

My specimens, ten males (one of them juvenal) and three females, are referable to the race C. o. alticola on the basis of their dark underparts. A male, collected at San Mateo by Anthony, was referred by Griscom (1932: 311) to C. frantzii alticola.

Myadestes obscurus Lafresnaye. A common species in oak forest, cloud forest, oak-pine forest, and pine forest from 4,800 to 9,400 feet. A female taken February 28 had a brood-patch. Males taken from February through April had enlarged testes. A nest with two eggs was found on April 15 in an oak-pine forest at 8,800 feet. The nest was on the ground at the base of a large rock. It was lined with pine needles and the outer layers were of mosses and lichens. The last date for spring singing was May 27. Fall singing started August 30. An adult male, collected August 15, was undergoing an extensive body molt.

My series of seven males and one female is referable to the race M. o. oberholseri, being somewhat darker than the nominate race.

Sialia sialis (Linnaeus). Common from 6,500 to 8,500 feet in corn fields, pastures, and near farm houses; from July to October seen daily in small flocks near town. Birds taken in March were in breeding condition. By the end of May, young were out of the nest. There was no sign of fall nesting.

My four males and two females are referable to the race S. s. guatemalae. Also referred to this race were specimens from Hacienda

Chancol collected by Nelson and Goldman (Ridgway, 1907: 147) and specimens collected by Anthony (Griscom, 1932: 312) at Huehuetenango (one male), Barillas (four females), and Chanquejelve (one male, three females).

Family Sylviidae

Polioptila caerulea (Linnaeus). Anthony collected a female (between January 21 and February 5) at Chanquejelve. Griscom (1932: 287) referred this specimen to the nominate race.

Two males and one female, collected by Anthony at Chanquejelve, were referred by Griscom (1932: 287) to the race P. c. nelsoni. I did not record this species.

Family Bombycillidae

Bombycilla cedrorum Vieillot. In February and May flocks of 30-50 cedar waxwings were seen on the edges of oak forest and oak-pine forest, and in fruit trees in pastures and cultivated land between 6,000 and 8,100 feet. This species was not recorded in the fall.

I collected a female on February 18 at 7,000 feet from a flock of about 25 birds on the edge of an oak forest.

Family Ptilogonatidae

Ptilogonys cinereus Swainson. This species was seen in small flocks in oak forest and in oak-pine forest from 7,500 to 8,600 feet. On two occasions it was seen in trees on the edge of Soloma, and once in a large tree on the edge of Santa Eulalia. It was common in March

and April, but I have only a few scattered sight records from June to October. Specimens taken from flocks in March and April had slightly enlarged gonads, but I do not think that the species bred in the region.

My specimens, three males and three females, are more richly colored than are specimens representing the nominate race. I refer them to the race P. c. molybdophanes. Also referred to this race are a male and four females collected by Anthony at San Mateo (Griscom, 1932: 322).

## Family Cyclarhidae

Cyclarhis gujanensis (Gmelin). Anthony collected a male at Chanquejelve. Griscom (1932: 321) identified the specimen as an intergrade between C. g. nicaraguae and C. g. flaviventris. I did not record this species.

## Family Vireonidae

Vireo huttoni Cassin. This species was not common. Specimens were collected between 8,000 and 9,300 feet in oak forest and scrub oak thickets. A female taken April 29 had a slightly enlarged ovary. Immature birds were taken in August, September, and October.

My series of specimens (two males, one female, three immature males, one immature female from Soloma and one immature male from Santa Eulalia) represent the very distinct, comparatively brightly colored race, V. h. vulcani.

Vireo solitarius (Wilson). On March 25 a female was taken in shrubs bordering a stream at 7,700 feet. The bird was molting on the

crown and throat. On September 25 and October 8 two birds were taken at 7,100 and 7,700 feet respectively in oak forests.

I refer my specimens, one male and two females, to the nominate race on the basis of their bright colors, there being a pronounced contrast between the gray of the head and the olive green of the back. Also referred to this race were specimens collected by Anthony at Barillas, three males; San Mateo, one male; Huehuetenango, one male and one female; and Chanquejelve, one male (Griscom, 1932: 317).

Vireo gilvus (Vieillot). Anthony collected a male and two females at Huehuetenango. Griscom (1932: 316) referred these specimens to the nominate race.

A female, which I collected on March 7 at 6,900 feet in an oak forest, is referable to the race V. g. swainsoni on the basis of its dull coloration, small bill, and size (wing 68 mm., tail 50).

Vireo flavoviridis (Cassin). I collected a male on the night of September 16 by a small fire on a 9,600 foot ridge. The species is strictly a lowland form and was not breeding in the region. The bird collected was obviously a migrant. I refer my specimen to the nominate race on the basis of its comparatively bright coloration and because of its size (wing 77 mm., tail 54).

## Family Coerebidae

Diglossa baritula Wagler. This species was not common until the latter part of July. I collected specimens between 6,600 and 8,800 feet in oak forest, oak-pine forest, and corn fields. Adults taken in

March and April did not have enlarged gonads. Breeding coincided with the maturing of the corn in the fall. When the corn reached a height of six to eight feet in August, males sang a great deal in the corn fields. Courtship, pairing, and nesting activity continued through August, September, and October. Adult birds taken in October had enlarged gonads; one immature was taken in October. There was no evidence of spring nesting. In this respect they exhibited a pattern similar to that of the hummingbirds.

One male, taken February 28, was in essentially a female-like plumage, but was molting into the adult male plumage. A fully adult male, taken March 29, was undergoing a body molt and a molt of the primaries. A non-molting male taken October 8 was in breeding condition, but had retained the female-like primaries, secondaries, and tail feathers of the immature plumage.

I refer my specimens (five males, three females, one female immature) to the race D. b. montana on the basis of the slate gray throats and the somewhat lighter heads of my adult males as compared with specimens representing the nominate race.

## Family Parulidae

Mniotilta varia (Linnaeus). Several black-and-white warblers were seen in oak forest and oak-pine forest between 5,900 and 8,400 feet in September and October. I did not see this species in the spring.

I collected a male on September 29 at 8,400 feet in an oak forest. Anthony collected a male at Chanquejelve (Griscom, 1932: 324).

Vermivora peregrina (Wilson). Anthony collected five males and

two females at Barillas (Griscom, 1932: 326). I did not record this species.

Vermivora ruficapilla (Wilson). Anthony collected five males and two females at Barillas. Griscom (1932: 325) referred the specimens to the race V. r. ridgwayi.

Vermivora superciliosa (Hartlaub). Common between 7,000 and 9,500 feet in scrub oak thickets, oak-pine forest, oak forest, and cloud forest. Much singing heard in March, April, and May. Specimens taken at that time had enlarged gonads. A female taken March 27 had a brood-patch. On June 16 adults were seen feeding young just out of the nest. The postnuptial molt was just ending in September, indicating that there was no fall nesting. Singing was not heard in the fall.

My specimens (seven males, five females, one immature male, one immature female) are referable to the nominate race. A male, collected at San Mateo by Anthony, was referred by Griscom (1932: 326) to the same race.

Peucedramus taeniatus (DuBus). A male, collected by Anthony at San Mateo, was referred by Griscom (1932: 327) to P. olivaceus auranti-acus. I did not record this species.

Dendroica coronata (Linnaeus). On February 25 a female was taken at 7,000 feet in shrubs bordering a stream. On March 31 a female was collected at 8,600 feet in a scrub oak thicket. I am unable on the basis of size to assign these specimens to either hooveri or the nominate race. I have found no color differences to separate females of these

two races. The measurements are: wing, 70, 71 mm.; tail, 53, 55.

Dendroica auduboni (Townsend). This species was noted from February to March 18. There were no fall records. One male was taken at 8,500 feet in an oak-pine forest on February 21. A second male was taken in oaks on March 8 at 8,000 feet. These specimens are referable to the race D. a. memorabilis on the basis of size: wing, 80 mm. (both specimens); tail, 61, 59.

Nelson (1897: 66) collected a single male at 10,000 feet near Hacienda Chancol. He described D. goldmani (now considered to be D. auduboni nigrifrons) from this specimen.

Dendroica townsendi (Townsend). This species was one of the most abundant birds in my area from September to April. I found it in oak forest, scrub oak thickets, cloud forest, oak-pine forest, and pine forest. The earliest date in the fall was September 8. The last date in the spring was April 8. It was common between 6,200 and 9,600 feet.

I collected a total of 29 specimens (15 males, five females, six immature males, three immature females). Anthony (Griscom, 1932: 335) collected specimens at Chanquejelve (one male, two females), Huehuetenango (two males), Barillas (two males, one female), and San Mateo (one male, two females).

Dendroica virens Gmelin. Anthony collected two females at Barillas and one female at Huehuetenango. Griscom (1932: 334) referred these specimens to the nominate race. I did not record this species.

Dendroica occidentalis (Townsend). This species was fairly com-

mon in oak-pine forest, oak forest, and pine forest from 5,300 to 8,400 feet. It was recorded in the Soloma region only in September and October. I do not think it wintered in the region.

I collected three males (one of them immature) and two immature females. Anthony (Griscom, 1932: 334) collected a female at San Mateo and a male and a female at Chanquejelve.

Dendroica fusca (Muller). I collected a male on April 29 at 9,300 feet in an oak forest. I have no other records of this species.

Seiurus aurocapillus (Linnaeus). Anthony (Griscom, 1932: 335) collected a bird of undetermined sex at Barillas. I did not record this species.

Seiurus noveboracensis (Gmelin). I collected a male on May 16 at 8,600 feet next to a stream. I refer the specimen to the race S. n. notabilis on the basis of the large bill and the grayish upperparts.

Oporornis formosus (Wilson). I collected an immature female on September 16 by a small fire at night on a 9,600 foot ridge. I never saw this species in the daytime.

Oporornis tolmiei (Townsend). Specimens were collected between 6,600 and 8,600 feet in oak forest and in shrubs bordering streams. The earliest date in fall was September 30, the latest spring date was April 14. Of eight specimens (four males, four females), seven are referable to the race O. t. monticola and one tends toward the nominate race on the basis of the difference between wing and tail (Phillips, 1947: 297). The measurements of the latter bird are: wing 59 mm.;

tail, 52.

Icteria virens (linnaeus). Anthony collected a female at Chanquejelve. Griscom (1932: 338) referred the specimen to the nominate race. I did not record this species.

Wilsonia pusilla (Wilson). This species was common in oak forest, oak-pine forest, cloud forest, and deserted fields between 5,900 and 9,600 feet. The earliest fall date for the species was September 4, the latest spring date was May 9.

Thirteen of my specimens (five males, two females, four immature males, two immature females) are referable to the brightly colored W. p. pileolata. Specimens collected by Anthony at Barillas and San Mateo were referred by Griscom (1932: 340) to this race.

Eight of my specimens are referable to the dull colored nominate race. Five were collected in fall (two by a fire at night), one in spring, and two in mid-February. A female collected by Anthony at Chanquejelve was referred by Griscom (1932: 339) to this race.

Wilsonia canadensis (Linnaeus). Three females (one of them immature) were taken by me about 2:00 a.m. at a fire on a 9,600 foot ridge on September 16. During this night one native killed over 400 Canada warblers while his companion took over 500 Canada and Wilson's warblers. I did not record this species in the daytime.

Cardellina rubrifrons (Giraud). An immature male was taken in oak-pine forest at 5,300 feet on September 15. No other individuals were seen. The bird was in a mixed flock of Dendroica occidentalis and

Wilsonia pusilla.

Setophaga picta Swainson. Anthony collected a male at Huehuetenango and a male at Chanquejelve. Griscom (1932: 341) referred these specimens to the race S. p. guatemalae. Also referred to this race were specimens collected by Nelson and Goldman at Hacienda Chancol (Ridgway, 1902: 729). I did not record this species.

Myioborus miniatus (Swainson). This species was recorded from 4,800 to 9,400 feet in humid oak forest and in dense thickets. Birds taken in March and April had enlarged gonads. Singing was frequently heard in those two months. An immature male was taken October 2. Adults were undergoing the postnuptial molt in the latter part of August. There was no evidence of fall nesting.

My specimens (seven males, one of them immature) are referable to the race M. m. intermedius on the basis of their orange underparts. The tail length is not long enough for hellmayri of western Guatemala.

Anthony collected two males and a female at Barillas. Griscom (1932: 341) referred these specimens to the race M. m. flammeus.

Ergaticus versicolor (Salvin). This species was common between 7,100 and 9,400 feet in oak forest, oak-pine forest, pine forest, cloud forest, and scrub oak thickets. Singing was most fervent in March, April, and May. Birds collected at that time were in breeding condition. A brown juvenal was taken May 9. The juvenal plumage is rapidly lost, immature birds taken in July and August having only a trace of brown on the belly and flanks. Immature birds taken in Sep-

tember and October looked like adults. The postnuptial molt was underway in July. No singing was heard in the fall. I collected 18 specimens near Soloma (six males, six females, three immature males, two immature females, one juvenal male) and four near Santa Eulalia (two males, two immature males). Anthony (Griscom, 1932: 346) collected two males at San Mateo. Nelson and Goldman (Ridgway, 1902: 761) collected specimens at Todos Santos and Hacienda Chancol.

Basileuterus belli (Giraud). Specimens were collected from 7,100 to 9,400 feet in oak forest, oak-pine forest, and cloud forest. Birds taken in March and April had enlarged gonads. Adults were molting in July. Immature birds were taken in July, August, and September. There was no evidence of fall nesting.

My specimens (three males, three females, two immature males, one immature female from Soloma, and an immature male from Santa Eulalia) are referable to the race B. b. scitulus on the basis of their dark upperparts (as compared with the nominate race). Nelson (1900: 268) collected specimens representing this race at Todos Santos.

Basileuterus rufifrons (Swainson). Anthony collected two males at Chanquejelve. Griscom (1932: 345) referred these specimens to the nominate race.

I collected an immature male on August 14 at 6,700 feet in a scrub oak thicket. I refer this specimen to the race B. r. salvini on the basis of the solid yellow underparts.

## Family Icteridae

Tangavius aeneus (Wagler). Anthony collected two males at Barillas. Griscom (1932: 387) referred these specimens to T. a. involucratus (now considered to be synonymous with the nominate race). I did not record this species.

Cassidix mexicanus (Gmelin). This species was common in town and on farms near town. In February it was in small flocks of 15-20 birds. On March 5 one was seen building a nest in a tall tree in town. Nesting continued through July 3. The first juvenals were seen April 14. By August 1 the birds were molting. There was no fall nesting. No specimens were obtained.

Euphagus cyanocephalus (Wagler). Nelson and Goldman (Ridgway, 1902: 250) collected specimens at Hacienda Chancol. I did not record this species.

Dives dives (Deppe). Anthony (Griscom, 1932: 399) collected five males and three females at Barillas. I did not record this species.

Icterus galbula (Linnaeus). A male was taken by me on February 24 at 8,000 feet in a woodlot hear a house. The species was seen in oaks from 4,800 to 8,500 feet until April 19. An adult female was collected October 8. This was the only fall record. Anthony (Griscom, 1932: 391) collected three males at Barillas.

Icterus maculi-alatus Cassin. Anthony (Griscom, 1932: 391) collected two males, one of them immature, at Chanquejelve. I did not record this species.

Icterus wagleri Sclater. A female taken at Huehuetenango and a female taken at Chanquejelve by Anthony, were referred by Griscom (1932: 392) to the nominate race. I did not record this species.

Icterus chrysater (Lesson). On July 28 I collected an adult female at 7,700 feet on the edge of an oak forest. The bird was molting. I have no evidence that this species was breeding in the area. It is essentially a sub-tropical zone bird and the individual collected was the only member of this species seen in the high country.

My specimen is referable to the nominate race (wing, 93 mm.; tail, 98). Anthony collected a male and six females at Barillas. Griscom (1932: 394) referred these to the same race.

Icterus pustulatus (Wagler). Anthony collected a female at Chanquejelve. Griscom (1932: 397) referred this specimen to the race I. p. formosus. This specimen is the only record of this species in Guatemala.

Sturnella magna (Linnaeus). I saw and heard this species on the grassy plains near Paquix in February and in June. The altitude was 11,500 feet. No specimens were taken.

## Family Thraupidae

Tanagra musica (Gmelin). This species is found principally in the sub-tropical zone in Guatemala, but occasionally it wanders into the high country. An immature female was taken at 8,500 feet in a scrub oak thicket on July 28. An adult female, molting, was taken at 8,700 feet on September 19 on the edge of the cloud forest. It was with an

adult male. My specimens are referable to the race T. m. elegantissima (adult female--wing, 62 mm.; tail, 46).

Thraupis abbas (Deppe). Anthony (Griscom, 1932: 377) collected four males and four females at Barillas. I did not record this species.

Piranga rubra (Linnaeus). I collected an adult female on September 30 at 8,600 feet in oaks bordering a cleared field. The specimen is referable to the nominate race on the basis of its small size (wing, 88 mm.; tail, 72).

Piranga flava (Vieillot). A male, collected by Anthony at Huehuetenango, was referred by Griscom (1932: 379) to the race P. f. albifacies.

A female, taken by Anthony at Chanquejelve, was identified by Griscom (1932: 379) as P. f. dextra. I did not record this species.

Piranga bidentata (Swainson). Three males, taken by Anthony at Barillas, were referred by Griscom (1932: 381) to the race P. b. sanguinolenta. I did not record this species.

Chlorospingus ophthalmicus (Du Bus). Specimens were collected from 7,900 to 9,300 feet in cloud forest and in humid oak forest. Females with brood-patches were taken in the latter half of March. Males taken in the latter part of June were in the postnuptial molt. By the end of July both males and females were in fresh fall plumage. In late summer and in fall the birds were always seen in small flocks of four or five birds, possibly family groups.

Griscom referred specimens from Barillas and San Mateo to the

race postocularis. Hellmayr (1936: 399) referred these same specimens to the race dwighti on the basis of head color and pattern. My specimens (eight males, one of them immature, and three females) are referable to dwighti in that throughout the series the pileum is slate gray bordered laterally with black. In postocularis the whole pileum is sooty drab.

Anthony (Griscom, 1932: 385) collected a female at Barillas and a male and two females at San Mateo.

## Family Fringillidae

Spinus atriceps (Salvin). Flocks of this rare species, which apparently did not breed in the vicinity of Soloma, were seen on several occasions in high, open, grassy pastureland in July, August, September, and October, and were extremely difficult to approach. One non-molting male was taken from a flock of 40-50 birds on July 28 at 8,400 feet. The crop contained grass seed. The flight of this species was undulating and the call notes were similar to those of S. tristis.

Saltator maximus (P. L. S. Müller) Anthony collected a male at Barillas. Griscom (1932: 353) referred this specimen to the race S. m. magnoides and he assigns this species to the tropical zone in Guatemala.

Guiraca caerulea (Linnaeus). I collected an adult female on April 11 at 7,500 feet in a corn field. The bird was very fat. There was no molt. I refer this specimen to the race G. c. interfusa on the basis of the tawny crown, nape, and upper back.

Passerina cyanea (Linnaeus). Two specimens were taken--an adult

male in winter feather (brown) in scrub oak at 7,600 feet, February 19, and a female in an oak thicket at 6,900 feet, March 7.

Anthony (Griscom, 1932: 365) collected five males and a female at Barillas, and two males at Chanquejelve.

Sporophila torqueola (Bonaparte). A male and a female, taken by Anthony at Barillas, were referred by Griscom (1932: 350) to the race S. t. morelleti. I did not record this species.

Atlapetes gutturalis (Lafresnaye). This species, which was more secretive than A. brunnei-nucha, apparently was restricted to scrub oak thickets between 7,500 and 8,800 feet. I saw it on only six occasions, taking a male on September 11. The specimen was undergoing an extensive molt of body plumage and flight feathers. I assign this specimen to the race A. g. griseipectus on the basis of the yellow on the gular area and foreneck. In all other races the foreneck lacks yellow.

Atlapetes brunnei-nucha (Lafresnaye). This species was found between 7,600 and 9,300 feet in the underbrush of oak forest and cloud forest. The birds had the habit of coming to open areas in the forest when I squeaked. One specimen was taken in pine forest and one in a scrub oak thicket, but they were not common in these habitats. Birds taken in March and April were in breeding condition. A nest with two well-incubated eggs was found on March 28. The nest was 18 inches from the ground near the edge of an oak forest. The eggs were white and unmarked. There was no sign of fall breeding. Adults were in fresh fall plumage by mid-September.

My specimens (five males, three females, one of them immature)

are referable to the race A. b. macrourus on the basis of the extensive amount of white on their underparts and because of their long tails (adult males, 85-91 mm., average, 88.4)

Pipilo erythrophthalmus (Linnaeus). This species lived between 6,800 and 9,700 feet in scrub oak thickets, pastures, and corn fields. It was abundant above 8,000 feet. In the non-breeding season it was often found in small flocks with Junco alticola and Zonotrichia capensis. Birds taken in March, April, and May were in breeding condition. During these months the birds were often heard singing. Adults were molting in July, August and September. There was no evidence of fall nesting, and singing stopped by mid-summer.

My specimens (six males, three females, three immature males, one immature female) are referable to the race P. e. repetens on the basis of the prominant dorsal streaking, the dark upperparts, and the large size (six adult males--wing, 82-89 mm., average, 85; tails, 89-102, average, 93.8). The race repetens represents the southern limit of the genus Pipilo. A male from Barillas and two males from San Mateo, collected by Anthony, were referred to the same race by Griscom (1932: 366).

Melozone leucotis Cabanis. Anthony collected a male at Chanquejelve. Griscom (1932: 368) identified this specimen as M. occipitalis (now M. l. occipitalis). I did not record this species.

Passerculus sandwichensis (Gmelin). Nelson and Goldman collected specimens at Hacienda Chancol. Ridgway (1901: 195) referred these specimens to P. s. alaudinus (now considered P. s. anthinus).

I did not record this species.

Ammodramus savannarum (Gmelin). Anthony collected a bird of undetermined sex at Chanquejelve. Griscom (1932: 359) referred the specimen to the race A. s. bimaculatus. I did not record this species.

Aimophila rufescens (Swainson). This species was not common in the Soloma region, and it was very secretive. Three specimens were taken between 6,700 and 7,800 feet on rocky slopes well covered with shrubs. Two adult females, taken March 6 and May 26 respectively, showed no signs of breeding. A male taken July 26 was just starting the postnuptial molt.

I refer my specimens to the race A. r. gigas (males--wing, 78 mm., tail, 77; females--wing, 67, 71 mm., tail, 71, 68).

Junco alticola Salvin. This species was found between 6,800 and 9,300 feet in short grass pastures, rocky hillsides, and in corn fields. A bird was observed building a nest on March 17. Another nest, with its complete clutch of two white, unmarked eggs, was collected March 26. The eggs were four or five days incubated. Each nest was on the ground in pastureland, at the base of a tall clump of grass, the first at an altitude of 8,800 feet, the second at 8,900 feet. Singing was common from March through August. Both adults and young molted in September and October.

The species J. alticola is closely related to J. phaeonotus. Hellmayr (1938: 554) considered alticola to be a race of J. phaeonotus. I, however, consider it to be a full species on the basis of the back color which is brown in J. alticola, but which is rusty in every race

of J. phaeonotus. The bill of J. alticola is dark above and yellow below and the iris is yellow.

I collected six males and two females. Anthony (Griscom, 1932: 362) collected five males at San Mateo. Nelson and Goldman (Ridgway, 1901: 303) collected specimens at Todos Santos and at Hacienda Chancol.

Zonotrichia capensis (P. L. S. Müller). This species was common between 6,800 and 9,200 feet in cultivated land, on grassy pastures, and in town. There were two distinct nesting seasons, the principal one in fall, when corn fields were the preferred habitat, a lesser one in spring, when the species frequented pastures and shrubbery in town. On June 16 a nest, containing three young, was found at the base of a tall clump of grass in a pasture near town. On June 19 a nest with two young was found in a similar situation. An immature male, streaked below, was taken June 20. Spring nesting stopped by mid-July. Singing increased again and fall nesting started in mid-August. Three two-egg clutches and one three-egg clutch were collected respectively on August 19, September 10, 22, and 29. One juvenal was taken September 24, one immature, streaked below, October 1. Nests were all on or near the ground, well hidden in tall grass or in shrubs in corn fields. One nest was four feet from the ground in a shrub in a corn field, but most nests were within a foot of the ground. The fall nesting season seemed to be of more importance to the species as many more individuals nested in the fall than in the spring. This latter statement is based on the number of nests found and on the amount of singing which was heard in the two seasons.

My specimens (seven males, three females, two immature males,

one immature female, one juvenal male from Soloma and one female from Santa Eulalia) are referable to the race Z. c. septentrionalis, the most northern race of this species. Also referred to this race were five males and one female from Barillas, and five males and one bird of undetermined sex from San Mateo, all collected by Anthony (Griscom, 1932: 363).

Melospiza lincolni (Audubon). Three specimens were taken between 6,600 and 8,600 feet respectively in scrub oak, in a corn field, and in shrubs bordering a stream. The earliest date was March 6, the latest, April 9. None of the birds was molting. The species was not recorded in the fall.

I refer my specimens to the nominate race (male, wing, 59 mm., tail, 51; females, wing, 59, 60 mm., tail, 53, 52). A male and a bird of undetermined sex, taken by Anthony at Chanquejelve, were referred to this race by Griscom (1932: 364).

Three males, taken by Anthony at Barillas, were referred to the race M. l. gracilis (Griscom, 1932: 364).

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