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Notes on a Semi-arid Region in the Aguan River Valley, Republic of Honduras*

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The Republic of Honduras, or Spanish Honduras as it is sometimes called to distinguish it from the crown colony of British Honduras, is situated near the geographical center of Central America. It extends across the continent from the Gulf of Fonseca on the Pacific to the Caribbean Sea where the more extensive coast line extends in a generally east-west direction and offers better harbor facilities.

The country has an area of about 46,000 square miles and, in common with the other Central American countries, exhibits a great variety of physiographic features. Along the Caribbean and, to a limited extent, about the Gulf of Fonseca is a low, sometimes marshy, region which varies from a very narrow strip where the mountains occasionally reach the sea to several miles in width. This coastal plain reaches its greatest width in the so-called Mosquitia Territory at the east and also extends inland along the main river courses, especially the Ulua and the Aguan. Excepting this low coastal plain the country is very rough and mountainous. From the plain the land may rise gradually in a series of foothills and plateau-like plains or the ascent may be rapid and abrupt with few or no foothills. The highest mountains are to be found

* I am indebted to Mr. L. A. Richardson of the Standard Fruit Company at La Ceiba, Honduras, for data relative to rainfall, geology of the valley, etc.

toward the Pacific side although a few peaks in the northern coastal range are reported to rise to a height of about 8,000 feet.

The prevailing trade winds blow from the northeast to southwest. As a consequence the northern Caribbean coastal plain and mountain slopes receive an ample rainfall. Plant life is abundant there and the mountain slopes are covered with a luxuriant rain-forest type of vegetation. In parts of the interior many of the mountains are densely forested much as those near the coast, especially towards their summits and in ravines where numerous species of trees, shrubs, ferns (many of which are tree-like), arums, bromeliads, many woody and herbaceous vines, peperomias, etc., grow very rank. In many parts of the interior the rainfall is less, and open, park-like regions with pine and oak forests are predominant. This type of forest is also to be found on the leeward slopes of the northern coastal range. One can find few regions elsewhere where so great a variation of ecological conditions are to be found as in Honduras, and, as Standley has pointed out, probably few areas of equal size yield as great a variety of species. A large part of the country still remains unexplored, botanically speaking, particularly in the mountainous interior and near the Salvador border where the country is especially rough and the mountains, according to report, are covered with a rich vegetation.

The writer, accompanied by James Koepper and Kenneth Wagner, spent the summer of 1938 from June to the middle of August making plant collections in the department of Atlantida on the slopes of the coastal range in the vicinity of La Ceiba and also along the Aguan River valley in the department of Yoro near the village of Coyoles above Olanchito. The Aguan valley, which lies behind the high coastal range, is especially interesting botanically because of the low rainfall and consequent semi-arid conditions. The period of our visit was during the comparatively dry summer season when only a small percentage of the species were in a flowering or fruiting condition suitable for collecting. Although a number of undescribed species were obtained, undoubtedly a collection made in the spring following the rainy season would reveal many additional and interesting plants.

The Aguan River rises in the mountains in the interior of the department of Yoro and flows in a northeasterly direction to

empty into the Caribbean Sea several miles east of Trujillo. Its valley lies between ranges of mountains on the southeast and on the north. The northern range extends in a generally east-west direction near the coast and reaches its highest elevation near the city of La Ceiba where Mts. Bonita and Cangrejal are claimed to be about 8,000 feet in height. The moisture-laden clouds from the Caribbean lose their water on the windward slopes of this northern coastal range and as a result the rainfall of that portion of the Aguan valley region which lies behind these mountains and above the town of Olanchito is much reduced. The precipitation varies considerably at different points in the valley. At Olanchito it is about 50 to 55 inches annually, but farther up the river at Coyoles it is only 35 to 40 inches which is probably the minimum for the valley. Of the total rainfall about 25 percent falls in May and June, 50 percent in October, November and December, and the other 25 percent during January, July, August and September with very little in January and ordinarily none in February, March and April. The rate of evaporation is very high so that, with the exception of that falling during the months of May, June, October, November and December, the rains do but little good. As a result of the low rainfall a part of the valley above Olanchito about 25 miles in length and 2 to 7 miles in width is semi-arid and represents a very unique region in Honduras.

The Aguan River has a good flow of water even in the dry season and in the rainy period overflows its banks and inundates a large amount of bottom land, or vega land as it is called locally. This vega land, which varies considerably in width in different parts of the valley, totals approximately 15,000 acres. It represents recently deposited alluvial soil made up of the sediments of the Aguan River and its tributaries and is quite fertile. The soil is calcareous in nature, indicating that the walls of the mountains adjacent to the headwaters are evidently chiefly limestone and marl.

Rising abruptly from the vega land to a height of about sixty feet is a bench or plateau-like area the soil of which is also calcareous and apparently represents an old alluvial terrace formed by the meandering of this same Aguan River. Near Coyoles the bench is about 495 feet above sea level but slopes gently upward toward the bordering mountains. It has an average width of

about 3,000 feet and merges with soils representing typical outwash formed by the erosion of the mountains.

Apparently the valley was originally more or less completely wooded. At the present time all but about 1,500 acres of the vega land is cleared. About 75 percent of the plateau-like bench, how-



A large *Cereus* is common in the semi-arid plateau region.

ever, remains wooded. Here and there on the bench occur cleared, oasis-like areas usually adjacent to old stream beds which are largely planted with grass for pastures as is also a large part of the vega land. During the rainy season corn and beans may also be grown there and, with the aid of irrigation, large banana plantations have been developed.

Mammoth ceiba (*Ceiba pentandra* (L.) Gaertn.) and guanacaste (*Enterolobium cyclocarpum* (Jacq.) Griseb.) trees are still to be found but many have been destroyed to establish plantations or for timber. However, most of the trees, especially on the bench, are small to medium size, forming a low-topped forest.

The river is bordered with a fringe of trees and a dense thicket of shrubs, lianas, etc. Along the river and on the sand and gravel bars one finds a variety of woody and herbaceous species mostly of wide distribution and often of a weedy nature, e.g., *Cenchrus echinatus* L.; *Mimosa pigra* L.; *Polygonum persicarioides* HBK.; *Solanum nudum* HBK.; *Tridax procumbens* L.; *Jussiaea repens* L.; *Crotalaria retusa* L.; *Prophyllum punctatum* (Mill.) Blake; *Commelina elegans* HBK.; *Cyperus rotundus* L.; *Trichachne insularis* (L.) Nees; *Scoparia dulcis* L.; *Borreria laevis* (Lam.) Griseb.; *Polyprenum procumbens* L.; *Oxalis Neaei* DC.; *Lobelia splendens* Willd.; *Pistia Stratiotes* L.; *Cissus sicyoides* L.; *Portulaca pilosa* L.; *Portulaca oleracea* L.; *Croton lobatus* L.; *Cassia occidentalis* L.; *Mimosa pudica* L.; *Muntingia Calabura* L.; *Talinum triangulare* (Jacq.) Willd.; *Lippia nodiflora* (L.) Michx.; *Lippia repens* HBK.; *Lantana Camara* L.; *Priva lappulacea* (L.) Pers., etc.

A much more interesting area for the botanist, however, is the bench where the most arid conditions seem to prevail and which is largely forested. In some places the growth is moderately open and one can move about easily but much of it is dense and entangled with numerous lianas which, together with the fact that many of the species are armed, make it necessary to do considerable cutting with a machete in order to penetrate any distance. Herbaceous species appear to be scarce in the forest of this region, at least in the dry season when even the leaves of the woody plants curl and wither and the soil, which is light colored, becomes dry and powdery. Many of the trees have an ash-colored bark which imparts a somewhat ghostly effect to the landscape. An outstanding feature of the vegetation is the occurrence of two species of tree-like cacti often 20 or more feet in height. One is an undescribed species of *Cereus* and the other an undescribed *Opuntia*. Several other cacti species both terrestrial and epiphytic also occur here. Another notable feature of this forest is the extremely large number of parasitic mistletoes (*Phoradendron* and *Struthanthus*

species) and epiphytic ferns, arums, bromeliads, orchids, peperomias, and cacti. It is rare to find a tree that is entirely free and many are very heavily loaded with them. *Bromelia sylvestris* Willd. and *Aechmea bracteata* (Sw.) Griseb., two large bromeliads, occur in large numbers throughout the area, mostly as terrestrial forms, and specimens of an unidentified *Agave* are not uncommon. Characteristic tree species include *Erythrina hondurensis* Standl., *Acacia riparia* HBK., and *Pithecolobium dulce* (Roxb.) Benth.,



A tree loaded with various epiphytic and parasitic plants characteristic of the semi-arid woodland region.

all of which are armed and common; *Bursera Simaruba* (L.) Sarg. which is very distinctive because of its smooth, brown, papery bark and height which is greater than many of the other trees in this area; several species of *Coccoloba*; *Clusia flava* Jacq. a species widely distributed in Central America; *Hasseltia floribunda* HBK.; *Celtis iguanaea* (Jacq.) Sarg.; *Cupania glabra* Sw., etc. Shrubs or sometimes small trees include several species of *Piper*; *Ardisia paschalis* D. Sm. which is common; *Russelia sarmentosa* Jacq.; the almost leafless *Pedilanthus tithymaloides* Poit. with its curious, slipper-like involucre; *Jatropha urens* L. with stinging hairs which

give a very painful sensation when touched; two or three species of *Acalypha*; *Rauwolfia hirsuta* Jacq.; several species of *Psychotria*; *Eupatorium albicaule* Sch. Bip.; *Acacia spadicigera* Schl. & Cham. with its bull-horn-like spines inhabited by colonies of vicious and persistent ants; *Croton flavens* L.; *Benthamantha mollis* (HBK.) Alef.; *Iresine nigra* Uline & Bray; *Amyris sylvatica* Jacq.; *Capparis* sp.; *Eugenia* sp., etc. Woody climbers include *Solanum unguis-cati* Standl. with its sharp, recurved spines; *Echites turrigera* Woodson; *Smilax mollis* H. & B.; *Combretum mexicanum* H. & B.; *Paullinia pinnata* L.; *Capparis* sp., etc. *Zamia furfuracea* L. f., a curious stemless cycad with poisonous properties, is also rather common.

As one passes through the arid bench towards the bordering mountains the surface becomes rougher with here and there ravines cut by mountain streams. The soil changes in character to some extent, becoming characteristically mountain out-wash. The rainfall is apparently greater and the character of the vegetation changes perceptibly as the foothills are approached. Parasitic and epiphytic species are less abundant and terrestrial ferns and herbaceous plants are more common. The ravines are richer in species and numbers of plants and the open areas develop a better coverage of grasses. Palms are more abundant and a number of different and somewhat larger species of trees, including pine and oak, are encountered. As one ascends to an altitude of 1,000 feet or more the forests become open and are made up predominately of several species of oak and a pine (*Pinus Caribaea* Mor.), with scattering specimens of other species, and the ground between the rocky outcroppings is covered with a rank growth of grass and small herbs.

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