

INTRODUCTION TO FLORA AND FAUNA OF BIO ITZA

and Potential for Further Research



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INTRODUCTION TO FLORA AND FAUNA OF BIO 1724

and Potential for Further Research

Reserva Natural Bio Itzá Reserva de la Biosfera Maya (RBM) Petén, Guatemala

NICHOLAS HELLMUTH FLAAR (USA) AND FLAAR MESOAMERICA (GUATEMALA)





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PHOTO FROM FRONT COVER Pistia stratiotes Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Jun. 24, 2021. Petén, Guatemala. Camera: iPhone 12 pro.

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Introduction to Bio Itzá

Bio Itzá is a protected nature reserve of 3,600-hectares, which is about 8,895 acres or almost 14 square miles. (3,600 hectares is 36 square kilometers which is 13.89 square miles).

Bio Itzá area is about 17 kilometers north of the town of San José. San José, on the steep hills along the north shore of Lake Petén Itzá, is the regional capital of the large Municipio de San José, Departamento de Petén.

The Itzá Maya of Guatemala came here "a thousand years ago" and so have been in this area for lots of generations. The Itzá language is derived from a regional form of Yucatec Maya. The Lacandón Maya of Chiapas are another example of a regional Yucatec Maya language which moved south after the Post Classic (or in the case of the Lacandón Maya, after the Spanish had removed the original Cholti Mayan speakers from this part of Chiapas).

Road to Bio Itzá. Photo by: Roxana Leal, FLAAR Mesoamerica, Jun. 24, 2021. Road to Bio Itza, Petén, Guatemala. Camera: Google Pixel 3XI So all these Maya are completely authentic Maya, but they have cultural and linguistic heritage a thousand or so years ago from the Yucatán Peninsula.

The Itzá Maya language deserves to be protected as do all the ecosystems of Petén. So it's very helpful for the Bio Itzá association to be protecting their natural reserve. It is also appreciated that research teams are welcome in their area.

We look forward to returning and documenting even more of the important flora and fauna of this area of the Reserva de la Biosfera Maya (RBM).



My Personal Experience with the Peten Itzá area of Guatemala

I first visited the El Remate side of Lake Peten Itzá in 1965. There was a two-rut mud "road" from Tikal to El Remate. The trip required a 4WD even in the dry season and in the rainy season was not even transitable by 4WD. Dr William Coe, then director of the University of Pennsylvania Tikal Project, drove us (probably Stan Loten and another two) down to El Remate. We saw a jaguar cross the road en route. During 1965 I worked at Tikal for 12 months as a student intern in architecture and photography. I returned a subsequent summer for another month to finish excavating and recording the palace of the Central Acropolis which abutted Str. 5D-73 and where in 1965 I had discovered the Tomb of the Jade Jaguar (Bu. 196).

I had probably visited Lake Petén Itzá in 1963 and 1964, as I was at Tikal one week each of those years, to learn more about Maya temple and palace architecture (since in those years I was an undergraduate student of architectural sciences at Harvard).

During the 1970's-1990's I brought tour groups to experience Petén and often stayed in Flores or Santa Elena (at the hotels of Tono Ortiz or Rafael Sagustume).

During the 1970's I did ethnohistorical research about the Itzá Maya people, especially their food, their house architecture, and aspects related to ethnobotany. I did research in the Carnegie Institute of Washington archives in the Tozzer Library of Harvard University's Peabody Museum, and then direct ethnohistorical research in the Archivo General de Centro America, in Zone 1 of Guatemala. One of those years I was awarded a fellowship (American Philosophical Society) to do research on the Choltí, Quejache, and Itzá Maya people in the Archivo General de Ias Indias in Sevilla, Spain.

I have spent many evenings reading friar Andrés de Avendaño's adventures with the Petén Itzá Maya people, plus reading about why the Itzá got here from Chichén Itzá of far away Yucatán, México (because the Itzá king abducted the wife of a king of another city and fled away far enough so that the other king could not run after his new wife).

I have spent many hours doing my best to work my way through the impressive ethnobotanical research of Scott Atran and Itzá Maya. Since the book on ethnobotany of the Lacandón Maya of Chiapas has a much more functional index, it's a challenge to use the index in the Petén Itzá monograph (and also, it is not easily available on-line as an open and searchable PDF; which would overcome the headache of searching through an incomplete index).

Although I had never gone north to the nature reserve of Bio Itzá, at least I have ethnohistorical and ethnobotanical experience with nearby Petén Itzá habitats. Now that I have been told that the nature reserve of Bio Itzá is part of a cooperation of an initiative by Tikal, PNYNN, Cerro Cahuí, and El Zotz, we look forward to accomplishing more field work at Bio Itzá to assist the nature reserve administrators and park rangers.



Full Name of the nature reserve and its main web site

Some websites call it Bioitza, others call it Bio-Itza; reserva natural Bio Itza (in all its variants); I write it just as Bio Itza, assuming that Bio is a potential abbreviation for Biotopo.

Their website, www.bioitza.com, lists its name in English as the Bio-Itzá Biosphere Reserve.

How to reach this nature reserve?

Coordinated by our project manager, Vivian Díaz, we met with Bio Itzá's Presidente de Bio Itzá, Oscar de Jesús Ríos Pancan and Administrator, Adérito Chayax Tesucún. They kindly took the time to drive out to the main turnoff to the Campamento Limón portion of the reserve. They took us to the turn off since the road signs get their paint eroded and faded with all the rainy season storms, and with Covid, new replacement signs had not yet been installed.

The Internet, and several books which mention Bio Itzá nature reserve show basic maps of where it is located, but none are enough if you are driving and want to be relaxed without wondering and worrying which turn to take, and which one not to take.

We will have a new map by FLAAR Mesoamerica available shortly. What can also really help people to drive here, would be drone photographs of the route out from San José, and every junction (to show you the actual buildings that indicate where to go straight or where to turn left or right).

Geology, elevation, and other aspects of the Bio Itzá nature reserve

In most hilltop areas of Petén, Izabal and elsewhere in the north half of Guatemala, you are in a karst geology area (limestone). Often the limestone sticks up as giant boulders, outcrops or even impressive sized hills. However, other areas of Petén (and elsewhere) are "bajos", so you don't normally see limestone cliffs, boulders, or other karst formations (such as caves). Bio Itzá is primarily a Lowland area. We will document the elevation and other aspects in future field trips.

What Ecosystem(s) can you expect to find in the Bio Itzá nature reserve?

Much of the land is secondary vegetation, meaning that before the Bio Itzá association acquired it, much of the vegetation of this area had been destroyed by commercial farming. Fortunately a healthy part of the area is a mature forest. The advantage of the secondary vegetation is that you will find lots of trees here that are less frequent in a mature forest (where the giant trees shade out smaller trees). So it's helpful to have both secondary vegetation and mature forest.

Cerro Cahuí has steep hills from which you can see monumental views of Lake Petén Itzá. So you get hillside and hilltop forest species. Bio Itzá is flatland, with aguadas and biodiverse habitats of the lowlands. On future field trips we will explore other habitats of Bio Itzá. The June 2021 field trip program was to visit each partner of the coordination group (Tikal, PNYNN, El Zotz, Cerro Cahuí, and Bio Itzá). In a future month we will camp within Bio Itzá and spend more days here. Different plants and trees bloom every month, so in our experience is better to return to each area every two months. If you go two months in a row, you don't see, experience, and have different species available to photograph in full flowering or with remarkable fruits.

List of Plants Photographed at Bio Itzá during the several hours of our initial visit

I estimate that Bio Itzá will have plants we have not yet found at Yaxha, Nakum and Naranjo. And I estimate that plants we have found at PNYNN can gradually be found at Bio Itzá. That said, each area will have a few plants that are not in the other area.

Aechmea bracteata (Sw.) Griseb.		Not yet listed in PNYNN Plan Maestro but FLAAR project has found in many locations	
Bignonia sp.		Not yet in any Plan Maestro list but should be present	
Bursera simaruba	Palo de jiote	Yes, listed for Yaxha	
Calliandra tergemina	old man's beard	Not yet in any Plan Maestro list for PNYNN	













Calliandra, estimated to be **Calliandra tergemina.** Bio Itza, RBM. Photo by Nicholas Hellmuth, Google Pixel 4a, June 24, 2021.



Calliandra, estimated to be **Calliandra tergemina**. Bio Itza, RBM. Photo by Nicholas Hellmuth, Google Pixel 4a, June 24, 2021.

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What plants of Bio Itzá have also been found in the PNYNN?

Bursera simaruba, Palo de Jiote, are found on hillsides and lower areas in many and potentially most areas of Petén. This tree and pimienta gorda are found in lots of areas of Petén. So these same trees are also common in PNYNN and Tikal and other areas.

The above tabulation has notes on which plants we saw on first hike into Bio Itzá and that we have also found and photographed at PNYNN.

In PNYNN the wild native bamboo, *Guadua longifolia*, jimba, is found en masse on the west side of the ancient Maya city of Naranjo, and en masse along much of the shores of Río Holmul. This bamboo is probably found around wetlands in or close outside the Tikal park, but has not yet been well documented. Since bamboo is "not a tree" most botanical reports skip it (Schultze and Whitacre for Tikal and Dix and Dix for Yaxha mention only "trees"; Dix and Dix also omit palms, since technically they are not trees. To me palms are as important to find, photograph, note, and report on as are trees.

To learn where else plants of Bio Itzá have been found?

Simply go to this webpage, enter the plant name, and you can find where else this plant has been found in Petén.

serv.biokic.asu.edu/neotrop/plantae/collections/harvestparams.php



Bignonia species Photo by: David Arrivillaga, FLAAR Mesoamerica, Jun. 24, 2021. Road to Reserva Bio Itzá. Camera: iPhone 12 ProMax.

Is there a potential medicinal use of plants of Bio Itzá by local people?

Medicinal uses of plants of nearby areas of Petén have already been professionally identified by Atran and local Itzá curers (Atran, Lois and Ucan 2004).

Which plants of Bio Itzá are edible?

Since so many books have been written on medicinal plants of different regions of the Mayan people, I focus primarily on edible plants:

- Native plants (not brought in by the Spaniards)
- Wild plants (not cultivated, albeit can be around a kitchen garden)

After we have found all previous lists of plants of Bio Itzá already published, we can comment on which ones are edible. Below are obvious ones. Keep in mind that "edible" does not mean that the Maya today still eat this plant or that a human can eat it and receive benefits thereby. Edible means that native people outside Guatemala are still eating the same plant.

Common names are from local guides, Standley and Steyermark, or Balick, Nee and Atha 2000.

The plant that is unexpectedly edible is Costus pulverulentus. Technically it's an herb but to my informal jargon it looks like a shrub because it grows to almost 2 or more meters in height. Since there are several species of Costus we need to double-check our species ID. The yellow flowering Costus is easy to ID as Costus pictus D. Don. So far we have not found this listed as edible. Costus has interesting relationships with ants.

Genus species	Common names	Comments	Our FLAAR folder names
Aechmea bracteata (Sw.) Griseb.	Gallito, nej ku'uk (Yucatec maya)	In the park (Aguada maya) but not in PNYNN list.	Bio-Itza-NEEDS-ID-Bromelia-Peten-parking-lot- iPhone-12pro-325pm-Jun-24-2021-NH Aechmea-bracteata-bromeliad-red-flower-entrance- Reserva-Bio-Itza-Peten-RBM-Jun-24-2021-DA
Calliandra tergemina		Some species are used as flavoring for cacao.	NEEDS-ID-Calliandra-Bio-Itza-Trail-Lemon- NikonD810-122pm-Jun-24-2021-NH
Ceiba pentandra (L.) Gaertn.	Ceiba, yaxche	Seeds of both species of Ceiba are edible.	Bio-Itza-Ceiba-pentandra-young-Trail-Lemon- Peten-RBM-iPhone-12pro-216pm-Jun-24-2021-NH
Costus pulverulentus C. Presl	Caña de cristo, ch'-uun, spiral ginger, wild ginger	Since there are several species of Costus we need to double-check.	NEEDS-ID-Costus-sp-Bio-Itza-RBM-Peten-Google- Pixel-4a-244pm-Jun-24-2021-NH
Guadua longifolia	jimba	Parts of many species of bamboo around the world are edible. <i>Guadua</i> <i>longifolia</i> is native to Guatemala and surrounding countries.	Bio-Itza-Road-to-Bio-Itza-Guadua-longifolia-Jimbal- iPhone-12pro-1029am-Jun-24-2021-NH
Manilkara zapota (L.) van Royen	Chicle, chico zapote		Bio-Itza-NEEDS-ID-chicle-tree-trunk-Trail-Lemon- iPhone-12pro-258pm-Jun-24-2021-NH
Pimenta dioica	Pimiento gorda, allspice	Tea is made of the leaves.	Pimenta-dioica-pimienta-gorda-allspice-peeling- bark-road-to-Bio-Itza-NikonD810-1135-Jun-24- 2021-NH Bio-Itza-Road-to-Bio-Itza-Pimenta-dioica-pimienta- gorda-allspice-peeling-bark-Peten-RBM-iPhone- 12pro-2pm-326pm-Jun-24-2021-NH
Thevetia ahouai (L.) A. DC.	Huevo de mico, huevo de chucho		Thevetia-ahouai-huevos-de-chucho-yellow-flower- Bio-Itza-Peten-RBM-Jun-24-2021-DA

Heliconia spissa Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Jun. 24, 2021. Road to Reserva Bio Itzá. Camera: iPhone 12 ProMax.

Heliconia spissa Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Jun. 24, 2021. Road to Reserva Bio Itzá. Camera: iPhone 12 ProMax.

Heliconia spissa Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Jun. 24, 2021. Road to Reserva Bio Itzá. Camera: iPhone 12 ProMax.

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Ceiba aesculifolia is the ceiba that is most often documented as having edible seeds (as flavoring for cacao beverage and other similar uses). However, Balick, Nee and Atha also list Ceiba pentandra as FOOD (if you undertake lots of research you would most likely learn that it's also the seeds). Ceiba pentandra is such a logo-tree that most of us do not classify any part of it as edible.

Pistia stratiotes, water lettuce is present en masse in the aguada at the end of the Limon Trail. However, I estimate 90% or even 99% of botanists automatically and instantly respond that *P. stratiotes* is introduced (not native).

But, what if *Pistia stratiotes* has been found in pollen analysis or in other geological studies as having been present thousands of years ago?

And the other issue is, if *Pistia stratiotes* was introduced, who brought it to a remote aguada in the middle of nowhere? There are no rivers to allow this plant to enter this aguada. The only way it could have been spread from a river this area is if birds ate the seeds and then pooped them out in far away places (spreading the plant anywhere and everywhere). It would be better if botanists, ornithologists study this aspect; and pollen analysis documents how long this plant has been flowering in Petén.



Road to Bio Itzá. Photo by: Roxana Leal, FLAAR Mesoamerica, Jun. 24, 2021. Road to Bio Itzá, Petén, Guatemala. Camera: Google Pixel 3XI

Concluding Discussion and Summary on Bio Itzá nature reserve

What most impressed me about Bio Itzá was how different the vegetation was compared with the remarkable biodiversity of Parque Nacional Yaxha, Nakum and Naranjo. For example, the multiple stands of *Heliconia spissa* of Bio Itzá have not yet been found anywhere in PNYNN (we have found perhaps one or two *Heliconia* species, usually just one or two plants, no continuous clusters; so far, there are lots of areas that need further field work). Since there is no *Heliconia*-focused field work in Parque Nacional Tikal, on which species are present, and how many plants of this species, this information totally unknown. I estimate there should be lots of *Heliconia* in Río San Pedro area. The parts of Guatemala with most *Heliconia* diversity are Alta Verapaz and the Municipio de Livingston, Izabal. We found, literally, over a million *Heliconia* plants between the town of Livingston and aldea Plan Grande Tatín.

So, if you want to study *Heliconia spissa* habitat, and cauliflorous trees, Bio Itzá is a friendly place to visit.

Since PNYNN is multiple times larger than most nature reserves, naturally it has hundreds of plants not found in other nature reserve. However, Bio Itzá has plants not found in a much larger park. In other words, to find all of what's available to study in Petén, it helps to visit more than one area: that is why our cooperationn project with CONAP is for the entire Reserva de la Biosfera Maya.

In past years (before the Coronavirus pandemic) the Bio Itzá association offered Spanish lessons for students from around the world. You could learn Spanish out in the rain forest or in the town of San José.

Zygia species Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Jun. 24, 2021. Sendero Limón, Petén. Camera: iPhone 12 ProMax.

Appendix A Reporte de kilometraje de la ruta a Bio Itzá, Petén 24 june 2021

Hora	Nombre local del lugar	Km y/o coordenadas del lugar
9:58 am	Saliendo del municipio de San José ruta hacia Reserva Natural Bio Itzá	Km 0.0
10:05 am	Cruce a la Izquierda	Km 3.7
10:10 am	Se encuentra el desvió a la Izquierda hacia la comunidad el Corozal- A la derecha Bio Itzá	Km 6.8
10:24 am	Jimba y Heliconia al atravesar un riachuelo	Km 9.2
10:44 am	Flor morada, probablemente Bignoniácea.	Km 9.4
10:56 am	Entrada a Reserva Natural Bio Itzá	Km 12.6
12:14 am	Ubicación de guanal.	Km 14.8
12:25 pm	Continuar el camino a la Derecha.	Km 17.4
12:28 pm	Campamentos y Ranchos de Bio Itzá	Km 17.7
Retorno de la Reserva hacia el Hotel		
03:43 pm	Salida a la Reserva Bio Itzá	Km 0.0
04:00 pm	Se Ubica el Cruce	Km 4.8
04:06 pm	El Jimbal	Km 8.3
04:09 pm	Cruce hacia la derecha para la comunidad el Corozal	Km 10.5
04:14 pm	Cruce a Cabecera San José, hacia el Remate	Km 13.7

Appendix B

June 24, 2021 Reporte de fotografía en viaje de campo de Petén, Bio Itzá

FOTOGRAFOS: NICHOLAS HELLMUTH, DAVID ARRIVILLAGA

iPhone 12pro

Google Pixel 4a

Nikon D810 and Nikon D5

Photos by David Arrivillaga

Hora en que se tomó la fotografía	Nombre Local del Lugar de donde se tomó la fotografía	Km local del lugar y/o coordenadas	Notes by Byron	Folder Name [s]
10:25 am	Ruta a Reserva Natural Bio Itzá	Km 9.2	Xanthosoma robustum AND <i>Heliconia</i> sp.	Bio-Itza-road-NEEDS-ID-Heliconia-and- malanga-1025am-Jun-24-2021-NH_6745. JPG
10:25 am	Ruta a Reserva Natural Bio Itzá	Km 9.2	Jimba y Heliconia	;?
10:29 am	Ruta a Reserva Natural Bio Itzá	Km 9.2	Jimba, Guadua longifolia	Bio-Itza-Road-to-Bio-Itza-Guadua- longifolia-Jimbal-iPhone-12pro-1029am- Jun-24-2021-NH Guadua-longifolia-Jimba-spines-trunk- Road-to-Reserva-Bio-Itza-Peten-RBM- Jun-24-2021-DA
10:42 am	Ruta a Reserva Natural Bio Itzá	Km 9.4	Bignonia sp.	Bignonia-species-purple-flowers-vine- Road-to-Reserva-Bio-Itza-Peten-RBM- Jun-24-2021-DA
11:00 am	Ruta a Reserva Natural Bio Itzá	Km 13.8	Heliconia spissa	Bio-Itza-Heliconia-spissa-road-to-Peten- RBM-team-photographing-iPhone-12pro- 1117am-Jun-24-2021-NH
11:17 am	Ruta a Reserva Natural Bio Itzá	Km 13.8	Papaya silvestre	Heliconia-spissa-road-to-Bio-Itza- NikonD810-1115am-Jun-24-2021-NH Heliconia-spissa-flower-yellow-orange- green-Road-to-Reserva-Bio-Itza-Peten- RBM-Jun-24-2021-DA
11:03 am	Ruta a Reserva Natural Bio Itzá		Carica papaya	Papaya-silvestri-road-to-Bio-Itza- NikonD810-1103am-Jun-24-2021-NH Carica-papaya-wild-papaya-fruit-and- yellow-flowers-Road-to-Reserva-Bio-Itza- Peten-RBM-Jun-24-2021-DA

Hora en que se tomó la fotografía	Nombre Local del Lugar de donde se tomó la fotografía	Km local del lugar y/o coordenadas	Notes by Byron	Folder Name [s]
11:35 am	Ruta a Reserva Natural Bio Itzá		Pimienta dioica	Pimenta-dioica-pimienta-gorda-allspice- peeling-bark-road-to-Bio-Itza-NikonD810- 1135-Jun-24-2021-NH
11:40 am	Ruta a Reserva Natural Bio Itzá	Km 13.8	Huevo de Chucho Thevetia ahouai	Thevetia-ahouai-huevos-de-chucho-yellow- flower-Bio-Itza-Peten-RBM-Jun-24-2021-DA
11:40 am	Ruta a Reserva Natural Bio Itzá	Km 13.8	NOT ID	Bio-Itza-Road-to-Bio-Itza-NEEDS-ID- fissured-tree-trunk-iPhone-12pro-1150am- Jun-24-2021-NH
12:12 pm	Ruta a Reserva Natural Bio Itzá	Km 14.5	Passiflora sp.	Passiflora-species-orange-fruits-vine-Road- to-Reserva-Bio-Itza-Peten-RBM-Jun-24- 2021-DA
12:14 am	Ruta a Reserva Natural Bio Itzá	Km 14.8	Cryosophila Stauracantha - ESCOBO	Bio-Itza-Road-to-Bio-Itza-escoba-escobal- Peten-RBM-iPhone-12pro-1214pm-Jun-24- 2021-NH
01:22 pm 01:24 pm	Sendero el Limón, en Reserva Natural Bio Itzá		Calliandra tergemina	NEEDS-ID-Calliandra-Bio-Itza-Trail-Lemon- NikonD810-122pm-Jun-24-2021-NH
01:24 pm	Sendero el Limón, en Reserva Natural Bio Itzá		Zanthoxylum sp.	NEEDS-ID-tree-with-giant-spines-Bio-Itza- Trail-Lemon-NikonD810-Jun-24-2021-NH
01:26 pm 01:27 pm	Sendero el Limón, en Reserva Natural Bio Itzá		MALVACEAE	Bio-Itza-NEEDS-ID-Ceiba-or-amapola-Trail- Lemon-Peten-RBM-iPhone-12pro-126pm- Jun-24-2021-NH Malvaceae-family-green-tree-leaves- Sendero-Limon-Reserva-Bio-Itza-Peten- RBM-Jun-24-2021-DA
01:30 pm	Sendero el Limón, en Reserva Natural Bio Itzá		Fotografía de la Hoja del árbol con espina	Malvaceae-family-green-tree-leaves- Sendero-Limon-Reserva-Bio-Itza-Peten- RBM-Jun-24-2021-DA
01:30 pm	Sendero el Limón, en Reserva Natural Bio Itzá		Bursera simaruba	Bio-Itza-Bursera-simaruba-Palo-de-Jiote- Trail-Lemon-Peten-RBM-iPhone-12pro- 130pm-and-220pm-Jun-24-2021-NH
01:30 pm	Sendero el Limón, en Reserva Natural Bio Itzá		NOT ID	Bio-Itza-NEEDS-ID-Bejuco-alternating- thick-single-spines-Trail-Lemon-Peten-RBM- iPhone-12pro-132pm-Jun-24-2021-NH
01:35 pm	Sendero el Limón, en Reserva Natural Bio Itzá		Wano /conocido por los guias como el Escobal Cryosophila Stauracantha	;?

Hora en que se tomó la fotografía	Nombre Local del Lugar de donde se tomó la fotografía	Km local del lugar y/o coordenadas	Notes by Byron	Folder Name [s]
01:37 pm	Sendero el Limón, en Reserva Natural Bio Itzá		Hongo POLYPORALES order	Polyporales-order-species-beige-cup- mushroom-Reserva-Bio-Itza-Peten-RBM- Jun24-2021-DA
01:38 pm	Sendero el Limón, en Reserva Natural Bio Itzá		Philodendron radiatum	Bio-Itza-NEEDS-ID-ARACEAE-138pm-Jun- 24-2021-NH_6784.JPG
01:39 pm	Sendero el Limón, en Reserva Natural Bio Itzá		Zygia peckii	Bio-Itza-NEEDS-ID-Zygia-species- cauliflorous-tree-flowers-Trail-Lemon-Peten- RBM-iPhone-12pro-139pm-Jun-24-2021-NH
01:44 pm	Sendero el Limón, en Reserva Natural Bio Itzá		Flor de color Rosado nacido sobre un arbusto	;?
01:50 pm	Sendero el Limón, en Reserva Natural Bio Itzá		Zygia peckii	NEEDS-ID-Zygia-species-cauliflorous-tree- flowers-Bio-Itza-Trail-Lemon-NikonD810- 150pm-Jun-24-2021-NH Zygia-peckii-white-flowers-on-trunk- Reserva-Bio-Itza-Sendero-Limon-Peten- RBM-Jan-24-2021-DA
01:57 pm	Sendero el Limón, en Reserva Natural Bio Itzá		Zygia peckii Fruit	Zygia-peckii-brown-pod-on-trunk-Reserva- Bio-Itza-Sendero-Limon-Peten-RBM-Jun-24- 2021-DA
02:04 pm	Sendero el Limón, en Reserva Natural Bio Itzá			Bio-Itza-NEEDS-ID-tree-trunk-bark-iPhone- 12pro-204pm-Jun-24-2021-NH
02:10 pm	Sendero el Limón, en Reserva Natural Bio Itzá		Fruto pequeño con florecitas blancas de 4 petalos	;?
02:16 pm	Sendero el Limón, en Reserva Natural Bio Itzá		Ceiba pentandra	Bio-Itza-Ceiba-pentandra-young-Trail- Lemon-Peten-RBM-iPhone-12pro-216pm- Jun-24-2021-NH
02:20 pm	Sendero el Limón, en Reserva Natural Bio Itzá		Bursera simaruba	Bio-Itza-Bursera-simaruba-Palo-de-Jiote- Trail-Lemon-Peten-RBM-iPhone-12pro- 130pm-and-220pm-Jun-24-2021-NH
02:25 pm	Sendero el Limón, en Reserva Natural Bio Itzá		Heliconia spissa	Bio-Itza-Heliconia-spissa-Trail-Lemon-Peten- RBM-iPhone-12pro-225pm-Jun-24-2021-NH Heliconia-spissa-flower-yellow-orange- green-Road-to-Reserva-Bio-Itza-Peten-RBM- Jun-24-2021-DA

Hora en que se tomó la fotografía	Nombre Local del Lugar de donde se tomó la fotografía	Km local del lugar y/o coordenadas	Notes by Byron	Folder Name [s]
02:25 pm	Sendero el Limón, en Reserva Natural Bio Itzá		Flor roja	;?
02:27 pm	Sendero el Limón, en Reserva Natural Bio Itzá		Flor amarilla	;?
02:27 pm 02:35 pm	Sendero el Limón, en Reserva Natural Bio Itzá		Pistia stratiotes NOT NATIVE	Bio-Itza-aguada-Trail-Limon-Peten-RBM- Pistia-stratiotes-water-lettuce-iPhone- 12pro-235pm-Jun-24-2021-NH
02:44 pm	Sendero el Limón, en Reserva Natural Bio Itzá		Costus scaber	NEEDS-ID-Costus-sp-Bio-Itza-RBM-Peten- Google-Pixel-4a-244pm-Jun-24-2021-NH
02:58 pm	Sendero el Limón, en Reserva Natural Bio Itzá		Manilkaria zapota	Bio-Itza-NEEDS-ID-chicle-tree-trunk-Trail- Lemon-iPhone-12pro-258pm-Jun-24-2021- NH
03:18 pm	Bio Itzá		Calliandra tergemina	NEEDS-ID-Calliandra-flower-Bio-Itza-RBM- Peten-Google-Pixel-4a-318pm-Jun-24-2021- NH
03:25 pm	Parking lot near Bio Itzá camp		Aechmea bracteata	Bio-Itza-NEEDS-ID-Bromelia-Peten-parking- lot-iPhone-12pro-325pm-Jun-24-2021-NH Aechmea-bracteata-bromeliad-red-flower- entrance-Reserva-Bio-Itza-Peten-RBM-Jun- 24-2021-DA
03:26 pm	Leaving camp		Pimienta dioica	Bio-Itza-Road-to-Bio-Itza-Pimenta-dioica- pimienta-gorda-allspice-peeling-bark-Peten- RBM-iPhone-12pro-2pm-326pm-Jun-24- 2021-NH

References Cited and Suggested Reading on Bio Itzá

Most helpful monographs on this Biotopo:

There is no monograph on Bio Itzá that we have yet found. These trees, plants, and ecosystems of this area certainly deserve more attention in Guatemala and adjacent countries

Part 1 Bio Itzá

PRIMACK, Richard B. (editor)

1999 La selva Maya: conservación y desarrollo
 Figure 21.1 shows the location of the Bio Itzá reserve and the different parts.

PRIMACK, Richard B., BRAY, David and Hugo A. GALLETTI

2013 Timber, Tourists, and Temples: Conservation and Development.

Part 2

Ethnohistory of the Petén Itzá people

AVENDAÑO y Loyola, Andrés de

1696 Relación de las dos entradas que hize ala conversión de los gentiles Itzaex y Cehachez. Handwritten manuscript, Newberry Library, Edward E. Ayer Collection, Manuscrito 1040, Chicago.

AVENDAÑO y Loyola, Andrés de

1987 Relation of Two Trips to Peten. Made for the Convertion of the Heathen Ytzaez and Cehaches, Frank E. Comparato (ed.), California, Labyrinthos, 1987.

AVENDAÑO y Loyola, Andrés de

1996 Relación de las dos entradas que hice a la conversión de los gentiles ytzáex,
y cehach, Temis, Vayhinger-Scheer (ed.), Mexicon, Occasional Publications, núm.
3, Möckmühl, Verlag Anton Saurwein, 1996

CASO Barrera, Laura

Hacia la Conquista del itzá. Idolatría y rebelión: comunidades mayas en el siglo XVII. En Andes, Nº 9: 69-93. Salta, Universidad Nacional de Salta.

HELLMUTH, Nicholas M.

1970 Bibliography of 16th-20th century Maya, Southern Lowlands, Chol, Chol Lacandon, Yucatec Lacandon, Itza, and Mopan. KATUNOB.

HELLMUTH, Nicholas M.

Bibliography of 16th-20th century Maya, Southern Lowlands, Chol, Chol Lacandon,
 Yucatec Lacandon, Itza, and Mopan. Anthropology, Archaeology Series, No. 2,
 University of Northern Colorado, Museum of Anthropology, Greeley, Colorado.

These two bibliographies are identical except for the design of the front cover and which area of the University of Northern Colorado published it (their Museum of Archaeology or KATUNOB a series of a professor at the university).

JONES, Grant D.

1992 The Canek Manuscript in Ethnohistorical Perspective", in Ancient Mesoamerica, núm. 3, 1992, pp. 243-268.

JONES, Grant D.

1998 The Conquest of the Last Maya Kingdom. Stanford University Press.

He graciously credits the work of my ethnohistorical research, plus my map of the town of Flores; everything from FLAAR is nicely cited to Nicholas Hellmuth.

MEANS, Philip A.

1974 History of the Spanish Conquest of Yucatan and of the Itzas, Nueva York, Kraus Reprint Co., 1974.

RUZ, Mario Humberto

1994 El Conquistador y el jurisconsulto. Testimonios sobre el Itzá., pp. 335-395 in Estudios de Cultura Maya, vol. XIX, México, CEM,IIF, UNAM, 1994

VILLAGUTIERRE y Soto-Mayor, Juan de

1933 Historia de la conquista de la provincia de El Itza, reducción y progresos de la de El Lacandón y otras naciones de indios bárbaros de la mediación de el Reyno de Guatimala a las Provincias de Yucatán, en la América Septentrional, Guatemala, Biblioteca Goathemala.

Part 3

Bibliography on Peten Itza Maya language and ethnobotany

ATRAN, Scott, LOIS, Mimena and Edilberto UCAN Ek'

2004 Plants of the Peten Itza' Maya. Museum of Anthropology, Memoirs, Number 38, University of Michigan. 248 pages.

Very helpful and nice collaboration with local Itza' Maya people. But would help in the future to have a single index that has all Latin, Spanish, and English plant names so that you can find plants more easily. Suzanne Cook's Lacandon ethnobotany index is significantly easier to use.

HOFLING, C. A., TESUCÚN, F. F.

1997 Itzaj Maya-Spanish-English dictionary (N.A.). Salt Lake City, Utah: Univ. of Utah Press.

Part 4 Generic Suggested Reading about Trees of Petén or surrounding areas

ARELLANO Rodríguez, J. Alberto, FLORES Guido, José Salvador, TUN Garrido, Juan and M. M. CRUZ Bojórquez

2003 Nomenclatura, forma de vida, uso, manejo y distribución de las especies vegetales de la Península de Yucatán. Etnoflora Yucatanense Fascículo 20. Universidad Autónoma de Yucatán, UADY. 815 pages.

ATRAN, Scott, LOIS, Mimena and Edilberto UCAN Ek'

2004 Plants of the Peten Itza' Maya. Museum of Anthropology, Memoirs, Number 38, University of Michigan. 248 pages.

Very helpful and nice collaboration with local Itza' Maya people. However, it would help in the future to have a single index that has all Latin, Spanish, and English plant names so that you can find plants more easily. Suzanne Cook's Lacandon ethnobotany index is significantly easier to use.

BALICK, Michael J., NEE, Michael H. and Daniel E. ATHA

2000 Checklist of the Vascular Plants of Belize: With Common Names and Uses. Memoirs of the New York Botanical Garden Vol. 85. 246 pages.

BLAKE, S. F.

1919 Native names and uses of some plants of Eastern Guatemala and Honduras. Spring. Economic Survey Mission of the United States State Department.

Download: https://repository.si.edu/bitstream/handle/10088/27024/usnh_0024.04.pdf

CHIZMAR, Carla

2009 Plantas Comestibles de Centroamérica. Instituto Nacional de Biodiversidad (INBio). Santo Domingo de Heredia. Costa Rica. 360 pages.

Download: www.museocostarica.go.cr/descargas/PlantasComestiblesCA-VE.pdf

CONABIO

n.d Listado de algas y plantas presentes en Ría Lagartos (Las Coloradas), Yucatán. (CONABIO, anexo 3).

This is just Anexo 3; the rest of the report is splattered in a dozen other PDFs. But this Anexo 3 had six species of *Croton* listed.

Download: www.conabio.gob.mx/conocimiento/manglares/doctos/anexos/PY71_Anexo_3.pdf

DIX, Margaret A. and M. W. DIX

1992 Recursos biológicos de Yaxhá-Nakúm-Yaloch. 54pp.

This is one of the sources for the tree list portion of CONAP's Plan Maestro reports on Yaxha in the past decade. Unfortunately the Dix and Dix list is rather limited. The 1999 Schulze and Whitacre list for Tikal is more complete (but all these lists need more field work to improve).

We have asked several times for a copy of the original Dix and Dix report, but have never received one

ESTRADA Loreto, Feliciana

2010 Indicadores ecológicos de la zona riparia del Río San Pedro, Tabasco, México. MS Thesis, El Colegio de la Frontera Sur. 131 pages.

ecosur.repositorioinstitucional.mx/jspui/bitstream/1017/1656/1/100000050585_documento.pdf

GARCIA de Miguel, Jesus

2000 Etnobotanica Maya: Origen y evolución de los Huertos Familiares de la Península de Yucatán, México.

GOODWIN, Z. A., LÓPEZ, G. N., STUART, N., BRIDGEWATER, G. M., HANSTON, E. M., CAMERON, I. D., MICHELAKIS, D., RATTER, J. A., FURLEY, P. A., KAY, E., WHITEFOORD, C., SOLOMON, J. LLOYD, A. J. and D. J. HARRIS

2013 A checklist of the vascular plants of the lowland savannas of Belize, Central America. Phytotaxa 101 (1): 1–119.

Download: www.eeo.ed.ac.uk/sea-belize/outputs/Papers/goodwin.pdf

GUERRA-Centeno, Dennis, VALDEZ-Sandoval, Carlos, OROZCO-Acevedo, Dennis and Héctor FUENTES-Rousselin

2016 Guía para la identificación de especies de árboles y arbustos comunes en el agropaisaje de Guatemala. 206 pages.

IBARRA-Manríquez, Guillermo, VILLASEÑOR, José Luis and Rafael DURÁN García

1995 Riqueza de especies y endemismo del componente arbóreo de la Península de Yucatán, México. Bol. Soco Bot. México 57: 49-77.

Download:

www.researchgate.net/publication/306128522_Riqueza_de_especies_y_endemismo_del_ componente_arboreo_de_la_Peninsula_de_Yucatan_Mexico

LUNDELL, Cyrus L.

1937 The Vegetation of Peten. Carnegie Institution of Washington, Publ. 478. Washington. 244 pages.

LUNDELL, Cyrus L.

2008 Plants Probably Utilized by the Old Empire Maya of Peten and Adjacent Lowlands. Papers of the Michigan Academy of Sciences, Arts and Letters 24, Part I:37-59.

PARKER, Tracey

2008 Trees of Guatemala. The Tree Press. 1033 pages.

Although more than half the book is copy-and-paste from Flora of Guatemala, it helps to have 99% of the trees of Guatemala in one single volume. And, since the Parker book is from 2008, it has additional information for some trees

SCHULZE, Mark D. and David F. WHITACRE

1999 A Classification and Ordination of the Tree Community of Tikal National Park, Peten, Guatemala. Bulletin of the Florida Museum of Natural History. Vol. 41, No. 3, pp. 169-297.

Even though from 20 years ago, it's the best list of trees of Tikal that I have found. There is a web site with plants of Tikal but they are not separated into trees, vines, shrubs, etc., so it is harder to use. The new monograph on *Arboles de Calakmul* is better than anything available so far on Tikal (and the nice albeit short book by Felipe Lanza of decades back on trees of Tikal is neither available as a scanned PDF nor as a book on Amazon or ebay).

STANDLEY, Paul C. and Samuel J. RECORD

1936 The Forests and Flora of British Honduras. Field Museum of Natural History. Publication 350, Botanical Series Volume XII. 432 pages plus photographs.

STANDLEY, Paul C.

1923 Trees and Shrubs of Mexico. Contributions from the United States National Herbarium, Volume 23, Part 3. Smithsonian Institution.

In this one monograph the species are not listed in alphabetical order, so it's a . mental adventure finding the species you are looking for.

All monographs by Standley and co-authors can be easily found and downloaded. I would recommend finding the .pdf versions as they are easier to store, easier to copy, and easier to share with students and colleagues.

STANDLEY, Paul C. and Julian A. STEYERMARK

1949 Flora of Guatemala. Fieldiana: Botany, Volume 24, Part VI, Chicago Natural History Museum.

VILLASEÑOR, José Luis

2016 Checklist of the native vascular plants of MexicoCatálogo de las plantas vasculares nativas de México. Revista Mexicana de Biodiversidad 87 (2016) 559–902.

http://revista.ib.unam.mx/index.php/bio/article/view/1638/1296



Google Maps 2021; CONRED - Amenaza por deslizamientos e inundaciones, 1701 Rainforest Alliance 21 Oct 2015; CONAP -Sistema de Información Geográfica, Centro de Monitoreo y Evaluación

Helpful web sites for any and all plants

There are several web sites that are helpful even though do not belong to a university or botanical garden or government institute.

However most popular web sites are copy-and-paste (a polite way of saying that their authors do not work out in the field, or even in a botanical garden). Many of these web sites are click bait (they make money when you buy stuff from the advertisements along the sides and in wide banners. So we prefer to focus on web sites that have reliable information.

https://serv.biokic.asu.edu/neotrop/plantae/

Neotropical Flora data base. To start your search click on this page: https://serv.biokic.asu.edu/neotrop/plantae/ collections/harvestparams.php

http://legacy.tropicos.org/NameSearch. aspx?projectid=3

This is the main SEARCH page.

https://plantidtools.fieldmuseum.org/pt/rrc/5582 SEARCH page, but only for the collection of the Field Museum herbarium, Chicago.

https://fieldguides.fieldmuseum.org/ guides?category=37

These field guides are very helpful. Put in the Country (Guatemala) and you get eight photo albums.

http://enciclovida.mx

CONABIO. The video they show on their home page shows a wide range of flowers pollinators, a snake and animals. The videos of the insects are great. www.kew.org/science/tropamerica/

imagedatabase/index.html

Kew gardens in the UK is one of several botanical gardens that I have visited (also New York Botanical Gardens and Missouri Botanical Gardens -MOBOT-, in St Louis. Also the botanical garden in Singapore and El Jardín Botánico, the open forest botanical garden in Guatemala City).

www.ThePlantList.org

This is the most reliable botanical web site to find synonyms. In the recent year, only one plant had more synonyms on another botanical web site.



ACKNOWLEDGEMENTS TO FLAAR MESOAMÉRICA

The reports are a joint production between the field trip team and the in-house office team. So here we wish to cite the full team:

Flor de María Setina is the office manager, overseeing all the diverse projects around the world (including FLAAR-REPORTS research on advanced wide-format digital inkjet printers, a worldwide project for over 20 years). We also utilize the inkjet prints to produce educational banners to donate to schools.

Vivian Díaz environmental engineer, is project manager for flora, fauna projects (field work and resulting reports at a level helpful for botanists, zoologists and ecologists, and for university students). Also coordinates activities at MayanToons, division where educational material for kids is prepared.

Victor Mendoza identifies plants, mushrooms, lichen, insects, and arachnids. When his university schedule allows, he also likes to participate in field trips on flora and fauna research.

Vivian Hurtado prepares the bibliography for each subject and downloads pertinent research material for our e-library on flora and fauna. All of us use both these downloads plus our in-house library on flora and fauna of Mesoamerica (Mexico through Guatemala into Costa Rica).

Sergio Jerez prepares the bibliography of each topic and download the pertinent research material for our electronic library on flora and fauna. We all use these two downloads plus our internal library on Mesoamerican flora and fauna (Mexico through Guatemala to Costa Rica).

Andrea de la Paz is a designer who helps prepare the masterplan for aspects of our publications. She is our editorial art director

Senaida Ba is photography assistant for many years. She knows the Canon, Nikon and is learning the two new Sony mirrorless cameras. She prepares, packs, sets-up, and helps the photographers before, during, and after each day's field trip.

Jaqueline González is a designer who puts together the text and photographs to create the actual report (we have several designers at work since we have multiple reports to produce).

Roxana Leal is Social Media Manager for flora and fauna research and publications, and MayanToons educational book projects

María Alejandra Gutiérrez is an experienced photographer, especially with the Canon EOS 1D X Mark II camera and 5x macro lens for photographing tiny insects, tiny flowers, and tiny mushrooms. Work during and after a field trip also includes sorting, naming, and processing. And then preparing reports in PDF format.

David Arrivillaga is an experienced photographer and is able to handle both Nikon and the newest Sony digital cameras. Work during and after a field trip also includes sorting, naming, and processing. Juan Carlos Hernández takes the material that we write and places it into the pertinent modern Internet software to produce our web pages (total network is read by over half a million people around the world).

Paulo Núñez is a webmaster, overlooking the multitude of web sites. Internet SEO changes every year, so we work together to evolve the format of our web sites.

Valeria Áviles is an illustrator for MayanToons, the division in charge of educational materials for schools, especially the Q'eqchi' Mayan schools in Alta Verapaz, Q'eqchi' and Petén Itzá Maya in Petén, and the Q'eqchi' Mayan and Garifuna schools in the municipality of Livingston, Izabal.

Josefina Sequén is illustrator for MayanToons and also helps prepare illustrations for Social Media posts and for animated videos.

Rosa Sequén is also an illustrator for MayanToons and also helps prepare illustrations for Social Media posts and for animated videos.

Laura Morales is preparing animated videos in MayanToons style since animated videos are the best way to help school children how to protect the fragile ecosystems and endangered species

Heidy Alejandra Galindo Setina joined our design team in August 2020. She likes photography, drawing, painting, and design.

Maria José Rabanales she is part of the team for editing photographic reports and educational material of Flora and Fauna since September 2020. She works together with others of the team to prepare the finished pdf editions of the material of the Yaxha, Nakum and Naranjo Project.

Alejandra Valenzuela biology student is now part of Flora y Fauna's photographic report and educational material editing team since September 2020.

Alexander Gudiel designer who join the editorial design team on December 2020. He will combine the text, pictures and maps into the FLAAR Mesoamerica editorial criteria.

Cristina Ríos designer student who join the editorial design team on December 2020. He will combine the text, pictures and maps into the FLAAR Mesoamerica editorial criteria.

Carlos Marroquín is a USAC graphic design student who volunteered to do his professional practice with the Editorial Design Team. We are very grateful with people like him who join our team and bring his knowledge and work.

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CECON, CONAP, FUNDAECO, INGUAT, ARCAS, IDAEH, Municipio de Livingston, etc. are welcome to publish our reports, at no cost.

All national parks, nature reserves, and comparable are welcome to have and use our reports at no cost.

To publish photographs

Hellmuth's photographs have been published by National Geographic, by Hasselblad Magazine, and used as front covers on books on Mayan topics around the world. His photos of cacao (cocoa) are in books on chocolate of the Maya and Aztec both by Dr Michael Coe (all three of editions) and another book on chocolate by Japanese specialist in Mayan languages and culture, Dr Yasugi. We naturally appreciate a contribution to help cover the costs our office expenses for all the cataloging, processing, and organization of the photos and the field trip data.

For your social media

You can post any of the FLAAR Mesoamerica PDFs about the Municipio of Livingston on your Social Media sites; you can send any of these PDFs to your friends and colleagues and family: no cost, no permission needed.

We hope to attract the attention of professors, botanical garden clubs, orchid and bromeliad societies, students, tourists, experts, explorers, photographers and nature lovers who want to get closer, to marvel at the species of flowering plants, mushrooms and lichen that FLAAR Mesoamerica finds during each field trip each month.

PHOTO FROM BACK COVER

Photo by: David Arrivillaga. FLAAR Mesoamerica, Jun. 24, 2021. Road to Bio itza, Petén. Camera: Sony Alpha A9 II. Lens: Sony FE Macro. Settings: 1/320 sec; f/8; ISO 2,500.

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