



FLAAR
MESOAMÉRICA

WETLANDS #17

EDIBLE MANGROVE FERN

— *Acrostichum aureum* —

Municipio de Livingston,
Izabal, Guatemala

NICHOLAS HELLMUTH

EDIBLE MANGROVE FERN

— *Acrostichum aureum* —

Municipio de Livingston,
Izabal, Guatemala



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Acrostichum aureum.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Dec. 12, 2021, 10:17 a.m. Río Blanco, Livingston, Izabal. Camera: iPhone 13 Pro Max.

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Acrostichum aureum.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Dec. 12, 2021, 10:24 a.m. Río Blanco, Livingston, Izabal. Camera: iPhone 12 Pro Max.



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Edible Wetlands Plants of Municipio de Livingston, Izabal

Wetland Series 1: from Swamps, Marshes and Seasonally Inundated Flatlands of Izabal



Wetland Series 2: plants that grow along the beach shore of Amatique Bay



Wetland Series 3: plants that grow alongside water: rivers, lagoons, swamps, or ocean





GLOSSARY

Ferns: (class Polypodiopsida), are a class of nonflowering yet vascular plants that possess true roots, stems, and complex leaves (but they have no flowers or seeds). Ferns reproduce by spores.

Plants: any of a kingdom Plantae of multicellular eukaryotic mostly photosynthetic organisms typically lacking locomotive movement or obvious nervous or sensory organs and possessing cellulose cell walls.

Bajo: is a low forest over totally flat land. Bajos often have a few centimeters of standing water in the wet season. In the dry season they are dry to the point that the ground has the typical surface fissures of completely dried mud. So a bajo is a seasonally inundated wetland. If the bajo has palo de tinto it is called a tinal. But there are lots of bajos with few and often no logwood whatsoever. Bajos occupy a lot of the land of Petén (the rest are hills that have different vegetation, usually with tall trees). That said, some bajos do have occasional tall trees.

Ciénaga: area pantanoso, soft mud, wet, and often a bog or swamp or marsh.

Manglar: is Spanish for mangrove swamp. Each area of each coast has slightly different mangrove species. In the Municipio de Livingston the most common mangrove is the mangle rojo. Black mangrove is also present in Izabal coastal areas. Rio San Pedro (Petén) is an inland area that surprises us all with its mangrove trees.

Marsh: usually has water all year but has no total tree cover. Grasses, reeds and low plants are more common; plus, underwater plants and floating plants. If there are trees everywhere, then I consider it a swamp.



GLOSSARY

Pantano: could be considered a Spanish translation of marsh, so lots of reeds and grasses (but not many trees). If the area is a forest with water at the foot of every tree, then it is a swamp. The definition of each of these words depends a bit whether you are in the wetlands of Tabasco, or Rio San Pedro (western Peten), or near Monterrico (inland from Pacific Ocean coast of Guatemala) or in the Municipio de Livingston or in Petén.

Riperian: the bank of a river or stream. In a location such as the Municipio de Livingston, it would help to have a single word for the bank of a river, stream, and lagoon. I will use shoreline or comparable.

Swamp: usually has water all year but has lots of trees. During the rainy season the water simply gets deeper. Petén has more marshes than swamps; Izabal has both. You get mangrove swamps all around the Caribbean coast and parallel to the Pacific Ocean coast (several impressive mangrove swamp areas inland from the Pacific coast of Guatemala).

Swampo: is the way this is pronounced in the Caribbean area of Guatemala.

Wetlands or Wetland: to me is a generic word to cover swamps, marshes, rivers, lakes, lagoons and seasonally inundated areas (including bajos, savannas, cibles, etc.). Each ecologist and geographer and botanist use their own academic terms. But, Holdridge (initiator of life zone systems concept) never hiked through the Savanna of 3 Fern Species nor the Savanna East of Nakum (PNYNN) nor took a boat up all the rivers entering into El Golfete. And if he cruised up Arroyo Petexbatún, he (and Lundell and all other capable scholars who accomplished fieldwork in Petén) did not get out of their seats on the lancha to hike through the tinal swamps to see what was 100 to 200 meters inland (namely the two tasistal areas that FLAAR has documented).

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LIFE
ON LAND



Life on land is the Sustainable Development Goal (number 15 of the United Nations proposal) which claims to ensure the conservation of terrestrial and freshwater ecosystems. Municipio de Livingston has multiple natural protected areas that includes tropical rain forests and species associated to rivers.



Acrostichum aureum.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Dec. 12, 2021, 10:17 a.m. Río Blanco, Livingston, Izabal.
Camera: iPhone 13 Pro Max.

INTRODUCTION TO ***ACROSTICHUM AUREUM* FERNS**

This fern was included in my 13th edition e-publication on edible and useable plants of the Maya; where I cite Fedick 2010 as the source. But since there are “hundreds if not thousands” of plants that I have been studying in the current two decades, I did not pay attention to this fern until I began to focus on edible plants of the wetlands of the Municipio de Livingston.

Then I found Fedick’s article again (since I have multiple thousands of PDFs in my huge e-library). And after looking up this plant I realized that it probably was one of the giant ferns that we have seen along Taponcito Creek (going from Amatique Bay up Tapon Creek to turn north onto Taponcito Creek to the FUNDAECO nature reserve towards the end of this creek). The snag is that there are two species of mangrove ferns: *Acrostichum aureum* and *Acrostichum daneaefolium*.

So I began doing more research since we wish to publish an entire series on edible plants of the swamps and marshes; and an additional series on edible plants from trees that grow directly along the edges of swamps, rivers, and lagoons.

Most botanical descriptions do not provide ethnobotanical information (in other words, nothing on uses by local indigenous people). But enough botanists do to allow us to recognize that *Acrostichum aureum* ferns are potentially edible and thus a source of food that requires no cultivation, no engineering of raised fields, etc. However I estimate that *Acrostichum aureum* ferns may grow most efficiently along the edge of seasonally elevated rivers. *Acrostichum daneaefolium* we found in a seasonally flooded agada area (named Aguada Maya or Poza Maya, partially formed by the Maya over a thousand years ago). In January 2022 I was surprised to find tall ferns on the northern edge of Spider Lily Savanna (southeastern area of Parque Nacional Laguna del Tigre, PNLT). We have not yet identified these tall ferns.

FULL BOTANICAL NAME

- *Acrostichum aureum* (L.) Copel. is the accepted name.
- Familia Polypodiaceae (Stolze 1981)
- Familia Pteridaceae (Villaseñor 2016: 583)
- Familia Pteridaceae (ThePlantList.org)
- Familia Adiantaceae (Balick , Nee y Atha 2000)

I welcome comments from botanists for what is the appropriate family name for genus *Acrostichum*. The most recent sources use Pteridaceae.

LOCAL NAMES FOR **ACROSTICHUM AUREUM**

- Helecho de playa (Colombia)
- Helecho de pantano
- Helecho mangle

Golden leather fern, swamp fern (and other names depend whether you are in a botanical garden or a commercial garden or out in the wetlands). Same or similar names for *Acrostichum danaeifolium*.

***Acrostichum aureum*.**

Photo by: María Alejandra Gutiérrez, FLAAR Mesoamerica, Apr. 19, 2021, 10:17 a.m. Tapón Creek, Livingston, Izabal. Camera: Canon EOS-1D X Mark II C. Settings: 1/1000; sec; f/8; ISO 2,500.



HERE ARE SYNONYMS FOR **ACROSTICHUM AUREUM**

- *Anapeltis lycopodioides* (L.) J. Sm.
- *Drynaria lycopodioides* (L.) Fée
- *Acrostichum aureum* f. *subdimorpha* (Christ) L.D. Gómez
- *Niphobolus lycopodioides* (L.) Keyserl.
- *Phlebodium lycopodioides* (L.) J. Sm.
- *Phymatodes lycopodioides* (L.) Millsp.
- *Phymatodes prominula* Maxon
- *Pleopeltis lycopodioides* (L.) C. Presl
- *Polypodium lycopodioides* L.
- *Polypodium lycopodioides* var. *longipes* Hassl.
- *Polypodium lycopodioides* f. *obtusum* Domin
- *Polypodium lycopodioides* var. *stipitatum* Bosco
- *Polypodium lycopodioides* var. *subdimorphum* Christ
- *Polypodium pellitum* Willd. ex Kaulf.
- *Polypodium prominulum* (Maxon) C. Chr.
- *Polypodium salicinum* Wikstr.
- *Polypodium venulosum* Desv.

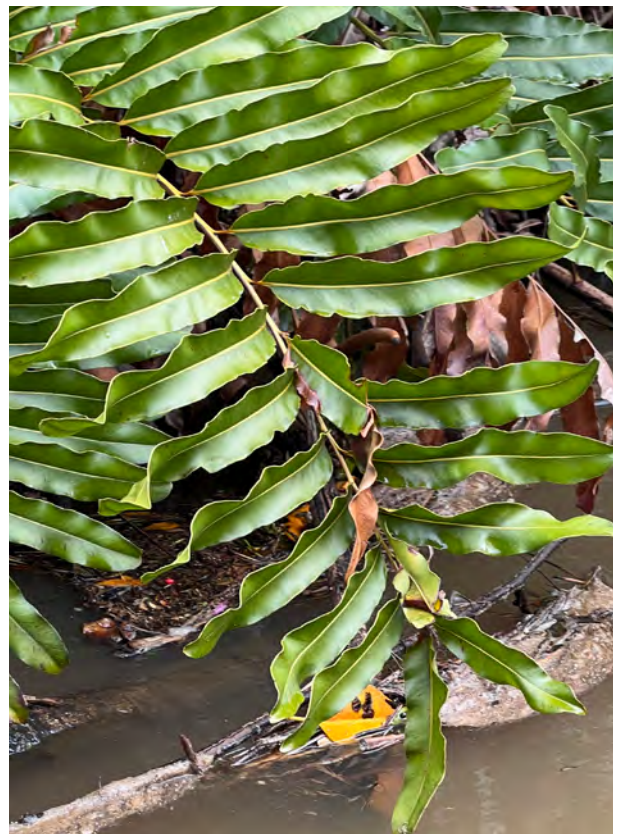
(www.theplantlist.org/tpl1.1/record/tro-26602318)

MAYAN NAMES FOR **ACROSTICHUM AUREUM**

- Not yet found

HABIT FOR *ACROSTICHUM AUREUM* FERNS

- Fern.



Acrostichum aureum

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Dec. 12, 2021, 10:17 a.m. Río Blanco, Livingston, Izabal. Camera: iPhone 13 Pro Max.

HABITAT FOR ***ACROSTICHUM AUREUM*** FERNS

The Swamp Fern grows in pantropical habitats, generally in areas with low water levels and on the shores of mangroves, swamps and marshes,...

[Original text in spanish]

Where I have seen these ferns they are along the edge of a river, in the edge of a swamp or marsh. Their roots are not under water the entire year. Each part of the coast has different ecosystems; sometimes the two species of *Acrostichum* are near each other; other times not. Now that I have learned a lot in my library research, we need to return to the Municipio de Livingston and see which of the two species are present, and in which ecosystems. It is my initial impression that *Acrostichum aureum* survives shade better than *Acrostichum daneaefolium*. The ferns that we found in mid-December 2021 were in brackish water at the entrance of Creek Blanco across from the town of Livingston. The water here is definitely brackish since Amatique Bay is a few meters away.



Acrostichum aureum.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Dec. 12, 2021, 10:22 a.m. Río Blanco, Livingston, Izabal.
Camera: iPhone 13 Pro Max.



Acrostichum aureum.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Dec. 12, 2021, 10:30 a.m. Río Blanco, Livingston, Izabal.
Camera: iPhone 12 Pro Max.



Acrostichum aureum.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Dec. 12, 2021, 10:22 a.m. Río Blanco, Livingston, Izabal.
Camera: iPhone 13 Pro Max.

BOTANICAL DESCRIPTION OF FERNS IN STANDLEY AND CO-AUTHORS CHICAGO BOTANICAL MONOGRAPHS

Acrostichum daneaefolium Langsd. & Fisch. Icon. Fil. 1: 5, t. 1.1810. *A. excelsum* Maxon, Proc. Biol. Soc. Wash. 18: 224. 1905. In mangrove swamps, marshes, or muddy banks of rivers or lakes, sea level to 1,200 m.; Escuintla; Guatemala; Izabal. Florida; West Indies; Mexico to Panama; Colombia to the Guianas, south to Bolivia and Paraguay. Rhizome scales not seen; leaves to 3 m. long (in ours); petiole yellowish to reddish brown, usually much shorter than the lamina; lamina 20-60 cm. broad, glabrous adaxially, copiously but minutely pilose abaxially, oblong or elliptic, most pinnae (not just the distal ones) of fertile laminae bearing sporangia; pinnae numerous, sharply ascending to (rarely) spreading, stalked to (distally) adnate, the proximal ones widely spaced, the rest crowded to (more commonly) imbricate, broadly to sharply cuneate at base, obtuse to (more commonly) acute, lanceolate to narrow-elliptic, margins plane, entire, cartilaginous; areoles aligned at 60-90 angles to the costa, the costal ones as broad or broader than long, also mostly oriented obliquely or perpendicularly to the costa; paraphyses numerous, light or dark brown, small (but many times larger than the spores), mostly borne on thin stalks and oblong or allantoid, commonly crispate on dried specimens. This and *A. aureum* are often difficult to separate as dried specimens, for the leaves are quite large, and few collectors include enough of the lamina to exhibit all of the diagnostic features. If only the central or proximal portions of lamina are mounted, the crowded to imbricate distal pinnae of *A. daneaefolium* will not be evident, or if only the distal portion of a fertile lamina is mounted, it may not be determined if the next, missing, pinnae are also fertile (*A. daneaefolium*) or sterile (*A. aureum*). In this case, two other characters, discerned even on a single sterile pinna, may be helpful. On Guatemalan specimens (and on most of the others I have examined) leaves of *A. aureum* are glabrous, whereas in *A. daneaefolium* the abaxial surface is minutely but amply strigose. Some authors have attempted to separate the two species on the angle at which the areoles are aligned on the pinnae. I have not found this to be consistent enough throughout the breadth of the pinnae, but it appears to be an effective character when applied strictly to the costal areoles; i.e., those of *A. daneaefolium* are broad and mostly spreading obliquely from or perpendicular to the costa. In *A. aureum* most of the basal veins spring from the costa and run alongside it before merging with the adjacent vein, or often simply rejoining the costa in any case, the areoles thus formed are long and narrow and are oriented parallel to the costa.

(Stolze 1981: 13 -14)

ACROSTICHUM AUREUM FERNS IN BELIZE: STANDLEY AND RECORD

POLYPODIACEAE. Polypody Family

ACROSTICHUM L.

Acrostichum danaeifolium Langsd. & Fisch.

Acrostichum aureum L. A large coarse fern of salt marshes.

(Standley and Record 1936: 61)

ADIANTACEAE

Acrostichum aureum L. — **Loc Use:** FOOD, MED. — **Nv:** helecho, tiger bush.

— **Habit:** Fern. ***Acrostichum danaeifolium*** Langsd. & Fisch. — **Habit:** Fern

(Balick, Nee and Atha 2000: 43).

ACROSTICHUM AUREUM MENTIONED IN FLORA OF YUCATAN, STANDLEY

In Flora of Yucatan only *Acrostichum danaeifolium* Langsd. & Fisch. Is mentioned by Standley (1930: 194):

Without locality, Gaumer 24348. A large coarse fern with simply pinnate leaves, growing usually in open swamps, in shallow water.

Villaseñor provides more up-to-date information about how many parts of Mexico you can find both species.

Acrostichum danaeifolium Langsd. & Fisch. CAM, CHIS, COL, GRO, JAL, MICH, NAY, OAX, QRO, QROO, SLP, TAB, TAMS, VER, YUC

(Villaseñor 2016: 583)

WHERE HAS *ACROSTICHUM AUREUM* BEEN FOUND IN THE MUNICIPIO OF LIVINGSTON?

Acrostichum danaeifolium is listed for the Pedernales river, which is a short river that rises north of the Jocoló cove and east of the Pitas river. Its currents are located in the municipality of Livingston, Department of Izabal, Guatemala.

<https://www.maya-ethnobotany.org/rio-dulce-el-golfete-municipio-de-livingston/giant-leather-ferns-acrostichum-danaeifolium-rio-dulce-izabal-guatemala.php>

<https://biodiversidad.gt/portal/collections/list.php?usethes=1&taxa=4989>

> **Is *Acrostichum aureum* listed for Biotopo Protegido Chocón Machacas, CECON/USAC?**

It is not mentioned in the master plan of the area, however in “El Portal de Biodiversidad de Guatemala” it is mentioned that a specimen of *Acrostichum aureum* was obtained in the biotope.

<https://biodiversidad.gt/portal/collections/list.php?usethes=1&taxa=4988>

> **Is *Acrostichum aureum* listed for Tapon Creek Nature Reserve (including Taponcito Creek), FUNDAECO?**

Not mentioned.

> **Is *Acrostichum aureum* listed for El Refugio de Vida Silvestre Punta de Manabique?**

Acrostichum aureum L. only (CONAP 2001); so only this species; not *Acrostichum danaeifolium*.

> **Is *Acrostichum aureum* listed for Ecoalbergue Lagunita Creek (Área de Usos Múltiples Río Sarstún)?**

Not mentioned.

> **Is *Acrostichum aureum* listed for Sarstoon-Temash National Park (northern side of Río Sarstún)?**

Not mentioned.

> **Is *Acrostichum aureum* listed for Bocas de Polochic?**

Here is *Acrostichum danaeifolium* (CONAP 2003: 16) but not *Acrostichum aureum*.



Acrostichum aureum.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Dec. 12, 2021, 10:08 a.m.
Río Blanco, Livingston, Izabal. Camera: iPhone 13 Pro Max.



Acrostichum aureum.

Photo by: María Alejandra Gutiérrez, FLAAR Mesoamerica, Apr. 19, 2021, 10:17 a.m. Tapón Creek, Livingston, Izabal.
Camera: Canon EOS-1D X Mark II C. Settings: 1/1000; sec; f/8; ISO 2,500.

IS *ACROSTICHUM AUREUM* FROM THE HIGHLANDS OR FROM THE LOWLANDS (OR BOTH)?

This is a lowlands plant, normally near the coast.

WORLD RANGE FOR *ACROSTICHUM AUREUM*

Pantropical: Africa, Asia, Americas.

DOES *ACROSTICHUM AUREUM* ALSO GROW IN HOME GARDENS?

This species is used by indigenous cultures in a medicinally, ferns are generally used ornamental form, in gardens, even inside houses.

[Original text in spanish]

<https://diversidadbiologica1upn.wordpress.com/2019/07/05/acrostichum-aureum-l-helecho-de-playa/>

Acrostichum danaeifolium is listed as in huerto familiar in the southeast of Mexico (Mariaca 2012: 53).

Golden leather fern can be grown under high light in garden soil or potting mix, if the substrate is kept constantly wet.

www.naturalista.mx/taxa/136915-Acrostichum-aureum

USES OF **ACROSTICHUM AUREUM**

Acrostichum aureum, edible (Fedick 2010: 953)

For the aquatics listed in the pollen diagram (2), the Cyperaceae family includes foods such as the tubers of chufa or yellow nutsedge (*Cyperus esculentus*) and the roots of the Caribbean spike-rush (*Eleocharis caribaea*). The *Typha* sp. (cattail) listed in the diagram, although not identified as a food plant for the ethnographic Maya, is widely used as an important food source in many cultures around the world. The spore-producing plants listed as *Pteridophyte psilate* monolete can include two species of ferns (*Microgramma lycopodioides* and *Acrostichum aureum*) recognized by the Maya as having edible shoots.

IS THERE POTENTIAL MEDICINAL USAGE OF **ACROSTICHUM AUREUM** BY LOCAL PEOPLE?

Yes, if you search for *Acrostichum aureum* medicinal you will find plenty of results, for example, for Belize (Balick and Arvigo 2015: 104). Plus, medicinal chemists around the world have done lab analysis of *Acrostichum aureum* so you can find plenty of technical articles of the medicinal potential of *Acrostichum aureum*.

ARE ANY PARTS OF **ACROSTICHUM AUREUM** EATEN BY MAMMALS?

The young leaves are eaten, used for fodder for animals.

<https://enciclovida.mx/especies/151266.pdf?from=>

WHAT ARE THE PRIMARY POLLINATORS OF ***ACROSTICHUM AUREUM*** FLOWERS?

Ferns do not have pollinators since they do not produce pollen, their reproduction occurs by spores. Ferns have developed spore expulsion mechanisms so that they reach up to 10m away. The spores move through passive mechanisms such as wind and water, humidity is important for the fertilization of the male and female gametes.

<https://www.investigacionciencia.es/noticias/dispersin-de-esporas-en-los-helechos-10012>



Acrostichum aureum.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Dec. 12, 2021, 10:08 a.m.
Río Blanco, Livingston, Izabal. Camera: iPhone 13 Pro Max.

CONCLUDING DISCUSSION AND SUMMARY **ON *ACROSTICHUM AUREUM* FERNS**

The first people who arrived in remote areas of the Mesoamerica were not the Classic Maya or even Preclassic; there were people living near both the Pacific Ocean and the Caribbean Sea a few thousand years before the Olmecs developed an early civilization in Mexico and the Maya and other civilizations followed in other nearby parts of Mesoamerica. So learning about edible wild plants of wetlands near the oceans is important because the earliest inhabitants did not yet have maize-beans-squash nor root crops, etc. And, once the Preclassic Maya had evolved, they still needed more than just the mythical maize-beans-and-squash to eat. Once the Late Classic arrived, LiDAR claims “millions of Maya occupied the Maya Lowlands” (some claims are a quantity of millions beyond belief). But even if there were only a few million, they needed more than modern milpa agriculture to survive. So it really helps that lots of Mayanists are working on which plants and which ecosystems provided edible plants.

I obviously also study hillsides and hilltop forests. and since I knew Dennis Puleston when he was expanding Cyrus Lundell’s suggestion that ramon nuts of hilly forests were a potential significant Mayan food. But I am increasingly focused on wetlands because not as much research has been on wetlands other than ridged fields and bajos. I am more focused on swamps, marshes, riversides, lakesides, and coastal vegetation, especially in mangrove swamps for the coastal areas of the Municipio de Livingston, Izabal, Guatemala and savannas of the Reserva de Biosfera Maya of Peten. LOTS of plants in these coastal swamps are EDIBLE and NONE REQUIRE AGRICULTURE: just harvest and eat them. *Acrostichum aureum* ferns can be found in the wetlands of the Maya Lowlands areas of Mexico: Campeche, Chiapas, Quintana Roo, Tabasco and Yucatan (obviously especially in coastal mangrove areas and brackish water upstream). *Acrostichum danaeifolium* is often found in comparable areas (Villasenor 2016: 583). And they are a challenge to tell the difference.

[Continues on the next page]

Both are found in Belize and we estimate both are in the Municipio de Livingston. *Acrostichum aureum* is edible; *Acrostichum danaeifolium* is not in this category. While doing library research, hour after hour, day after day, I noticed that 90% of the areas that list *Acrostichum aureum* also list *Acrostichum danaeifolium* as growing in nearby areas (this does not mean they always grow adjacent to each other, though we need to study this aspect in the wetlands that we are visiting each month). For Peten, however, Cyrus Lundell only lists *Acrostichum danaeifolium*; never *Acrostichum aureum*.

However *Acrostichum aureum* grows around outside Peten, in Chiapas, Tabasco, Campeche, Yucatan, Quintana Roo, and Belize. But if *Acrostichum aureum* requires being near the sea or at least brackish water, then perhaps it is not native to Peten. Yet, curiously, Stolze (1981: 13) lists *Acrostichum aureum* for Peten! Unfortunately the Neotropical Flora database has only one lonely specimen for Guatemala, on the Pacific Ocean coast (<https://serv.biokic.asu.edu/neotrop/plantae/collections/list.php>). Very disappointing results; normally this database is very helpful. As a result of noticing that in many areas the two species are nearby yet in other areas only one species is present, the final chapter of this report suggests that students can do to help learn more about the two species.



***Acrostichum aureum*.**

Photo by: David Arrivillaga, FLAAR Mesoamerica, Dec. 12, 2021, 10:23 a.m. Río Blanco, Livingston, Izabal.
Camera: Sony Ag (ILCE-9M2 S. Settings: 1/3200; sec; f/6.8; ISO 2,000.

SUGGESTED FURTHER **FIELDWORK**

Better documentation, such as full-color infographic banners are needed to show “how to distinguish between *Acrostichum danaeifolium* and *Acrostichum aureum*.” Then go out into the swamps and marshes and take both close-up photographs and also panorama photographs of the surroundings (are the plants in water or up on shore; and how does this water level change by month in this location).

SUGGESTED FURTHER **LIBRARY RESEARCH**

Where is each species found? Where is only one found and not the other? Would be helpful for a student to undertake this as a botanical project; and also find all the berbaria databases that can help (Neotropical database was a surprising failure for *Acrostichum aureum* for Guatemala; surely there are several other databases that have more info for this plant).

PLACE	<i>ACROSTICHUM AUREUM</i>	<i>ACROSTICHUM DANAEIFOLIUM</i>	COMMENTS
Central Peten (Lake systems)		<i>Acrostichum danaeifolium</i>	
Rio San Pedro (western Peten)		<i>Acrostichum danaeifolium</i>	
Tikal		<i>Acrostichum danaeifolium</i>	Aguda
PNYNN		<i>Acrostichum danaeifolium</i>	Lagoon
Biotopo Protegido Chocón Machacas	<i>Acrostichum aureum</i>		
Bocas de Polochic		<i>Acrostichum danaeifolium</i>	Not even much brackish water here.
Punta de Manabique	<i>Acrostichum aureum</i>		Plenty of marine water here.
Río Pedernales (Livingston)		<i>Acrostichum danaeifolium</i>	



Acrostichum aureum.

Photo by: David Arrivillaga, FLAAR Mesoamerica, Dec. 12, 2021, 10:23 a.m. Río Blanco, Livingston, Izabal.
Camera: Sony Ag (ILCE-9M2 S. Settings: 1/3200; sec; f/6.8; ISO 2,000.



Acrostichum aureum.

Photo by: David Arrivillaga, FLAAR Mesoamerica, Dec. 12, 2021, 10:24 a.m. Rio Blanco, Livingston, Izabal.
Camera: Sony Ag (ILCE-9M2 S). Settings: 1/800; sec; f/9; ISO 640.

REFERENCES CITED ON *ACROSTICHUM AUREUM* AND SUGGESTED ADDITIONAL READING

Most helpful article on this plant is because it reminded me that *Acrostichum aureum* is edible:

FEDICK, Scott L.

2010 The Maya Forest: Destroyed or cultivated by the ancient Maya? PNAS January 19, 2010 107 (3) 953-954. www.pnas.org/content/107/3/953

Most helpful web sites on this plant:

<https://diversidadbiologica1upn.wordpress.com/2019/07/05/acrostichum-aureum-l-helecho-de-playa/>

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.

Not available as a download.

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CONAP

2003 II PLAN MAESTRO 2003-2007. Plan Maestro del Refugio de Vida Silvestre Bocas del Polochic–RVSBP- . CONAP, Fundación Defensores De La Naturaleza.

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LUNDELL, Cyrus L.

1938 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 1:37-59.

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n.d. *Botánica // Acrostichum aureum* (Pteridaceae). Venezuela.

<https://steemit.com/stem-espanol/@lupafilotaxia/botanica-acrostichum-aureum-pteridaceae>

REYES Morales, Elsa María de Fatima (coordinator)

2009 Los Cuerpos de Agua de la Región Maya Tikal –Yaxhá: Importancia de la Vegetación Acuática Asociada, Calidad de Agua y Conservación. USAC, Programa Universitario de Investigación en Recursos Naturales y Ambiente. PUIRNA.

<http://glifos.senacyt.gob.gt/digital/fodecyt/fodecyt%202008.25.pdf>

RUIZ, CLAUDIA, et al.

2006 Plan Maestro de la Reserva Protectora de Manantiales Cerro San Gil, 2008-2012. Consejo Nacional de Áreas Protegidas (CONAP), Fundación Para el Ecodesarrollo y la Conservación (FUNDAECO), The Nature Conservancy (TNC)

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.

1926 Trees and Shrubs of Mexico. Contributions from the United States National Herbarium, Volume 23, Part 5. 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 Louis O. WILLIAMS

1974 Flora of Guatemala. Fieldiana: Botany, Volume 24, Part X, Numbers 3 and 4, Chicago Natural History Museum.

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HELPFUL WEB SITES FOR **ANY AND ALL PLANTS**

There are several web sites that are helpful even though not of 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 in the advertisements that are all along the sides and in wide banners also. 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 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

Flor de María Setina is the administrator of the office, she is in charge of several projects around the world (since FLAAR-REPORTS has been researching large format printers around the world for over 20 years.)

Vivian Díaz coordinator of the Flora & Fauna and MayanToons projects (publications, results, reports for all audiences and experts on each topic). She is an environmental engineer and for more than six years she has supported us with the organization of each team and the Yaxha and RBM project from 2018 to 2022.

Victor Mendoza Identifies species of flora, fauna and fungi. Participates as a researcher in the office and sometimes on field trips

Vivian Hurtado At first she supported us with the preparation of bibliographies on different topics. From now on, she coordinates the field trips of the MBR 2022 project and supports the management of other Flora & Fauna activities.

Andrea de la Paz is a graphic designer who helps propose art for the overall template and for aspects of our posts.

Senaida Ba Has been our photo assistant for several years. Now she prepares PowerPoint presentations for teachers and students on various topics of Flora, Fauna and Mayan Iconography

Jaqueline González is a designer who diagrams text and photos to create the current reports.

Roxana Leal Bachelor of Communication is the one who manages all our social networks and the digital community. He sometimes accompanies us on field trips because he likes the adventure and nature of Guatemala.

María Alejandra Gutiérrez She is an experienced photographer who today prepares the Photograph Catalogs for the current RBM project. He supported us with the coordination of the trips for the Livingston, Izabal project.

David Arrivillaga is an experienced photographer and can handle both Nikon and the latest Sony digital cameras. Their work during and after a field trip also includes sorting, naming, and processing.

Juan Carlos Hernández receives the material we write and puts it into Internet software to produce our web pages.

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

Valeria Áviles is an illustrator for MayanToons, a division in charge of educational material for schools, especially the Mayan Q'eqchi' schools in Alta Verapaz, Q'eqchi' and Peten Itza Maya in Peten, and the Mayan and Garifuna Q'eqchi' schools in the Municipality of Livingston, Izabal.

Josefina Sequén is an illustrator for MayanToons and also helps prepare illustrations for social media posts and animated videos.

Rosa Sequén is an illustrator for MayanToons and also helps to prepare illustrations for social media posts and animated videos.

Heidy Alejandra Galindo Setina is a designer who diagrams text and photos to create the actual reports.

Laura Morales is preparing animated videos in the style of MayanToons, as animated videos are the best way to help schoolchildren protect ecosystems fragile and endangered species.

Maria José Rabanales She has been part of the Flora y Fauna photographic reportage and educational material editing team since September 2020. He works together with others in the team to prepare the finished pdf editions of the Yaxhá Nakum Naranjo Project material.

Alejandra Valenzuela She is a biology student and is part of the editing team of photographic reports and educational material of Flora and Fauna since September 2020.

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

Cristina Ríos is a design student who joins the editorial design team in December 2020. She will combine the text, images and maps in the editorial criteria of FLAAR Mesoamerica.

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

Sergio Jerez supports us with the identification of plants, bibliographic research and the generation of maps of the routes carried out in the expeditions

Edwin Solares is an environmental engineering student with a strong interest in ecology. He is a photographer and videographer during our expeditions and later edits this content to be able to use it in the materials we generate.

Belén Chacón Her work includes the ordering and tabulation of the useful and edible flora listed in the FLAAR bibliography and many other references, to make a complete list of useful plant species with updated taxonomic information

Diana Sandoval Her work is based on the collection of scientific information that shapes the reports that are published on our pages.

Paula García is part of our MayanToons Animation team. With his work he gives life and sounds to our favorite characters from the jungles, wetlands and savannahs of the region.

Niza Franco is part of our MayanToons Animation team. With his work he gives life and sounds to our favorite characters from the jungles, wetlands and savannahs of the region.

María José Toralla Collects information and bibliographic references to feed our electronic library of Flora & Fauna and support research for reports and websites

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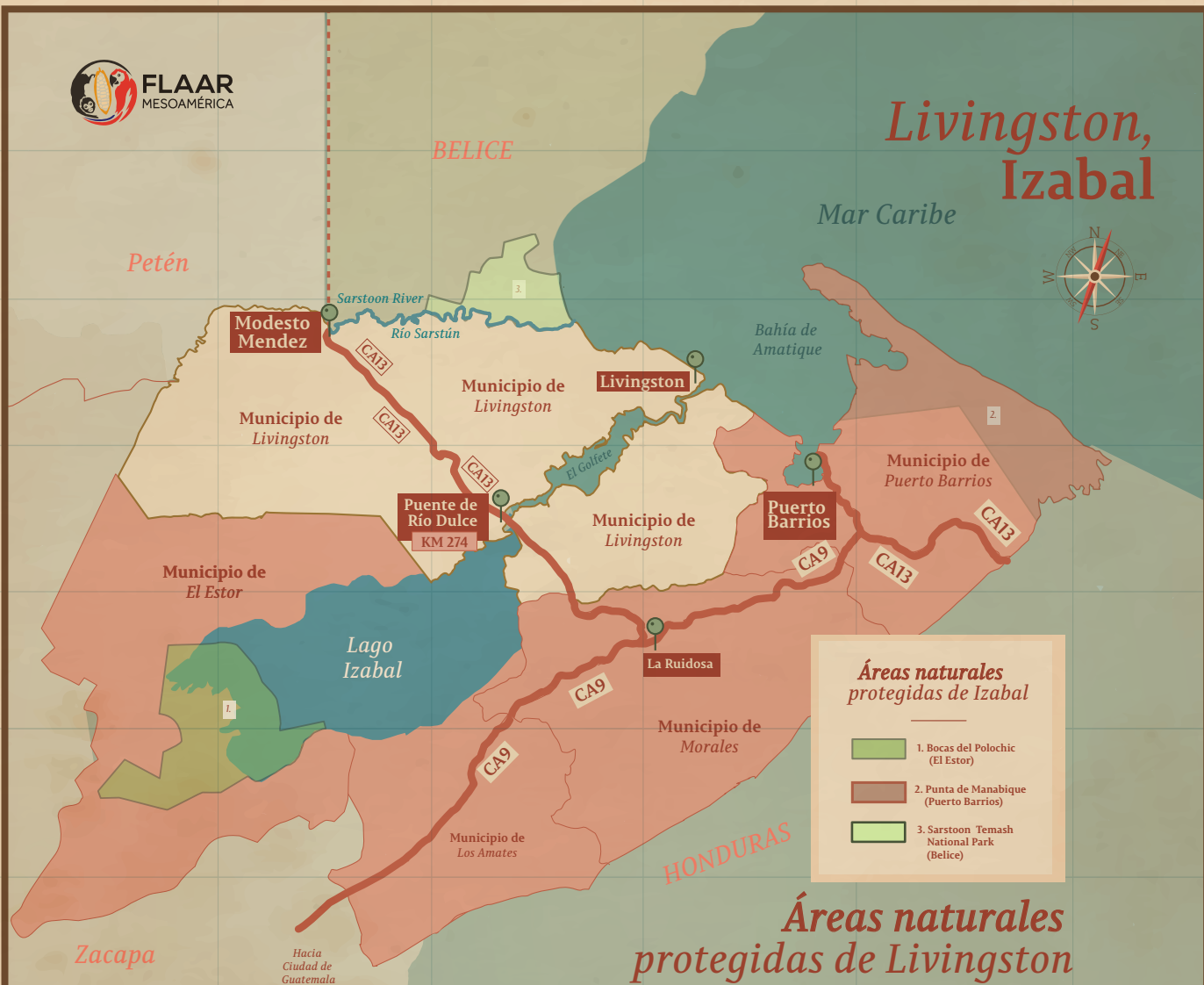
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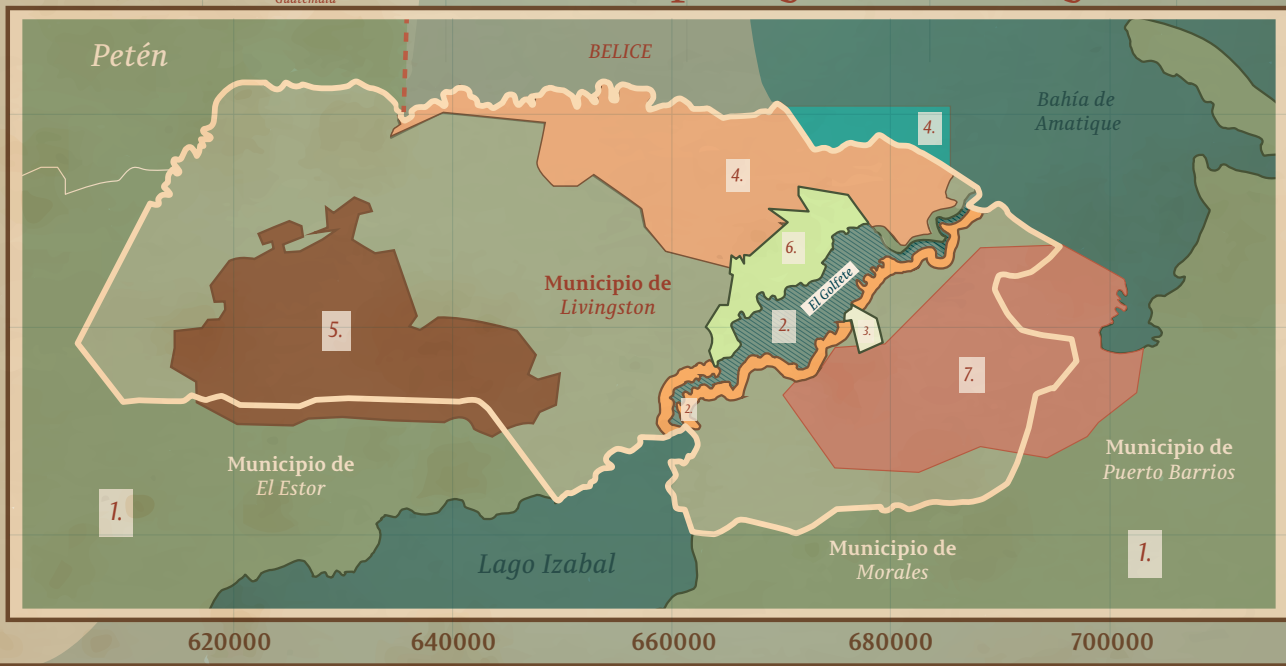
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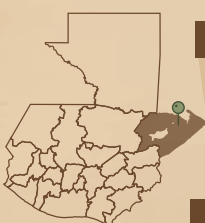
Áreas naturales protegidas de Livingston



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Izabal

- 1. Área sin protección
- 2. Parque Nacional Río Dulce
- 3. El Higuerito
- 4. Área de Usos Múltiples Río Sarstún
- 5. Sierra de Santa Cruz
- 6. Biotopo Protegido Chocón Machacas
- 7. Reserva Protectora de Manantiales Cerro San Gil



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Reserva Natural Tapón Creek, Livingston

Bahía de Amatique

Área de Usos Múltiples
Río Sarstún

Punta
Cocolí

Aldea Buena
Vista Tapon Creek

San Juan

Reserva Natural Tapón Creek
Municipio de Livingston

Siete
Altares

Finca
Gangadiwali

Sarstún Creek

Taponcito
Creek

El Rosario

San
Martin

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Plan Grande
Tatín

Área de Usos Múltiples
Río Sarstún

Biotopo
Chocón Machacas

El Golfete

Parque Nacional
Río Dulce

Izabal



Información de referencia:

- Límites departamentales de Guatemala. (IGN)
- Instituto Geográfico Nacional (IGN) (Hojas 2463 IV y 2463 III)
- Google Map data 2020. Shapes: Sistema Guatemalteco de Áreas Protegidas 2017.
- Cuerpos de agua. Ministerio de Agricultura Ganadería y Alimentación (MAGA)
- Dirección de Análisis Geoespacial del (CONAP), Marzo/2017.



Edible Wetlands Plants of Municipio de Livingston, Izabal

Wetland Series 1: from Swamps, Marshes and Seasonally Inundated Flatlands of Izabal

<p>Cyperus esculentus</p> <p>Chufa, Yellow Nutsedge, Earth Almond</p> <p>MLW#1</p>	<p>Eleocharis geniculata Eleocharis caribaea</p> <p>Caribbean Spike-Rush</p> <p>MLW#2</p>	<p>Montrichardia arborescens</p> <p>Camotillo Water Chestnut</p> <p>MLW#3</p>	<p>Nymphoides indica</p> <p>Floating Heart Water Snowflake</p> <p>MLW#4</p>
<p>Pachira aquatica</p> <p>Zapoton</p> <p>MLW#5</p>	<p>Pontederia cordata</p> <p>Pickereel Weed</p> <p>MLW#6</p>	<p>Sagittaria latifolia</p> <p>Water Potatoes</p> <p>MLW#7</p>	<p>Typha domingensis</p> <p>Cattail</p> <p>MLW#8</p>

Wetland Series 2: plants that grow along the beach shore of Amatique Bay

<p>Amphitecna latifolia</p> <p>Black calabash</p> <p>MLW#9</p>	<p>Coccoloba uvifera</p> <p>Uva del mar</p> <p>MLW#10</p>	<p>Manicaria saccifera</p> <p>Confra, Manaca</p> <p>MLW#11</p>	<p>Chrysobalanus icaco</p> <p>Coco Plum</p> <p>MLW#12</p>	<p>Avicennia germinans</p> <p>Black Mangrove</p> <p>MLW#13</p>	<p>Rhizophora mangle</p> <p>Red Mangrove</p> <p>MLW#14</p>
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Wetland Series 3: plants that grow alongside water: rivers, lagoons, swamps, or ocean

<p>Guadua longifolia</p> <p>Jimba</p> <p>MLW#15</p>	<p>Acoelorrhaphe wrightii</p> <p>Pimientillo, Tasiste, Palmetto Palm</p> <p>MLW#16</p>	<p>Acrostichum aureum</p> <p>Mangrove Fern</p> <p>MLW#17</p>	<p>Annona glabra</p> <p>Alligator Apple</p> <p>MLW#18</p>	<p>Bactris major</p> <p>Huiscoyol Palm</p> <p>MLW#19</p>	<p>Diospyros nigra</p> <p>Zapote negro</p> <p>MLW#20</p>
<p>Grias cauliflora</p> <p>Palo de Jawuilla</p> <p>MLW#21</p>	<p>Inga vera Inga multijuga Inga thibaudiana</p> <p>River Koko</p> <p>MLW#22</p>	<p>Pithecellobium lanceolatum</p> <p>Bastard Bully Tree Chucum Red Fowl</p> <p>MLW#23</p>	<p>Coccoloba belizensis</p> <p>Papaturro</p> <p>MLW#24</p>	<p>Symphonia globulifera</p> <p>Barillo</p> <p>MLW#25</p>	<p>Lacmellea standleyi</p> <p>Lechemiel</p> <p>MLW#26</p>

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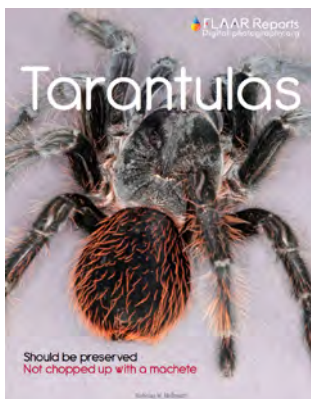
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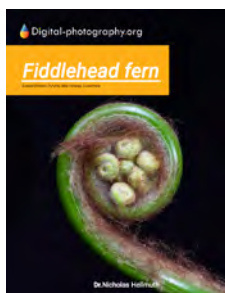
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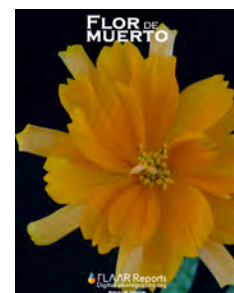
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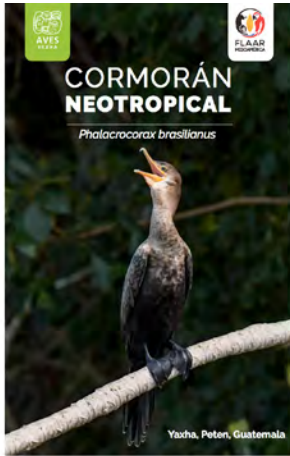
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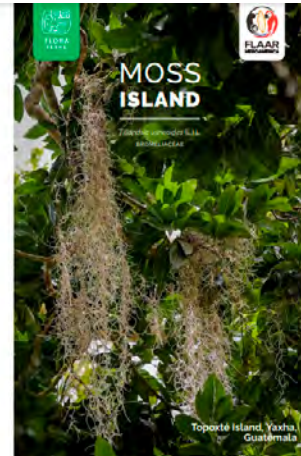
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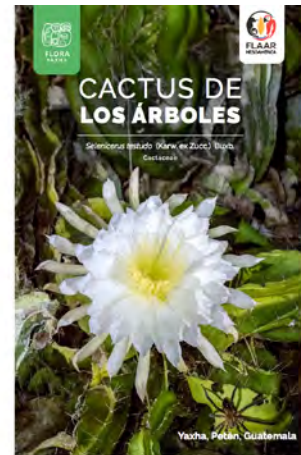
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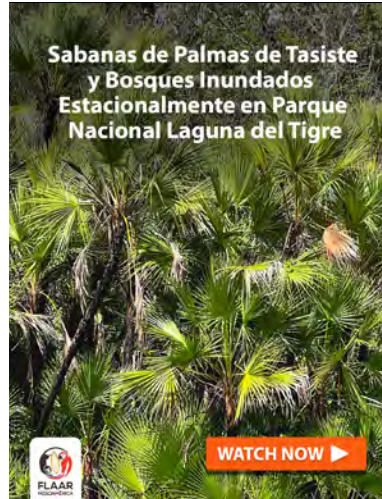
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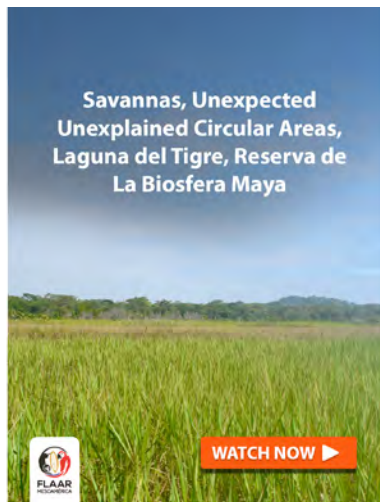
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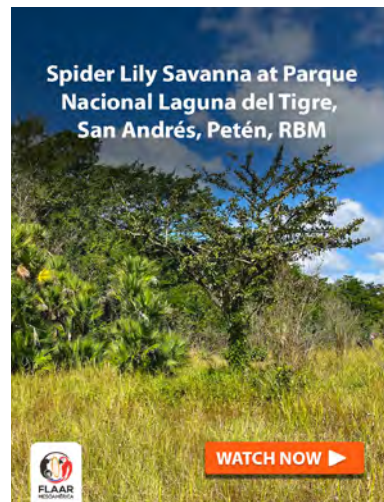
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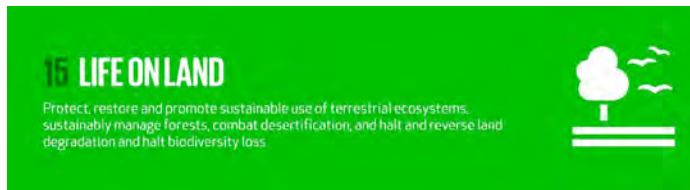


Savannas, Unexpected Unexplained Circular Areas, Laguna del Tigre, Reserva de la Biosfera Maya
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The current Alcalde of Livingston, Mr. Daniel Pinto, together with his team on the Division of International Cooperation, has set the goal of achieving the municipality development in the years 2020-2024 based on the goals and indicators proposed by the 2030 Agenda for Sustainable Development. In this regard, bot FLAAR (USA) and FLAAR Mesoamerica (Guatemala) will collaborate whit this Municipality achieve the Sustainable Development Goal (SDG), number 15 "Life on Land".

Throughout this cooperation project, different materials will be and publishes prepared, as this Photo Essay. These will help to collect information on species, different ecosystems (terrestrial, wetlands and fresh water asociated) and biodiversity. This information will also be useful as it is considered in various conservation estrategias to protect threatened species and prevent their extinction. Moreover, the municipality goals also look forward to promote the sustainable use, conservation and research of the flora and animal species of all terrestrial, wetlands, aquatic shore and coastal associated ecosystems of the Guatemalan Caribbean region. You can learn more about this project and the SDG indicators wich are being pursued at:

<https://flaar-mesoamerica.org/rain-forests-rivers-lakes-bays-ocean-caves-canyons-livingston-the-caribbean-biodiversity-wonderland-of-guatemala/>

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Any school, college, university, botanical garden, zoological garden, botanical or zoological association (or club) may post this report on their web sites, (at no cost) as long as they link back to one of our web sites:

- www.maya-ethnobotany.org
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This report may be cited with this information:

HELLMUTH, Nicholas (2022)
 Edible Mangrove Fern, *Acrostichum aureum*. Municipio de Livingston, Izabal, Guatemala. FLAAR (USA) and FLAAR Mesoamérica (Guatemala). Wetlands series 3: rivers, lagoons, swamps, or ocean, Wetlands #17

BACK COVER PHOTO
Acrostichum aureum.

Photo by: David Arrivillaga, FLAAR Mesoamerica, Dec. 12, 2021, 10:24 a.m. Río Blanco, Livingston, Izabal. Camera: Sony Ag (ILCE-gM2 S. Settings: 1/800; sec; f/g; ISO 640.

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